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Aims and Scope

Turkish Journal of Surgery (Turk J Surg) is the official, peer reviewed, open access publication organ of the Turkish Surgical Association, Turkish Hepatopancreatobiliary Surgery Association and Turkish Association of Endocrine Surgery (TAES). The financial expenses of the journal are covered by the Turkish Surgical Association. The journal is published quarterly on March, June, September and December and its publication language is English.

The aim of Turkish Journal of Surgery is to publish high quality research articles, review articles on current topics and rare case reports in the field of general surgery. Additionally, expert opinions, letters to the editor, scientific letters and manuscripts on surgical techniques are accepted for publication and various manuscripts on medicine and surgery history, ethics, surgical education and forensic medicine fields are included in the journal.

The journal is a surgical journal that covers all specialities and its target audience includes academicians, practitioners, specialists and students from all specialities of surgery.

The editorial and publication processes of the journal are shaped in accordance with the guidelines of the International Committee of Medical Journal Editors (ICMJE), World Association of Medical Editors (WAME), Council of Science Editors (CSE), Committee on Publication Ethics (COPE), European Association of Science Editors (EASE), and National Information Standards Organization (NISO). The journal is in conformity with the Principles of Transparency and Best Practice in Scholarly Publishing (doaj.org/bestpractice).

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All expenses of the journal are covered by the Turkish Surgical Association.

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TURKISH JOURNAL OF SURGERY

Instructions to Authors

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2- Drafting the work or revising it critically for important intellectual content; AND
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4- Agreement to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

In addition to being accountable for the parts of the work he/she has done, an author should be able to identify which co-authors are responsible for specific other parts of the work. In addition, authors should have confidence in the integrity of the contributions of their co-authors.

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Title page: A separate title page should be submitted with all submissions and this page should include:

- The full title of the manuscript as well as a short title (running head) of no more than 50 characters,
- Name(s), affiliations, and highest academic degree(s) of the author(s),
- Grant information and detailed information on the other sources of support,
- Name, address, telephone (including the mobile phone number) and fax numbers, and email address of the corresponding author,
- Acknowledgment of the individuals who contributed to the preparation of the manuscript but who do not fulfill the authorship criteria.

Abstract: English abstract should be submitted with all submissions except for Letters to the Editor. The abstract of Original Articles should be structured with subheadings (Objective, Material and Methods, Results, and Conclusion). Please check Table 1 below for word count specifications.

Keywords: Each submission must be accompanied by a minimum of three to a maximum of six keywords for subject indexing at the end of the abstract. The keywords should be listed in full without abbreviations. The keywords should be selected from the National Library of Medicine, Medical Subject Headings database (https://www.nlm.nih.gov/mesh/MBrowser.html).

Manuscript Types

Original Articles: This is the most important type of article since it provides new information based on original research. The main text of original articles should be structured with Introduction, Material and Methods (with subheadings), Results, Discussion, , Conclusion subheadings. Please check Table 1 for the limitations for Original Articles.

Statistical analysis to support conclusions is usually necessary. Statistical analyses must be conducted in accordance with international statistical reporting standards (Altman DG, Gore SM, Gardner MJ, Pocock SJ. Statistical guidelines for contributors to medical journals. Br Med J 1983: 7; 1489-93). Information on statistical analyses should be provided with a separate subheading under the Material and Methods section and the statistical software that was used during the process must be specified.

Units should be prepared in accordance with the International System of Units (SI).

Expert Opinions: Editorial comments aim to provide a brief critical commentary by reviewers with expertise or with high reputation in the topic of the research article published in the journal. Authors are selected and invited by the journal to provide such comments. Abstract, Keywords, and Tables, Figures, Images, and other media are not included.

Review Articles: Reviews prepared by authors who have extensive knowledge on a particular field and whose scientific background has been translated into a high volume of publications with a high citation potential are welcomed. These authors may even be invited by the journal. Reviews should describe, discuss, and evaluate the current level of knowledge of a topic in clinical practice and should guide future stud-

ies. The main text should contain Introduction, Clinical and Research Consequences, and Conclusion sections. Please check Table 1 for the limitations for Review Articles.

Case Reports: There is limited space for case reports in the journal and reports on rare cases or conditions that constitute challenges in diagnosis and treatment, those offering new therapies or revealing knowledge not included in the literature, and interesting and educative case reports are accepted for publication. The text should include Introduction, Case Presentation, Discussion, and Conclusion subheadings. Please check Table 1 for the limitations for Case Reports.

Surgical Methods: Images of remarkable, striking and rare cases that emphasize the basic mechanisms of diagnosis and treatment of diseases, express discrepancies and extraordinary situations and explain new treatment techniques and options are evaluated for publication. Display items are important in this type of manuscripts and supporting the manuscript with video (in WMV, AVI or MPEG formats) images can facilitate a faster evaluation process and increase the possibility of publication.

Letters to the Editor: This type of manuscript discusses important parts, overlooked aspects, or lacking parts of a previously published article. Articles on subjects within the scope of the journal that might attract the readers' attention, particularly educative cases, may also be submitted in the form of a "Letter to the Editor." Readers can also present their comments on the published manuscripts in the form of a "Letter to the Editor." Abstract, Keywords, and Tables, Figures, Images, and other media should not be included. The text should be unstructured. The manuscript that is being commented on must be properly cited within this manuscript.

Tables

Tables should be included in the main document, presented after the reference list, and they should be numbered consecutively in the order they are referred to within the main text. A descriptive title must be placed above the tables. Abbreviations used in the tables should be defined below the tables by footnotes (even if they are defined within the main text). Tables should be created using the "insert table" command of the word processing software and they should be arranged clearly to provide easy reading. Data presented in the tables should not be a repetition of the data presented within the main text but should be supporting the main text.

Figures and Figure Legends

Figures, graphics, and photographs should be submitted as separate files (in TIFF or JPEG format) through the submission system. The files should not be embedded in a Word document or the main document. When there are figure subunits, the subunits should not be merged to form a single image. Each subunit should be submitted separately through the submission system. Images should not be labeled (a, b, c, etc.) to indicate figure subunits. Thick and thin arrows, arrowheads, stars, asterisks, and similar marks can be used on the images to support figure legends. Like the rest of the submission, the figures too should be blind. Any information within the images that may indicate an individual or institution should be blinded. The minimum resolution of each submitted figure should be 300 DPI. To prevent delays in the evaluation process, all submitted figures should be clear in resolution and large in size (minimum dimensions: 100 × 100 mm). Figure legends should be listed at the end of the main document.

All acronyms and abbreviations used in the manuscript should be defined at first use, both in the abstract and in the main text. The abbreviation should be provided in parentheses following the definition.

When a drug, product, hardware, or software program is mentioned within the main text, product information, including the name of the product, the producer of the product, and city and the country of the company (including the state if in USA), should be provided in parentheses in the following format: "Discovery St PET/CT scanner (General Electric, Milwaukee, WI, USA)"

All references, tables, and figures should be referred to within the main text, and they should be numbered consecutively in the order they are referred to within the main text.

Limitations, drawbacks, and the shortcomings of original articles should be mentioned in the Discussion section before the conclusion paragraph.

References

While citing publications, preference should be given to the latest, most up-to-date publications. If an ahead-of-print publication is cited, the DOI number should be provided. Authors are responsible for the accuracy of references. Journal titles should be abbreviated in accordance with the journal abbreviations in Index Medicus/ MEDLINE/PubMed. When there are six or fewer authors, all authors should be listed. If there are seven or more authors, the first six authors should be listed followed by "et al." In the main text of the manuscript, references should be cited using Arabic numbers in parentheses. The reference styles for different types of publications are presented in the following examples.

Journal Article: Rankovic A, Rancic N, Jovanovic M, Ivanović M, Gajović O, Lazić Z, et al. Impact of imaging diagnostics on the budget - Are we spending too much? Vojnosanit Pregl 2013; 70: 709-711.

Table 1. Limitations for each manuscript type

Type of manuscript	Word limit	Abstract word limit	Reference limit	Table limit	Figure limit
Original Article	5000	250 (Structured)	50	6	7 or total of 15 images
Review Article	5000	250	50	6	10 or total of 20 images
Case Report	1500	250	15	No tables	10 or total of 20 images
Surgical Methods	500	No abstract	5	No tables	10 or total of 20 images
Letter to the Editor	500	No abstract	5	No tables	No media

Book Section: Suh KN, Keystone JS. Malaria and babesiosis. Gorbach SL, Barlett JG, Blacklow NR, editors. Infectious Diseases. Philadelphia: Lippincott Williams; 2004.p.2290-308.

Books with a Single Author: Sweetman SC. Martindale the Complete Drug Reference. 34th ed. London: Pharmaceutical Press; 2005.

Editor(s) as Author: Huizing EH, de Groot JAM, editors. Functional reconstructive nasal surgery. Stuttgart-New York: Thieme; 2003.

Conference Proceedings: Bengisson S. Sothemin BG. Enforcement of data protection, privacy and security in medical informatics. In: Lun KC, Degoulet P, Piemme TE, Rienhoff O, editors. MEDINFO 92. Proceedings of the 7th World Congress on Medical Informatics; 1992 Sept 6-10; Geneva, Switzerland. Amsterdam: North-Holland; 1992. pp.1561-5.

Scientific or Technical Report: Cusick M, Chew EY, Hoogwerf B, Agrón E, Wu L, Lindley A, et al. Early Treatment Diabetic Retinopathy Study Research Group. Risk factors for renal replacement therapy in the Early Treatment Diabetic Retinopathy Study (ETDRS), Early Treatment Diabetic Retinopathy Study Kidney Int: 2004. Report No: 26.

Thesis: Yılmaz B. Ankara Üniversitesindeki Öğrencilerin Beslenme Durumları, Fiziksel Aktiviteleri ve Beden Kitle İndeksleri Kan Lipidleri Arasındaki Ilişkiler. H.Ü. Sağlık Bilimleri Enstitüsü, Doktora Tezi. 2007.

Manuscripts Accepted for Publication, Not Published Yet: Slots J. The microflora of black stain on human primary teeth. Scand J Dent Res. 1974.

Epub Ahead of Print Articles: Cai L, Yeh BM, Westphalen AC, Roberts JP, Wang ZJ. Adult living donor liver imaging. Diagn Interv Radiol 2016 Feb 24. doi: 10.5152/dir.2016.15323. [Epub ahead of print].

Manuscripts Published in Electronic Format: Morse SS. Factors in the emergence of infectious diseases. Emerg Infect Dis (serial online) 1995 Jan-Mar (cited 1996 June 5): 1(1): (24 screens). Available from: URL: http:/ www.cdc.gov/ncidodIEID/cid.htm.

REVISIONS

When submitting a revised version of a paper, the author must submit a detailed "Response to the reviewers" that states point by point how each issue raised by the reviewers has been covered and where it can be found (each reviewer's comment, followed by the author's reply and line numbers where the changes have been made) as well as an annotated copy of the main document. Revised manuscripts must be submitted within 30 days from the date of the decision letter. If the revised version of the manuscript is not submitted within the allocated time, the revision option may be canceled. If the submitting author(s) believe that additional time is required, they should request this extension before the initial 30-day period is over.

Accepted manuscripts are copy-edited for grammar, punctuation, and format. Once the publication process of a manuscript is completed, it is published online on the journal's webpage as an ahead-of-print publication before it is included in its scheduled issue. A PDF proof of the accepted manuscript is sent to the corresponding author and their publication approval is requested within 2 days of their receipt of the proof.

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TURKISH JOURNAL OF SURGERY

Contents

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Editorial

As the family of Turkish Surgical Journal, we are happy to complete our 33rd year successfully.

We are sure of that we will publish next issues more hopefully and more ambitiously with the supports of Turkish Surgical Association, which is one of the biggest professional organizations in our country, and with the close interests of our valuable colleagues.

With the contributions of a great number of qualified articles that have been submitted by you in the last one year, a serious increase has occurred in the readability and citation rate of our journal. Our main goal within this period is to be scanned by international indices.

Last year, we made some innovations. First of all, we accomplished to publish our journal completely in English. Besides that, we provided the submitted articles to be assessed quickly and the process to be completed as soon as possible. Our journal is periodically published four times a year and we paid strict attention to publish them on time. In the following issues, we will continuously improve the quality of our journal by working meticulously. This is the first issue of the 34th volume and it includes a wide review that examines the problem of disejaculation, which is a rare complication of hernia surgery. Moreover, it includes 3 articles about hernias and studies on the other areas of surgery.

I would like to request you to submit your high-quality clinical and experimental studies to our journal and to refer the articles published in our journal in your other studies published in other journals.

Hoping a future better than today, I wish you healthy and happy days.

Wish you success in your studies.

Prof. Mustafa ŞAHİN

Editor in chief

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Review

An overlooked complication of the inguinal hernia repair: Dysejaculation

İlhan Ece, Hüseyin Yılmaz

ABSTRACT

The objective of this study was to investigate the rate of post-herniorrhaphy dysejaculation in the current literature. A comprehensive search of PubMed, Medline, Google Scholar, and Google databases was performed using the keywords "groin hernia and chronic pain," "inguinal hernia and chronic pain," "dysejaculation," and "ejaculatory pain." The eligible studies were evaluated in terms of ejaculatory pain and surgical technique used. Ten studies with 122 patients were eligible for the analysis. The rate of ejaculatory pain for a total of 5521 patients was found to be 2.2%. The incidence of postoperative ejaculatory pain was found to be 2.1% following laparoscopic techniques and 1.1 % following open repair. Open techniques were not related to the increased frequency of dysejaculation. Sufficient data could not be obtained from the studies for the ejaculatory pain, and thus, no statistical evaluation was performed. Dysejaculation is a common cause of postoperative morbidity after inguinal hernia repair. Attention to technical details of the primary operation may reduce the incidence of dysejaculation.

Keywords: Ejaculatory pain, herniorrhaphy, inguinal hernia, sexual dysfunction

INTRODUCTION

Inguinal hernia repair is one of the most widely performed surgical procedures in the world. This procedure has several complications that can result in the reduction in the quality of life and sexual activity (1, 2). The most commonly known long-term complications after inguinal hernia repair are recurrent hernia and chronic pain. After inguinal hernia repair, chronic pain-related sexual dysfunction may occur in 2%– 3% of the males (3). However, dysejaculation or painful ejaculation is a neglected issue after this procedure. Post-herniotomy dysejaculation was first described by Bendavid as a painful, burning, or searing sensation during ejaculation (4). Ejaculatory pain is often located at the superficial inguinal ring that can last from a few minutes to several hours. Although dysejaculation is a rare complication of pure tissue repairs, the incidence of dysejaculation has increased with the widespread use of meshes for inguinal hernia repair. The reported rate of dysejaculation is approximately 3%-4% after mesh herniorrhaphy (5). Patients may even hesitate to report their sexual function, and thus, the actual incidence of dysejaculation may be even higher-than-reported. The aim of this study was to review the existing literature existing to date regarding the dysejaculation after open and laparoscopic inguinal hernia repair.

METHODS

A comprehensive search of the PubMed, Medline, Google Scholar, and Google databases was performed including the following keywords: groin hernia and chronic pain, inguinal hernia and chronic pain dysejaculation and ejaculatory pain. The search accrued data between January 2000 and December 2017. All instances of abstracts, case reports, letters to the editor, and original articles published in English language in peer-reviewed journals were evaluated. Moreover, the reference lists for relevant articles were reviewed. Repetitive articles or patient groups were excluded. Articles with insufficient information or insufficient data on patients' characteristics were also excluded. The inclusion criteria were post-herniorrhaphy ejaculatory pain in sexually active male patients. Patients with chronic inguinal pain were excluded because the pain is not related to ejaculation. Of the 17.121 articles, only 10 met the inclusion criteria; hence, a total of 122 patients were identified (Figure 1). All patients had complained about pain during or after ejaculation. Table 1 presents the following information: first author surname, year of publication, total number of sexually active patients, number of patients with dysejaculation, number of patients with postoperative sexual pain, number of patients with preoperative sexual pain, surgical technique, and median follow-up period of each study. Most of the current studies focused on chronic inguinal pain. Thus, sufficient data could not be obtained on ejaculatory pain; thus, no statistical evaluation was performed. Information regarding the rate of postoperative dysejaculation and sexual pain, surgical technique, and follow-up period was collected to assess surgical outcomes.

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Table 1. Outcomes of 10 studies related to dysejaculation following inguinal hernia repair in the literature published from January 2000 to December 2017

Author	Total number of sexually active patients*	Number of patients with painful ejaculation**	Number of patients with postoperative sexual pain**	Number of patients with preoperative sexual pain**	Surgical technique*	Follow-up period (months)
Bischoff et al. (3) (2012)	1172	25 (2.1)	88 (7.5)	-	TAPP	39
Aasvang et al. (6) (2010)	442	4 (1.6) Lichtenstein 1 (0.5) TAPP	25 (5.6)	52 (11.7)	244 Lichtenstein 198 TAPP	6
Aasvang et al. (5) (2006)	1015	41 (4.0)	68 (6.7)	-	NA	
Tolver et al. (7) (2015)	113	1 (0.9)	11 (9.7)	29 (25.6)	TAPP	6
Nienhuijs et al. (8) (2007)	166	1 (0.6) Lichtenstein 0 Kugel	-	-	84 Lichtenstein 82 Kugel	3
Negro et al. (9) (2011)	520	1 (0.2)	-	-	Lichtenstein	12
Schouten et al. (10) (2012)	386	3 (0.7)	35 (9.0)	82 (21.2)	TEP	27
Andresen et al. (11) (2017)	259	3 (2.3) Onstep 4 (3.1) Lichtenstein	17 (6.5) Onstep 30 (11.5) Lichtenstein	-	130 Onstep 129 Lichtenstein	6
Burgmans et al. (12) (2015)	429	7 (1.6)	6 (1.3)	154 (35.9)	TEP	12
Pommergaard et al. (139 (2017)	1019	31 (3.0)	115 (11.2)	-	TAPP	31

* : n, ** : n (%), NA: not available; TAPP: transabdominal pre-peritoneal; TEP: totally extraperitoneal repair

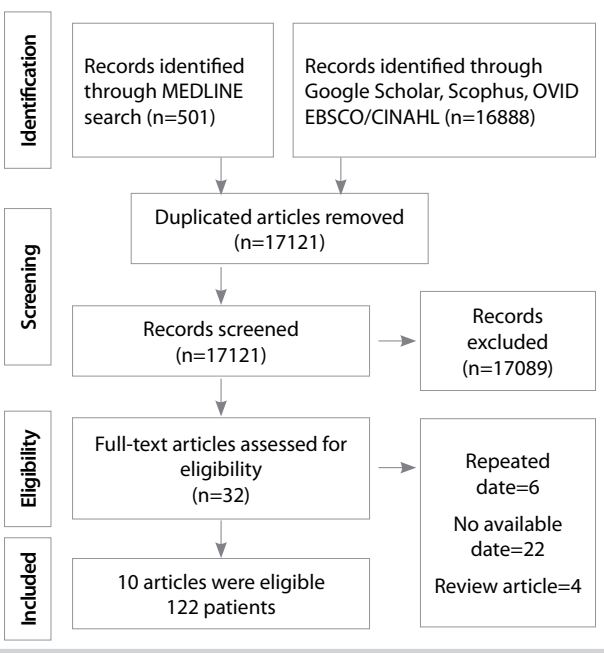

Figure 1. Flowchart of included studies

RESULTS

A total of 17,389 articles were identified from the databases. Duplicate articles and titles or keywords of the articles that did not meet the search criteria of the study were excluded. Thirty-two articles were included for further assessment. After the review of full-text articles, 10 articles were included for the final evaluation. A total of 5521 patients who underwent inguinal hernia repair were identified, and dysejaculation was reported for 122 patients in 10 studies (3, 5-13).

A total of 3317 patients underwent laparoscopic inguinal hernia repair and 1189 patients were subjected to an open inguinal hernia repair. Transabdominal pre-peritoneal (TAPP), totally extraperitoneal repair (TEP), Lichtenstein, Kugel, and Onstep repair techniques were performed on 2502, 815, 977, 82, and 130 patients, respectively. The rate of ejaculatory pain was found to be 2.2% for a total of 5521 patients. For laparoscopically treated patients, the incidence of dysejaculation was higher with TAPP repair than with TEP repair technique (1.2% vs. 2.4%). No dysejaculation was detected in patients who underwent Kugel operation. However, this group of patients constituted only 1.4% of the total cohort. Only 82 patients had been operated with Kugel technique, and this limitation should be considered while interpreting the study results. In contrast to our current knowledge, open techniques are not related to increased frequency of dysejaculation. The incidence of postoperative ejaculatory pain was calculated to be 2.1% (71 of 3317) for laparoscopic techniques and 1.1% (13 of 1189) for open repair. Eight of the 10 studies mentioned postoperative sexual pain, and the incidence of post-herniorrhaphy sexual pain was determined to be 8.2% (395 of 4835 patients). Preoperative sexual pain with an incidence of 23.1% was reported in only four of the studies comprising 317 patients in total.

DISCUSSION

Chronic inguinal pain is the well-known long-term complication of inguinal hernia repair. Moderate or severe chronic inguinal pain could cause a decreased sexual function of some patients. Dysejaculation was defined as a searing or burning sensation just prior to, during, or after ejaculation and is an ignored symptom after inguinal hernia repair. Pain is usu-

ally experienced on the superficial ring of the inguinal canal. Recently, the incidence of dysejaculation has reportedly increased because of the routine use of meshes for inguinal herniorrhaphy. Loos et al. classified the post-herniorrhaphy pain syndromes into three groups: neuropathic pain, non-neuropathic pain, and pain possibly related to spermatic cord (14). Neuropathic pain is an activity-induced, sharp pain combined with trigger point and signs of a neurophysiological disequilibrium. It is caused by the compression of the nerves in the inguinal region with mesh or fibrosis, and half of these patients benefit from peripheral nerve blocks. Surgical removal of the mesh and transection of the nerves may be a successful way for the treatment. Incorrectly positioned deep suture on the pubic tubercle, recurrent hernia, or a missed femoral hernia could be a cause of non-neuropathic pain. An implanted mesh may also implement mechanical pressure on neighboring structures or may fold or wrinkle (meshoma), causing chronic pain (15). Spermatic cord-related pain occurs when the spermatic cord and vas deferens compress and fold with mesh and fibrosis. Sexual pain is the development of pain and hyperesthesia during erection and sexual contact. Pain is experienced on the inguinal region, suprapubic region, glans, and/or scrotal skin. Ejaculatory pain is only associated with ejaculation. The main problem is that the vas deferens becomes swollen due to the fibrosis of the mesh in the inguinal region of the patients. Intraluminal strictures and extraluminal adhesions creating a sharp, sinuous course of the vas may prevent the flow of the semen (4). Recent studies have suggested that the risk of dysejaculation can be reduced with laparoscopic techniques, especially with the non-invasive mesh fixation and use of lightweight meshes (3). Heavy patches increase the frequency of post-herniorrhaphy chronic inguinal pain as a result of ilioinguinal and iliohypogastric nerve compression with the increase of inflammation in the inguinal region (16).

The innervation of the vas deferens originates from the genitofemoral nerve of the genitalia, pelvic, and testicular plexus. Seminal vesicle and vas deferens help in ejaculation by peristaltic movements. The rhythmic contractions of the vas deferens and the tension that emerges from the semen are the main causes of pain. Direct contact of the mesh with vas deferens results in inflammation leading to pain during ejaculation (17). Verhagen et al. demonstrated that a majority of patients (67%) experienced pain both during and after ejaculation, and 12% of patients reported only pain during ejaculation (18). The remaining 21% felt pain just after ejaculation. Pain sometimes lasted for 1 min after ejaculation and sometimes persisted for up to 2 days. In a great majority of patients, maximum pain was experienced on the external inguinal annulus and rarely spread to the scrotum and glans (19). In addition, the rate of patients exposed to postoperative painful ejaculation was much higher than expected. However, moderate-to-severe pain (2.8%) causes sexual dysfunction in patients and requires medical attention (19).

A majority of studies reported that laparoscopic surgical techniques cause less sexual pain than open repair (20). However, the effects of laparoscopic procedures on dysejaculation are not clear. Only one study comparing open and laparoscopic repair reported less postoperative dysejaculation rate for laparoscopic repair (6). The analysis of 10 studies showed that the open techniques were not clearly associated with the increase in dysejaculation rate. Bischoff et al. performed a nationwide questionnaire-based study and reported that dysejaculation occurring after laparoscopic repair was present in nearly 25 (3.1%) of 805 patients (3) and 19 (2.4%) patients reported that the pain had impaired their sexual activity to a moderate or a severe degree. Nevertheless, Aasvang et al. (6) reported an incidence of 0.5%, and Bittner et al. (21) reported 1% dysejaculation rate following TAPP repair. In a study conducted by Pommergaard et al. in 1421 sexually active patients, it was found that the use of fibrin glue and tacker during TAPP repair did not differ between the frequency, spread, and severity of ejaculatory pain (12). Aasvag et al. reported that the operations for recurrence are associated with more frequent ejaculatory pain (9.8% vs. 3.4%) (5).

Most of the studies demonstrated that there are patients with preoperative ejaculatory pain due to inguinal hernia. The study conducted by Burgmans et al. involving 473 patients that used TEP hernia repair technique revealed a preoperative dysejaculation in 10 patients and complaints of almost eight patients disappeared within 6–12 weeks (13). However, seven new dysejaculation cases were detected post-operatively. Aasvang et al. reported a TAPP series of 442 (244 open surgery, 198 laparoscopic surgery) patients (6). There was a preoperative history of dysejaculation in six patients, whereas complaints of five patients were disappeared in the follow-up of 6 months. But five new patients experienced an ejaculatory pain (four open vs. one laparoscopic).

DIAGNOSIS

The primary diagnostic tool for dysejaculation is a carefully obtained patient history. Physical examination is normal in a majority of patients (22). Pain is always localized to the inguinal region and radiates from the deep to the superficial region. The decrease of libido and erectile function due to pain is not uncommon. Aasvang et al reported that pressure-pain detection and tolerance thresholds were significantly lower in the dysejaculatory patients and all patients mentioned their maximum pain on the external inguinal annulus. (19). Although magnetic resonance examination may show spermatic cord pathology, cord edema, and increased spermatic cord caliber (23), there was no radiographic difference between chronic inguinal pain and dysejaculatory patients.

TREATMENT

Despite the lack of adequate data in literature, it is appropriate to initiate medical treatment similar to the peripheral neuropathies. In the first step, tricyclic antidepressants and serotonin reuptake inhibitors could be preferred. Gabapentin and pregabalin may be subsequently added to the treatment. Opioids of the tramadol or oxycodone may be useful when the pain cannot be controlled (24). Surgical treatment is often suggested for moderate-to-severe ejaculatory pain syndrome that cannot be controlled by medical treatment. On the basis of surgical treatment for neuropathic pain, it is a preferred method to surgically remove the twisted mesh in the shrinking wound bed and decompressing the vas deferens (25). A strangulated vas deferens and dilation of the cord blood vessels could be seen in the inguinal area (26). Routine removal of the ilioinguinal and iliohypogastric nerves and genitofemoral nerves during this procedure is recommended to prevent neuropathic pain that may occur after the procedure (16).

CONCLUSION

Dysejaculation is a common complication after inguinal hernia repair. Generally, moderate-to-severe pain scores decrease the quality of life and impair the sexual functions in the patients. The rate of dysejaculation is not seemingly associated with the type of surgery. Surgical technique, type of implanted meshes, and mesh fixation materials could be effective for the development of post-herniorrhaphy dysejaculation.

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Evaluation of stressors in intensive care units

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ABSTRACT

Objective: Physical and psychological stressors adversely affect the treatment and length of stay of patients in intensive care units. In this study, we aimed to describe environmental and psychological stressors affecting intensive care unit patients and to determine their priorities.

Material and Methods: In this study, the 40-item Intensive Care Unit Environmental Stressor Scale was administered to patients in the General Surgery Intensive Care Unit and the Anesthesiology and Reanimation Intensive Care Unit. The patients' age, gender, marital status, educational status, cause of hospitalization, and intensive care unit length of stay were questioned and recorded. Acute Physiology And Chronic Health Evaluation II scores were determined for intensive care unit patients.

Results: A total of 98 patients, 80 in the General Surgery Intensive Care Unit and 18 in the Anesthesiology and Reanimation Intensive Care Unit, were included in the study between May 1, 2015 and October 31, 2015. Fifty-six of the patients were male (57.1%) and 42 were female (42.9%). The mean age of the patients was 55.1±15.1 years. The mean intensive care unit length of stay was 3.4±1.6 days. The median Acute Physiology And Chronic Health Evaluation II score of the patients was 6 (0 to 17). The patients were most affected by thirst (mean 2.44). The second most stressful stress factor was the presence of tubes in the mouth and nose (mean 2.25). The least stressful factor for the patients was the presence of nurses constantly performing activities around the bed. Although 51% of the patients were postoperative, pain was ranked 5th among stress factors.

Conclusion: The environmental and psychological factors affecting intensive care unit patients varied according to age, sex, and educational and surgical status. These factors had adverse effects on the patients. The elimination or modification of these factors would contribute positively to the treatment of intensive care unit patients and shorten their length of stay in the intensive care unit.

Keywords: Environmental, intensive care, psychological, stress

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INTRODUCTION

The intensive care unit (ICU) is a new and different environment for patients. Patients are exposed to unusual sounds and smells in the ICU. An unfamiliar medical team provides care for these patients (1, 2). The treatment process of the intensive care patient is extended to these external factors by adding psychological factors such as not being able to fully understand the disease, having no information about the treatment process and being away from the family (3, 4). Factors such as pain, unfamiliar and unusual noises, and constant ambient light disturb the sleeping patterns of critically ill ICU patients. Sleep disturbances can elevate blood pressure, impair immune system function, and lead to a negative nitrogen balance. Delirium is a common disorder in ICUs. Although the impact of the environment on delirium is not clear, it has been stated that the ICU environment may be a contributing factor to the development of delirium (5-7). The addition of conditions such as sleep disturbance and delirium triggered by environmental factors to existing medical conditions has negative effects on the treatment process of disease. Environmental stressors vary according to factors such as age, sex, and educational and surgical status (4). Therefore, describing the physical and psychological factors affecting ICU patients and determining their degrees of influence are important for effective follow-up and treatment.

In this study, we aimed to describe environmental and psychological factors affecting ICU patients using the Intensive Care Unit Environmental Stressor Scale (ICUESS) and to determine the priorities of these factors, especially in patients who did and did not undergo surgery.

MATERIAL AND METHODS

This study was approved by the Non-interventional Clinical Research Ethics Board of Hacettepe University Faculty of Medicine. The ICUESS was administered to patients in the General Surgery Intensive Care Unit (GSICU) and the Anesthesiology and Reanimation Intensive Care Unit (ARICU) in Hacettepe University School of Medicine. The patients' age, gender, marital status, educational status, cause of hospitalization, and ICU length of stay were questioned and recorded. APACHE II scores were determined for the ICU patients.

Patient Group

Patients who were hospitalized from 24 hours to 7 days between May 1, 2015 and October 31, 2015 in the GSICU with nine beds and the ARICU with four beds in Hacettepe University Faculty of Medicine were enrolled in the study. Patients who were under 18 years of age, had persistent neurological damage, had psychological problems, whose general condition prevented them from answering questions, and who had previously stayed in the ICU were excluded from the study. Written consent was obtained from the patients who participated in the study.

The Intensive Care Unit Environmental Stressor Scale

The validity and reliability of the scale administered in the study were determined by Ballard (8) and Nastasy (9). Permission was obtained to use the scale at the beginning of the study. The ICUESS was translated into Turkish and culturally adapted before its application. The scale was translated from English to Turkish by two independent persons. 10 persons from different socio-cultural levels compared the two translations. A group of hospital staff, patient and patients relatives made choices in terms of independence of the individual, more easily understood from the word differences between the translators A Turkish version of the scale was created by the two independent translators; also, the Turkish version of the scale was re-translated into English by a different person. An independent person with good English skills compared the translation to the original scale and supervised the translation. The Turkish version of the scale was administered to ICU patients, and its clarity was confirmed. The patients were informed about the scale before it was applied. The patients were asked 40 questions. Each question in the scale was assessed as (1) not stressful; (2) moderately stressful; (3) very stressful; or (4) extremely stressful.

Statistical Analysis

The data were evaluated using Statistical Package for the Social Sciences version 15.0 software (SPSS Inc.; Chicago, IL, USA). The variables were investigated using visual (histogram and probability plots) and analytical (Kolmogorov-Smirnov/Shapiro-Wilk tests) methods to determine whether they were normally distributed. The descriptive analyses were presented using mean and standard deviation for normally distributed variables. Cross-tabulations were performed for age, gender, marital status, educational and surgical status, and ICU length of stay with the stress factors on the scale. The difference between the groups was compared using the chi-square test or Fisher's exact test. p-values less than 0.05 were considered statistically significant.

RESULTS

A total of 98 patients, 80 in the GSICU and 18 in the ARICU, were included in the study between May 1, 2015 and October 31, 2015. Fifty-six patients were male (57.1%) and 42 were female (42.9%). The mean age of the patients was 55.1±15.1 years. The mean ICU length of stay was 3.4±1.6 days. The median APACHE II score of the patients was 6 (0 to 17). Fifty-one per cent of the patients were postoperative (50 patients); 49% of the patients were medical (48 patients). The rates of illiteracy, literacy, and elementary, middle school, high school, and university education were 10.2%, 4.1%, 28.6%, 8.2%, 14.3%, and 34.7%, respectively.

Table 1. Ranking of stressors

	Mean
1- Thirst	2.44
2- Presence of tubes in the nose or mouth	2.25
3- Not being in control of yourself	2.22
4- Inability to sleep	2.11
5- Pain	2.05
6- Inability to move hands due to i.v. line	1.98
7- Seeing family and friends for only a few minutes each day	1.91
8- Being in a room that is too hot or too cold	1.85
9- Having lights on constantly	1.70
10- Having to look at the pattern of holes in the ceiling	1.66
11- Unfamiliar and unusual noises	1.64
12- Being aware of unusual smells around you	1.63
13- Hearing buzzers and alarms from machinery	1.62
14- Hearing other patients cry out	1.59
15- Missing husband or wife	1.58
16- Not knowing when to expect things will be done to you	1.56
17- Being stuck with needles	1.54
18- Not having treatments explained to you	1.53
19- Uncomfortable bed and/or pillow	1.49
20- Being bothered	1.46
21- Having to wear oxygen	1.46
22- Not knowing what time it is	1.46
23- Not knowing what day it is	1.39
24- Having blood pressure taken often each day	1.38
25- Having the team use words you cannot understand	1.34
26- Nurses and doctors talking too loudly	1.34
27- Being cared for by unfamiliar doctors	1.27
28- Hearing the heart monitor alarm go off	1.26
29- Being awakened by nurses	1.25
30- Having strange machines around you	1.21
31- Not having the nurses introduce themselves	1.19
32- Constantly being examined by doctors and nurses	1.19
33- Feeling the nurses are watching the machines more closely than they are watching you	1.15
34- Lack of privacy	1.14
35- Having nurses be in too much of a hurry	1.13
36- Seeing i.v. bags hanging over your head	1.13
37- Not knowing where you are	1.11
38- Hearing the telephone ring	1.10
39- Being tied down by tubes	1.10
40- Presence of nurses constantly performing activities around your bed	1.09

The patients were most affected by thirst (mean 2.44). The second most stressful factor was the presence of tubes in the mouth and nose (mean 2.25). The least stressful factor was the presence of nurses constantly performing activities around the bed (Table 1). Postoperative patients were most affected

Table 2. Ranking of stressors among postoperative patients and medical patients

Postoperative patients	Mean	Medical patients	Mean
1- Thirst	2.61	1- Thirst	2.27
2- Presence of tubes in the nose or mouth	2.44	2- Not being in control of yourself	2.27
3- Not being in control of yourself	2.17	3- Being in a room that is too hot or too cold	2.18
4- Inability to sleep	2.10	4- Inability to sleep	2.12
5- Pain	2.06	5- Inability to move your hands due to i.v. line	2.10

Table 3. Ranking of stressors among age ≤40 and age> 40 ICU patients

Age ≤40 ICU patients	Mean	Age >40 ICU patients	Mean
1- Seeing family and friends for only a few minutes each day	2.67	1- Thirst	2.48
2- Thirst	2.28	2- Presence of tubes in the nose or mouth	2.25
3- Presence of tubes in the nose or mouth	2.24	3- Not being in control of yourself	2.23
4- Not being in control of yourself	2.18	4- Inability to sleep	2.14
5- Pain	2.06	5- Pain	2.05

ICU: intensive care unit

by thirst (mean 2.61). Medical patients were most affected by thirst and not being in control of themselves (mean 2.27) (Table 2). Pain was the fifth greatest stressor in postoperative patients (mean 2.04). There was no statistically significant difference between patients who did and did not undergo surgery in terms of pain (p=0.65) and inability to sleep (p=0.94).

There was no statistically significant difference between college graduates and non-college graduates in terms of lack of privacy (p=0.27). There was no statistically significant difference between male and female patients in terms of lack of privacy (p=0.07). Patients over the age of 40 were most affected by thirst (mean 2.48). Patients under the age of 40 were most affected by seeing family and friends for only a few minutes each day (mean 2.67) (Table 3). Male patients were most affected by thirst, followed by the presence of tubes in the mouth and nose. Female patients were most affected by not being in control of themselves and the presence of tubes in the mouth and nose, respectively.

DISCUSSION

Patients are exposed to psychological factors such as separation from family, dependence on bed and health personnel, and environmental factors such as unfamiliar devices, sounds, and smells in the ICU. Studies on determining the priorities of these physical and psychological factors and eliminating them in ICU patients would contribute positively to the treatment process of ICU patients.

Cornock (10) stated that thirst was the most common stressor and the presence of tubes in the mouth and nose was the second most common stressor. In our study, thirst was the most common stressor. Cochran and Ganong (11) found that the presence of tubes in the mouth and nose was the most disturbing stress factor for patients. Similarly, Hweidi et al. (1) found that the presence of tubes in the mouth and nose was the most disturbing stress factor for patients. In our study, we found that the presence of tubes in the mouth and nose was the second most common stress factor, in accordance with the study by Cornock (10).

Failure to detect or treat pain can lead to complications involving the cardiovascular, pulmonary, and neurological systems. Good pain control decreases these complications (12). In Malaysia, Soh et al. (13) found that pain was the most frequent complaint of patients. In our study, although 51% of the patients were postoperative, pain was ranked 5th among stress factors. There was no statistically significant difference between postoperative and medical ICU patients in terms of pain. The low pain ranking suggested that sufficient pain control was provided because pain was frequently assessed with various scoring systems in our ICU.

We found that ICU patients were less affected by the presence of unfamiliar devices, smells and noise. This situation suggested that awareness of critical illness and intensive care have increased. In our study, approximately 50% of the patients were high school and college graduates. We believe that the high level of education contributed to the fact that the patients were less affected by these stressors. We found that most of the patients had already been followed up by doctors and nurses; therefore, they were less anxious about their situations and futures. The least stressful factor for the patients was the presence of nurses constantly performing activities around the bed. We believe that the patients had confidence in the doctors and nurses.

Intensive care unit patients are often bedridden; also, their basic needs are met by medical personnel. Lack of privacy can be a stressor for patients (14). In our study, lack of privacy was ranked 34th among the stress factors in the ICU. There was no statistically significant difference between male and female patients regarding lack of privacy. There was no statistically significant difference between college graduates and non-college graduates regarding lack of privacy. This situation suggested that curtains/screens are frequently used in the ICUs, nurses and health personnel consider the discomfort patients may experience due to their physical condition when planning patient care, and a relaxing environment is provided for patients. Intensive care units are noisy environments due

to the nature of the working environment and the technical equipment and alarms used. Noise and light in the ICU cause sleep disorders in patients (15). Inability to sleep in the ICU was ranked 4th among the stress factors in our study. In China, So and Chan (16) stated that inability to sleep was ranked 3rd among stress factors.

The ICU is a stressful environment with many environmental and psychological factors that affect patients. It should be known that some of these factors can be changed or reduced. Puntillo et al. (17) reported that some stress factors in the ICU are subjective and can be modified. They stated that thirst, which was ranked 1st among stress factors in the ICU, can be reduced with simple and inexpensive methods such as placing wet gauze on the lips and using cold water sprays. Environmental factors such as noise, light, and temperature, which lead to sleep disorders, are controllable stressors in the ICU. Moreover, when considering the working conditions of the ICU and the psychological needs of patients, the physical and psychological stressors of ICU patients can be removed or reduced with interchangeable factors such as frequent evaluation of the necessity for tubes in the nose and mouth and vascular accesses as well as their timely withdrawal, effective control of pain monitored by scoring systems, and well-organized visiting hours.

We believe the limitations of this study are low APACHE II scores, short ICU lengths of stay, and inclusion of patients from the GSICU and ARICU.

CONCLUSION

It is important to determine the environmental and psychological factors that affect patients in ICUs. These factors can vary according to age, sex, and educational and surgical status; also, their priorities may change. Elimination or modification of these factors would contribute positively to the treatment of ICU patients and their length of stay in the ICU.

Ethics Committee Approval: Ethics committee approval was received for this study from the ethics committee of Hacettepe University School of Medicine Non-interventional Clinical Research Ethics Board.

Informed Consent Written informed consent was obtained from patient who participated in this study.

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Objectively structured verbal examination to assess surgical clerkship education: An evaluation of students' perception

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ABSTRACT

Objective: The objectivity and reliability of examining methods are controversial. We subjected fourth-year medical students to a specially designed verbal exam which we called objectively structured verbal examination. We aimed to evaluate feedback from students about objectively structured verbal examination as an assessment instrument for gauging their surgical knowledge.

Material and Methods: Objectively structured verbal examination modules were developed according to the learning goals of the surgical clerkship. Upon finishing surgery rotation, the students were subjected to objectively structured verbal examination as part of their final evaluation. The students' perception of objectively structured verbal examination was assessed by their responses to a questionnaire.

Results: Forty-two of 58 students returned filled questionnaires. Objectively structured verbal examination was accepted by 72% of the students as an objective tool, and 86% of them found it enabled unbiased evaluation. Overall, most students expressed positive feedback regarding objectively structured verbal examination.

Conclusion: The feedback received from students showed that objectively structured verbal examination is a reliable and objective method to assess their knowledge. This feedback reflects that objectively structured verbal examination merits further development and enhancement.

Keywords: Clinical reasoning, exam, Medical education

INTRODUCTION

Medical education has changed dramatically over the years. Currently, the transfer of hands-on experience from master to pupil has largely been replaced by formal lectures, case studies, and practical applications (1, 2). Students' knowledge, clinical reasoning, and problem solving skills obtained in the course of surgical clerkship programs can be assessed in several ways. Oral exams with open ended questions (OEQ), multiple choice questions (MCQ), and essay writing are commonly used. However, the objectivity and reliability of these examining methods remain controversial (3). We subjected students to a specially designed verbal exam which we called objectively structured verbal examination (OSVE).

Objectively structured verbal examination consists of several exam modules; each module addresses a specific surgical problem with a hypothetical case scenario. The main objective of OSVE is assessing the student's problem-solving efficiency when confronting different surgical problems. In the present study, the students' perception of OSVE was determined by their responses to a questionnaire, and its reliability was discussed.

MATERIAL AND METHODS

This study was performed in the Department of Surgery of the School of Medicine. Ethical approval was obtained from the ethical committee of the institution. The participants' approval was obtained as stated in the questionnaire. Our undergraduate medical education program requires a 9-week surgical clerkship in the fourth year. Upon completing their surgery rotations, students were subjected to OSVE as part of the final evaluation of their performance. Briefly, several exam modules were developed according to the objectives of the surgical clerkship. All modules were designed to evaluate students' understanding, diagnostic approach, and decision-making regarding basic surgical problems such as abdominal pain, breast mass, thyroid nodule, and gastrointestinal bleeding. Each module starts with the complaints of a hypothetical patient with a surgical problem and continues with sections that disclose differential diagnosis, diagnostic workup, and management. Each section has a list of expected answers. The examiner is asked to tick each correct answer that is given by the student. Each module is assigned a score that consists of the sum of the scores that are collected from each answer. An example module is given in Table 1. The students were assigned to examiners; each examiner offered modules to the student and calculated the total score according to the correct answers. After the evaluation period was fin-

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ished and the student's scores were announced, the students were given a questionnaire to express their perceptions of OSVE. The questionnaire consisted of 10 questions, 6 of which expressed positive opinions and 4 of which expressed negative opinions. Students were asked to specify their impressions by scoring from 1 to 5, as described in Table 2.

RESULTS

A total of 58 students were subjected to OSVE modules. Forty-two students returned filled questionnaires. Scores 5 and 4 were accepted as "agreement," 3 was "not sure," and 2 and 1 were "disagreement." Seventy-two percent of the students found the exam was objective, and 86% of them affirmed that the exam enabled unbiased evaluation. Ninety percent of the students agreed that the exam was well organized and 85% of them said that the hypothetical cases were relevant to real life. Thirty percent of the students said they were unfamiliar with this type of exam and had difficulty responding to the questions. However, 65% of the students expressed the opposite opinion. Thirty percent of the students found the exam was stressful. The results are summarized in Table 3.

DISCUSSION

Assessing the clinical reasoning skills of students is an essential part of evaluating the surgical clerkship period (4). There are many ways to evaluate medical students' knowledge and their ability to solve clinical problems (5). Our surgery department uses three steps to evaluate students' accomplishments during their surgery clerkship. First, the students maintain a logbook in which the teaching activities they are involved in during the clerkship period are recorded, such as taking histories, examining patients, and conducting basic procedures. Second, they are subjected to a specially designed verbal exam, which we called OSVE. Finally, they take a multiple choice test.

What a student is expected to know, understand, and/or be able to demonstrate after completion of the surgical clerkship period describes the learning outcomes (6). As a part of the Bologna process, our department has described learning goals for surgical undergraduate education. With respect to the determined learning goals, we developed several OSVE modules. Each module was based on a specific surgical problem. For example, the abdominal pain module evaluates the standard approach when a patient presents with acute onset abdominal pain, including what questions should be asked, what signs are expected, the differential diagnoses, and required tests.

We surveyed students' appreciation of OSVE using a questionnaire. Most of the students agreed that the exam allows unbiased and objective measuring of their knowledge. Most of the students affirmed that the hypothetical cases were consistent with real-life medical situations they observed during clerkship. Some students declared that they experienced some anxiety; however, most students found the cases and ques-

Table 1. An example of a module

Rectal bleeding module (Total score: 15)	
Forty-two years old man presents with bleeding during defecation. What questions should be asked for evaluation?	
	Score
How long he has noticed rectal bleeding?	1
What is the blood quality (fresh or cherry-colored blood, or blood mixed with stool)	1.5
Bowel movement (constipation, diarrhea)	1.5
Asking anal pain during defecation	1
Asking concomitant abdominal pain	1
The patient says that his complaints have continued for 15 days, his bowel movement is 4–5 times per day, first feels some abdominal pain at lower quadrants and releases small amount of loose stool mixed with cherry-colored blood and mucus. What are your differentials?	
Colorectal malignancy	1
Inflammatory bowel disorders	1
Infectious colitis	1
What would your differentials be if the patient says he has constipated and feels anal pain following defecation with hard stool and dripping of fresh blood?	
Anal fissure	1
Internal hemorrhoidal disease	1
What would you look for during exam in this patient?	
Abdominal exam to evaluate a mass or pain	1
Anal exam for fissure, prolabed hemorrhoidal mass or any other lesion	1
Digital rectal exam to look for rectal mass or pain	1
Examining the finger of glove for blood, mucus and stool quality	1

Table 2. The questionnaire

Please vote the questionnaire below for the verbal exam you had subjected. You do not have to give your personal information. Filling the questionnaire is not a must and would has no effect on your graduating score. Data derived from the questionnaire are intended to be used for academically and never shared with any third party persons or institutions except scientific purposes. Please note that you will have accepted the using this data scientifically by filling the questionnaire.

		Agree		Not sure		Disagree
		5	4	3	2	1
1	Exam process is objective					
2	Exam provides better gauging of knowledge					
3	I had difficulties to express my knowledge					
4	It was more stressful					
5	Cases were not relevant with the real life					
6	I did not understand exactly what was being asked during exam					
7	Exam provides unbiased assessment of knowledge					
8	Exam may grant higher score					
9	Exam helped me to understand my shortcomings					
10	Exam was well organized					

Table 3. Students' response to the questionnaire

Positive items (1, 2, 7, 8, 9, 10)	**Agree %**	**Not sure %**	**Disagree %**
Exam process is objective	73	22	5
Exam provides better gauging of knowledge	67	25	8
Exam provides unbiased assessment of knowledge	86	14	-
Exam may grant higher score	72	18	10
Exam helped me to understand my shortcomings.	85	10	5
Exam was well organized	90	10	-
Negative items (3, 4, 5, 6)	**Agree**	**Not sure**	**Disagree**
I had difficulties to express my knowledge	30	5	65
It was more stressful	40	20	40
Cases were not relevant with the real life.	-	15	85
I did not understand exactly what was being asked during exam	15	10	75

tions were easy to understand. Taking all the answers together, most of the students expressed positive feedback regarding OSVE.

The objectivity and reliability of examining methods are crucial. Traditional methods, MCQ and OEQ, have been used extensively. MCQ provides objective assessment of knowledge and facilitates the evaluation of large numbers of students. However, MCQ provides written options, may limit students' creative thoughts, and cannot measure their bedside clinical problem-solving abilities (7). Oral exams with OEQ may evaluate students' competence in clinical reasoning and problem solving; however, the objectivity of the examiner is arguable, and examiners' bias may occur (8). We propose that OSVE provides two important elements to gauge knowledge. First, students should express their knowledge without being given options; therefore, they must provide their postulations freely, which requires mental effort to demonstrate their knowledge in solving a given medical problem. Second, proposed answers are written on the examiner's sheet; thus, the objectivity of the exam is assured and examiner's bias is prevented.

For assessment of medical knowledge, structured examinations such as objectively structured clinical examination (OSCE) and objectively structured practical examination (OSPE) have been previously developed, used, and reported (9, 10). These methods have been found to be objective, valid, and reliable tools for assessment that eliminate examiner bias (11). We developed OSVE as a modification of OSCE and OSPE. The major difference is that real patients are not used in OSVE. Although testing the students' knowledge when facing real patients is extremely valuable, it is not always practical in every setting. The number of students may be a limiting factor, it is not easy to provide enough patients on the exam day, and it may impair patients' rights and be uncomfortable for some patients. For this reason, we spread our testing of the bedside performance of our students throughout the clerkship period, as they confronted real patients during rounds or out-patient visits, and used OSVE at the end of the period to evaluate the students' problem-solving abilities.

This study evaluates only the students' viewpoint for a specific style of examining method. We do not know exactly how their performance in OSVE can be extrapolated to their true extent of knowledge. The national residency entrance exam performance of the students may provide some data regarding whether their OSVE scores had any impact on their overall exam success (12). Because our students have not graduated, we do not have any information about this. However, written exams are unable to evaluate medical graduates'

clinical abilities; these exams only measure solid, statistical knowledge (13). Therefore, continuing to use methods such as OSVE to pursue our determined learning goals seems appropriate.

CONCLUSION

From the students' perspective, OSVE provides reliable and objective measurement of knowledge. The feedback we received from students in the questionnaire may lead us to use OSVE more widely with improvements in the future. This feedback is considered valuable for further development and enhancement of OSVE.

Ethics Committee Approval: Ethics committee approval was received for this study from the ethics committee of Dumlupınar University School of Medicine.

Informed Consent: Written informed consent was obtained from student who participated in this study.

Peer-review: Externally peer-reviewed.

Author Contributions: Concept - S.A.D.; Design - S.A.D.; Supervision - S.A.D., S.Z., Z.B.; Resource - S.A.D., S.Z., Z.B.; Materials - S.A.D., S.Z., Z.B.; Data Collection and/or Processing - S.A.D., S.Z., Z.B.; Analysis and/or Interpretation - S.A.D., S.Z., Z.B.; Literature Search - S.A.D.; Writing Manuscript - S.A.D.; Critical Reviews - S.Z., Z.B.

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Can volumetric measurement be used in the selection of treatment for inguinoscrotal hernias?

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ABSTRACT

Objective: Inguinoscrotal hernias are often qualified subjectively as big, giant, scrotal, etc. In order to classify this type of hernia, objective criteria are needed. For this purpose, we aimed to introduce a scrotal volume measurement-based classification system and propose a corresponding surgical plan (open or laparoscopic surgery, anterior or posterior repair) based on volumetric data.

Material and Methods: Between October 2012 and October 2013, 30 consecutive male patients with a mean age of 59.5 years (range: 36 to 82 years) presenting with unilateral ISH were included in this retrospective study. Physical measurements in the upright position and computerized tomography measurements using the Valsalva maneuver were obtained from all patients.

Results: Of the 30 patients, 26 patients had scrotal volumes less than 1000 mL, two patients had SVs between 1001 and 2000 mL, one patient had an SV between 2001 and 3000 mL, and one patient had an SV greater than 3000 mL. Laparoscopic total extraperitoneal repair was performed in patients with scrotal volumes inferior to 1000 mL. In three patients with scrotal volumes between 1000 and 3000 mL, an open posterior approach was used. In one patient with a scrotal volume superior to 3000 mL, no surgical intervention was performed due to the patient's cardiac comorbidity.

Conclusion: By establishing a common language among surgeons, we believe that the volumetric measurement-based scrotal hernia classification system proposed in this study will lead to further studies on the subject.

Keywords: Classification system, inguinoscrotal hernia, scrotal volume

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INTRODUCTION

There is no consensus among surgeons on the classification of inguinal hernias. A survey by Zollinger showed that although the Nyhus, Gilbert, and Schumpelick systems are commonly used, most specialists still use the traditional classification for groin hernias (1, 2). Given the large number of operative techniques and approaches for the repair of groin hernias, it appears that no one classification system can satisfy everyone (2). In addition to these, no other classification system, including the European Hernia Society (EHS) classification, has addressed the different types of ISHs (3).

Because the borders of the scrotum have not been described anatomically, it has not been possible to correctly define scrotal hernias. Instead, in the current surgical literature, scrotal hernias are subjectively named scrotal, big scrotal, giant scrotal, etc. However, to develop a common terminology, objective descriptions are needed to identify these different types of hernias. Evaluation of these type of hernias by their volumes could be an objective alternative. For this purpose, scrotal size was measured physically and by computerized tomography (CT) and compared in patients with ISHs. Physical measurements were made to obtain more practical, applicable data.

In this report, we aimed to introduce an objective classification system for ISH and to propose surgical management according to scrotal volumetric measurements.

MATERIAL AND METHODS

Between October 2012 and October 2013, volumetric measurements of the hernia sac were performed in 30 consecutive patients who were diagnosed with ISHs. After obtaining their informed consent and with the approval of the ethical committee, abdominoscrotal CT scans were performed on all patients. Anatomically, any hernia passing beyond the inguinal ligament and extending into the scrotum was termed an ISH. The values determined by externally measuring the volumes of the hernia sacs were compared with CT measurements.

To obtain measurement correlation, three-dimensional measurements were independently taken by two surgeons and two radiologists. Measurements were taken with a caliper gage while the patient was in the

standing position, as seen in the illustration (Figure 1). For hernia volume and CT volume, the largest dimensions were taken for the measurements (Figure 2). The largest height from the inguinal ligament to the lowest identifiable point of the hernia sac in the scrotum was measured. Volumetric measurements were performed while the patient was standing. Measurements of the length, depth, and width of the hernia sac were obtained with a caliper gage. A mathematical formula was used to perform an approximate calculation of the volume of the scrotal hernia sac (4).

Scrotal volume (SV)=~lengthxdepthxwidthx0.52

When the scrotal volume (SV) was greater than 2000 mL, the ratio of the scrotal and intra abdominal volumes was also analyzed. For this purpose, a second mathematical formula was utilized (4), as given below:

Volume relationship (VR)=scrotal volume/abdominal cavity volume

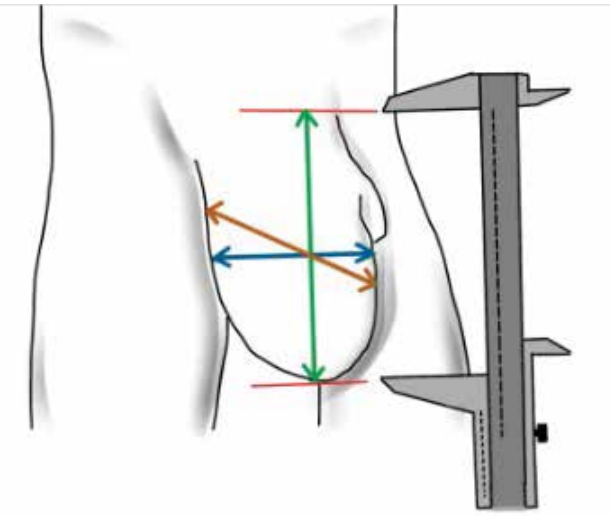

Figure 1. Measurement of external dimensions by caliper gage

RESULTS

All the patients were male, with a mean age of 59.5 years (range: 45 to 82 years). All the hernias were unilateral. Of the 30 patients, 26 patients had SVs less than 1000 mL (CT volume range 94.31 to 849.83 mL), 2 patients had SVs between 1001 and 2000 mL (1098.2 to 1115.40 mL), one patient had an SV between 2001 and 3000 mL (2357 mL), and one patient had an SV greater than 3000 mL (8880 mL). In the two patients with SVs greater than 2000 mL, the scrotal-abdominal volume relationship in the CT scan showed that the VR value was less than 25% in one patient and greater than 25% in the other patient.

The intraclass correlation coefficient value (Fisher, 1954, Edinbrugh, United Kingdom), of the standing volume measurements by the two surgeons is 0.992 (0.983 to 0.995, acceptance level >0.700). The intraclass correlation coefficient value of the CT volume measurements by the two radiologists is 0.995 (0.988 to 0.997, acceptance level >0.700) (Table 1). The intraclass correlation coefficient value of the CT volumes and standing volumes is 0.993 (0.986 to 0.997, acceptance level >0.700) (Table 2).

There was no statistically significant difference between the CT-scan-based and physically measured volumes (p=0.121) (Table 3).

Table 1. Inter-observer measurement reliability

		95% confidence interval	
	Intraclass correlation coefficient	Lower bound	Upper bound
Standing volume	0.992	0.983	0.995
CT volume	0.995	0.998	0.997

CT: computerized tomography

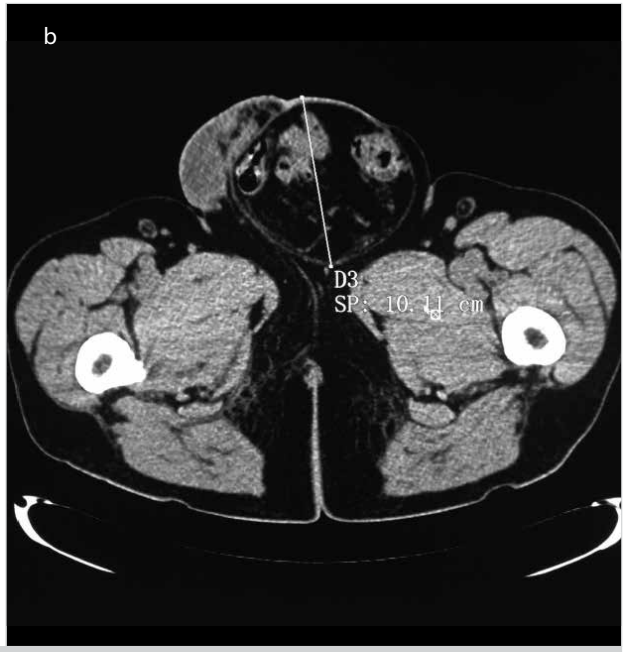

Figure 2. CT volume measurements, (a) coronal view, (b) axial view

The CT volume and standing volume method measurements were consistent according to the Passing-Bablok regression method, and the R2 values of the two methods are significantly correlated at 0.998 (p=0.0001) (Figure 3).

Laparoscopic total extraperitoneal repair (TEP) was performed in patients whose scrotal volumes were less than 1000 mL. In three patients with scrotal volumes between 1000 and 3000 mL, an open posterior approach (Wantz procedure) was used. In one patient with a scrotal volume of more than 3000 mL, surgery was omitted due to the patient's age (82 years) and cardiac comorbidity. This patient died four months later during follow-up. The mean follow-up period of the operated patients was 16.5 months (10 to 22 months). No recurrence or any significant complications were observed during this time. All the hernias were repaired using prosthetic meshes.

Among the 26 patients treated by TEP repair, seroma developed in 14 and hematoma in 1 patient. No recurrence was observed in the follow-up period (5 to 23 months, mean 13.5 months). Based on the volumetric measurements, we established a classification system of inguino-scrotal hernias and propose corresponding management. We adapted textile size codes (S, M, L, XL, XXL) to our suggested classification for simplification. This system is provided in Table 4.

Table 2. Measurement confidence

		95% confidence interval	
	Intraclass correlation coefficient	Lower bound	Upper bound
CT volume/standing volume	0.993	0.986	0.997

CT: computerized tomography

Table 3. Lack of statistically significant differences between the CT volumes and the volumes (p=0.121)

	CT volume	Standing volume	p
Lowest value	75	78	0.121
Highest value	8880	9880	
Arithmetic mean±SD	788.03±1595.23	844.6±1783.52	
Median	354.5	358.5	
Regression equation: CT volume = **-3.2634+1.0206** *standing volume			
Intercept A		-3.26	
95% CI		-18.14-7.93	
Slope B		1.021	
95% CI		0.99-1.07	
Cusum test for linearity no significant deviation from linearity (p>0.05)			

CT: computerized tomography; SD: standard deviation

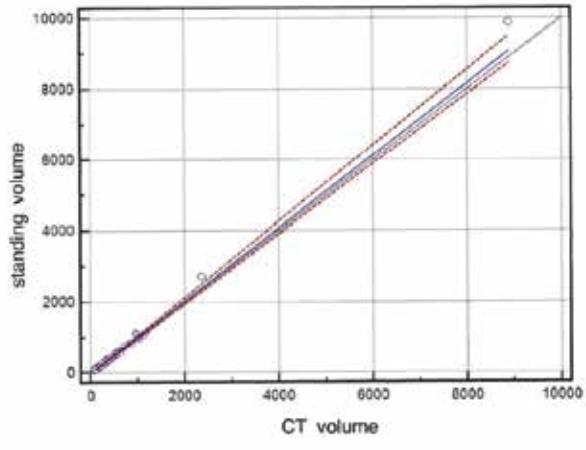

Figure 3. Passing-Bablok regression and the R2 values of the two methods

DISCUSSION

The classification system of inguinal hernias should be simple, easily understandable, and easy to use in clinical settings. In this report, we aimed to introduce an objective classification system for ISHs and to propose a surgical strategy based on this system.

In the presence of scrotal hernias, because the hernia sac typically protrudes from the human body, it is possible to measure the dimensions of the hernia sac in an upright position with a caliper gage without any need for ultrasonography or CT. As we have demonstrated statistically in our study, the physical measurements provide reliable and accurate values. However, when the scrotal hernias were large, and when it was necessary to compare the scrotal (hernia sac) volume to the abdominal volume, abdominoscrotal CT scans were performed.

To calculate the volume of the hernia, a mathematical formula that is frequently used by radiologists to measure the volumes of ellipsoid structures was used (4, 5). In our observation, the term "giant scrotal hernia" should be used if the hernia volume is greater than 1000 mL. In our 20 years of experience, TEP repair can be readily performed in ISHs with volumes inferior to 1000 mL (6). In the presence of an irreducible hernia measuring between 1000 and 2000 mL in volume, a transabdominal preperitoneal (TAPP) repair can be performed with a relatively larger operative space by an experienced surgeon. Ferzli et al. (7) described a hybrid procedure that combines the open and TEP techniques. Another study has suggested that TAPP repair can be successfully performed in scrotal hernias (8). In brief, depending on the surgeon's experience, a laparoscopic approach may be preferred in patients with scrotal hernias.

Table 4. The volumetry-based classification system and the proposed corresponding surgical management of inguinoscrotal hernias

	Textile	Volume (mL)	Surgical procedure				
Inguinoscrotal (ISH)	S	0-500	Anterior		TEP	TAPP	
	M	500-1000					
	L	1000-2000		Posterior			
	XL	2000-3000					Loss of domain
	XXL	>3000					

In an adult male patient, laparoscopic surgery is performed with an optimal intra-abdominal pressure of 12 mmHg, which necessitates the insufflation of 3000 mL CO_2 (9). Any gas volume above this value may result in disturbances in venous return and consequent cardiopulmonary problems, which together may trigger abdominal compartment syndrome. Accordingly, any scrotal hernia with a volume of 3000 mL or greater may induce similar problems. At these values, the relationship between the scrotal volume (SV) and abdominal cavity volume (ACV) should be taken into account (5, 10). If the SV/ACV ratio is superior to 25%, hernia repair should be considered on the basis of loss of domain principles (5, 11). Furthermore, the total scrotal volume should be calculated in the presence of bilateral hernias.

CONCLUSION

Traditionally, various techniques have been used in the treatment of scrotal hernias; the use of these techniques depends entirely on the surgeon's experience. Hernia volume measurements obtained in the upright position and CT-based calculationsprovide accurate and statistically significant results, which can help determine the rational management of ISHs.

By creating a common language among surgeons, we believe that the volumetric measurement-based scrotal hernia classification system that we propose in this study will lead to further studies and discussion on the management of these hernias.

Ethics Committee Approval: Ethics committee approval was received for this study from the ethics committee of İstanbul University Cerrahpaşa School of Medicine.

Informed Consent: Written informed consent was obtained from patients who participated in this study.

Peer-review: Externally peer-reviewed.

Author Contributions: Concept - M.E., H.G.; Design - M.E., H.G.; Supervision - M.E., H.G., E.H.; Resource - M.E., H.G., V.Ö.; Materials - M.E., H.G., V.Ö., E.H.; Data Collection and/or Processing - H.G., V.Ö.; Analysis and/or Interpretation - M.E., H.G., E.Y.; Literature Search - H.G., E.H., V.Ö., E.Y.; Writing Manuscript - M.E., H.G., V.Ö.; Critical Reviews - M.E., H.G., V.Ö.

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Randomized prospective comparison of long-term results of onlay and sublay mesh repair techniques for incisional hernia

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ABSTRACT

Objective: Incisional hernia is a significant problem after laparotomy, and there is still no consensus on an ideal treatment method. The aim of this study was to compare the results of onlay and sublay mesh repair techniques.

Material and Methods: In this randomized prospective trial, 100 patients were divided into two groups: onlay and sublay groups. Recurrences were evaluated by performing a physical examination.

Results: The median follow-up was 37.1 (26.6 to 46.5) months. In the onlay group, the mean operation time was significantly shorter. However, in terms of postoperative pain and wound complications, the sublay group had significantly better results. The recurrence rates were found to be similar in both groups (6% in the onlay group and 2% in the sublay group).

Conclusion: In the treatment of incisional hernia, sublay mesh repair is superior to onlay mesh repair in terms of postoperative pain and wound complications. Both techniques have similar recurrence rates.

Keywords: Incisional hernia, mesh repair, onlay, sublay

INTRODUCTION

Incisional hernia is a significant complication after laparotomy; its incidence ranges between 10% and 20% (1-4). This common problem can result in bowel strangulation, pain, and enterocutaneous fistula, and it affects the quality of life. The results of repair techniques vary widely. High recurrence rates have been reported for suture techniques, whereas mesh placement can reduce recurrence (5-10). In mesh repair, one of the most important problems is the placement of the mesh. Some techniques are reported to be associated with particularly high rates of some complications, such as recurrence, wound infection, and fistula (11, 12). In the literature, several studies compare mesh and suture repair techniques, open and laparoscopic repair techniques, and mesh type as well as the plane in which the mesh should be placed. Currently, there is no consensus regarding the abdominal plane in which the mesh should be placed (13).

The aim of this study was to compare the early and late results of onlay and sublay mesh repair techniques.

MATERIAL AND METHODS

This randomized prospective study was conducted between January 2011 and December 2014. Permission was acquired from the Selçuk University School of Medicine Clinical Trials Ethical Committee. All procedures were in accordance with the ethical standards of the responsible committee on human experimentation and with the Helsinki Declaration of 1975 as revised in 2008. The trial is registered at clinicaltrials.gov, and the ID is NCT02314091. Patients who were admitted at the outpatient clinic with incisional hernia were evaluated. To prevent bias, only patients with midline incisional hernias were included. Patients with a body mass index (BMI) of above 40 kg/m^2, an American Society of Anesthesiologists score (ASA) of 4, or severe pulmonary or cardiac disease were not included. The remaining patients who agreed to be involved and signed the informed consent form were randomized into two groups: onlay group and sublay group. After the initial evaluation, 100 patients were included and were randomized to each group by the closed envelope method. The patients' demographic data, BMI, diameter of fascial defects, operation time (from first incision to dressing), visual analog scale (VAS) scores at the second and 24th hours, length of hospital stay, drain takeoff time, postoperative complications, and recurrences were recorded. The fascial defect diameter was measured intraoperatively and is presented in cm^2. All operations were performed according to the elective standard. There were no emergency operations.

Operative Technique

All operations were performed under general anesthesia, and no antibiotic was administered. After excision of the old incision scar, the hernia sac was dissected and the peritoneal cavity was opened. Adhesions between visceral organs and the abdominal wall were dissected. The peritoneal surface was closed with an absorbable continuous suture.

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In sublay mesh repair, the posterior aspect of the rectus muscle was dissected and a polypropylene mesh was placed below the rectus muscle. The mesh was fixed to the posterior rectus sheet using polypropylene sutures. If the fascia could be closed without tension, it was sutured to the closest part of the mesh. In all patients, the mesh was placed so that at least 5 cm overlapped the fascia at all sides.

In onlay mesh repair, the peritoneal surface and fascia were closed with polypropylene sutures. The subcutaneous tissue was released to place the mesh on the anterior aspect of the fascia. The mesh was placed on the anterior aspect of the fascia with at least 5 cm overlapping the fascial edges at all sides and was fixed to the fascia with polypropylene sutures. In all patients, a vacuum drain was placed above the mesh, and the skin and subcutaneous tissue were closed with absorbable sutures.

After the operations, the VAS scores were recorded at the second and 24th hour. The vacuum drains were removed when the daily drainage was below 50 mL. Patients were followed up at the first and second weeks; at the first, the third, and the sixth months; and then yearly. At each follow-up visit, the patients were examined for recurrences; when in doubt, recurrence was confirmed by ultrasonography. At the termination of the study, all patients were called for a follow-up visit and all were evaluated by a physical examination. During the follow-up visits, the patients were examined by a blinded attending surgeon. A flow chart of the study is presented in Figure 1. Wound infection was defined as erythema and suppuration around the wound. Any collection at the wound was drained and examined for bacterial contamination.

Statistical Analysis

Statistical analysis was performed using Statistical Package for the Social Sciences 22.0 (IBM Corp.; Armonk, NY, USA) software. The Student's t test was used to compare quantitative parametric data, and the Mann-Whitney U Test was used to compare quantitative non-parametric data. The chi-square test was used to compare qualitative data. Statistical significance was accepted at 0.05.

RESULTS

One hundred patients were included in the study, with a mean age of 55.4±11.9. Of the patients, 64% were female and 36% were male. The groups were similar in terms of age and gender. The mean BMI of all patients was 25.9±3.5 kg/m^2, and the groups were similar in terms of BMI. The mean hernia defect was also similar in both groups (73.4±66.3 cm^2). The median follow-up of the study was 37.1 (26.6 to 46.5) months. The demographic data are presented in Table 1.

The mean operation time was 65.3±17.2 minutes; this was significantly shorter in the onlay group then in the sublay group (56.7±15.7 min and 73.9±14.2 min, respectively) (p<0.001) (Figure 2). The mean length of hospital stay was 3.36±1.9 days in the onlay group and 3.52±2.6 days in the sublay group. The mean length of hospital stay was similar in both groups (p=0.734).

Postoperative pain was evaluated by VAS at the second and 24th hours. At the second hour, the mean VAS score was 7.38±1 in the onlay group and 6.9±1 in the sublay group. The mean VAS score at the second hour was significantly lower in the

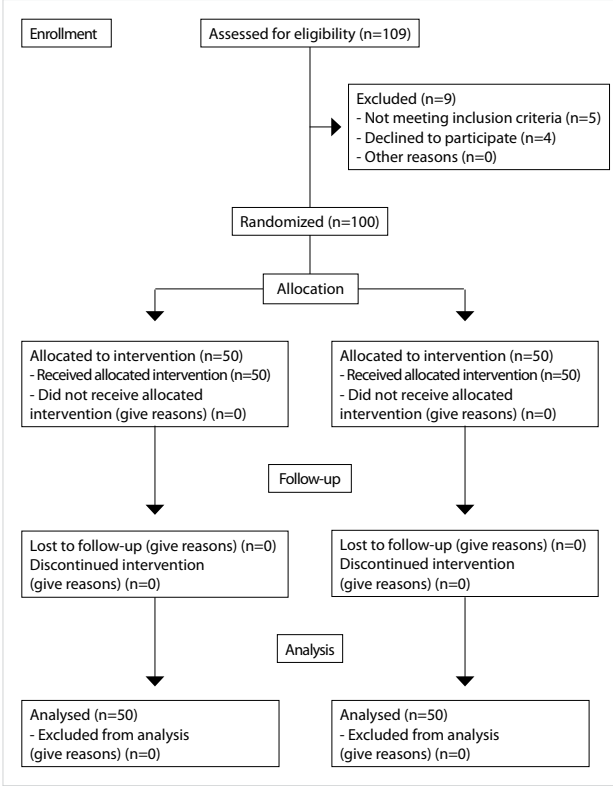

Figure 1. Flow diagram

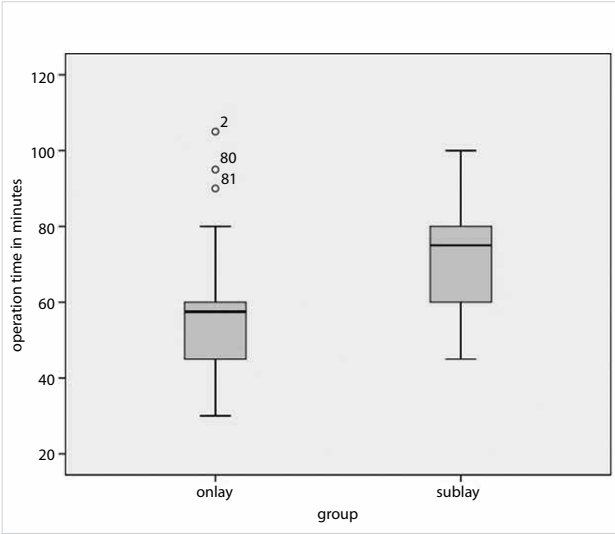

Figure 2. Comparison of operation times

sublay group (p=0.031). Similarly, at the 24th hour, the mean VAS score was significantly lower in the sublay group (2.5±0.8 vs. 2.9±1, respectively) (p=0.010).

In all operations, a vacuum drain was placed. The drains were removed when the daily outcome was below 50 ml. The mean drain removal time was 5.4±2.3 days in the onlay group and 3.2±1.1 days in the sublay group (p=0.001). The mean operation time, length of hospital stay, VAS scores, and drain removal time are presented in Table 2.

The overall postoperative wound complication rates were significantly lower in the sublay group: 24% (n: 12) in the onlay group and 8% (n: 4) in the sublay group (p=0.029). The most

Table 1. Demographic data of the patients

		Onlay group	Sublay group	p
Age[a]		55.9±11.8	55.9±12.1	0.703*
Gender[b]	Male	22 (44)	14 (28)	0.096**
	Female	28 (56)	36 (72)	
BMI (kg/m^2) (mean±SD)		25.5±3.5	26.4±3.3	0.170*
ASA score	1	8 (16)	5 (10)	0.643**
	2	22 (44)	25 (50)	
	3	20 (40)	20 (40)	
Diameter of the hernia defect (cm2) (mean±SD)		61.6±58.3	85.1±72.1	0.077*
Follow-up[c] (months)		35.9 (26.6-45.7)	37.9 (27.4-46.5)	0.097***

SD: standard deviation; BMI: body mass index; ASA: American Society of Anesthesiologists
*Student's t test; **Chi-square test; ***Mann-Whitney U test; [a]: mean±SD; [b]: n (%); [c]: [median (min-max)]

Table 2. Comparisons of groups in terms of operation time, length of hospital stay, VAS scores, and drain removal time

		Onlay group (n=50)	Sublay group (n=50)	p*
Operation time (min)		56.7±15.7	73.9±14.2	0.001
LOS (days)		3.36±1.9	3.52±2.6	0.734
VAS score	2nd hour	7.38±1	6.9±1	0.031
	24th hour	2.9±1	2.5±0.8	0.010
Drain removal time (days)		5.4±2.3	3.2±1.1	0.001

SD: standard deviation; LOS: length of hospital stay; VAS: visual analoque scale *Student's t test. Datas were presented as mean+ Standard deviation

Table 3. Postoperative wound complications

	Onlay group (n=50)	Sublay group (n=50)	p*
Wound infection	2 (4)	2 (4)	1.00
Seroma	7 (14)	1 (2)	0.027
Hematoma	3 (6)	1 (2)	0.307
Overall	12 (24)	4 (8)	0.029

*Chi-square test ; n (%)

common complication was seroma formation in 8 (8%) patients, followed by wound infection in 4 (4%) patients and hematoma in 4 patients. The complications are presented in Table 3. During the study period, no patients died due to the surgery. Only one patient died from myocardial infarction after the 3rd year control.

Within the median follow-up of 37.1 months, the groups were similar in terms of recurrence. The recurrence rates were 6% (n: 3) in the onlay group and 2% (n: 1) in the sublay group (p=0.307).

DISCUSSION

Incisional hernia remains a major problem after laparotomy. Previously used open primary suture techniques had high recurrence rates and complication rates as high as 44% (14). Although many techniques are defined for the repair of incisional hernias, in open mesh repair techniques, the location where the mesh should be placed is still under debate. Despite reports that show no association of complications or recurrence rate with the location where the mesh is placed, this controversy is ongoing (15-17).

Postoperative wound complications are one of the major problems following mesh repair of incisional hernia. Wound complications such as infection, seroma, and hematoma increase the risk of recurrence by 4.1, 3.4, and 3.5 times, respectively (15). In a randomized prospective study, Venclauskas et al. (18) reported that onlay mesh repair requires less time than sublay mesh repair. Moreover, they reported that sublay mesh repair had a lower postoperative complication rate. However, in a cohort study, Gleysteen (17) reported that onlay and sublay mesh repair techniques have similar wound complication rates (16% and 12%, respectively). In a recent meta-analysis, sublay mesh repair was reported as having the least wound infection rate than onlay, inlay, and underlay mesh placement [Odds Ratio: 0.449 (95% CI, 0.12-1.16)] (19). In the present study, the mean operation time was shorter in the onlay group and the mean complication rate was lower in the sublay group.

In the literature, postoperative pain has been reported to be much greater using suture techniques. Considering onlay and sublay mesh repair techniques, Venclauskas et al. (18) reported similar postoperative pain scores both at rest and during physical activity. However, Den Hartog et al. (20) reported sublay mesh repair to cause less pain than onlay mesh repair. Similarly, our results show that the sublay group had lower VAS scores at the second and 24th hours.

The recurrence rates by onlay and sublay mesh repair techniques remain controversial. According to Başoğlu et al. (15) the recurrence rates are similar by onlay and sublay mesh re-

pair techniques. In a randomized controlled trial with a 5-year follow-up, Weber et al. (21) reported that sublay mesh repair has a significantly higher recurrence rate than onlay mesh repair (20% vs. 12%, respectively). Den Hartog et al. (20) reported recurrence rates of 7.4% by onlay mesh repair and 13.6% by sublay mesh repair. Moreover, Venclauskas et al. (18) reported recurrence rates of 10.5% using onlay mesh repair and 2% using sublay mesh repair. In a meta-analysis, Mathes et al. (22) reported no difference in recurrence rates. Similarly, in the present study, the recurrence rates using onlay and sublay mesh repair techniques were found to be similar: 6% using onlay mesh repair and 2% using sublay mesh repair.

The main limitation of this study is the relatively low numbers of patients in both groups. To identify a difference of 8% in the recurrence rate, there should be 375 patients in each group. This number of patients can only be achieved by multicenter studies. As the main goal of the study was to compare the recurrence and complication rates between onlay and sublay mesh repair techniques, we did not evaluate the pain scores, time of return to activity, or long-term patient satisfaction. However, we believe that with more than three years of follow-up, our results are valuable and reliable.

CONCLUSIONS

In this prospective trial with a median follow-up of 37 months, sublay mesh repair was found to be superior to onlay mesh repair in terms of postoperative pain and complications and equal in terms of recurrence rate.

Ethics Committee Approval: Ethics committee approval was received for this study from the ethics committee of Selçuk University School of Medicine Clinical Trials Ethical Committee.

Informed Consent: Written informed consent was obtained from patients who participated in this study.

Peer-review: Externally peer-reviewed.

Author Contributions: Concept - B.S., A.O., Ö.K.; Design - B.S., A.O., S.A.; Supervision - A.O., Ö.K.; Resource - B.S., A.O., N.A.; Materials - B.S., S.A., N.A.; Data Collection and/or Processing - B.S., A.O., N.A.; Analysis and/or Interpretation - B.S., A.O.; Literature Search - B.S., S.A., N.A.; Writing Manuscript - B.S., A.O.; Critical Reviews - B.S., Ö.K.

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A short term analysis of surgical management of umbilical and paraumbilical hernia

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ABSTRACT

Objective: Umbilical hernia and paraumbilical hernia are ventral herniae that occur in infants and adults. According to current evidence, mesh repair is the treatment of choice to avoid recurrence. The aim of this study is to analyze the surgical methods, the types of meshes used, and their benefits.

Material and Methods: A retrospective analysis of patients diagnosed with umbilical hernia and paraumbilical hernia was performed. The patients' consent was obtained retrospectively. The various surgical techniques and different meshes used were analyzed. Forty-three patients were selected for the study. Of these, 23 patients underwent open mesh repair, 12 patients underwent laparoscopic intraperitoneal onlay mesh repair repair, and eight patients underwent open intraperitoneal onlay mesh repair repair. The duration of the surgery, mesh used, number of days of hospital stay, type of anesthesia, and postoperative complications were analyzed.

Results: Of the 43 patients, the patients who underwent open intraperitoneal onlay mesh repair had shorter postoperative hospital stays compared to other methods (median=1 day; range=1 to 2 days). The duration of surgery was longer for laparoscopic intraperitoneal onlay mesh repair and open mesh repair compared to the open intraperitoneal onlay mesh repair technique ($p<0.05$).

Conclusion: The open intraperitoneal onlay mesh repair technique had advantages over the other methods for small-defect umbilical hernia and paraumbilical hernia. The duration of surgery was long for laparoscopic intraperitoneal onlay mesh repair compared to open mesh repair and the open intraperitoneal onlay mesh repair technique. Postoperative complications were insignificant for all three methods. Another advantage of the open intraperitoneal onlay mesh repair technique was a shorter postoperative hospital stay.

Keywords: Open mesh repair, IPOM, open IPOM technique, laparoscopy

INTRODUCTION

Umbilical hernia (UH) and paraumbilical hernia (PUH) are ventral herniae that occur in the region of the umbilicus or around the umbilicus (1, 2). UH accounts for 10% of abdominal herniae (3). UH occurs in infants and children, while PUH occurs in adults. UH rarely occurs in adult patients with ascites, obesity, and massive abdominal distention from various causes. There are advantages to the management of UH and PUH using meshes (3, 4). The different surgical methods employed in the repair of UH and PUH are open anatomical repair, open mesh repair with different sites of mesh placement (onlay, sublay, and inlay), laparoscopic intraperitoneal onlay mesh repair (IPOM), and open IPOM. The recurrence rate (19% to 54%) is greater in anatomical suturing than in mesh repair (5-7). The different sites of deployment of mesh have advantages and disadvantages. In this study, we attempted to analyze two common techniques (open onlay mesh repair and laparoscopic IPOM) and a newer technique, open IPOM, using Ventralex ST for UH and PUH.

MATERIAL AND METHODS

A retrospective analysis of patients who underwent operations for UH and PUH at the Institute of General Surgery, Madras Medical College, was performed. Patients who underwent surgery for UH and PUH over a period of four months, from November 2015 to February 2016, were chosen for the study. Institutional ethical committee clearance was obtained to collect the data. Informed consent was obtained from the chosen patients. Fifty-four patients were diagnosed with UH and PUH. Of these, five patients underwent open anatomical suture repair operations as an emergency procedure and another six patients underwent open mesh repair with associated bowel pathology, for which bowel surgery was performed. Excluding these 11 cases, 43 patients with UH and PUH in whom different types of mesh were used were chosen for the study. All the patients were euthyroid before and after surgery. Of the 43 patients who underwent mesh repair, 23 patients underwent open mesh repair using Prolene mesh, 12 patients underwent laparoscopic IPOM using composite dual side mesh (Ethicon Physiomesh flexible composite mesh), and eight underwent open IPOM using a Ventralex ST hernia patch. The surgeons had preferences with regard to the operative methods. All the surgeries were performed by professors and assistant professors and were assisted by senior residents of the institute. The demographic data were analyzed (Table 1). The descriptive data analyzed were the duration of the surgery, the number of days of postoperative hospital stay, the type of anesthesia, and the immediate postoperative complications. A short term follow-up of five months was performed to analyze the immediate recurrence.

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Technique

In open onlay mesh repair, under regional anesthesia, the sacs of the UH and PUH were dissected all around, and the defect was closed using 1.0 Prolene. Then, a cutaneous flap was raised around the defect for 5 cm, and an onlay Prolene mesh (Bard Davol Inc; Murray Hill, NJ, USA) was placed and fixed to the anterior rectus sheath using 2.0 Prolene; then, a suction drain was placed to avoid seroma to complete the procedure. In the laparoscopic IPOM technique, under general anesthesia, Palmer's point was chosen for a 10 mm camera port and two 5 mm working ports were placed using the baseball diamond technique. Composite dual side mesh (Ethicon Physiomesh; Johnson & Johnson, USA, which has since been withdrawn from the market due to high recurrence) was used in all cases; the defects were closed with 1.0 Prolene, and the composite mesh was fixed using absorbable tackers (Ethicon Securestrap; Johnson & Johnson, USA). In the open IPOM technique, under regional anesthesia, the UH or PUH sac was opened, the contents were reduced, and the adhesions were released. A composite mesh with a Seprafilm-coated adhesion barrier (Ventralex ST hernia patch; Bard Davol Inc., USA) was placed intraperitoneally; then, the mesh was fixed to the rectus sheath. In all cases, the skin was closed in layers and a sterile dressing was applied.

Statistical Analysis

Statistical Package for the Social Sciences version 20.0 (IBM Corp.; Armonk, NY, USA) was used for data analysis. Continuous variables were analyzed using the median and range. Other variables were analyzed using the Pearson Chi-Square test. The statistical significance was accepted if the $p<0.05$ (confidence interval 95%). Independent variables were analyzed using Student's paired t-test, with expected statistical significance if the $p<0.05$. A postoperative complication was defined as any discomfort to a patient who required either conservative management or intervention.

RESULTS

Forty-three patients were chosen for the study. The median age of the studied population was 48 (range=40, 28 to 68). The sex ratio of the participants was almost equal (male vs. female, n=21 vs. 22; 48.2% vs. 51.8%). There were 69.8% cases of PUH (n=30) and 30.2% cases of UH (n=13) that were operated with different types of meshes. The number of cases diagnosed as PUH or UH and the different meshes used in the various surgical methods are illustrated in Table 2. The three techniques used by the surgeons for UH and PUH were open onlay mesh repair, laparoscopic IPOM repair, and open IPOM repair. The median size of the defects in both UH and PUH was 2 cm (mean=1.6 cm, min 1 cm to max 2 cm).

Most of the surgeons preferred the open technique with onlay mesh repair (53.5%, n=23) using Prolene mesh. A few surgeons preferred laparoscopic IPOM repair (27.9%, n=12), and the remaining surgeons preferred open IPOM repair (18.6%, n=8) using the Ventralex ST hernia patch. The widely followed surgical technique of open onlay mesh repair using Prolene mesh had an average duration of 50.13 minutes (median=49 min). The mean postoperative stay after open onlay mesh repair was 6.43 days, with a median of 6 days and SD=+1.037. In all the patients, the drainage tubes were retained to avoid seroma. There was an incidence of wound dehiscence (n=1) despite the placement of a drainage tube in an open onlay mesh repair case. In addition to wound dehiscence, postoperative complications included formation of seroma and pain.

Table 1. Characteristics of the study group

Characteristics	n=43
Age* (years)	44.07 (24-64)
Gender**	
Male	21 (48.8)
Female	22 (51.2)
BMI**, (kg/m^2)	
25 to 29.9	14 (32.6)
30 and above	29 (67.4)
PUH**	30 (69.8)
UH**	13 (30.2)

BMI: body mass index; UH: umbilical hernia; PUH: paraumbilical hernia *: mean (range), **: n (%)

Table 2. Meshes used for paraumbilical hernia and umbilical hernia

Meshes used for PUH and UH

		Mesh used			
		IPOM	PROLENE	VST	Total
Diagnosis	PUH	10	15	5	30
	UH	2	8	3	13
Total		12	23	8	43

PUH: paraumbilical hernia; UH: umbilical hernia; IPOM: laparoscopic intraperitoneal onlay mesh repair; PROLENE: used for onlay open mesh repair; VST: ventralex ST used in the open mini-IPOM technique

Table 3. Types of meshes used and the preferred type of anesthesia

Meshes used for PUH and UH

		Type of Anesthesia		
		Regional Anesthesia	General Anesthesia	Total
Mesh used	IPOM	0	12	12
	PROLENE	23	0	23
	VST	8	0	8
Total	31	12	43	

PUH: paraumbilical hernia; UH: umbilical hernia; IPOM: laparoscopic intraperitoneal onlay mesh; PROLENE: open onlay mesh repair; VST: open mini-IPOM technique

In laparoscopic IPOM repair, the mean duration of surgery was 68.25 mins (median=67 minutes, range=62 to 80 minutes). Comparing the laparoscopic IPOM technique with open mesh repair, the duration of laparoscopic IPOM surgery was longer ($p=0.04$ with CI=95%); however, there was no significant difference in the number of days of postoperative stay in both techniques. The most common complication of laparoscopic IPOM was pain, which responded well to analgesics.

The open IPOM technique had the shortest duration of postoperative stay and the shortest duration of surgery. The mean and median duration of surgery using this technique was 14

minutes (SD=+1.85). It was significant (p=0.001) that the open IPOM technique took less time to perform (mean=14 minutes), and the duration of postoperative stay was shorter (median=1 day). The postoperative pain was lower (visual analog scale 2) with this method compared to the other techniques. It was evident that the postoperative stay increased as the duration of surgery increased (p=0.014, paired t-test). General anesthesia was preferred by all surgeons for laparoscopic IPOM repair. Both the open IPOM technique and open repair were performed under regional anesthesia (Table 3).

DISCUSSION

Umbilical hernia and PUH are repaired using mesh to avoid recurrence. In this study, we compared three different surgical techniques employed for UH and PUH and the influence of various meshes (Prolene, composite IPOM, composite IPOM for the open IPOM technique) on the duration of the surgery and the postoperative hospital stay. The use of mesh in UH and PUH repair results in very low recurrence. (5) The study population had a median defect size of 2 cm (range 1 to 2). The average BMI of the study population was 30.431 (range 27 to 34). Therefore, the statistical significance of the variables obtained from this study is appropriate for mildly obese patients and for UH and PUH with small defects.

In the open mesh repair onlay technique, the use of Prolene mesh requires more time for flap dissection and mesh reinforcement. The longer the surgery, the more frequent the occurrence of complications, as revealed by the postoperative pain, seroma, and wound gapping experienced following open onlay mesh repair compared to the other methods. The duration of surgery strongly signifies definitive postoperative pain (p=0.029, Pearson Chi-Square test); however, there is no statistical significance with regard to duration of surgery when compared to seroma formation and wound gapping (8).

The laparoscopic IPOM technique is technically demanding. The cost of the mesh is high when compared to the mesh used for open herniae. Generally, postoperative pain due to tackers is less than that due to intracorporeal suturing. However, the open IPOM technique is not technically demanding compared to laparoscopic IPOM. In open mesh repair, the long duration of postoperative stay was attributed to delayed removal of the drainage tube. Although many surgeons favor open onlay mesh repair, the postoperative stay and frequency of seroma formation make it a less attractive option.

The objectives of open IPOM repair are a small incision, minimal dissection, and shorter duration of surgery (9). This technique has statistical significance for shorter postoperative stay (median=1 day); thus, this technique is preferable for patients who desire early recovery to resume their regular activities. In this study, the cost factor and the long-term recurrence rates were not studied. However, many studies have revealed that the open IPOM technique for UH and PUH has lower recurrence rates (10). The minimal postoperative pain in the open IPOM technique is due to the shorter duration of surgery and minimal tissue handling. As the mesh is anchored in the midline along the linea alba at one or two sites, the postoperative pain is lower compared to that of multiple anchoring in the laparoscopic IPOM and open mesh repair techniques.

Limitations

An important aspect of the validity of any hernia surgery is the long-term recurrence rate, which is not addressed here. The cost of the different meshes was not analyzed. The influence of the open IPOM technique on UH and PUH with large defects remains to be addressed.

CONCLUSION

Of the three techniques, open IPOM is the preferred choice for patients with small defects who need to return to work early with less postoperative pain.

Ethics Committee Approval: Ethics committee approval was received for this study from the ethics committee of Institute of General Surgery, Madras Medical College.

Informed Consent: Written informed consent was obtained from patients who participated in this study.

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Management of iatrogenic injuries due to endoscopic sphincterotomy: Surgical or conservative approaches

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ABSTRACT

Objective: The best therapeutic approach for endoscopic retrograde cholangiopancreatography-related perforations remains controversial; while some authors suggest routine conservative management, others advocate mandatory surgical exploration. We aimed to evaluate our clinical experience of perforations during endoscopic sphincterotomy.

Material and Methods: A retrospective chart review from January 2010 to October 2015 identified 20 patients with endoscopic retrograde cholangiopancreatography-related perforations. Data collection included demographics, time to diagnosis, type of perforation, treatment strategy, surgical procedure, complications, hospital stay, and outcome. All patients were classified into two groups on the basis of radiological and operative findings.

Results: Only five patients underwent surgical treatment, whereas 15 patients were managed conservatively. The mean time to diagnosis was 7.8 hrs (range: 1 to 36 hrs). In patients who underwent surgical treatment, the types of perforations included type I and III in one patient each and type II in three patients. Surgical procedures included laparoscopic and open cholecystectomy with t-tube drainage in two patients each and primary repair of duodenal injury with hepaticojejunostomy in one patient. Among conservatively managed patients, eight, four, and three had type II, type III, and type IV injuries, respectively. Of these 15 patients, 60% (n=9) underwent percutaneous procedures. The mean length of hospital stay was similar for conservatively and surgically treated patients (12 vs. 12.4 days, respectively, p=0.790). One patient (5%) with type I injury died of multiorgan deficiency.

Conclusion: With close close clinical follow-up, medical treatment can be beneficial for most patients, and surgical procedures should be reserved for patients with type I (definite) and type II/III injuries; in patients with these clinical parameters, conservative management will likely be unsuccessful.

Keywords: Complication, duodenum perforation, endoscopic retrograde cholangiopancreatography, surgical repair

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INTRODUCTION

Endoscopic retrograde cholangiopancreatography (ERCP) was first described in 1968 by McCune et al. (1). It is an invasive method used today for the diagnosis and treatment of pancreatic and biliary diseases. Since the emergence of other non-invasive or less invasive methods, such as magnetic resonance colangiopancreatography (MRCP) and endoscopic ultrasonography (EUS), respectively, ERCP has been used mainly for treatment (2). This highly invasive procedure is associated with a higher frequency of serious complications, ranging between 4% and 16% (3-7). Although the risk of ERCP-related perforation (ERCP-rP) is low (<1% for patients undergoing sphincterotomy), it is associated with high morbidity and mortality, particularly for patients in whom conservative therapy is unsuccessful and who have a delayed diagnosis of perforation (8-11).

There is still no consensus on whether ERCP-rP should be managed by a conservative or surgical approach. Literature related to the management of ERCP-related complications mostly includes limited case series and case reports (12-14). Although in the past, many authors advocated early surgical management for ERCP-rP, most recent studies have reported good outcomes with conservative management for carefully selected patients (5, 15). Early diagnosis and definition of injury type play major roles in the management of ERCP-rP. Increased experience in endoscopic interventions and emerging technology has enabled clinicians to address these injuries with endoscopic interventional methods. Retroperitoneal perforation related to papillotomy is observed in most patients; intraperitoneal perforation is observed less frequently.

Based on a single center experience with the management of ERCP-rP, we aimed to analyze the types of injuries, surgical options, and outcomes of patients with ERCP-rP.

MATERIAL AND METHODS

Over a five-year period between January 2010 and October 2015, all ERCP procedures (n=3432) that were performed at the Gastroenterology and General Surgery Clinic at Şişli Hamidiye Etfal Training and Research

Hospital were retrospectively reviewed. The 17 patients with a diagnosis of ERCP-rP were enrolled in the study. This study was approved by the institutional review board at our institution (Local Ethics Committee of Şişli Hamidiye Etfal Training and Research Hospital), and informed written consent was obtained from all the reviewed subjects to use their clinical records in this study. The ERCP reports and medical records of the patients with perforations were evaluated. While 13 patients (0.3%) were from our hospital, 4 cases were referred from different hospitals. All patients were classified classified into two groups based on treatment approaches: conservative (C) and surgical (S).

All patients underwent chest X-rays, plain abdominal radiography, abdominal ultrasound (US), and computed abdominal tomography (CAT). Complete blood counts and biochemical profiles were assessed. Data collection included demographic features, indication for ERCP, type of injury, time to diagnosis, treatment approach (conservative or surgery), surgical procedure, length of hospital stay, morbidity and mortality.

The classification of ERCP-rP is shown in Table 1. Based on the type of injury, patients with type I injury underwent surgical treatment, while conservative treatment was mostly preferred for patients with type II, III, and IV injuries. Patients treated with a conservative approach underwent closed monitoring for vital signs, intermittent physical examination, and blood tests. In the presence of at least two of systemic inflammatory response syndrome (SIRS) criteria (sepsis) (10) (body temperature >38°C or <36°C, heart rate >90 pulse/min., respiratory rate >20/min. or $PaCO_2$ <32 mmHg, white blood cell count >12000/mm^3 or <4000/mm^3, >10% immature neutrophil (bands)), repeat CAT was performed to determine possible free fluid collection or abscess formation. Percutaneous abscess drainage was applied for patients with conservative treatment whose CAT scans revealed intraperitoneal or retroperitoneal localized abscesses during the follow-up period.

For statistical analysis, Statistical Package for the Social Sciences version 20.0 for (IBM Corp.; Armonk, NY, USA) was used. Only descriptive measures were used. Continuous variables were represented as mean±standard deviation or median and range. Categorical variables were represented as percentages.

RESULTS

Of the 3492 ERCP cases during the study period, 59 patients with abdominal pain following ERCP procedures were admitted to the General Surgery Clinic with a preliminary diagnosis of ERCP-rP. Free air in the intraperitoneal and/or retroperitoneal areas, contrast leakage, fever and/or elevated leucocytes, and C-reactive protein were found in 16 patients; they were diagnosed with post-ERCP iatrogenic duodenal perforation (0.4%). In addition, four patients with a diagnosis of ERCP-rP were referred from other hospitals. Only 3 out of 20 patients were diagnosed with perforation due to contrast leakage during ERCP, whereas the remaining patients (85%) were diagnosed during post-ERCP follow-up.

Table 1. Classification of ERCP-related perforations

Type of injury	Definition
I	Lateral or medial wall perforations
II	Perivaterian injuries
III	Distal bile duct injuries related to wire or basket instrumentation near an obstructing entity
IV	Retroperitoneal air alone

ERCP: endoscopic retrograde cholangiopancreatography

There were 12 female (60%) and 8 male (40%) patients with a mean age of 46 years (range: 23 to 76). The mean time to diagnosis was 7.8 hours (range: 1 to 36 hours). In patients with a suspected perforation, oral intake was ceased and initial treatment with fluids, analgesia and appropriate antibiotics was started. Three patients (17%) initially treated with a conservative approach underwent surgical procedures due to peritonitis findings, fever, and elevated WBC and C-reactive protein during follow-up. The mean duration between diagnosis and surgery was 24 hours (range: 18 to 36).

The mean length of hospital stay was 12 days in the conservative group, whereas it was 12.4 days for the surgery group. In nine patients with conservative treatment (Table 2), percutaneous drainage was performed during follow-up due to intraabdominal abscess. One patient in the surgery group died of sepsis on postoperative day 8. She was diagnosed with perforation 12 hours after ERCP and underwent hepaticojejunostomy with gastroenterostomy. Detailed data for the patients treated with surgical approaches are shown in Table 3.

DISCUSSION

Although ERCP is an invasive procedure, it is still one of the most common procedures used for the diagnosis and

Table 2. Demographics and diagnosis of patients who were not surgically treated

Age	Sex	Indication for ERCP	Type of injury	Time to diagnosis (hours)	Length of hospital stay (days)
54	M	CL	II	2	7
46	M	CL	IV	3	9
66	F	Periampullary tumor	II	1	12
38	M	CL	III	1	10
47	F	Cholangitis	II	2	15
43	F	CL	II	13	35
52	F	CL	III	12	26
71	M	Pancreas tumor	II	3	13
33	M	CL	III	1	7
58	M	CL	II	3	6
45	F	CL	III	8	12
39	F	CL	IV	1	7
24	F	Cholangitis	II	8	9
23	F	Cholangitis	II	2	8
32	F	CL	II	3	9

M: male; F: female; CL: choledocholithiasis; ERCP: endoscopic retrograde cholangiopancreatography

Table 3. Detailed data of patients who underwent surgical treatment

Age	Sex	Indication for ERCP	Type of injury	Surgical procedure	Time of diagnosis (hours)	Length of hospital stay (days)
76*	F	Choledochal cyst (type 1)	I	Primary repair of injury+HJ+ gastroenterostomy	12	8
43	M	CL	II	Lap. chol+ exploration of CBD+T-tube drainage	3	7
52	F	Cholangitis	III	T-tube drainage	24	13
45	F	CL	II	Lap. chol+drainage	18	12
38	M	CL	II	Cholecystectomy+ exploration of CBD+T-tube drainage	36	15

M: male; F: female; CL: cholodocholithiasis; HJ: hepaticojejunostomy; CBD: common bile duct; Lap. chol: laparoscopic cholecystectomy

*This patient died of multiorgan failure

treatment of biliary diseases (1). It has various complications, including gastrointestinal system perforation, which has significant morbidity and mortality rates (3-7, 9). In this study, we evaluated the treatment approach to perforations and discovered that only some of these patients required surgical treatment. For better outcomes, diagnosis of the injury and determination of the injury type should be given priority.

While almost all authors advocate surgical treatment for type I injuries, a debate remains as to whether conservative or surgical strategy should be performed for other types of injuries. Timely diagnosis of ERCP-related perforations is important in establishing better treatment approaches. In cases of perforations involving peritoneal signs, type IV perforations are more commonly diagnosed. In contrast, it is more difficult to detect retroperitoneal perforations, which only can be identified using radiological imaging methods due to post-ERCP abdominal pain. Clinical studies investigating the diagnostic methods for ERCP-related perforations have revealed that CAT is the most sensitive method in patients with high suspicion of perforation (16). Genzlinger et al. (17) reported the efficacy of CAT after ERCP. About one-third of the patients with perforation are diagnosed at the time of ERCP procedure. In our study, diagnosis of perforation was established for only three patients (15%) due to contrast leakage during ERCP. The remaining 17 patients were diagnosed using imaging methods (CAT, US, MRCP).

Various classification methods have been presented for the definition and classification of ERCP-related perforations (10, 11). In this study, we used the classification system that Stapfer et al. (10) previously introduced. They reported that type I injuries generally require extensive emergency surgical procedures, whereas type II and III injuries with minimal contrast leakage and absence of fluid accumulation can be managed conservatively. Type IV injuries are classified as pseudoperforations related to air pressure during ERCP.

There has been no consensus on the management of ERCP-related gastrointestinal system perforations to date. Although emergency surgical treatment has been advocated in previous studies, conservative treatment was commonly reported with successful outcomes in appropriate cases in recent series. (10,12, 18, 19). Mortality rates between 7% and 25% were reported in several studies, in which the most common types of perforations were type I and II (12, 19, 20). In our study, the most common type was type II injury (60%); only one patient with type I injury (5%) died of sepsis.

Conservative treatments include endoscopic clip application and percutaneous drainage catheter insertion. Patients diagnosed with retroperitoneal abscess can be managed with percutaneous drainage, which may result in fistula formation. In our study, 60% (9 of 15) patients were managed conservatively by insertion of a percutaneous drainage catheter. Five of these patients required catheter adjustments or additional catheter insertion.

CONCLUSION

Accurate diagnosis and timely intervention are very important in patients with ERCP-rP. Clinical symptoms, imaging methods, and the mechanism of injury should be evaluated, and all these parameters should be considered before deciding whether to operate. Conservative treatment with close follow-up can prevent unnecessary surgery, whereas early operation on patients who fail to respond to medical treatment may prevent morbidity and mortality that can be caused by delayed surgery.

Ethics Committee Approval: Ethics committee approval was received for this study from the ethics committee of Şişli Hamidiye Etfal Training and Research Hospital.

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Factors affecting successful colonoscopy procedures: Single-center experience

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ABSTRACT

Objective: Colonoscopy is a gold standard procedure for several colon pathologies. Successful colonoscopy means demonstration of the ileocecal valve and determination of colon polyps. Here we aimed to evaluate our colonoscopy success and results.

Material and Methods: This retrospective descriptive study was performed in İstanbul Eren hospital endoscopy unit between 2012 and 2015. Colonoscopy results and patient demographics were obtained from the hospital database. All colonoscopy procedures were performed under general anesthesia and after full bowel preparation.

Results: In all, 870 patients were included to the study. We reached to the cecum in 850 (97.8%) patients. We were unable to reach the cecum in patients who were old and obese and those with previous lower abdominal operations. Angulation, inability to move forward, and tortuous colon were the reasons for inability to reach the cecum. Total 203 polyp samplings were performed in 139 patients. We performed 1, 2, and 3 polypectomies in 97, 28, and 10 patients, respectively. There were 29 (3.3%) colorectal cancers in our series. There was no mortality or morbidity in our study.

Conclusion: General anesthesia and full bowel preparation may be the reason for increased success of colonoscopy. Increased experience and patient-endoscopist cooperation increased the rate of cecum access and polyp resection and decreased the complication rate.

Keywords: Colonoscopy, diagnosis, cecum, polyp

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INTRODUCTION

Endoscopic applications are the most efficient approaches used for executing mucosal pathologies in the gastrointestinal system. Today, colonoscopy is a gold standard method for determining the pathologies of lower gastrointestinal system (1). Colonoscopy is the basis of colon cancer screening process (2). It enables therapeutic procedures as well as diagnostic use. It can be used for interventional purposes such as biopsy, polypectomy, treatment of gastrointestinal system bleeding, excision of foreign body, volvulus detorsion, stenotic segment dilatation, stent placement, and tumor fulguration (2). Colonoscopy is made most frequently for colorectal cancer screening and data vary among societies (3). The colonoscopy results in our country were presented from different geographies (4-7). When examining the colonoscopy results, reaching the cecum and not overlooking the adenomas are shown as success criteria (8, 9). Failing to anesthetize and inadequate bowel cleansing are the most important failure factors (4).

In this study, we aimed to examine the endoscopy results of lower gastrointestinal system applied at a specific interval at our hospital in Istanbul by questioning our failed interventions with the literature information.

MATERIAL AND METHODS

Information about 896 patients applying to İstanbul Eren Hospital Endoscopy Unıt in June 2012 and September 2015 with colonoscopy indication was evaluated retrospectively from hospital files. The research was conducted according to the principles of the World Medical Association Declaration of Helsinki "Ethical Principles for Medical Research Involving Human Subjects." Rectal bleeding, change in bowel habits, stomach ache, fecal occult blood positivity, anemia, persistent non-infectious diarrhea, and personal and familial colorectal cancer history were determined as endoscopy indications for further examination of radiological colorectal pathologies. Only first diagnostic applications of patients who are diagnosed as inflammatory bowel disease were included in the study. Patients who had serious arrhythmia, who had 3 and 4 WHO performance score, who were in acute phase of diverticulitis, and who had coagulation disorder posing contraindications for biopsy or polyectomy were not included in the study. In colonoscopy, patients whose cecum cannot be reached and the most proximal reaching distance were determined. In the examination, while diminutive polyps were removed using cold forceps and polypectomy was performed using snares for polyps that measured 1 cm or more. Age,

gender, body mass index (BMI), previous abdominal surgical history, colonoscopy findings of patients, and pathology results of samples taken during colonoscopy were examined retrospectively. Characteristics of patients whose cecum could not be reached were compared with the characteristics of patients whose cecum was reached.

Informed consent was taken from all patients before the procedure. Nutrition with pulpless, liquid food was started two days before the intervention. Bowel cleansing of patients was provided by oral cenosite solution and rectal sodium phosphate rectal enema one day before the examination Patients with inadequate colon cleansing were prepared again by additional doses within the same day and their procedures were repeated on the following day. Secondary interventions were reported as valid procedure. Patients were scheduled for colonoscopy after minimum 8 h of fasting. All colonoscopy procedures were performed under sedation and analgesia guided by a Anesthesiology and Reanimation Specialist. For sedation, 1-5 mg midazolam and 0.5 mg/kg propofol were administered intravenously, and for analgesia, 50-150 mg meperidine was administered. All procedures were carried out using Pentax EPK-100p (Hoya Comp; Tokyo, Japan) and the most proximal section that was reached was documented by photographing it.

Statistical Analysis

Data obtained were recorded in Statistical Package for the Social Sciences 15.00 (SPSS Inc.; Chicago, IL, USA) program. The results were given by mean±standard deviation. Chi square independent test was used for statistical analysis and $p<0.05$ was accepted as significant.

RESULTS

Of the total 870 patients, 382 were males (43.9%) and 488 were females (56.1%). Mean age of patients was determined to be 53.3±8.4 years (range: 13-90); 48.7% were ≥50 years old. Mean BMI of patients was found to be 32.1±3.2. Cecum and terminal ileum were reached in 850 (97.8%) patients. Cecum could not be reached only in 20 (2.2%) patients. The most proximal distance that could be reached was hepatic flexura in 10 patients, splenic flexura in 8 patients, and sigmoid colon in 2 patients. Sharp angulation in 9 patients, discontinuation of colonoscopy in 8 patients, and tortuous structure of colon in 3 patients were seen as the reason why cecum could not be reached. The comparison of patients whose cecum could or could not be reached is given in Table 1. It was determined that mean age of patients whose cecum could not be reached was 62.3±6.2 years, their female/male ratio was 13/7, and their mean BMI was 36.4±2.8. Pathologies detected in colonoscopy examination are given in Table 2. Colorectal polyp was detected in 139 patients in our study (15.9%) and total 203 polyps were sampled pathologically. It was found that the number of patients having a single polyp that was sampled was 97 (69.7%), 2 polyps that were sampled was 28 (20.1%), and 3 polyps that were sampled was 10 (7.1%). Sampling of more than 3 polyps was carried out for the other 4 patients. Snare polypectomy was performed in 49 (35.2%) of 139 patients having colorectal polyp. In the study, the number of patients having colorectal cancer diagnosis was 29 (3.3%), and according to their localizations, these cancers were located in the rectum in 6 (20.7%) patients, in the sigmoid colon in 6 (20.7%) patients, in the hepatic flexura in 5 (17.2%) patients, in the colon in 4 (13.8%) patients, in the cecum in 3 (10.3%) patients, in the descending colon in 2 (6.9%) patients, in the rectosigmoid junction in 2 (6.9%) patients, and in the splenic flexura in 1 (3.4%) patient (Table 3). Of the colorectal cancer patients, 26 (89.6%) were

Table 1. Comparison of patients in whom can not reach the cecum and cecum is reached

	Cecum was reached (n=876)	Cecum inaccessible (n=20)	p
Age* (year)	52.8±8.1	62.3±6.2	<0.05
BMI* (kg/m^2)	32±3.1	36.4±2.1	<0.05
History of colorectal surgery**	14 (1.5)	1 (5)	0.19
History of non-colorectal lower abdominal surgery**	22 (2.5)	4 (20)	<0.05

BMI: body mass index
Datas are presented as * mean±standard deviation, ** n (%).

Table 2. Our results with lower gastrointestinal endoscopy

Endoscopic diagnosis	Number	Percentage (%)
Normal	354	40.6
Colorectal cancer	29	3.3
Colorectal polyp	150	17.2
Hemorrhoidal disease	191	21.9
Diverticular disease	67	7.7
Colitis		
Nonspecific colitis	68	7.8
Ulcerative colitis	33	3.7
Crohn disease	9	1
Ischemic colitis	1	0.1
Anal polyp	11	1.2
Anal fissure	46	5.2
Perianal fistula	10	1.1
Solitary rectal ulcer	5	0.5
Anastomotic ulcer	1	0.1
Rectal prolapse	1	0.1
Angiodysplasia	1	0.1
Parasites	1	0.1

Table 3. Tumor localization in patients diagnosed with colorectal cancer

Tumor localization	Number	Percentage (%)
Rectum	6	20.7
Sigmoid colon	6	20.7
Rectosigmoid junction	2	6.9
Ascending colon	4	13.8
Splenic flexure	1	3.4
Hepatic flexure	5	17.2
Descending colon	2	6.9
Cecum	3	10.3

≥50 years old. Fourteen (1.6%) patients included in the study had previous surgical history with the reason of colorectal cancer. Although tumor recurrence was not observed in the anastomosis line of any patients, 1 patient having anterior resection history before 7 years was diagnosed with metacrone colorectal cancer in hepatic flexura. No complications developed during or after the procedure in any patient undergoing an endoscopic procedure.

DISCUSSION

Today, colonoscopy procedures are the gold standard in the diagnosis of gastrointestinal mucosal pathologies, especially in colorectal cancers. In addition to diagnostic evaluations, colonoscopy enables therapeutic procedures such as biopsy, polypectomy, endoscopic mucosal resection, volvulus detorsion, bleeding control, dilatation of strictures, and endoluminal stent applications (6). Quality of colonoscopy depends on cecal intubation and adenoma detection (8).

Older age is the major risk factor for colorectal cancers. For this reason colonoscopy procedure every 10 years after 50 years of age is the most effective cancer screening method. Mean age of patients undergoing (49-57.9) colonoscopy procedures in our study was similar to that reported in the previous studies (4, 7, 10, 11). In the study, most of the cases of colorectal cancer detected in patients undergoing colonoscopy were ≥50 years old. This result proved the necessity of again giving importance to colon cancer screening programs in patients aged ≥50 years (12). Success concept in colonoscopy is defined by imaging the cecum. Reaching the cecum or terminal ileum is an aim for accepting the intervention as successful and efficient. Especially, publications arguing that the rates of colonoscopy procedures in which cecum is imaged should be about 95% in specialized health centers (11). American Cancer Society Colorectal Cancer Task Force determined the standard criteria of cecum intubation success as 90% and set 95% goal as the ideal rate. Rates of reaching the cecum in important centers in United States were found to be 96%-100% (13). Colonoscopy success depends on three factors (12): (1) endoscopist related, experience and skill; (2) patient related, vital findings during procedure, colonoscopy reason, gender, BMI, previous abdominal surgery, radiotherapy, and situation of bowel cleansing; (3) technique related, sedation technique used and colonoscopy device. In a study conducted by Aslina et al. (13), it was found that the rate of reaching the cecum in females (92.7%) was lower than that in males (95.5%). As for the study by Anderson et al. (14), it was determined that gender was not a factor related to failure.

In our study, higher failure rate in females can be explained by the fact that previous non-colorectal lower abdominal operations are mostly gynecological surgeries. In the study conducted by Cirocco and Rusin (15), it was reported that previous hysterectomy operations are a factor for failed colonoscopy. While low BMI (<25) was found to be a failure factor in the study conducted by Anderson et al. (14), failure was higher in overweight patients in our study. We think that this is caused by the fact that overcoming the technical problems is more difficult in overweight patients. Previous colorectal surgery of patients is not a failure factor for colonoscopy. Reducing the flexures in colorectal surgery may provide advantage for colonoscopy. Increase in colon length and decrease in resistance are seen by age (16). In the literature, advanced age was shown as the factor for failure in colonoscopy (17). Aslinia et al. (13) reported that the success rate for reaching the cecum decreased in patients aged 65 years and above.

In some studies conducted in our country, colonoscopy success rates were presented between 61.7% and 81% (4, 5). Patient discord and inadequate bowel cleansing were shown as the reason of low rates. The basic reason why rates in our study are higher is that procedures are performed in the presence of Anesthesia and Reanimation Specialists. Considering the centers attaining high success rates, it is seen that 90% of colonoscopies are performed using propofol support (17). Unfortunately, the fact that Anesthesia and Reanimation Specialists are inadequate in number for colonoscopy examinations, reduces the success rates. Administration of propofol by nurses has shown better results but it's not possible for regulations in our country (18). Overcoming the obstacle of inadequate bowel cleansing is possible and additional bowel cleansing preparation was made for repeating in our patients the following day. Thus, inadequate bowel cleansing was not seen among the reasons of failed colonoscopy.

Another factor in colonoscopy activity is the success of polyp detection. In meta-analysis conducted by Van Rijn et al. (19), overlook rate of polyps was 21% in small-sized polyps (≤5 mm) and 13% in medium-sized polyps (6-9 mm). In screening programs, it was seen that colorectal cancer related to overlooked lesions developed in 0.7 in 1000 of normal reported colonoscopy examinations (20). Polyp determination rates by endoscopists are therefore among significant criteria. In the study conducted by Bretagne JF et al. (21), 1-, 2-, and 3-piece polyp detection rates of endoscopists were found to be 25%-46%, 5%-21%, and 2%-12%, respectively. According to the numbers of polyps sampled at our center, successful results were obtained. In the literature, the fact that endoscopists carry out more than 200 procedures and have experience of more than 5 years is shown as the reason why endoscopists are successful in colonoscopy (22). At our center, surgical endoscopist experience reached this number and all endoscopists had basic endoscopy training as a part of their specialization training programs. Colonoscopy education among surgeons are good enough for high quality. Surgeon-performed colonoscopies meet the standard quality (23).

Colonoscopy-related mortality was reported as 0.02%, and colonoscopy-related morbidity was reported as 0.25% (24). In some studies conducted in our country, complication rate in diagnostic colonoscopy varied between 0% and 0.16% (6, 7). Complication rates increase depending on inadequate bowel cleansing and previous abdominal surgery (4). It was seen that this rate increased more in mucosal resection and therapeutic procedures applied for large polyps. In our study, total 205 polyps were sampled pathologically using forceps or snares. The fact that no complication was seen in our study may depend on no intervention except biopsy and polyectomy, adequate bowel cleansing, and team-patient harmony provided by anesthesia and the gained experience.

In colonoscopy examinations, occurrence rate of normal findings varies between 34% and 42% (4, 5, 25). The most frequent pathology following normal findings is haemorrhoidal dis-

ease. Haemorrhoidal disease rates are seen to be around 14%-58% in our country (4, 5, 18). Different rates in the literature were obtained from different geographic regions, and 21% rate in our study supports the haemorrhoidal disease rate in Istanbul region. Following the hemorrhoid, the most frequent pathology is polyps; 60%-90% of colorectal cancers are caused by adenomatous polyps (26). Therefore, all colorectal adenomas should be sampled. Thirty percent of polyps may be overlooked in screening only by rectosigmoidoscopy (27). Colonoscopy examination should be conducted in all cases in which polyps are detected. Polyp detection rates in our country are between 7% and 20% and are similar to the results of our study (4, 5, 7).

Inflammatory bowel diseases are seen at different rates in the world. Although they are more frequent in Nordic countries, the frequency in our country is low. The rate of inflammatory bowel diseases among colonoscopy procedures in the study made of Bowles et al. was 13% (25). However the rate of inflammatory bowel disease among colonoscopy procedures in the studies performed in our country were between 3.9%-4.9%. (6, 7). Other pathologies such as diverticulitis, anal fissure, and rectal solitary ulcer detected in colonoscopy were seen at rates similar to those in the literature (4-7).

Colonoscopy is the gold standard method for the diagnosis of colorectal cancers. In the studies conducted in our country, as a result of lower gastrointestinal system endoscopy, colorectal cancer detection rates are between 1% and 14% and vary by region (6, 7). In another study conducted in Istanbul, colorectal cancer was detected in 3.55% of patients undergoing colonoscopy and in 3.06% of patients undergoing rectosigmoidoscopy (5). In our study, this rate was 3.2% and showed similarity with this study. In many studies, it was shown that colorectal cancers were frequently located in left colon (5). In our study, the most frequent two localization places were determined as rectum and sigmoid colon. The rates of existence of colorectal cancers in rectum and sigmoid in our study were 20.7% and 20.7% which were similar with the rates presented in the literature. In our colonoscopy applications, it was seen that while the rate of reaching the cecum was so high, colorectal cancer detection rate was low according to the literature. This may be because colonoscopy results in the literature studies are frequently obtained from risky groups in screening programs, and in our study, colonoscopy was performed for other pathologies except cancer.

CONCLUSION

Colonoscopy success rates may be increased by adequate bowel cleansing with anesthesia. Increase in experience increases the rates of patient harmony, reaching the cecum, and polyp excision and reduces the complication rates. Surgeons can perform high-quality colonoscopy.

Ethics Committee Approval: Authors declared that the research was conducted according to the principles of the World Medical Association Declaration of Helsinki "Ethical Principles for Medical Research Involving Human Subjects" (amended in October 2013).

Informed Consent: Informed consent was not received due to the retrospective nature of the study.

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Treatment of phytobezoars: Tailoring management to diverse presentations

Zeki Özsoy, İsmail Okan

ABSTRACT

Objective: A minimally invasive approach is feasible and successful for the treatment of phytobezoars. We would like to draw attention to the overconsumption of Sorbus domestica and discuss the management options of patients presenting with different symptoms due to phytobezoars.

Material and Methods: Data from patients diagnosed with phytobezoars in the Department of General Surgery from 2010 to 2016 were prospectively collected and evaluated.

Results: Twenty patients diagnosed with phytobezoars were included in the study. The etiology of phytobezoar was Sorbus domestica seeds in 12 patients, watermelon seeds in two patients, Japanese persimmon seeds in one patient, and unidentified in five patients. Fourteen patients underwent surgery, while the remaining patients were treated conservatively. Minimally invasive surgery was used in all but two cases, where the surgery was converted to laparotomy. Two patients developed postoperative morbidity. There was no mortality.

Conclusion: The treatment modality should be selected for each patient according to the presenting symptoms and characteristics of phytobezoar. In cases where surgery is performed, a minimally invasive approach is feasible and successful for the treatment of ileus.

Keywords: Minimally invasive approach, phytobezoar, sorbus domestica, treatment

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INTRODUCTION

Bezoars can be defined as the accumulation of indigestible materials, such as hair, vegetable and fruit seeds, fibers, and skin, in the gastrointestinal system. *Phytobezoars* are accumulations of indigestible fibers and seeds of fruits and vegetables; *trichobezoars* comprise hair, bristles, and feathers; *lactobezoars* are formed of milk and milk products; and *pharmacobezoars* are the result of copious intake of medication. Phytobezoars are the most common form of bezoar and are usually detected in the stomach (1). The presentation of bezoars may vary from subtle, dyspepsia-like symptoms to more pronounced findings, such as ileus. However, in rare cases of prolonged exposure, bezoars can induce serious inflammatory changes, leading to ulcer formation, perforation, and misdiagnosis of tumor.

Phytobezoars are mostly encountered in patients with digestive and gastric motility problems, diabetes mellitus (DM) with gastropathy, and gastric resections. Seeds of fiber-rich fruits and vegetables and indigestible material can accumulate in any part of the gastrointestinal system where the passage is slowed or obstructed. Many fruit and vegetable materials, such as banana, persimmon, coconut, Brussels sprout, and potato peel, have been reported to cause phytobezoars and subsequent ileus (2). The use of herbs, fruits, and vegetables for the treatment of bezoars is common in folk medicine (3). *Sorbus domestica* (SD) has been traditionally used for the treatment of DM in Turkey and other parts of Europe (4). However, there has been no report in the literature of ileus due to phytobezoar formation caused by SD (Figure 1). In this study, we seek to draw attention to the issue of overconsumption of SD (called üvez in Turkey) and discuss management options for patients presenting with different symptoms.

MATERIAL AND METHODS

Data on patients diagnosed with phytobezoar in the Gaziosmanpaşa University School of Medicine, Department of General Surgery from 2010 to 2016 were collected. Because this was a retrospective study, we did not apply for ethical committee approval. This study was performed in accordance with the Declaration of Helsinki. The patients were diagnosed through esophagogastroduodenoscopy (EGD), abdominal computed tomography (CT), or admission for surgery due to ileus. When phytobezoar was suspected or diagnosed, a careful history of diet, concomitant diseases, previous surgery, and drugs used was taken, and a thorough physical examination was performed. If the patient presented with ileus, routine diagnostic (plain abdominal X-ray, abdominal CT, etc.) and treatment modalities (intravenous hydration, patient monitoring, etc.) were employed. In cases of surgery, patients underwent minimally invasive operations. Written informed consent was obtained from patients participated in this study. The demographic data, dietary habits, presenting symptoms and findings, laboratory values,

operations, postoperative complications, and follow-up data of the patients were prospectively collected and evaluated.

Statistical Analysis

For statistical evaluation, Statistical Package for the Social Sciences version 15.0 (SPSS Inc.; Chicago, IL, USA) was used. For descriptive data, numeric values were given as mean±standard deviation and categoric values were given as rates.

Table 1. Demographic and clinical characteristics of the patients

	n	%
Patients	20	
Gender		
Male	11	55
Female	9	45
Age (years, mean±standard deviation)	56.7±14.3	
Presenting symptoms and findings		
Dyspepsia, nausea, and vomiting	6	30
Ileus	14	70
Comorbidities		
DM	7	35
CRF	1	5
None	12	60
Previous gastric surgery		
Yes	3	15
No	17	85
Etiology		
Sorbus domestica	12	60
Watermelon seeds	210	
Japanese persimmon	1	5
Unidentified	5	25
Time between ingestion and presentation of symptoms (months, mean±standard deviation)	2.75±1.25	

DM: diabetes mellitus; CRF: chronic renal failure

RESULTS

Twenty patients with a diagnosis of phytobezoar were included in this study. The mean age of the patients was 56.7±14.3 years, and 11 patients were male. Fourteen patients presented to the emergency department with ileus; phytobezoar was diagnosed via abdominal CT. Six patients presented with dyspepsia, nausea, and vomiting; phytobezoar was diagnosed with EGD and abdominal CT. Two patients were diagnosed during surgery. The etiologies of phytobezoar were SD seeds in 12 patients, watermelon seeds in two patients, Japanese persimmon seeds in one patient, and unidentified in five patients. The demographic and clinical details of the patients are presented in Table 1. Fourteen patients underwent surgery, while the remaining patients were treated conservatively. The details of clinical management are presented in Table 2.

Minimally invasive surgery was used in all but two cases, where the surgery was converted to laparotomy. In one patient, we found a phytobezoar in the descending colon during surgery. Because it was too dangerous to propagate the bolus using laparoscopy due to its spiked edges, the contents were crushed and passed through the anal canal via laparotomy. A second patient presented with acute mechanical intestinal obstruction; she was monitored for three days. In abdominal CT, an obstructing mass was identified in the terminal ileum. During laparotomy, an obstructing ileal mass causing partial necrosis and edema in the intestinal wall was detected. Segmental ileal resection and end-to-end intestinal anastomosis were performed. Three more bezoars were detected in the stomach with palpation. Vigorous attempts to crush the bezoars were unsuccessful; therefore, gastrotomy was performed to retrieve the bezoars. Post hoc anamnesis revealed that the patient had recently ingested a copious amount of Japanese persimmon.

Two patients experienced postoperative morbidity. The first patient developed postoperative ileus four days after the first bezoar operation. Laparotomy revealed a bezoar proximal to the first enterotomy incision. Because its edges were spiked, a segmental resection was performed to retrieve the bezoar. End-to-end intestinal anastomosis was then performed. In fact, the bezoar was observed during the first operation in the stomach, and it was planned to attempt endoscopic digestion after the

Figure 1. a-c. *Sorbus domestica*. (a) Fresh SD, (b) dried SD, (c) phytobezoar formation caused by SD

Table 2. Details of clinical management

			Treatment (n)						
Patients n (%)	**Localization**	**Diagnosis**	**S1**	**S2**	**S3**	**S4**	**S5**	**S6**	**CM**
9 (45)	Small intestine	CT	5	3					1
5 (25)	Stomach	EGD				1			4
5 (25)	Small intestine and stomach	EGD, CT, and during surgery	1			1	1	1	1
1 (5)	Descending colon	During surgery			1				

S1: Surgery 1 (crushing and passing the contents through the cecum); S2: Surgery 2 (removing the bezoar by enterotomy); S3: Surgery 3 (crushing and passing the contents through the anal canal); S4: Surgery 4 (removing the bezoar by gastrotomy); S5: Surgery 5 (removing the bezoar by gastrotomy and segmental ileal resection); S6: Surgery 6 (removing the bezoar by enterotomy and gastrotomy); CM, conservative management (scattering by endoscopy and ingestion of pineapple juice)
CT: computed tomography; EGD: esophagogastroduodenoscopy

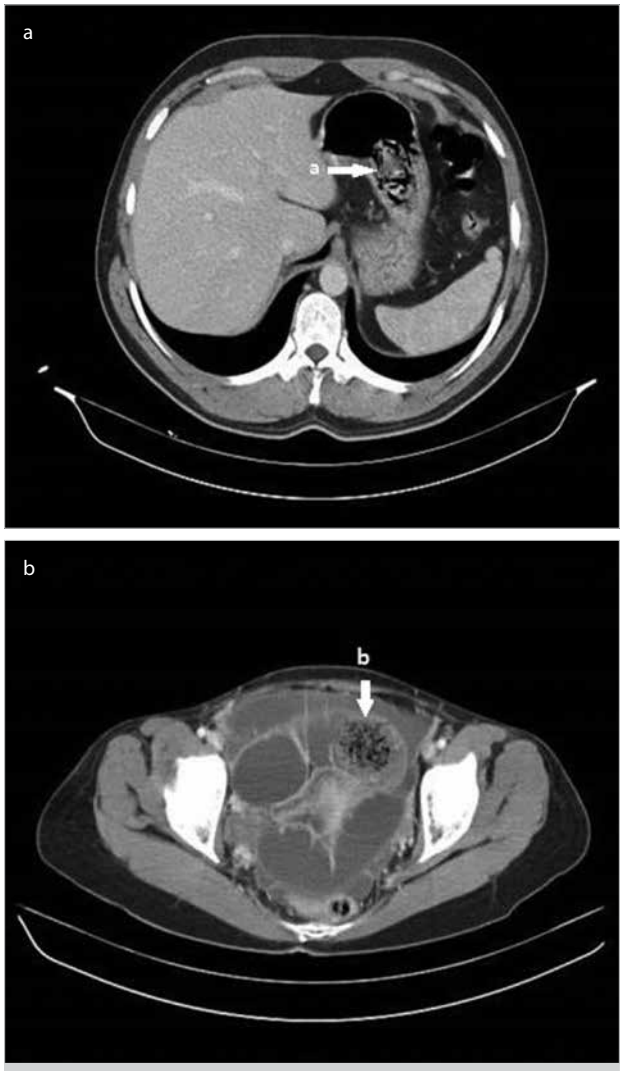

Figure 2. a, b. CT scan showing a phytobezoar. Typical mottled appearance of a phytobezoar in the stomach (a) and distal ileal bowel loops (b)

operation. The second complicatıon was enterocutaneous fistula (treated surgically). There was no mortality. The features of the operations and postoperative periods are presented in Table 3.

Table 3. Features of the operations and postoperative periods

Minimally invasive surgery	14 (100)
Conversion to laparotomy	2 (14.2)
Mean operative time (minutes)	85.2±22.1
Complications	2 (14.2)
Length of hospital stay (days)	3.8±2.4
Mean follow-up period (months)	14.3±14.8
Morbidity	2 (14.2)
Mortality	0
n (%)	

DISCUSSION

Phytobezoars are rare causes of gastrointestinal obstruction. They may arise due to the consumption of fiber-rich and digestive-enzyme-resistant nutrients, such as date palm, citrus fruit, quince, fig, coconut, grape, cabbage, and banana (2). Previous gastric surgery, vagotomy-induced hypoacidity, and delay in gastric emptying are believed to be the most important factors facilitating bezoar development; there is a 5% to 12% change in the incidence of bezoar after gastrectomy (5-7). Reduced gastric secretion and illnesses such as diabetic neuropathy, hypothyroidism, and myotonic dystrophy associated with motility are additional medical conditions that have been identified as putative predisposing factors (8).

Plants have been used for medicinal purposes for thousands of years. Although the use of herbal medicines showed a decline after the scientific revolution in Europe, it has regained popularity worldwide in recent years. However, the public has many misconceptions related to the medicinal use of herbs. They are considered to be safer than pharmaceutical drugs; furthermore, long-term use at high doses is also accepted as safe. Although many studies have been conducted to assess the adverse effects of herbal drugs and drug-herbal remedy interactions, adverse effects caused by plants that result in the need for surgical intervention have not attracted much attention. SD is a wild fruit that is well known throughout Europe and has been used for medicinal purposes for centuries. It is also used as an adjunct for the treatment of DM. When people with predisposing factors such as diabetic gastropathy and orchronic diseases consume large amounts of the fruit with seeds, they are prone to develop phytobezoars. In our study, 12 of 20 patients recalled the ingestion of copious amounts of SD with seeds. Interestingly, the time between ingestion and the presentation of symptoms was more than two to three months. Therefore, in taking patients' histories of ingestion of

fruits or vegetables, the period of the history should extend back several months prior to the presentation of symptoms.

Bezoars are often seen in the stomach; however, as they develop, they may not initially have surgical indications. Rather, they may be clinically silent and detected accidentally. When they reach a large size, they may cause gastrointestinal bleeding or perforation. As in some of our cases, the inflammation can be sufficiently severe to be mistaken as malignant ulceration. Bezoars generally cause obstructions in the jejunum or ileum, with signs of intestinal obstruction. If patients have previous surgery in their medical histories, the cases may initially be perceived as ileus, and treatment may be delayed. Abdominal CT is the most frequently used imaging modality; it has a high success rate in locating obstructions and bezoars. Ripolles et al. (9) stated that the bezoar detection rate using CT imaging is 97%. Bezoars are seen in CT as uniformly bounded, round masses with air bubbles inside and contrast-enhanced edges (10) (Figure 2).

In bezoars in the stomach, upper gastrointestinal system endoscopy can be used both for diagnostic and therapeutic purposes. Gastric phytobezoars are generally treated conservatively. To accomplish this, various methods are conventionally used. Among these, the oldest known method is ingestion of pineapple juice (11). In surgical clinics, repeat doses of cola have been used, and successful outcomes have been reported (12, 13). Frequently used proteolytic enzymes for gastric and proximal jejunum bezoars are n-acetylcysteine, papain, and cellulase (14). Gastric bezoars that are nonresponsive to treatment should be scattered using an endoscopic method. In cases with acute abdomen, such as those involving complete intestinal obstruction in the distal gastrointestinal system or perforation, the treatment is surgical. In cases with malnutrition on the intestinal walls, after determining if the partial intestinal resection and intraluminal mass is a bezoar, the passage can be relieved by crushing, splitting, and milking the contents into the cecum (15). Among the surgical treatment options, removing the bezoar via enterotomy is an option; however, enterotomy should only be performed if the bezoar cannot be split or mobilized (16).

Surgical treatment of bezoars is also possible with a laparoscopic approach. Although laparoscopy is difficult to implement for intestinal obstructions, it has been stated that with technical development, laparoscopy can be used safely by experienced physicians and provides better postoperative results (16, 17). Yau et al. (6) compared the open approach with the laparoscopic approach in their study of 24 cases of intestinal obstruction due to bezoars; they showed the superiority of laparoscopy in selected patients in whom better postoperative results were obtained. Ganpathi and Cheah (18) identified phytobezoars in the terminal ileum in patients who underwent laparoscopy with a mechanical intestinal obstruction diagnosis and who had no previous history of abdominal surgery; in these patients, the bezoars were extracted using enterotomy. Yol et al. (19) reported that it is also laparoscopically possible to move the bezoar forward into the cecum by crushing it.

As the symptoms of phytobezoars vary greatly, so do the treatment modalities. Observing patients and making several attempts to break down the phytobezoars endoscopically should be the first choice. If the patient presents with acute intestinal obstruction, surgery is inevitable. As can be seen from our study, minimally invasive surgery is feasible and safe in experienced hands. If the mass is movable inside the intestinal lumen, it should be possible to force it into the cecum while taking care not to injure the intestine. However, if the bezoar is stuck or impossible to move without injuring the bowel wall, enterotomy should be performed to remove the phytobezoar. We selected the treatment modality according to the presenting symptoms and clinical conditions of our patients. Another important point during surgery is to control the small bowels and stomach to investigate whether additional bezoars are present. It has been confirmed that 9% of cases in which operations are performed to remove bezoars undergo a repeat operation (10). To reduce the formation of bezoars and ileus after discharge, exercises should be recommended for patients to develop their mastication functions, and a diet program that is low in fibrous food and high in phytonutrient content should be recommended (20).

CONCLUSION

In patients with phytobezoar, the treatment modality should be selected for each patient according to the presenting symptoms and characteristics. In the case of surgery, a minimally invasive approach is feasible; ileus can be successfully treated either by crushing and passing the contents through the cecum or by performing enterotomy.

Ethics Committee Approval: Authors declared that the research was conducted according to the principles of the World Medical Association Declaration of Helsinki "Ethical Principles for Medical Research Involving Human Subjects" (amended in October 2013).

Informed Consent: Written informed consent was obtained from patients who participated in this study.

Peer-review: Externally peer-reviewed.

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Non-operative management of abdominal gunshot injuries: Is it safe in all cases?

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ABSTRACT

Objective: In line with advances in diagnostic methods and expectation of a decrease in the number of negative laparotomies, selective non-operative management of abdominal gunshot wounds has been increasingly used over the last three decades. We aim to detect the possibility of treatment without surgery and present our experience in selected cases referred from Syria to a hospital at the Turkish-Syrian border.

Material and Methods: Between February 2012 and June 2014, patients admitted with abdominal gunshot wounds were analyzed. Computed tomography was performed for all patients on admission. Patients who were hemodynamically stable and did not have symptoms of peritonitis at the time of presentation were included in the study. The primary outcome parameters were mortality and morbidity. Successful selective non-operative management (Group 1) and unsuccessful selective non-operative management (Group 2) groups were compared in terms of complications, blood transfusion, injury site, injury severity score (ISS), and hospital stay.

Results: Of 158 truncal injury patients, 18 were considered feasible for selective non-operative management. Of these, 14 (78%) patients were treated without surgery. Other Four patients were operated upon progressively increasing abdominal pain and tenderness during follow-up. On diagnostic exploration, all of these cases had intestinal perforations. No mortality was observed in selective non-operative management. There was no statistically significant difference between Group 1 and Group 2, in terms of length of hospital stay (96 and 127 h, respectively). Also, there was no difference between groups in terms of blood transfusion necessity, injury site, complication rate, and injury severity score ($p>0.05$).

Conclusion: Decision making on patient selection for selective non-operative management is critical to ensure favorable outcomes. It is not possible to predict the success of selective non-operative management in advance. Cautious clinical examination and close monitoring of these patients is vital; however, emergency laparotomy should be performed in case of change in vital signs and positive symptoms concerning peritonitis.

Keywords: Abdominal, gunshot, non-operative management, selective

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INTRODUCTION

In 1960, Shaftan (1) reported that 34.1% of patients with abdominal injury were laparotomy negative and suggested that the need for surgery in abdominal injury patients should be determined with physical examination. In his series, the non-operatively treated patients comprised mostly patients with stab wounds, but included some with gunshot wounds. The negative laparotomy rate of about 20% determined during the Vietnam War was found acceptable because of the low morbidity in laparotomy negative cases (2). Subsequently, serious objections to obligatory laparotomy were raised, and consequently, a selective conservative approach in penetrating abdominal traumas was introduced to treatment (3, 4). In 1986, Demetriades et al. (5) non-operatively treated penetrating hepatic injuries with a success rate of 33%. Objections to this approach peaked in the 1990s. The negative outcomes of negative laparotomy were scrutinized and it was reported that the rates of complications associated with negative laparotomy were about 20 percent (6-9). With advances in diagnostic methods and the expectation of a decrease in the number of negative laparotomies, the obligatory surgical exploration in all penetrating abdominal injuries was questioned. Many authors reported acceptable results with non-operative therapy in patients with no findings related to peritonitis and with hemodynamic stability (8-10). The follow-up procedure of abdominal gunshot injuries has been increasingly used for the past three decades. Selective non-operative management (SNOM), supported by prospective and retrospective studies, is currently a popular approach (11-19). Evidence supporting the practibility and safety of non-operative therapy in abdominal injuries is increasingly being reported (20, 21).

The purpose of this study is to investigate feasibility of non-operative therapy in cases with penetrating abdominal gunshot injuries and to present experience of our second-degree center, situated at the Turkish-Syrian border, which receives many gunshot injury referrals from Syria's active battle districts.

MATERIAL AND METHODS

Patients with penetrating truncal gunshot injuries in the period between February 2012 and June 2014 were retrospectively studied. Of these patients, those who were hemodynamically stable and did not

have signs and symptoms of peritonitis at the time of presentation were included in the study. Patients who had undergone emergency surgery and with incomplete patient files were excluded from the study.

The data from the patients were retrospectively studied in terms of age, gender, injury site (anterior abdomen or posterior abdomen), number of blood transfusions, abdominal organ injuries (those determined), extra-abdominal organ injuries, length of hospital stay and need for laparotomy after follow-up. Non-surgically followed patients were divided into two groups as successful SNOM (Group 1) and unsuccessful SNOM (Group 2) according to necessity of surgical treatment during follow-up period.

The area among the line between both nipples and the symphysis pubis was accepted as the anterior abdomen, and the area between the inferior angles of the scapulae and gluteal folds was accepted as the posterior abdomen. The mid-axillary line was used to demarcate the anterior abdomen from the posterior. Patients who were hemodynamically stable, with no signs and symptoms of peritonitis, and with penetrating abdominal injury determined by radiological methods, were selected for SNOM. Hemodynamic stability was accepted as a systolic blood pressure of above 90 mm Hg and a pulse under 110/min. Patients without abdominal pain, tenderness, defense, or rebound were accepted to have no peritonitis. All patients underwent abdominal and thoracic computed tomography (CT) during the first admission. When required, cerebral CT, extremity CT, and direct radiographies were also performed for diagnostic purposes.

The patients' recovery criteria were no abdominal pain, oral intake of food, no vomiting, bowel movement, adequate bowel sounds by auscultation, no fever and tachycardia, and no finding or complaint indicating any pathology. All patients were examined (about every 3 h), followed up, and operated by the same surgeon. The patients were discharged from the hospital when their general condition was stable and with their own will. Because of the retrospective nature of our study, there was no need for an ethical committee approval. The study was designed according to "World Medical Association Declaration of Helsinki Ethical Principles for Medical Research Involving Human Subjects," amended in October 2013. The patients participating in the study gave their approval after being informed regarding the possible complications that could occur during therapy and follow-up.

Statistical Analysis

Statistical Package for the Social Sciences version 22 software package (IBM Corp.; Armonk, NewYork, USA) was used for statistical analysis. For the analysis of categorical variables and continuous data, Fisher's Exact test and Mann-Whitney U test were used, respectively. $p<0.05$ was considered statistically significant.

RESULTS

One hundred and fifty-eight cases were analyzed. One hundred and forty patients were operated and negative laparotomy rate was 7% (n=11) in operatively treated group. Eighteen patients (11.3%) who were followed in intensive care unit without surgical intervention were included in the study (Figure 1). The patients were all male and the average age was 29.6 (±8.34) years; 35.7% (n=5) of these non-surgically treated patients had radiologically diagnosed solid organ injuries and were managed conservatively. Of these patients, 3, 1 and 1 had liver, spleen, and kidney injuries, respectively. On CT examination in Group 1, apart from solid organ injuries, 3 patients had isolated intraperitoneal foreign bodies, 3 had free air and foreign body, 2 had degradation of peritoneal surface and mesointestinal edema, and 1 had only free air. CT images of 3 cases belonging to Group 1, showing solid organ injury, intra-abdominal extraluminal air, and intra-abdominal foreign body are shown in the Figure 2, 3.

Four (22.2%) patients underwent surgery because of peritonitis signs during the intensive care follow-up. Besides changes in vital signs, intra-abdominal free air was observed in four

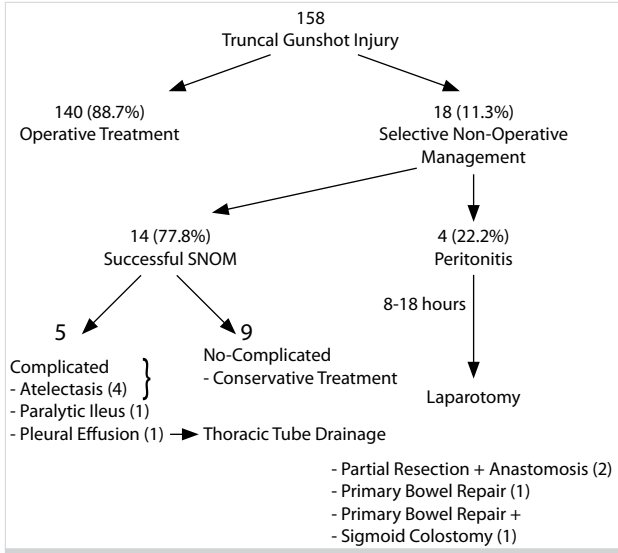

Figure 1. The algorithm of selective non-operative management at our center

Figure 2. CT scan of a selective non-operative management patient. Foreign bodies are seen in liver parenchyma and right thoracic subdermal space. Intra-abdominal extraluminal air can be seen

(22%) patients on CT, and delayed laparotomy was performed for these patients. Patients who were in unsuccessful SNOM (Group 2) group were kept under observation for 13 (8-18) h before surgery. Small bowel injuries were noted in three patients and small bowel-colonic injury was determined in one patient. Partial resection and primary anastomosis in two patients, primary repair of small bowel in one patient, and primary bowel repair+sigmoid colostomy in one patient were performed for the treatment of bowel injuries (Figure 1).

Of the total number of patients, 55.5% (n=10) had been wounded in the anterior abdomen, 38.8% (n=7) in the posterior abdomen, and 5.5% (n=1) in the right anterior hemi thorax. There was no difference between groups in terms of injury site (p=1.000). In the analysis of Group 2 patients with regard to wound site, 50% (n=2) had been wounded in the anterior abdomen and 50% (n=2) had been wounded in the posterior abdomen.

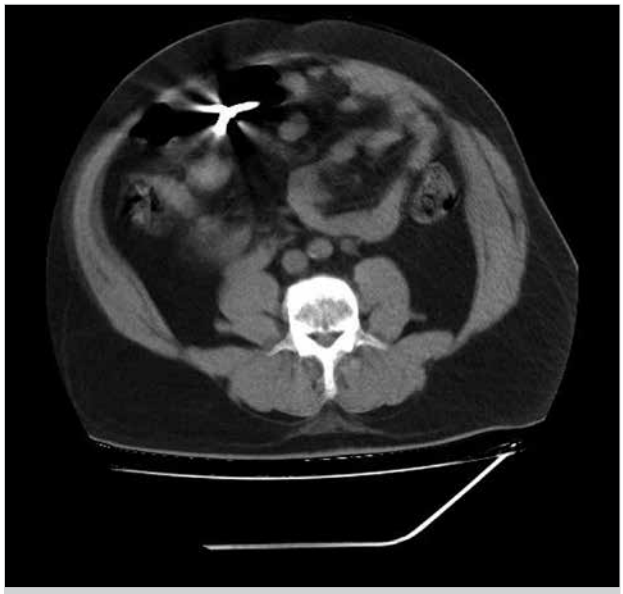

Figure 3. A CT scan of intra-abdominal foreign body in the successful selective non-operative management group

There was no mortality in either Group 1 or 2. Total complication rate was 44.4% (n=8). The rate of complications in Group 1 was 35.7% (n=5). The complications were lung atelectasis in three patients, paralytic ileus in one patient, and pulmonary effusion in one patient. Although the patients with atelectasis and paralytic ileus were treated with non-surgical approaches, pulmonary effusion was treated with thoracic tube drainage. Surgical site infection developed in three (75%) Group 2 patients. There was no significant difference between groups in terms of complication rate (p=0.275). There was no significant difference between Group 1 and Group 2, in terms of average injury severity score (ISS) (4.9 and 6, respectively, p=0.422).

Of the patients, 44.4% (n=8) did not receive blood transfusion, and of those who did, the average transfusion volume was 1.2 units. There was no significant difference between groups in terms of blood transfusion (p=0.129). The average total length of hospitalization was 103 h. There was no significant difference between groups in terms of hospitalization period (p=0.202). A detailed comparison of Groups 1 and 2 is shown in Table 1. Six (33.3%) patients in SNOM group also had extra-abdominal organ injuries. Four of them had a pulmonary injury, one had an upper leg injury, and one had a forearm injury. The treatment of pulmonary injury cases involved thoracic tube drainage in three (75%) and conservative management in one (25%). Upper leg and forearm injuries treated conservatively. No major surgical intervention was performed in these patients. The distribution of all organ injuries is shown in Table 2.

DISCUSSION

Selective non-operative management of cases with abdominal gunshot injuries decreases the rate of negative laparotomies. In addition, the non-operative management of penetrating abdominal gunshot wounds means reduced potential for post-

Table 1. Detailed comparison of Group 1 and Group 2 patients

		SNOM				
		Group 1		Group 2		p
		n	%	n	%	
Wound Site	Anterior	2	50.0	8	57.1	1.000
	Posterior	2	50.0	5	35.7	
	With Hemitorax	0	0.0	1	7.1	
Complication	+	3	75.0	5	35.7	0.275
	-	1	25.0	9	64.3	
Extra-abdominal injury	+	0	0.0	6	42.9	0.245
	-	4	100.0	8	57.1	
		Mean±SD	Min.-Max.	Mean.±SS	Min.-Max.	
Age		28.5±7.77	19-38	29.93±8.75	18-50	0.873
Blood Tx Necessity (Unit)		0.25±0.5	0-1	1.5±1.79	0-6	0.129
Injury severity score (ISS)		6±2.71	4-10	4.93±3.93	0-12	0.422
Hospital Stay (hour)		127±14	110-142	96.86±50.38	24-188	0.202

Fisher's Exact test, Mann Whitney U test
SNOM: selective non-operative management; SD: standard deviation

Table 2. Injured organs diagnosed by CT scans and their distribution in patients

Injured organs	SNOM successful	SNOM unsuccessful
Abdominal		0
Liver	2	0
Kidney	1	0
Spleen	1	0
Colon	0	1
Small bowel	0	4
Extra-abdominal		
Lung	4	0
Femur	1	0
Forearm	1	0

CT: computed tomography; SNOM: selective non-operative management

operative complications, depending on the prevention of negative laparotomies (7, 8). The rate of negative laparotomy was reported above 20% and the rates of complications associated with negative laparotomy were reported to be in the range of 19.7%-25.9% (6-9). In the present study, the rate of negative laparotomy was 7% (n=11). In our opinion, if we would not apply SNOM for our suitable cases, negative laparotomy rate would increase up to 15.8% (n=25). We believe that potential complications of surgical interventions were prevented in these patients by following SNOM. Diagnostic laparoscopy can be considered in hemodynamically stable patients to determine peritoneal penetration with potential intestinal injuries and to decrease the number of negative laparotomies (12). Diagnostic laparoscopy in gunshot wounds, in some cases, can lead to false negative results and requires experience in this sense. For our case series, diagnostic laparoscopy was not performed due to insufficient technical capability and low experience.

DuBose et al. (22) reported that non-operative approach is a safe method for appropriately selected patients' solid organ injuries in abdominal gunshot wounds. They presented 9% SNOM failure with patients having solid organ injuries. In our study, all of five patients who had solid organ injuries were treated with SNOM because of their low-grade injuries. It is crucial for the patients under SNOM to undergo abdominal CT scanning. CT shows whether the injury has penetrated the abdomen or not, the injury path, and the presence of intra-abdominal solid and luminal organ injuries (23). In addition, the basic approach should include CT scanning, physical examination, vital findings, and clinical observation, as we did in our study (18-21).

One of the most important problems in the management of abdominal gunshot injuries with SNOM is delayed surgical treatment of luminal organ injuries. SNOM is especially recommended in solid organ injuries (22). The reason of SNOM failure cases was the presence of luminal organ injury. While the clinical examination and radiological findings were normal at admission, the treatment and management changed during the follow-up period by the development of alarming symptoms. These findings emphasize the importance of close clinical and radiological follow-up.

According to the literature, in selected patients with abdominal gunshot injury, non-operative 24-h observation is reported as applicable (17). In our study, there were four patients with luminal organ injury and they were classified as unsuccessful SNOM (Group 2). These patients were taken into surgery after 13 h. In the evaluation of patients with regard to morbidity, surgical site infection occurred in only three patients. There was no complication after the repair of small bowel injuries. Colostomy treatment should also be performed if the patient is managed with operative treatment instead of SNOM; besides, we believe that no additional surgical risk occurred in SNOM of the colonic injury. Due to the small number of patients who failed SNOM, the discussion of this issue is limited.

In their meta-analysis covering the years 1990 to 2012, Lamb et al. (21) reported SNOM in 33% of abdominal gunshot wounds, and reported a rate of 15.5% for delayed laparotomy. In our study, SNOM rate was 8.8% and the failure rate of SNOM was 22.2%, a higher value than that reported in the literature. In our series, the rate of patients with SNOM was lower than that in the literature. Because all our patients were with abdominal gunshot injuries wounded in a battlefield and as our center is in a different country from the battlefield, our study group mostly comprised complicated trauma patients. In addition, nonoperative approach as primary treatment could be applied at a lower rate than that reported in the literature because of the regional socio-cultural characteristics.

Study of the relevant literature shows that centers that apply SNOM are high-volume and experienced trauma centers. These institutions are Level 1 trauma centers according to the trauma center classification of the American College of Surgeons and American Trauma Society (24, 25). Our center is between Levels 2 and 3. Our center is compatible with Level 2 in terms of its physical and technical facilities, but since we have no management protocol for trauma patients and cannot present a definitive treatment to all patients, our center nears Level 3. There are fewer studies carried out at low-volume trauma centers with limited experience (6, 26, 27).

Studies on SNOM have been carried out at a limited number of centers, and the capacity of trauma surgeons to undertake this management approach is unknown. A study by Jansen et al. (28) showed that slightly more than half of the surgeons in trauma centers are experienced in SNOM and that most of the surgeons work at Level 1 trauma centers. There is no consensus on and no classification of SNOM application and there are known regional differences in the practice of SNOM (27). We think that creating clinical application protocols in trauma centers and applying diagnosis and therapy according to these protocols may decrease the failure rates of SNOM. Moreover, in view of current medicolegality, SNOM seems to cause a marked anxiety in surgeons (6). Our center did not have a remarkable experience in abdominal gunshot wounds in the past. However, with necessary attention current medical approaches were applied referring to the literature.

Limitations

Our study has several limitations. First of all, our study was a retrospective clinical study. Our patient number was lower than that reported in other series in literature. Also because of the limitations we mentioned above, the rate of SNOM was low in our study than that in the literature.

CONCLUSION

In conclusion, SNOM is a feasible management method in the treatment of abdominal gunshot wounds, especially in patients with only solid organ injuries. It is not possible to predict the success of SNOM, in advance. The most sensitive point in taking this approach is the selection of appropriate patients. To decrease the morbidity and mortality in SNOM, patient selection and management should be performed carefully. In the presence of alarming symptoms, laparotomy should always be kept in mind.

Ethics Committee Approval: Authors declared that the research was conducted according to the principles of the World Medical Association Declaration of Helsinki "Ethical Principles for Medical Research Involving Human Subjects" (amended in October 2013).

Informed Consent: Written informed consent was obtained from patients who participated in this study.

Peer-review: Externally peer-reviewed.

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A new surgical approach for pilonidal sinus disease: "de-epithelialization technique"

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ABSTRACT

Objective: In the treatment of pilonidal sinus disease different approaches are used such as conservative treatment and fasciocutaneous rotation flap. The aim of this study was to evaluate the efficacy of "de-epithelialization technique" as a new approach in pilonidal sinus disease treatment.

Material and Methods: Forty pilonidal sinus disease patients treated with de-epithelialization method were evaluated retrospectively. Patient age, gender, body mass index, wound healing time, visual analog scale scores, operation times, hospital stay duration, drain removal time, cosmetic satisfaction rates, complications, and recurrence rates were evaluated.

Results: The numbers of male and female patients in this study were 39 and 1, respectively. The median age of the patients was 25 years and the mean BMI was 26.6. The mean operating time was 43 min, and all patients were discharged 5 h after the operation. Wound healing time varied from 10 to 20 days. Median follow-up period was 9 months (4-17 months). One patient with high body mass index suffered from partial wound separation. No other complications such as infections and fluid collections (hematoma and seromas) were observed. Maximum cosmetic satisfaction rate was 90% (n=36), and no patient had a recurrence during the follow-up period.

Conclusion: "De-epithelialization" may be considered as a complementary and/or alternative approach to other surgical techniques such as primary closure, rhomboid excision, and Limberg flap in the treatment of pilonidal sinus disease, with acceptable cosmesis and recurrence rates.

Keywords: De-epithelialization, flap, natal cleft, pilonidal sinus disease, sacrococcygeal region

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INTRODUCTION

Pilonidal sinus disease (PSD) is a common disorder of the sacrococcygeal region (1). The incidence is reported in 6 per 100,000 individuals (2). However, the etiopathogenesis is still unclear. Further, it has recently been suggested to be an acquired disease by some authors (3, 4).

Treatment of pilonidal sinus is still controversial and different surgical methods have been applied (1, 5, 6). However, rates of complications and recurrences vary, and yet there is no consensus on a specific technique. Different surgical methods have been compared for many years. The main factors to be considered to form an ideal treatment procedure are practical surgical technique, shorter length of stay at the hospital, short recovery period, fewer postoperative complications and pain, low rates of recurrence (1). In all techniques (primary closure or flap), a cavity is created after the excision of the pilonidal cyst accompanying healthy tissue; this should be filled or closed, or else it causes is a technical problem, which is frequently encountered, and can result in complications such as "dead space", hematoma, wound infection, and wound separation during the early postoperative period (7, 8). The main drawback is the complication of wound healing. Hypoesthesia and cosmetic problems of the sacrococcygeal region are also seen, especially in flap technique, at the late period (9). This method is defined as a flap or graft of thinned cutaneous layer (10). Aesthetic surgeons usually perform this method for mammaplasty. Basically, in this method, after de-epithelization of the cutaneous tissue is performed, cutaneous flap and fatty tissue are inverted to create the breast protrusion (11). De-epithelialized skin grafts are used for many indications.

The aim of the study is to describe and discuss the "de-epithelialization technique" as a new approach in PSD treatment.

MATERIAL AND METHODS

During the year 2013, at Bursa Military Hospital, Department of General Surgery, 40 patients with the diagnosis of PSD were treated with de-epithelialization method. All patients were operated by the same surgeon. In order to evaluate the technique, complicated pilonidal sinus cases, such as infective sinus, cavity abscess, recurrent disease, were excluded from the study and only uncomplicated PSDs were operated.

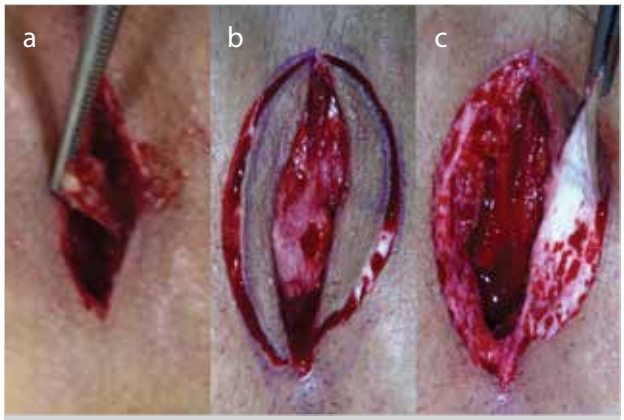

Figure 1. a-c. (a) Excision of the cyst, (b) partial thickness elliptical intradermal incision, (c) de-epithelialization by applying traction force both at 90° angle to the surface with scalpel blade

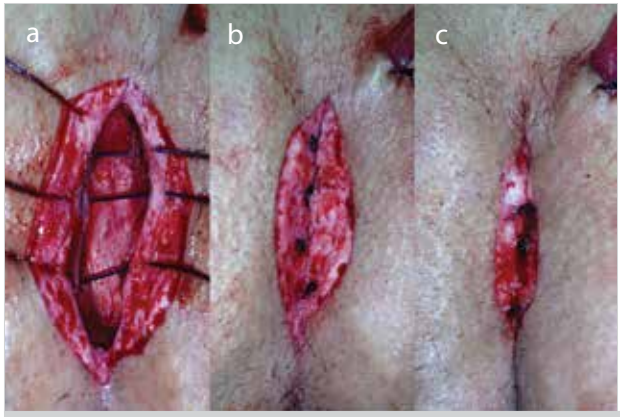

Figure 2. a-c. (a) Primary closure of free edges of the de-epithelialized skin, (b, c) inversion and primary closure of de-epithelialized wound

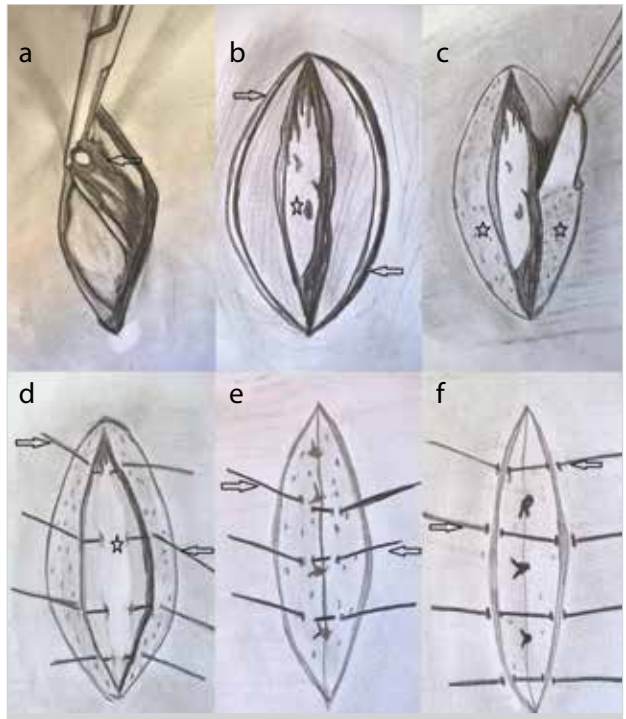

Figure 3. a-f. Drawing of the de-epithelialization technique. (a) Excision of the cyst tissue with surrounding healthy fatty tissue (arrow) and created cyst cavity (star), (b) determination of the oval shaped de-epithelialization line (arrows) with a scalpel, (c) de-epithelialized skin (stars) skin covering the cyst tissue, (d) first suturation of the free edges of de-epithelialized wound with absorbable sutures (arrows), which were fixed to the presacral fascia (star), (e) inversion and second suturation (arrows) for reciprocal overlapping with absorbable sutures (f), Primary closure of the wound with nonabsorbable sutures (arrows)

Patient data including gender, age, body mass index (BMI), operational time, postoperative length of hospital stay, pain score at 24 h (using a visual analog pain scale), wound healing period, postoperative complications (wound dehiscence and infection, seroma, hematoma, etc.), and recurrence were retrospectively evaluated from the hospital records. In the first-month outpatient follow-up, subjective evaluation of postoperative cosmetic results was also recorded (1 to 5; 1=worst, 5=best result). During the follow-up period, the patients were invited to the clinics by phone.

Surgical Procedure

The patient was placed in the prone position with the buttocks taped apart for exposing the natal cleft. Subsequent to the skin disinfection via povidone iodine, 20 mL of 2%prilocaine was applied to the sacrococcygeal area around the surgical site for local anesthesia. The tract was then delineated, using a sterile solution of methylene blue, injected via a plastic cannula. Thereafter, a flat intergluteal incision of approximately 5 cm in length and till the postsacral fascia in depth was performed. Pilonidal cyst and tract were exposed and excised with surrounding healthy fatty tissue but the surrounding cutaneous and some subcutaneous tissue were preserved (Figure 1a). An elliptical intradermal incision of partial thickness was made with a number 10 scalpel blade, limited by the upper and lower point of the intergluteal incision including sinus orifices (Figure 1b). Thus, this ellipsoid area was easily de-epithelialized by applying traction force both at 90-degree angle to the surface with the scalpel blade, similar to "peeling an orange" (Figure 1c). A Penrose drain was placed in the cavity. The drain was passed through the tract orifice. Primarily, the first suturations were performed between edge of the de-epithelialized skin, presacral fascia and the other reciprocal free edge, respectively, with 0 nonabsorbable suture sutured (Figure 2a). Subsequently, the de-epithelialized wound was inverted and sutured to cause reciprocal overlapping with 3/0 nonabsorbable sutures (Figure 2b, c). Finally, the wound was closed primarily with 3/0 nonabsorbable sutures. Thus, the cavity of excised pilonidal cyst was filled by inverting de-epithelialized skin. The drawing of the technique is shown in Figure 3a-f. Diclofenac sodium (intramuscular and/or oral) was used for postoperative analgesia.

Statistical Analysis

Statistical Package for the Social Sciences version 20.0, (IBM Corp.; Armonk, NY, USA) computer program was used for statistical analyses. As the number of patients was 40 (<50), variables distribution was tested by Shapiro-Wilk normality test ($p>0.05$ was accepted as the normal distribution).

Table 1. Demographic findings and characteristics of the patients

Age* (years)	25 (17-37)
Sex (M/F)	39/1
Body mass index** (kg/m^2)	26.60±3.76
Operational time** (minutes)	43.02±4.73
Stay of drain* (days)	3 (2-4)
Suture removal time=wound healing time* (days)	10 (10-20)
Follow-up* (months)	9 (4-17)
Complications***	1 (2.5)
Recurrence***	0 (0)

M: male; F: female
The datas are presented as *mean (range); **mean±standard deviation; ***n (%)

Table 2. Drain removal time

Drainage tube removal time (days)	**n (%)**
2	11 (27.5)
3	19 (47.5)
4	10 (25)

Table 3. Suture removal (wound healing) time

Suture removal time (Wound healing time) (days)	**n (%)**
10	23 (57.5)
12	6 (15)
15	10 (25)
20	1 (2.5)

Table 4. Visual analogue pain scale (VAS) of the patients at 24th postoperative hour

Visual analog pain score (VAS)	**n (%)**
1	3 (7.5)
2	8 (20)
3	11 (27.5)
4	11 (27.5)
5	5 (12.5)
6	2 (5)

Table 5. Cosmetic satisfaction of the patients after suture removal (1 point=very bad; 5 points=excellent cosmesis)

Cosmesis score	**n (%)**
5	36 (90)
4	2 (5)
3	2 (5)

Continuous variables showing normal distribution were expressed as mean±standard deviation; non-parametric continuous variables were expressed as median and minimum-maximum. Categorical variables were expressed as percentages (%). For all statistical analyses $p<0.05$ was accepted as significant.

RESULTS

Forty patients were operated with this technique. Thirty-nine of all cases were male (97.5%). The median age of the patients was 25 year (17-37 years) and mean BMI was 26.6±3.76 (21-36.5). The mean operating time was 43.02±4.73 min (33-52 min) (Table 1).

All patients were operated under local anesthesia and discharged on the 5th postoperative hour. Median drainage time was 3 days (2-4 days) (Table 2). *Wound* healing time varied from 10 to 20 days. The sutures were removed after 10 days in 23 patients (57.5%), 12 days in six patients (30%), and 15 days in 10 patients (25%) (Table 3). In one patient, whose BMI was 36.5, the suture was removed on the 20th postoperative day. Median follow-up period was 9 months (4-17 months).

None of the patients had a recurrence, wound infection, seroma, hematoma, or complete wound separation during follow-up. There was partial wound separation in only one overweight patient with a history of hypertension. For 11 patients (27.5%), the postoperative 24-h visual analog pain scale (VAS) rating was3, and for 11 other patients, it was 4 (Table 4). The maximum cosmetic satisfaction rate was 90% (n=36) (1 point=worst cosmesis, 5 points=best cosmesis) (Table 5). In two patients, wound cosmesis was 4 points, and in two patients, it was 3 points. We observed that de-epithelialization method provide the flattening of natal cleft in all patients.

DISCUSSION

"de-epithelialization" is not a new surgical technique, and has been performed successfully since 1970's in mammaplasty by plastic and reconstructive surgeons (12-14). This technique has been used for many rare indications in various specialist areas. Yoon et al. (15) used this for reconstructing oral and/or oropharyngeal defects after surgically removing the tumor. Additionally, Jun Hee Lee et al. (16) treated finger defects with exposed tendon or bone by using de-epithelialized cutaneous graft of the wound edges. Balat et al. (17) obtained satisfactory result after using de-epithelialized rhomboid flap in the treatment of vulvar cancer. In another case, a patient who had Peyronie's disease was treated with penile reconstruction using a de-epithelialized Belman (superficial external pudendal artery) flap and the result was well (18). In a case series by Park et al. (19), bronchopleural fistulas were obliterated using a musculocutaneous flap of serratus anterior after de-epithelization. Additionally, a right ventricle rupture related to sternal wound infection was reconstructed by utilizing de-epithelialized myocutaneous latissimus dorsi flap which is previously published (20). Gupta et al. (21) demonstrated that in the repair of hypospadias after Snodgrass urethroplasty, using a de-epithelialized flap for the extra covering of the constructed neourethra was a good option.

According to our knowledge, no study has been found in English literature reporting the use of de-epithelialization in PSD treatment so far. Thus, we decided to apply this well-known surgical procedure to PSD.

Over the years, many different techniques have been described as PSD treatment modalities. For instance, Thompson et al. (22) proposed simple removal of midline skin pits without wide excisions. Likewise, as a minimally invasive approach, therapeutic ablation of cavity epithelia with phenol or radiofrequency were suggested by some authors instead of cyst excision (5, 23, 24). Washer et al. (25) described a much more complicated flap technique (gluteal fascial advancement) as a perfect method to cure PSD. In this text, there is no consensus on the "gold standard" surgical approach. Obviously, the chosen technical method may differ with the experience of the surgeon and patient condition. Nevertheless, widely accepted prospects for an ideal PSD treatment should be based on principles such as a practical and painless technique, rapid discharge from the hospital, minimal postoperative complications, and also low rates of recurrence.

The overall success rate of phenol application varies between 67% and 95% in most reported studies (5, 23, 26). Khan et al. (27) report the recurrence rate after the primary closure technique to be 8% in their study. In their prospective randomized study, Dass et al. (28) indicated the success of the Limberg flap to be up to 100%. Recurrences were noted in 2% of patients in the case series of Yildiz et al. (29) who performed the Karydakis flap procedure.

Although the median follow-up period (9 months) is relatively short in our series, during the follow-up period, none of the patients had a recurrence. Flattening the natal cleft, which was the outcome of the de-epithelialization technique, could be the main reason of the low recurrence rate. As a matter of fact, flattening of the natal cleft and lateralization have already been described by Yildiz et al. (29) as the goal of an ideal treatment for PSD. However, the data will need to be reevaluated at the end of a longer follow-up period.

In practice, wide excision with flap reconstruction is usually performed under spinal anesthesia and the patients need to spend at least one night in the hospital (5). De-epithelialization is a less invasive method and can be performed under local anesthesia, which prevents the complications of spinal anesthesia, and allows patients to get discharged on the very same day of the procedure. Additionally, the mean operational time is found to be relatively shorter (43.02±4.73 min) compared with other excisional procedures. For instance, in the randomized clinical trial by Khan et al. (27), the mean operating time in excision+primary closure group was reported as 55 min and in excision+Limberg flap group as 70 min; in the randomized study by Dass et al. (28), the mean operating time for primary closure was 44 min.

It is well-known that the presence of hematoma, seroma, and wound infection are risk factors for recurrence (30). Kirkil et al. (31) mentioned that the complication rates of drained and non-drained Limberg flap group were 17.8% and 29.6%, respectively. Käser et al. (32) reported the overall complication percentage as 49% in Limberg flap group and 12% in the excision only group. In the study of Arslan et al. (30), 19.8% seroma formation and 15.4% wound dehiscence was noted in patients treated with Karydakis flap procedure. We did not observe any wound infection, seroma, and/or hematoma formation in our series, and only one overweight patient (BMI=36.5) had partial wound dehiscence and was treated by leaving the open part of the wound for secondary healing. It was considered that the causes of satisfactory result in the early period were reducing the cavityby inverting de-epithelialized skin graft and protecting the seroma and/or hematoma, wound infection and dehiscence caused by dead space. However, mean BMI of our study group was found to be 26.6±3.76, which is mildly higher than the normal upper limit. Thus, the correlation between BMI and wound complication should be evaluated in larger series.

In their study, Kirkil et al. (31) question the efficiency of cavity drainage: they compared complication rates between drained and non-drained Limberg flap groups and found that these rates were similar. Herewith the authors claimed that routine drain usage did not affect surgical site complications in Limberg flap technique for PSD (31). We chose to use an aspiration drain in every case intending to avoid intracavitary seroma and/or hematoma, but a controlled randomized study is required to evaluate the drain's effectiveness in a better manner. In their randomized clinical trial, Akca et al. (33) remarked that median pain VAS score was 4 in excision and primary closure group and 2 in rhomboid excision and Limberg flap technique. Käser et al. (32) found 2.4 and 2.5 as mean pain score at discharge in Limberg flap group and excision only group, respectively. Dass et al. (28) pointed out the association between wound tension and increased pain VAS score and claimed that primary closure was a more painful technique. In our study, median pain VAS score was found to be 3 (range, 1-6), concordant to pain scores of other described surgical methods. However, as expected, less invasive procedures such as radiofrequency seem to cause less postoperative pain (34).

Arslan et al. (30) categorized first-postoperative-year patient satisfaction in four ratings as "excellent," "good," "not bad," and "bad." In all different flap groups (Limberg, modified Limberg, and Karydakis flap group) total "excellent" and "good" patient satisfaction ratings at the end of the first year were 74%, 78%, and 70%, respectively. In our study, 90% of all 40 patients indicated their cosmetic satisfaction rate as "excellent" (score=5). None of the patients described the cosmetic results as "bad" (score=2) or "very bad" (score=1). Better patient cosmesis was only reported in studies investigating the less invasive interventions, such as phenol application or cavity ablation (5, 34).

Study Limitations

We have some limitations in our study. It has a retrospective nature and a relatively short follow-up period. Further, the exclusion of complicated patients was a limitation for this study; thus, the results of de-epithelialization technique in complicated PSD cases should be further evaluated in larger randomized studies. Another limitation was the lack of prospective comparison of the reported approach with a widely common other technique; there is no control group to evaluate any new proposition. However, there are many reports of various surgical techniques such as marsupialization, Karydakis, oblique primary repair, and flap techniques in the literature. Therefore, this may not be regarded as a complete limitation.

CONCLUSION

Healthy, fresh dermal bed with high vascularity was obtained with de-epithelialized flap. Thus, some complications such as wound separation can be prevented by providing stronger wound healing. We also planned to minimize the cavity after excision by inverting de-epithelialized tissue with this technique in PSD surgery. Moreover, de-epithelialization of skin is easy. Our new technique provides a short operation time, short duration of hospital stay, and less postoperative morbidity. The major advantage of this technique is the absence of any need for hospitalization. It allows a quicker return to daily activities and reduces costs. Furthermore, we believe that the risk of recurrence may be reduced by increasing the angle of the natal cleft during this technique. Also, this method has a satisfying aesthetic outcome.

Currently, we continue this study to see the long-term results of this technique and for comparison with other techniques. This preliminary report suggests that this new surgical approach seems to be a reasonable method in the treatment of PSD, especially in patients with uncomplicated primary disease, and is worth studying further.

Ethics Committee Approval: Ethics committee approval was received for this study from the ethics committee of Bursa Şevket Yılmaz Training and Research Hospital (2011-KAEK-25 2015/23-06).

Informed Consent: Written informed consent was obtained from patients who participated in this study.

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Analysis of 89 patients who underwent tube thoracostomy performed by general surgeons

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ABSTRACT

Objective: Death due to thoracic trauma accounts for 20% of all trauma deaths. The aim of this study was to discuss the approach applied by general surgeons to thoracic trauma in our center.

Material and Methods: A total of 89 patients (82 male, 7 female; mean age: 26.8 years; range: 7 to 77 years) with thoracic trauma who were admitted to the emergency department and underwent thoracostomy performed by general surgeons between January 2008 and December 2013 were retrospectively analyzed.

Results: Penetrating trauma was found in 61 patients (68%); this was the most common cause of thoracic trauma. Pneumothorax, the most common clinical sign, was found in 57 patients (64%). Abdominal pathologies, the most common concomitant extra-thoracic pathologies, were found in 17 patients (19%). Fifteen patients (17%) underwent laparotomy due to intra-abdominal organ injuries. Splenic trauma and diaphragmatic injury were detected in five patients. Complications were seen in two patients (2.2%): one had an air leak and one had persistent pneumothorax. Three patients with multi-trauma died in the early period due to additional pathologies. No mortality was seen in any patient due to thoracic trauma.

Conclusion: All general surgeons should be highly familiar with approaches to thoracic trauma, and necessary interventions should be performed in emergency situations. It is also essential to correctly identify patients who require timely and appropriate referral to a tertiary center to reduce the rates of mortality and morbidity.

Keywords: Hemothorax, pneumothorax, thoracic injury, tube thoracostomy

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INTRODUCTION

Tube thoracostomy due to trauma may be regarded differently by general surgeons than by thoracic surgeons. Most cases in the literature are reported by thoracic surgeons. Mortality and morbidity rates are high in blunt or penetrating thoracic trauma. The mortality rate due to thoracic trauma is approximately 4%-20% (1). Therefore, early diagnosis and treatment are essential to provide respiratory continuity. Applying appropriate approaches to patients with thoracic trauma may substantially reduce mortality and morbidity rates. Although thoracic surgeons usually address thoracic trauma, treatment and follow-up of many patients are performed by general surgeons in places where no thoracic surgeon is available or in cases with multi-trauma. Tube thoracostomy is a tool with unique diagnostic and therapeutic capabilities. The question of whether a general surgeon requires the aid of a thoracic surgeon in all cases has been widely addressed by the real-world practices of general surgeons. The lifesaving capacity of tube thoracostomy due to its facile application should not be overlooked by general surgeons due to concerns of malpractice.

The aim of the present study was to discuss our approach to patients with thoracic trauma in our center, where no thoracic surgeon is available.

MATERIAL AND METHODS

Written informed consent was obtained from each patient. The study protocol was approved by the local Ethics Committee. The study was conducted in accordance with the principles of the Declaration of Helsinki. A total of 89 patients with thoracic trauma who were admitted to the emergency department of our hospital, who underwent tube thoracostomy, and who were followed at the general surgery outpatient clinic between January 2008 and December 2013 were retrospectively analyzed. Patients with tube thoracostomy due to iatrogenic causes or due to other operations or interventions were excluded from the study. The patients included in the study were evaluated in terms of age, sex, etiology of the trauma, clinical signs, accompanying trauma, applied surgical interventions, referral to an advanced center, and mortality. All patients were evaluated by physical examination, laboratory tests, and radiology and were monitored with serial posteroanterior chest X-rays. Additional imaging, such as thoracic computed tomography (CT), was performed if required. Patients with extra-thoracic injury were treated and monitored concomitantly by relevant specialists.

Table 1. Demographic characteristics of patients	
Age* (years)	26.8
Sex**	
Male	82 (92)
Female	7 (8)
Etiology**	
Blunt	25 (28.1)
Penetrating	64 (71.9)
Length of hospital stay* (days)	5.1
Removal of tube* (days)	3.4
Datas are presented as * mean±standard deviation, ** n (%).	

Table 2. Etiological causes		
Etiology	**n**	**%**
Stab wounds	61	69
Traffic accident	11	12
Fall	9	10
Beating	5	6
Gunshot	3	3
Total	89	100

Table 3. Clinical signs		
Findings	**n**	**%**
Pneumothorax	58	65
Hemopneumothorax	22	25
Hemothorax	9	10
Total	89	100

Table 4. Other thoracic pathologies		
Other thoracic pathologies	**n**	**%**
Multiple rib fracture	8	8
Single rib fracture	4	4
Subcutaneous emphysema	6	7
Diaphragmatic injuries	5	6
Pulmonary contusion	3	3
Heart injury	2	2
Scapula fracture	1	1
Clavicle fracture	1	1

Table 5. Extra-thoracic pathologies		
Extra-thoracic pathologies	**n**	**%**
Abdominal	17	19
Lower extremity	8	9
Upper extremity	7	8
Cranial	3	3
Peripheral vascular	1	1
Total	35	39

Statistical Analysis

Data concerning demographicand clinical characteristics were analyzed by using descriptive methods (means, minimum-maximum). The statistical software used was Statistical Package for the Social Sciences for Windows, version 15.0 (SPSS Inc.; Chicago, IL, USA)

RESULTS

Of all the patients, 82 (92%) were male and seven (8%) were female, with a mean age of 26.8 (range: 7-77) years (Table 1). Tube thoracostomy was performed in the left hemithorax, right hemithorax, and bilaterally in 53, 33, and 3 patients, respectively. Posteroanterior chest X-rays were obtained in all patients except three, whose general conditions were poor. CT was obtained in 33 patients (37%) for whom further imaging was necessary. Penetrating trauma was found in 61 patients (68%); this was the most common cause of thoracic trauma. Other etiological causes are shown in Table 2. Pneumothorax, the most common clinical sign, was found in 57 patients (64%), followed by hemopneumothorax in 21 patients (23%). Other findings are shown in Table 3, 4. Abdominal pathologies, the most common concomitant extra-thoracic pathologies, were found in 17 patients (19%), followed by extremity pathologies in 15 patients (17%). Other extra-thoracic pathologies are shown in Table 5. Fifteen patients (17%) underwent laparotomy due to intra-abdominal organ injury. Splenic trauma and diaphragmatic injury were detected in five patients, while two patients underwent splenorrhaphy and three underwent splenectomy. Diaphragm injuries were repaired in all these patients. Other reasons for laparotomy included injuries to the liver, small bowel, urinary bladder, stomach, and colon (Table 6). One patient who was admitted to the hospital due to a motor vehicle accident had first- and second-degree burns in an area less than 10% of the body surface. One patient had a fracture of the mandible. Three patients died during the first hour after arrival at the hospital due to additional cranial pathologies. Pneumothorax was present in three patients with cranial pathologies; however, no hemothorax was detected. Emergency thoracotomy was performed following the development of severe hypotension in two patients who had isolated thoracic penetrating knife injuries that penetrated the thoracic cavity. Left ventricular and left atrial injuries were each found in one patient. Both patients were stable postoperatively and were discharged uneventfully on the fifth and eighth postoperative days, respectively.

Complications were seen in two patients (2.2%): one had an air leak and one had persistent pneumothorax. Nine patients (10%) were referred to an advanced medical center after the first intervention was performed due to severe hemorrhagic drainage from the thoracic tube in six patients, persistent pneumothorax in one patient, and prolonged air leak in one patient. One patient was referred to a center with a cardiovascular surgery clinic due to popliteal artery injury. Feedback reports revealed that three patients with high levels of drainage were treated by thoracotomy, while others were treated non-surgically; all the patients were discharged in good condition. The mean hospital stay and mean time to extubation in the early period, excluding the aforementioned nine patients and three death events, were 5.1 (range: 2-14) and 3.4 (range: 1-7) days, respectively.

Table 6. Causes for laparotomy

Laparotomy	Operations	n	%
Splenic and diaphragmatic injury	Splenorrhaphy (n=2), splenectomy (n=3), diaphragm repair (n=5)	5	6
Liver injury	Primary repair	4	5
Small bowel injury	Primary repair	3	3
Bladder injury	Primary repair	1	1
Stomach injury	Primary repair	1	1
Colon injury	Primary repair	1	1
Total		15	17

DISCUSSION

Mortality and morbidity are high in blunt or penetrating thoracic traumas; the mortality rate of all thoracic trauma cases is approximately 4%-20% (1). Thoracic trauma is the third most common type of trauma, following head and extremity trauma (2, 3). Blunt and penetrating traumas cause other organ injuries in 75% of cases, which substantially increases the rates of mortality and morbidity (2). In the literature, the rates of penetrating and blunt trauma have been reported to be variable. Leblebici et al. (4) reported an incidence of penetrating trauma of 63.3%. However, blunt trauma was reported to be more common in several studies, while penetrating trauma accounted for 30% of cases (5, 6). The incidences of blunt and penetrating trauma were also reported to be 58.7% to 75.8% and 24.1% to 41.3%, respectively (4, 7-10). In the present study, 25 patients (28.1%) had blunt trauma and 64 patients (71.9%) had penetrating trauma. The different rates of penetrating and blunt trauma in our study are mostly due to socioeconomic status and the proximity of the research area to a region with busy roads.

In addition, thoracic traumas have been reported to occur more frequently in men (4, 8, 9). Consistent with this finding, 82 patients (92%) were male in our study. Furthermore, the most frequent bone pathologies accompanying thoracic traumas are single or multiple rib fractures. In addition to rib fractures, clavicle, scapula, and sternal fractures have been reported (8, 9). Although sternal fractures are rare, the risk of cardiac injury is increased in those cases, particularly in the presence of rib fractures (11). Similarly, in the present study, rib fractures were the most common bone pathology. We also found cardiac injury in two patients. In both patients, the etiological cause was penetrating injury but not blunt trauma. Rupture of the diaphragm is seen principally on the left side due to a sudden increase in intra-abdominal pressure (12-14). Five patients (6%) had diaphragmatic injury in the present study; all were repaired using an abdominal approach.

Hessani et al. (15) and Martin et al. (16) reported the duration of hospital stay in patients who underwent thoracic tube placement to be 4.1 days and 10.4 days, respectively. Removal of the tube was reported after 5.9 and 3 days by Martin et al. (16), and Younes et al. (17), respectively. In the present study, the mean hospital stay and mean duration until extubation were 5.1 days and 3.4 days, respectively. Complications of tube thoracostomy include persistent air leak, persistent pneumothorax, recurrent pneumothorax, and non-functioning tube. In several studies, the rate of complications was reported to vary between 4.8% and 30% (16-20), consistent with our study findings (2.2%). Duration of the removal of the tube, length of hospital stay, and development of complications related to the thoracic tube have been associated with severity of injury. The specialty of the health professional, such as surgery or emergency medicine, inserting the thoracic tube and the team transporting the patients have been also implicated in the development of complications (16).

In a study reported by general surgeons, 110 patients with thoracic trauma were evaluated; 14 complications (12.7%) were seen where procedures other than tube thoracostomy were undertaken by general surgeons alone, which resulted in higher complication rates compared to our study (21). According to Ball et al. (22), complications may vary depending on the training discipline. The rates of complications in general surgery, internal and family medicine, other surgical disciplines, and emergency medicine were 7%, 13%, 25%, and 40%, respectively. Bevis et al. (23) also reported that complication rates decreased from 12% to 8% when surgeons with advanced practice skills treated the patients rather than trauma surgeons. In another study supporting the previous study, Etoch et al. (19) showed that the rate of complication was 6% in patients treated by thoracic surgeons, while it was 13% in patients treated by emergency physicians. Moreover, they stated that referring all patients to a thoracic surgeon resulted in a complication rate of 38%. The results of our study were different from what we expected compared to previous studies. We consider that the reduced duration of hospitalization, time to extubation, and complication rates may all be due to the fact that patients with severe injuries were referred to more advanced centers.

In addition, extremity fractures have been reported to be the most common extra-thoracic pathologies (50%-54%). Head trauma (27.4%-44%) and abdominal injuries (13.7% to 21%) are among the other commonly seen extra-thoracic pathologies (24, 25). However, these rates were found to be lower in the present study. The most common extra-thoracic pathology was abdominal injury (19%). Extremity fractures were seen in 17% of the patients, while head trauma was seen in 3% of the patients. The most common injury was splenic damage among the patients requiring laparotomy. Appropriate interventions were performed in patients with intra-abdominal injuries.

In contrast, no mortality was seen in any patients with thoracic trauma who underwent tube thoracostomy in the present study. We consider that the most important reasons for

this result are the timely diagnosis of patients with severe injury, timely initial intervention, and appropriate referrals to advanced centers. Therefore, the motto of a general surgeon should be not to refer every patient to tertiary centers and not to delay referral in selected cases to achieve acceptable rates of mortality and morbidity.

CONCLUSION

All general surgeons should be highly familiar with approaches to thoracic trauma, and necessary interventions should be performed in emergency situations. It is also essential to correctly identify patients who require timely and appropriate referral to a tertiary center to reduce the rates of mortality and morbidity.

Ethics Committee Approval: Ethics committee approval was received for this study from the ethics committee of Haseki Training and Research Hospital.

Informed Consent: Written informed consent was obtained from patient who participated in this study.

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Thoracoscopic vagal-sparing esophagectomy and colonic interposition for caustic stricture

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ABSTRACT

Minimally invasive esophagectomy is an increasing trend in surgery. Thoracoscopic esophagectomy is applicable and an alternative procedure to conventional esophagectomy in patients especially with end-stage benign diseases like caustic stricture.

A 33-year-old female patient was admitted to the department of general surgery with dysphagia. The patient was suffering from caustic stricture due to ingestion of hydrochloric acid. A totally thoracoscopic and laparoscopic vagal-sparing esophagectomy and colonic interposition was performed.

As a more physiologic alternative, vagal-sparing esophagectomy is the ideal operation for these patients.

Keywords: Causticesophageal stricture, esophagectomy, esophageal diseases, minimally invasive surgery, thoracoscopy, vagal nerve preservation

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INTRODUCTION

The general intention of surgeons is to perform a standard transhiatal or transthoracic esophagectomy with colonic interposition or gastric pull-up procedure for benign end-stage and premalignant or in situ malignant lesions of the esophagus. During none of these operations, the standard preservation of paraesophageal vagal nerves is performed (1). According to the complex connections of vagal innervation, the complications of truncal vagotomy are, as well known, diarrhea, gastric stasis, dumping, early satiety, weight loss, and also cholelithiasis. Consequently, vagal-sparing esophagectomy (VSE) may avoid all these complications and might be considered as an attractive alternative to conventional esophagectomy.

Vagal-sparing esophagectomy was first described by Akiyama in 1982 (2); further, Collard et al. (3) and Banki et al. (1) performed successful esophageal stripping operation series with preservation of the vagal nerve. Regarding the literature, there are some other authors who have reported on the preservation of the vagal nerve during esophagectomy (4-6).

The common aim of all studies about vagal-sparing esophagectomy was to convince that esophagectomy might be the "gold standard" procedure for end-stage benign and early malign esophageal diseases if vagal nerves could be preserved during the operation (1). However, most authors do not favor preserving the vagi (7-9). Thus, in the literature, there are very few reports of esophagectomy with vagal preservation.

CASE PRESENTATION

A 33-year-old female patient was admitted to the department of general surgery with dysphagia. She had attempted suicide 1 year ago by ingesting of caustic substance (hydrochloric acid: HCl). She had undergone several unsuccessful endoscopic dilatations. Her past medical history revealed epileptic seizures.

On admission, the blood pressure was 110/65 mmHg, heart beat rate was 92 beats/min, and body temperature was 36.7°C. Laboratory tests revealed the following: Hct: %37.8, Hb: 12.9 g/dL, WBC: 8900/µL, Plt: 385000/µL, BUN: 10 mg/dL, creatinine: 0.7 mg/dL, blood glucose: 97 mg/dL, K: 4.2 mEq/L, Na: 139 mEq/L, CA 19-9: 17.8, AFP: 2, CEA: 0.8, Ast: 16, ALT: 11, ALP: 116, GGT: 65, total bilirubin: 0.4, albumin: 4, International Normalized Ratio (INR): 1.00, ESR: 22 mm/h, and hsCRP: 6.0 mg/l. Physical examination revealed burn scars in both her upper extremities. Chest radiography and echocardiography (ECG) at that time did not reveal any pathology. Upper endoscopy showed an intense fibrosis stenosis at the proximal esophagus, 15 cm from the teeth, impeding the progression of a 9-mm endoscope. Axial computed tomography (CT) scan of the thorax and abdomen was performed on the same day. CT scan showed a suspicious tracheoesophageal fistula at the arcus aorta level.

No finding on behalf of a fistula but multiple strictures was noticed in esophageal fluoroscopic studies performed with a water-soluble oral radiocontrast material (Figure 1). The colonic vascular structure was evaluated by mesenteric angiography and no significant finding was noticed.

Pulmonary function studies were performed. The patient's respiratory reserve was found favorable. Patient was consulted with the neurology and psychiatry clinics. Psychiatry consultant diagnosed major depression with psychotic features. Thus, she was put on escitalopram (10 mg/d oral solution) and risperidone liquid (2 mg/d). She was also put on valproic acid (750 mg/d oral solution) as suggested by the neurologist and psychiatrist.

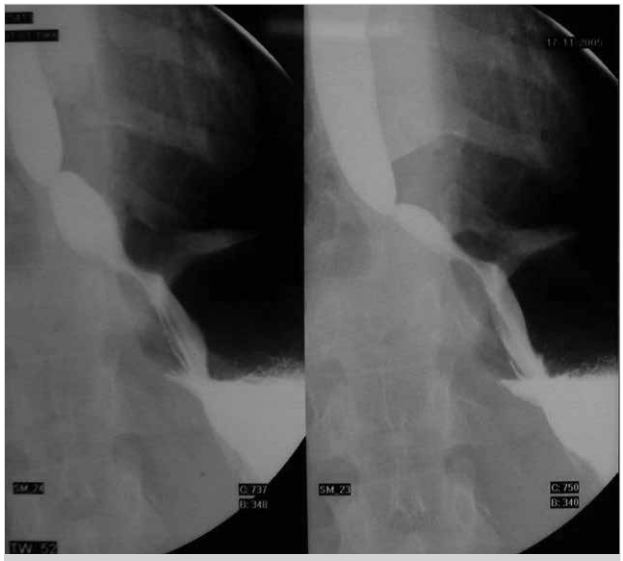

Figure 1. Multiple esophageal strictures on barium studies

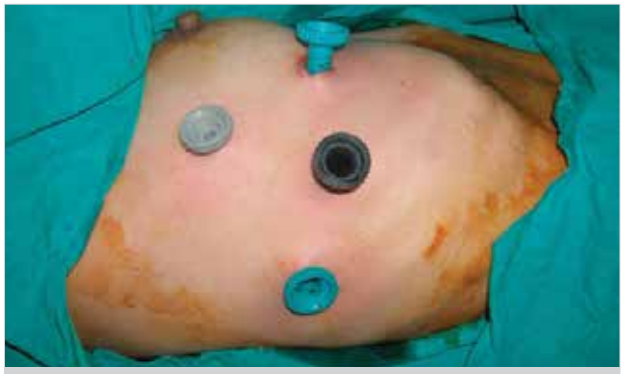

Figure2. Placement of the thoracoscopic trocars

Figure 3. The identification of vagal nerves and traction of esophagus

Written informed consent was obtained from the patient and she was operated at the 10th day of her administration. A thoracoscopic VSE and colonic interposition was carried out. First days of the postoperative period were uneventful. On the 2nd postoperative day, 20% human albumin (100 cc/d) and total parenteral nutrition were initiated. The patient was allowed gradually to drink water on the 2nd day and she was put on early liquid enteral nutrition on the 3rd day of the surgery. Apical thorax tube and abdominal drain were withdrawn on the 4th day. Unfortunately, on the night of the 7th postoperative day, she had an unexpected cardiopulmonary arrest due to another suicide attempt by taking a box of warfarin sodium pills per os, probably acquired with the help from one of her family member, despite the frequent psychiatric consultations and 24-hstrict surveillance by nurses. She did not respond to CPR and died at the hospital.

Surgical Tactic

The surgical tactic consists of three main operations: thoracoscopy, laparotomy, and cervicotomy.

After the routine general anesthesia induction, the patient was selectively intubated with a double-ducted 7-F endobronchial tube and left lung was isolated. The prophylactic antibiotic combination (cefuroxime axetil 1500 mg flacon IV+metronidazole 500 mg flacon IV) was infused just after the induction. Then the patient was positioned in left lateral decubitus for optimum exposure of the upper portion of the mediastinum. The skin was cleaned with antiseptics and the area was covered with sterile scrubs.

Thoracoscopy

Four thoracoscopic ports introduced into the thorax were used for the thoracoscopic exploration and dissection: 4th intercostal space on mid-axilla line, 5th intercostal space on anterior-axilla line, 7th intercostal space on mid-axilla line, and 8th intercostal space on posterio-axilla line (Figure 2). With an endoscopic retractor, the right lung was moved to the medial portion of the right hemithorax. The mediastinal pleura was incised and an adequate exposure of the esophagus was obtained. Vagal nerves were identified and medially retracted and then the dissection of distal portion of esophagus was performed (Figure 3). According to the dissected portion of the esophagus, the surgical instruments and even the optics were transferred from one port to another. Identification of the azygos vein and its division were performed using the endoscopic vascular stapler device (Endo-Gia device; US Surgical, Norwalk, CT). The vagal nerves were freed from the muscular wall of the esophagus. The preservation of the nerves was the critical part of this procedure (Figure 4). The esophagus was dissected from the superior thoracic aperture to the hiatus, and 28-and 30-F thoracic catheters were placed and attached to an underwater-seal bottle without negative suction. The port sites were sutured. The thoracoscopic procedure time was about 2.5h.

Laparotomy and cervicotomy

After esophageal dissection, the two other main operations were performed in sequence, with colonic transposition and hypopharingocolonic anastomosis.

The patient was replaced in a supine position and the skin was prepared in the routine manner. Median incision was

performed. The abdominal part of the vagal nerves was also preserved. The left colonic portion vascularized by the left colonic artery was prepared for the interposition. Left cervical incision was made through the skin and platysma muscle along the anterior border of the sternocleidomastoid muscle. Cervical esophagus was dissected by preserving the left recurrent nerve and vascular structures. Proximal part of the stomach was divided at the esophago cardiac junction. Esophagus specimen was withdrawn out by the cervical way (Figure 5). The transverse colon was placed in the retro gastric space and pulled-up through the mediastinal tunnel into the neck and hypopharingo colonic anastomosis were performed. The distal end of the colonic segment and proximal end of the stomach was anastomosed. A mediastinal drainage with a closed system was performed. Also, two silastic drains were placed for temporary drainage; one into the cervical space and the other into Douglas' space.

These two steps took approximately 4 h. Even being submitted to single lung ventilation during surgery, respiratory parameters were unremarkable. After surgery, the patient was monitored in the intensive care unit on her first postoperative day. By thoracic drainage with closed system, the pulmonary expansion was restored in a short period.

DISCUSSION

Caustic substance ingestions can seriously damage the esophagus, stomach, and duodenum. The clinical presentation depends upon the type and concentration of the caustic material and the most common early complication is the perforation, which can be fatal. However, it is also very difficult to treat the long-term complications, especially the formation of esophageal strictures, which may even cause carcinomas. Corrosive strictures of the esophagus after the ingestion of caustic materials appear in up to 85% of the patients (7).

Prevention of stricture formation includes steroids, stenting, use of indwelling nasogastric tube, and early dilatation; even various immunomodulators have been used to prevent the fibrosis (10, 11). However, the definitive treatment of caustic esophageal strictures is a reconstructive surgery. Traditional procedures for esophageal reconstruction are transhiatal or transthoracic esophagectomy with gastric pull-up or colonic interposition with interruption of vagal nerves. On the other hand, the sacrification of the vagi may result in many severe postoperative gastrointestinal complications such as diarrhea, gastric stasis, dumping, weight loss, and cholelithiasis.

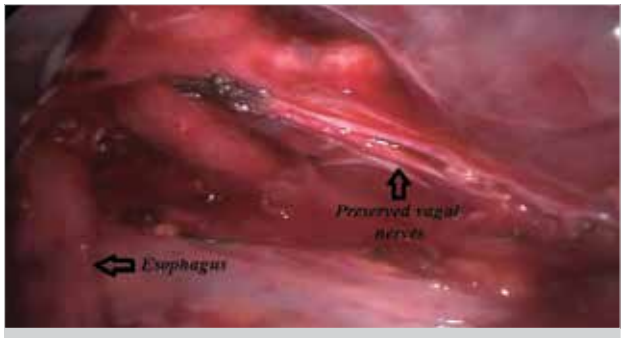

Figure 4. Bird's-eyeview of preserved vagal nerves

Figure 5. Esophagus specimen

Regarding the literature, Akiyama (2) is the first author who described esophageal stripping with preservation of the vagal nerves. Nevertheless, this technique did not achieve the deserved popularity and transhiatal esophagectomy with colonic interposition still remains the most favorite approach. Although esophageal stripping with preservation of the vagal nerves can be performed with a very small morbidity rate (12), surgeons are unwilling to perform VSE by stripping because the technique includes a blind dissection. Yet, we emphasize the importance of the necessity of the many communicant branches between the two vagi on the physiological vagal function. Chang and Jobe (13) and DeMeester (14, 15) indicated that it is possible to protect this physiological functions by preserving of the vagal plexus. Further, in latest articles, preservation of vagal nerves is recommended in terms of the advantages of a vagal-sparing procedure over a standard esophagectomy for patients with end-stage benign disease and Barrett's high-grade dysplasia or intramucosal adenocarcinoma (16-18). Our aim was to avoid the postoperative complication of vagatomy; therefore, we performed VSE. The patient was put on early liquid enteral nutrition, and during her early postoperative monitoring, the patient did not suffer from the arduous classical post-vagatomic complications (dumping, diarrhea, gastric stasis, etc.) until her suicide attempt. Unfortunately, we were not able to observe long-term outcomes of the surgery because of sudden suicidal death of the patient.

The preservability of the vagal nerves and the esophageal plexus with esophageal stripping technique was particularly emphasized by Banki et al. (1). Their study demonstrated that VSE had better results in terms of gastric secretion, gastric emptying, meal capacity, and body mass index when compared with standard esophagectomy. This procedure allowed the patients to eat a normal meal, free of dumping or diarrhea.

Traditional anatomy textbooks described mediastinal portions of vagal nerves composing a plexus around the esophagus. However, Herbella et al. (19) identified four patterns of vagal trunks in their cadaveric study. Two distinct trunks without communicating branches, present in 26.7% (type 1) and two crossing trunks in 3.3% (type 4). The two other vagi patterns include two trunks communicating with a plexus (56.7%), which were classified as type 2, and one or more bifurcated trunks (13.3%), classified as type 3. The authors reported that VSE was feasible in all cases. Nevertheless, the study was conducted on cadavers; therefore, it could be much more difficult to perform such surgery in patients with type 2 or 3 anatomical variation of vagi. However, in 30% of all cases, there are only two vagal trunks and no esophageal plexus. In this manner, in 30% of all cases, it would beeasier to preserve the vagal nerves. In patients with type 1 and 4 intramediastinal vagal anatomy, the vagi should be preserved during esophagectomy to avoid post-vagatomic syndromes.

Regarding the literature, in most of the studies about vagal preservation, patients undergo open surgery. In contrast, minimally invasive thoracoscopic surgery is associated with significantly less blood loss, reduced postoperative pain and pulmonary complication, increased respiratory function, diminished risk of chylothorax, and shortened length of hospital stay (20-22). Likewise, thoracoscopic procedure offers to the surgeon a closer wide range of sight with its magnification, which cannot be obtained even during the exploration with standard thoracotomy (20).Furthermore, a combination of thoracoscopy and laparoscopy could be performed in these patients. In our case, for esophagectomy, we chose the minimally invasive approach instead of thoracotomy. Accordingly, we could remove the apical thorax tube of the patient on the 4th day. Her daily pulmonary auscultations after surgery showed no major abnormality, she did not suffer from major pain, and her respiratory function was good.

Nowadays, an increasing trend in surgery, minimally invasive esophagectomy, might be applicable as an alternative procedure to conventional esophagectomy in patients, especially with end-stage benign disease (8, 9). Also, it is possible to spare the vagal nerves by a thoracoscopic approach with a careful dissection, which is a more physiologic alternative. In case of benign or early-malignant lesions, there is no need of nodal or en-block dissection, which make the thoracoscopic VSE an ideal operative technique for these patients.

CONCLUSION

Although the surgical approach must be chosen according to the patient, it is evident that thoracoscopic VSE is applicable and an alternative procedure to conventional esophagectomy in patients with end-stage benign disease. For now, because of the insufficient series of patients with end-stage caustic stricture, the technical possibility of this procedure is just a proposal. Regarding to our case, if a conventional esophagectomy is planned for a patient with a benign esophageal disease, vagal-sparing thoracoscopic esophagectomy can also be chosen instead of the standard procedures.

Informed Consent: Written informed consent was obtained from patient who participated in this case.

Peer-review: Externally peer-reviewed.

Author Contributions: Concept - D.T., O.A.; Design - D.T., T.M., T.Ç., O.A.; Supervision - O.A.; Resource - F.A., O.A.; Materials - O.A.; Data Collection and/or Processing - D.T., T.M., T.Ç.; Analysis and/or Interpretation - D.T., F.A., O.A.; Literature Search - D.T., O.A.; Writing Manuscript - D.T.; Critical Reviews - O.A.; Other - T.M., T.Ç., F.A.

Conflict of Interest: No conflict of interest was declared by the authors.

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First experience with a new technique: Portable gamma camera usage for sentinel lymph node identification in a patient with breast cancer

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ABSTRACT

The newest development in sentinel lymph node imaging is portable gamma probe imaging. In this case report, results of all SLN detection methods were analyzed. The patient was imaged using a large field-of-view gamma camera with additional blue dye administration and intraoperative localization of sentinel lymph node using both gamma probe and portable gamma camera was performed. In this case report, the value of additional portable gamma camera imaging was analyzed.

Keywords: Breast cancer, gamma probe, portable gamma camera, sentinel lymph node

INTRODUCTION

Preoperative physical examination, ultrasonography, computed tomography/magnetic resonance imaging are initially performed on evaluation of axilla in patients with breast cancer. Additionally, invasive methods like fine needle aspiration biopsy or Tru-cut biopsy may be necessary in some patients. However, sentinel lymph node (SLN) analysis is the accepted method for staging axillary lymph nodes (1). Despite all the advances in the field of imaging for oncology (Positron emission tomography imaging or magnetic resonance imaging), SLN imaging continues to be the most important modality in axillary staging in early breast cancer patients with radiopathologically negative axillary lymph node status (2, 3). Intraoperative gamma probe applications have become a standard procedure in SLN identification during the surgery (1). There are some discussions about the necessity of preoperative gamma camera imaging; however, scintigraphy imaging provides the exact number of lymph nodes, and the additional lymph nodes may be observed outside the axillary region (4). Portable gamma camera imaging is a new development that provides intra-operative images of the injection site and possible SLNs. The expectations from this new modality in SLN imaging are finding out additional lymph nodes, confidence regarding the complete excision of all SLNs, and ruling out possible unexpected lymph nodes like internal mammarian lymph nodes if preoperative gamma camera imaging was not performed (5). There are limited numbers of studies concerning the performance of portable gamma camera in SLN imaging for breast cancer patients (6). SLNs initially discovered by both of the gamma probe and gamma camera in combined manner after while sentinel nodes were removed via gamma probe then axilla was checked with gamma camera for unrevealed nodes (6).

In this case, the influence of all SLN imaging methods was demonstrated in the reported patient. We aimed to find out the effectivity of portable gamma camera in SLN imaging.

CASE PRESENTATION

A 68-year-old female patient with anamnesis of breast lesion identified previously, which was diagnosed as malignant, visited our hospital and left mastectomy and additional SLN excision was planned.The patient had palpable left breast tumor without palpable lymph node in the axillary region (clinically N0). Prior to the surgery and after the informed consent was obtained, gamma camera imaging for SLN identification was performed by subdermal administration of 1 mCi (37 MBq) nanocolloidusing a double-head SPECT gamma camera in a dynamic manner in anteroposterior projection. The injection was administered in the Nuclear Medicine Department about 1 h prior to the surgery. Single SLN was identified in left axilla by scintigraphy. Additional blue dye administration was performed. In the operating room prior to surgery, activity of injection site and additional lymph node in left axilla was localized by portable gamma camera (Crystal Cam; with technical specialties as follows;dimensions: 65 ×65×180mm; detector: CdZnTe, 16×16=256 Pixel; detector dimensions: 39.06×39.06×5mm; energy range: 45-250keV; energy resolution: <6% at 122keV, <5.5% at Tc-99m) (Video 1). Left simple mastectomy and SLN dissection were planned for the patient. A clinician from Nuclear Medicine Department was in the operating room; one of surgeons performed the dissection with the guidance of gamma probe. During the opera-

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Figure 1. Exploration of sentinel lymph node using portable gamma camera

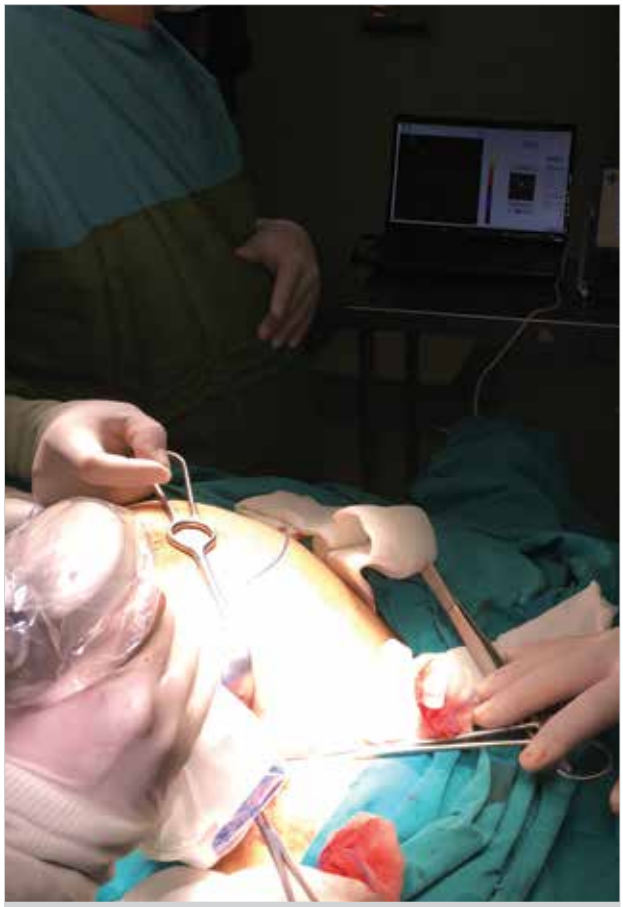

Figure 2. After the clarification of the axillary region, absence of activity anywhere else was verified using portable gamma camera

tion, simultaneous evaluation of SLN by both portable gamma camera (Figure 1) and gamma probe pointed out the same lesion that was excised after awhile and was proved to be the target SLN by both devices.Clarification of the axillary region and absence of activity anywhere else was verified using the portable gamma camera (Figure 2). The identification and excision of the lymph node took 15 min. Frozen section analysis of the SLN did not reveal any tumor-bearing lymph node and additional left mastectomy specimen showed a 2 cm invasive ductal carcinoma lesion. Patient had an eventless postoperative period with no complications.

DISCUSSION

In patients with N0 clinical nodal status, it is possible to perform SLN dissection instead of axillary dissection, which is a morbid procedure (1). Radionuclide identification of the SLN and radioguided surgery is the method of choice in most of the centers like ours.Recent advances have improved SLN detection rates and provided easier identification of SLNs in especially difficult cases that may require additional SPECT/CT imaging, an imaging modality which helps with anatomical information in addition to planar gamma camera imaging and intraoperative gamma probe localization (7). In some cases, identification of SLNs may be challenging, despite the injection of blue dye and preoperative scintigraphy imaging and gamma probe localization, requiring longer time for SLN excision (8). The possible difficulties in SLN imaging may be in transit nodes, internal mammary lymph nodes, and lymph nodes in close proximity to the injection site (9). Soluri et al. (10) considered portable gamma camera imaging beneficial in 27% of their patients. Vermeeren et al. (11) reported additional 24% improvement in SLN detection rate by application of portable gamma camera. Vidal-Sicard et al. (12) found that portable gamma probe might identify SLN in 88% of cases. Although previous authors report about 10 min of prolonged operation time, in our experience, we did not observe additional time delay to complete the operation (13). The identification and excision of SLN took 15 min. Cardona-Arbonies et al. (14) emphasized the fact that there might be additional sentinel lymph nodes other than the preoperative scintigraphy because of different positions of the patient during the surgery and during the scintigraphy, and they observed two cases with additional lymph nodes depicted after the excision because of remaining activity observed using the portable gamma camera.

In order to obviate the need for axillary dissection, it is advised to achieve an identification rate of >90% and a false negativity rate of <5% according to recent guidelines (5). However, a false negativity rate below 5% is considered difficult according to the literature (5). Goni Girones et al. (5) reported an increase of 1.7% in localization with additional portable gamma camera imaging. These authors also report a slight increase in the number of patients with 3 or more sentinel lymph nodes, although not statistically significant (5).

CONCLUSION

The limitations of this novel method are application of two different devices (gamma probe and portable gamma camera), which may cause some increase in the duration of the surgical procedure. This method may be more critical in radionuclide lesion localization for breast lesions and residue removal for thyroid carcinomas.

The combined usage of blue dye, preoperative gamma camera imaging, intraoperative gamma probe imaging, and portable gamma camera revealed complementary results in this case for the identification of sentinel lymph nodes. Portable gamma camera may also add information in more complicated cases for sentinel lymph node identification.

Video: Exploration of the lymph node in left axilla by portable gamma camera

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Informed Consent: Written informed consent was obtained patient who participated in this study.

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Case Report

Agenesis of the isthmus of the thyroid gland

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ABSTRACT

The thyroid is an endocrine gland composed of two lobes connected by the isthmus tissue. Thyroid isthmus agenesis is a rare condition, and only a few cases have been reported in the literature. Here, we discuss the case of a 56-year-old female patient in whom agenesis of the thyroid isthmus was discovered incidentally during surgery for a multinodular goitre. When agenesis of the isthmus is found, associated thyroid lobe agenesis and the presence of ectopic thyroid tissue must be considered. In addition, associated autoimmune thyroid nodule, thyroiditis, primary thyroid carcinoma, metastasis, and amyloidosis must be considered in the differential diagnosis. Preoperative awareness of potential agenesis of the isthmus and its associated thyroid anomalies in patients with planned thyroid surgery will significantly contribute to safety during surgical procedures and result in fewer surgery-related complications.

Keywords: Agenesis, isthmus, thyroid

INTRODUCTION

The thyroid gland is an endocrine gland composed of two lobes connected by the isthmus tissue (1). The isthmus is localized at the level of the second and third tracheal rings (2). A wide range of morphological variations of the isthmus, such as hypoplasia, ectopy, hemiagenesis, and agenesis as well as developmental anomalies have been described in the literature. Thyroid isthmus agenesis is rare, and only a few cases have been identified (3). Here, we discuss the case of a patient in whom agenesis of the thyroid isthmus was discovered incidentally during total thyroidectomy for multinodular goitre.

CASE PRESENTATION

The patient was a 56-year-old female patient who provided her consent for the publication of this case report. She underwent surgery for multinodular goitre, and agenesis of the isthmus was determined intraoperatively. Her past medical history was significant for hypertension and total abdominal hysterectomy with bilateral salpingo-oophorectomy. Preoperatively, physical examination revealed palpable nodules in both thyroid lobes, and neck ultrasonography (USG) revealed multiple hypoechoic thyroid nodules, the largest being 4 cm and located in the right lobe. Total thyroidectomy was planned. Laboratory analyses were normal. Total thyroidectomy was performed under general anaesthesia with neuromuscular monitoring. It was discovered that the patient had no thyroid isthmus tissue during intraoperative surgical exploration. Intra-operative images of the patient and images of both thyroid lobes after surgical excision are shown in Figures 1 and 2, respectively.

DISCUSSION

Although the incidence of thyroid isthmus agenesis has been reported to range between 0.5% and 10%, the precise incidence rate is unknown (4, 5). Because a few cases have been reported, data regarding the incidence of thyroid agenesis are mainly based on cadaver series. Dixit et al. (1) reported the rate of isthmus agenesis to be 14.6% in a series of 41 cadavers, whereas Ranade et al. (6) reported a rate of 33% in a series of 105 cadavers. Therefore, with such a limited number of cadaver series available in the literature, the data on the incidence of isthmus agenesis is considered to be insufficient.

The etiology of isthmus agenesis is also not completely known. It has been reported that it may be related to genetic factors, developmental anomalies, and mutations of chromosome 22 and thyroid transcription factor (TITF) 1–2 genes (4, 7, 8).

Clinically, scintigraphy with an overload of thyroid stimulating hormone (TSH) can be used to diagnose agenesis of the isthmus. It can also be diagnosed using USG, computed tomography (CT), and magnetic resonance imaging (MRI) or during thyroid surgery (1). In this case report, agenesis of the isthmus was determined during thyroid surgery. In our patient, the reason for not determining agenesis of the isthmus by preoperative neck USG may be because of the expansion of the thyroid lobe into the midline by the large nodule in the right lobe. Patients with isthmus agenesis are generally euthyroid but hypothyroidism or hyperthyroidism may be seen (5). In our case, thyroid function was normal.

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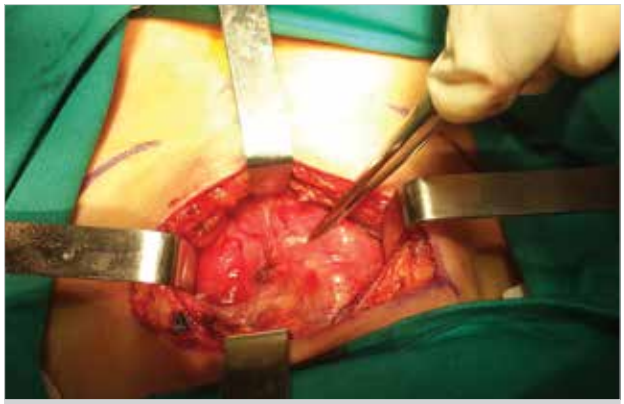

Figure 1. Perioperative image of the patient

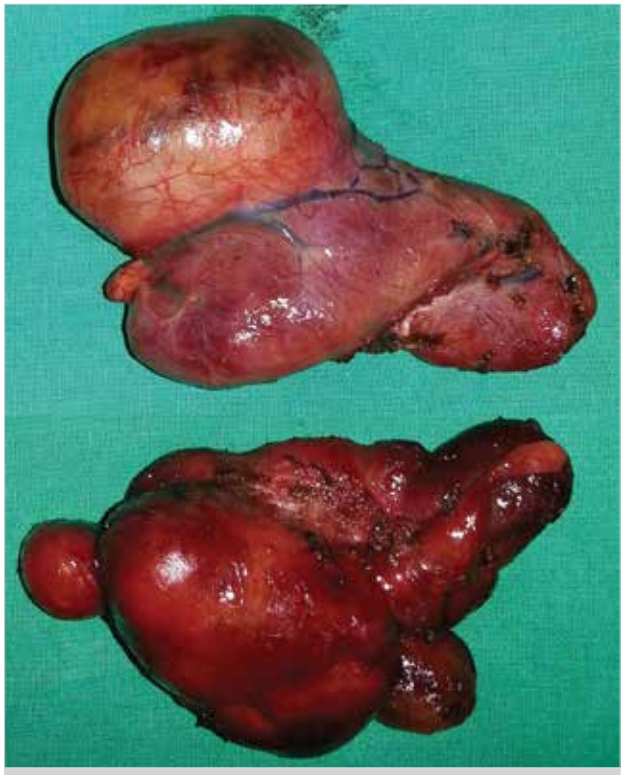

Figure 2. Thyroid tissue after surgical excision

When agenesis of the isthmus is determined, diseases such as autoimmune thyroid nodule, thyroiditis, primary thyroid carcinoma, metastasis, and amyloidosis must be considered in the differential diagnosis. Agenesis of the isthmus can be associated with agenesis of the thyroid lobe, ectopic thyroid tissue, or parathyroid hyperplasia (1, 5, 9). Bearing these associations in mind may contribute to safer surgical procedures and fewer surgery-related complications. Therefore, the importance of diagnosing agenesis of the isthmus and other associated thyroid anomalies in preoperative assessment should be remembered in patients for whom thyroid surgery is planned.

CONCLUSION

Agenesis of the thyroid gland is rare. When agenesis of the isthmus is determined, its association with agenesis of the thyroid lobe or the presence of ectopic thyroid tissue must be kept in mind. In addition, diseases such as autoimmune thyroid nodule, thyroiditis, primary thyroid carcinoma, metastasis, and amyloidosis must be considered in the differential diagnosis. It should be remembered that the determination of agenesis of the isthmus and other thyroid anomalies during preoperative assessment in the patients for whom thyroid surgery is planned would contribute significantly to safer surgical procedures and fewer surgery-related complications.

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Case Report

Glomus tumor of the stomach

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ABSTRACT

Glomus tumor is a rare benign mesenchymal neoplasm derived from the glomus body, an arteriovenous shunt mainly located in dermis and subcutis. The most common localization of this tumor is extremities, especially nailbed. Glomus tumor in the gastrointestinal system is a rare condition. Here we report a gastric glomus tumor to raise awareness of this tumor and show the difficulties in the diagnosis.

Keywords: Gastric, glomus, tumor, uncommon

INTRODUCTION

Glomus tumor is a rare benign mesenchymal neoplasm. As the name indicates, the tumor arises from the glomus body, which is an arteriovenous anastomosis, functioning without an intermediary capillary bed (1). It represents approximately 2% of all soft tissue tumors. The majority of glomus tumors occur in the distal extremities especially in the fingers, particularly in the subungual region and the skeletal muscle (2). The stomach is an exceptional site for glomus tumor. The first case of gastric glomus tumor was reported in 1951 by Kay et al. (3). Since then, few cases have been reported (1). Gastric glomus tumors, which are located in the antrum or pylor, are typically seen in the submucosa and muscularis propria. The tumors are generally benign. However, rarely they may show malignant behavior, according to localization, size, high nuclear grade, and atypia (4, 5).

CASE PRESENTATION

A 68-year-old man was admitted to our emergency service with an upper gastrointestinal bleeding episode. The patient was hemodynamically stabile and laboratory results were in normal limits. An upper gastrointestinal endoscopy was planned (Figure 1). Endoscopy revealed a submucosal mass located in the antrum. Due to the submucosal mass existence, an endoultrasonographic evaluation was performed. A hypervascularized mass of 4 cm, with microcalcifications inside, was found in muscularis propria (Figure 2). With prediagnosis of gastrointestinal stromal tumor (GIST), endoultrasonographic fine-needle aspiration was performed. Hypocelluler biopsy had few SMA positive smooth muscle cells, fibrin, and blood. Immunohistochemically, CD34, S100, DOG1, and CD117 were negative and Ki-67 index was 1%. With these findings, biopsy was not consistent with GIST. The patient was subjected to further investigation. Abdominal contrast-enhanced computed tomography (CT) was performed and revealed a well-circumscribed, homogeneously enhanced 25×23 mm solid submucosal tumor located in the gastric antrum in the greater curvature (Figure 3). The tumor was interpreted with a prediagnosis of neuroendocrine tumor (NET). Surgery was planned with prediagnosis of GIST and NET. Additional tests for CEA, CA 19-9, Chromogranin A, and gastrin levels were in normal limits. Wedge resection and a partial omentectomy were performed.

In macroscopic examination, 5.5×2.5×2.5 cm nodular mass, arising from the submucosa and extending through the muscularis of the stomach, was observed. The excised specimen had clear margins. The cut surface of the mass was white and hyperemic. In microscopic examination, it was a highly vascular tumor composed of thin-walled vessels. The vessels were surrounded by monomorphic, small, round-to-polygonal cells forming nests, sheets, and strands. The cells had centrally located nuclei, inconspicuous nucleoli, and clear-to-eosinophilic cytoplasm with sharply defined cell borders (Figure 4). There were neither necrosis nor mitosis in the tumor. Collagen type IV, an immunohistochemical marker in favor of glomus tumor, was focally and mildly positive. Immunohistochemically, SMA (Figure 5) and vimentin (Figure 6) were diffusely positive, and caldesmon was focally positive in tumor cells. CD 117, DOG 1, S100, CD34, chromogranin, synaptophysin, CD56, CD57, PGP9.5, and desmin were all negative. Ki-67 index was 1%, consistent with the former biopsy. Clinical, morphologic, and immunohistochemical findings were consistent with the diagnosis of glomus tumor.

After the diagnosis of glomus tumor, the patient underwent systemic examination, but no evidence of metastasis was found. The patient was discharged from the hospital six days later without any postoperative complications.

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Figure 1. A submucosal mass in the antrum on endoscopic examination

Figure 2. A hypervascularized submucosal mass with microcalcifications in muscularis propria of the antrum

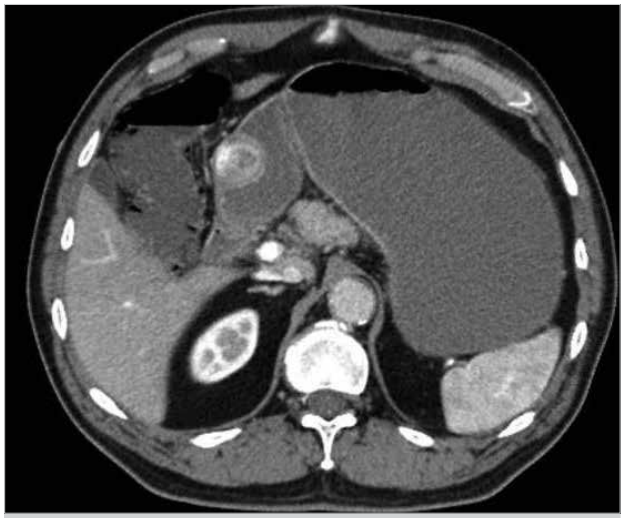

Figure 3. Well-circumscribed, homogeneously enhanced, solid, submucosal tumor on contrast-enhanced computed tomography

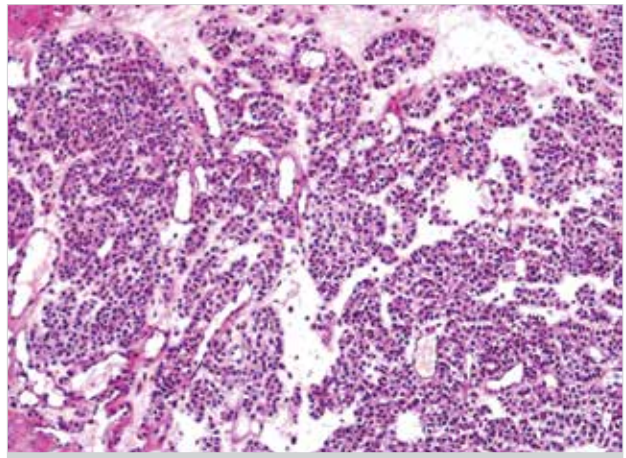

Figure 4. Glomus tumor: highly vascularized tumor with monomorphic, small, round, eosinophilic cells with a centrally located nuclei (H-EX100)

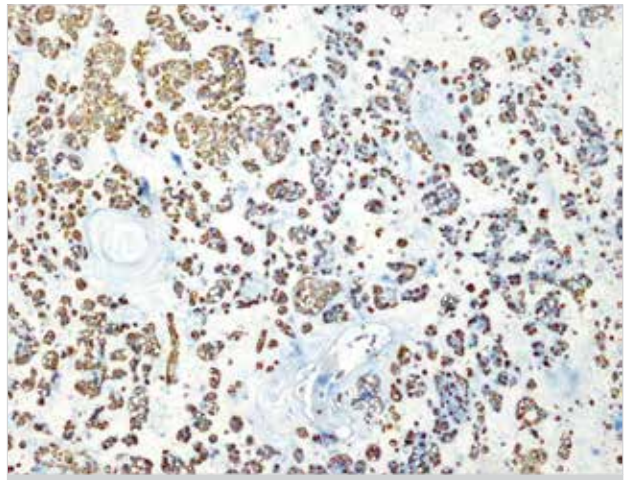

Figure 5. SMA was diffusely positive (100×)

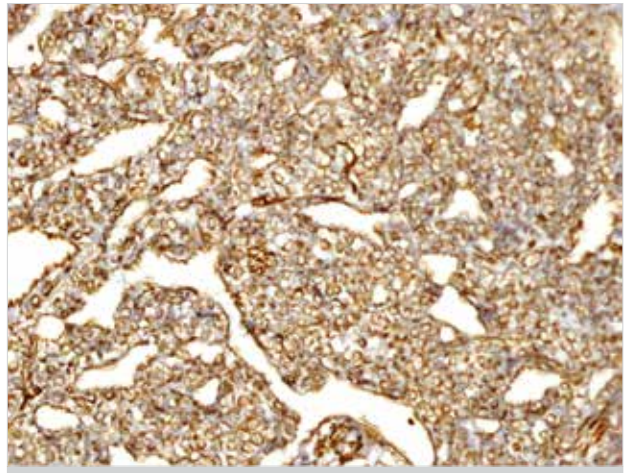

Figure 6. Vimentin was strongly and diffusely positive (200×)

DISCUSSION

Glomus tumors arise from specialized cells of the glomus body. They are typically found in peripheral soft tissues, generally located in dermis and subcutis. Miettinen et al. (6) reported a series of 32 gastrointestinal glomus tumors, and 31 of them were gastric and one of them had cecal localization. According to them, gastric glomus tumors constitute 1% of the gastric stromal tumors. Gastric glomus tumors generally located in the submucosa or muscularis propria of the gastric wall. The symptoms are nonspecific, e.g., abdominal discomfort, epigastric pain, and/or upper gastrointestinal bleeding (5). Gastric glomus tumors are generally solitary and located in the greater curvature (7, 8). They are commonly seen in the sixth decade (9). These tumors are more frequent in women than in men (6). Although the gender was uncommon, our patient had the other common features of the tumor.

Most of the tumors have well-circumscribed borders and their size ranges from 1 to 22 cm. In microscopic examination, the tumors compose of vascular channels surrounded by monomorphic, small round cells with sharp cell borders, centrally located nuclei, and inconspicuous nucleoli. Pleomorphism, atypia, mitosis, and necrosis are uncommon findings. Immunohistochemically, the tumor is strongly positive for SMA, vimentin, actin, calponin, type IV collagen, and laminin. CD 117, DOG 1, S100, CD34, desmin, and neuroendocrine markers such as chromogranin, synaptophysin, neuron-specific enolase, CD56, CD57, and PGP 9.5 are negative (1, 5). Our patient's morphologic and immunohistochemical features were consistent with the literature.

The diagnosis of gastric glomus tumor can be challenging with endoscopic and radiologic findings, which can also be seen in other gastric stromal and mesenchymal tumors (4). Gastrointestinal stromal tumor paraganglioma, and NET should be considered for differential diagnosis. Gastrointestinal stromal tumor is the most common mesenchymal tumor of the stomach. Epithelioid type of GIST is one of the most important tumor in differential diagnosis of glomus tumor. Different from glomus tumor, GISTs are positive for CD117, DOG 1, and CD 34. Positivity for desmin, vimentin, and SMA are variable and S100 immunoreactivity is rare in glomus tumors (1, 9, 10). Different from GIST, our tumor had distinctive dilated vascular structures. CD117 and DOG1 were applied to three tumor blocks and all were negative.

Paragangliomas are generally located in the retroperitoneum. They have Zellballen and alveolar pattern with accompanying thin-walled vessels. They characteristically show immunoreactivity with chromogranin, synaptophysin, and S-100 protein (1). All of these markers were negative in our submucosal localized gastric tumor.

Neuroendocrine tumors have nests and cords of oval and/or spindle large cells. The nuclei have salt and pepper chromatin pattern. They are positive for synaptophysin, chromogranin, and neuron-specific enolase (1, 2, 11). Our patient's tumor had neither this morphologic pattern nor immunohistochemical features. Folpe et al. (12) proposed some criteria for malignant glomus tumors: deep location, size greater than 2 cm, atypical mitosis, or high mitotic activity (5 mitoses/50 HPF) with moderate-to-high nuclear grade. Although the gastric site was accepted as a deep location in the past, it was understood that there are serious differences between gastric glomus and deep peripheral soft-tissue glomus tumors. According to the literature, absence of nuclear atypia and low mitotic activity did not exclude malignant potential, especially in larger tumors (>5 cm) (5). *Symplastic glomus tumors* are described as high nuclear grade tumors without any other malignant features. Glomus tumor of uncertain malignant potential term is used for tumors having high mitotic activity and additional criteria such as superficial location, large size, or deep localization (13). Our patient had a 5.5-cm tumor without mitosis and necrosis. The tumor had small monotonous cells with a centrally located nucleus. Nucleolus was not prominent. According to these features, our case was considered as benign and follow-up was recommended. Our patient is under control and out of disease for 18 months.

CONCLUSION

Gastric glomus tumors are rare mesenchymal tumors that are difficult to diagnose before excision. Their clinical, radiologic, endoscopic, and even cytologic features can overlap with the common stromal and mesenchymal gastric tumors. After the removal, morphologic features and immunohistochemical examination play an important role for the diagnosis of gastric glomus tumor.

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Case Report

Idiopathic weight loss due to an entero-enteric fistula from a gossypiboma retained for 27 years

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ABSTRACT

Gossypiboma refers to a mass formed around surgical instruments or materials left in the body postoperatively. The occurrence of gossypibomas remains an important problem, despite improvements in surgical procedures and operating room facilities. The clinical presentation of gossypiboma can vary depending on the host response. This report describes a case of abdominal gossypiboma after splenectomy. A 48-year-old man who had undergone splenectomy 27 years ago was admitted to our clinic suffering from non-specific symptoms for 2 weeks. He was cachectic, but laboratory test results were normal. Abdominal ultrasonography and computed tomography revealed a mass in the left hypochondrium. An entero-enteric fistula and an encapsulated foreign body (surgical compress) were detected during an exploratory laparotomy, and the foreign body was removed. Preventing gossypibomas is very important because of their potential to create medico-legal problems and increase mortality and morbidity. Therefore, forgotten surgical material should be considered in all patients with a surgical history, and surgery should be performed carefully.

Keywords: Entero-enteric fistula, foreign body, gossypiboma, textiloma

INTRODUCTION

The term gossypiboma (textiloma, cottonoid, gauzoma, and muslinoma) is used to describe the development of a mass around forgotten surgical materials, such as gauze pads or compresses. The incidence of gossypiboma is not precisely known (1, 2). Patients with gossypiboma may be asymptomatic or may present with non-specific symptoms. The clinical symptoms of gossypiboma can vary from mild discomfort, pain, malabsorption syndrome, chronic anemia, weight loss, or intermittent vomiting to severe pain, fever, generalized peritonitis, acute gastrointestinal bleeding, and bowel obstruction. Symptoms may occur up to 1 year after the initial surgery. A diagnosis of gossypiboma is usually made based on imaging results (1, 3). Here, we present a case of abdominal gossypiboma 27 years after a splenectomy.

CASE PRESENTATION

A 48-year-old man presented with fatigue, intermittent bilious vomiting, and abdominal colicky pain for 2 weeks. The patient had undergone a splenectomy 27 years ago due to blunt abdominal trauma. The patient had been followed by an internal medicine clinic due to chronic iron deficiency anemia and had been admitted to an emergency clinic several times for abdominal colicky pain and a 10-kg weight loss within the previous 3 months. A physical examination revealed cachexia and abdominal pain in the epigastric region. Laboratory test results were normal, except for moderate iron deficiency anemia. Abdominal ultrasonography (USG) revealed hypoperistaltic bowel loops and the presence of a hypoechoic mass in the left hypochondrium. Abdominal contrast-enhanced computed tomography (CECT) revealed a heterogeneous hyperechoic mass compressing the distal transverse colon externally, suggesting the presence of a foreign body or tumor (Figure 1). Results of upper digestive endoscopy and colonoscopy were normal.

The patient underwent an exploratory laparotomy. An entero-enteric fistula was detected between the proximal jejunum and the distal ileum, and an encapsulated granuloma had formed between the fistula and the distal transverse colon mesentery. This encapsulated mass was opened to reveal a foreign body (a 20×15×15 cm surgical compress). The intraluminal contents of the compress were occluding the lumen (Figure 2), and the foreign body was removed (Figure 3). The entero-enteric fistula was treated by removing a 15-cm segment of the jejunum and a 15-cm segment of the ileum, and the intestinal loops were end-to-end anastomosed. A nasogastric tube was pushed forward up into the duodenum, and a feeding tube was placed in the jejunum because the anastomosis between the jejunal loops was very close to the ligament of Treitz. The incision was sutured, and the abdomen was closed. The patient was discharged on postoperative day 8 after tolerating enteral nutrition and recovering. The feeding tube was removed surgically 1 month later. No complications occurred during follow-up, and the patient's weight returned to normal.

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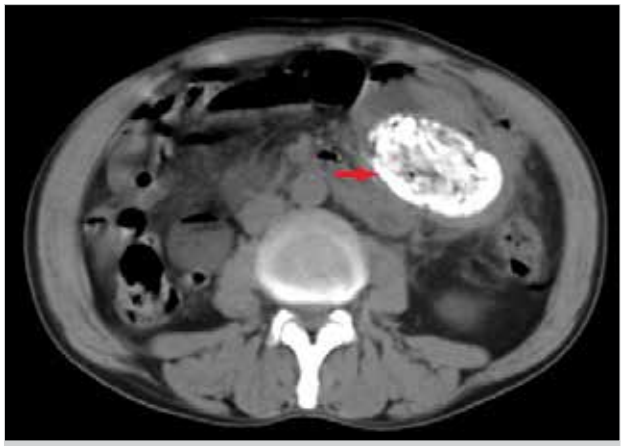

Figure 1. A CECT image showing intraluminal heterogeneous hyperechoic mass

Figure 2. Intraoperative image showing withdrawal of compress from the lumen of bowel loop

Figure 3. The retained surgical sponge

DISCUSSION

Gossypiboma remains an important medical condition, despite improvements in surgical procedures and operating room facilities. The true incidence of gossypiboma is not precisely known, but has been estimated to occur in 1 in 1,000 to 1 in 1,500 surgeries (4).

Several risk factors related to patients, the surgical procedure, and foreign body features, including emergency surgery, obesity, long operative period, inexperienced staff, inadequate number of staff, staff changes during the operation, unstable patient, and lack of a clearly defined material-count protocol, have been reported in cases of gossypiboma (5). Although swabs, towels, pads, and surgical instruments may be retained in the abdominal cavity, surgical gauze is the most frequently retained foreign body because it is commonly used and is small (6). Gawande et al. (7) reported surgical gauze as the cause of gossypiboma in 69% of cases and surgical instruments in 31% of cases. In our case, the patient underwent emergency surgery, including splenectomy, due to trauma, and the retained material turned out to be a surgical compress.

Patients may be asymptomatic or may present with nonspecific symptoms. The clinical presentation of gossypiboma includes abdominal pain, vomiting, gastrointestinal bleeding, weight loss, and anemia, but can vary greatly depending on the type of host response and the location and size of the foreign body. Gossypiboma can present years after the initial surgery (8, 9). Surgical cotton material, including gauze pads and compresses, are inert and do not change in the body. However, foreign bodies can cause two types of reactions, such as a granuloma formation or an exudative reaction. A granuloma occurs due to an aseptic fibrous response, leading to adhesions and encapsulation, and generally has a quiet clinical period. An exudative reaction occurs due to an inflammatory response, leading to abscess formation and clinical symptoms during the early postoperative period (4). In some cases, foreign bodies migrate into the bowel lumen by eroding the bowel wall because of the pressure exerted. The most common parts of the bowel that are penetrated are the ileum and colon, although bowel penetration can occur in any part of the intestinal tract (10). Penetration and migration leads to perforation, formation of internal and external fistulas or an abscess, gastrointestinal obstruction, and bleeding (5). In our case, an internal fistula formed between the proximal jejunum and the distal ileum, in addition to the presence of an encapsulated granuloma. An aseptic fibrous response occurred in response to the surgical compress material, and our patient remained asymptomatic for 27 years after the initial surgery. The foreign body was detected during an evaluation for intermittent vomiting and extreme weight loss.

The diagnosis of gossypiboma is typically made using imaging results from simple X-ray, USG, CECT, or magnetic resonance imaging. A simple X-ray was highly significant for diagnosis in the present case, as surgical cotton is radiopaque. USG or CECT is useful for other foreign bodies or to confirm the diagnosis. While USG reveals a mass of mixed echogenicity with intense and sharp acoustic shadowing, CECT reveals a well-circumscribed mass and internal structures with a whirl-like appearance (9). The present case showed such characteristic CECT findings.

CONCLUSION

Preventing gossypiboma is very important because of the potential medico-legal problems and increased morbidity and mortality. Therefore, forgotten surgical materials should be considered in all patients with a surgical history. Surgical staff should not change during a surgical procedure, particularly

during an emergency surgery, and surgical instruments should be counted, if necessary. An intraoperative X-ray should be obtained when conflicting count results occur.

Informed Consent: Written informed consent was obtained from patient who participated in this study.

Peer-review: Externally peer-reviewed.

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Case Report

Primary splenic angiosarcoma diagnosed after splenectomy for spontaneous rupture

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ABSTRACT

Primary splenic angiosarcoma is a rare abnormality and has a bad prognosis. It has unknown pathogenesis. This abnormality is usually presented by splenic rupture. Surgery is the most promising treatm Surgery is the most accepted and accurate method for diagnosis and treatment. Surgery before rupture increases the life expectancy. A 65-year-old woman who presented to the emergency room with abdominal pain, abdominal distension, and anemia was found to have a splenic mass and massive ascites. After getting a hemorrhagic sample from the abdomen, the patient was operated with splenic rupture prediagnosis. The spleen material was reported as splenic angiosarcoma. The staging 18F-FDG-Positron Emission Tomography-Computed Tomography did not show any metastasis. Five months later, paclitaxel treatment was initiated upon liver and bone metastasis, and the treatment still continues. Splenic angiosarcoma has a place among splenic parenchymal lesions. The splenectomy material names the diagnosis. Pathologic examination of splenectomy material is revealed certain diagnosis.

Keywords: Imaging, primary splenic angiosarcoma, spontaneous splenic rupture, splenectomy

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INTRODUCTION

Primary splenic angiosarcoma is a rare lesion with an incidence rate of 0.14-0.25 cases per year per million individuals. The prognosis is poor and 30% of the cases are diagnosed on splenectomy due to spontaneous rupture (1, 2). It was first described by Langhans in 1879 (3). Around 75% of cases present with abdominal pain, where one-third of the cases witnesses rupture of the involved organ. Although the treatment consists of splenectomy followed by chemotherapy (sometimes combined with radiotherapy), it is known as a chemoresistant tumor.

We aimed to describe a patient with splenic rupture diagnosed to have primary splenic angiosarcoma on splenectomy.

CASE PRESENTATION

The patient was informed that she has a rare disease; her written consent was received for publication purposes. 65-year-old women patient with anemia was referred from another hospital. Multiple polyps were found in the colon, and she was transfused three units of erythrocyte suspension/RBCs within 2 days due to gastrointestinal bleeding. She presented at our emergency room with abdominal pain and distension. Her ultrasound showed a splenic mass, which was sized about 12×9 cm in diameter with central necrosis and massive peritoneal fluid collection around the liver and spleen. Subsequently, contrast-enhanced computed tomography (CT) yielded well-defined exophytic mass with heterogeneous contrast enhancement and necrotic areas in middle spleen, which were 10 cm in diameter. Massive amount of perisplenic, perihepatic, and pelvic fluid was also detected (Figure 1). The sampling of this fluid showed pure blood, and patient was taken to the operating room. During laparotomy, free blood was found in the abdomen. Aproximately 10 cm mass was seen along posterior to hilus in spleen. Spontaneous rupture and active bleeding was found on the splenic capsule of mass (Figure 2). Total splenectomy was performed using ligasure and ties of the vascular structures and attachments. The abdominal cavity was irrigated with warm water. The patient was discharged on postoperative day 4.

The pathology showed primary angiosarcoma, which was 9×5 cm in diameter and confined to the spleen (Figure 3, 4).

As staging 18F-FDG-Positron Emission Tomography-Computed Tomography (PET-CT) showed no distant metastasis and chemotheraphy was not given (Figure 5). After 5 months, CT scan showed bone and liver metastasis, and chemotherapy (paclitaxel 80 mg/m^2/day; days 1, 8, 15, and 28) was initiated and it still continues.

Figure 1. Contrast-enhanced CT shows an exophytic semisolid mass with contrast enhancement in the spleen. Hemoperitoneum is also seen in perisplenic and perihepatic areas

Figure 2. Macroscopic view of the surgical specimen

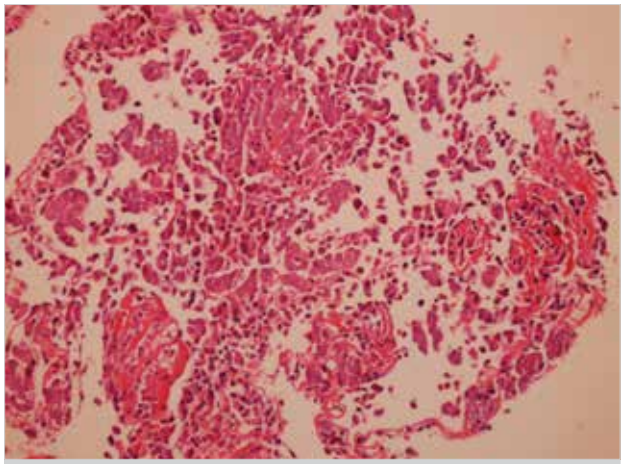

Figure 3. Angiosarcoma, spleen, H&E 200×, and papillary and vascular channels lined by typical, hyper-chromatic cells

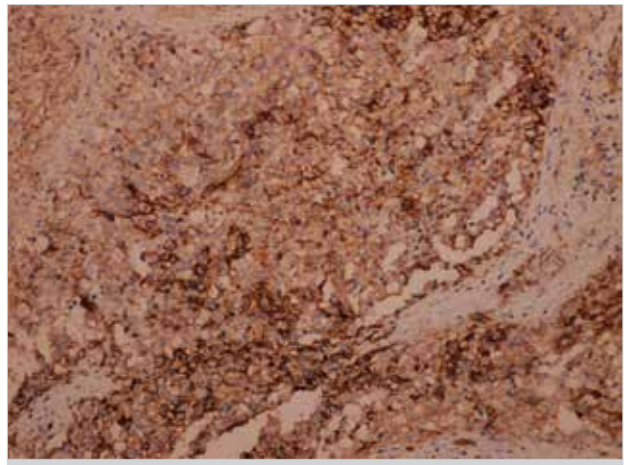

Figure 4. Cytoplasmic expression of CD31 in the tumor cells, 200×

Figure 5. Follow-up contrast-enhanced abdominal CT examination shows hepatic metastasis 5 months after surgery

DISCUSSION

Primary splenic angiosarcoma is a rare and aggressive tumor (1). It is originated from mesenchymal cells located in vascular endothelium and splenic sinusoids (1). The risk of local recurrence and metastasis is high. It is more common in females, frequently after 40 years of age. Our case was a 65-year-old woman.

There is no specific screening test for diagnosis, and 80% of cases present with upper abdominal pain. However, fever, weight loss, and fatigue are seen in less than 10% of cases (1, 2). Splenomegaly is the dominant physical finding, which is felt as a palpable mass in left upper quadrant of body. The ratio of splenic rupture is 13%-32%. Our patient presented with anemia and abdominal pain, and the CT scan showed abdominal hemorrhage due to splenic rupture.

Splenic angiosarcoma was first described by Langhans in 1879 (3). Jimenz-Heffernan et al. (4) reported a case presented by rectal bleeding due to rupture of the spleen into the colon. The symptoms of splenic angiosarcoma may be different; in 75% of cases, abdominal pain is the main symptom, and in one-third cases, there are symptoms of ruptured organ (1, 3). Anemia, leucopenia, elevation of LDH, and thrombocytopenia are frequently reported. Anemia is secondary to destruction of erythrocyte surface and can be severe due to hemolysis (5). Sometimes, thrombocytopenia is the first sign of the disease (5).

Splenic angiosarcoma has poor prognosis, and only 20% of cases have a survival longer than six months (2, 4). In most

cases, survival is limited to 30-90 days after surgery (1, 2). Intra-abdominal bleeding is a poor prognostic factor (1). The metastasis rate is between 69% and 100% and is mostly seen in liver, bone, and bone marrow (1, 2). In our patient, the outcome was similar and metastasis in the liver and bone was detected in 4-5 month after surgery. Preoperative biopsy as a diagnostic tool is dangerous considering bleeding and seeding. Preoperative CT is helpful for diagnosis and detection of complications in 60% of cases (6). It shows splenic enlargement or mass and punctate calcification n the spleen (7). Even in our case, CT helped identify a mass and the rupture of the spleen.

Splenectomy is the option for localized disease (1, 8). The median survival for splenic angiosarcoma is 5 months. In literature, there are cases responding to weekly paclitaxel treatment (9, 10). The PET CT scan after surgery did not show any sign of metastasis. The patient was followed up for 4-5 months and after this period, metastasis to the liver and bone was found. Therefore, paclitaxel treatment with 80 mg/day on days 1, 8, 15, and 28 was initiated. The patient continues to be on the same treatment.

CONCLUSION

A spontaneous splenic mass rupture can be primary splenic angiosarcoma. Because of the aggressive progress and mortality of the disease, it should be considered that splenectomy without rupture may prolong patient survival significantly.

Informed Consent: Written informed consent was obtained from patient who participated in this study.

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Case Report

Is erythema nodosum coexisting with lesions of the breast a suggestive sign for idiopathic granulomatous mastitis?

Metehan Gümüş[1], Zeynep Meltem Akkurt[2], Hatice Gümüş[3]

ABSTRACT

Coexistence of idiopathic granulomatous mastitis and erythema nodosum is very unusual. In this paper, we present a patient with idiopathic granulomatous mastitis accompanied by erythema nodosum to highlight the diagnostic importance of erythema nodosum and its relationship with treatment response of breast lesion. A 39-year-old female with a breast lesion and erythema nodosum was started on treatment with corticosteroids before the results of her histopathological evaluation were obtained. The response to treatment was very quick. Erythema nodosum totally disappeared and the breast lesion regressed noticeably within a week. We think that erythema nodosum associated with a breast lesion may be a sign suggestive of idiopathic granulomatous mastitis and can be used for the evaluation of the response to corticosteroid treatment. More case reports are needed to justify the use of erythema nodosum as a sign suggestive of idiopathic granulomatous mastitis.

Keywords: Corticosteroids, erythema nodosum, idiopathic granulomatous mastitis

INTRODUCTION

Although idiopathic granulomatous mastitis (IGM) is a very unusual disease worldwide, it is relatively common in Turkey, particularly in our region. Although erythema nodosum (EN) usually has no specific documented causes, it may be the first sign of a systemic disease (1). In the literature, a few case reports have shown that it can also occur in association with GM (2-4). GM has different treatment options, one of which is treatment with corticosteroids (2, 3). There are diagnostic challenges because GM can be easily confused with cancer. Therefore, a histological examination is essential for exact diagnosis. IGM is a diagnosis of exclusion because there are several processes, such as sarcoidosis or tuberculosis of the breast, that may induce GM. Evaluation can take quite a while (3). In some cases, the response to treatment can aid diagnosis. However, this response cannot be seen immediately, and some parameters are needed for its evaluation. Here we report a case of IGM associated with EN to present the diagnostic importance of EN and its relation with treatment response of breast lesion.

CASE PRESENTATION

In this study, after obtaining an informed consent, we present a 39-year-old female who was admitted to our clinic with breast and skin lesions. Her description revealed that she had observed a growing breast lesion 2 months ago and skin lesions few days ago on her legs (Figure 1a). On physical examination, the breast lesion was attached to the overlying skin, which was thickened and ulcerated. A mammogram revealed asymmetric density in the retroareolar area and the upper and lower outer quadrants of the right breast (Figure 2). Ultrasonography showed multiple tubular, circumscribed heterogeneous hypoechoic masses with extension to the overlying skin, particularly in the lower outer quadrant of the right breast. The breast lesion was biopsied for exact histopathological diagnosis. At the same time, treatment with methylprednisolone was started at a dose of 0.5 mg/day, and the patient was hospitalized for evaluation of the response to treatment. Two days later, her skin lesions showed evident regression (Figure 1b). Then, her drugs were ordered, and she was discharged. Her pretibial skin lesions totally disappeared within a week (Figure 1c). Also, there was regression in the breast lesion, as observed at a follow-up 2 weeks later. Histopathological evaluation of the breast lesion confirmed our preliminary diagnosis of GM. Her treatment with corticosteroids was completed in 2 months. The patient showed complete remission 1 year later.

DISCUSSION

Erythema nodosum is a relatively common skin disorder, and it may be associated with many factors, including infections, sarcoidosis, rheumatologic diseases, inflammatory bowel diseases, medications, autoimmune disorders, pregnancy, and malignancies. EN has seldom been reported in association with IGM (2-4). Although it is not a frequent association, dermatologists should keep in mind that EN can be caused by IGM, and a breast examination should not be neglected in patients with EN.

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Figure 1. a-c. Pretibial erythematous nodules in the patient with granulomatous mastitis. Upon admission to the clinic (a), Two days after initiation of systemic corticosteroid treatment (b), One week after initiation of treatment (c)

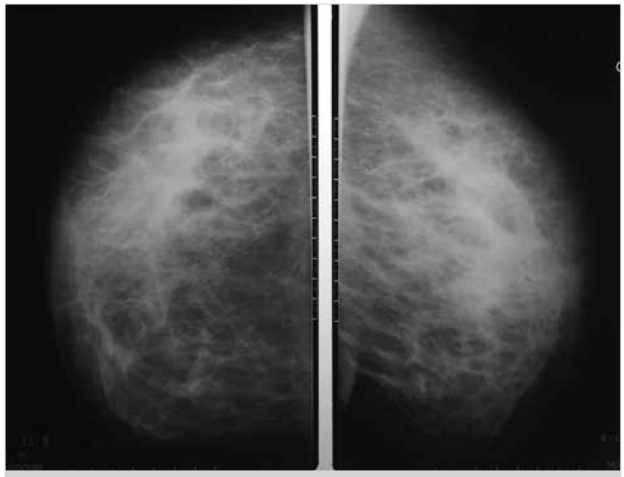

Figure 2. Asymmetric density in the retroareolar area and the upper and lower outer quadrants of the right breast on mammogram

In EN, pretibial involvement is most common, although the extensor surfaces of the forearm, thighs, and trunk also may be affected (5). Our patient had pretibial involvement.

Granulomatous mastitis has several treatment options, and although most cases respond to monotherapy, some patients require a combination of options (5). Our case was treated with systemic corticosteroids. EN tends to be self-limited, and the most common approach is treatment of any underlying disorders and supportive therapy. Systemic corticosteroids at 1 mg per kg body weight per day have been advocated as a relatively safe therapeutic option (1). Fortunately, the same steroid treatment can be used for GM (5).

In a histopathologically diagnosed previous case, we experienced that both breast and pretibial lesions in EN related to GM are very sensitive to treatment with corticosteroids (6). In this case, we had initiated systemic corticosteroids without waiting for histopathological confirmation. The patient's response to the corticosteroid treatment supported our diagnosis. Association with EN has been stated to support an autoimmune pathogenesis in IGM (7). Response of IGM to treatment is not achieved in a short time period in every patient but that of IGM associated with EN may be good. If new cases in the literature support this result, EN may be viewed as a sign suggestive of GM, which can prevent delay of treatment until results of histopathological evaluation of the breast are available.

CONCLUSION

In conclusion, we suggest that EN can be not only used as a sign suggestive of GM but also for prediction of response to treatment. Considering these findings, it is for certain that more cases are necessary to support our speculation.

Informed Consent: Written informed consent was obtained from patient who participated in this case.

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Case Report

Severe decrease in SpO_2 and methemoglobinemia following subareolar isosulfan blue administration and clinical relevance

Esra Yüksel[1], Dilek Duman[1], Levent Yeniay[2], Sezgin Ulukaya[1]

ABSTRACT

The level of axillary lymph node involvement in breast cancer is a critical decision factor for adjuvant therapy and the most important indicator of prognosis and survival. Sentinel lymph node biopsy is a minimally invasive technique with low morbidity in axillary staging of breast cancer. Radiocolloid substances (Technetium-99m) and/or blue dyes such as methylene blue or isosulfan blue are used during sentinel lymph node biopsy. Isosulfan blue stain is frequently used in sentinel lymph node biopsy and rarely causes complications. The present case report presents a severe decrease in SpO2 due to methemoglobinemia following isosulfan blue administration as well as skin and urine signs and inconsistency with clinical picture in a 67-year-old, 77 kg, ASA II female case who underwent sentinel lymph node biopsy under general anesthesia.

Keywords: Isosulfan blue, methemoglobinemia, sentinel lymph node biopsy

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INTRODUCTION

Sentinel lymph node biopsy (SLNB) involves staining lymph nodes via regional injection during breast surgery; it is an easily applied implementation with low morbidity and an accuracy rate of over 90%, and has prognostic importance (1). The stains used most frequently for detection of sentinel lymph nodes include isosulfan blue, patent blue, and methylene blue. Isosulfan blue is an aniline dye; it is the 2.5-disulfan isomer of patent blue (2).

Unfortunately, as a disadvantage of regional staining, methemoglobinemia is one of the most frequent complications seen following isosulfan blue injection, in addition to allergic reactions ranging from simple rashes to anaphylactic reactions (3-5). The amount of methemoglobin (MetHb), which is an abnormal form of the hemoglobin molecule, is normally less than 1%. Cyanosis occurs when the blood MetHb concentration exceeds 10% to 15%; weakness following tissue hypoxia, tachycardia, and respiratory distress occur when the MetHb concentration exceeds 35%; and lethargy, stupor, and syncope are observed when the MetHb concentration exceeds 55%. A MetHb concentration of over 70% is fatal unless treated. Methemoglobinemia may occur as a side effect of local anesthetic toxicity or inhaled NO administration. Peripheral oxygen saturation (SpO_2) in methemoglobinemia patients is low and is independent from real partial oxygen pressure (PaO_2) in blood (6). However, the relationship between SpO_2 decrease and the clinical condition of the patient, as well as whether treatment is required, remain unclear.

The present case report introduces a severe decrease in SpO_2 following isosulfan blue administration, as well as skin and urine signs, perioperative process, and inconsistency with clinical condition in a patient who underwent SLNB under general anesthesia.

CASE PRESENTATION

Sentinel lymph node biopsy under general anesthesia was planned for a 67-year-old, 77 kg, 165 cm, ASA II female patient due to left breast cancer. Preoperative characteristics of the patient included warfarin sodium use due to past pulmonary embolus and levothyroxine use for thyroid function disorder. Prior to the surgery, warfarin sodium was replaced with 0.4 ml enoxaparin sodium. Routine laboratory tests revealed mild anemia (Hb 10.4, Htc 33.6). An intravenous route was opened (20 G) in the operating room, and isotonic serum infusion was started. Anesthesia induction of the patient included 1 mg/kg lidocaine, 2 mg/kg propofol, 1 µg/kg fentanyl, and 0.6 mg/kg rocuronium performed under routine ECG, with non-invasive blood pressure, SpO_2, and capnography monitoring; an orotracheal tube (no. 7) was then placed. Initially, the patient's SpO_2 was 99%, her blood pressure was 100/70 mmHg, and her heart rate was 75/minute in room air.

Maintenance of anesthesia was provided with 50% O_2/N_2O and 1% to 3% sevoflurane. Ten minutes after subcutaneous administration of 10 ml 1% isosulfan blue by the surgeons into the patient, who was he-

modynamically stable, SpO_2 first decreased to 87% from 99% and then to 75% in minutes despite 100% oxygen support. Meanwhile, blood pressure and $ETCO_2$ monitoring were unremarkable. After verifying that the anesthesia device worked correctly, the airway pressure did not increase, and the endotracheal tube had been placed accurately, a blood sample was taken from the patient for arterial gas analysis. A severe increase was suspected in MetHb concentration because SpO_2 remained at 75% although the concentration of inspired oxygen was 100%; a solution of 2500 mg ascorbic acid in 500 ml 5% dextrose was administered to the patient intravenously until the arterial blood gas results were obtained. However, the arterial blood gas results were as follows: pH: 7.54, $PaCO_2$: 23.3 mmHg, PaO_2: 281 mmHg, SaO_2: 99%, and MetHb: 2.7%. Biochemical analysis revealed a blood MetHb concentration of 2%. Meanwhile, the surgery was rapidly completed. Taking the patient's history of pulmonary embolus into account, her clot quality was evaluated by thromboelastogram to assess hypercoagulability. The thromboelastogram showed a tendency toward hypercoagulability (R period: 6.3 min., K period: 1.1 min, alpha angle: 75.5°, MA: 76 mm, and CI: 2.7). However, because the arterial blood gas parameters were good, the hemodynamics of the patient were stable, and the methemoglobin concentration was not very high, the patient was extubated after surgery; she was relaxed, cooperative, and had adequate respiration. Despite the absence of respiratory or neurological distress, the patient's SpO_2 only increased to 85% within 2 hours with 5 L/min oxygen support via face mask in the operating room as the patient was extubated. At that time, the patient's skin, particularly in the upper part of her body, had turned blue; this was most remarkable in her face. The color of the blood plasma taken from the patient for biochemical analysis was blue. The color of the urine passing through the urinary catheter placed in the intensive care unit was also blue. Twelve hours after 5 L/min oxygen inhalation via mask, the patient's SpO_2 reached 90%. During monitoring in the intensive care unit on the postoperative 1st day, the facial color and urine color of the patient remained blue, her SpO_2 was 92%, and her arterial blood gas levels were as follows: pH: 7.44, PaO_2: 76.1 mmHg, $PaCO_2$: 38.2 mmHg, SpO_2: 99%, and MetHb: 1%. During monitoring in the clinic on the postoperative 2nd day, her SpO_2 was 95% without oxygen support, and her facial and urine color returned to normal. The patient was discharged on the 3rd day without any problem. Written informed consent was obtained from the patient who was presented in this case report.

DISCUSSION

Isosulfan blue is used for SLN marking; it passes into the regional lymph channels after injection and renders the blood visible by dying it blue.

The rapid and sudden decrease in peripheral oxygen saturation in the present case initially suggested to us a new embolus because of the patient's history of pulmonary embolus. However, her stable hemodynamics, lack of decrease in $ETCO_2$ saturation, and normal clot quality by thromboelastogram ruled out this diagnosis.

Allergic and anaphylactic reactions rarely occur due to isosulfan blue; they may also accompany a decrease in oxygen saturation. Recently, it has been demonstrated that isosulfan blue acts as an antigen and causes an IgE-mediated reaction. The incidence of these reactions is between 0.6% and 2.5%. A wide spectrum of symptoms may be seen, ranging from mild (urticaria, erythema) to severe (pulmonary edema, hypotension, vascular collapse) (7). Cinar et al. (8) reported a case of anaphylactic reaction after use of isosulfan blue.

However, the present patient had no symptoms of anaphylactic reaction, such as airway problems or respiratory-circulatory insufficiency. The blue color in her skin, mucosa, and urine were due only to MetHb. Isosulfan blue stain-induced methemoglobinemia was diagnosed based on knowledge of the use of the stain due to the characteristics of the surgical procedure, the high methemoglobin concentration both in arterial blood gas analysis and in further biochemical blood analysis, and the decrease in SpO_2 saturation regardless of normal PaO_2. Upon observing a low SpO_2 saturation regardless of normal PaO_2 and discovering a high methemoglobin concentration in the blood samples, we concluded that this was a case of isosulfan blue-induced methemoglobinemia.

Isosulfan blue, which is bound to plasma albumin and is excreted 90%through bile and 10% through urine, causes methemoglobinemia by oxidizing iron in hemoglobin molecules from the ferrous (Fe^{2+}) form to the ferric (Fe^{3+}) form. An increase in MetHb concentration, which is normally less than 1% and has no oxygen-carrying ability, shifts the oxyhemoglobin curve to the left and may cause tissue hypoxia, lactic acidosis, and death in severe cases. A definitive diagnosis of methemoglobinemia can be rapidly made by demonstrating an increase in MetHb via a co-oxymeter. A co-oxymeter is a spectrophotometer that measures light absorption at four different wavelengths and thus differentiates various forms of hemoglobin (oxyhemoglobin, deoxyhemoglobin, methemoglobin, and carboxyhemoglobin) (6).

A mild decrease in SpO_2 saturation after isosulfan blue administration is a routine condition. As such, similar cases have been reported in the literature (5,9,10). Blue urine color has been reported in some cases in addition to the commonly encountered low SpO_2 saturation and methemoglobinemia. There are two cases in the literature in which three of these findings were found (9,10). Unexpectedly, the present patient case had a severe decrease in SpO_2 saturation although the methemoglobin concentration was not very high; more typically, she experienced a remarkable change in the color of her skin-mucosa and, later, her urine, which lasted longer. A severe initial decrement in peripheral oxygen saturation without a color change to blue may suggest other diagnoses. Therefore, it is important to control the airway, respiration, and anesthesia device as soon as possible upon a severe decrease in SpO_2 (75%), as in the present case. Although our diagnosis focused on methemoglobinemia because of the characteristics of the surgical procedure, the diagnosis was made definitive after blood gas analysis showed no abnormality in PaO_2 saturation, an increase in methemoglobin, and a remarkable change in skin color.

Lai et al. (11) detected a decrease from 100% to 89% in a breast cancer case 5 minutes after administration of 4 mL (100 mg) patent blue, which was reflected in arterial blood gas measurements of pH: 7.45, PaO_2: 544.7 mmHg, $PaCO_2$: 35.7 mmHg, SaO_2: 99.9%, and MetHb: 3.5%. It was observed that the pa-

tient's urine and face turned blue; however, SpO_2 saturation returned to normal limits after 2 hours. No additional treatment was given. Methemoglobin was found to be 1.2% in the patient, who was normal a day after surgery, and the patient was discharged after 3 days without any problem (11). In the present case, we attributed the rapid decrease in SpO_2 to 75% and persistent maintenance to the dose of isosulfan blue, which was as high as 10 mL. However, it is interesting that the MetHb concentration was not found to be high in line with the given dose, although it was verified by two different methods. This raises the question of whether skin color may reflect SpO_2 independent of serum methemoglobin concentration. In fact, the patient's SpO_2 may have been sufficient, because the good clinical condition of the patient is more consistent with mild methemoglobinemia than with low SpO_2 saturation.

The first step of methemoglobinemia treatment in severe cases is intravenous administration of methylene blue, which is the antidote. Normally, the low amount of methemoglobin that occurs in blood is rapidly degraded in the erythrocytes by NADH-methemoglobin reductase (cytochrome b5 reductase). There is another methemoglobin reductase system in erythrocytes that uses NADPH as a cofactor. This enzyme is physiologically inactive and becomes active in the presence of certain redox compounds; it reduces the molecule by transferring an electron from NADPH to methemoglobin. The effect of methylene blue in the treatment of methemoglobinemia occurs by this method (11). However, we were unable to obtain methylene blue in our hospital. Therefore, we intravenously administered ascorbic acid, which reduces methemoglobin non-enzymatically *in vitro*. The efficacy of ascorbic acid therapy is not definite; however, the clinical status of the patient remained stable and required no further treatment.

CONCLUSION

Sentinel lymph node biopsy is a less invasive alternative to axillary dissection. However, methemoglobinemia due to dye use is a rare complication of this procedure. In contrast, patients undergoing this operation can be safely monitored with co-oximetry and blood sampling for MetHb.

Informed Consent: Written informed consent was obtained from patient who participated in this case.

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Case Report

Intraabdominal gossypiboma: Report of two cases

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ABSTRACT

Gossypiboma which cause medico-legal implications is a heritage of previous surgery. In this study, we present two cases of gossypiboma mimicking intraabdominal malignancy. Case 1: A 28-year-old woman presented with an epigastric mass measuring 10 cm in diameter and a history of open cholecystectomy performed three years ago. Radiological exams revealed a cystic mass at the lesser sac and suggested serous cystadenocarcinoma. Case 2: A 36-year-old female patient with a history of two caesarean sections had a mass in the left lower quadrant. Radiological imaging showed tumoral mass near the left ovary. The exact diagnosis of gossypiboma were achieved by laparotomy and pathological examination in both cases. Gossypibomas usually present with nonspecific symptoms and appear many years after surgery. Therefore, its preoperative diagnosis is very difficult. High degree of suspicion is essential and it should be considered in the differential diagnosis of intraabdominal masses in patients who have previously undergone surgery.

Keywords: Intraabdominal mass, foreign body, gossypiboma

INTRODUCTION

Gossypiboma or textiloma is used to describe a retained surgical sponge as a heritage of previous surgery, causing medico-legal issues. General surgical operations (52%) and gynecologic procedures (22%) are the main interventions related to gossypiboma (1). Although they may be detected in various parts of the body, gossypibomas are mostly found in the abdomen (56%), pelvis (18%), and thorax (11%) according to the study by Wan et al. (2). Its reported frequency varies between 1 out of 1,000 and 1 out of 1,500 intraabdominal operations, whereas actual occurrence rate is believed to be much higher (3).

Gossypiboma may appear either immediately or as long as a few decades after an operation and its symptoms are usually nonspecific. Thus, diagnosis tends to be difficult and usually is established with operation. Here, we present two cases of gossypiboma mimicking an intraabdominal malignancy.

CASE PRESENTATIONS

Case 1

A 28-year-old woman presented with a history of open cholecystectomy performed three years ago and was admitted to our clinic. She was suffering from abdominal pain and on physical examination, a mass lesion was found at the epigastric region. Biochemical parameters were normal. Abdominal computed tomography (CT) with intravenous contrast revealed a well-defined heterogeneous mass with a dense, enhanced wall, measuring 77×65×108 mm in diameter at the lesser sac with the contiguity of the left hepatic lobe, gastric antrum, and jejunal loops. Magnetic resonance imaging (MRI) was suggestive of serous cystadenocarcinoma of the pancreas. Gastroscopy was normal. After obtaining informed consent, laparotomy was performed; numerous dense adhesions between the lesion and the neighboring organs were observed and wall of the lesion was inadvertently opened during the dissection. Retained surgical sponges were detected from inside of the mass after running out of serous fluid. Mass was completely retrieved with pseudocapsule (Figure 1). Postoperatively, the patient recovered uneventfully. Microscopic examination revealed fibrous encapsulation containing the foreign-body giant cell reaction (Figure 2).

Case 2

A 36-year-old female patient was admitted to our clinic with the complaint of painful mass in the left lower quadrant for the last three months. There were two caesarean sections performed 13 and 15 years ago in her surgical background. A 10×10-cm mass was palpated on the left lower abdomen. Biochemical parameters were within normal limits. Ultrasonography showed a heterogeneous mass next to the left ovary and calcifications created acoustic shadows. On CT, a 110×90×70-mm tumoral mass

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near the left ovary, with smooth borders and cystic, necrotic, and hyperdense foci in the center was observed (Figure 3). Informed consent was taken and in the exploratory laparotomy, the mass adherent to the posterior abdominal wall and surrounded by the omentum was encapsulated and resembled a stromal tumor. It was completely removed from neighboring structures including small bowel, left ovary, and fallopian tube (Figure 4). The patient was discharged on the postoperative 6th day. Pathological examination revealed the true nature of the lesion to be foreign-body-type granulation tissue.

DISCUSSION

Accidentally left surgical sponges present diverse clinical findings depending on the types of foreign body reactions in the body and cause medico-legal issues. The first type of reaction is aseptic fibrinous reaction in which the adhesion and encapsulation results in a granuloma formation and remain asymptomatic for a long time (3-5). Then, similar to our cases, patients present with the symptoms of pseudotumor syndrome including abdominal pain, palpable mass, vomiting, diarrhea, abdominal distension, anorexia, and weight loss. Yildirim et al. (6) reported 14 patients with gossypiboma; 10 had aseptic fibrinous reactions, and the interval between first surgery and the onset of symptoms in their series varied between 12 months and 40 years. The second type of foreign body reaction is exudative inflammatory reaction, which usually is detected immediately following the surgery and by symptoms of the abscess or fistula formation (7). They may account for visceral perforation or obstruction by migrating into the luminal organs.

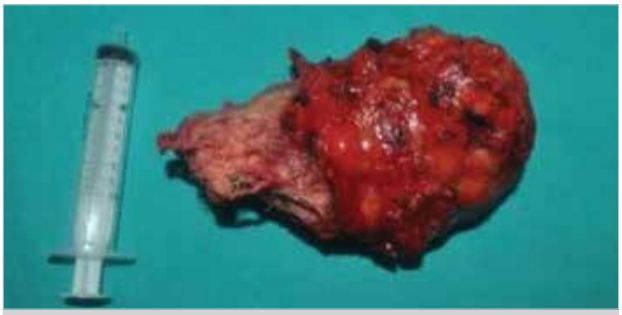

Figure 1. Mass was completely retrieved with pseudocapsule

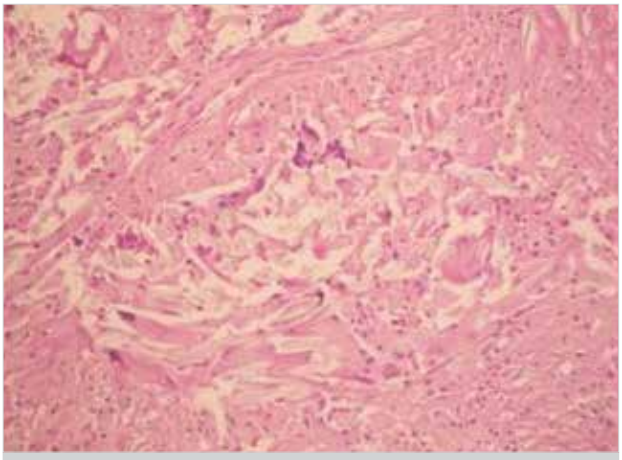

Figure 2. Pathological examination showed fibrous encapsulation containing the foreign-body giant cell reaction

Figure 3. CT revealed a tumoral mass with smooth borders and cystic, necrotic and hyperdense foci in the center

Gawande et al. (8) found that emergency interventions, unexpected changes in an operation, and high body mass index of the patient were the risk factors of leaving a foreign material inside the human body. Females have a greater possibility of this issue because of high number of gynecologic procedures, deep pelvis anatomy, and high body mass indexes (9). Similarly, our patients were female and obese, and one had two caesarean sections as a risk factor.

Preoperative correct diagnosis of gossypiboma has been reported to occur in only one-third of all cases (9). A new-onset or recurrent tumor is the most presumptive differential diagnosis of gossypiboma. This misdiagnosis may lead to extensive surgical resections and causes patient's anxiety as well. Therefore, gossypiboma should be included in the differential diagnosis of tumoral masses detected in patients with a history of a prior operation. In our first case, we suspected pancreatic serous cystadenocarcinoma in the light of radiological evaluations. The second case was suggested to be an intraabdominal stromal tumor. However, perioperative findings in the first case and the pathological examination in the second one revealed gossypiboma.

Although surgical sponges with radiopaque markers increase the probability of the detection of these retained swabs, the radiopaque filament is not always visible in a plain radiograph due to plication, bending, or fragmentation over time. Ultrasonographic finding of gossypiboma is a well-defined mass containing a wavy hyperechoic area and dense posterior acoustic

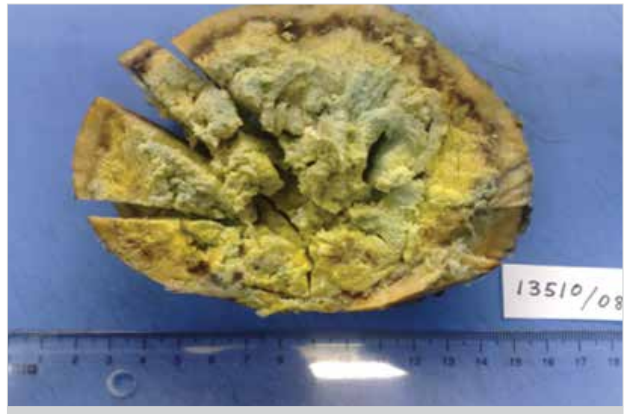

Figure 4. Macroscopic appearance of gossipiboma

shadowing (5). On CT, it appears as a well-demarcated cystic lesion with hyperdense internal material showing spongiform air bubbles with marked rim enhancement and mural calcifications (10). MRI is also helpful by illustrating a mass with a center having variable signal intensity depending on the fluid and its protein content and peripheral wall enhancement after intravenous gadolinium administration on T1-weighted imaging (3).

Prevention of gossypiboma is more important than diagnosis and treatment. Therefore, only sponges with radiopaque markers should be used during laparotomy. Thorough count of surgical materials at the onset and the end of the procedure must be performed with patience. Exploration of the surgical field before the closure of the wound is essential. If there is any doubt regarding the count, the surgeons should carefully check the surgical sites and take abdominal x-rays. Adherence to these basic details and paying meticulous attention will decrease the incidence of gossypibomas, which also account for serious medico-legal problems.

CONCLUSION

Retained surgical sponges may cause granuloma with foreign body reactions and mimic malignancy. As gossypibomas usually present with nonspecific symptoms and appear many years after surgery, their preoperative diagnoses are very difficult and require high degree of suspicion. They should be considered in the differential diagnosis of intraabdominal masses in patients who have previously undergone abdominal surgery. Moreover, prevention of gossypiboma is crucial to avoid medico-legal issues.

Informed Consent: Written informed consent was obtained from patients who participated in this case.

Peer-review: Externally peer-reviewed.

Author Contributions: Concept - E.O., G.Y., M.U., F.C.; Design - E.O., F.C.; Supervision - E.O., F.C.; Data Collection and/or Processing - G.Y., N.A.; Analysis and/or Interpretation - N.A., E.O., F.C.; Literature Search - E.O., N.A.; Writing Manuscript - E.O.; Critical Reviews - G.Y., M.U.

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Case Report

Endoscopic repair of rectal perforation due to colonoscopy with a clamp method

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ABSTRACT

Colon perforation during colonoscopy is a rare complication that usually requires surgical intervention. Traditionally, primary repair by laparoscopy, laparotomy, resection, and anastomosis is performed for such perforations. More recently developed minimally invasive endoscopic instruments have also been used in the repair of these perforations; this is becoming increasingly common. An endoscopic over-the-scope clip clamp was used in a 59-year-old male patient who suffered a rectum perforation in connection with a diagnostic colonoscopy. He was referred to our clinic. A colonoscopy was performed in our clinic to assess the rectal perforation caused by a diagnostic colonoscopy 2 h after the initial colonoscopy, with the concurrent therapeutic purpose of repairing the perforation using an endoscopic clamping method. Oral feeding was started 24 h after the procedure. After three days, the patient was discharged. An endoscopic clamping method in appropriate cases can be a safe and appropriate alternative therapy in the management of colonoscopic perforations.

Keywords: Colonoscopy, clamp, perforation

INTRODUCTION

Colonoscopy is a commonly used method in the diagnosis and treatment of lower gastrointestinal system diseases. The most common complications in colonoscopy are bleeding and perforation. Less often, pneumothorax, pneumomediastinum, colonic volvulus, hernia incarceration, retroperitoneal abscess, and mesenteric tears may occur. The risk of perforation during a diagnostic colonoscopy is 0.2% to 0.5% (1), while the risk of perforation in therapeutic colonoscopy is approximately 2% (2). In terms of anatomical location, iatrogenic perforation occurs most commonly in the sigmoid colon. Extraperitoneal injuries are rare. Colonic perforation during colonoscopy can occur by several mechanisms. These include the application of heat energy during polypectomy, direct mechanical trauma from the endoscope tip, application of increased lateral pressure during the spinning of the endoscope, and pneumatic injury through overinsufflation (3). While injuries due to mechanical trauma are usually noticed during endoscopic procedures, perforations due to pneumatic injury and excessive energy may be overlooked. The most common physical examination findings in perforation cases are persistent abdominal pain and distension (3). If perforation is detected late, peritonitis may develop. Indeed, delay in treatment may lead to septic shock and even death.

The most advantageous aspect of colonic perforation after colonoscopy is that it can be noticed immediately; this situation may allow more frequent use of minimally invasive procedures. Currently, endoscopic perforations are commonly repaired by laparoscopy or laparotomy. Endoscopic repair of perforations due to colonoscopy is being increasingly discussed in the literature (4). Here we present a case in which the patient suffered a rectal perforation during colonoscopy and was treated with an endoscopically placed over-the-scope clip (OTSC) clamp.

CASE PRESENTATION

A 59-year-old male patient who had undergone a colonoscopy at another center because of abdominal pain and constipation suffered a perforation during retroflexion to examine the rectum; he was admitted to our emergency clinic 2 h after the perforation. The patient was hospitalized with a diagnosis of rectal perforation. The patient's general condition was good: he was conscious, cooperative, and oriented. His BP was 120/70 mmHg, pulse: 70/min, temperature: 37°C, and BMI: 35. There was tenderness in the abdomen on physical examination, and there was no defense or rebound. Other systemic examinations were normal. Upon digital rectal examination, sensitivity in the rectum and hematochezia were present. White blood cells and CRP were normal. A plain X-ray showed no free air. Intravenous fluid therapy, ceftriaxone, ornidazole, and famotidine were begun simultaneously. The patient was scheduled for a colonoscopy.

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The patient was transferred to the interventional procedure room. The patient underwent sedoanalgesia with 20 mg pethidine and 2 mg midazolam, and treatment began. A 1.5 cm rectal perforation was seen in the proximal rectum (Figure 1). With aspiration, air was evacuated in the lumen. After the perforated edges shrank, and while maintaining the wound edges with an endoscopic grasper, one endoscopic OTSC clamp was used (Figure 2). The process was ended after the perforation was totally closed using the clamp. An oral diet (regimen 1) was begun 24 h after the procedure. After three days in hospital, the patient was discharged.

DISCUSSION

Colonoscopy remains the gold standard for the diagnosis and treatment of diseases of the colonic mucosa. Diagnostic and interventional endoscopic procedures have become increasingly common with the development of new endoscopic techniques. Today, many colon lesions, including some tumors, are treated with endoscopic surgery. With the increasingly widespread use of colonoscopy, the incidence of complications has also increased. The most serious complications of colonoscopy are bleeding and perforation. Perforation risk is especially increased by lack of experience with interventional procedures. However, perforations may still occur even with experienced endoscopists and the use of advanced endoscopes.

Figure 1. Rectal perforation

Figure 2. Application of an endoscopic OTSC clamp in rectal perforation

The traditional treatment of perforation due to colonoscopy is laparotomy, although treatments are being performed more frequently with laparoscopic methods. Although primary repair is usually preferred, resection and anastomosis or stoma are also among the treatment options. To decide on which treatment to use, the size of the perforation, the detection time of the perforation, and the intraperitoneal contamination rate must be considered. Perforation due to a colonoscopy is usually detected during the colonoscopy, and bowel preparation has usually already been performed prior to the perforation in these cases. Early detection of colonic perforation and clearing of content before the procedure have brought endoscopic perforation repair to the forefront in recent years. Recently, several case reports or small case series have been reported on treatment methods for perforation due to colonoscopy.

Colonoscopic procedures must be performed carefully and by experienced endoscopists; otherwise, colonoscopic perforations can result in malpractice allegations and lawsuits. Early detection of the perforation and early treatment reduce the risk of patient morbidity and mortality. Lohsiriwat divided colonoscopic perforation treatment into three categories: conservative management, endoscopic repair, and operative repair (5). A conservative approach may be applicable in selected cases of colonoscopic perforations. Especially, lower rectum injuries can be monitored non-operatively with good follow-up and with close monitoring of clinical laboratory values and radiological imaging.

Today, minimally invasive surgical treatment of colonoscopic perforations is preferred. Minimally invasive methods are being increasingly used for the management of colonic perforation, with corresponding decreases in the use of conventional laparotomy techniques. With the prominence of laparoscopic treatment, some algorithms related to laparoscopic repairs have been reported (6). Zhang et al. (7) indicated a mean operation time of 2.3±0.6 h for perforation repair using a laparoscopic suture, whereas in our case, the endoscopic clamping process required 15 min a nd resulted in no perioperative bleeding. They stated that oral intake was started 3.9±2.0 days later, whereas we began an oral diet (regimen 1) within the first 24 h. Their hospitalization was 6.8±4.2 days, whereas our patient was discharged at 3 days. The major disadvantage associated with laparoscopy is the learning curve; in small centers, this technique may be difficult, especially in emergency cases, due to lack of equipment. Laparotomy is still used in the management of perforation in large-scale perforations, in delayed cases, in small centers where laparoscopy is contraindicated, or in the absence of adequate surgical experience and equipment.

The development of endoscopic instruments similar to laparoscopic instruments in modern surgery has made endoscopic therapy possible in the same session. Colonoscopy preparation had been performed in our case, and the perforation was identified during a colonoscopy. Perforation of the rectum was below the perineal reflex, and findings of peritonitis were not noted. Radiological and laboratory findings were normal. Our clinic was experienced in the use of endoscopic clips in colonic perforations. However, in this case, a perforation of ~1.5 cm was present. We decided to use an endoscopic OTSC clamp on this patient. The endoscopic clip method is especially used in

small perforations. A greater number of clips may be necessary with increasing diameter of the perforation. This increases the time and cost of the process and also reduces the technical success rate.

Trecca et al. (8) stated in a review that an endoscopic clip was used in 55% to 96% of colonic perforations during therapeutic colonoscopy and that the success rate was 69% to 93%. However, they reported that perforations greater than 10 mm and perforations occurring during diagnostic endoscopy created contraindications to endoscopic closure. Thus, in large perforations, endoscopic clamping methods may be more appropriate. Clips and clamping applications associated with iatrogenic perforation are being increasingly reported. A metallic clip was previously used for hemostasis in gastrointestinal bleeding. Kim et al. (9) reported 27 colon perforations in 115,285 diagnostic colonoscopies over 12 years. In total, 16 patients underwent endoscopic clipping; of these, three patients underwent surgery. None of the patients suffered major morbidity or mortality. Repair of a perforation with an endoscopic clamp may be applicable at any location in the colon. This method can be applied in therapeutic endoscopy applications relatively easily by experienced endoscopists.

It may be difficult to repair all colonoscopic perforations endoscopically. Endoscopic surgical repair should be reserved for centers where experienced practitioners and adequate infrastructure are available and, if necessary, surgical treatment should be administered without delay. We anticipate that in the future, endoscopic clips and clamping methods, which are minimally invasive, will become widespread at many centers.

Sagawa et al. (10) reported no perforation in their series of diagnostic colonoscopies and reported colon perforation in 8 (0.3%) patients undergoing therapeutic colonoscopies. The most common perforation was reported during endoscopic submucosal dissection (3.8%). CRP also had a lower value in those endoscopic clippings. They stated that the average CRP level in patients with clips was 2.9±1.6 mg/dL; the level was 9.7±6.2 mg/dL in those without clips.

In the management of perforation due to colonoscopy in selected patient groups (bowel preparation prior to colonoscopy, perforation localization, perforation diameter, peritoneal contamination degree, general condition of the patient, and endoscopist experience), if it is inappropriate to treat the patient conservatively, an endoscopic clamp method should be considered before surgery. Treatment of patients with non-operative methods, in addition to reducing mortality and morbidity, provides advantages such as shorter hospital stay, reduced infection risk, quicker restoration of quality of life, and reduced overall cost.

There is not yet enough data to assess the implementation of endoscopic clamps in urgent cases or cases of delayed perforation. We believe that in such cases, if the endoscopy unit has adequate equipment and the endoscopist has sufficient experience, this endoscopic method can be attempted before surgical treatment. However, the patient's general condition should be taken into consideration, and delay should be avoided in cases requiring surgery. If success cannot be achieved with endoscopic methods (primarily laparoscopic procedures), surgical treatment should be used.

CONCLUSION

Iatrogenic colon perforations are being encountered more frequently due to the increasing number of diagnostic and therapeutic colonoscopies. The ideal approach is the detection of this complication by endoscopists who are aware of all treatment methods and the use of minimally invasive methods where possible to treat the patient. We conclude that the use of non-operative treatments, such as endoscopic clamping, will increase in the future.

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