

The efficacy of fibrin glue to control hemorrhage from the gallbladder bed during laparoscopic cholecystectomy

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Objective: The aim of the study is to report our experience with fibrin glue application in the management of bleeding from the gallbladder bed during laparoscopic cholecystectomy, which could not be controlled by conventional methods.

Material and Methods: Three hundred eighty-two patients underwent laparoscopic cholecystectomy. Fourteen patients with bleeding from the gallbladder bed, which could not be controlled by conventional methods, were analyzed retrospectively.

Results: Fibrin glue was used in 10 patients. Six (71%) were female and 4 were (29%) male. The mean age was 55.7 years. Fourteen patients were operated for the presence of symptomatic gallstones. Thirteen patients (92%) had a concomitant pathology. The mean time spent to maintain hemostasis was 23.9 minutes (15-35). Blood products were used in two patients with hemoglobin values under 8 mg/dL. Hemostasis could not be achieved in a patient despite fibrin glue application, and the operation was converted to open surgery.

Conclusion: The application of fibrin glue for bleeding from the gallbladder bed during laparoscopic cholecystectomy can reduce conversion rates, further studies including more patients are required.

Key Words: Laparoscopic cholecystectomy, bleeding from gallbladder bed, fibrin glue

INTRODUCTION

In general surgery clinics in surgical procedures involving extensive coverage, laparoscopic cholecystectomy (LC); is the preferred standard surgical method in symptomatic gallstone disease and other benign gallbladder diseases (1). Laparoscopic cholecystectomy is the preferred surgery for patients due to less post-operative pain, better cosmetic results, a shorter duration of hospital stay and earlier return to work. Laparoscopic cholecystectomy is accepted as the gold standard in gallbladder surgery (2). This surgical procedure that is currently being frequently performed has numerous complications (3). The most known complications are bleeding from the liver gallbladder bed and biliary tract injuries.

Fibrin sealant use in surgical procedures is gaining popularity in the recent years and this drug's efficacy in bleeding is well known. Especially in patients with bleeding disorders such as hemophilia they can be safely used (4). Tisseel® is a biodegradable biological medication formed by a combination of highly concentrated human plasma-derived fibrinogen (75-115 mg/mL) and thrombin (500 IU/mL). In the presence of calcium chloride, mixture of these components leads to the development of three-dimensional polymerized fibrin matrix. During this process, the final step in biological coagulation is imitated (5). Therefore, fibrin adhesives can be used as an adjunct in hemostasis during surgical procedures (6, 7).

The aim of this study is to present our experience in the application of fibrin glue for bleeding from the gall bladder bed during laparoscopic cholecystectomy, which could not be controlled by conventional methods.

MATERIAL AND METHODS

From January 2009 until July 2012, 382 patients underwent laparoscopic cholecystectomy in our clinics, all with written informed consent. Among these, 14 patients who had gallbladder bed bleeding that could not be controlled by conservative methods and in whom fibrin glue had been used were

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retrospectively analyzed. The data was obtained from hospital records (operation notes and discharge summaries). Patients with incomplete data or conversion to open surgery due to injury of bile ducts in addition to bleeding were excluded from the study.

Data of these 14 patients related to gender, age, systemic concomitant diseases, intraoperative time spent to control hemostasis, need for blood transfusion, total amount of discharge from the abdominal drain, conversion to open surgery and length of hospital stay were evaluated. A preoperative prophylactic single dose of first-generation cephalosporin was administered to all patients undergoing LC. The operations were performed under general anesthesia. Following pneumoperitoneum via a Veress needle introduced through the umbilicus and carbon dioxide insufflation (10-14 mmHg), a standard 4-port technique was used. A subhepatic drain was not routinely used, nevertheless a drain was placed in all patients with fibrin glue application for bleeding. Bleeding from the gallbladder bed initially either was attempted to control by application of electrocautery or by applying direct pressure with a gauze inserted into the abdomen through the 10 mm trocar. Tisseel® was injected to the gallbladder bed if bleeding could not be controlled by these methods. The gallbladder bed was observed at least for 5 minutes following complete hemostasis for the possibility of bleeding. Length of hospital stay was accepted as the period from the day of the operation until hospital discharge.

RESULTS

Bleeding from the gallbladder bed occurred in 14 of 382 patients who underwent laparoscopic cholecystectomy. Fibrin glue was applied when bleeding could not be controlled by conventional methods (Figure 1). Ten patients (71%) were women and 4 (29%) were men in whom fibrin glue was used. The mean age of the patients was 55.7 (38-82). All 14 patients were operated on for symptomatic gallstones. Thirteen patients (92%) had a concomitant disease. Five patients had hypertension controlled by medications. Two patients with heart valve replacement were using Coumadin. In these patients Coumadin treatment was discontinued in the pre-operative period and treatment was switched to low molecular weight heparin. The patients were operated after normalization of the prothrombin time and INR. Three patients had type 2 diabetes mellitus, 1 patient had chronic obstructive pulmonary disease, and 1 had congestive heart failure. One patient had chronic liver disease due to hepatitis B virus, in stage B according to Child-Pugh classification. The mean time spent on bleeding control to achieve hemostasis was 23.9 minutes (15-35). Two patients required blood transfusion with their hemoglobin values decreasing below 8 mg/dL. In all patients an intra-abdominal drain was placed in the subhepatic region. The mean amount of fluid drained was found to be 127 mL (50-300). The drain was removed when its contents became serous and the amount of drainage below 30cc. The operation was converted to open surgery in one patient, who had been using Coumadin for a heart valve replacement and was switched to low molecular weight heparin, because the bleeding could not be con-



Figure 1. Hemorrhage control by application of fibrin glue to the gallbladder bed

trolled despite the use of fibrin glue. The abdominal exploration revealed bleeding from a superficial vein from the liver bed and was controlled by primary suture. Additionally, in 17 of 382 patients (4.4%) who underwent LC the procedure was converted to open surgery. The reasons for conversion were inability to expose the Calot triangle due to dense adhesions, cystic artery bleeding and common bile duct injury. The mean length of postoperative hospital stay was 2.9 days (2-5). The data of these 14 patients are summarized in Table 1. None of the patients with bleeding required reoperation for another reason. None of the patients were re-admitted to our hospital due to a complication associated with cholecystectomy. There were not any recorded problems during their outpatient clinic follow-ups.

DISCUSSION

Laparoscopic cholecystectomy is currently the most common and most widely practiced laparoscopic procedure. Although it has become the gold standard for benign gallbladder diseases since its introduction, conversion to open surgery might be necessary based on intraoperative findings, technical capability and experience of the surgeon (2). This ratio ranges between 2-15% in the literature (2, 8). The main reasons for conversion to open surgery have been reported as failure to expose the exact anatomy, adhesions, bleeding and bile duct injuries (9, 10). Bleeding complications constitute one-third of major complications, leaving bile duct injuries aside (8).

The decision to convert to open cholecystectomy is indisputable in some cases, while the timing and the conditions requiring conversion when bleeding occurs might be questionable. In such circumstances, the most important considerations are the location and amount of bleeding. Intraoperative bleeding can be classified as vascular injuries, hemorrhage from the cystic artery clip or following ligation, bleeding from the liver gallbladder bed and others (2).

In our study, we have focused on bleeding from the gallbladder bed. As the first intervention in this type of bleeding many surgeons use electro-cautery. In cases where this often effec-

Table 1. Demographic, pre- and post-operative data of patients

	Gender	Age	Preoperative morbidity	Time to hemostasis (min) ^a	Requirement of blood transfusion (u)	Total drain output (mL) ^b	Conversion to open surgery	Length of hospital stay (days)
1	F	62	HT	25	-	80	-	2
2	F	54	HT, DM	20	-	100	-	3
3	F	76	Coumadin	35	1	150	-	3
4	F	46	HT	25	-	100	-	2
5	M	65	Chr. Liver Disease	30	-	150	-	4
6	F	57	DM	20	-	100	-	2
7	M	42	COPD	15	-	150	-	3
8	F	38	-	20	-	100	-	2
9	F	72	HT	25	-	150	-	3
10	M	52	Coumadin	30	1	300	+	5
11	M	43	HT	30	-	100	-	3
12	F	45	DM	25	-	50	-	2
13	F	68	CHF	20	-	100	-	3
14	F	61	CRF	15	-	150	-	4

HT: Hypertension, DM: Diabetes mellitus, CHF: Congestive Heart Failure, CRF: Chronic Renal Failure
^aTime spent to stop bleeding (minutes), ^bTotal amount of drain output until drain withdrawal (mL)

tive method fails; LigaSure, laparoscopic suture placement and direct pressure with a gauze sponge are being used. In particular, the use of electrocautery is known to create a risk for postoperative bile leakage. While applying these procedures the amount of bleeding should be followed. Fibrin glue, which has gained popularity in recent times, can be used at this stage (11).

Fibrin sealant (fibrin glue) is an organic based topical hemostatic agent. Its effects in controlling bleeding during liver and spleen surgeries have been shown in studies (8, 12).

This product consists of the union of two mixtures. The first mixture contains fibrinogen + aprotinin and factor XIII. The other mixture includes thrombin + calcium chloride. The two mixtures are stored in separate syringes, are applied to the desired area simultaneously and in the same amount by the common piston of the two syringes (8). These agents are combined in the application area; they stop the bleeding and accelerate healing. We therefore applied Tisseel® as fibrin glue in 14 patients with bleeding from the gallbladder bed.

Fibrin sealant (Crosseal, 58 patients) and topical hemostatic agents (ActifoamR, Avitene, GelfoamR, OxyceIR, SurgicelR, Surgicel Nu-KnitR, ThrombinarR, 63 patients) were compared in a study. The hemostasis time and postoperative complications was found to be less in the group where fibrin sealant was used and fibrin sealant was shown to be superior (13).

Solid matrix fibrin sealant (Tachosil, 59 patients) were compared with argon cautery (62 patients), in patients who underwent liver resection, in terms of hemostasis effects. The hemostasis time was superior in the fibrin sealant group. However,

a significant difference was not detected between the two groups (14).

In patients undergoing hepatic resection, solid matrix fibrin sealant (Tachosil, 57 patients) and conventional hemostasis techniques (58 patients) were compared in another study, and an effective reduction in moderate post-operative complications, postoperative blood transfusion requirements and daily drainage volume were observed in the fibrin sealant used group (15).

It should be considered that in cases of acute cholecystitis, cirrhosis and portal hypertension, surgical bleeding and other complication rates would be higher. In these patients, laparoscopic cholecystectomy is recommended due to shorter duration of the operation and lower rates of bleeding and other complications (16, 17). In our series, two patients had been using anticoagulants and one patient had chronic liver disease. In two of these cases the gallbladder bed bleeding were controlled by fibrin glue application. However, in one patient conversion to open surgery was required.

There are also some other studies that do not recommend the routine use of fibrin sealant, showing that in patients undergoing liver surgery its application to the resection surface does not reduce postoperative complications (18).

The exact rate of conversion to open surgery due to bleeding from the gallbladder bed is not known since studies in the literature do not document the cases in detail. In this study, fibrin glue was applied to 14 patients because of bleeding, the bleeding was under control in 13 patients, and in 1 patient it had to be converted to open surgery due to continued bleed-

ing and hemostasis was achieved in this way. The rate of conversion to open surgery in this series was 7.1%.

Study Limitations

The study limitation was the retrospective nature of the study, with no control groups.

CONCLUSION

The application of fibrin glue in patients with bleeding from the gallbladder bed during laparoscopic cholecystectomy is shown to reduce the rate of conversion to open surgery. Larger studies on this subject are required.

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