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# Benefits of xiphoidectomy in total gastrectomy: Technical note

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ABSTRACT

**Objective:** The esophago-gastric junction may be challenging during total gastrectomy due to gastric cancer. This situation may compromise the security of both the dissection and anastomosis. The purpose of this study was to investigate the usefulness of xiphoidectomy to overcome this issue.

**Material and Methods:** The files of patients who underwent total gastrectomy + D2 lymph node dissection due to proximal gastric cancer or cardia cancer between April 2002-December 2013 were retrospectively evaluated. We assessed the outcome in patients with xiphoidectomy in addition to the midline incision in terms of xiphoidectomy technique, xiphoidectomy time, and operative and postoperative complications.

**Results:** Thirty cases were identified to undergo xiphoidectomy. Nineteen patients were male and 11 were female, with a mean age of 51 (21-80) years. The time required for xiphoidectomy was 7-15 minutes (mean 8.7 minutes). The mean additional time required for the closure of the incision in cases with xiphoidectomy was 2 minutes. There was minimal arterial bleeding from the diaphragmatic surface in one patient, which was controlled by electrocautery. Only two patients developed wound infection.

**Conclusion:** Performing xiphoidectomy is quite easy, after a certain learning phase. The operative time was 7-15 minutes longer due to excision of xiphoid and closure of the related defect. Minor hemorrhage was a problem during surgery. There were no early or late post-operative complications. We suggest that the procedure is beneficial in selected cases with requirement of a wider operative field or better exposure of the esophago-gastric junction during total gastrectomy for gastric cancer, and recommend removal of the xiphoid bone

**Keywords:** Xiphoidectomy, xiphoid process, total gastrectomy, esophago-gastric junction

## INTRODUCTION

Total gastrectomy may be the only treatment option to ensure safe surgical margins in proximal gastric and cardia tumors, with an additional resection of the distal 2-6 cm esophageal segment (1). Excellent exposure of the surgical field is essential for the security of dissection and anastomosis. Obesity, narrow costal angle, wide anteroposterior thoracic diameter, and deep and high-located oesophageal hiatus make exposure difficult. Xiphoidectomy is routinely implemented in Japan to better access the surgical field. In our country, there is no study on this issue. In this study, we analyzed the cases that underwent xiphoidectomy due to technical requirements after midline incision and investigated its necessity.

## MATERIAL AND METHODS

Files of 262 patients who underwent total gastrectomy due to proximal gastric cancer or cardia cancer between April 2002 and December 2013 at our clinic were retrospectively reviewed. 189 patients with total gastrectomy for distal-located cancer were excluded. The patient files of 30 out of 73 patients were extracted. All patients underwent total gastrectomy and D2 lymph node dissection for proximal gastric cancer. Oesophago-intestinal continuity was provided in all patients with Roux-Y oesophago-jejunostomy. The oesophago-jejunostomy was done with 25 mm circular stapler (EEA™ Covidien, USA). The jejuno-jejunostomy was either performed by end-to-side hand-sewn anastomosis or side-to-side linear stapler. Within the pathology results of 30 patients, 22 had signet ring cell gastric cancer and 8 had carcinoma with mucinous component. 14 patients had Stage 2 disease according to the tumor, lymph node and metastasis (TNM) classification system, 8 had Stage 1 and 8 had stage 3 disease. Written informed consent was obtained from all our patients.

We evaluated the results of our patients in whom a xiphoidectomy was added to the midline incision in a way to extend the incision to the sternoxiphoid joint in terms of xiphoidectomy technique, duration, operative and postoperative complications.

### Xiphoidectomy Decision

After entering the abdomen via a midline incision, following exploration resection was continued if there is no difficulty in exploration and hiatal dissection. However, during the course of surgery, if

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difficulties were perceived in both dissection or carrying out the anastomosis then xiphoidectomy was added to create enough space.

**The Technique of Xiphoid Process Excision**

The skin incision was extended 2 cm beyond the junction of xiphoid-sternum (Figure 1a) and the cross-fibers of the right and left rectus muscle that were fixed to the xiphoid process were visualized (Figure 1b). These cross-fibers were transected at the midline and dissected in both sides to mobilize the anterior and lateral borders of the xiphoid (Figure 1c). The diaphragmatic fibers attaching to the inferior edge of the xiphoid were detached and the xiphoid process was completely denuded. The completely denuded xiphoid process was transected at the level of sterno-xiphoidal junction with a cautery and removed (Figure 1d). Meanwhile, the surrounding minor arteries were cauterized to control bleeding. In order to eliminate the dead space formed after the removal of xiphoid process, the peritoneum was sutured to the posterior rectus sheath on both sides or to linea alba with 0 polyglactin sutures. At the end of the operation, the fascia was closed in a continuous manner with number 1 polypropylene suture. The skin was closed with silk sutures or staplers.

## RESULTS

There were 30 cases with xiphoidectomy. Nineteen patients were male and 11 were female. The mean age was 51 (21-80) years. The characteristics of our patients are summarized in Table 1. In patients with xiphoidectomy, the xiphoidectomy took additional 5 to 13 minutes (median 8.7 minutes). A minimal arterial bleeding occurred on the diaphragmatic side in one case, which was controlled with electrocautery.

There were no problems related to the jejunojejunostomy and oesophagojejunostomy anastomoses in any patients. Infection occurred in two patients (2/30), both of which were treated with drainage. Patients were started on liquid diet on the third day. They were discharged on the 7$^{th}$ day (5-11 days).

## DISCUSSION

The subxiphoidal region is a quite complex area that is composed of bone, cartilage, and abdominal fascia. The shape of the xiphoid process varies considerably from case to case. Removal of the xiphoid process has been the subject of several studies in patients with difficulty in access to the oesophago-cardiac junction and the hepatic veins (2, 3). It has been reported that xiphoidectomy has a role in creating additional surgical field even in operations like intra-abdominal cytoreductive surgery performed for other reasons (1, 2). Likewise, in patients who underwent sternotomy, removing the xiphoid was found to be useful in creating enough space for surgery (1, 4).

Although some authors prefer extending the midline incision upward from one side of the xiphoid without removing it, it is stated that excision of the xiphoid provides a larger field of view than unilateral extension of the incision (3). We preferred xiphoidectomy during surgery in our operations. In this way, the upper end of the incision spontaneously opened laterally, and the costal margin could be more easily extended with retraction. During surgery, we observed that it provided significant convenience for both dissection and anastomosis. Removal of the xiphoid process can be performed with the aid of electrocautery at all stages. The process itself is quite simple once performed. It adds an average 8.7 minutes to the operative time without causing serious complications. During incision closure phase, a mean of 2 minutes is spent to close the xiphoidectomy-related cavity.

Similar to our case, several authors reported arterial bleeding that was attributed to branches of the internal mammary artery (3). This bleeding could easily be managed. Postoperative wound infection rate does not differ from the overall average. At 12 months follow-up after surgery, incisional hernia was not detected in any patients with xiphoidectomy. We think that careful closure of the complex opening formed by xiphoidectomy and proper closure of the dead space contributed to the low number of infection and herniation. We pay attention to closing this gap since it is a potential source of infection and may facilitate the formation of hernias. These findings show that excision of the xiphoid does not bring an additional issue and that it is applicable when required.

## CONCLUSION

In our study, while the requirement for xiphoidectomy in selected cases was emphasized we concluded that additional

Table 1. Patient characteristics

| | Xiphoidectomy (n=30) | |
|---|---|---|
| | **Male** | **Female** |
| Gender | 19 | 11 |
| Age (Mean=51) | 51 | |
| Surgical site infection | 2 | - |

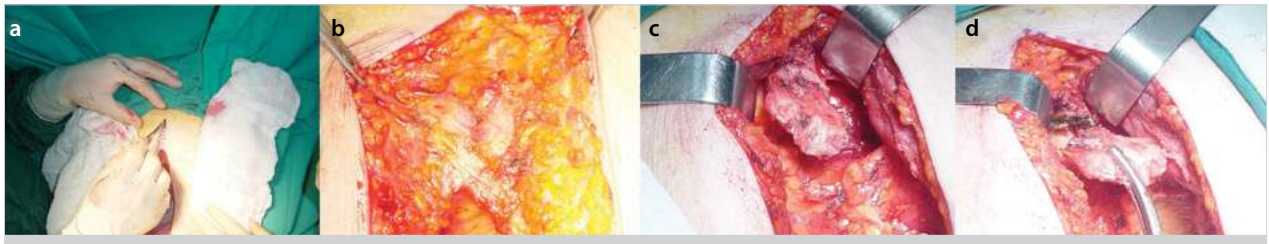


Figure 1. a-d. Technique of xiphoid process excision. (a) Extending the skin incision to 2 cm superior to the xiphoid-sternum junction. (b) Visualization of the right and left rectus muscle cross-fibers attached to the xiphoid process. (c) Transection of the cross-fibers at the midline, lateral dissection on both sides. (d) Excision of the xiphoid process from the sternoxiphoidal junction by cautery

morbidity was not caused to the patient. We recommend removal of the xiphoid process in selected patients who require a wider working space and better exposure of the surgical site (the oesophagogastric junction) during total gastrectomy for gastric cancer.

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**Ethics Committee Approval:** Since this study is a retrospective study, ethics committee approval was not provided.

**Informed Consent:** Informed consent form including the treatment protocol and possible surgical techniques and options was taken from all patients included in this study.

**Peer-review:** Externally peer-reviewed.

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