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Clinical Experience of the Upper Midline Abdominal Incision with the Sternum-splitting Transmediastinal Incision

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Introduction

The upper midline abdominal incision, the upper midline abdominal incision with an accessory transverse incision, and the upper midline abdominal incision with an antero-lateral incision for thoracotomy are commonly used in approaching the esophago-cardiac lesion. However, in some patients, only single laparotomy cannot give a wide operating vision, but thoraco-abdominal approaches should be prevented. Therefore, to treat these patients the use of the upper midline abdominal incision with the sternum-splitting incision has been reported³⁾. This method is known to provide a wide operating vision to the lower esophagus and the cardiac lesion without thoracotomy¹⁻⁴⁾. However, the value of this method is not yet clear. Therefore, we attempted to approach the esophago-cardiac lesion by this method in six patients with lower esophageal cancer or cardiac lesion carcinoma. In this report, we describe our experience with the upper midline abdominal incision with the sternum-splitting transmediastinal approach, and the advantage and disadvantage of this method.

Procedure of the Upper Abdominal Incision with Sternum-splitting Transmediastinal Approach

The upper midline abdominal incision with the sternum-splitting transmediastinal approach was carried out as follows³⁾.

Laparotomy is performed with the patients in the supine position by a median incision in the upper abdomen. Then the presence of the lesion of the abdominal cavity is ensured. The skin incision extends approximately 10 cm upward in a patient in whom the use of the sternum-splitting transmediastinal approach is judged to be suitable, and the body of the sternum is sufficiently exposed. Then, the posterior part of the sternum and connective tissue of the anterior mediastinum are detached by hand from the lower side of the xiphoid process. Next, the

Key words: Sternum-splitting incision, Lower esophageal cancer, Cardiac lesion carcinoma.

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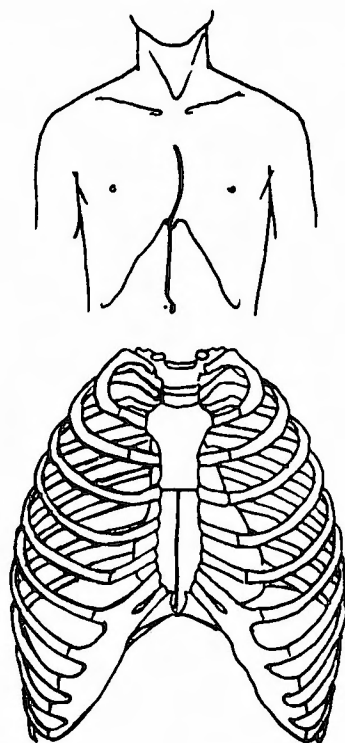


Fig. 1. Outline of the upper abdominal incision with the sternum-splitting incision

periosteum of the sternum is incised with an electrotome. The body of the sternum is vertically cut with an electric saw, and sternum is cut transversely at the level of the upper margin of the vertical incision line of the sternum, completing a T-shape incision of the sternum. The anterior mediastinum is exposed by opening the sternum to the right and the left with a sternal retractor. Then, the left triangular ligament is separated and the left lobe of the liver is retroflexed toward the right side. The basis solum of the heart sac is detached from the diaphragm up to the level

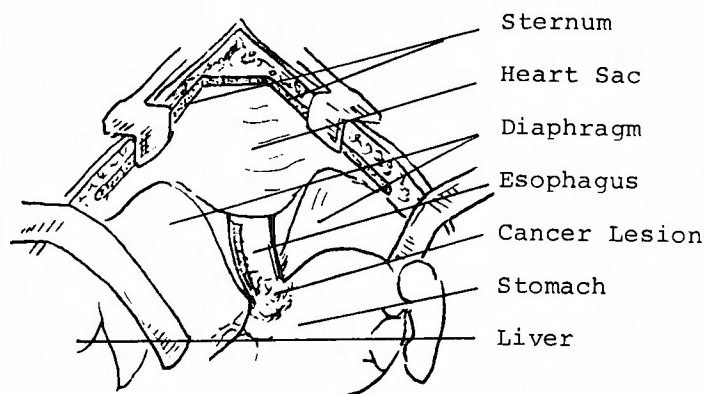


Fig. 2. Schema of the upper midline abdominal incision with sternum-splitting transmediastinal incision. The left lobe of liver was retroflexed toward the right side. Diaphragm was incised to the esophageal hiatus.

of the esophageal hiatus. The detached diaphragm is incised up to the esophageal hiatus. Then the diaphragm and basis solum of the heart sac are detached right and left. After completing this procedure, we have a good operating field to the lower esophagus. The visual fields obtained by the upper midline abdominal incision and by the sternum-splitting transmediastinal incision give us a good operating field from the lower esophagus to the stomach.

When the wound made by the sternum-splitting transmediastinal approach is closed, the diaphragm is first closed by suture. A portovac catheter is inserted into the anterior mediastinum. The sternum is sutured with stainless steel wire. Last, the skin is sutured. The wound made by the upper midline abdominal incision is closed by the usual method.

Case Report

Case 1

The patient was a 52-year-old man with carcinoma in the cardiac lesion. The upper abdomen was opened by a median incision. Then, total gastrectomy was performed. Infiltration of cancer was observed in the cut end of the oral side on histologic examination during the operation. Therefore, the lower esophagus had to be further resected. We approached the lower esophagus by the sternum-splitting transmediastinal incision. The lower esophagus was partially resected and the lymph nodes were dissected. Part of the diaphragm was resected. As of now, two years and seven months after the operation, he is well and working. Roentgenograms of the stomach of this patient before and after the operation are shown in Figure 3.

Case 2

The patient was a 49-year-old woman with carcinoma in the cardiac lesion. Roentgenogram of the esophagus and stomach before the operation indicated infiltration of the cancer in the abdominal esophagus. We approached the lesion by the upper midline abdominal incision with the sternum-splitting transmediastinal approach. The cardiac side of the stomach was resected and the lower esophagus was partially resected. Then, a tube was made from the remaining

Table 1. Six cases of the upper midline abdominal incision with sternum-splitting incision

case	age	sex	diagnosis	operation procedure	postoperative complication	progress
1	52	M	gastric cancer C.M. Borr III	total gastrectomy (Henley's operation)	(—)	31 months still alive
2	49	F	gastric cancer CE, Borr III	cardiectomy, partial esophagectomy (esophago-gastrostomy)	pleuritis	26 months still alive
3	60	M	gastric cancer C.M.A.D. Borr IV	total gastrectomy (gastro-jejunostomy)	suture insufficiency	2 months death
4	51	M	esophageal cancer, Ei	lower esophagectomy (esophago-gastrostomy)	osteomyelitis in the sternum	25 months still alive
5	76	M	gastric cancer M. Borr II esophageal cancer, Ea	total gastrectomy abdominal-esophagectomy (esophago-jejunostomy)	pyothorax suture insufficiency	10 days death
6	57	F	gastric cancer CE, Borr IV	total gastrectomy (gastro-jejunostomy)	pleuritis	4 months still alive

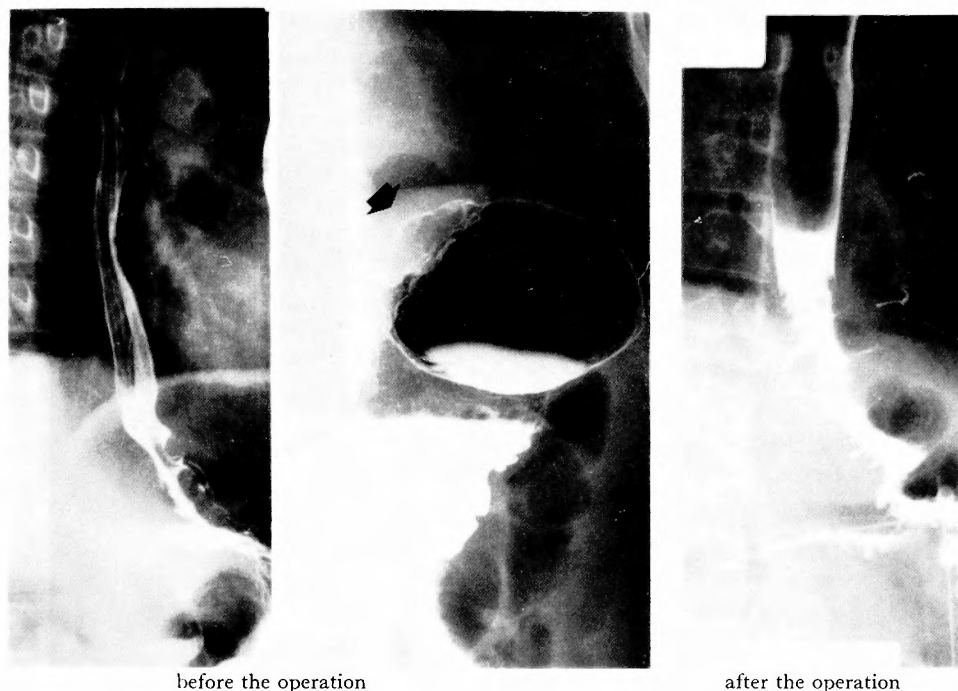


Fig. 3. Roentgenogram of the stomach of Case 1 before the operation and after the operation.

stomach, and an attempt was made to anastomosis the esophagus and the stomach tube in the mediastinum. However, it was difficult to anastomosis them under the visual field obtained by the sternum-splitting transmediastinal approach. Therefore, the right chest was opened, and the esophagus and the stomach tube were anastomosed in the thoracic cavity. As of now, two years and two months after operation, the patient is still alive. Roentgenograms of the stomach of the patient before and after the operation are shown in Fig 4.

Case 3

The patient was a 60-year-old man with gastric cancer. Total gastrectomy was required because the cancer extended throughout the stomach. Therefore, we approached the stomach and lower esophagus by the upper midline abdominal incision with the sternum-splitting transmediastinal approach. Total gastrectomy was carried out. After that, the esophagus was anastomosed with the jejunum in the mediastinum with an autosuture. The patient died 60 days after the operation because of major leakage due to failure of the suture. A roentgenogram of the stomach of the patient before the operation is shown in Fig 5.

Case 4

The patient was a 51-year-old man with lower esophageal cancer. The patient had disturbances in respiratory function due to pulmonary tuberculosis. Therefore, we wanted to prevent opening the chest. We approached the stomach and lower esophagus by the upper midline abdominal incision with the sternum-splitting transmediastinal approach, and observed the lesion in the esophagus. As a result, we considered that wide excision of the oral side the lower esophagus would cause difficulties in anastomosis in the mediastinum. Therefore, the lesion in

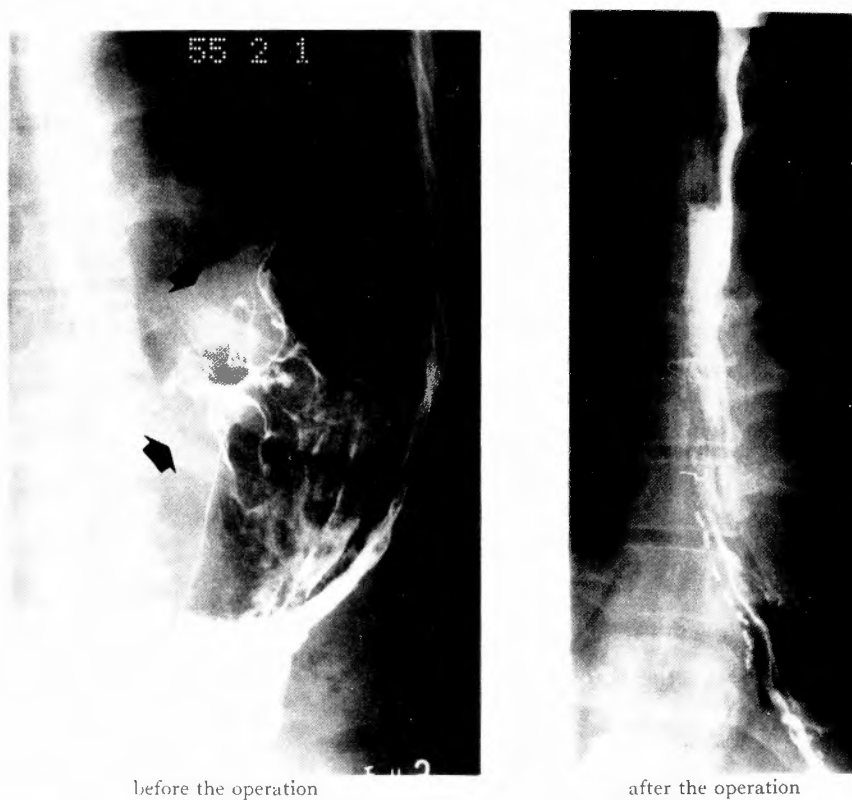


Fig. 4. Roentgenogram of the stomach of Case 2 before the operation and after the operation.



Fig. 5. Roentgenogram of the stomach of Case 3 before the operation.

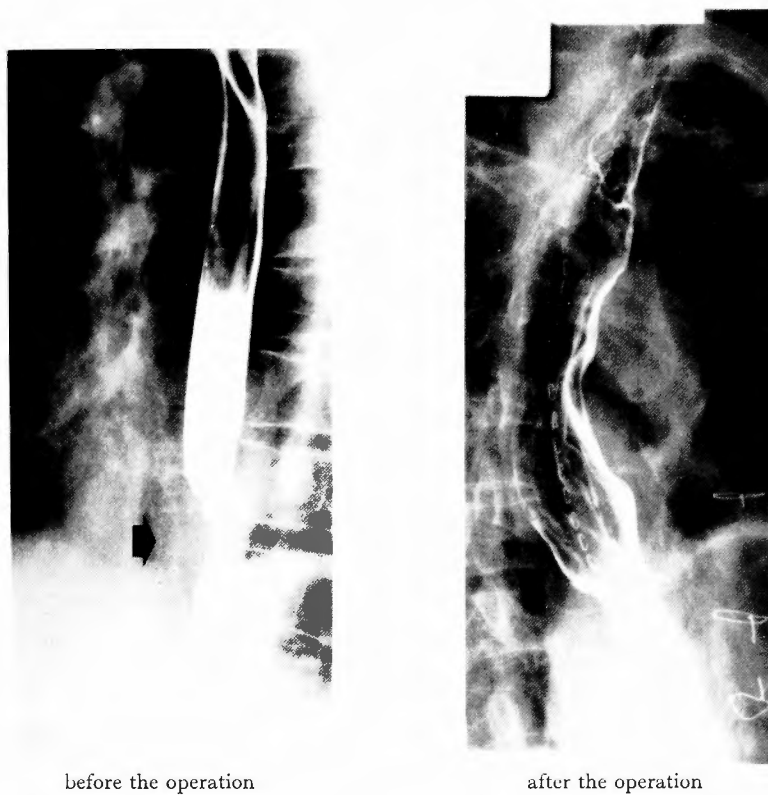


Fig. 6. Roentgenogram of the esophagus of Case 4 before the operation and after the operation.

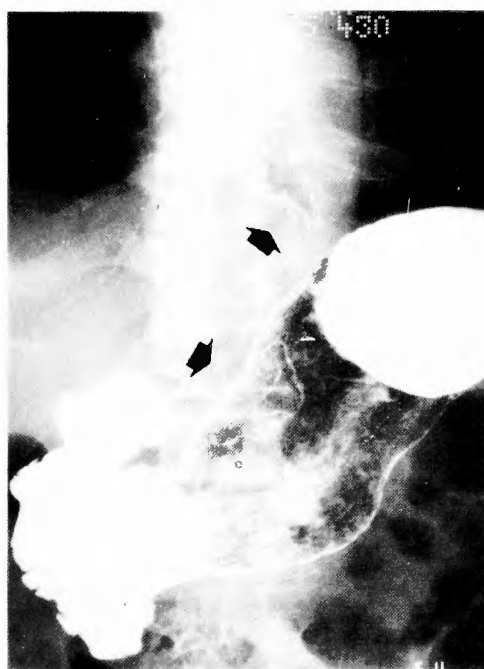


Fig. 7. Roentgenogram of the stomach and esophagus of Case 5 before the operation.

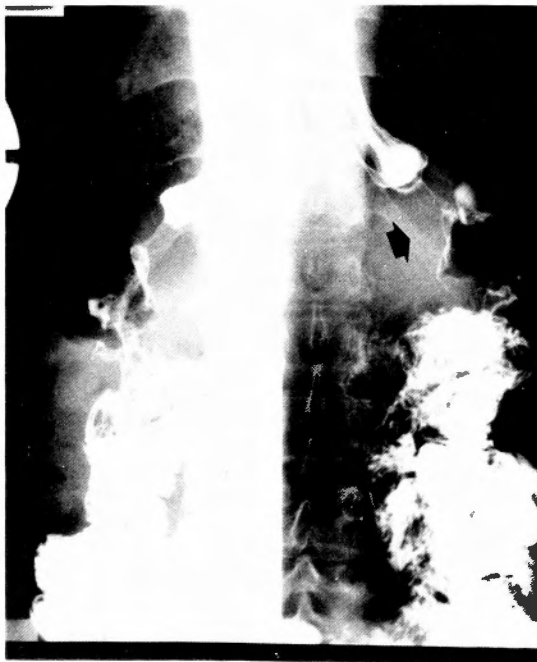
the esophagus was detached in the mediastinum under our visual field. Then, the esophagus was pulled out upward through a skin incision made in the neck, and the cervical esophagus was anastomosed with the stomach tube in the neck. In this case, we succeeded in excising the esophageal lesion without opening the chest. As of now, two years and one month after the operation, the patient is still alive. This patient had osteomyelitis in the incised lesion of the sternum, and the osteomyelitis improved about six months later. A roentgenogram of the stomach of the patient before the operation is shown in Fig 6.

Case 5

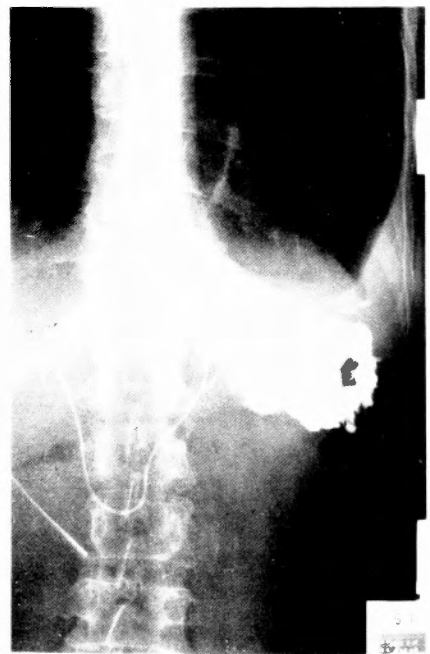
The patient was a 76-year-old man with carcinoma of the abdominal esophagus and gastric cancer (double cancer). We did not want to open the chest because of his old age and of disturbances in the respiratory function. Therefore, the upper midline abdominal incision with the sternum-splitting transmediastinal approach was selected. Carcinoma of the esophagus was found to have heavily infiltrated into the surrounding area when the abdomen was opened. A localized abscess was formed by perforation of the esophageal carcinoma. Resection of the esophagus in the abdomen and total gastrectomy were carried out, then the esophagus was anastomosed with the jejunum in the mediastinum. This patient had pyothorax and failure of the suture, and died ten days after the operation. A roentgenogram of the stomach of this patient before the operation is shown in Fig 7.

Case 6

The patient was a 57-year-old woman with cancer of the remaining stomach. She received



before the operation



after the operation

Fig. 8. Roentgenogram of the remaining stomach of Case 6 before the operation and after the operation.

a subtotal gastrectomy because of gastric cancer ten years ago. At this time, total gastrectomy was required because of cancer of the remaining stomach. Infiltration of the cancer into the abdominal esophagus was suspected. Therefore, we approached the lesion by the upper midline abdominal incision with the sternum-splitting transmediastinal approach. The remaining stomach was totally resected, the abdominal esophagus was resected and the esophagus was anastomosed with the jejunum in the mediastinum. The patient had pleuritis after the operation. As of now, four months after the operation, she is still alive. Roentgenograms of the stomach of this patient before and after the operation are shown in Fig 8.

Discussion

KATAYANAGI et al.³⁾ gave the following advantages of the sternum-splitting transmediastinal approach: 1) Surgical intervention is slight because the chest is not opened. 2) The lower esophagus can be appreciably resected up to its oral side. 3) Dissection of the lymph nodes and resection together with the diaphragm can be carried out. 4) Anastomosis of the esophagus and jejunum can be made under a good operating field.

However, there are also counter opinions regarding this method. In Case 1, we were able to use this method to advantage. We were able to resect the lower esophagus, dissect the lymph nodes, and partially excise the diaphragm. In addition, we were able to anastomosis the esophagus with the jejunum under a wide operating field. This method is very useful in a patient like this one, in whom the lower esophagus needed to be resected over a wider range on the basis of histological findings during the operation.

In Cases 2 and 4, we could not obtain a good operating field though we approached the lower esophagus by this method. This indicates the limitation of the application of this method. That is, the method can give a good operating field when the abdominal esophagus is resected, while it cannot give a good field when the thoracic esophagus is resected. However, a lesion in the lower esophagus can be resected under the vision obtained by this method, with the lesion confirmed by sight. In such a case, the method has the disadvantage that anastomosis is difficult under the vision obtained by this method. Therefore, in these cases, the esophagus can be separated by pulling it out at the level of the neck, and then it can be anastomosed with the stomach tube in the neck. This surgical procedure is very easy and the operation can be accomplished without opening the chest.

We studied the postoperative complications that occurred. In Cases 3 and 5 the suture insufficiency had occurred, but this failure was not related to this method. Furthermore, some patients had osteomyelitis in the sternum or pyothorax. However, these complications can be prevented if the surgeons are skilled in this method.

Summary

We attempted to approach the esophago-cardiac lesion by the upper midline abdominal incision with the sternum-splitting transmediastinal incision in six patients with lower esophageal

cancer or cardiac lesion carcinoma. This method gave a good operating field in the esophago-cardiac region, and its useful because the abdominal esophagus can be resected and anastomosed without opening the chest. Some patients had osteomyelitis in the sternum or pyothorax after the operation. However, these postoperative complications can be prevented if the surgeons are skilled in this method.

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和文抄録

上腹部正中切開兼胸骨縦切開・経縦隔法の経験

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下部食道あるいは胃噴門部領域を含んだ癌症例の6例について上腹部正中切開兼胸骨縦切開・経縦隔法による到達を試みた。その結果、本法は食道胃境界領域に良好な視野を与え有用であった。本法によって非開胸的に腹部食道を切除し、良好な視野内で消化管再建

を行うことが容易に遂行し得た。

術後合併症として胸骨々髄炎、膿胸などがみられたが、このような合併症は本法に熟達することで予防し得ると思われる。