Hand-Assisted Laparoscopic Transhiatal Esophagectomy Using the Dexterity Pneumo Sleeve

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ABSTRACT

Background: As the use of laparoscopic techniques have expanded to more complicated procedures, limitations of laparoscopy have begun to be realized. To help regain the ability to palpate and bluntly dissect tissues, and handle larger organs, surgeons have begun to utilize devices which allow the surgeon's hand to be inserted into the abdomen during laparoscopic procedures. One such device is the Dexterity Pneumo Sleeve, which was used here to perform transhiatal esophagectomy in two patients.

Methods: Two patients with adenocarcinoma of the esophagus underwent hand-assisted laparoscopic transhiatal esophagectomy. The stomach mobilization was carried out using laparoscopic technique facilitated by the use of the surgeon's hand. Blunt dissection of the esophagus through the hiatus was then carried out. Dissection of the proximal esophagus and creation of a cervical esophagogastroduodenal anastomosis was then performed in the neck through a cervical incision.

Results: The Pneumo Sleeve proved useful for handling the stomach, as well as, blunt dissection of the esophagus while still maintaining the benefits of laparoscopy, including small incisions, and no postoperative ileus.

Conclusion: Hand-assisted laparoscopic esophagectomy can be carried out with good, early, postoperative recovery.

Key Words: Hand-assisted laparoscopy, Esophagectomy, Esophageal cancer.

INTRODUCTION

Minimally invasive surgical techniques have become accepted as providing many advantages over open surgery, including decrease in morbidity, shortened hospital stay, and quicker return to activity. In light of these advantages, laparoscopic techniques have been applied to a wider variety of surgical procedures, and to progressively more complicated techniques. As the use of laparoscopic techniques has expanded, limitations of laparoscopy have begun to be realized. The ability to palpate tissues, bluntly dissect tissue planes, and handle large organs has proven to be limited with completely laparoscopic techniques. To address this dilemma, surgeons have explored techniques using devices which allow the operator's hand to be inserted into the abdomen during laparoscopic procedures. Hand-assisted techniques have been described for colectomy,1,2 small bowel resection,2 adhesiolysis,3 rectopexy,4 Nissen fundoplication,5 splenectomy,6,7 gastrectomy,8 nephrectomy,9 and esophagectomy.10 This report is of a technique using hand-assisted laparoscopic surgery utilizing the Dexterity® Pneumo Sleeve® (Dexterity Incorporated, Blue Bell, PA) to perform transhiatal esophagectomy.

TECHNIQUE

The patient was placed in the supine position. A 12 mm EndoPath endoscopic port (Ethicon Incorporated, Sommerville, NJ) was then placed through an incision at the umbilicus. The laparoscope was then introduced into the abdomen. A 7.5 cm midline incision, positioned just inferior to the xyphoid process, was opened for the Dexterity Pneumo Sleeve®. The accompanying wound protector was then inserted into the wound. The Pneumo Sleeve was then applied to the skin around the incision using the adhesive flange. Additional 11 mm laparoscopic ports were then placed in the right upper quadrant and left upper quadrant in approximately the mid-clavicular line (Figure 1).

The operator, standing on the patient's right side, then placed his left arm through the Pneumo Sleeve®, and performed laparoscopic dissection using the port in the right upper quadrant. The laparoscope was placed in the
A window was then opened posterior to the gastroesophageal junction. An endoscopic vascular GIA stapler was used to transect the left gastric artery. At this point, the entire circumference of the stomach was mobilized with the right gastric and right gastroepiploic vessels carefully preserved to protect the stomach's blood supply. A Kocher maneuver was then performed bluntly using the operator's hand to mobilize the duodenum, completing the abdominal dissection.

The operator, remaining on the patient's right side, then exchanged hands in the Pneumo Sleeve so that his right hand was now available for blunt dissection through the diaphragmatic hiatus into the posterior mediastinum (Figure 3). Dissection proceeded proximally on the esophagus to a level just above the carina. The vessels supplying the esophagus were able to be grasped and retracted to within reach of the abdomen where they were clipped or cauterized under the direct vision of the laparoscope to maintain hemostasis.

The pneumoperitoneum was released, and the operator moved to the patient's left side. An incision was made along the anterior border of the sternocleidomastoid muscle, and the cervical esophagus was dissected using standard open technique. Dissection of the proximal esophagus was carried out until the previous planes of dissection were reached in the mid-esophagus, indicating the entire length of the esophagus was mobilized. The cervical esophagus was then transected, and a large rubber sling was secured to its distal margin of transection. The Pneumo Sleeve® was removed from the patient's skin, leaving the wound protector in place to provide retraction of the wound. The stomach and esophagus were then withdrawn through the wound protector, leaving the rubber sling passing through the mediastinum. An open TA stapler was used to transect the stomach, removing the cardia along with the esophagus. A pyloroplasty was then performed using open technique through the wound protector.

The fundus of the stomach was secured to the rubber sling, now in place in the mediastinum, and drawn up through the mediastinum until it lay adjacent to the previously transected cervical esophagus. The fundus was then secured to the prevertebral fascia to relieve tension from the anastomosis, which was performed between the fundus and cervical esophagus using interrupted silk sutures. A drain was placed adjacent to the anastomosis, and the wound was closed.
The jejunum was then identified through the Pneumo Sleeve incision with the wound protector still in place providing retraction, and a feeding catheter jejunostomy was created in the left upper quadrant. The laparoscopic port sites and Pneumo Sleeve® incision were then closed.

CASE 1

The patient is a 68-year-old male, who experienced progressive dysphagia over approximately a three-month period, over which time he experienced a weight loss of 22 pounds. Barium swallow revealed a lesion in the distal esophagus. Endoscopic examination and biopsy of this lesion revealed adenocarcinoma. The patient was prepared for surgery by instituting total parenteral hyperalimentation, while also undergoing neoadjuvant chemotherapy and radiation therapy. The operation was accomplished on the day of admission without complication in 305 minutes, with an estimated blood loss of 500 ml.

Following the procedure, enteral hyperalimentation was instituted in the Recovery Room via the feeding catheter jejunostomy, placed at the time of surgery. Feedings were advanced over the subsequent days until he was tolerating full nutritional support enterally. A chest tube was placed at the time of surgery because one pleural space was entered. After a few days of suction, the chest tube was removed. The patient's pain was controlled with intermittent narcotic injections, which were discontinued after the first few days. On the seventh postoperative day, the patient was discharged home receiving enteral nutritional support via the jejunostomy. On the 14th postoperative day, a barium swallow showed a well-healed cervical anastomosis, and oral intake was begun.

CASE 2

The patient is a 77-year-old male, who experienced progressive dysphagia over approximately a six-month period, over which time he experienced a weight loss of 21 pounds. Barium swallow revealed a lesion in the distal esophagus. Endoscopic examination and biopsy of this lesion revealed adenocarcinoma. The patient underwent placement of a laparoscopic jejunostomy for enteral nutritional support, while undergoing neoadjuvant radiation and chemotherapy in preparation for surgery. The patient was admitted the day prior to surgery for medical stabilization of cardiac and pulmonary disease, and then
underwent surgery without complications in 280 minutes, with an estimated blood loss of 200 ml.

Following the procedure, enteral nutritional support was resumed in the Recovery Room and advanced over subsequent days until full support was attained. Intermittent narcotic injections were used for pain control over the first few days before being discontinued. On the tenth postoperative day, the patient was discharged. On the fourteenth postoperative day, oral intake was begun, after barium swallow showed an intact anastomosis.

DISCUSSION

As surgical technology becomes more and more advanced, surgeons are discovering that the best surgical instrument is still the surgeon’s hand. This becomes increasingly evident as laparoscopic procedures become more advanced. In many cases, however, it may not be necessary to completely forfeit the advantages of laparoscopy. The advantages of minimally invasive surgery appear to be retained by using a hand-assisted laparoscopic technique. In these two patients, the laparoscopic benefits of small scars and no postoperative ileus were realized. Laparoscopy also helped in the maintenance of hemostasis during the mediastinal dissection by providing visualization for the clipping or cauterization of vessels.

Compared with completely laparoscopic esophagectomy, a hand-assisted approach may have the benefit of shorter operative time. In these two patients, the average operative time was just under 5 hours, compared to one report of the same procedure performed completely laparoscopically where the operative time averaged 6.5 hours. The average estimated blood loss of 290 ml found there was similar to 350 ml encountered in these two patients. The length of stay for the completely laparoscopic procedure ranged from 4 to 9 days, which also is similar to the 7 and 10 day length of stay in this report.

This report demonstrates that transhiatal esophagectomy can be performed using a hand-assisted laparoscopic technique. The length of the procedures was reasonable, and the patients’ postoperative hospital stays and return to activity were also good. A controlled study will be needed to verify these findings.

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