Oesophageal Tumours: Benign and Malignant

27

S. Michael Griffin, Barry Dent, and Shajahan Wahed

Abstract

Oesophageal tumours provide a challenge in management. Curative treatment for adenocarcinoma and squamous cancer invariably involve surgical resection. Small cell cancer is managed without surgical intervention. Benign lesions such as leiomyomas must be monitored but rarely require intervention unless they are causing obstruction. The staging investigations are often extensive and complex as there is no place for palliative surgery for metastatic disease. Surgery requires alymphadenectomy and feeding access. The procedures are high risk and complications are common. This chapter highlights practical ideas to make the procedure and the management of the complications more clear and straightforward.

Keywords

Oesophageal tumours • Oesophagectomy • Lymphadenectomy • Omentoplasty • Jenenostomy

27.1 Introduction

The most common malignant tumours of the oesophagus are adenocarcinoma and squamous cell carcinoma. Squamous cell carcinoma is the most predominant histological type worldwide. In the UK and western world, adenocarcinoma predominates and accounts for over half of all oesophageal cancers [1–3]. The incidence of

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adenocarcinoma continues to rise, and is strongly associated with reflux disease, obesity and Barrett's oesophagus [4, 5]. Rare malignant tumours of the oesophagus include primary melanoma, small cell carcinoma, leiomyosarcoma and adenoid cystic carcinomas.

Benign tumours of the oesophagus include leiomyomas and gastrointestinal stromal tumours (GIST). Leiomyomas are more common but in the majority of patients can be left alone. Surgery is rarely required but may be indicated if necrosis or obstructive symptoms occur. Endoscopic ultrasound and fine needle aspirate can be used if there is diagnostic uncertainty. The risk of malignancy with a leiomyoma is extremely low. Oesophageal GISTs are rare. Larger GISTs can demonstrate malignant behaviour so warrant full investigation and treatment. Rare granular cell tumours can be observed.

Patients with oesophageal cancers should undergo clinical staging and discussion at a specialist upper GI multidisciplinary meeting (MDT). Staging investigations will include endoscopy, endoscopic ultrasound and computed tomography of the chest, abdomen and pelvis. Most patients also will have a positron emission tomogram (PET-CT) to look for distant metastases [6]. Neck ultrasound and magnetic resonance imaging of the liver can clarify the nature of lymph nodes in the neck or lesions in the liver, respectively. Patients should undergo formal fitness assessment and review by an anaesthetist specialising in oesophageal surgery to risk stratify patients and identify any aspects of a patient's condition that can be optimised. Cardiopulmonary exercise testing has been adopted in recent years although its value in predicting morbidity and mortality is yet to be clarified. Nutritional assessment by a specialist dietician is equally as crucial.

Most patients with potentially curative oesophageal cancer present with locally advanced disease and will receive neoadjuvant chemotherapy or chemoradiotherapy prior to surgical resection [7–9]. It is important to recognise that resection should not be performed in the palliative setting. This includes cancers that have perforated, as the development of recurrent disease is inevitable [10]. Oesophagectomy is in most cases performed as a two-phase procedure with a radical en bloc two-field lymphadenectomy. The stomach is the most common conduit replacement for resected oesophagus [11]. The aims of surgical resection are to remove all cancerous tissue, provide the optimal chance of cure and optimal disease staging whilst maintaining as best possible the patient's quality of life.

27.2 Technical Tips and Tricks

Oesophagectomy is performed under general anaesthesia with a double lumen endotracheal tube, nasogastric tube insertion, intravenous antibiotic prophylaxis and mechanical venous thromboembolism prophylaxis. A thoracic epidural has traditionally been used although paravertebral and wound catheters offer an alternative approach to postoperative pain management.

1. Abdominal access and gastric mobilisation

   Excision of the xiphisternum will improve access from a long midline incision. A retractor anchored to the operating table such as the Omni-tract® is crucial

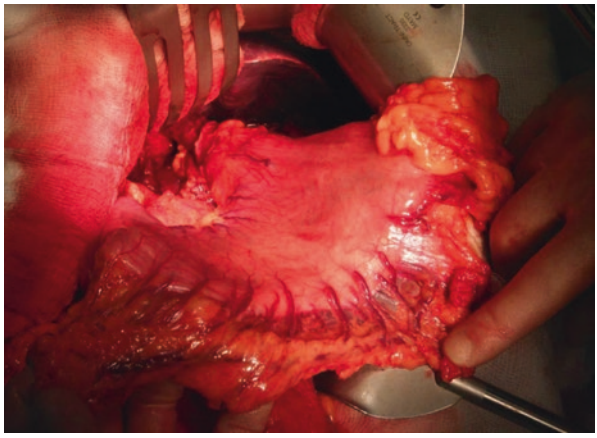

Fig. 27.1 Preservation of the right gastroepiploic vessels and arcade

to provide the required exposure, with more traction required for the left side of the abdominal wall. The left triangular ligament attaching the left lobe of the liver to the diaphragm can be divided to aid hiatal exposure but ensuring the dissection does not injure the diaphragm, liver, phrenic vein or inferior vena cava. Use of a headlight significantly enhances visualisation of the operative field.

Palpating and tracing the route of the gastroepiploic vessels is the first step before commencing gastric mobilisation. Variations in the anatomy need to be appreciated as the arcade can sometimes take a course much further away from the greater curve than expected [12, 13]. Some of the omentum from the greater curve should be preserved to wrap the oesophagogastric anastomosis and conduit staple line in the thorax. Bipolar scissors and an energy-sealing device are used for the dissection (Fig. 27.1).

The duodenum should be kocherised and the tissue within the 'C' of the duodenum dissected to free any attachments to the colon and allow the pylorus to reach the hiatus. Failure to achieve sufficient mobility and leaving the pylorus or distal stomach in the abdominal cavity can result in significant postoperative gastric emptying problems.

2. En bloc lymph node dissection

   Diathermy forceps or bipolar scissors are a good instrument for the abdominal nodal dissection in order to coagulate the small surrounding vessels. The easiest starting point is around the anterior common hepatic node, using atraumatic grasping forceps to lift the lymph node and continuing the dissection back to the junction with the splenic artery. The proximal splenic nodes are dissected in a similar way. The left gastric vein will be encountered and needs to be ligated in continuity before being divided. The dissection is continued onto the left gastric lymph nodes, left gastric artery (ligated and divided in continuity) and coeliac vessels before progressing up to the hiatus. This part of the dissection is often best approached with the stomach retracted in the cranial direction, although the view through the pars flaccida window can also be utilised (Fig. 27.2).

3. Hiatal dissection

   This part of the dissection proceeds along the pre-aortic plane, resecting pleura and the pericardial fat en bloc. A renal vein retractor provides good retraction to

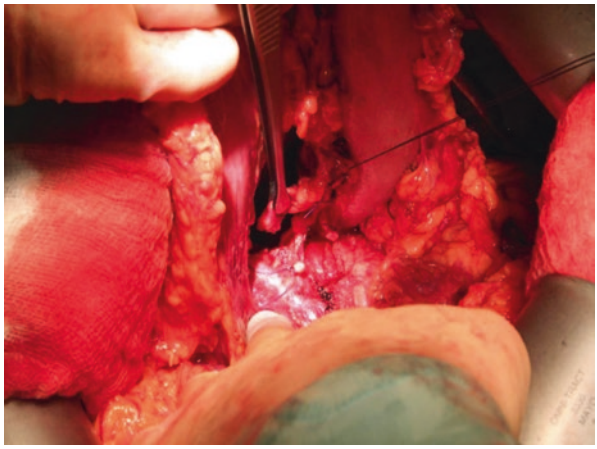

Fig. 27.2 En bloc abdominal lymphadenectomy

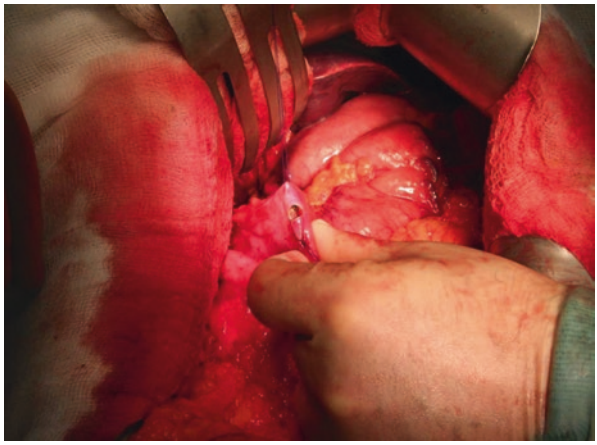

Fig. 27.3 Performing a pyloroplasty

allow exposure for the dissection. Part of each crus is resected en bloc, and this will allow tension-free delivery of the gastric conduit during the thoracotomy. Complete mobilisation can be checked by running a hand freely from above the hiatus behind the stomach to the duodenum without any obstructing tissue.

4. Pyloroplasty

   A pyloroplasty is used to prevent postoperative gastric drainage problems. Diathermy is used to divide the muscle between stay sutures. Forceps or the sucker tip can be used to open up the anterior wall. A Gambee-type suture at either end can reduce bleeding from submucosal vessels. It is crucial to confirm that a small amount of mucosa is incorporated in the sutures whilst checking that no sutures catch the posterior wall (Fig. 27.3).

5. Feeding jejunostomy

   This is routinely performed to provide nutritional support in the postoperative period. It becomes especially important in the event of any postoperative complications that delay resumption of oral intake or necessitate additional

nutritional requirements [14]. It is however a potential source of morbidity in itself, so the technique to insert it should be meticulous.

The authors use a 14Fr MIC feeding tube. The flushed tube is drawn through the abdominal wall after making a stab incision and cut to the appropriate length (approximately 30 cm from the balloon). This is inserted through a 2.0 Vicryl™ purse-string into the proximal jejunum, leaving a 1 cm gap from the balloon to the entry point. The purse-string is tied and the two ends wrapped back around the tube and retied to prevent the tube from slipping back out. The tube is covered with a Witzel tunnel created with interrupted 2.0 Vicryl™ and then anchored to the abdominal wall with three or four anchor sutures. It is easier to insert the lateral sutures first before pulling the balloon back into the abdominal wall and tying. The medial sutures are inserted next. A split is created in a suitable part of the omentum that is attached to the transverse colon. This is placed around the jejunostomy before tying proximal and distal anchor sutures that incorporate peritoneum, omentum, jejunum and omentum. These sutures prevent twisting at the jejunostomy site whilst the omental wrap reduces the possibility of infracolic contents herniating through the hiatus. The balloon is inflated with 2–4 mL of sterile water within the preperitoneal abdominal wall. The jejunostomy should be flushed at this point to ensure there is free flow.

6. Thoracic access

   The ideal space for the right posterolateral thoracotomy is the fourth intercostal space. The neck of the rib should be excised to allow the rib space to open up fully without fracturing further ribs. It is the authors' experience that post-thoracotomy wound pain is reduced if a length of intercostal nerve is excised at the level of rib resection. The Omni-tract® or a finochietto retractor is used for retraction and exposure.

7. Ligation of azygos vein

   When mobilising the arch of the azygos vein, it is important to identify branches of the bronchial vessels that can cause nuisance bleeding. The knots from the ligatures on the azygos arch need to be tied squarely to avoid twisting of the vein and slippage of the ties that could result in catastrophic bleeding.

8. Dissection and ligation of thoracic duct

   The dissection should follow the line of the azygos vein caudally. Bipolar scissors are the authors' instrument of choice for this. The dissection is deepened onto the pre-aortic plane. At the level of the hiatus, the thoracic duct should be clearly identified and ligated in the groove between the azygos vein and aorta. It is vital that no traction is placed on the thoracic duct to avoid avulsing small branches off the main duct (Fig. 27.4).

9. Para-aortic dissection

   The dissection in the pre-aortic plane takes the dissection back in the cranial direction and onto the infracarinal tissue. The fingers of the retracting left hand are crucial in elevating and stretching the tissue to allow dissection with the bipolar scissors taking everything away from the aorta. Any vessels branching directly off the aorta need to be identified and controlled before division. It is important not to retract tissue from the left side of the aorta, because bleeding

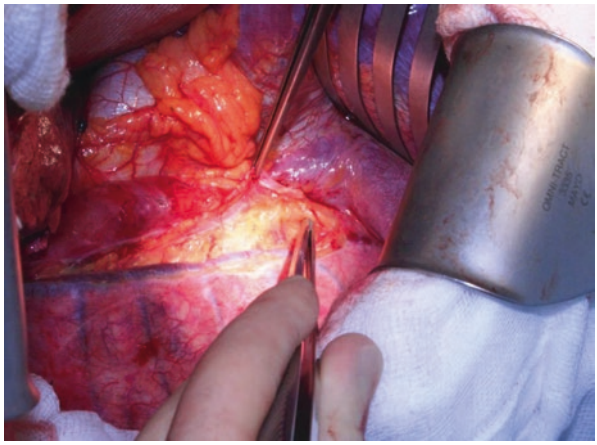

Fig. 27.4 Identification of the thoracic duct at the level of the hiatus

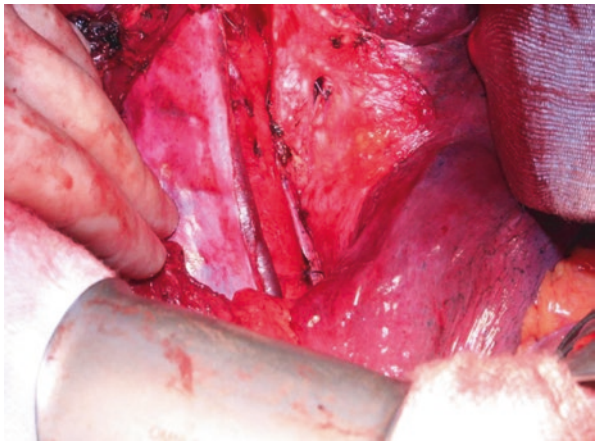

Fig. 27.5 Appearance after mediastinal dissection including en bloc lymphadenectomy around the bronchi

from any divided tissue on that side will be extremely difficult to control. Once a window has been created in this plane, a Nylon tape can be used to sling the oesophagus up and open the plane cranially for further dissection.

10. Tracheobronchial lymphadenectomy

    The optimal approach for this part of the dissection is to continue the dissection up from the back of the pericardium. The upper and lower edges of the cartilaginous rings of both bronchi need to be identified before dissecting into this region to avoid injury. The balloon on the endotracheal cuff should be palpable in the left main bronchus. Traction (consider Wangensteens or Babcock forceps) can help pull these infracarinal lymph nodes away from the pericardium and allow a clean dissection. There will be vessels supplying the lymph nodes at the apex within the carina and at the edge of each bronchial node that should be ligated to prevent bleeding (Fig. 27.5).

    The dissection continues onto the right paratracheal tissue. The vagus nerve should be divided without diathermy to avoid conduction of energy damaging the recurrent laryngeal nerve. The stay sutures are inserted into the proximal oesophagus once the mobilisation is complete. Interrupted full-thickness 2-0

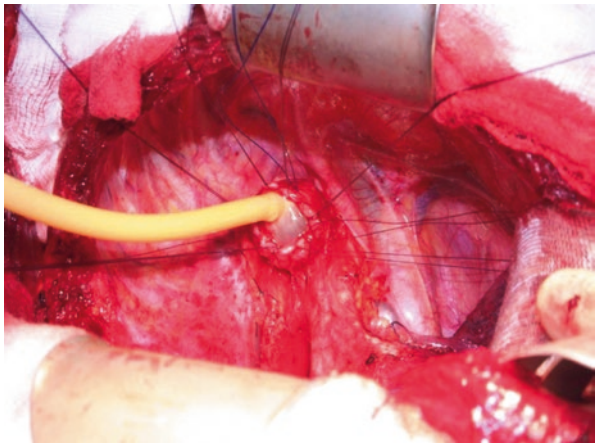

Fig. 27.6 Using a Foley catheter to dilate the proximal oesophagus after the purse-string suture has been inserted

Monocryl sutures are inserted before a 0 Prolene purse-string suture that is used to tie in the anvil of an appropriately sized anvil. The proximal oesophagus is dilated with the balloon of a Foley catheter prior to the anvil insertion (25 or 28 mm). It is important to take the tension off the interrupted sutures when tying the purse-string (Fig. 27.6).

11. Delivery and formation of conduit

    Completion of the hiatal dissection is left until the end of the oesophageal mobilisation to avoid abdominal fluid spilling into the thorax and obscuring the operative field. Once the dissection has been completed, the gastric conduit should be delivered by gentle traction along the greater curve of the stomach. The pyloroplasty should lie at or above the level of the hiatus with the sutures palpable anteriorly. It is crucial to ensure that the stomach has not twisted during delivery.

12. Anastomosis and drainage

    The conduit should be prepared by dividing the lesser curve fat at the junction between the left and right gastric arteries. The high point of the stomach needs to be identified and checked so that it will reach the proximal oesophagus. The anastomosis should lie above the level of the divided azygos arch. A long oesophageal clamp is used to mark the level of transection from the point on the lesser curve and the stomach divided with diathermy below this. Babcock forceps are used to pick up the gastric conduit edges. It is imperative to ensure that the distance between the chosen anastomosis site and gastrotomy edge is not too short. The conduit itself should not be narrowed too much (the authors' minimum recommendation is 5 cm) as this will damage intramural vascular arcades and put the conduit at risk of ischaemic necrosis [15].

    When the circular stapler is inserted, the distance to the edge of the gastrotomy should again be checked to ensure it is not too short (minimum 2 cm). The stapler point should be advanced through the gastric wall whilst two fingers press either side of the exit point. A purse-string suture is inserted around the exit point of the anvil to prevent a split in the gastric wall. After engaging the stapler and anvil, a check is made to ensure no other tissue is caught in between. The doughnuts should be inspected for complete circumferential integrity after the stapler has been fired and the staple gun removed. The nasogastric tube

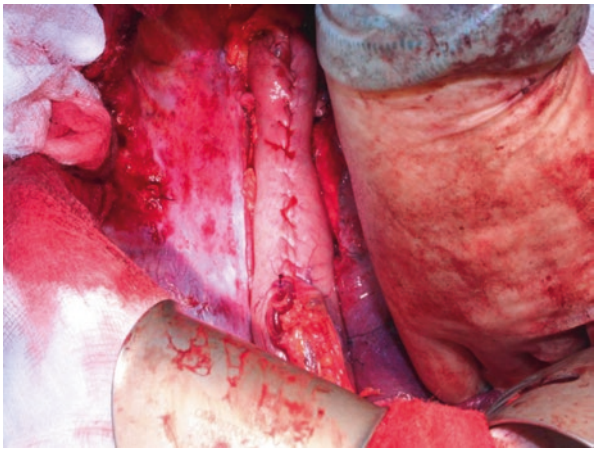

Fig. 27.7 The gastric conduit after inversion of the gastrotomy staple line

should be sited in the distal stomach and secured to a nasal bridle. Although the gastrotomy is closed with a stapler, the authors invert the staple line with a continuous suture.

The greater curve fat/omentum is placed alongside the airways and wrapped over the anastomosis and gastrotomy with interrupted sutures. The parietal pleura at the apex of the thoracic cavity is used to provide additional cover over the fat at the anastomosis.

The authors use two soft 24Fr chest drains to drain the apex and base of the right thoracic cavity (Fig. 27.7).

27.3 Tips and Tricks that Will Avoid and Deal with Intraoperative Anticipated and Unanticipated Complications

27.3.1 Splenic Injury

The first manoeuvre in the abdominal dissection should be to identify and release any adhesions from the gastrosplenic ligament to the lower pole of the spleen to prevent inadvertent traction injury and bleeding. Placing the patient head up and right side down helps with the exposure for this step.

Control of bleeding from small tears on the spleen can be achieved by using ball diathermy or haemostatic tissue glues in order to preserve the spleen.

27.3.2 Bleeding

Ensure the short gastric vessels are clearly defined before ligation and division or before application of an energy device to seal the vessels. Inadequate exposure can lead to troublesome bleeding if vessels are only partially sealed before division. Use of energy devices is not a substitute for adequate dissection.

The small vessels branching directly off the aorta are encountered during the pre-aortic dissection and oesophagus mobilisation. These can cause significant bleeding. Prevention is the best course of action, so firm retraction with the fingers of the left hand will stretch the para-aortic tissue and allow identification of these branches before they are inadvertently cut. The dissection should take one layer of the pre-aortic tissue at a time with the bipolar scissors. The safest option for the aortic branches is ligation, although controlled bipolar diathermy is suitable for the smallest branches. The dissection should ensure that a small stump of the vessel is left on the aortic wall to facilitate ligation in continuity. The branch that appears near the start of the arch of the aorta is a particularly sizeable vessel and in most cases can be avoided. If it enters the plane of dissection, it should be ligated and then divided.

27.3.3 Chyle Leaks

A double (or rarely triple) thoracic duct is sometimes encountered, more commonly in females. In these cases both ducts need to be ligated and divided. There are often large side branches from the main thoracic duct particularly in its distal part that need to be ligated separately.

During the hiatal dissection of the abdominal phase, the cisterna chyli is at risk of injury, particularly in thin patients. The dissection of the pre-aortic plane at this level needs to avoid damaging this structure.

The small lymphatics around the abdominal lymph nodes rarely cause significant chyle leak, but they can be ligated during the lymphadenectomy to prevent small pools of chyle.

27.3.4 Lymph Node Fracture

It is best practice to avoid holding lymph nodes if at all possible as they fracture easily. If there is no other option, then use of atraumatic forceps such as Wangensteens is least likely to cause disruption. Babcock forceps to completely encircle the lymph node are the other instruments that are useful during lymphadenectomy. The posterior common hepatic node often needs to be ligated at an appropriate level to avoid injury to the portal vein.

27.3.5 Airway Injury

The membranous part of the trachea and bronchi are fragile and particularly susceptible to injury. The edges of these structures should be clearly identified by vision and palpation. Avoiding the use of diathermy in close proximity to these structures is recommended. If diathermy is necessary, it should be with bipolar scissors. Dissection in the direction of the airways is made safer by placing the fingers of the retracting hand flat against the airways to protect them.

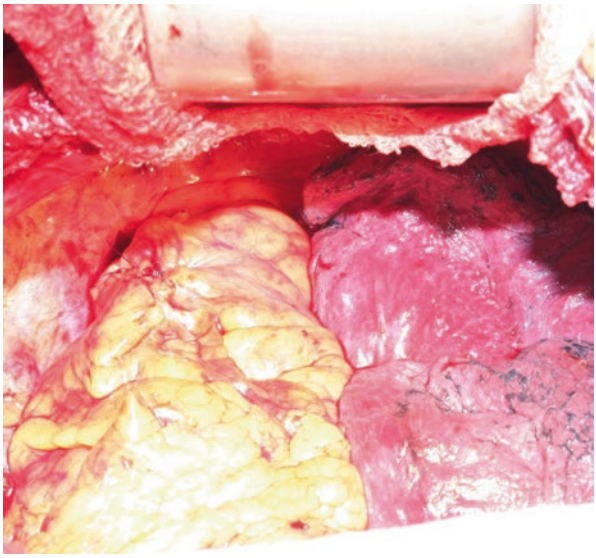

Fig. 27.8 Omentoplasty covering the anastomosis and gastrotomy and acting as a barrier between the conduit and the airways

The omentum should be placed between the airways and conduit and then onto cover the gastrotomy and anastomosis. This offers additional protection should there be any leak from either part of the staple line (Fig. 27.8).

27.4 Alternative Methods

Endoscopic resection is a potentially curative option in patients with T1a (mucosal) cancer [16]. These cases should still be fully staged as with any other oesophageal cancer and be discussed in the MDT prior to endoscopic resection. Endoscopic mucosal resection is performed under sedation and intravenous analgesia in the endoscopy department by a specialist endoscopist. Mucosal lesions with histologically clear vertical and circumferential margins (including biopsies from the edge of the resection site) can be followed up with endoscopic surveillance. Endoscopic resection is not suitable for cancers that have reached the submucosal layer because of the risk of lymph node metastases [17].

The use of minimally invasive techniques for oesophagectomy has increased in the UK [18]. The same resection as in open surgery should be performed if minimally invasive techniques are chosen. Appropriate placement of the ports is crucial in making the dissection less onerous, particularly of mobilising the distal stomach and performing the pyloroplasty. Using the Nathanson retractor to lift up the whole stomach once the left gastric vessels have been divided helps with mobilising the duodenum free from hepatic flexure attachments and with kocherisation. The feeding jejunostomy can be performed more easily by extending the left side supraumbilical port and placing the sutures under direct vision in the same way as described above.

One major pitfall when performing laparoscopic mobilisation is failure to identify the route of the gastroepiploic arcade particularly in obese patients. This can be inadvertently damaged, rendering the stomach unsuitable as the conduit and, if not recognised at the time of operation, resulting in gastric necrosis [19]. Creation of a too narrow conduit will also significantly increase the risk of conduit necrosis [12, 15].

Thoracoscopic mobilisation can be helped by appropriate port placement, with the arm abducted and rotated above the patient's head.

27.5 Uncommon Pathology

A duplicate or even triplicate thoracic duct is sometimes encountered. Failure to appreciate that this variant exists can result in a postoperative chyle leak.

27.6 Postoperative Management

Patients should be prepared in advance for the postoperative period. Enhanced recovery programmes have been demonstrated to improve outcomes and reduce hospital stay in patients undergoing oesophagectomy [20]. Early, regular physiotherapy and mobilisation is crucial to reduce the risk of atelectasis, respiratory tract infections and venous thromboembolism. It also helps gut function return quicker. Enteral nutrition can be provided via the feeding jejunostomy according to local dietetic protocols. It is important to build up enteral jejunostomy feeds gradually to prevent nausea, bloating and pain. Routine use of laxatives can also help expedite the return of gut function.

27.7 Tips and Tricks to Deal with Postoperative Complications

Patients who have had an oesophagectomy can deteriorate rapidly in the event of postoperative complications. Prevention is the best strategy and involves preoperative optimisation, meticulous surgical technique and postoperative mobilisation and physiotherapy. A high index of suspicion must be adopted when reviewing patients with a low threshold for prompt investigation.

In the majority of patients, anastomotic leaks can be successfully managed with intensive conservative management [21]. This includes intravenous antibiotics and antifungals, intravenous proton pump inhibitor, enteral feeding, targeted chest drainage and stopping any oral intake. A radiological nasogastric tube should be placed. Patients should be endoscoped to identify the degree of disruption. A return to theatre is infrequently required in these cases. Surgical options in patients requiring intervention include closure of defects over a T-tube and the use of intercostal muscle flaps. Formation of an oesophagostomy with take down of the anastomosis is rarely required. The routine use of oesophageal stents to treat anastomotic leaks

is unnecessary. Stents are associated with significant complications including mortality [22].

Chyle leaks can result in immunosuppression and malnutrition. It is usually due to damage to the main thoracic duct or a large side branch, although occasionally can arise from damage to the cisterna chyli. Chyle can be confirmed by sending drain fluid for chylomicrons or triglycerides. The differential serum lymphocyte count should be checked. Management involves reducing the flow of chyle, draining any chylothorax, maintaining nutritional status and preventing opportunistic infection. Enteral feeds should be switched to medium chain triglyceride types. Intravenous co-trimoxazole is given to prevent opportunistic infections. Fluid and electrolyte balance should be strictly monitored. Indications for a return to theatre for thoracotomy would be a persistent leak of >1000 mL/24 h persistent for 48 h. Radiological insertion of a pleuroperitoneal shunt is an option for persistent leaks where there is no identifiable duct or branch to ligate surgically.

27.8 Conclusions and the Future

Oesophageal cancer is a condition requiring specialist and complex management. Oesophagectomy requires meticulous attention to detail. This chapter has highlighted some techniques that can be adopted into practice to prevent intraoperative and postoperative difficulties.

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