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Surgical pathology is a predictor of outcome in post-operative lymph leakage

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ABSTRACT

Background: Post-operative lymph leak is a potentially serious complication which may contribute to fluid and electrolyte imbalance, malnutrition and an increase risk of sepsis and mortality.

We aimed to study the use of TPN in the treatment of post-operative lymph leak.

Methods: Retrospective review of prospectively collected clinical database comprising patients with post-operative lymph leak treated with TPN collected over 1998–2006. An analysis of morbidity and mortality was performed.

Results: 36 patients developed lymph leak following radical neck dissection ($n = 10$), Whipples procedure ($n = 13$), oesophagectomy ($n = 10$) and pulmonary/vascular/retroperitoneal ($n = 3$) surgery. The survival to discharge was 89%. The mortality rate in patients with chylothorax following oesophagectomy was 30% (three out of ten). The majority of patients (67%, 24 out of 36) with lymph leak settled on TPN alone. The overall re-intervention rate was 20%. Of the seven survivors after oesophagectomy, five underwent re-intervention thoracic surgery (two also had ischaemic perforation of gastric remnant needing revision surgery). Overall, the re-intervention rate in all patients undergoing oesophageal surgery is 60%.

Conclusion: Most patients with post-operative lymph leak receiving TPN alone survived. It is rare for re-operation to be necessary in patients who have lymph leaks in the neck or retroperitoneum. Re-operative intervention is more commonly performed in lymph leak after oesophagectomy.

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1. Introduction

Lymph leak is a rare but potentially serious complication following major surgery of the neck,¹ chest,² abdomen,³ axilla⁴ and groin.⁵ Untreated, it may result in hyponatraemia, hypo-proteinaemia, oedema and malnutrition with decreased immune function which may contribute to sepsis and increased mortality. Most patients with lymph leak are treated conservatively in the first instance. Such treatment may include oral or/and intra-venous fluid, oral diet, somatostatin analogue, total parenteral nutrition (TPN) and others. Failure to resolve usually necessitates operative intervention. Many treatments ranging from dietary modification,⁶ pharmacological treatment (somatostatin analogue,^{7,8} pancreatic lipase inhibitor⁹), tissue sealant (e.g. fibrin glue,¹⁰ canoacrylate,¹¹ pressure dressing and vacuum-assisted device), interventional radiological procedures¹² to direct surgical repair^{13–15} have been reported. However, most studies have included a small number of patients and it remains difficult to identify the best treatment strategy. We report our experience in the use of TPN and clear fluids

orally in the treatment of post-operative lymph leak in one institution.

2. Methods

Between January 1998 and December 2006, data were collected prospectively from all patients receiving TPN ($n = 442$) in our hospital. 36 patients received TPN because of post-operative lymph leak greater than 500 ml over 48 h.

All patients were cared for in the Department of Surgery, Glasgow Royal Infirmary during their TPN treatment by a multi-disciplinary nutrition team. Once the decision had been made that parenteral nutrition was appropriate, each patient was reviewed by the senior surgical dietitian who estimated their nitrogen and energy requirements. One of four standard commercially prepared three chamber parenteral nutrition bags (with Nitrogen content between 9 and 14 g and total energy between 1600 kJ and 2500 kJ) was selected for use depending on patient requirements, with electrolytes and fluid volume adjusted depending on fluid losses and serum electrolytes. Vitamins and trace elements were added in the pharmacy sterile supplies unit. No glutamine supplementation was used. A single consultant surgeon supervised or performed the insertion of a dedicated central parenteral nutrition line for TPN. Patients were permitted clear fluids orally only and parenteral nutrition was continued until the leakage of lymph had been stopped for at least 48 h. At this stage oral food intake was introduced over several days and parenteral nutrition stopped when oral intake was judged to be at least half of the estimated requirements and if no further lymph leak had occurred.

Prospective data were collected about date of admission and operation, indication for parenteral nutrition, line insertion site and complications, TPN prescription, dates of starting and stopping TPN, dates and nature of any other

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intervention or complication and date of discharge or death. Specific complications collected include inability to site parenteral nutrition line; misplacement of parenteral nutrition line; pneumothorax secondary to parenteral nutrition line placement; line infection (septicaemia, exit site or tunnel infection felt to be secondary to parenteral nutrition line, i.e. positive cultures from line site or central line blood in the absence of other infection source and with symptoms and signs settling on removal of line).

The main outcomes were survival to discharge; cessation of lymph leak with TPN alone; length of TPN and length of hospital stay; need for further intervention and complications. The need for surgical intervention was left to the discretion of the individual surgeon.

3. Results

There were 14 women and 22 men, with a median age of 62 years (range 38–87). Of these, 10 underwent radical neck dissection, 13 Whipple's procedure (pancreaticoduodenectomy), 10 oesophagectomy, one abdominal aneurysm repair, one pulmonary resection and one radical adrenalectomy (for hepatocellular metastases). All operations were performed for malignant disease except one oesophagectomy which was performed for Boerhaave syndrome.

The survival to discharge in all patients was 89% (32 of 36; 9 of 10 radical neck dissection; 13 of 13 Whipple's procedure; 7 of 10 oesophagectomy). One non-survivor had bilateral radical neck dissection with radial forearm flap for cancer of uvula and palate but developed unilateral lymph leak, contralateral pneumothorax, neck cellulitis and died of multi-organ failure, unrelated to the lymph leak or TPN. One had Ivor-Lewis oesophagectomy for a neo-adjuvant chemotherapy-treated squamous cell carcinoma of oesophagus and developed early lymph leak (which was successfully treated with TPN) but died of hospital acquired pneumonia on the 43rd post-operative day; a second patient had a radical McKeown 3-stage oesophagectomy, developed cardiac arrest associated with pulseless electrical activity and died of irreversible ischaemic brain injury. The lymph leak developed as a secondary adverse event which was present at the time of death. The third patient underwent thoracotomy for persistent lymph leak despite TPN treatment but died of respiratory failure.

67% (24 out of 36) of patients with lymph leak settled on TPN alone. The response rate for radical neck dissection was 90% (9 of 10), for Whipple's procedure was 92% (12 of 13) and for oesophagectomy was 30% (3 of 10). Two patients developed recurrent lymph leak needing re-introduction of TPN but it eventually settled spontaneously.

The mean length of TPN treatment was 16 days (standard deviation SD = 14 days) in survivors. This did not differ between patient groups (radical neck dissection (16 days), Whipple's procedure (18 days), and oesophagectomy (15 days)).

The mean hospital stay of survivors was 39 days (SD = 35 days). This was longer in surviving patients undergoing oesophagectomy (mean = 63 days) than in patients who had radical neck dissection (35 days) and Whipple's procedure (35 days).

Re-intervention was needed in seven patients. One patient with chylous ascites required the placement of a peritoneovenous shunt for persistent lymph leak. Of the three non-survivors after oesophagectomy, one responded to TPN alone; one had re-thoracotomy and one had persistent lymph leak at the time of death. Of the seven survivors after oesophagectomy, five underwent re-intervention thoracic surgery (two also had ischaemic perforation of gastric remnant needing revision surgery). Overall, the re-intervention rate in all lymph leak patients who had undergone oesophageal surgery was 60%.

One patient developed parenteral nutrition line sepsis which was treated by line replacement. There were no other complications of TPN.

4. Discussion

This is the largest study in the literature which compares the outcome of iatrogenic lymph leak across various body zones after major surgery and treated with TPN. Whilst lymph leak may occur following axillary or inguinal lymph node dissection and also peripheral vascular surgery, it is usually self-limiting and does not require TPN. Therefore such cases have been excluded in our series. This may also reflect case mix and practice at our institution. Our study shows that TPN, used in the management of post-operative lymph leak, can be safely administered by a dedicated multi-disciplinary team with minimal morbidity.

The thoracic duct, cisterna chyli and right lymphatic duct are the main lymphatic trunks which transport lymph and digested fat into the venous system. The cisterna chyli is an elongated and sometimes dilated sac in the retrocrural space at the level of L2. It receives the right and left lumbar trunks, intestinal trunk and the lowest intercostal vessels. The thoracic duct has three components: abdominal, thoracic and cervical. The abdominal part starts from the cranial part of the cisterna chyli, passes through the diaphragm to enter the posterior mediastinum to form the thoracic part. During its ascent, the thoracic duct is closely related to the hemiazygous vein, oesophagus, diaphragm and pericardium. It then drains into the left subclavian vein. The right lymphatic duct drains the right hemithorax, right head and neck and also the right extremity. Several variations have been described on the pattern of termination of the thoracic duct and also the right lymphatic duct into the venous system.¹⁶ The variable anatomy of the thoracic duct lends itself to injury during surgery of head and neck, oesophagus, abdominal or thoracic aorta, pancreas and other retroperitoneal structures.

Absorption of fat takes place in the small intestine in the form of chylomicrons. Fatty acids with greater than 10 carbon atom are mostly transported in lacteals (lymphatic capillaries) via the lymphatic vessels and thoracic duct into the circulatory system. Smaller fatty acids (fewer than ten carbon atoms) are preferentially transported in the portal venous system. It is estimated that 3–5 l of lymph fluid passes through the thoracic duct daily. The volume of flow through the thoracic duct is between 60 and 190 ml/h. An increase in the lymph flow across the thoracic duct is seen during absorption phase of digestion. Conversely, a decrease is seen in fasting; consumption of a modified medium-chain triglyceride (MCT) diet¹⁷ or a fat-free diet¹⁸; mechanical ventilation¹⁹ and also the administration of TPN,²⁰ somatostatin analogue,²¹ vasoconstrictor²² and pancreatic lipase inhibitor.⁹ These measures have been used in various combinations in the treatment of post-operative lymph leak.

The principles of treatment of lymph leak are: reduction of the lymphatic flow by physiological or pharmacological manipulation; replacement of fluid and electrolytes and maintenance of nutrition; tissue sealant-related agent or devices and interventional procedure and/or direct surgical closure. In almost all series, nutritional replacement and supplement is felt to be a vital part of support for the patient. Most reports of successful treatment of lymph leak using innovative therapy comprise of small anecdotal cases of different case mix and are reflective of institutional practice.

In our practice, the objectives of reducing lymph flow across main lymphatic ducts and providing nutrition support could be accomplished by a combination regimen of simple clear fluid and TPN. Spontaneous closure of lymph leak was possible in the majority of cases whilst parenteral nutrition was able to meet the estimated nutritional requirements and to replace loss of fluid and electrolytes. Although the use of low-fat MCT diet has been known to reduce lymph leak, it is not used routinely in our practice as it

does not fully bypass the digestive tract of fats while adequately providing the nutrition needed.

Across the body zones, lymph leak in patients after head and neck and also abdominal surgery usually responded to fasting, oral clear fluids and parenteral nutrition alone. However, lymph leak in patients undergoing oesophageal surgery appeared to be an adverse event associated with a significant re-intervention rate (60%) and mortality (30%). This was an observational study rather than a randomised study but the finding that intervention was commonly undertaken for lymph leak in the thorax is consistent with other published literature.^{2,23–25} This may be explained by the extensive injury or even complete extirpation to the lymphatic system after oesophagectomy which is unlikely, or in some instances impossible, to heal without surgical intervention. A space-occupying, septated collection of lymph in the pleural cavity is associated with a decrease in pulmonary volume, increase in intra-pleural pressure with ventilation/perfusion imbalance. This may predispose to pneumonia, sepsis and respiratory failure. However, lymph leak may also simply represent a secondary event associated with the complicated course of patients after oesophagectomy. In the literature, the mortality of lymph leak following oesophagectomy varies from 0% to 50%.^{23,24,26} Early ligation of thoracic duct (within 48 h) is thought to be associated with a lower mortality of 10–16%.²⁵ Recently, an interventional technique using percutaneous lymphangiography and embolization of cisterna chyli has been reported with success.^{27,28}

This was an observational rather than an experimental study. Nevertheless, our study shows that the use of TPN by a dedicated multi-disciplinary team may be an effective primary treatment modality in the majority of patients with post-operative lymph leak.

5. Conclusion

In summary, the prognosis of post-operative lymph leak is primarily related to its body zone. After head and neck and also abdominal surgery most lymph leaks respond well with TPN alone. However, in patients undergoing oesophageal surgery, re-operative intervention seems to be more commonly needed.

Ethical approval

No. This is a retrospective review of a prospectively collected database where no patient contact was made.

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None.

Conflict of interest

None declared.

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