

Chyle Leaks in Upper Gastrointestinal Cancer Surgery



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Background

Upper gastrointestinal cancer surgery has become more radical over the last few years. The field of lymph node dissection has increased at Imperial College Healthcare NHS Trust in response to work being done in Japan, where upper gastrointestinal surgery is pioneered.¹ The purpose of removing as many lymph nodes as possible from the surrounding organs and tissues is to minimise the chances of any microscopic cancer cells being left behind after the resection of the primary tumour, which would lead to a recurrence of the cancer.² However, with an increased removal of lymph nodes follows an increased risk of damage to the lymphatic system. We noted in our Trust a higher incidence of chyle leaks as a result of this extended technique and proposed a clinical audit in order to determine the incidence of chyle leaks after changes in surgical technique, whether the length of stay differed in patients with chyle leaks, and whether the type of nutrition delivered affected recovery time.

Chyle leaks occur as a result of damage caused to the lymphatic system following an accidental surgical snip to the lymph vessels or an incomplete ligation of the lymph vessels. Chyle leaks may occur as part of other surgeries too: radical neck dissections, abdominal aortic aneurysm repair, pancreatic resections, as well as others. Other causes of chyle leaks include: congenital lymphangiectasia, lymphomas, cirrhosis, lymphangioleiomyomatosis and penetrating traumas to the chest or abdomen.³

Chyle, a milky looking substance, is a product produced post digestion of food and is a key way in which the body absorbs and transports fat from the gut. Standard fats that are found in the diet are composed of long chain fatty acids, medium chain fatty acids and short chain fatty acids. When long chain fatty acids are ingested

chylomicrons are formed and enter the lymphatic system as part of the digestion process. This increased uptake of substance into the lymphatic system leads to an increased output via the drain site and prevents the lymphatic vessels from healing whilst these fats are being fed to the patient. Chyle is composed of fats (phospholipids, cholesterol and triglycerides), proteins (albumin, immunoglobulins and fibrinogen), electrolytes, fat soluble vitamins and lymphocytes. Although chyle is frequently identified by its milky appearance in a drain collection, a definitive test to measure the triglyceride content may be carried out. A triglyceride content of $\geq 110\text{mg/dl}$ would confirm the liquid to be chyle.

At the time of surgery, drains are inserted into the body to allow lymph drainage for the first few days, then as the output slows and ceases the drains would be removed. However, if there is a leak, drain output continues and prevents the healing of the lymphatic system. Whilst chyle is being produced the lymphatic vessels are not able to heal and the drains cannot be removed. As such, the patient cannot be progressed onto a normal fat diet. This increases the patient's morbidity and prolongs the length of stay. In order to prevent this phenomenon and to allow the lymphatic vessels to heal, the patient must either be fed a fat-free diet which is not nutritionally complete as it does not include essential fatty acids or fat soluble vitamins, or a diet which is low in long chain fatty acids and conversely high in medium chain fatty acids. If left untreated the chyle leak would cause complications, such as compression of the surrounding tissues, impaired immunity due to the high content of lymphocytes present within chyle, nutritional deficiencies due to the loss of calories, protein and fat soluble vitamins. Metabolic complications due to the loss of fluid and electrolytes may also occur.³

Altering the fat profile of the patient's diet in order to allow the chyle leak to resolve is successful in 60 to 80 per cent of cases.⁷

There is no consensus on chyle management at present,^{4,5,6} with different Trusts providing different treatments. At Imperial College Healthcare NHS Trust, where an enteral route is possible, a medium-chain triglyceride (MCT) feed (see **Table One**) is provided as first line treatment. Where there is no enteral route possible and the patient requires to be nil by mouth (NBM), parenteral nutrition (PN) is provided, and once the patient is allowed to take oral intake a specially devised MCT and very low fat diet is provided. A carefully devised menu was put together with catering to ensure suitable foods would be provided to our patients when a chyle leak was present. The main courses were tailored to provide no more than 2g of fat each, and the desserts and snacks less than 1g of fat each. Recipes using Liquigen were devised, and a combination of Liquigen, Peptamen® Vanilla Bottle and Ensure® Plus Juice were provided in addition to the meals to meet the patient's calorific and protein requirements as best as possible. Written guidance in the form of a diet sheet was produced to give to patients on discharge when the consultants wished for this very low fat diet to be continued another two weeks.

Altering the fat profile of the patient's diet in order to allow the chyle leak to resolve is successful in 60 to 80 per cent of cases.⁷ PN will always result in the cessation of chyle leak whilst it is being provided, however, if the patient has a chylothorax (chyle in the pleural cavity) as opposed to chylous ascites (chyle in the abdomen) then it may be that surgery with ligation of the thoracic duct will be the only method able to finalise the chyle leak in a sensible time frame and permit the patient to return to enteral feeding. Both the specialised enteral nutrition and the use of PN to assist in chyle leak closure are considered conservative measures. Octreotide may also be used to aid the resolution of a chyle leak. However, this is an expensive treatment with increased morbidity. The exact mechanism by which octreotide works is unknown. It is proposed that octreotide causes mild vasoconstriction of splanchnic vessels, including hepatic venous flow. This leads to reduction in gastric, pancreatic and intestinal secretions as well as intestinal absorption. These mechanisms collectively reduce the flow of chyle.⁸

Our audit

A retrospective case note review was carried out in all upper gastrointestinal cancer patients who had surgery (oesophagectomy, subtotal gastrectomy with Roux-en-Y reconstruction or total gastrectomy with Roux-en-Y reconstruction) at St Mary's Hospital between June 2009 and June 2011. The extended surgical lymphadenectomy began after June 2010, thus we collected data from patients before and after the change in surgical management.

113 patients were identified. Dietetic records were reviewed to determine the surgical procedure carried out (oesophagectomy, subtotal gastrectomy with Roux-en-Y reconstruction or total gastrectomy with Roux-en-Y reconstruction), chyle leak occurrence and duration, length of stay, route and type of nutrition used, and clinical course, including any change in the method of nutrition support. Four records were unavailable and three patients were excluded due to insufficient information, leaving 106 for analysis.

The rate of chyle leak between the two years was compared using Fischer's exact test, and the length of stay between those who experienced a leak and those who did not was compared using an independent t-test. The duration of chyle leaks between those who were fed orally and those who were fed enterally (via nasogastric, nasojejunal or jejunostomy tube) was compared using an independent t-test. Patients who were fed a high MCT enteral feed, the number of patients who resolved on oral or enteral nutrition, and the number of patients who were switched to PN to allow their leak to resolve, were calculated with respect to the whole group of chyle leak patients and expressed as percentages. All patients who were fed orally received the special very low fat diet provided by catering as well as the supplements (Liquigen, Peptamen® Vanilla Bottle and Ensure® Plus Juice), and all the patients who were fed enterally received Peptamen® in a volume designed to meet their nutritional requirements.

The rate of chyle leaks increased from 7.8 per cent to 22 per cent ($p=0.06$) following increasingly radical lymphadenectomy, patients with chyle leaks experienced prolonged lengths of stay 16 vs 24 days ($p=0.003$). 73 per cent of patients with chyle leaks resolved with specialised oral (27%) or

Table One: MCT Feeds Available on the Market as of May 2013

Feed Name	MCT content (%)	Kcal/ml	Protein/100ml	Osmolarity mOsm/l
Peptamen®	70.3	1.0	4	200
Peptamen® HN	70	1.3	6.6	350
Peptamen® AF	50	1.5	9.4	380
Vital® 1.5 kcal	64	1.5	6.8	487
Nutrison MCT	60.6	1.0	5.0	265
Perative®	40	1.3	6.7	308
Reconvan	57.5	1.0	5.5	270

enteral feeding (72%); 27 per cent required parenteral nutrition (TPN), of which one patient required surgical closure of the leak despite conservative measures. Those on oral intake had a reduced duration of chyle leak and hospital stay. See Figures 1, 2 and 3.

The results demonstrate that the incidence of chyle leaks increased with increasingly radical surgery. Patients with chyle leaks experienced longer hospital stays as the leak must be resolved before building up to a normal diet, and surveillance is required. The majority of patients' leaks resolve with specialised oral or enteral nutritional measures: a very low fat or MCT diet. Nevertheless, a minority of patients still required PN to enable the leak to heal. The majority of patients that formed part of the group where oral intake was provided, and where there was a reduced duration of the chyle leak and hospital stay, were those who had the least complicated surgery: subtotal gastrectomy with Roux-en-Y reconstruction. Therefore, it is not entirely possible to conclude from this small number that the oral intake per se was the determining factor in reducing the length of the chyle leak and the length of stay; and in view of the small numbers further sub-analyses would be futile.

Conclusions

The results support the use of conservative measures to assist with the resolution of chyle leaks and the figures agree with the literature, where a 60 to 80 per cent success rate is frequently quoted with enteral feeds. There is no specific guidance on when a switch from enteral to parenteral feeding should be considered. Although it is widely accepted that PN has a high success rate in the resolution of chyle leaks, it does carry with it an increased financial cost and risk of sepsis, as well as liver dysfunction and decreased gut immunity.

Whether the provision of an MCT feed immediately after surgery would avoid chyle leaks from occurring by lessening the stress on the lymphatic system in the early phase is yet to be investigated.

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Figure 1: Chyle Leak Rate (%) Pre and Post Radical Lymphadenectomy

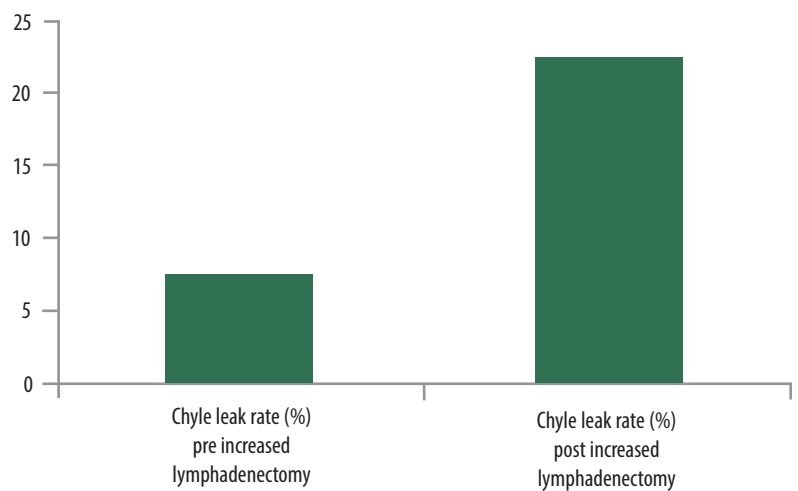


Figure 2: Length of Stay (days) in Patients with and without Chyle Leak

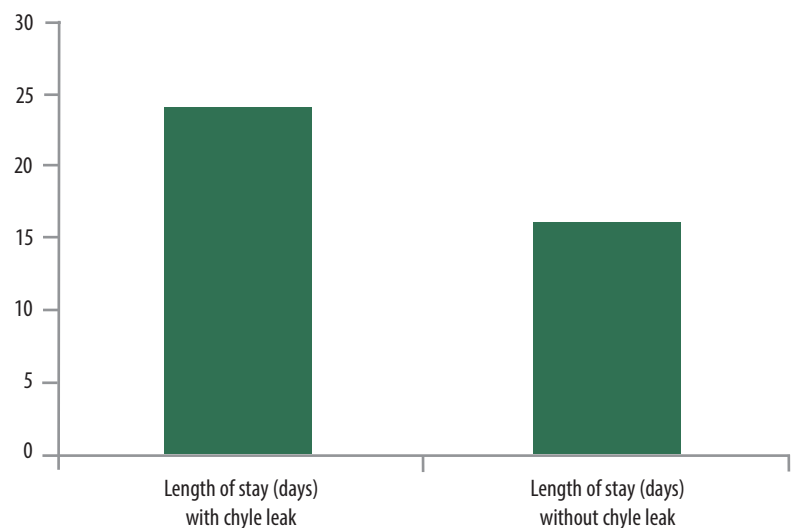


Figure 3: Method by which Chyle Leak was Resolved (%)

