

# Successful conservative treatment of chylothorax following oesophagectomy – a clinical algorithm

FRANK BENEDIX, M.D.

HANS-ULRICH SCHULZ, M.D.

HUBERT SCHEIDBACH, M.D.

HANS LIPPERT, M.D.

FRANK MEYER, M.D.

Department of Surgery, University Hospital, Magdeburg, Germany

## Summary

**Objectives.** Chylothorax is an infrequent but serious complication after thoracic surgery. Optimal management is still controversial. Surgical re-interventions are associated with significant morbidity and mortality.

**Design.** During a 2-year period, 3 patients developed chylothorax after oesophagectomy. This was treated conservatively, following our departmental protocol.

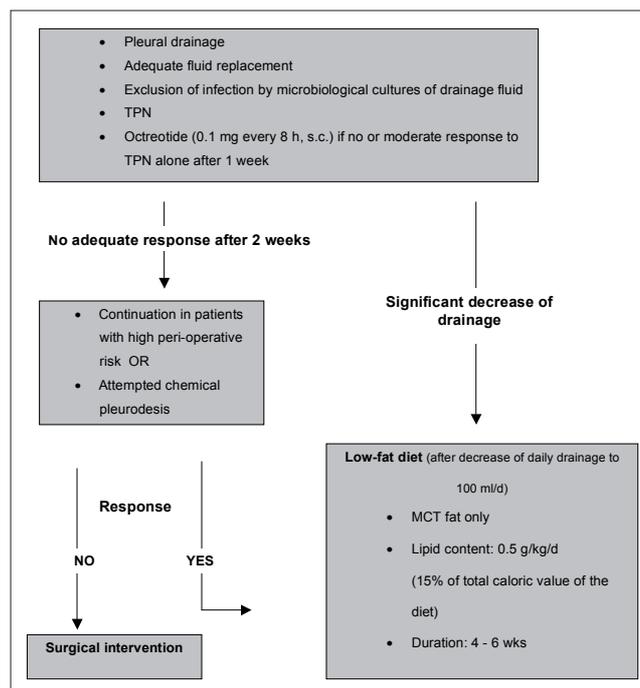
**Results.** Conservative management (total parenteral nutrition, bowel rest, pleural drainage and octreotide, followed by a low-fat diet) was successful in all 3 cases within a reasonable period of time (14 - 18 days).

**Conclusion.** We recommend conservative measures as the first-line treatment for postoperative chylothorax.

The incidence of chylothorax after oesophagectomy ranges from 0.5% to 3% in most reports.<sup>1</sup> Although rare, it can result in life-threatening malnutrition, immunosuppression and metabolic deterioration. In particular, nutritionally debilitated patients with oesophageal cancer cannot tolerate the loss of large amounts of fluid, proteins, vitamins, fat and T cells.<sup>2,3</sup> The optimal management of postoperative chylothorax is controversial. This report discusses current options, and our protocol.

## Patients and methods

During a 2-year period, all patients in our department treated by subtotal oesophagectomy for carcinoma were prospectively analysed. Postoperative chylothorax was confirmed by the presence of chylomicrons in the pleural effusion and triglyceride levels above 6.1 mmol/l. Once the diagnosis was established, therapy was instituted immediately. According to our protocol (Fig. 1), conservative measures (fluid replacement, pleural drainage, total parenteral nutrition (TPN) and bowel rest for 2 weeks) were initiated. In the case of no or moderate



**Fig. 1.** Step-by-step protocol for treatment of postoperative chylothorax (MCT = medium-chain triglycerides; s.c. = subcutaneously; TPN = total parenteral nutrition). Percutaneous embolisation of the thoracic duct is not yet established in our department.

response to TPN alone, octreotide was added. After a significant decrease or cessation of chyle output, patients received a strict low-fat diet with medium-chain triglycerides (MCTs) for at least 4 weeks. After discharge, all patients were seen regularly in the clinic.

## Results

From December 2006 to November 2008, 56 patients underwent sub-total oesophagectomy with two-field

TABLE I. INCIDENCE OF CHYLOTHORAX, PATIENT AGE AND TIME INTERVALS

Incidence of chylothorax	5.4 %
Median age of patients with chylothorax (yrs) (range)	61 (49 - 64)
Median time to diagnosis (d) (range)	10 (9 - 11)
Median time to resolution of chylothorax (d) (range)	16 (14 - 18)
Median hospital stay (d) (range)	31 (27 - 33)
Median follow-up (mo.) (range)	11 (5 - 14)

lymphadenectomy for oesophageal carcinoma. Postoperative chylothorax occurred in 3 patients, all males and aged 49 - 64 years. The median time to diagnosis was 10 days, and to resolution of chylothorax a further 16 days. Two patients required octreotide. There were no further postoperative complications. Hospital stay was 27 - 33 days. The patients were followed up in an outpatient clinic (median follow-up 11 months), with no recurrence of chylothorax (Table I).

**Case 1.** A 49-year-old man with a squamous cell carcinoma of the base of the tongue also had a Barrett's carcinoma. After radiotherapy for the carcinoma of the tongue, subtotal oesophagectomy was performed, with gastric tube transposition. On day 9, the drainage fluid became milky and its volume increased to 600 ml/d. Conservative therapy was immediately initiated. After 8 days, the daily drainage decreased to <150 ml. After 2 weeks of TPN, the drain was removed and a strict low-fat diet with MCT fat was instituted for 4 weeks. Subsequent chest radiographs showed no residual pleural fluid.

**Case 2.** A 64-year-old man underwent sub-total oesophagectomy following neo-adjuvant therapy for a locally advanced adenocarcinoma of the distal oesophagus. On day 11 he became dyspnoeic, with a large right-sided pleural effusion. The chest drain was re-inserted and 2 litres of chylous fluid was drained. With TPN and bowel rest, the drainage fluid cleared and decreased from 1 300 to 800 ml/d within 5 days. However, after 8 days there was no further decrease of daily drainage, so octreotide was started (100 µg 8-hourly subcutaneously) with continuation of TPN. Following this, drainage ceased almost completely and the chest tube was removed after 16 days. A strict MCT diet was instituted and the patient was discharged home 1 week later. There was no recurrence at follow-up.

**Case 3.** A 61-year-old man with Barrett's carcinoma underwent sub-total oesophagectomy. When oral nutrition was initiated on day 10, the drainage fluid became milky and its volume increased to 1 000 ml/d. Because response was only moderate after 6 days of TPN alone, octreotide was added. Subsequently the output of chyle fell to 300 ml/d after 7 days and to 100 ml/d after 18 days. At this stage the chest drain was removed and an MCT diet instituted. The patient was discharged home 4 weeks after initial presentation with no further accumulation of chyle.

## Discussion

Chylothorax is a rare but serious complication after thoracic surgery, particularly after oesophagectomy.<sup>1</sup> It may be caused by extensive mediastinal lymph node dissection with injury to the thoracic duct and/or its tributaries.<sup>2</sup> Early on, diagnosis can be delayed because the fluid may be straw-coloured, not milky white. If drainage persists for more than 5 - 7 days

and chylothorax is suspected, the diagnosis can be confirmed by administration of cream by mouth or via the nasogastric tube.<sup>1</sup> Once an oral diet or enteral feeding has been initiated, chyle assumes its characteristic appearance and can easily be diagnosed. The presence of chylomicrons in the pleural effusion defines the diagnosis. In addition, triglyceride levels >6.1 mmol/l nearly always indicate chylous pleural effusion.<sup>4</sup>

Persistent chylous drainage should initially be treated with bowel rest, TPN and adequate fluid replacement, irrespective of the initial drainage volume. TPN resolves 77% of cases, but can cause problems (increased infection rate, thrombosis or cholestasis).<sup>5</sup> Other options are specific enteral diets rich in MCTs, as they bypass the lymphatic system by direct uptake into the portal circulation. The positive effect of these diets and TPN is some reduction in chyle flow, and this may help seal the leak. However, triglyceride and chylomicron levels can rise after a diet rich in MCT, and water alone can increase drainage by 20% in some patients. This could explain the poor resolution after treatment exclusively with an MCT diet.<sup>6</sup> When a fat-free, non-elemental diet was compared with TPN, the closure rate favoured TPN.<sup>7</sup> Therefore TPN should be the first choice; once drainage has almost ceased, an oral/enteral diet can be instituted. Our experience with 3 cases indicates that a strict MCT diet should then be continued for at least 4 - 6 weeks to prevent recurrence.

Surgery is warranted if there is a poor response to conservative treatment or metabolic complications. Thoracic duct ligation has been the procedure of choice, with the duct typically ligated between the 8th and 12th thoracic vertebrae.<sup>8</sup> However, this type of repair is associated with significant morbidity (nearly 40%)<sup>2</sup> and mortality (as high as 25%<sup>9,10</sup>). Marts *et al.*<sup>11</sup> compared surgical with conservative management, and found that 50% of surgically treated patients developed a significant postoperative infection. Further, surgery may fail to identify the leak and carries the risk of damage to the gastric tube. In the light of these data, the indications for surgery should be reconsidered, particularly in elderly and debilitated patients with a high peri-operative risk.

A promising technique is embolisation of the thoracic duct, which can be accessed by percutaneous puncture of the cisterna chyli or retroperitoneal lymphatics. If catheterisation of the duct is unsuccessful, disruption of small lymphatics by repeated percutaneous needle puncture may interrupt chyle flow to the damaged area of the duct.<sup>12-18</sup> However, these methods need to be further evaluated in larger trials and in centres with expertise in interventional procedures.

Other options include mechanical or chemical pleurodesis with intrapleural infusion of OK-432 or bleomycin.<sup>19,20</sup> Ullibari first described the use of somatostatin in 1990.<sup>21</sup> This benefit has been confirmed in further studies.<sup>22,23</sup>

Although the exact mechanism of action is not clear, the effect is attributed to a slowing of thoracic duct lymph flow.<sup>24</sup> Lim reported the largest series of patients with chylothorax following cardiac surgery;<sup>25</sup> intravenous somatostatin was effective in all 9 patients. In our series, 2 out of 3 patients with a moderate response to TPN were treated with octreotide and TPN. In both cases complete resolution was observed (after 16 and 18 days). It should be noted that most of the encouraging results come from case reports and case series. Again, prospective trials are required to assess efficacy and safety of these drugs in patients with leaks that persist despite dietary interventions. Interestingly, intra-operative application of fibrin glue to seal suspected injuries to the thoracic duct or its tributaries failed to show any benefit.<sup>26</sup> When surgery is not possible and conservative management has failed, pleuroperitoneal shunting may be effective.

The small number of patients in our study makes it difficult to draw confident conclusions for daily clinical practice. Our protocol is only a suggestion how to manage this rare complication. To clarify the efficacy of the algorithm, a randomised multi-centre trial comparing different regimens has been initiated.

In conclusion, we propose conservative treatment of postoperative chylothorax in the first instance. Once chylothorax is diagnosed, pleural drainage, fluid replacement, bowel rest and TPN should be the first steps. If there is no or moderate response to TPN alone (after 1 week), we recommend addition of octreotide to the TPN for 1 - 2 weeks. An MCT diet should be initiated once daily drainage is 100 ml/d or less and should be continued for at least 4 weeks to prevent recurrence. Surgical therapy (thoroscopic thoracic duct ligation) is warranted after 3 weeks of conservative therapy with no or moderate reduction of daily drainage. In patients with high peri-operative risk, chemical pleurodesis can be attempted as an alternative to surgery. Thoracic duct embolisation may become a real alternative to surgery, but it can be technically difficult and expertise is only available in very few institutions.

**Conflict of interest.** The authors declare that they have no conflict of interest.

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