

Conference on ‘Malnutrition matters’

Symposium 3: Nutrition is the cutting edge in surgery: peri-operative feeding

Jejunostomy after oesophagectomy: A review of evidence and current practice

Graeme Couper

Royal Infirmary of Edinburgh, 51 Little France Crescent, Old Dalkeith Road, Edinburgh EH16 4SA, UK

Patients undergoing oesophagectomy often have nutritional needs at the time of diagnosis and in the post-operative period. The aim of this article is to review the current literature and report on the author's experience of routine feeding jejunostomy insertion following oesophagectomy. The records of forty-eight consecutive patients undergoing oesophagectomy under the author's care were reviewed. Although the evidence of benefit of peri-operative feeding in patients undergoing oesophagectomy is limited, there is a clear need to establish a feeding route at the time of surgery. Oesophagectomy is associated with a mortality rate of 5–10% and a morbidity rate of 30–40% even in high-volume specialist centres. Over 50% of patients developing complications will require an alternative to oral feeding beyond 30 d. The enteral route is preferred in terms of safety and cost. A surgical feeding jejunostomy is associated with a low complication rate and a mortality rate of less than 1%. In forty-eight patients undergoing oesophagectomy the average weight loss at 6 months was 8.4 kg with only 8% regaining their pre-operative weight. Large reductions in weight at 6 months post-operatively were recorded irrespective of the development of post-operative complications or early recurrent disease. Routine jejunostomy insertion is recommended to ensure adequate nutrition in patients who develop post-operative complications and for those patients with long-term reduced appetite and poor oral intake.

Oesophageal cancer: Feeding jejunostomy: Peri-operative nutrition

Within Europe, 5-year survival rates for oesophageal cancer patients are low at only 12%⁽¹⁾. In the past 40 years there has been a steady rise in the incidence of oesophageal cancer, principally due to increases in the number of patients diagnosed with adenocarcinoma of the oesophagus. In the period from 1983 to 1997 these rises were greatest in Northern regions, particularly in the United Kingdom and Ireland⁽²⁾. Scotland has among the highest reported incidences at 15.1 per 100 000 person-years for men and 4.2 per 100 000 person-years for women. Unfortunately, the disease tends to present late with patients often malnourished having lost a significant amount of weight due to cancer cachexia or the presence of dysphagia (difficulty in swallowing or inability to swallow) or odynophagia

(painful swallowing of food)⁽³⁾. Surgery remains the best chance for cure but carries one of the highest morbidity and mortality rates for any routinely performed elective procedure^(4,5).

Pre-operative feeding

Poor nutritional status is known to increase operative risks such as infective complications, the development of deep vein thrombosis, impaired wound healing and respiratory failure^(6–10). Significant respiratory complications are reported to occur in 18–30% of cases following oesophagectomy and can carry a 50% mortality rate^(11–14).

Corresponding author: Graeme Couper, fax +44 131 242 3664, email graeme.couper@luht.scot.nhs.uk

All attempts should be made to address nutritional issues as soon as possible after diagnosis, ideally with a dietetic review at the initial clinic appointment.

The majority of patients with swallowing difficulties can tolerate oral supplementation. The enteral route should always be used when possible and on occasion this may involve the passage of a nasogastric feeding tube. Pre-operative total parenteral nutrition should be avoided in well-nourished or mildly undernourished patients as it provides either no benefit or increased morbidity⁽¹⁵⁾.

In a study by Gianotti *et al.* 305 patients undergoing surgery for gastrointestinal cancer were randomised to either pre-operative nutrition alone, pre- and peri-operative nutrition or no nutritional supplementation⁽¹⁶⁾. A clear benefit was demonstrated in the group of patients receiving pre-operative nutrition compared with those in the no-supplement group with a reduction in infection rates from 30 to 13%. Length of hospital stay was shortened from 14 to 11 d. This study demonstrated no additional benefit to the addition of peri-operative nutrition to those patients receiving pre-operative nutrition.

A large number of patients considered suitable for curative resection will receive pre-operative or neo-adjuvant therapy⁽¹⁷⁾. In the United Kingdom most patients receive pre-operative chemotherapy alone based on the Medical Research Council OEO2 trial of Cisplatin and 5-fluorouracil delivered in two cycles⁽¹⁸⁾. This demonstrated a 2-year survival advantage of 9% in the group treated with chemotherapy followed by surgery over the surgery alone group (43% v. 34%). A smaller but significant survival advantage remained at 5-year follow-up (5-year 23% v. 17%). During the time of chemotherapy some patients will have an improvement in their swallow as a result of tumour response to treatment.

Early post-operative feeding

Published literature on the role of early post-operative feeding in patients undergoing oesophagectomy does not demonstrate clear benefit. A meta-analysis of thirteen randomised controlled trials of early feeding (within 24 h) in patients undergoing intestinal surgery reported a reduced mortality but an increased rate of vomiting⁽¹⁹⁾. While vomiting may not be a significant risk factor in colorectal surgery it is a very major concern in oesophageal surgery where the anastomosis lies proximally and vomiting should be avoided at all costs. An anastomotic leak is a catastrophic complication with a high mortality⁽²⁰⁾. Gianotti *et al.* have reported that pre-operative supplementation is as effective as peri-operative nutrition in improving outcome⁽¹⁶⁾. Similarly, a prospective randomised trial of early enteral feeding after upper gastrointestinal surgery with immune-enhancing formula compared with intravenous crystalloid solutions reported no significant differences in minor, major or infectious complications between the two groups⁽²¹⁾. The authors recommended that early enteral feeding with immune-enhancing formula was not beneficial. Evidence that immediate post-operative feeding may have a detrimental effect has been reported⁽²²⁾. This study involved patients undergoing either oesophagectomy or

pancreatoduodenectomy who received immediate post-operative enteral feeding via jejunostomy or no enteral feeding during the first six post-operative days. Post-operative vital capacity and forced expiratory volume (1 s) were lower in the group of patients receiving feeding. Post-operative mobility was also lower in the feeding group. Early mobilisation is essential to reduce the risk of chest infection and pulmonary embolism following oesophagectomy. Post-operative feed should be administered at a controlled rate with particular attention paid to patient's symptoms of abdominal bloating and nasogastric tube output. While few upper gastrointestinal surgeons would support a prolonged period of 'nil-by-mouth' following major surgery many units, including our own, prefer to commence feeding within 48 h of surgery⁽²³⁾.

Post-operative nutrition should be via the enteral route whenever possible to maintain gut integrity and function. A combination of enteral and supplementary parenteral feeding may be required in some cases⁽¹⁵⁾. The cost of total parenteral nutrition is reported to be three to ten times that of enteral nutrition and requires close biochemical monitoring^(23–25). Enteral access can be either by jejunostomy or nasoduodenal tube. A randomised trial comparing feeding jejunostomy with nasoduodenal feeding in patients undergoing oesophagectomy reported both methods were effective in providing enteral feeding⁽²⁶⁾. Tube displacement occurred in 23% of patients with a nasoduodenal tube compared with 6% with a jejunostomy. Thirty percent of patients in the jejunostomy group and 21% in the nasoduodenal tube group required feeding beyond 14 d. Seven patients with anastomotic leaks were discharged with enteral feeding.

Long-term nutritional needs

The main indications for nutritional support in patients undergoing oesophagectomy are for patients who develop a post-operative complication or those with prolonged poor nutritional intake. The need for prolonged periods of feeding following complications of oesophagectomy have been reported in several series^(27–29). In a UK study of 262 consecutive patients undergoing oesophagectomy 63% of patients required enteral nutrition for 10 d or more⁽²⁷⁾. Feeding was started on the first post-operative day via a jejunostomy. Nineteen percent required nutritional support for more than 20 d. In a similar-sized study from India, patients undergoing oesophagectomy received a mean of 16 d on jejunostomy feeding⁽²⁸⁾. Almost two-thirds of the patients developed an anastomotic leak, and half of the patients with post-operative complications required enteral feeding beyond 30 d. No serious complications relating to the jejunostomy were reported in the 204 patients and home feeding was established in those who felt well enough for discharge⁽²⁸⁾. Han-Geurts *et al.* reported an anastomotic leak rate of approximately 9% in 150 patients undergoing oesophagectomy⁽²⁹⁾. The median duration of enteral support via jejunostomy was 11 d with a range of 2–126 d. In patients who require long-term nutritional support a feeding jejunostomy is considered more

Table 1. Weight loss at 6 months following oesophagectomy in thirty-seven patients in relation to the development of post-operative complications and recurrent disease

| | Weight loss at 6 months post-oesophagectomy (kg) | |
|---|--|---------------|
| | Average | Range |
| With post-operative complications (<i>n</i> 17) | 9.7 | +11.9 to -31 |
| Without post-operative complications (<i>n</i> 20) | 6.7 | +4.8 to -15.1 |
| Disease free at 24 months (<i>n</i> 26) | 7.6 | +11.9 to -31 |
| Recurrent disease within 24 months (<i>n</i> 11) | 7.8 | +1.5 to -18.4 |

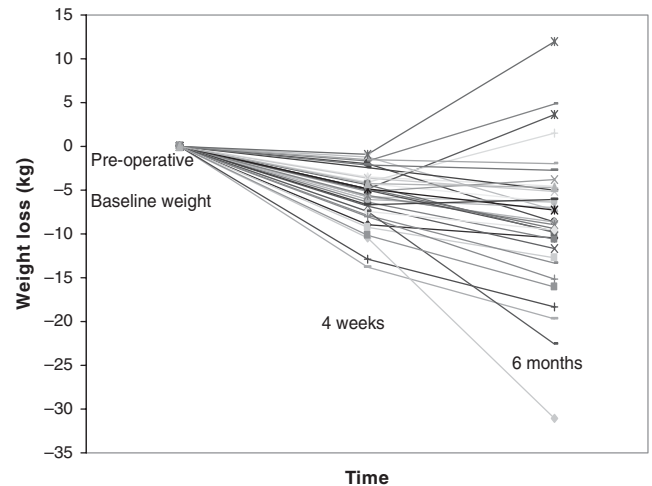
comfortable than a nasoduodenal tube and has a much lower displacement rate⁽²⁷⁾.

Feeding jejunostomies

Several varieties of tube have been described for use as a surgical jejunostomy. The use of a Foley catheter or t-tube is advocated by some and these have the advantage of a wide bore, allowing administration of medications in addition to feed and a potential to reduce the risk of tube blockage. Complications have been reported in relation to intestinal obstruction as a result of over-distension of the catheter balloon⁽³⁰⁾. It is practice in some units to perforate the balloon at the time of insertion to prevent this occurrence. The larger diameter does potentially increase the leak rate and there are now several purposely designed jejunostomy kits available. A feeding jejunostomy can be placed in the vast majority of patients undergoing oesophagectomy⁽²⁸⁾. Reported complication rates for feeding jejunostomy inserted during elective surgery vary greatly from 1.1 to 45%^(29,31–35). The majority of complications reported in modern series are of a minor nature. These include occlusion, catheter displacement and local cellulitis at the site of insertion⁽²⁸⁾. Serious complications include leakage into the peritoneal cavity resulting in peritonitis, volvulus at the point of fixation to the anterior abdominal wall, aspiration pneumonia, necrotising fasciitis or jejunal necrosis at the site of catheter insertion, septicæmia and pneumatosis intestinalis⁽²³⁾.

Personal series

Fifty consecutive patients undergoing oesophagectomy at the Royal Infirmary of Edinburgh under the care of the author were identified from the unit database. Notes were available for forty-eight patients. There were nine females and thirty-nine males. Thirty-eight patients had adenocarcinoma, eight squamous cell carcinoma, one high-grade dysplasia and one neuroendocrine tumour. The average age was 62 years (range 43–82). Twenty-seven patients underwent oesophageal resection using a right thoracic approach and twenty-one a thoroscopically assisted oesophagectomy^(36,37). Thirty-five percent (17/48) had received pre-operative chemotherapy. A feeding jejunostomy using a FREKA[®] surgical jejunostomy set was inserted in all cases and feeding started at 48 h post-operatively. Supplemental feeding was continued until a

**Fig. 1.** Weight change in thirty-five patients undergoing oesophagectomy at 4 weeks and 6 months post-operatively.

dietary review determined that adequate nutrition could be taken orally.

The median length of jejunostomy tube insertion in patients with complications was 11.5 weeks (range 4–32 weeks). In patients without complications the median duration was 8 weeks (1–32 weeks).

The unit policy is to discharge patients home with a jejunostomy tube *in situ* and all patients are taught to flush the tube with water daily. Nine patients (19%) were discharged home on feeding. The main reason was poor oral intake in five patients. Two patients with anastomotic leaks, one patient felt to be at high risk of aspiration and one patient with a temporary recurrent laryngeal nerve palsy were also discharged on home feeding. Four patients required feeding to be restarted at clinic follow-up, all due to poor oral intake. Recorded weights pre-operatively, at 4 weeks and 6 months post-operatively were available for thirty-five out of forty-eight patients (Fig. 1). At 6 months the average weight loss was 8.4 kg with only 8% regaining their pre-operative weight.

A significant reduction in weight at 6 months post-operatively might be expected in those patients developing a significant post-operative complication. A total of twenty-four complications occurred in twenty-one patients (21/48 (44%)). These included ten patients with pneumonia, five anastomotic leaks, one post-operative haemorrhage, one chyle leak, three patients with atrial fibrillation,

one prolonged ileus, one recurrent laryngeal palsy with resolution, one aspiration and one pulmonary embolism. There were no mortalities. Weights were recorded at 6 months post-operatively in seventeen out of twenty-one patients. Large weight losses were recorded in patients irrespective of the development of post-operative complications (Table 1).

All forty-eight patients were beyond 24 months from operation when reviewed. Fourteen patients who developed recurrent disease within 24 months were considered as early recurrence. Three patients survived less than 6 months from surgery. The average weight loss in patients with recurrent disease developing within 24 months at 6 months post-oesophagectomy was similar to the group of patients with no evidence of recurrent disease (Table 1).

Of patients 12.5% (6/48) had minor tube complications. Four fell out at 9 weeks, 12 weeks, 6 months and 7 months without complication. A tube pulled out at 7 d caused no problems. A superficial wound infection at 4 weeks was treated with removal and a short course of oral antibiotics. No tube required replacement or reoperation.

Conclusion

All patients at the time of diagnosis with oesophageal cancer need dietary assessment and supplementation if nutritional intake is poor. Insertion of a surgical jejunostomy in patients undergoing oesophagectomy is safe. Routine insertion is recommended to ensure adequate nutrition in those patients who develop post-operative complications. There is also a clear need for dietary supplementation in those patients with long-term reduced appetite and poor oral intake.

Acknowledgements

The author declares no conflict of interest. This research received no specific grant from any funding agency in the public, commercial or not-for-profit sectors.

References

- Berrino F, De Angelis R, Sant M *et al.* (2007) Survival for eight major cancers and all cancers combined for European adults diagnosed in 1995–99: Results of the EURO-CARE-4 study. *Lancet Oncol* **8**, 773–783.
- Steevens J, Botterweck AAM, Dirx MJM *et al.* (2010) Trends in incidence of oesophageal and stomach cancer subtypes in Europe. *Eur J Gastroenterol Hepatol* **22**, 669–678.
- Edington J, Kon P & Martyn CN (1996) Prevalence of malnutrition in patients in general practice. *Clin Nutr* **15**, 60–63.
- Lerut T, Coosemans W, De Leyn P *et al.* (1999) Is there a role for radical esophagectomy. *Eur J Cardiothorac Surg* **16**, Suppl. 1, S44–S47.
- Ando N, Ozawa S, Kitagawa Y *et al.* (2000) Improvement in the results of surgical treatment of advanced squamous esophageal carcinoma during 15 consecutive years. *Ann Surg* **232**, 225–232.
- Visbal A, Allen M, Miller D *et al.* (2001) Ivor Lewis esophagogastrectomy for esophageal cancer. *Ann Thorac Surg* **71**, 1803–1808.
- Karl R, Schreiber R, Boulware D *et al.* (2000) Factors affecting morbidity, mortality and survival in patients undergoing Ivor Lewis esophagogastrectomy. *Ann Surg* **231**, 635–643.
- Griffin S, Shaw I & Dresner S (2002) Early complications after Ivor Lewis subtotal esophagectomy with two-field lymphadenectomy: Risk factors and management. *J Am Coll Surg* **194**, 285–297.
- Mariette C, Taillier G, Van Seuning I *et al.* (2004) Factors affecting postoperative course and survival after en bloc resection for esophageal carcinoma. *Ann Thorac Surg* **78**, 1177–1183.
- Law S, Wong KH, Kwog KF *et al.* (2004) Predictive factors for postoperative pulmonary complications and mortality after esophagectomy for cancer. *Ann Surg* **240**, 791–800.
- Smithers BM, Gotley DC, Martin I *et al.* (2007) Comparison of the outcomes between open and minimally invasive esophagectomy. *Ann Surg* **245**, 232–240.
- Tandon S, Batchelor A, Bullock R *et al.* (2001) Peri-operative risk factors for acute lung injury after elective oesophagectomy. *Br J Anaesth* **86**, 633–638.
- Rindani R, Martin C & Cox M (1999) Transhiatal versus Ivor-Lewis oesophagectomy: Is there a difference? *Aust N Z J Surg* **69**, 187–194.
- Rente J, Bull D, Harpole D *et al.* (2003) Transthoracic versus transhiatal esophagectomy: A prospective study of 945 patients. *J Thorac Cardiovasc Surg* **125**, 1114–1120.
- Braga M, Ljungqvist O, Soeters P *et al.* (2009) ESPEN guidelines on parenteral nutrition: Surgery. *Clin Nutr* **28**, 378–386.
- Gianotti L, Braga M, Nespoli L *et al.* (2002) A randomized controlled trial of preoperative oral supplementation with a specialized diet in patients with gastrointestinal cancer. *Gastroenterology* **122**, 1763–1770.
- Halliday BP, Skipworth RJ, Wall L *et al.* (2007) Neoadjuvant chemotherapy for carcinoma of the oesophagus and oesophago-gastric junction: A six-year experience. *Int Semin Surg Oncol* **4**, 24.
- MRC OEO2 (Medical Research Council Oesophageal Cancer Working Group) (2002) Surgical resection with or without preoperative chemotherapy in oesophageal cancer: A randomised controlled trial. *Lancet* **359**, 1727–1733.
- Lewis SJ, Andersen HK & Thomas S (2009) Early enteral nutrition within 24 h of intestinal surgery versus later commencement of feeding: A systematic review and meta-analysis. *J Gastrointest Surg* **13**, 569–575.
- Lerut T, Coosemans W, Decker G *et al.* (2002) Anastomotic complications after esophagectomy. *Dig Surg* **19**, 92–98.
- Heslin MJ, Latkany L, Leung D *et al.* (1997) A prospective, randomized trial of early enteral feeding after resection of upper gastrointestinal malignancy. *Ann Surg* **226**, 567–577.
- Watters JM, Kirkpatrick SM, Norris SB *et al.* (1997) Immediate postoperative enteral feeding results in impaired respiratory mechanics and decreased mobility. *Ann Surg* **226**, 369–377.
- Wakefield SE, Mansell BN, Baigrie RJ *et al.* (1995) Use of a feeding jejunostomy after oesophagogastric surgery. *Br J Surg* **82**, 811–813.
- Bower RH, Talamini MA, Sax HC *et al.* (1986) Post-operative enteral vs parenteral nutrition. A randomized controlled trial. *Arch Surg* **121**, 1040–1045.

25. Baigrie RJ, Devitt PG & Watkin DS (1996) Enteral versus parenteral nutrition after oesophagogastric surgery: A prospective randomized comparison. *Aust N Z J Surg* **66**, 668–670.
26. Han-Geurts IJ, Hop WC, Verhoef C *et al.* (2007) Randomized clinical trial comparing feeding jejunostomy with nasoduodenal tube placement in patients undergoing esophagectomy. *Br J Surg* **94**, 31–35.
27. Sica GS, Sujendran V, Wheeler J *et al.* (2005) Needle catheter jejunostomy at esophagectomy for cancer. *J Surg Oncol* **91**, 276–279.
28. Gupta V (2009) Benefits versus risks: A prospective audit. Feeding jejunostomy during esophagectomy. *World J Surg* **33**, 1432–1438.
29. Han-Geurts IJM, Verhoef C & Tilanus HW (2004) Relaparotomy following complications of feeding jejunostomy in esophageal surgery. *Dig Surg* **21**, 192–196.
30. Chester JF & Turnbull AR (1988) Intestinal obstruction by overdistension of a jejunostomy catheter balloon: A salutary lesson. *J Parenter Enteral Nutr* **12**, 410–411.
31. Brandmair W & Lehr L (1988) Early postoperative feeding following esophageal resection. *Langenbecks Arch Chir* **373**, 248–255.
32. Gerndt SJ & Orringer MB (1994) Tube jejunostomy as an adjunct to esophagectomy. *Surgery* **115**, 164–169.
33. Mercer CD & Mungara A (1996) Enteral feeding in esophageal surgery. *Nutrition* **12**, 200–201.
34. Yagi M, Hashimoto T, Nezuka H *et al.* (1999) Complications associated with enteral nutrition using catheter jejunostomy after esophagectomy. *Surg Today* **29**, 214–218.
35. Date RS, Clements WDB & Gilliland R (2004) Feeding jejunostomy: Is there enough evidence to justify its routine use? *Dig Surg* **21**, 142–145.
36. Akiyama H, Tsurumaru M, Udagawa H *et al.* (1994) Radical lymph node dissection for cancer of the thoracic esophagus. *Ann Surg* **220**, 364–372.
37. Smithers BM, Gotley DC, McEwan D *et al.* (2001) Thoracoscopic mobilization of the esophagus. A 6 year experience. *Surg Endosc* **15**, 176–182.