The impact of operative approach on outcome of surgery for
gastro-oesophageal tumours
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Abstract

Background: The choice of operation for tumours at or around the gastro-oesophageal junction
remains controversial with little evidence to support one technique over another. This study
examines the prevalence of margin involvement and nodal disease and their impact on outcome
following three surgical approaches (Ivor Lewis, transhiatal and left thoraco-laparotomy) for these
tumours.

Methods: A retrospective analysis was conducted of patients undergoing surgery for distal
oesophageal and gastro-oesophageal junction tumours by a single surgeon over ten years.
Comparisons were undertaken in terms of tumour clearance, nodal yield, postoperative morbidity,
mortality, and median survival. All patients were followed up until death or the end of the data
collection (mean follow up 33.2 months).

Results: A total of 104 patients were operated on of which 102 underwent resection (98%).
Median age was 64.1 yrs (range 32.1–79.4) with 77 males and 25 females. Procedures included 29
Ivor Lewis, 31 transhiatal and 42 left thoraco-laparotomies. Postoperative mortality was 2.9% and
median survival 23 months. Margin involvement was 24.1% (two distal, one proximal and 17
circumferential margins). Operative approach had no significant effect on nodal clearance, margin
involvement, postoperative mortality or morbidity and survival. Lymph node positive disease had a
significantly worse median survival of 15.8 months compared to 39.7 months for node negative (p
= 0.007), irrespective of approach.

Conclusion: Surgical approach had no effect on postoperative mortality, circumferential tumour,
nodal clearance or survival. This suggests that the choice of operative approach for tumours at the
gastro-oesophageal junction may be based on the individual patient and tumour location rather
than surgical dogma.

Background
Distal oesophageal and gastro-oesophageal junction (GOJ) tumours now represent the commonest oesopha-
geal tumour type in many western countries [1]. GOJ
tumours are further classified as either lower third
oesophageal with GOJ involvement (Siewert type I), true
junctional (Siewert type II) or gastric cardia/fundal can-
cers with GOJ involvement (Siewert type III) [2]. In prac-
tice the precise classification is difficult and this may pose difficulties when deciding on the optimal surgical approach. Although a transabdominal technique is applicable to surgical resection of tumours of the gastric cardia/ fundus (Siewert type III), a number of different approaches have been employed for surgical resection of cancer of the distal oesophagus and Siewert type I and II GOJ tumours.

It is claimed that the surgical approach used for these tumours may influence the ability to obtain tumour clearance and therefore impact upon survival. However, studies directly comparing different surgical approaches are difficult to interpret and have yielded contradictory results. The Ivor Lewis transthoracic and transhiatal approaches have been compared in patients with oesophageal cancer in terms of duration of procedure, hospital stay, postoperative outcome and survival, with no obvious benefit to either approach [3-8]. These studies include three randomised controlled trials and show no significant difference in rates of anastomotic leakage, postoperative mortality or survival between the approaches [4-6]. Only three studies have addressed specifically tumours of the distal oesophagus, GOJ and gastric cardia, with only Sasako et al., noting a higher morbidity in patients undergoing the left thoraco-laparotomy approach in comparison to transhiatal techniques [8-10]. Population based figures from the Scottish Audit of Gastric and Oesophageal Cancer (SAGOC), showed that there was little difference in outcome between the three commonest operative approaches for oesophageal cancer i.e. transhiatal, Ivor Lewis and left thoraco-laparotomy [11].

Irrespective of the approach utilised, positive surgical resection margins have been shown to adversely impact upon loco-regional recurrence and long term survival in oesophageal cancer patients [12-15]. Although achieving adequate nodal clearance per se has not been shown to the influence prognosis, the lymph node yield carries prognostic information in the presence of node positive disease [4,7,16].

This study focuses on tumours of the distal oesophagus and the gastro-oesophageal junction (Siewert types I and II) which now represent the commonest tumour type in western societies. It compares three surgical approaches in terms of resection margin clearance, lymph node yield and the prevalence of positive nodal disease and their impact on outcome.

**Methods**

Data was collected prospectively and analysed retrospectively on patients with oesophageal and gastro-oesophageal (GOJ) tumours undergoing potentially curative surgery between 1994 and 2003.

**Tumour location**

Analysis was focused on oesophageal tumours in the distal third of the oesophagus (>33 cm ab orum) and type I and II tumours of the GOJ according to the Siewert classification [2]:

Type I tumours – adenocarcinoma of the distal oesophagus with the bulk of the disease 1 to 5 cm above the GOJ, arising from Barrett’s epithelium

Type II tumours – true adenocarcinoma of the cardia arising from the cardiac epithelium or short segments with intestinal metaplasia at the GOJ, with the bulk of tumour 1 cm above to 2 cm below the GOJ.

**Clinical staging**

All subjects were medically fit (ASA grade I – III, WHO performance status ≤ 2) and underwent initial staging consisting of endoscopy, chest radiograph and thoracic and abdominal computerised tomography (CT) scan with contrast. Abdominal ultrasound scanning was performed to evaluate any abnormalities identified on the abdominal CT and a barium swallow performed if the endoscope was unable to traverse the lesion. During the final year of the study patients underwent endoscopic ultrasound as part of the staging process. Staging laparoscopy was performed to assess some type I and II tumours, based on radiological findings and at the surgeons discretion. All patients were discussed within the Upper Gastro-intestinal Multi-Disciplinary Team meeting, consisting of oncologists, radiologists and surgeons with a sub-specialty interest in gastro-oesophageal disease.

**Surgery**

Surgery was performed two to four weeks following the completion of neo-adjuvant chemotherapy. During the early study period, patients were randomised to receive neo-adjuvant or no neo-adjuvant chemotherapy as part of the OE02 trial, while latterly all patients received neo-adjuvant chemotherapy based on the results of this trial [17]. All but seven patients completed the two cycles of chemotherapy.

One of three surgical approaches (Ivor Lewis, transhiatal or left thoraco-laparotomy) was performed by a single surgeon at a single institution. A gastric tube was formed for the neo-oesophagus for all patients. A left thoraco-laparotomy approach through the 8th intercostal space was the operation of choice for GOJ tumours in the early part of the study. This was gradually phased out and replaced by a transhiatal approach during the study.
period and is now generally reserved for patients with
deep chests or who are obese.

The transhiatal approach was used selectively for tumours
less than 6 cm in length and when the whole tumour
could be dissected under direct vision from within the
abdomen after enlargement of the hiatus with a left sided
cervical anastomosis. Two patients were converted from
the transhiatal to Ivor Lewis approach during surgery.

Pathology
Pathological staging was performed according to the crite-
ria from the American Joint Committee on Cancer [18].
All tumours underwent complete macroscopic clearance
(R0/R1). Overall margin involvement included, either dis-
tal, proximal and/or circumferential resection margins
(CRM). Evidence of tumour 1 mm or less from any surface
was taken as a positive margin. The lymph node yield as
well as the number of tumour positive lymph nodes was
documented.

Follow up
All patients were followed up until death or the end of
the data collection (August 2004) with a mean follow up of
33.2 months. Documented postoperative morbidity
included anastomotic leak (based on clinical and/or radi-
ological evidence with all patients undergoing a water sol-
uble contrast swallow on the fifth post operative day),
chest infection/pneumonia (clinical and/or radiological
evidence) and cardiac complications (myocardial infarc-
tion/ischaemia or dysrhythmias on electrocardiogram or
elevation in cardiac enzymes). Postoperative mortality
was defined as 30-day mortality. In hospital mortality is
also depicted.

Statistical analysis
Survival analysis was performed using Kaplan-Meier sur-
vival curves with comparisons drawn using log rank test.
Test of association used the Chi-squared statistic, Fishers
exact test (2-sided) or One Way ANOVA (Statistical Pack-
age for Social Sciences (SPSS) version 12.1). Statistical sig-
nificance was denoted by a $p$ value of <0.05.

Results
Patient and tumour characteristics
104 patients with distal third oesophageal or type I/II GOJ
tumours underwent surgery within a 10 year period. Sur-
gical resection was possible in 102 patients (98%). In two
patients abdominal exploration identified more advanced
disease than had been evident on preoperative staging
precluding resectional surgery. There was no significant
difference in patient demographics between each of the
operative approaches used (table 1) with a median age of

### Table 1: Patient and tumour characteristics

| Characteristic          | Ivor Lewis | Transhiatal | Left Thoraco-laparotomy | $p$ value |
|-------------------------|------------|-------------|--------------------------|-----------|
| Number Resected         | 29         | 31          | 42                       |           |
| Median Age (years)      | 61.8       | 64.0        | 66.6                     | 0.858     |
| Male                    | 20         | 23          | 34                       | 0.503     |
| Histology               | Adenocarcinoma | Squamous Cell | Carcinoma         |           |
|                         | 22         | 29          | 37                       | 0.125     |
| Stage                   | I          | 5           | 6                        | 0.013     |
|                         | II A       | 13          | 10                       | 0.594     |
|                         | II B       | 2           | 7                        | 0.191     |
|                         | III        | 8           | 8                        | 0.092     |
|                         | IV A       | 1           | 0                        | 0.281     |
| Tumour Location         | Oesophageal | 21          | 12                       | 0.002     |
|                         | GOJ        | 8           | 19                       | 0.29      |
| Neoadjuvant chemotherapy| 11         | 15          | 17                       | 0.686     |

![Figure 1](image_url)

Distribution of procedures over time.
64.1 years (range 32.1 – 79.4), with 77 males and 25 females. As expected, adenocarcinoma was the dominant histological type with tumours at this location.

**Tumour location and stage**
46 (45%) tumours were located within the distal oesophagus whilst 56 tumours were classified as GOJ tumours. As expected, the Ivor Lewis approach was performed more often for distal third oesophageal tumours and transhiatal/left thoraco-laparotomy approach more often for GOJ tumours ($p = 0.002$) (table 1). There were significantly fewer stage I tumours within the left thoraco-laparotomy group ($p = 0.013$) although the proportion of stage I tumours was similar for both the Ivor Lewis and transhiatal groups.

**Treatment**
There was no difference in the proportion of patients receiving neo-adjuvant chemotherapy between each of the operative approaches used as all patients were subject to identical randomisation protocols for the OEO2 trial (table 1). Figure 1 displays the distribution of each procedure over the study period demonstrating a phased withdrawal of the thoraco-laparotomy approach in favour of a transhiatal technique.

**Postoperative morbidity and mortality**
Overall 53 patients (52%) suffered a significant postoperative complication, the most common of which was chest infection (31%), followed by cardiac events (11%) and anastomotic leak (10%) (table 2). There was no statistically significant difference between the incidence of complications and the different surgical approaches ($p = 0.864$), although chest infections tended to occur more frequently in patients undergoing an Ivor Lewis approach and anastomotic leakage was more common in patients with a neck anastomosis in the transhiatal approach. The overall postoperative mortality was 2.9%, with similar rates for each of the three techniques used (table 3). In hospital mortality was 4.9%. Tumour location had no impact on postoperative mortality.

**Survival**
Irrespective of the approach, the overall median survival was 23 months, with a one and five year survival of 68% and 20% respectively. The median survival for those undergoing the Ivor Lewis, transhiatal and left thoraco-laparotomy were 18, 44 and 17 months respectively ($p = 0.395$), with five year survival displayed in figure 2. Tumour location had no impact on survival (table 3). The use of neo-adjuvant chemotherapy had no significant effect on five year survival, (figure 3). The study period was analysed as an influential variable on survival and was found to have no significant impact on five year survival, $p = 0.442$ (figure 4).

**Lymph node yield**
Comparisons of nodal yield and tumour margins were based on 83 cases with full pathological data available (25 Ivor Lewis, 25 transhiatal and 33 left thoraco-laparotomy). The median number of resected nodes was similar irrespective of the operative approach used, Ivor Lewis (9, range 2–16), transhiatal (8, range 1–18) and left thoraco-laparotomy (7, range 0–23) ($p = 0.285$) (figure 5a).
Tumour location had no effect on nodal yield ($p = 0.898$). In those with full pathology data available ($n = 83$), 45 patients had one or more lymph nodes positive for tumour. The median number of lymph nodes involved were 0 (range 0–8), 1 (range 0–7) and 1 (range 0–13) respectively for the Ivor Lewis, transhiatal and left thoraco-laparotomy approaches (figure 5b). Lymph node positive tumours had a significantly reduced median survival of 15.8 months in comparison to 39.7 months for lymph node negative tumours ($p = 0.007$) (figure 6).

**Circumferential tumour margin**

Overall margin involvement, including two distal, one proximal and 17 circumferential margins (CRM), was 24.1% (20 of 83) with a positive CRM accounting for 85% of these cases. There was no significant difference between the three techniques in the prevalence of CRM involvement (Ivor Lewis 5, transhiatal 6, left thoraco-laparotomy 6) ($p = 0.860$) (table 4). Tumour location had no impact on CRM involvement (distal oesophageal 6, GOJ 11) ($p = 0.451$). Tumour T stage had a significant impact on CRM, $p = 0.005$, with all apart from one (T2 tumour, Ivor Lewis) CRM involvement occurring in T3–4 disease. Neo-adjuvant chemotherapy did not affect CRM involvement ($p = 0.172$).

There was no significant difference in the median survival between overall (inclusive of circumferential, proximal and distal resection margins) positive and negative resection margins of 17.4 and 23.4 months, respectively, ($p = 0.836$) irrespective of surgical approach used. Although the difference in median survival of CRM positive patients was worse, at 17.4 months compared to 32.8 months for CRM negative tumours (figure 7), this did not reach statistical significance ($p = 0.195$). Higher T staging lead to a more likely positive CRM and therefore a trend effect on survival (although not significant). This is intuitive and as shown in our study in that all but one of the CRM positives occurred in higher T stage tumours. The one case of a T2 tumour with a positive CRM was clearly a disappointing reflection of inadequate surgical clearance.

**Discussion**

The choice of operation for tumours at or around the gastro-oesophageal junction remains controversial with little evidence to support one technique over another. Indeed a population based audit demonstrated a number of different techniques used for oesophageal and gastro-oesophageal cancers, the three most common being: Ivor Lewis (30%), left thoraco-laparotomy (30%) and transhiatal (15%) [11].

In this study we have compared these three approaches undertaken by a single surgeon, over a 10 year period, so eliminating inter-operator variability, which may be greater than the differences between techniques per se, as shown in previous surgical studies [19]. The reduction in
the number of resections performed each year is explained by the employment of a further two surgeons undertaking oesophago-gastric cancer resections. The resections performed by the other two surgeons were deliberately not included in order to reduce inter-operator variability. This was not a randomised trial but rather a pragmatic and practical approach to tailor the operative technique to the individual patient and tumour location and length. The transhiatal approach was limited to tumours in which dissection could be performed under direct vision to beyond the tumour and the Ivor Lewis technique applied to longer and more proximally situated tumours. During the study period, there was a deliberate and phased withdrawal of the left thoraco-laparotomy approach which was then reserved for patients with deeper chests or obesity. The selection of surgical approach was therefore performed on the basis of tumour length and location (i.e. Ivor Lewis versus transhiatal/Left thoraco-laparotomy), and not on the basis of stage.

The overall postoperative mortality in this series (2.9%) compares favourably to population based figures [11] and individual series comparing the three procedures [20-22]. Similarly, the one-year survival in this series was 68% with a five-year survival of 20% (median survival was 23 months) which is similar to reported series [13]. Although some reports have suggested a trend towards reduced long term survival with the transhiatal approach, no significant difference between the procedures in terms of disease free survival have been reported. Furthermore these studies have included patients with disease of the mid oesophagus for which the transhiatal approach may not be appropriate [5,9]. In contrast this series found a trend towards improved survival amongst the transhiatal resections. This is likely to represent the selective approach employed rather than any oncological advantage to the transhiatal method of oesophagectomy.

We found in this series, as have others, that patients with positive lymph nodes had a significantly worse prognosis than lymph node negative patients [4,7]. The value of extended lymphadenectomy in oesophageal cancer remains controversial [5,23,24]. In this series the surgical approach did not influence the number of lymph nodes recovered and an en-bloc resection of a junctional tumour is possible with each of the approaches used. Although the number of harvested nodes remains low in this series compared with others [5,7], three studies have also reported a similar low node harvest [9,15,25] with Stark et al., removing on average of 10.7 and 10.8 nodes for the transhiatal and Ivor Lewis approaches, respectively [9]. The lymph node yield is not only reflective of the surgery, but also of the pathological reporting systems. During the study period, no clear guidelines existed in the United Kingdom [26] as to the minimum number of nodes to be assessed, in comparison with other consensus groups [27], a possible explanation for the low lymph node yield. Furthermore, there may have been relative under staging due to the use of neo-adjuvant chemotherapy.

Table 4: Margin involvement

| Resection Margin | Procedure          | p value |
|------------------|--------------------|---------|
|                  | Ivor Lewis | Transhiatal | Left Thoraco-laparotomy |
| Overall          | 19         | 18         | 26       | 0.836 |
| Margins Clear    | 6          | 7          | 7        |
| Margins Involved | Proximal    | 0          | 0        | 1       |
|                  | Distal      | 1          | 1        | 0       |
|                  | CRM         | 5          | 6        | 6       | 0.860 |

Figure 4
Influence of study period on five year survival.
A postoperative complication occurred in 52% of patients in this series, similar to that of national figures [11]. Although there was a trend towards a reduced incidence of pulmonary complications with the transhiatal approach, this did not reach statistical significance. A trend towards an increased cervical anastomotic leak rate was noted in transhiatal resections consistent with findings noted by some [9,28] but not all studies [5,29].

Tumour clearance was similar with each approach used with a positive CRM being present in 20.5% of cases, with neo-adjuvant chemotherapy having no effect on CRM involvement. This was lower than reported in the SAGOC study with a 31% positive CRM [11]. As expected, tumour T stage had a significant effect on circumferential tumour clearance, with only one T2 tumour having a circumferential positive margin. This was a clearly disappointing reflection of inadequate surgical clearance. Distribution of tumour stage was only significantly skewed in stage I tumours and as expected, this had no effect on the overall proportion of positive resection margins. Reported rates of CRM involvement in the literature vary from 7–47% and as well as reflecting surgical technique, they may also vary according to the definition of positive resection margins [3,12-14,30]. Higher rates have been reported when a strict definition of any tumour within 1 mm of the margin is included. This was the definition used in this study and in the SAGOC report where positive CRM patients had a one year survival of 39% compared to 68% with a negative CRM [11]. Furthermore, in a study comparing gastrectomy to oesophagectomy for type II and III tumours, Ito et al demonstrated margin involvement to be an independent prognostic factor [15]. It is therefore important that clear resection margins are achieved. In this series, surgical approach did not alter margin involvement which may be due to our selection process, although it may be influenced by the small numbers. The overall rate of positive CRM must be reduced and strategies for doing so may include improved patient staging and neoadjuvant therapy. The impact of endoscopic ultrasound in this situation is being investigated as part of a major ongoing trial [31]. However, it is likely that surgical philosophy may be equally if not more important with surgery being reserved for patients in whom an R0 resection is most likely rather.

**Conclusion**

In this series, the surgical approach for distal oesophageal and oesophago-gastric tumour resection had no effect on postoperative mortality, survival, circumferential tumour clearance or nodal yield. We suggest that the choice of operative approach for tumours at or around the gastro-oesophageal junction may be based upon the individual patient and tumour location and length rather than surgical dogma.
1. Dolan K, Sutton R, Walker SJ, Morris AI, Campbell F, Williams EM: New classification of oesophageal and gastric carcinomas derived from changing patterns in epidemiology. Br J Cancer 1999, 80:834-842.

2. Siewert JR, Stein HJ: Classification of adenocarcinoma of the oesophagogastric junction. Br J Surg 1998, 85:1457-1459.

3. Pommier RF, Vetto JT, Ferris BL, Wilmarth TJ: Relationships between operative approaches and outcomes in oesophageal cancer. Am J Surg 1998, 175:422-425.

4. Goldminc M, Maddern G, Le Prise E, Meunier B, Campion JP, Launois B: Oesophagectomy by a transthoracic approach or thoracotomy: a prospective randomised trial. Br J Surg 1993, 80:367-370.

5. Balschun JBF, van Sandick JW, De Boer AGEM, Wijnhoven BPL, Tijssen JGP, Fockens P, Stalmeier PFM, Ten Kate FJW, van Delkhen K, Obertop H, Tilanus HW, van Lanschot JJB: Extended transthoracic resection compared with limited transthoracic resection for adenocarcinoma of the oesophagus. N Engl J Med 2002, 347:1662-1669.

6. Chu K-M, Law SYK, Fok M, Wong J: A prospective randomised trial of transthoracic and transthoracic resection of lower third oesophageal carcinoma. Am J Surg 1997, 174:320-324.

7. Johansson J, DeMeester TR, Hagen JA, DeMeester SR, Peters JH, Ober S, Brenner CG: En bloc vs transthiatal oesophagectomy for stage T3 N1 adenocarcinoma of the distal oesophagus. Arch Surg 2004, 139:627-633.

8. Goldfaden D, Orringer MB, Appelman HD, Khalil R: Adenocarcinoma of the distal esophagus and gastric cardia. Comparison of results of transhiatal esophagectomy and thoracoabdominal esophagogastricectomy. J Thorac Cardiovasc Surg 1986, 91:242-247.

9. Stark SP, Romberg MS, Pierce GE, Herrmreck AS, Jewell WR, Moran JF, Cherian G, Delcore R, Thomas JH: Transhiatal versus transthoracic oesophagectomy for adenocarcinoma of the distal oesophagus and cardia. Am J Surg 1996, 172:478-482.

10. Sasako M, Sano T, Yamamoto S, Sairenji M, Arai K, Kinoshita T, Nashimoto A, Hiratsuka M: Left thoracoabdominal approach versus abdominal transthoracic approach for gastric cancer of the cardia or subcardia: a randomised controlled trial. Lancet 2006, 367:651.

11. Gilbert FJ, Park KGM, Thompson AM, Eds: Scottish Audit of Gastric and Oesophageal Cancer. Report 1997–2000. A prospective audit [http://www.crag.scot.nhs.uk/committees/CEPS/reports/0_prelims.pdf]. [Last accessed on August 4, 2007]

12. Dexter SPL, Sue-Ling H, McMahon MJ, Quirke P, Mapstone N, Martin IG: Circumferential resection margin involvement: an independent predictor of survival following surgery for oesophageal cancer. Gut 2001, 48:667-670.

13. Mulligan ED, Dunne B, Griffithing M, Keeling N, Reynolds JV: Margin involvement and outcome in oesophageal carcinoma: a 10-year experience in a specialist unit. Eur J Surg Oncol 2004, 30:313-317.

14. Law S, Arcilla C, Chu K-M, Wong J: The significance of histologically infiltrated resection margin after oesophagectomy for oesophageal cancer. Am J Surg 1998, 176:286-290.

15. Ito H, Clancy TE, Osseen RT, Swanson RS, Bueno R, Sugarbaker DJ, Ashley SW, Zinner MJ, Whang EE: Adenocarcinoma of the gastric cardia: What is the optimal surgical approach? J Am Coll Surg 2004, 199:880-886.

16. Akiyama H, Tsurumaru M, Udagawa H, Lajiyama Y: Radical lymph node dissection for cancer of the thoracic oesophagus. Ann Surg 1994, 220:364-373.

17. MRC Oesophageal Cancer Working Party: Surgical resection with or without preoperative chemotherapy in oesophageal cancer: a randomised controlled trial. Lancet 2002, 359:1727-1733.

18. Esophagus: American Joint Committee on Cancer: AJCC Cancer Staging Manual 6th edition. New York: Springer; 2002.

19. Hartrink HH, van de Velde CJH, Putter H, Boeninkamp J, Klein Kranenberg E, Songun I, Welvaart K, van Krieken JHJM, Meijer S, Plukker JTM, van Elk PJ, Obertop H, Gouma DJ, van Lanschot JJB, Taat CW, de Graaf PW, van Meyelendift MF, Tilanus H, Sasako M: Extended lymph node dissection for gastric cancer: Who may benefit? Final results of the randomised Dutch gastric cancer group trial. J Clin Oncol 2004, 22:2069-2077.

20. Jamieson GG, Mathew G, Ludemann R, Wayman J, Myers JC, Devitt PG: Postoperative mortality following oesophagectomy and problems in reporting its rate. Br J Surg 2004, 91:943-947.

21. Gotley DC, Beard J, Cooper MK, Britton DC, Williamson RC: Abdominocervical (transthiatal) oesophagectomy in the management of oesophageal carcinoma. Br J Surg 1990, 77:815-819.
22. Mattioli S, Di Simone MP, Ferruzzi L, D’Ovidio F, Pilotti V, Carella R, D’Errico A, Grigioni WF: Surgical therapy for adenocarcinoma of the cardia: modalities of recurrence and extension of resection. Dis Esophagus 2001, 14:104-109.

23. Fok M, Law S, Stipa F, Cheng S, Wong J: A comparison of transhiatal and transthoracic resection for oesophageal carcinoma. Endoscopy 1993, 25(Suppl):660-663.

24. Hagen J, Peters J, DeMeester T: Superiority of extended en bloc esophagogastrectomy for carcinoma of the lower oesophagus and cardia. J Thorac Cardiovasc Surg 1993, 106:850-858.

25. Han S, Sakinci U, Dural K: Left thoracophrenotomy and cervical approach in the surgery of distal third oesophageal and cardia tumours. ANZ J Surg 2005, 75:1045-1048.

26. Mapstone N: Minimum dataset for oesophageal carcinoma histopathology reports 2007 [http://www.rcpath.org/resources/pdf/G006OesophagealdatasetFINALFeb07.pdf]. London: The Royal College of Pathologists [last accessed on August 4, 2007]

27. Fumagalli U, Akiyama H, DeMeester TR: Resective surgery for cancer of the thoracic esophagus: results of a consensus conference held at the Vth World congress of the international society for diseases of the Esophagus. Dis Esophagus 1996, 9:30-38.

28. Rindani R, Martin CJ, Cox MR: Transhiatal versus Ivor Lewis oesophagectomy: is there a difference? Aust N Z J Surg 1999, 69:187-194.

29. Gluch L, Smith RC, Bambach CP, Brown AR: Comparison of outcomes following transhiatal or Ivor Lewis oesophagectomy for oesophageal carcinoma. World J Surg 1999, 23:271-276.

30. Khan OA, Fitzgerald JJ, Soomro I, Beggs FD, Morgan WE, Duffy JP: Prognostic significance of circumferential resection margin involvement following oesophagectomy for cancer. Br J Cancer 2003, 88:1549-1552.

31. Park K, Russell I: COGNATE: Cancer of the oesophagus or gastricus: new assessment of the technology of endosonography 2004 [http://www.bangor.ac.uk/imscar/cognate]. [last accessed on August 4, 2007]