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## Minimally invasive oesophagectomy in Wales

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### ABSTRACT

**Introduction:** The uptake of minimally invasive oesophagectomy remains low in the UK. As the only centre in Wales which offers this approach, our aim was to determine the short-term outcomes following endoscopic 2-stage oesophagectomy with stapled intra-thoracic anastomosis.

**Methods:** Details of 50 consecutive patients [88% (44) male, median age (range) 66 (42–83) years] with operable mid to distal oesophageal and gastro-oesophageal junctional cancer who underwent endoscopic 2-stage oesophagectomy were analysed prospectively between June 2009 to November 2013. Primary outcome measures were overall and disease free survival from diagnosis. Secondary outcome measures were length of hospital stay, morbidity, mortality, lymph node harvest and margin involvement.

**Results:** Median follow-up was 25 months. Seventy per cent ( $n = 35$ ) of patients had stage II or greater disease and underwent neoadjuvant chemotherapy. The median length of hospital stay was 10 (range 8–104) days. There was a trend towards a decreasing length of stay as experience increased. Overall 30-day operative morbidity was 40% ( $n = 20$ ) and there was no 30, 60, 90-day or in-patient mortality. Anastomotic leak occurred in 6 patients (12%). The median lymph node harvest was 20 (range 7–35) nodes. Nine patients (18%) had involvement of the circumferential resection margin (all T3). Overall and disease free 2-year survival was 84.2 and 80.9% respectively.

**Conclusions:** Endoscopic 2-stage oesophagectomy can be performed safely and effectively with good early oncological and surgical outcomes.

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### Introduction

Since the first report of a total minimally invasive laparoscopic, thoracoscopic 2-stage oesophagectomy by Sir Alfred Cuschieri in 1992,<sup>1</sup> numerous centres have published individual series describing various modifications of the procedure with good short-term outcomes.<sup>2,3</sup> The only multicentre

randomised controlled trial (TIME trial) comparing three-stage minimally invasive oesophagectomy (MIO) with open surgery has shown that the minimally invasive approach resulted in significantly lower post-operative respiratory complications and a shorter duration of hospital stay without compromising the adequacy of lymphadenectomy.<sup>4</sup> Moreover, a meta-analysis of 16 case-control studies of over 1200 patients

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reported equivalent oncological outcomes following MIO compared to open surgery.<sup>5</sup>

Based on this evidence, the National Institute of Health and Clinical Excellence (NICE) supported the use of MIO by trained surgeons who should be mentored during their initial operations.<sup>6</sup> Despite these recommendations, the uptake of MIO remains low in the United Kingdom. A recent report using Hospital Episode Statistics (HES) data showed that of the 7502 oesophageal resections undertaken in England between April 2005 and March 2010, 15.5% were performed with a minimally invasive component, rising to 24.7% over 2009 to 2010.<sup>7</sup> This low uptake could be due to concerns regarding the increased rate of gastric tube ischaemia following MIO.<sup>8</sup>

As the only centre in Wales which offers a fully minimally invasive oesophagectomy, we aimed to determine the short-term oncological and surgical outcomes following endoscopic 2-stage oesophagectomy with stapled intra-thoracic anastomosis for cancer in the mid to distal oesophagus and gastro-oesophageal junction.

## Materials and methods

Details of all patients with operable mid to distal oesophageal and gastro-oesophageal junctional tumours who underwent endoscopic 2-stage oesophagectomy were studied prospectively between June 2009 to November 2013 at the North Wales Upper GI Cancer Unit at Wrexham Maelor Hospital (WMH). Upper gastrointestinal (GI) cancer services in North Wales and Cheshire were centralised at WMH since 2007. Surgery is performed by 4 consultant surgeons (2 in-reach), one of whom performs a total minimally invasive 2-stage oesophagectomy. All patients underwent staging investigations including computed tomography, endoscopic ultrasound, positron-emission tomography with or without staging laparoscopy. Staging investigations were reported in accordance with the UICC tumour-node-metastasis (TNM) characterisation (7th Edition).<sup>9</sup> Management was tailored according to the patients' perceived radiological stage, co-morbidity and patient choice. Neoadjuvant chemotherapy using cisplatin and 5-fluorouracil was offered to patients who had stage T2 or greater disease regardless of nodal status.<sup>10</sup>

### Surgery

The patient was placed in a supine position with the operating surgeon and first assistant (camera) standing on the patient's left and the second assistant on the patient's right. The abdominal phase begins with mobilisation of the stomach from the pylorus to the fundus by dividing the greater omentum and short gastric arteries whilst preserving the right gastroepiploic arcade. Similarly the gastrohepatic ligament is divided displaying the right crus. The pancreas is denuded and the left gastric pedicle is divided at its origin using a 10 mm LigaSure™. Full hiatal mobilisation of the oesophagus and perioesophageal tissues is ensured. The gastric pouch is formed using an endoscopic stapler (Endo GIA™ Tri-Staple™, purple cartridge; Autosuture, Norwalk, Connecticut, USA) starting above the incisura on the lesser curve, ensuring a pouch diameter of 4 cm. The distal resection margin is then

tied to the gastric pouch with two interrupted 2/0 vicryl sutures to prevent the pouch from twisting as it is delivered into the thorax.

The thoracic phase is then performed in the full prone position using 3 right sided ports. The right lung is deflated and a 5 mm LigaSure™ is used to mobilise the oesophagus. The azygos vein is divided with a vascular stapler (Endo GIA™ Tri-Staple™, tan cartridge; Autosuture). Perioarctic dissection is performed down to the hiatus. Routine identification of the thoracic duct is not performed. However, if identified, it is controlled with clips. The subcarinal lymph node package is dissected out. The proximal oesophagus is transected above the level of the azygos vein using an endoscopic stapler (Endo GIA™ Tri-Staple™, purple cartridge; Autosuture, Norwalk, Connecticut, USA). The gastric pouch is then delivered into the thorax and disconnected from the distal resection margin. The specimen is extracted via the lower port site by extending the incision as required. Rarely, a rib will need to be broken to facilitate this. The anaesthetist then inserts the 25 mm OrVil™ device trans-orally, and a gastrotomy is performed on the pouch at a convenient position along the staple line, to allow insertion of the circular stapler. The anastomosis is then performed and the gastrotomy closed with an endoscopic stapler (Endo GIA™ Tri-Staple™, purple cartridge; Autosuture, Norwalk, Connecticut, USA). An inter-costal chest drain is inserted and an on-table endoscopy is performed to view the anastomosis and pouch, and to insert a triple lumen nasojejunal (NJ) feeding tube under vision. All procedures were performed by a single surgeon (ALB). We offered this approach to all patients suitable for open surgery and no patient selection occurred. Further details of this technique can be viewed as a video.<sup>11</sup> Outcomes following MIO were audited every 6 months following approval by the hospital clinical governance committee.

### Post-operative care

As part of an enhanced recovery programme which was introduced in July 2012, patients were extubated immediately post-operatively with a planned two-day stay in the high dependency unit. NJ feeding was commenced on Day 1 and patients were mobilised from the morning after surgery and received regular chest physiotherapy. Sips of fluid were allowed orally on Day 4 if clinically well. Oral diet was slowly built up and the patient discharged on Day 8 following removal of the inter-costal chest drain, epidural catheter and NJ tube.

### Outcome measures

The primary outcome measure was overall and disease free survival from diagnosis. Secondary outcome measures include length of hospital stay, operative morbidity, 30, 60, 90-day and in-hospital mortality, lymph node harvest and margin involvement rate. Circumferential resection margin involvement was reported according to the Royal College of Pathologists definition.<sup>12</sup> Operating time was measured from incision to completion of the on-table endoscopy and insertion of NJ tube.

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