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An Australian regional hospital's oesophagectomy experience: A 10-year case series from Tasmania

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ABSTRACT

Introduction: Oesophagectomy is recommended as part of curative treatment for oesophageal cancer but is associated with substantial morbidity. Centralization has been recommended to improve outcomes, but this has not been widely applied in Australia. This study aimed to audit a regional hospital's experience over ten years and compare it to outcomes from national and international centres to support the view that oesophagectomy can be performed safely in select regional centres in Australia.

Methods: Patients undergoing oesophagectomy at a single regional hospital in North-East Tasmania, Australia between January 2014 and December 2023 were retrospectively identified. Preoperative patient and tumour characteristics, and outcomes (mortality, anastomotic leak, length of stay, respiratory complications, long-term complications and survival) were compared to other centres.

Results: 65 patients were identified. 53 % were male, mean age was 65.2 years, 29.2 % had respiratory disease and 18.5 % were current smokers. The anastomotic leak rate was 7.7 %. 25 % developed pneumonia post-operatively. Average ICU length of stay was 4.6 days, median acute inpatient length of stay was 15 days. There was one in-hospital mortality and one 30-day mortality. 2 patients (3 %) required diaphragmatic hernia repair; 12 patients (18.5 %) required endoscopic dilatation of anastomotic strictures. The 5-year survival rate was 66 %. Our results compare favourably to published rates of anastomotic leak (10–15 %), inpatient stay (15 days), pneumonia (20–30 %), 30-day mortality (1–4 %) and anastomotic stricture (20 %).

Conclusions: Oesophagectomies can be safely performed in regional centres in Australia that routinely undertake a higher volume of cases per year, provided services required to manage complications are readily available.

Introduction

Oesophageal cancer is associated with a poor prognosis despite many advances in treatment. Oesophagectomy is a key component of the care of patients who are candidates for curative treatment, however it is associated with substantial morbidity [1]. Studies have suggested that oesophagectomies performed at higher volume centres are associated with lower morbidity and mortality [2], and this has prompted changes to policy in countries such as the UK and the Netherlands with regards to the centralisation of cases. In 2018 an Australian study reported overall better performance in higher-volume hospitals [3], however in 2019 another Australian study suggested that oesophagectomies could be safely performed in low-volume centres meeting specific conditions [4]. Currently within Australia, centralisation has not occurred. This is partly due to issues related to access to resources and geographical barriers, patient reluctance to travel and financial burden involved, as well as a public health system run separately by each state. Therefore, oesophagectomies in Australia are still routinely performed in regional centres.

The aim of this study was to investigate an Australian regional hospital's outcomes after oesophagectomy to assess the safety and quality of this service provision in a single institution and to compare outcomes to higher-volume centres in Australia and internationally.

Methods

This single centre case series was conducted retrospectively at a single regional hospital in Tasmania, Australia. This is a 400-bed acute care teaching hospital that provides emergency, in-patient and out-patient services to the North and North-East of Tasmania. In 2021, the population of Tasmania was approximately 558,000 people, with 44 % residing in Hobart and 27 % in Launceston and the North-East [5].

The upper gastrointestinal unit includes two consultant upper GI

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surgeons, supported by a level 3 intensive care unit, interventional radiology services and gastroenterologists with interventional endoscopy skills. Ivor Lewis oesophagectomy was performed open (chest and abdomen), and 3 stage oesophagectomy was a hybrid procedure (thoracoscopic chest, open abdomen).

Data on all patients undergoing oesophagectomy between January 2014 and December 2023 was retrieved from the medical records. Patients were identified in a database search for codes specific to oesophagectomy.

Demographic and pre-operative data included age, gender, BMI, co-morbidities, smoking status, anticoagulation status, neoadjuvant treatment and tumour histology. Post-operative outcomes included length of stay, anastomotic leak, return to theatre, chyle leak, infection, pneumonia, DVT/PE, mortality (in-hospital, 30-day) and long-term complications (i.e. diaphragmatic hernia and anastomotic stricture).

Patients were reviewed in a weekly multidisciplinary meeting, referred for neoadjuvant treatment and assessed in a multidisciplinary clinic by surgeons, anaesthetists, intensivists, physiotherapists and dieticians. Patients were followed up in the outpatient clinic three-monthly in the first year, six-monthly in the second year and yearly thereafter for a minimum of five years.

Statistical analysis was performed using STATA/IC 14.2.

Ethics approval was granted for this study by the Research Ethics and Governance Unit responsible for the study institution, and is registered at ClinicalTrials.gov. This study is reported in line with the PROCESS criteria[6].

Results

A total of sixty-five patients underwent oesophagectomy between January 2014 and December 2023. Patient demographics and co-morbidities are summarised in Table 1.

Sixty-three patients had surgery for oesophageal malignancy (fifty-four for adenocarcinoma and nine for squamous cell carcinoma), and one each for a gastrointestinal stromal tumour and benign oesophageal stricture. Ivor Lewis oesophagectomy was performed in fifty-eight (89 %) and 3-stage oesophagectomy in seven (11 %) patients. Preoperative tumour and treatment characteristics are summarised in Table 2.

Postoperative outcomes are outlined in Table 3. There were five anastomotic leaks. Three were identified on post operative day five, and two were identified ten- and fourteen-days post operatively. All were managed with endoscopic placement of stent, antibiotics and nutritional support. Two occurred after 3-stage thoracoscopic oesophagectomy, while three occurred after Ivor Lewis oesophagectomy.

Eight patients required return to theatre. Five were anastomotic leaks that required endoscopic placement of stents. Another patient required endoscopic clipping of an anastomotic bleed, and one had incision and drainage of a thoracotomy wound infection. One patient was transferred to a tertiary centre for further management of gastric staple line dehiscence (and survived).

Twelve patients (18.5 %) developed complications of a Clavien-Dindo grade 3 or above. The median hospital stay was fifteen days (range 7–60). Respiratory complications were prominent in our case series. 26.2 % of patients had pneumonia (four required returns to the intensive care unit for respiratory support), three patients had pleural effusions managed with chest drainage alone and four developed thromboembolic complications.

Postoperative tumour characteristics are detailed in Table 4. Of the sixty-three patients that underwent oesophagectomy for malignancy, eighteen had complete tumour response to neoadjuvant treatment. There were no positive proximal or distal resection margins. Fifteen

Table 1
Patient baseline characteristics.

Patient demographics		Total ($n = 65$)
Age (years)	Mean ± SD	65.2 ± 8.6
	Median (range)	66 (42 – 83)
Gender (male)	n (%)	53 (81.5)
BMI (kg/m2)	Mean ± SD	27.4 ± 4.3
<20	n (%)	2 (3.1)
21–25	n (%)	20 (30.7)
26–30	n (%)	25 (38.5)
31–35	n (%)	14 (21.5)
36–40	n (%)	4 (6.2)
ASA grade		
I	n (%)	1 (1.5)
II	n (%)	34 (52.3)
III	n (%)	26 (40)
IV	n (%)	4 (6.2)
Co-morbidities		
Cardiac	n (%)	41 (63.1)
Respiratory	n (%)	19 (29.2)
Current smoker	n (%)	12 (18.5)
Ex-smoker	n (%)	38 (58.5)
Diabetes	n (%)	16 (24.6)

Table 2
Preoperative tumour and treatment characteristics.

Tumour histological type		Total ($n = 65$)
Adenocarcinoma	n (%)	54 (83.1)
Squamous cell carcinoma	n (%)	9 (13.9)
Other	n (%)	2 (3)
cT-stage		
T0–1	n (%)	6 (9.2)
T2	n (%)	21 (32.3)
T3	n (%)	38 (58.5)
T4	n (%)	0
cN-stage		
N0	n (%)	20 (30.8)
N1	n (%)	36 (55.4)
N2	n (%)	9 (13.8)
N3	n (%)	0
Neoadjuvant therapy		
None	n (%)	4 (6.2)
Chemotherapy	n (%)	18 (27.7)
Chemoradiotherapy	n (%)	40 (61.5)
Other	n (%)	3 (4.6)
Surgical approach		
Open	n (%)	58 (89.2)
Hybrid thoracoscopic (3-stage)	n (%)	7 (10.8)

Table 3
Postoperative outcomes.

Post operative outcomes		Total ($n = 65$)
Acute complications		
Anastomotic leak	n (%)	5 (7.7)
Return to theatre	n (%)	8 (12.3)
Chyle leak	n (%)	0 (0)
Wound infection	n (%)	4 (6.2)
Intra-abdominal infection	n (%)	2 (3.1)
Pneumonia	n (%)	17 (26.2)
DVT/PE	n (%)	4 (6.2)
Other	n (%)	2 (3.1)
Length of stay		
ICU	Mean (range, median)	4.6 (3–42, 4)
Total	Median (range)	15 (7–60)
Adjuvant treatment	n (%)	15 (23.1)
Recurrence	n (%)	6 (9.2)
Long-term complications		
Diaphragmatic hernia	n (%)	2 (3.1)
Anastomotic stricture	n (%)	12 (18.5)
Chronic pain	n (%)	4 (6.2)
Small bowel obstruction	n (%)	2 (3.1)
Recurrent laryngeal nerve palsy	n (%)	1 (1.5)

Table 4
Postoperative tumour characteristics and staging.

Post operative tumour characteristics		Total ($n = 63$)
pT-stage		
T0	n (%)	18 (28.6)
T1	n (%)	12 (19.0)
T2	n (%)	14 (22.2)
T3	n (%)	15 (23.9)
T4	n (%)	4 (6.3)
pN-stage		
N0	n (%)	39 (61.9)
N1	n (%)	19 (30.1)
N2	n (%)	3 (4.8)
N3	n (%)	2 (3.2)
Tumour stage		
0	n (%)	18 (28.6)
I	n (%)	11 (17.5)
II	n (%)	13 (20.6)
III	n (%)	19 (30.1)
IV	n (%)	2 (3.2)

patients (23.1 %) underwent some form of adjuvant treatment (chemotherapy, immunotherapy or both). Biopsy-proven recurrence occurred in six patients (9.2 %). Patients were followed up for a minimum of five years or until death occurred. Long-term data was missing in three patients.

Twelve patients (18.5 %) developed anastomotic strictures that required endoscopic dilatation, and two patients (3.1 %) developed diaphragmatic hernias requiring surgery (after Ivor Lewis oesophagectomy). Four patients (6.2 %) developed chronic pain at the thoracotomy incision site and two patients (3.1 %) required laparotomy for small bowel obstruction secondary to intra-abdominal adhesions several years later. One patient developed recurrent laryngeal nerve palsy after a 3-stage oesophagectomy that did not require surgical intervention.

There was one in-hospital death from post operative complications (anastomotic leak and multiorgan failure) after Ivor Lewis oesophagectomy. There was one 30-day mortality in a patient who represented to hospital with a malignant pleural effusion and one 90-day mortality who represented with an acute myocardial event and myocarditis after Ivor Lewis oesophagectomy. Time in the study (to the closest year) and survival outcome was used to calculate a Kaplan Meier survival curve (Fig. 1). The 5-year overall survival rate was 66 %.

Discussion

The Esophageal Complications Consensus Group (ECCG) has published guidelines for reporting complications after oesophagectomy after prospectively assessing the outcomes of 24 high volume centres over a 5-year period [7]. Their reported outcomes were a severe complication rate (Clavien Dindo III or greater) of 17.2 %, anastomotic leak 11.4 %, chyle leak 4.6 % and 90-day mortality 4.5 %. A study assessing outcomes from the International Oesophago-gastric Anastomosis Audit, the Esophagectomy Complications Consensus Group and the Dutch Upper Gastrointestinal Cancer Audit reported inpatient mortality of 1.8 % and 30-day mortality of 2.4 % [8]. Rates of pneumonia in international studies were approximately 14–20 % [8], while the anastomotic stricture rate was 17.9 % [9] and diaphragmatic hernia rate was 5.3 % [10].

This case series has audited oesophagectomy outcomes over a 10-year period at a single regional institution. From a retrospective audit of a much lower volume centre, our outcomes are comparable to international studies, with a severe complication rate of 18.5 %,

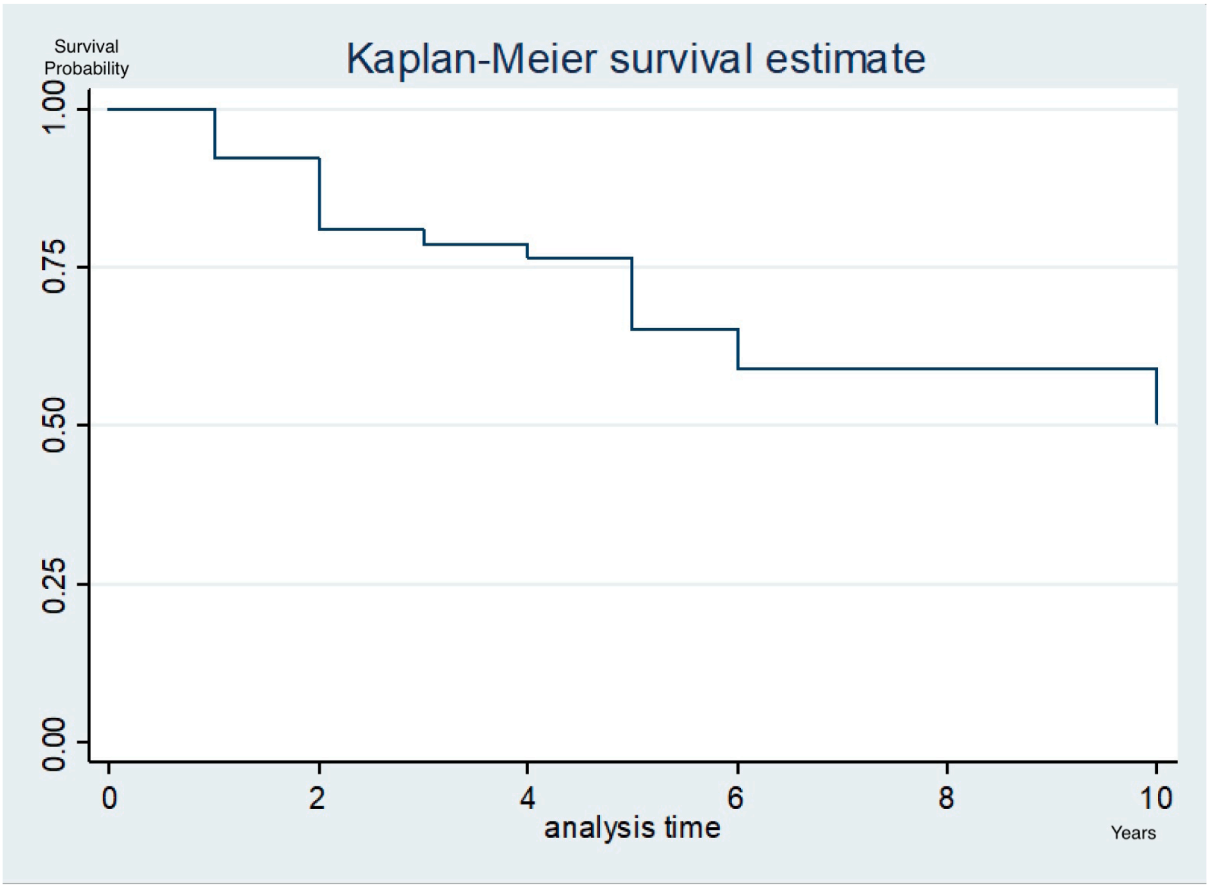

Fig. 1. Kaplan-Meier overall survival curve.

anastomotic leak 7.7 %, pneumonia 26.2 %, and in-patient, 30-day and 90-day mortality of 1.5 %. The rate of diaphragmatic hernia requiring surgery was 3.1 %, and anastomotic stricture requiring endoscopic dilatation was 18.5 %. Our results are also consistent with higher volume Australian centres that have reported a median inpatient length of stay of 15.2 days [3], 30-day and in-hospital mortality rates of 2.1 % and 3.1 % [3] (both 1.5 % in our series), and diaphragmatic hernia rate of 8.1 % [11]. The 5-year survival rate was higher than what has been reported in Australian and international studies (40 %) [12–14]. We attribute this to the retrospective nature of the study and lack of long-term records for several patients.

The concept of "failure to rescue" [15] patients after complications of oesophagectomy could possibly explain the higher rate of morbidity and mortality seen in some lower volume hospitals. However, our results demonstrate that our outcomes are comparable to higher volume units, indicating a low failure to rescue rate. We attribute this to having a Level 3 intensive care unit, as well as interventional radiology and endoscopy services. While our results suggest that our failure to rescue rate is low, 24-hour access to resources required to manage major complications may be where regional services could be vulnerable.

Our study provides insight into regional Australian oesophagectomy outcomes and demonstrates that morbidity and mortality post oesophagectomy is comparable to higher volume centres. Our study suffers from the limitations of retrospective studies which include incomplete data availability and loss to follow-up long-term due to three patients moving interstate or overseas. For further analysis of outcomes, a composite quality measure such as "textbook outcomes" post oesophagectomy could be used [16].

Conclusions

Our data suggests that oesophagectomies can be performed safely in regional centres which have the requisite level of support. The outcomes compare favourably to Australian and international centres performing a higher number of procedures per year. The advantage of offering this procedure in a regional centre is that patients do not have to travel long distances and receive care in familiar surroundings with family support and cost savings. Considering the geography of Australia and to maintain equitable access, it would be better to develop a model to support such surgeries in appropriate regional centres, rather than centralizing them to larger centres.

Sources of funding

The authors have no sources of funding to declare.

Ethical approval

Ethics approval was granted for this study by the research ethics board responsible for the study institution.

Consent

Ethics committee approval was given to waive consent from individual patients for inclusion in this study given the anticipated size and the retrospective nature of this case series.

CRediT authorship contribution statement

Renishka Sellayah: Conceptualization, Methodology, Writing – original draft, Writing – review & editing. **Girish Pande:** Conceptualization, Data curation, Formal analysis, Supervision, Writing – review & editing.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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