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Short and long term outcomes of oesophagectomy in a provincial New Zealand hospital

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Abstract

Background Oesophagectomy is a complex procedure associated with a significant morbidity and mortality rate. There is very little published data from New Zealand, with no published data from a non-Tertiary New Zealand hospital. We aimed to evaluate the outcomes of oesophagectomy at a single provincial hospital in New Zealand.

Method Retrospective review of clinical records of all patients who underwent oesophagectomy at Palmerston North Hospital (a level II provincial New Zealand public hospital) between 1993 and 2010 was performed. Demographic data, operative details, postoperative recovery parameters, survival data, pathological data, and details of adjuvant treatment were collected.

Results Data from all 68 patients who underwent oesophagectomy were included. Mean age was 63.6 ± 10.9 years, and 69% of patients were male. Mean operating time was 438.37 ± 101.8 min, and mean intraoperative blood loss was 934.5 ± 790.2 ml. Median intensive care unit stay was 7 (1–29) days, and total day stay was 17.5 (4–60) days. Tracheostomy was performed in 20 patients (29.4%). Anastomotic leak occurred in 7 patients (10.3%), chylothorax in 6 patients (8.8%) and cardiopulmonary complications in 34 patients (50.0%). The all cause in-hospital mortality rate was 4.4%. Overall survival at 30 days was 98.5%, at 1 year was 78.3% and at 5 years was 30.3%.

Conclusion Survival outcomes of oesophagectomy in this provincial New Zealand hospital are comparable to published series from national and international tertiary centres.

Oesophagectomy is a potentially curative treatment for patients with resectable oesophageal cancer, and is the mainstay of treatment for adenocarcinoma in patients without metastatic disease.[1] The procedure is, however, associated with considerable morbidity,[2] and despite advances in surgical technique and adjuvant therapy, 5-year survival rates in all published series remain at or below 40%.[3–7]

A multitude of factors influence survival rates after curative oesophageal resection. These include: patient selection criteria, tumour location, surgical technique, perioperative care practices, adjuvant therapy protocols, and various population factors.[4,7,8]

The impact of hospital and surgeon volume on operative mortality has also been well reported.[9–11] As a result of this, referral of patients suitable for oesophagectomy to dedicated specialised centres has been advocated, in keeping with international trends

towards centralisation and specialisation of low-volume complex surgery.[12–14] However, there is currently no evidence that volume has any influence on long-term survival or improvement in quality of life after oesophagectomy.[15] In addition, it has been noted that volume alone is insufficient to define centres of excellence, and that a lowest recommended annual volume has not actually been defined.[15]

In New Zealand, geographical and population barriers to centralisation have meant that oesophagectomy continues to be performed in some non-tertiary centres. A single case series published from a tertiary centre has demonstrated equivalent outcomes for oesophagectomy in New Zealand compared with international data;[16] however, there is currently no published data from a non-tertiary hospital.

Palmerston North Hospital (PNH) is a level II provincial hospital servicing the city of Palmerston North (population 75,000) and the Manawatu province of the lower central North Island of New Zealand (population 160,000). It is the only secondary level hospital in the Manawatu region, and one of six national Regional Cancer Treatment Service centres, providing specialist intensive care, medical and surgical subspecialty services for a larger population of up to 500,000.

The aim of this study is to evaluate the outcome of oesophagectomy at PNH.

Methods

Patients—All patients who underwent an oesophagectomy at PNH between 1st January 1993 and July 2010 were included in this study (clinical records prior to 1993 are not available, as a significant number, particularly of deceased patients, have been deliberately destroyed in accordance with national clinical records guidelines). There were no exclusion criteria.

Data collection—Retrospective review of patient clinical records, the Otago Audit System electronic database[21] (prospectively maintained by the Department of General Surgery since 1993), as well as Operating Theatre and Department of Pathology electronic records was performed by two investigators (F.A., D.H.). Data collected included demographic data, intraoperative parameters, postoperative outcomes, pathological / histological data, details of adjuvant and neo-adjuvant therapy, and survival data.

Statistics—Results were tabulated and analysed using SPSS® for Windows® version 17.0 (Lead Technologies Inc, Chicago, Illinois, USA). Continuous variables were tested using the Shapiro-Wilk test for normality and the results presented as Mean (Standard Deviation) for parametric data and Median (Range) for non-parametric data.

Results

Patients—Sixty-eight patients underwent surgery for oesophagectomy between January 1993 and July 2010 in PNH. Mean patient age was 63.3 years, and 69.1% of the patients were male (Table 1).

Fifty-two patients (76.5%) presented with pathology sited in the distal third of the oesophagus, and the remaining with pathology in the middle third of the oesophagus. Sixty-five patients underwent an Ivor-Lewis oesophagectomy; 1 underwent Ivor-Lewis oesophagectomy with pancreatectomy; 1 underwent oesophagectomy via abdominal and right thoracotomy with oesophago-jejunal anastomosis (because of previous total gastrectomy), and 1 underwent left thoraco-abdominal oesophagestrectomy.

Table 1. Baseline patient parameters

Variables	N (%)
Age (Mean in years, SD)	63.6 (10.9)
Sex	
Male	47 (69.1%)
Female	21 (30.9%)
BMI (Mean in kg/m^2, SD)	25.9 (7.4)
ASA score	
I	6 (8.8%)
II	43 (63.2%)
III	19 (27.9%)
Previous major abdominal surgery	24 (35.3%)

SD: Standard Deviation.

Intraoperative data—Four surgeons performed all the operations, with one surgeon (M.Y.) performing 35 operations, and another (B.R.) performing 31 operations. The other two surgeons performed one oesophagectomy each during this period. Mean operating time was 438.4 ± 101.8 min and mean intraoperative blood loss was 934.5 ± 790.2 ml (Table 2).

Median intraoperative blood transfusion requirement was 2 units (0–8), and mean intravenous fluid requirement was 6.6 ± 1.4 L. Eight patients had intraoperative complications: 5 patients had a splenic injury (all requiring splenectomy), 1 patient had a liver injury (treated conservatively with packing and a re-look laparotomy on day 1, and 2 patients developed an intraoperative acute coronary syndrome.

Table 2. Intraoperative parameters

Variables	N (%)
Operation	
Ivor-Lewis oesophagectomy	65 (95.5%)
Oesophagectomy + splenectomy + pancreatectomy	1 (1.5%)
Oesophagectomy + oesophago-jejunal anastamosis	1 (1.5%)
Thoraco-abdominal oesophagectomy	1 (1.5%)
Operative intent	
Cure	64 (94.1%)
Palliation	4 (5.9%)
Operation time (Mean in min, SD)	438.7 (101.8)
Blood loss (Mean in ml, SD)	934.5 (790.2)
Blood transfused (Red cells, Median in units, Range)	2 (0–8)
Intravenous fluids (Mean in L, SD)	6.6 (1.4)
Intraoperative complications	
Splenic injury	5 (7.4%)
Liver injury	1 (1.5%)
Acute coronary syndrome	2 (2.9%)
Total (per patient)	8 (11.8%)

Postoperative data—Median intensive care unit stay was 7 days (1–29), and median time to extubation was 3 days (0–23, Table 3). Twenty (29.4%) patients required

tracheostomy. Mean intravenous fluid infusion in the first 24 hours was 10.4 ± 2.1 L, median time of total parenteral nutrition administration was 7.5 days (0–33), and median time of jejunal or nasogastric enteric feeding administration was 0.5 days (0–47). The median total hospital stay was 17.5 (4–60) days.

Table 3. Postoperative recovery parameters

Parameter	Value
Intravenous fluids 1st 24hours (Mean in L, SD)	10.4 (2.1)
Days in ICU (Median, Range)	7 (1–29)
Day extubated (Median, Range)	3 (0–23)
Total days intubated (Median, Range)	4 (0–23)
Tracheostomy required	20 (29.4%)
Days on TPN (Median, Range)	7.5 (0–33)
Days on enteric feed (Median, Range)	0.5 (0–47)
Day oral fluids started (Median, Range)	8 (0–55)
Day oral solid food started (Median, Range)	11 (0–57)
Day stay (Median, Range)	17.5 (4–60)
Major postoperative complication	
Anastomotic leak	7 (10.3%)
Chylothorax	6 (8.8%)
Other intra-abdominal	3 (4.4%)
Sub-phrenic abscess	1
Stomach perforation	1
Mesenteric ischaemia	1
Cardiopulmonary	34 (50.0%)
Pneumonia	25
ARDS	2
Pulmonary embolism	1
Congestive cardiac failure	1
Myocardial infarction	3
Cardiac Arrhythmia	4
Cerebrovascular Event / Stroke	1
Prolonged unexplained hypotension	1
Acute renal failure	2 (2.9%)
Costal osteomyelitis	2 (2.9%)
Central line sepsis	1 (1.5%)
Total (per patient)	39 (57.54%)
Minor postoperative complication	
Atrial Fibrillation	20
Wound infection	3
Urinary tract infection	2
DVT	1
Early anastomotic stricture	4
Foot drop	1
Total (per patient)	25 (36.7%)
Re-operation	6 (8.8%)
Re-admission to ICU	10 (14.7%)

ICU=Intensive Care Unit; SD=Standard Deviation.

An anastomotic leak occurred in seven patients (10.3%), chylothorax in six patients (8.8%) and cardiopulmonary complications in thirty-four patients (50.0%, Table 3).

Six patients (8.8%) required reoperation to resolve major postoperative complications, and ten patients (14.7%) required re-admission to ICU after they had been discharged to the general surgical ward. Minor early / inpatient postoperative complications occurred in 25 patients (36.7%).

Pathology—Fifty-one patients (75.0%) had adenocarcinoma diagnosed on histology, 11 (16.2%) had squamous carcinoma, 2 patients (2.9%) had adeno-squamous carcinoma, 2 patients (2.9%) had Barrett's disease with high grade dysplasia but no invasive cancer, 1 (1.5%) had a gastrointestinal stromal tumour, and 1 (1.5%) had a non-invasive neuroendocrine tumour. Further details on staging and adjuvant/ neoadjuvant therapy for the 64 patients with confirmed invasive cancer are presented in Table 4.

Table 4: Pathology and adjuvant/neoadjuvant therapy for patients with invasive carcinoma (n=64)

Variables	N (%)
Differentiation	
Well	12 (18.8%)
Moderate	32 (50.0%)
Poor	16 (25.0%)
Not available	4 (6.3%)
Lymph nodes (Mean, SD)	
Total nodes	13.1 (8.7)
Positive nodes	3.3 (5.9)
T	
T1	12 (18.8%)
T2	11 (17.2%)
T3	40 (62.5%)
T4	1 (1.6%)
N	
N0	32 (50.0%)
N1	32 (50.0%)
M	
M0	61 (95.3%)
M1	3 (4.7%)
Preoperative Chemotherapy / Radiotherapy	
Chemotherapy	17 (26.6%)
Radiotherapy	2 (3.1%)
Nil	45 (70.3%)
Postoperative Chemotherapy / Radiotherapy	
Chemotherapy	10 (15.6%)
Radiotherapy	19 (29.7%)
Chemotherapy + Radiotherapy	1 (1.6%)
Nil	34 (53.1%)

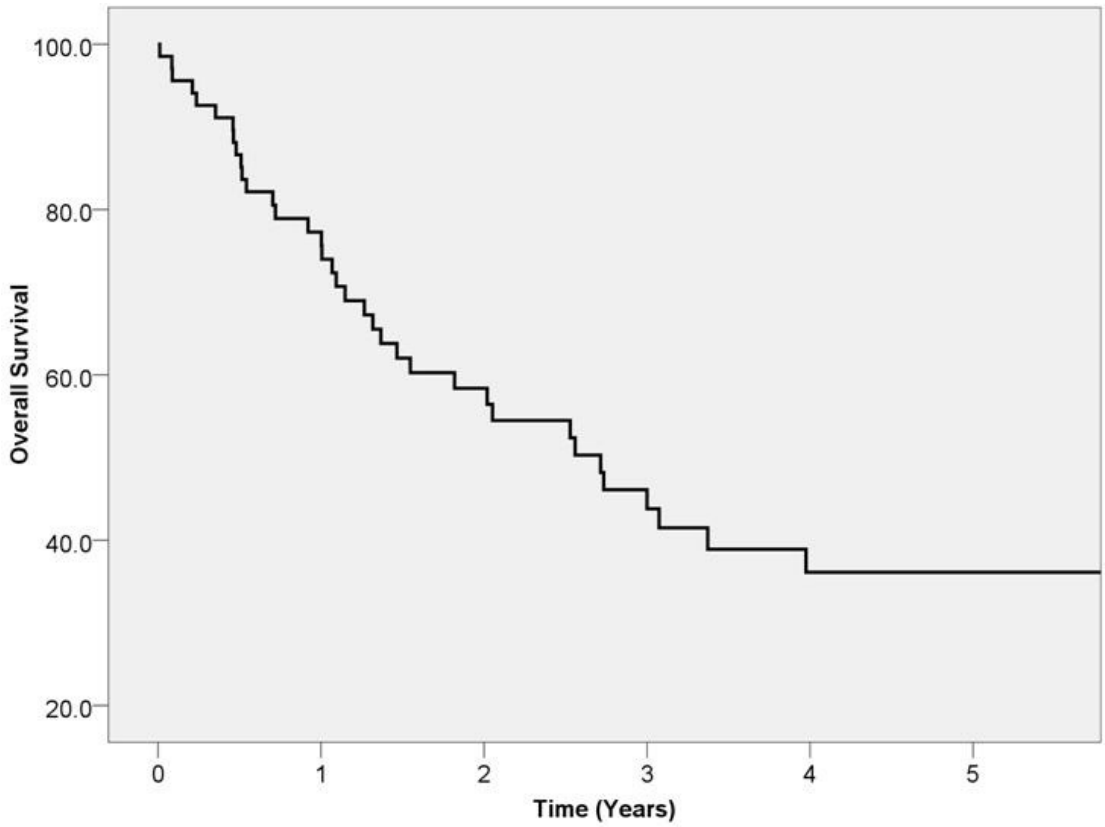
Survival—There were 3 postoperative in-hospital deaths. One patient died secondary to systemic sepsis after a clinical anastomotic leak, 1 patient had a global mesenteric embolic event on day 4, and 1 patient died after a myocardial infarction on day 31. Thus the total in-hospital survival rate was 95.6%.

For patients with a confirmed diagnosis of invasive carcinoma on the resection specimen, the 1-year survival rate was 77.2% and the 5 year survival rate was 30.3% (Table 5). A Kaplan-Meier survival curve is shown in Figure 1. The survival rate for the entire patient cohort (including patients with non-invasive disease) was marginally higher.

Table 5. Survival for patients with invasive carcinoma (n=64)

Variables	Percentage
30 days (n=64)	98.4%
1 year (n=57)	77.2%
2 years (n=50)	56.0%
3 years (n=42)	42.9%
4 years (n=40)	32.5%
5 years (n=33)	30.3%

Figure 1. Kaplan-Meier survival graph for patients with invasive carcinoma (n=64)



Discussion

We have conducted a retrospective study looking at the short and long-term outcomes of oesophagectomy in a secondary level provincial New Zealand hospital. The results

demonstrate outcomes that are generally comparable with current national and international data.[2,5,6,9–11,15–20]

The 5-year overall survival rate in this study was 30%, which compares favourably with the published 5 year rate of 23% by Omundsen et al (the only published oesophagectomy case series from a tertiary New Zealand hospital).[16] The trend is similar for survival at 1 year (77.2% vs 54.5%); and 3 years (42.9% vs 35%) as well.[16]

The apparent differences in survival rate could be explained by a number of factors. In our series only 1 patient (1.6%) was diagnosed with a stage T4 tumour, versus 12 patients (18%) in the Omundsen study.[16] It is unclear whether this difference is due to patient selection or earlier detection. In addition, a higher percentage of patients in our series were given neo-adjuvant chemotherapy compared with the relatively low rates in the Omundsen series.[16] This is probably because their data set pre-dates publication of the MAGIC trial of neo-adjuvant therapy for oesophago-gastric adenocarcinoma.[21]

Since publication of the MAGIC trial recommendations, use of neo-adjuvant chemotherapy has probably increased in New Zealand.[22] Certainly, since early 2007, Palmerston North Hospital's Regional Cancer Treatment Service has adopted the MAGIC protocol for neoadjuvant therapy for bulky stage II and III oesophageal or gastric adenocarcinoma (as evident on preoperative imaging) in otherwise fit patients.[21].

The postoperative complication rate in our study is relatively high. Although the anastomotic leak rate of 10.3% is within the accepted range for this procedure, a relatively high proportion of patients developed postoperative cardiopulmonary complications (50.0%) compared to other published series.[9, 11, 15, 16, 20, 23] One possible explanation for this finding is the relatively prolonged intubation time experienced by these patients (3 days).

Indeed, the long intensive care unit stay (7 days) is not only a reflection of the lack of a dedicated high dependency unit in PNH, but also the high rate of utilisation of a tracheostomy for ventilation (which anecdotally is a practice peculiar to the PNH intensive care unit). However, it has been previously shown that early extubation may significantly reduce the rate of postoperative cardiovascular complications, and from a resource utilisation perspective it is clear that an early extubation policy should be advocated.[24-26]

Another possible reason for the high cardiopulmonary complication rate is the highly positive intraoperative and postoperative fluid balance. Patients received on average 2 units of blood and 6.6 L intravenous fluids intraoperatively, despite an estimated blood loss of less than 1 L. In addition, the total volume of intravenous fluids administered in the first 24 hours was 10.4 L.

There is now clear evidence that a policy of relative fluid restriction is advantageous in terms of cardiopulmonary complications after major abdominal surgery, and specifically after oesophagectomy.[17, 27, 28] Taking these practices one step further, a recent case-control study by Munitiz et al demonstrates significant advantages using a clearly defined enhanced recovery perioperative protocol in the management of patients undergoing oesophagectomy.[17]

As part of this protocol, all patients were extubated in the operating theatre or immediately on arrival in the intensive care unit, and a policy of negative fluid balance over the first 4 days was adhered to. As a result, pulmonary complications were significantly reduced from 23% to 14% (P=0·025).[17] These modifications in perioperative management are being discussed at PNH, with view to implementation, at the time of writing of this manuscript.

Despite the relatively higher postoperative cardiopulmonary complication rate in our study, it should be noted that the in hospital mortality rate in our series was relatively low at 4.4%.[9,11,15,16,20,23] Thus, the impact of hospital volume on short and long term survival was not readily apparent.

The major limitation of the current study is the retrospective nature of the data collection. In addition, mortality data was derived from the Palmerston North Hospital Clinical Records Department rather than the New Zealand Births and Deaths Registry. Nonetheless, all deaths notified by the New Zealand Births and Deaths registry are cross-referenced automatically with the Palmerston North Hospital Clinical Records Department, and therefore we can assume that survival data is accurate. Another weakness of this study is that disease-specific mortality and cancer recurrence rates could not be established.

Conclusion

Outcomes of oesophagectomy in this provincial New Zealand hospital are comparable to published series from national and international tertiary centres.

Competing interests: None declared.

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