

Transhiatal versus transthoracic resection for oesophageal carcinoma in Yemen

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ABSTRACT

Introduction: Cancer of the oesophagus is a major problem in Yemen, where most of the patients present with advanced disease. Curative oesophageal resection for carcinoma may be carried out by either the transhiatal or transthoracic technique. The aims of this study were to compare the morbidity, mortality, short term outcome and long term survival of the two techniques in the treatment of oesophageal carcinoma.

Methods: From March 1998 to July 2004, 118 patients with cancer of the oesophagus were studied. The tumours in 84 patients were resected by transhiatal oesophagectomy (43) and transthoracic oesophagectomy (41).

Results: The two groups were comparable in terms of age, sex, location of the tumours, risk factors and stage of the disease. There was no significant difference in the mean intensive care unit stay, blood transfusion and mean hospital stay. Anastomotic leak was higher in the transhiatal oesophagectomy group than transthoracic group (21 percent versus 12 percent, p-value is equal to 0.001). Recurrent laryngeal nerve lesion was present in 18.6 percent of the transhiatal group and absent in the transthoracic group. The overall hospital mortality was 8.3 percent with no significant difference between the two groups (transhiatal 9.3 percent versus transthoracic 7.3 percent, p-value is equal to 0.742).

Conclusion: Transhiatal oesophagectomy was associated with a higher incidence of anastomotic complications and recurrent laryngeal nerve lesions, but there was no significant difference in the mortality between the two groups.

Keywords: oesophageal cancer, oesophagectomy, oesophagus, transhiatal resection, transthoracic resection

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INTRODUCTION

Oesophageal cancer is the seventh most common malignancy worldwide⁽¹⁾. Annually, approximately 13,200 people in the U.S are diagnosed with oesophageal cancer and 12,500 die of this malignancy⁽²⁾. Some of the highest rates occur in northern China and northern Iran, where the incidence exceeds 100 in 100,000 individuals⁽²⁾. In Yemen, cancer of the oesophagus is a major problem where it is quite common and most of the patients present with advanced disease⁽³⁾. Surgical resection remains the primary treatment modality for oesophageal carcinoma as it provides sustained palliation of dysphagia and the best chance of cure⁽⁴⁾. Over the past 10 years, advances in surgical and anaesthetic techniques, together with improvement in perioperative management, have reduced the risks of oesophageal resection to an acceptable level⁽⁴⁾.

Controversy exists as to the optimal surgical approach to patients with carcinoma of the oesophagus. For decades, the most popular approach has been the Ivor-Lewis (transthoracic) technique although today, the transhiatal one seems to be the approach of choice in order to avoid a painful incision and to decrease mortality, morbidity and duration of operation. So far, there has been no study to compare transhiatal and transthoracic oesophagectomy in the treatment of cancer of the oesophagus in Yemen. We undertook such a study to compare the two methods, transhiatal oesophagectomy (THO) versus transthoracic oesophagectomy (TTO), in the treatment of cancer of the oesophagus. Our hypothesis was that in such a dismal disease, there is no difference between these techniques.

METHODS

This is a prospective non-randomised study that included 118 patients who were admitted to the surgical department at Al-Thawra Teaching Hospital between March 1998 and July 2004. The study was authorised by the surgical department board of

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Sana'a Faculty of Medicine and Health Sciences. A detailed history and comprehensive physical examination were the first step in every case. Age, sex, clinical manifestations and duration of symptoms prior to evaluation, and risk factors (gastro-oesophageal reflux disease, the use of tobacco, Kat and alcohol) were assessed. Initial evaluation routinely included laboratory measurements (complete blood picture, serum albumin, glucose, creatinine, and liver function tests), electrocardiography (ECG) and chest radiograph. Barium swallow and meal, upper gastrointestinal endoscope and biopsy were also done. Abdominal and thoracic computed tomography (CT) were performed in some cases. Abdominal ultrasonography was also used as a screening tool to detect the presence of metastatic lesions to the liver of some patients.

Initial management included correction of anaemia, dehydration and hypoalbuminaemia. The correction was done by blood transfusion (if Hb was less than 10g/dL), by intravenous fluid (in case of dehydration) and by parenteral nutrition (if serum albumin was less than 30g/L). Two main techniques were performed for the selected 84 patients, namely: THO with left cervical oesophageal anastomosis for 43 patients (51%) and TTO with intrathoracic anastomosis for 41 patients (49%). Other techniques were used for the non-selected 34 patients (Table I). Selection of the surgical technique was determined by tumour location, patient condition and surgeon's preference. TTO was used with slightly greater frequency for mid- and upper-thoracic tumours in order to ensure safe mediastinal dissection. THO has been used with increasing frequency in lesions arising in the lower one third of the oesophagus and gastro-oesophageal junction (GOJ), particularly if the patient has significant co-morbidity.

The stomach was used as plasty for replacement of all the resected 90 cases (43 THO, 41 TTO and 6 McKeown). The pyloric ring was dilated manually until the thumb could be inserted. The drainage tube and /or the chest tube were left in until a gastrografin swallow on the 5th-7th postoperative day was performed. Contraindications to resection (in 28 cases) included the demonstration of metastatic cervical lymphadenopathy, hepatic metastases, bulky coeliac lymphadenopathy that might preclude control of the left gastric artery and overt evidence of thoracic visceral invasion on CT. Macroscopical tumour clearance was aimed at all cases but no extended lymph node dissection was done. Carcinoma of the oesophagus was classified according to the pTNM criteria for carcinoma of the

Table I. Lines of treatment used for the 118 patients.

| Surgical procedures | Number (%) |
|--------------------------|-------------|
| THO | 43 (36.44%) |
| TTO | 41 (34.75%) |
| McKeown | 6 (5.08%) |
| Bypass | 3 (2.55%) |
| Celestin tube | 22 (18.7%) |
| Jejunostomy feeding tube | 3 (2.55%) |
| Total | 118 (100%) |

THO: transhiatal oesophagectomy;
TTO: transthoracic oesophagectomy.

oesophagus by the American Joint Committee on Cancer⁽⁵⁾.

Operative mortality included 30-day mortality as well as any later death occurring during the initial postoperative hospital stay. All major operative and postoperative complications (bleeding, respiratory and anastomotic leak) as well as the minor complications (wound infection) were included. Patients were followed by direct evaluation, relative consultation or phone interview until death or the end of the present study.

The primary endpoints were hospital mortality and morbidity, ICU admission days, amount of blood transfusion and length of hospital stay. The secondary endpoints were short term outcome and the long survival rate.

All data were analysed using Statistical Package for Social Sciences, version 11 (SPSS Inc, Chicago, IL, USA). Data between the THO and TTO were compared by unpaired Student's t-test (age distribution) and chi-square analysis (all other variable) as appropriate. Means are reported with standard deviation. P-value of less than 0.05 was considered as significant.

RESULTS

This is a prospective non-randomised clinical trial was performed over 75 months and included 118 patients with cancer of the oesophagus. 84 patients were submitted either to THO (43 patients) or TTO (41 patients). The remaining 34 patients were unsuitable for either procedure and were excluded due to one or more contraindications, but were treated as clinically appropriate (Table I).

The characteristics and preoperative findings of the selected 84 patients in the two study groups (THO and TTO) are shown in Table II. The commonest symptoms were dysphagia in 81 patients (96.4%), regurgitation in 53 patients (63.1%), and anorexia in 54 patients (64.3%). Weight loss of 10kg or more

Table II. Demographical characteristics and preoperative findings of the selected 84 patients.

| Characteristics | THO (n=43) | TTO (n= 41) | *p-value | Total |
|--------------------------------------|---------------|---------------|----------|-------|
| Age (years): Mean (sd): | 61.19 (8.34) | 59.00 (12.37) | 0.354 | |
| Sex: Male | 25 | 19 | 0.279 | 44 |
| Female | 18 | 22 | | 40 |
| Dysphagia (mean duration in months): | 41 (3.73) | 40 (3.75) | 0.960 | 81 |
| Weight loss (10 kg or more): | 25 | 22 | 0.679 | 47 |
| Tobacco smoker | 22 | 26 | 0.257 | 48 |
| †Kat chewer | 31 | 25 | 0.289 | 56 |
| Gastro-oesophageal reflux | 1 | 7 | 0.021 | 8 |
| Hot food | 39 | 36 | 0.668 | 75 |
| Spices | 35 | 36 | 0.417 | 71 |
| Dehydration | 32 | 33 | 0.506 | 65 |
| Height mean (cm) | 156.67 (6.88) | 156.71 (8.41) | 0.984 | |
| Weight mean (kg) | 43.47 (6.88) | 45.11 (8.41) | 0.243 | |
| Arm circumference mean (cm) | 20.86 (3.15) | 21.05 (2.34) | 0.758 | |
| Haemoglobin mean (g/dL) | 12.11 (1.80) | 12.58 (1.86) | 0.248 | |
| Serum albumin mean (g/L) | 32.65 (6.10) | 32.93 (5.68) | 0.828 | |
| Preoperative nutrition | | | | |
| Parenteral | 24 | 29 | 0.218 | 53 |
| Enteral | 18 | 10 | | 28 |

†Kat is a type of green leaf present in Yemen and Africa's horn; *p<0.05 is significant.

was recorded in 47 patients (56%). 65 patients (77%) were found to be dehydrated and needed intravenous fluid infusion. Nutritional depletion was evident by hypoalbuminaemia (less than 35g/L in 65.5% of the patients) and by loss of weight in 47 patients (56%). Preoperative preparation included parenteral nutrition for 53 patients (63%) who were unable to swallow even liquids, and enteral nutrition for 28 patients (33.3%) who were able to swallow liquids or who had a feeding tube. One patient in the THO group required a thoracotomy for control of haemorrhage. A gastric conduit was used in all resectable cases and a finger dilatation of the pylorus was performed in all the cases.

Tumours were located in the upper third of the oesophagus in nine patients (10.7%), in the middle third in 18 patients (21.4%), in the lower third in 57 patients (68%), and in the GOJ in five patients (6%). 44% of the tumours were squamous cell carcinoma and 56% were adenocarcinoma. The pathology in the resected tumours revealed stage II (1.2%), III (94%) and IV (4.8%). Stage 0 and stage I tumours were not recorded in our study. There were no significant differences between the two groups either in the histology, or the stage of the tumours. Blood transfusion was given to all

patients, with a mean of 2.49 units. Transfusion requirements were similar in both groups (2.4 versus 2.6 units) and there was no statistically significant difference (p=0.206).

All the selected patients (84) were admitted to the intensive care unit (ICU) for a mean of 3.16 days and there was no significant difference in the median ICU stay between THO and TTO groups (p=0.791). The postoperative complications included, anastomotic leak in 14 patients (16.7%), recurrent laryngeal nerve lesion (RLNL) in eight patients (9.5%), and wound infection in 20 patients (23.8%). The differences in the aforementioned complications between the THO and TTO groups were statistically significant (p=0.001, 0.004, 0.007, respectively). The other complications are shown in Table III.

Transthoracic leak was the cause of death in two patients, while transhiatal leak resulted in only one mortality. All the cases of recurrent laryngeal nerve paralysis (8 cases) occurred ipsilateral to the cervical incision. The overall mortality (30 days) rate was 8.3% (7 out of 84 patients). The mortality consisted of four out of 43 patients (9.3%) in the THO group and three out of 41 patients (7.3%) in the TTO group. The difference between the two groups was not statistically

Table III. Postoperative outcome of the †THO and ‡TTO groups.

| Characteristics | THO (n=43) | TTO (n=41) | *p-value | Total (n=84) |
|---------------------------------------|-------------|-------------|----------|--------------|
| Location: Upper third | 6 | 3 | | 9 (10.7%) |
| Middle third | 2 | 16 | 0.207 | 18 (21.4%) |
| Lower third | 34 | 18 | | 52 (61.9%) |
| §GOJ | 1 | 4 | | 5 (6%) |
| Mean of blood transfusion (units)[SD] | 2.37 [0.90] | 2.61 [0.80] | 0.206 | 2.49 [0.657] |
| Mean of ICU admission (days) | 3.51 | 4.12 | 0.791 | 3.81 |
| Histopathology | | | | |
| Squamous cell carcinoma | 19 | 18 | 0.979 | 37 (44%) |
| Adenocarcinoma | 24 | 23 | | 47 (56%) |
| Pathological (pTNM) staging: II | 1 | 0 | 0.617 | 1 (1.2%) |
| Pathological (pTNM) staging: III | 40 | 39 | | 79 (94.0%) |
| Pathological (pTNM) staging: IV | 2 | 2 | | 4 (4.8%) |
| Complications | | | | |
| Anastomotic leak: cervical | 9 (21%) | 0 | | 9 (10.7%) |
| intrathoracic | 0 | 5 (12%) | 0.001 | 5 (5.95%) |
| Pneumonia | 1 | 1 | 0.973 | 2 (2.38%) |
| Adult respiratory distress syndrome | 1 | 1 | 0.973 | 2 (2.38%) |
| Recurrent laryngeal nerve lesions | 8 (18.6%) | 0 | 0.004 | 8 (9.52%) |
| Haemorrhage (intra and postoperative) | 4 | 2 | 0.349 | 6 (7.14%) |
| Wound infection | 8 | 12 | 0.007 | 20 (23.8%) |
| Mortality | 4 (9.3%) | 3 (7.3%) | 0.742 | 7 (8.3%) |
| Hospital stays mean (days) | 21.48 | 21.70 | 0.879 | 21.59 |

†THO: transhiatal oesophagectomy; ‡TTO: transthoracic oesophagectomy; §GOJ: gastro-oesophageal junction; *p<0.05 is significant; SD: standard deviation.

significant ($p=0.742$). The causes of death included bleeding in two patients, arrhythmia and cardiac arrest in two patients, empyema and sepsis due to intrathoracic leak in two patients, and cervical leak followed by adult respiratory distress syndrome (ARDS) and pneumonia in one patient.

The mean (and standard deviation [s.d.]) hospital stay was 21.95 (s.d. 7.63) days and the difference between the two groups was not statistically significant ($p=0.875$). The follow-up was successful for only 24 patients (28.6%). 11 patients were seen after 3-12 months, six patients were seen after 13-24 months, four patients were seen after 25-36 months, two patients were seen after 37-48 months, and only one patient was seen after 60 months during the follow-up. The mean was 19.92 months, with a minimum of three months and a maximum of 60 months.

DISCUSSION

Most patients with oesophageal cancer in Yemen continue to seek treatment at an advanced stage of the disease. Similarly, Li and Yao⁽⁶⁾ found a large

portion of cases at an advanced stage because of late diagnosis. In this study, 99% of the tumours were in stages III and IV. Surgical therapy continue to be the cornerstone of nearly all treatment protocols and is the only consistently effective modality for achieving substantial palliation and survival of these patients. However, despite the recent advances, the result of surgery in advanced stages of the disease remains undeniably disappointing⁽⁶⁾.

In the last seven years, this type of resection (oesophagectomy) has been performed in at least three centres in Yemen, including the Al-Thawra Teaching Hospital. This has been made possible due to improvement of surgical skills and supportive care, which allowed resection in patients previously considered unfit for surgery. In the present study, there was no randomisation and the patients were selected on the basis of surgeon's criteria, which may introduce selection bias. Different surgical techniques have been practiced, with their advantages and disadvantages. However, we agree with Nguyen et al's⁽⁷⁾ conclusion that the advantages of THO

include avoidance of morbidity, including the respiratory compromise associated with thoracotomy, and the fact that if a leak does occur, it will be in the neck where it is more accessible⁽⁷⁾. We also agree with Schrupp et al's⁽⁸⁾ report that the advantages of TTO include better visualisation and access, resection of the upper two-thirds of the oesophagus and mediastinal disease, and avoidance of blind blunt dissection with tumours of the midthoracic oesophagus⁽⁸⁾.

Anastomotic leakage can be a major complication after oesophagectomy, whether it occurs in the chest or in the cervical region⁽⁹⁾. In this series, the cause of death was the intrathoracic anastomotic leak in two out of five (40%) leaks, and the cervical leak was the cause of death in one out of eight (11%) leaks. This is in agreement with Boyle et al's⁽¹⁰⁾ conclusion where it was mentioned that anastomotic leaks that occur after cervical anastomosis tend to run a more benign course⁽¹⁰⁾. Similar findings to our mortality due to a leak of an intrathoracic anastomosis were reported by Baulieux et al⁽¹¹⁾.

The low incidence of recurrent laryngeal nerve lesion (9.5%) in our study was nearly similar to Law et al's⁽¹²⁾ results (6%), but less than Bousamra⁽⁹⁾ results, and dramatically lower than the up to 70% observed in the Japanese reports⁽¹²⁾. This could be explained by the differences in the dissection technique around the recurrent laryngeal nerve. Hulscher et al⁽¹³⁾ recommended that in an extended transthoracic resection, the cervical anastomosis should be made on the left side to minimise the risk of bilateral vocal cord paralysis⁽¹³⁾. In contrast to Boyle et al⁽¹⁰⁾, the difference in this study between the two groups (THO versus TTO) with regard to the anastomotic leak and RLNL was statistically significant ($p=0.001$ and 0.004 , respectively) (Table III).

Meneu-Diaz et al⁽¹⁴⁾ reported that the majority of tumours were located in the lower third and cardia (71%), and 19% were adenocarcinoma. Our results reveal a similar location (74%), but differ in the percentage of adenocarcinoma (56%). This is in agreement with Bousamra et al⁽⁹⁾. In the present study, the pathological staging revealed advanced cancer, where no cases of stages 0 and I were recorded, and only 1.2% of the cases were in stage II. This is in contrast to other studies^(9,15) where 62% were in stages I and II. These findings confirm our belief that most of our patients present in an advanced stage.

The mean postoperative ICU stay in our study was 3.16 days (range: 1-11 days), which is shorter than the 12 days (range: 3-46 days) reported by Meneu-Diaz et al⁽¹⁴⁾. The mean postoperative

hospital stay in our study (21.95 days, range: 3-42 days) was similar to that recorded by Meneu-Diaz et al⁽¹⁴⁾ (mean: 25 days, range: 12-36 days). The operative mortality rate of oesophagectomy has been falling over the past three decades⁽¹⁶⁾. Hofstetter et al⁽¹⁷⁾ mentioned that the operative mortality dropped from 12% to 6%⁽¹⁷⁾. Some authors have mentioned that oesophagectomy associated with low mortality rates (ranging from 3% to 14.7%) in many experienced centres^(6,18,19). In our study, the operative mortality rate was 8.3%, slightly higher than that reported by some studies⁽²⁰⁻²⁴⁾, but lower than that reported by others⁽²⁵⁻²⁸⁾. The difference in the mortality in our study between THO and TTO (4 versus 3, respectively) was not statistically significant ($p=0.742$).

Only 24 patients were followed up for a mean of 19.92 months (range 3-60 months), with the other patients being lost in the follow up. Therefore, the long-term survival rate in our study cannot be determined, but we believe that it would be low, because most of our patients were in advanced cancer stage.

We conclude that there were no significant differences between THO and TTO with respect to mortality and short-term survival, while there were significant differences in morbidity (anastomotic leak and RLNL). The long-term survival rate is likely to be low and the strategies to improve the outcome of this distressing disease must focus on earlier diagnosis. Our data do not permit us to make a clear recommendation of one treatment over the other.

At present, the choice for patients with cancer of the oesophagus is between lower morbidity (intrathoracic leak) but with a more serious outcome and the hope of better long-term benefits with TTO; or increased morbidity (cervical leaks, RLNL) but with benign outcome and apparently decreased long term survival with THO.

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