

# Gastric transposition for pharyngolaryngo-oesophageal cancer: the Unicamp experience

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## Abstract

Carcinomas of the pharyngo-oesophageal junction continue to be a challenge to head and neck surgeons. We report a series of 30 patients who underwent gastric transposition for advanced pharyngo-oesophageal tumours, with personal insights about the surgical technique and the need for neck and mediastinal node dissection. The median hospital stay was 21.6 days, with resumption of oral feedings around the 16th day in 91.7 per cent of the surgical survivors. Ten patients had multiple primary tumours (33.3 per cent), with 20 per cent of synchronous carcinomas. Serious local and systemic complications occurred in 17 patients (56.7 per cent), the most important being tracheal complications, cervical and systemic infections, fistulas, rupture of major vessels and pulmonary embolus. Post-operative deaths occurred in 20 per cent of the patients. The locoregional control of disease was significant (only 14.2 per cent of deaths from regional recurrence) but 64.2 per cent of the patients died from distant metastasis. Survival without disease was 13.3 per cent at five years. Gastric transposition was judged to be the procedure of choice for palliation or occasional cure in patients with pharyngo-oesophageal tumours.

**Key words:** Hypopharynx; Oesophagus; Neck; Oesophageal Neoplasms; Pharyngeal Neoplasms; Esophagectomy; Pharyngectomy; Stomach, Surgery

## Introduction

Radical resection of the hypopharynx and cervical oesophagus with immediate reconstruction continues to be a major concern of surgeons around the world. Since cure is unlikely in most patients, the surgical treatment should aim at palliation with a prompt return to oral feeding. Many methods for repairing circumferential pharyngo-oesophageal defects have been described since the beginning of the 20th century. Transmediastinal gastric transposition and pharyngogastric anastomosis is perhaps the most widely accepted method for restoring alimentary continuity after pharyngo-oesophageal resection, mainly because of the several advantages of using the stomach. Following description by Denk,<sup>1</sup> of an instrument for extracting the oesophagus in cadavers and animals, and Turner's<sup>2</sup> first report of extra-pleural oesophagectomy, Ong and Lee<sup>3</sup> and LeQuesne and Ranger<sup>4</sup> pioneered total pharyngolaryngo-oesophagectomy and gastric transposition (PLE&GT). These authors challenged Goligher and Robins's<sup>5</sup> opinion that the stomach would never reach the pharynx. In the last four decades, other authors have popularized this procedure.<sup>6–25</sup> The objective of this report was to assess the outcome of

this treatment in our institution, adding some personal technical considerations.

## Materials and methods

From 1980 to 1995, 30 patients with pharyngo-oesophageal tumours underwent PLE&GT and pharyngogastric anastomosis. Fourteen patients had tumours located in the cervical oesophagus, six in the pyriform sinus, six in the post-cricoid region, three in the larynx and one had a pharyngo-oesophageal recurrence of a previously operated follicular thyroid adenocarcinoma.

The patients' ages ranged from 31 to 71 years (median 56 years); 27 (90 per cent) were men. Smoking and drinking were present in 93 per cent of the patients. All patients had obstructive upper aerodigestive symptoms and weight loss. Nine patients (30 per cent) had clinically positive neck nodes, four (13.3 per cent) had ulceration or soft part (muscles, subcutaneous tissue, skin) neck infiltration and one (3.3 per cent) had interscapulothoracic pain.

Ten patients (33.3 per cent) needed tracheostomy prior to the procedure. Four (13.3 per cent) patients had had head and neck procedures for previous metachronous tumours in this region: two with carcinoma of the floor of the mouth and base of

tongue and two with epidermoid carcinoma of the lip. In addition, three (10 per cent) patients had previous gastric surgery: two had gastrostomy and one had vagotomy and pyloroplasty (for a duodenal ulcer). One patient also had an endo-oesophageal prosthesis inserted prior to referral. Radiotherapy directed to the head and neck region was used in 13 patients (43.3 per cent), either to treat the pharyngo-oesophageal tumour or to treat a previous head and neck primary. Chemotherapy had been used previously in only four patients (13.3 per cent).

In addition to the routine work-up, the patients underwent tracheal and laryngeal planigraphy, oesophagoscopy and oesophagography, abdominal ultrasound, bronchoscopy and head, neck and thoracic computerized tomography (CT). A tissue diagnosis was obtained in all patients either by oesophagoscopy or direct laryngoscopy. The CT scan was especially helpful in evaluating extent of the local primary tumour and mediastinal and posterior tracheal wall invasion, but less useful for assessing neck node metastasis. Oesophagoscopy determined the exact location of the tumour in hypopharyngeal and oesophageal carcinomas (median distance from incisors of 18 cm). Abdominal ultrasound showed hepatic metastasis in one patient (follicular thyroid carcinoma) and cholelithiasis in two patients. Bronchoscopy was helpful in 11 patients (36.7 per cent) and indicated tracheal mucosal changes, bulging, real invasion, and the number of tracheal rings possibly involved. Indirect laryngoscopy was abnormal in 15 (50 per cent) patients, with pyriform sinus obliteration in 15, gross invasion of the larynx in 12, and a visible tumour in 10, with frequent occurrence of these clinical findings in the same patient. Twenty-seven (90 per cent) patients were either stage III or IV, the exceptions being three cases with oesophageal carcinomas (stage IIA). Twenty-one out of the 30 patients (70 per cent) were severely malnourished.

#### *Technical aspects of the surgery*

The technique used was basically the same as reported previously by others, with specific modifications at each step. We used different types of neck incisions, depending on the need for neck dissection. In our most recent patients we have routinely used a collar incision that extends approximately 2 cm beyond the manubrium. Depending on the amount of posterior tracheal wall removed, this additional skin can be used to fashion the definitive tracheostomy without tension. A routine circumferential pharyngolaryngectomy was performed, with transection above the hyoid bone. Occasionally, to preserve more tissue for the proximal anastomosis, the pharyngeal transection was done below the hyoid bone.<sup>26</sup> A number of tracheal rings were included in the resection, depending of the extent of posterior tracheal wall invasion. Extensive longitudinal resection of the posterior tracheal wall was not an absolute contraindication to resection, as long as the tumour was limited to the midline and margins could be obtained. Reconstruction may be per-

formed with the anterior gastric wall during transposition.<sup>27</sup> Better visualization of this extensive tracheal resection was obtained with the help of a laparoscopy light system, which combined a TV screen with direct visualization. The tracheo-oesophageal dissection was then carried out, using blunt or sharp dissection. Occasionally manubrium resection and mediastinal tracheostomy was necessary, at which time a muscle flap or transposed omentum<sup>20</sup> was used to protect the great vessels. In mobilizing the stomach, we have modified the technique of omentum preservation to protect the great vessels.<sup>28</sup> The minimum and imperative tracheal length permitted in such cases was 5 cm of normal remnant trachea. Another concept that evolved from our experience is that there was a need for mediastinal node dissection, more so in patients with cervical oesophageal carcinomas. The limits of our mediastinal dissections were: laterally, the great vessels (carotid arteries, jugular veins and innominate vessels) and the mediastinal pleurae; posteriorly, the prevertebral fascia; inferiorly, the aortic arch. The drawback of transmediastinal PLE&GT is that intrathoracic mediastinal lymph nodes dissection is not possible.

During transmediastinal dissection, tears in the posterior wall of the trachea or bronchus were best managed by removing the specimen, returning the stomach to its original position and suturing the tear through the neck incision, either directly or using the laparoscopy light system. There was no need of a thoracotomy in these cases. Independent of the length of the membranous tear, the entire posterior wall of the trachea and bronchus can be sutured this way.

The usual pharyngogastric anastomosis was performed in two layers, using the gastric fundus as the most cephalic portion. An alternative technique used in three patients involved a circular stapler pharyngogastric anastomosis,<sup>26</sup> with satisfactory results in all. A pyloromyectomy and a jejunojejunostomy were routine procedures.

## **Results**

### *Surgical aspects*

The median duration of the PLE&GT was 5.4 hrs, which increased to 6.3 hrs when a neck dissection was added to the procedure. The median intraoperative blood loss was 800 ml (range 250–2000 ml), attributable to the head and neck procedure. Table I summarizes our surgical findings. Frank invasion of the trachea was common (n = 12, 40 per cent), as confirmed by pathology. Six of these 12 patients (50 per cent) had oesophageal carcinomas, five (41.7 per cent) had post-cricoid carcinomas and one (8.3 per cent) had pyriform sinus carcinoma. The average number of tracheal rings resected was four. Extensive posterior wall tracheal resection was done in three patients and required resection 1.5–2.0 cm from the carina and reconstruction with the anterior wall of the stomach. Initially, only one patient required true mediastinal tracheostomy, but eventually four others needed it, because of complica-

TABLE I  
SURGICAL ASPECTS OF PATIENTS STUDIED

Data	n	%
Proximal tracheal invasion	12	40
Extensive tracheal resection	3	10
Mediastinal tracheostomy	1	3.3
'False mediastinal tracheostomy'	12	40
Gross pre-vertebral fascia invasion	1	3.3
Recurrent laryngeal nerve invasion	13	46
Total thyroidectomy*	10	34.4
Thyroid lobectomy*	16	55.2
Thyroid preserved*	3	10.3
Pleural lesions	16	53
Thoracic duct injury	2	6.7
Myocutaneous flap	4	13.3

\*One patient excluded (previous total thyroidectomy).

tions. In addition, 12 (40 per cent) had a 'false mediastinal tracheostomy', defined by us as a tracheostomy done below the sternal notch but without resection of the manubrium. Pre-vertebral fascia invasion occurred in one patient and was responsible for interscapulothoracic pain. Recurrent laryngeal nerve invasion by the primary tumour was more frequent in oesophageal carcinomas (five patients), followed by post-cricoid region carcinomas (four), pyriform sinus carcinomas (three) and laryngeal carcinoma (one patient). One patient also had invasion of the sympathetic chain by the primary tumour. Excluding one patient with previous total thyroidectomy and laryngectomy for follicular thyroid cancer, total thyroidectomy or thyroid lobectomy was usually necessary. Ninety per cent of the total thyroidectomies were done for post-cricoid, laryngeal or pyriform sinus carcinomas and 73 per cent of the thyroid lobectomies were done for oesophageal carcinomas. Invasion of the thyroid was confirmed by histological analysis in four patients with pyriform sinus carcinomas, four with post-cricoid carcinomas, two with carcinoma of the larynx and two with carcinoma of the oesophagus.

Pleural lesions were found in 16 patients (53 per cent) during the procedure, whereas 27 (90 per cent) of the 30 patients had pleural effusions in the post-operative period. Thoracic duct injury was recognized and treated in two patients, both of whom developed chylothorax. Four patients needed myocutaneous flaps (three pectoralis major island flaps and on thoracoacromial flap) for skin defects or the protection of vessels. Pharyngogastric anastomosis was accomplished satisfactorily in all patients.

Invasion of the adjacent region (larynx, hypopharynx and cervical oesophagus) by the primary tumour was analysed in 28 patients. Twenty-two (78.5 per cent) had adjacent region invasion, the exceptions being five patients with oesophageal carcinomas and one patient with a double primary (larynx and oesophagus), in which the tumours were restricted to their sites of origin (Table II).

Excluding the neck dissections done for metachronous primary tumours (previous or subsequent to the procedure), 14 patients (46.7 per cent of the total number) were submitted to 17 neck dissections. Most of these neck dissections were concomitant with the pharyngolaryngo-oesophagectomy (82 per cent). The remaining 18 per cent were done for subsequent neck metastasis. Three patients had bilateral neck dissections. Nine neck dissections were therapeutic and all showed positive nodes. Eight neck dissections were elective and four (50 per cent) showed positive nodes. Thus, 11 out of the 30 patients (36.7 per cent), which represented 78.5 per cent of the 14 patients with neck dissections, had positive neck nodes. Likewise, 13 out of 17 neck dissections (76.4 per cent) had positive nodes. Most of the neck dissections were radical (47 per cent), extended radical (17.6 per cent) or modified radical (11.7 per cent). Selective neck dissection was done in four patients, and in two it was positive. Most patients submitted to neck dissections and with primary sites in the pyriform sinus, post-cricoid region, and larynx had positive nodes (50, 66.7 and 66.7 per cent, respectively). Four out of 14 patients with isolated oesophageal primary had five neck dissections performed and only two (14.3 per cent) had positive neck nodes. However, three out of the five neck dissections done for cervical oesophageal tumours were positive (60 per cent), one of which had 46 positive nodes out of 75 dissected. In five patients (35.7 per cent), neck nodes invaded important neck structures, such as the skin, great vessels (external carotid artery) and nerves (hypoglossus).

Upper mediastinal lymph node (para-tracheal and para-oesophageal) dissection was routine in all patients. Thirteen (43.3 per cent) patients had positive mediastinal nodes, distributed in 42.8 per cent of the oesophageal carcinomas, 50 per cent of the pyriform sinus carcinomas, 50 per cent of the post-cricoid carcinomas, and in the one patient with recurrent follicular carcinoma. None of the laryngeal carcinoma patients had mediastinal node metastasis. Table III summarizes the positive cervical and mediastinal node metastasis.

TABLE II  
ADJACENT REGION PRIMARY TUMOUR INVASION IN 22 PATIENTS

Primary	n	Oesophagus	Per cent	P. sinus	Per cent	Post-cricoid	Per cent	Larynx	Per cent
Oesophagus	9			5	55.8	8	88.8	5	55.6
P. sinus	6	5	83.3			6	100	6	100
Post-cricoid	6	6	100	6	100			3	50
Larynx	1			1	100	1	100		
Total	22	11		12		15		14	
Per cent	78.5	50		54.5		68.1		63.6	

\*Two previous laryngectomies and six patients without adjacent region invasion were excluded.

TABLE III

PRIMARY TUMORS WITH CERVICAL AND MEDIASTINAL METASTASIS

Primary	n (total)	Cervical mets		Mediastinal mets	
		n	Per cent	n	Per cent
Oesophagus	14	2	14.3	6	42.8
P. sinus	6	3	50	3	50
Post-cricoid	6	4	66.7	3	50
Laryngeal	3	2	66.7	0	0
Fol. thyroid	1	0	0	1	100
Total	30	11	36.7	13	43.3

mets = metastasis.

*Hospital stay*

Excluding the post-operative deaths, the median hospital stay was 21.6 days (range, 10–68 days), with a median stay of 16 and 27.7 days for patients without and with serious complications, respectively.

*Swallowing rehabilitation and social outcome*

Oral feedings were started eight to 75 days after the procedure (average of 16.5 days). Only three patients started oral feeding after 25 days. The tolerance to solid food was excellent or good in 15 of 24 survivors (62.5 per cent), and to a soft or liquid diet in 22 survivors (91.7 per cent). Only two patients required prolonged enteral nutrition after surgery. Post-operatively, 17 (70.8 per cent) patients gained or maintained their weight. All patients leaving the hospital returned to their family affairs, seven returned to their social affairs but only four patients returned to work.

*Pathological analysis*

Twenty-nine of the primary carcinomas for which the PLE&GT was indicated extended beyond the mucosa or muscular coats of the organ of origin. Only six tumours were restricted to their site of origin; the remainder showed invasion of adjacent regions, as mentioned. With one exception (follicular thyroid carcinoma), all tumours were epidermoid carcinomas. Most carcinomas were grade II (moderately differentiated) or III (poorly differentiated) (60 per cent). The grade III tumours were mainly oesophageal or post-cricoid carcinomas. The margins were negative in 28 out of 30 patients. No specimen showed peri-neural invasion but eight had venular or

lymphatic invasion (mainly oesophageal epidermoid carcinomas).

Forty-nine tumours were found in the pathological specimens: 20 patients (66.6 per cent) had a single primary and 10 (33.3 per cent) had 19 multiple primary tumours. Ten (52.6 per cent) of the multiple primary tumours were synchronous with PLE&GT (occurring in six out of the 30 patients of this series), five (26.3 per cent) were previous metachronous, and four (21 per cent) were subsequent metachronous. All multicentric tumours were epidermoid carcinomas and most were invasive (15, 78.9 per cent). Thirteen (68.4 per cent) out of 19 multiple primaries were located in the oesophagus or hypopharynx.

Four hundred and eighty lymph nodes were dissected from 14 patients with a neck dissection (average of 34.2 nodes per patient). Only a few nodes (75 or 15.6 per cent of neck nodes) were positive but extracapsular invasion was significant, occurring in eight (57 per cent) of the 14 patients. The average number of positive neck nodes per patient was 5.7. The most frequent site of positive neck nodes was level III (38 per cent), followed by level IV (31 per cent), level II (17 per cent), level V (seven per cent) and level I and VI (three per cent each). There was, nonetheless, differentiation of the level of invasion according to the primary site.

One hundred and forty-five mediastinal lymph nodes were dissected. Again, only a minority of these nodes were positive (34 nodes, 23.4 per cent). Eight (26.6 per cent) patients had extracapsular invasion in the nodes.

*Complications*

All patients had some type of complication during the post-operative period, with 124 complications occurring in the 30 patients. In 17 patients (56.7 per cent) the complications were considered serious. The association of multiple locoregional and systemic complications in the same patient was common.

Intra-operative complications included rupture of the posterior tracheal wall in four patients (13.3 per cent), caused by manipulation of the endotracheal tube during the procedure. The only important intra-abdominal complication was one ruptured spleen, with uneventful splenectomy.

TABLE IV

IMMEDIATE POST-OPERATIVE LOCOREGIONAL AND SYSTEMIC COMPLICATIONS IN THE 30 PATIENTS STUDIED

Locoregional complications	n	Per cent	Systemic complications	n	Per cent
Hydropneumothorax	27	90.0	Pneumonia	8	26.7
Hydroparathyroidism	20	69.0	Haemodynamic instability	6	20.0
Superficial stomal necrosis	11	36.7	Sepsis and bacteraemia	5	16.7
Cervical infection	8	26.7	Psychogenic complications	4	13.3
Tracheitis sicca	8	26.7	Arrhythmia	4	13.3
Gastrocutaneous fistula	8	26.7	Anasarca	3	10.0
Innominate rupture	3	10.0	Upper GI bleeding	3	10.0
Chylous fistula	2	6.7	Respiratory failure	2	6.7
Tracheal wall necrosis	2	6.7	Paralytic ileus	2	6.7
Partial gastric wall necrosis	2	6.7	Transient jaundice	2	6.7
Paralytic ileus	2	6.7	Pulmonary embolus	1	3.3
Ascites	2	6.7	Hepatic failure	1	3.3
Carotid rupture	1	3.3	Renal failure	1	3.3

GI = gastrointestinal.

TABLE V  
MORTALITY: IMMEDIATE AND ASSOCIATED CAUSES IN SIX PATIENTS

Immediate causes	<i>n</i>	Per cent	Associated causes	<i>n</i>	Per cent
Innominate artery rupture	2	33.3	Infection	5	83.3
Carotid artery rupture	1	16.7	Malnutrition	5	83.3
Pneumonia	1	16.7	Previous radiotherapy	4	66.7
Cardiac arrhythmia	1	16.7	Serious tracheal complications	2	33.3
Pulmonary embolus	1	16.6	Chylothorax	2	33.3
			Pharyngocutaneous fistula	1	16.7

Table IV summarizes all immediate locoregional and systemic complications, which occurred in 21 and 18 patients, respectively. Many of these complications were multiple in the same patient.

Late post-operative complications included two cases of persistent gastric regurgitation (which subsided after four months), two stomal stenosis that required revision and one stomal obstruction due to secretion (which occurred at six months and was the cause of death of this patient). Twenty-three patients were evaluated for late hypoparathyroidism and in 13 (56.5 per cent), the condition persisted. Only one out of eight total thyroidectomy patients who survived the surgery reverted the hypoparathyroidism. Fourteen survivors underwent partial thyroidectomy and 10 developed hypoparathyroidism, which persisted in six patients (42.8 per cent with persistent hypoparathyroidism after partial thyroidectomy).

Table V summarizes the immediate and associated causes of mortality in six patients.

#### Follow-up and end results

Of the 30 patients studied, 22 were followed from four to 97 months (median, 19.5 months). Of the remaining eight, six were post-operative deaths and two were lost to follow-up. The Kaplan–Meier survival curve showed a survival of 35 per cent at

one year, 25 per cent at two years and 13.3 per cent (four patients) at five years. The latter patients show no without evidence of disease after 100, 97, 43 and 27 months. Three patients died of unrelated tumour causes at six, five and eight months (tracheal secretion plug, upper gastrointestinal bleeding and post-operative complications of a second primary tumour). Fourteen (46.7 per cent) patients died from disease (locoregional recurrence or distant metastasis); the sites of recurrence are shown in Figure 1. Thus, 12 out of 14 patients (85.7 per cent) died with distant metastasis and none solely from local recurrence. The most frequent sites of distant metastasis were the liver (29 per cent), lung (25 per cent) and mesentery (13 per cent), followed by bone, skin, small and large bowel, brain and spleen (8.5 per cent for each site). Six of these patients had a primary in the oesophagus (42.8 per cent), three in the post-cricoid region or pyriform sinus (21.4 per cent each) and one in the larynx or thyroid (7.1 per cent each). The most important prognostic differences between the patients alive without disease (AWD) and those dead of disease (DOD) included a greater number of positive nodes in the DOD group (average of 5.8 vs. 1.6 nodes) and the presence of extracapsular invasion (66.6 per cent vs 0 per cent).

#### Discussion

An extensive review of the use of gastric transposition for pharyngo-oesophageal tumours from 1960 to 1998 revealed approximately 1700 cases, excluding duplicated reports. There were 47 published reports among several institutions around the world, with a median of approximately 36 cases per author or institution. Most reported 50 or fewer cases (68 per cent). Ten articles (21.2 per cent) related 50–100 cases and only four (8.5 per cent) reported more than 100 cases.<sup>7,10,12,13</sup> Our present study represents 1.8 per cent of the literature and 63.8 per cent of the cases for Latin America, including the 17 cases published by Padron-Amare and Plaza-Caster<sup>29</sup> from Venezuela. We have only eight ward beds at our Head and Neck Service in a 400-bed general University Hospital. Despite this limitation, the average number of major head and neck oncology surgical procedures is around 300 per year. About eight per cent of the oesophageal cancer patients have tumours of the cervical oesophagus or of the pharyngo-oesophageal junction, and a minority are selected for PLE&GT. Although this series represents the experience of only one surgeon, this

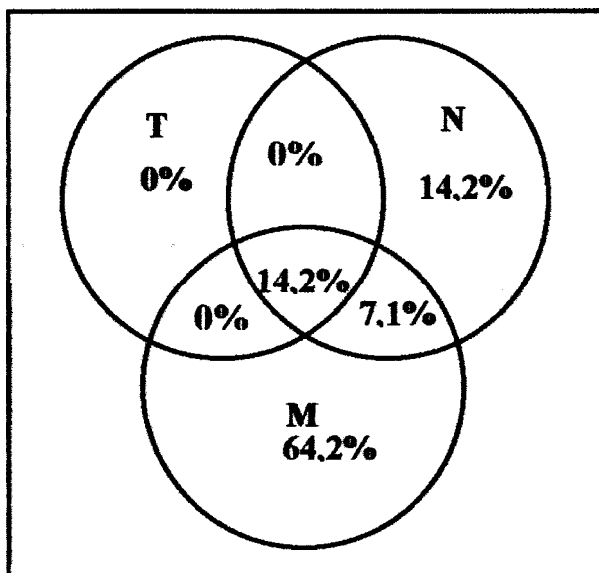


FIG. 1

Site and percentage of recurrence. T = tumour; N = neck; M = distant metastasis.

procedure is indicated in selected patients (average of two patients per year).

Among the signs and symptoms of our patients, the presence of interscapulothoracic pain may denote gross invasion of the prevertebral fascia, not reported in the literature.

In the pre-operative work-up, oesophagoscopy, bronchoscopy and a CT scan were essential for planning the procedure, especially in patients with suspected involvement of trachea. Most of our patients had an advanced stage of disease, with frequent extension of the tumour beyond the organ of origin, resulting in frequent invasion of the adjacent region, recurrent nerve, trachea and thyroid. The incidence of tracheal invasion (40 per cent) was higher than previously reported (eight per cent according to Cahow and Sasaki;<sup>16</sup> 25 per cent according to Marmuse *et al.*;<sup>18</sup> and 35 per cent according to Collin and Siro<sup>8</sup>).

The surgical technique was similar to other reports, with some modifications. Although several types of neck incisions were used, we currently prefer a collar-type incision, prolonging the lower limb about 2 cm beyond the sternal notch. Since these patients frequently required varying degrees of posterior tracheal wall resection, the collar-type incision facilitated the reconstruction of the stoma at the end of the procedure. Only one (3.3 per cent) of our patients initially needed mediastinal tracheostomy. The need for mediastinal tracheostomy is reported to be between 4.2 per cent and 11.8 per cent<sup>13,16,18</sup> but may be as high as 58 per cent.<sup>11</sup> Forty per cent of our patients had what we termed a 'false mediastinal tracheostomy', already defined by us. Theoretically, this tracheostomy carries almost the same risk as a true mediastinal tracheostomy. For selected patients, invasion of the posterior tracheal wall may no longer be an absolute contra-indication to the surgery. If this invasion is limited to the midline, and as long as adequate margins can be obtained, almost the entire posterior tracheal wall can be reconstructed by suturing the remnant lateral tracheal wall to the anterior gastric wall serosa. Although our experience is limited,<sup>27</sup> the above approach functioned well. The bulging of the gastric wall into the trachea was not enough to obstruct the lumen. A soft deflated tracheostomy tube must be maintained for a few days post-operatively. There is, however, a potentially possibility for a gastrotracheal fistula. As would be expected, from 12 patients who had tracheal invasion, 11 had oesophageal or post-cricoid carcinomas. The use of a laparoscopy light system was helpful during extensive tracheal wall resection, as well as for suturing tracheal or bronchial lacerations, thus dispensing a thoracotomy. We have used this light system to ensure the integrity of the membranous tracheal and bronchial posterior wall, by looking directly into the lumen after mediastinal manipulation. The use of a circular stapler for pharyngogastric anastomosis<sup>26</sup> is a novel method and was employed in three patients of this report with no complications. The preservation of part of the greater omentum, to be transposed with

the stomach to the neck, is a technique that may be helpful in protecting the great vessels, and was devised in a manner similar to that reported by Freeman *et al.*<sup>20</sup> We had no difficulty in bringing the stomach up to the pharynx for anastomosis in our patients.

The high incidence of hypoparathyroidism (69 per cent in the immediate post-operative period and 56.5 per cent in the follow-up) was attributable to the need to obtain adequate margins around the tumour. Although some authors advocate preservation of the parathyroid glands during the procedure,<sup>9,10,16,25</sup> we considered this inappropriate in some of our patients. Furthermore, only one of our total thyroidectomy patients reversed the hypoparathyroidism (85.7 per cent continued with hypoparathyroidism). Partial thyroidectomy (done in 16 patients in this series) was no guarantee that hypoparathyroidism would not occur, since the persistence of the condition in this series was still 42.8 per cent. The incidence of hypoparathyroidism in the literature varies from 23.7 per cent<sup>16</sup> to 67 per cent when total thyroidectomy is done.<sup>25</sup> However, in the latter study, the frequency of hypoparathyroidism was seen in 13 per cent of partial thyroidectomy and 5.3 per cent when the thyroid was totally preserved.

The adjacent region invasion (Table II) confirmed the advanced tumour condition of these patients, as well as the centrifugal growth of the carcinomas. Despite the advanced stage of the lesions, the margins were negative in 93.3 per cent of the cases, perhaps because of the radical nature of the procedure adopted. Other studies have reported positive margin frequencies of three to 46.1 per cent.<sup>10,17,18</sup>

Neck dissections in patients with advanced pharyngolaryngo-oesophageal tumours are well accepted in the literature. Our frequency of neck metastasis was 36.7 per cent, compared with reported incidence of 32.5 per cent,<sup>7</sup> 41 per cent,<sup>12</sup> 66.1 per cent<sup>16</sup> and 73.3 per cent.<sup>15</sup> When the laryngeal and hypopharyngeal carcinomas in our series were separated, the frequency of cervical metastasis was 60 per cent. Superior mediastinal dissection for possible positive nodes is an acceptable procedure in patients with cervical oesophageal tumours, which occurred in 42.8 per cent in our series. Other series have described higher frequencies, varying from 71.4 per cent<sup>30</sup> to 84 per cent.<sup>8</sup> The question arises about performing elective neck dissection in oesophageal carcinomas, since it occurred in only 14.2 per cent of our patients and in 16.2 per cent of other study.<sup>7</sup> Akyama<sup>19</sup> and other Japanese authors<sup>31,33</sup> recommended neck dissection even for thoracic oesophageal carcinomas (the so-called 'three field lymph node dissection') with frequencies of cervical metastasis in the range of 26 per cent. Mediastinal node dissection in hypopharyngeal and laryngeal carcinomas is also a subject of debate in the literature and occurred in 50 per cent and 0 per cent of our cases, respectively. Literature values for mediastinal node metastasis in hypopharyngeal and laryngeal carcinomas range from 8.6 per cent and

17.6 per cent<sup>30</sup> to 10 per cent<sup>12</sup> and 16 per cent,<sup>7</sup> respectively. The bottom line is that a neck dissection is indicated in over half of the patients with pharyngo-oesophageal carcinoma and mediastinal dissection is still controversial, indicating that there is a need for a prospective study in this regard. This is important, since the most relevant prognostic factor in our series, was the presence of extracapsular node invasion, in addition to the local stage of the disease.

Ten out of 30 patients (33.3 per cent) had multiple metachronous tumours in their medical history, confirming once more the concept of field cancerization. Six patients (20 per cent) had synchronous multiple primaries, most of which were invasive and located in the pharyngo-oesophageal region (68.4 per cent). The frequency of multiple synchronous primaries in these patients varies in the literature from 17.4 per cent<sup>14</sup> to 25 per cent.<sup>17,18</sup> These data corroborate the need for total pharyngolaryngo-oesophagectomy in such patients. Further details about multicentricity in our patients with pharyngo-oesophageal tumours is in another report.<sup>33</sup>

The median hospital stay of our patients (21.6 days) agrees with other reports. Patients with serious complications had longer stays (27.7 days). Surprisingly, patients with oesophageal carcinomas tended to have an earlier discharge (18 days), compared to patients with post-cricoid carcinomas (20 days) and laryngeal carcinomas (28 days). As far as the quality of life was concerned, the palliation achieved by this procedure, based on the resumption of oral feedings, was excellent or good in all except two patients (91.7 per cent).

Some type of complications occurred in all patients, at a high rate, perhaps because of stage of the disease, poor nutrition and previous manipulation (tracheotomies, neck incisions, gastric procedures or radiotherapy). Serious complications occurred in 56.7 per cent of our cases. Complications considered serious included tracheal complications, cervical and systemic infections, pharyngogastric and chylous fistulas, rupture of major vessels, arrhythmia and pulmonary embolus. The complication rate for PLE&GT in the literature varies from 22 per cent<sup>18</sup> to 100 per cent.<sup>9,12,14</sup> This perhaps reflects the fact that only the serious or important complications are usually reported. The median complication rate worldwide for PLE&GT was calculated by us to be around 62 per cent. The median mortality rate was 12 per cent, but varied from 5.5 per cent<sup>16</sup> to 30 per cent.<sup>12,23</sup> Even though we had a 20 per cent mortality, we have since operated on 10 additional patients with no deaths, thus reducing the mortality to a more acceptable level (15 per cent). The largest series of PLE&GT had a mortality of nine per cent.<sup>13</sup>

The complications responsible for post-operative deaths are listed in Table V. Only four patients (13.3 per cent) had major vessel rupture but 50 per cent of the post-operative deaths were due to this complication, making it the most important complication in this procedure. In most series, the frequency of major vessel rupture varies from 4.6 per cent<sup>22</sup> to as

high as 20.3 per cent.<sup>12</sup> The use of omentum pedicled flap reduces this complication.<sup>28</sup> All post-operative deaths occurred in patients with multiple associated complications or factors, especially infection (five cases), malnutrition (five cases) and previous radiotherapy (four cases). One case of carotid artery rupture was secondary to pharyngocutaneous fistula. The two cases of innominate artery rupture were associated with tracheostoma necrosis without fistula and two other patients had a chylous fistula and systemic infection (with death from pneumonia caused by *Staphylococcus aureus* in one and pulmonary embolism in the other). One patient died of a sudden arrhythmia without myocardial infarction.

The follow-up and final outcome of the patients revealed that most died of distant metastasis, with or without local or regional metastasis. The deaths from distant metastasis reported ranges from 30 to 50 per cent.<sup>7,12,15,24</sup> However, none of our patients died exclusively from local recurrence and only 14.2 per cent died of regional recurrence, demonstrating a high locoregional control of the disease, despite the initially advanced stage. In contrast, the local recurrence rate in the literature varies widely: 7.4 per cent;<sup>12</sup> 14 per cent;<sup>14</sup> 42 per cent<sup>16</sup> or even around 54 per cent.<sup>15,18</sup> Similarly, the regional recurrence rate also varied from 10 per cent<sup>8</sup> to 24 per cent,<sup>7</sup> and as high as 34 per cent.<sup>24</sup>

## Conclusion

Despite the high rate of complications, total PLE&GT is our procedure of choice for palliation or even occasional cure in patients with pharyngo-oesophageal tumours. The procedure offers a significant chance of locoregional control of the disease and early post-operative oral feeding. There is, however, a need for more effective methods of controlling distant metastasis if survival is to be improved.

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