

Free Jejunum Transfer for Hypopharyngeal Reconstruction: Technical Aspects and Outcome

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ABSTRACT

Background: The free jejunal flap is rapidly evolving as a preferred method for restoration of upper digestive tract continuity following total laryngopharyngectomy. Our experience with the technique is reported.

Material and methods: Twenty-two patients with hypopharyngeal cancer were included in the study period October 1996-December 2000. There were 20 males and two females with average age of 45 years. Total laryngopharyngectomy with neck dissection was carried out for all patients. Transfer of a jejunal segment to neck with microvascular technique was used for reconstruction. All patients received postoperative radiation therapy.

Results: Average operation time was 5 hours with estimated blood loss of 800 cc. Ischemia time ranged between 40-130 minutes. Two cases (9%) died in the immediate postoperative period (reactionary hemorrhage and systemic sepsis following flap loss). Five patients developed complications (27%); flap loss in two patients and salivary fistula in three patients that closed on conservative treatment. Overall success rate was 88% (18/22). For successful cases, swallowing was resumed on post operative day 7. All patients tolerated radiation therapy well.

Conclusion: Free jejunal flap is a dependable one stage procedure that will restore gastrointestinal continuity. The mucosal lined flap represents an excellent anatomic and physiologic replacement for the hypopharynx.

Key Words: Hypopharynx - Free jejunal flap - Microvascular.

INTRODUCTION

Hypopharyngeal cancer remains a poor prognostic disease with 2-year survival in the range of 5-10% [2]. There had not been much improvement in outcome in past decades. Primary focus was on developing better reconstructive techniques following resection. Gastric pull-up has been widely accepted as best suitable replacement for the upper digestive tract [11]. However, such technique carries a high compli-

cation rate. Free jejunal flap is increasingly becoming a preferred method of reconstruction. Easy harvest, one stage repair and quick return of swallowing are among the factors cited for the increasing role of such flap. The two major advantages of the technique are the avoidance of chest manipulation in such patients with already compromised pulmonary reserve (aspiration) and the preservation of gastric reservoir [10]. Early experience and results of the technique at the National Cancer Institute, Cairo University are reported.

PATIENTS AND METHODS

Twenty-two patients with hypopharyngeal cancer were included in the study period October 1996-December 2000. Average age was 45 years (range 25-65). All cases were referred from outside physician with advanced disease stage (T3 and T4). Fifteen patients had clinically enlarged cervical nodes. Preoperative work-up included routine laboratory tests, chest X-ray and a Gastrograffin swallow was done to visualize lower extent of the disease. Direct endoscopy was carried out to assess tumor extent and to obtain tissue diagnosis. Selection criterion was absence of apparent involvement of cervical esophagus.

Operative technique:

Details of the technique have been described in detail elsewhere [10]. The procedure starts with tumor resection; a total laryngopharyngectomy, with neck dissection was carried out as dictated by tumor extent. The crucial point in selecting patients for free jejunal transfer is the lower extent of the tumor after complete mobilization of the laryngo-pharynx complex. Pres-

ence of a sufficient length of esophagus in the superior mediastinum to permit suture application through the cervical incision after negative frozen section examination of resected margin was the guiding factor in patient's selection. Once the decision was taken for validity of the procedure, recipient vessels were looked for on the contralateral side of the tumor. Primary choices were for the inferior thyroid artery and the internal jugular vein. If the inferior thyroid artery was not available the superior thyroid vessel was used. In case the internal jugular vein had to be ligated this was done cephalad to the inferior thyroid vein thus leaving a stump that later on was closed and the microvascular anastomosis was done in an end-to-side fashion.

Following complete dissection of the specimen, attention was turned on to the abdominal part of the procedure. The abdomen was entered through an upper midline incision and the jejunum was pulled outside the abdominal cavity. Under good lighting, suitable sized jejunal vessels were selected. The third or fourth jejunal arcades were used and a segment of sufficient length to bridge the pharyngeal defect was carefully dissected. According to the recipient vessels selected, the jejunal segment was designed, with the principal vessels close to distal or proximal end of the jejunal segment taking into consideration the isoperistaltic orientation of the flap in the neck. As much mesentery as possible was also harvested to provide a good cover for the neck structures and vascular anastomosis. After selecting the segment, jejunal vessels were carefully dissected down to the origin from the superior mesenteric vessels trying to acquire as much length as possible. The segment was left attached by the pedicle which was not divided till completion of the intestinal anastomosis to minimize the ischemia time. 5000 units of heparin were administered intravenously and after two minutes the pedicle was divided. This will prevent thrombosis in the microcirculation during ischemia time.

Microvascular anastomosis:

Microvascular anastomosis was performed by interrupted sutures under magnifying loop (X 3.5) using 8/0 Ethilon (ETHICON Ltd UK). Arterial anastomosis was carried out in an end-to-end fashion and was done first to minimize ischemia time. Inferior thyroid artery was the recipient vessel in 16 patients and in the re-

maining 6 patients, the superior thyroid artery was used. Venous anastomosis was done in an end-to-side technique, with the internal jugular vein (directly in 18 patients and via the common facial vein in 4 patients). Following completion of the anastomosis, the flap was inspected for viability and presence of profuse bleeding from edges (trimmed if necessary) and good peristaltic movement.

The jejunoesophageal anastomosis was then carried out first as this provided better control to the esophagus and allowed gaining additional few centimeters as safety margin if required. In the first five patients, an end-to-end anastomosis using interrupted sutures was done, however in the remaining 17 patients, the anastomosis was done in side (jejunum) to end (esophageal) anastomosis to avoid possible stricture development. Finally, the oropharyngeal to jejunal anastomosis was carried out after enlarging the jejunal opening by a longitudinal snap along the antimesenteric border. Excess mesentery was used to cover the vascular anastomosis. A nasogastric tube was placed for feeding.

Postoperative management:

Postoperatively, all patients received antibiotics for 48 hours, Heparin was used (5000 IU every 12 hours by continuous IV drip) in the first two patients (continued for 48 hours). This was later on abandoned and replaced by low molecular weight Dextran and maintained for 24 hours following completion of the procedure. In the last 5 patients, only low dose aspirin (50 mg b.i.d.) was used for 5 days postoperatively.

A gastrograffin swallow was done on post operative day seven prior to start of oral feeding.

Flap monitoring:

In two patients, the distal (lower) two cm of the flap was divided and left attached to mesentery. This segment was exteriorized to monitor the flap. In 5 patients, the cervical incision was left open (window) on one side to enable monitoring. In the remaining 15 patients, monitoring was carried out by direct laryngoscopy.

RESULTS

Twenty two patients with hypopharyngeal cancer were included in the study period October 1996-December 2000. There were 20 males

and two females with average age of 45 years (range 25-65). Five patients had a T3 lesion and seventeen patients had a T4 disease. All patients had pathologically positive cervical nodes. Patients' characteristics and tumor sites are detailed in Table (1). The distal safety margin was negative in all cases with least length of 3 cm.

The average operative time was 4.5 hours (range 3-9) and blood loss was estimated at 800 cc. There were no intraoperative mortalities. The flap average ischemia time was one hour (range 40-130). for uncomplicated cases swallowing was restored on postoperative day 7 and average hospital stay was 12 days.

Mortality:

The mortality rate for the series was 9% (two patients); first patient developed reactionary hemorrhage 6 hours following surgery and on neck exploration the bleeding was evident from mesenteric edge of the flap as well as from the suture line. Trials to under-run the bleeding were unsuccessful. This patient did receive heparin in the postoperative period and mortality was attributed to systemic coagulopathy. Use of systemic anticoagulants was discontinued afterwards. The second patient developed salivary fistula with infection. Continuous trickling of saliva into the superior mediastinum resulted in systemic sepsis and patient's demise.

Flap monitoring by exteriorized segment was not accurate and resulted in unnecessary exploration of one patient where the exteriorized segment showed color changes and the patient's neck was immediately explored to reveal a healthy flap. For patients where cervical incision was left open, rapid granulation tissue formation over 24 hours period did hinder flap monitoring and was also discontinued. Direct laryngoscopy on the other hand was effective in monitoring the flap as mucosa is usually the first layer to undergo ischemic changes.

Morbidity:

The morbidity rate was 27% (five patients), two patients developed flap loss (arterial thrombosis in one patient and venous thrombosis in the other) and the flap was removed with establishment of an esophagostome and orostome. In other three patients, salivary fistula was evident on postoperative day 5 and was confirmed by gastrograffin to originate from the lower suture

line. All patients were scoped to confirm flap viability and they were managed conservatively (nasogastric tube feeding and antibiotics) and the fistula eventually closed.

Table (1): Patients and tumor characteristics.

Tumor characteristics	No of patients (%)
<i>Sex</i>	
Male	20 (91%)
Female	2 (9%)
<i>Site</i>	
Post cricoid region	3 (13.6%)
Ary-epiglottic fold	2 (9%)
Piriform fossa	2 (9%)
Circumferential	15 (68.2%)
<i>Tumor Stage</i>	
T3	5 (22.7%)
T4	17 (77.3%)
<i>Lymph nodes</i>	
Clinical	15 (68.2%)
Pathological	22 (100%)

DISCUSSION

Hypopharyngeal cancer continues to carry a poor prognosis that is largely attributed to the late presentation of the patients together with close proximity of the region to the major lymph trunks in the neck resulting in early nodal involvement. The average 2-year survival in most series is in the range of 5-10% and those survivors are limited to patients with early lesions (T1 & T2) [4]. In view of the limited survival time, one stage restoration of upper digestive tract has always been the prime objective [1]. The ideal technique should be a dependable, one stage procedure associated with minimal morbidity and mortality and that restores swallowing function in the shortest possible time [10]. With the introduction of gastric pull-up technique in the late 70's, tumor resection and reconstruction had been carried out in one stage and the technique had become widely practiced. However, the procedure carries several disadvantages: chest complications due to blind manipulation in the mediastinum that could mount in patient's fatality, loss of gastric reservoir and functional obstruction with persistent vomiting [5,11]. The free jejunal flap is rapidly emerging as the best flap to fulfill the above criteria. It will avoid chest manipulations, is easily harvested and will preserve gastric reservoir [12]. The recently reported success rate for the proce-

sure is in the range of 95-100% and this figure includes primary and salvage flaps [3,7,10]. In our series, being an early experience, we had a success rate of 88% (4/22 patients with total flap loss). We did not use salvage flaps due to late detection of the ischemic changes and presence of sepsis that hampered any possible intervention. The general complication rate (mortality and morbidity) for our series was 31.8%. This figure closely matches those reported for other techniques including myocutaneous flaps and gastric pull-up [5]. The two essential challenges with this flap are the microvascular anastomosis and esophageal safety margin. Presence of large vessels in the neck together with high blood flow will facilitate the microvascular anastomosis. These vessels are rarely affected by radiation changes and are unlikely to develop spasm. The superior thyroid artery is reportedly the most commonly used recipient vessel [10]. However, in this series primary choice was for the inferior thyroid artery which was used in 16/22 patients. The location of the vessel allows for easy anastomosis and is of sufficient length and matching caliber with the jejunal arcades. The internal jugular vein is the ideal recipient vessel and the respiratory venous suction pump provided by the negative intrathoracic pressure is an added advantage to the venous drainage [14]. Flap ischemia, should be avoidable by use of meticulous technique. However, despite all precautions, a small percentage will still develop such a complication. Ischemia time is another added factor, the shorter the ischemia time the better the outcome. Mucosal changes start to develop as early as 30 minutes of ischemia time, however, significant pathologic changes will take around three hours after which, these changes are progressively irreversible and cumulative with permanent cellular damage [6,9,13]. The ischemia time for two of the flaps lost in this series was more than 90 minutes, however the small number of patients does not allow for conclusions. Increased experience ultimately decreases the flap ischemia time. The use of systemic anticoagulants has not been proven to improve results and essentially the use of nonsteroidal anti-inflammatory agents will improve microcirculation [3]. Systemic anticoagulants were the cause of one of our mortalities, probably the use of heparinized solutions for flushing of the flap vessels could have a cumulative effect with systemic administration leading to uncontrolled coagulopathy.

Early detection of ischemic changes is detrimental as revision of anastomosis or a salvage flap (another jejunal segment or gastric interposition) would be possible thus avoiding orostome and esophagostome. The three flaps lost in the current series were not detected early enough to permit salvage.

Monitoring therefore is a major issue to improve outcome. Several methods have been described, of which exteriorization of a jejunal segment is widely accepted (two patients) [12]. Caution should be experienced with this technique; failure to provide continuous moistening of the flap will lead to dryness and false impression of ischemia with unnecessary exploration. In addition, any twisting of exteriorized segment will lead to immediate color changes, so close observation is mandatory. Leaving a skin window (in five patients) was also not accurate as rapid granulation tissue formation hinders flap inspection and thus loses its value after 24-48 hours. Direct laryngoscopy on the other hand will allow direct visualization of the mucosa which is the first layer to undergo color changes (15 patients). Recently, use of colored laser doppler to detect ischemia is being evaluated [8].

Esophageal safety margin is the second major issue that debated use of jejunal flaps. It is generally agreed that a 2-cm margin is oncologically safe and should be checked by frozen section examination [15]. In this series, the least esophageal safety margin obtained was 3 cm. It is to be noted that this distance is measured on fixed contracted pathological specimen and represents 0.50-0.75 of the actual length in the living state. Generally sufficient safety margin will always be available except in cases where cervical esophagus is infiltrated by the tumor.

Functional outcome is usually very satisfactory in uncomplicated cases and the flap tolerance to radiation is good. Swallowing could be restored as early as postoperative day 5 [10].

In conclusion, free jejunal transfer is a versatile flap that will repair upper aerodigestive tract defect from substernal locations to the soft palate. It provides a one stage reconstruction with early return of swallowing and can tolerate radiation well. In equipped centers it should be the first choice to replace the hypopharynx while the stomach is reserved for cases that ne-

cessitate esophageal resection on oncologic background.

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