



## Hypopharyngeal reconstruction using pectoralis major myocutaneous flap after total hypopharyngolaryngectomy

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### ABSTRACT

**Introduction:** Pharyngoesophageal defect after resection of hypopharyngeal carcinoma is usually reconstructed with gastric pull-up or free vascularized flap either jejunum or radial forearm. **OBJECTIVE:** The aim is to assess the use of pectoralis major myocutaneous flap (PMMCF) sutured directly to the prevertebral fascia for reconstruction of hypopharyngeal defect following total hypopharyngolaryngectomy. **Material and Methods:** Total hypopharyngolaryngectomy, total thyroidectomy, partial oesophagectomy and with or without neck dissections were performed for ten patients (seven females and three males) with hypopharyngeal cancer. The defects were reconstructed with PMMCF. The skin island was sutured to the prevertebral fascia. The main outcome measures included: durations of tube feeding, and hospital stay, character of diet and speech, persistent pharyngocutaneous fistula, recipient and donor site morbidity, tumor recurrence and mortality. **Results:** In seven out of ten patients, the duration of hospital stay ranged between 10–42 days while that of nasogastric tube feeding was 20 – 42days. In the 8th patient pharyngotracheal fistula had occurred and failed to heal conservatively, surgical closure was done in association with secondary radical neck dissection. In the 9th patient persistent pharyngocutaneous fistula was reported and the patient was diverted for feeding gastrostomy. She died during the course ofchemoradiotherapy for a recurrent tumor. In the 10th patient the healing attempts were poor and wound dehiscence was occurred and the patient died because of carotid blowout. One patient developed seroma at the donor site. **Conclusion:** The use of PMMCF and suturing it to the prevertebral fascia, gives a simple and time-saving method of reconstruction of the pharynx after total hypopharyngolaryngectomy with acceptable results.

## Introduction:

The incidence of cancer of the hypopharynx varies depending on worldwide geographic location. In Egypt, it constitutes 14.5% of head and neck cancer. In Upper Egypt, the postcricoid tumors form the majority of cases followed by pyriform fossa tumors<sup>1, 2</sup>.

Unlike other malignant epithelial tumors of the head and neck area, hypopharyngeal cancer has a very poor prognosis irrespective of the therapeutic regimen instituted; because of the late presentation, tendency to submucosal extension into the esophagus, lack of anatomical barriers of the hypopharyngeal wall and early metastases to regional lymphatic nodes of the neck, as well as a higher incidence of distant metastases<sup>3</sup>. An extended resection to achieve radicality is therefore mandatory and safe macroscopic margin is considered<sup>4</sup>.

Direct closure of the residual pharynx that respects radicality and preserves an adequate food intake can be achieved only in tumors limited to the medial wall of the pyriform sinus. In more extended lesions, ablation of a large portion of the pharynx requires a reconstructive procedure. Many different solutions have been proposed<sup>5</sup>. The most commonly used techniques are those which adopt gastric transposition or micro vascularized free flaps, the most popular of them are the free jejunal and the radial forearm flaps<sup>6</sup>.

Reconstruction of the hypopharynx with the PMMCF is an easier and faster technique that can be performed by a single surgical team. It was first described in 1984 by Fabian<sup>7</sup> and then simplified by Spriano et al., in 2001.<sup>8</sup>

The aim of this study is to assess the use of pectoralis major myocutaneous flap (PMMCF) sutured directly to the prevertebral fascia for reconstruction of the hypopharyngeal defect after total hypopharyngolaryngectomy.

## Material and Methods

After obtaining an IRB approval No. IRB00008718, this prospective case series was undertaken in ten patients with hypopharyngeal carcinoma.

### A. Preoperative assessment:

- Age, sex, clinical complaint and detailed ENT history and examination.
- Radiological examination and laboratory investigations.
- Assessment of the general and nutritional status.
- Endoscopic examination and biopsy taking.

### B. Surgical intervention:

**1. Tumor resection:** total hypopharyngolaryngectomy, total thyroidectomy and partial oesophagectomy. Radical neck dissections were done primarily in cases with preoperative evidence of lymph node metastasis (clinical & radiological) and secondary if lymph node metastasis appears during the follow-up period. (Figure: 1)

**2. Reconstruction:** The pectoralis major myocutaneous flap (PMMCF) was harvested from the left side by another team or by the ablation team after completion of the resection. The skin paddle was designed in a rectangular shape wide below (6-8cm) and narrow above (3-4cm) to adapt the oropharyngeal and the oesophageal stump (Figure 2). It was situated between the parasternal line medially and midclavicular line laterally, from the 2nd to the 6th ribs, medial to the nipple

with its long axis along an imaginary line extending from the xiphisternum to the tip of the acromial process. The skin incision began from the anterior axillary crease and the deltopectoral flap was preserved for possible later use. The incision around the paddle was deepened till the muscle was reached with great care taken to insure the presence of muscle tissue under the skin. Interrupted sutures were placed connecting the dermis to the underlying muscle to prevent the skin paddle shearing from the flap during dissection.

Elevation of the flap was started inferiorly, medially, and laterally where the muscle was dissected from the ribs and continued in the plane between the pectoralis major and minor muscles. The pectoral branches of the thoracoacromial artery were identified and seen running on the deep surface of the muscle.

The clavicular and humeral attachments and the lateral and medial pectoral nerves were divided, and the pedicle was skeletonized. The deltopectoral flap was dissected; a suitable tunnel was created over the clavicle to allow flap transmission to the pharyngeal defect. Hemostasis was done, suction drain was applied, and skin was closed.

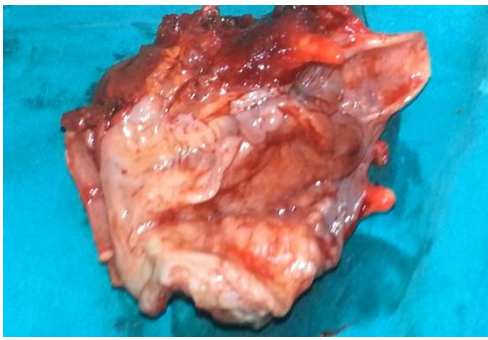


Fig.1: Tumour resection



Fig.2: Reconstruction with Pectoralis major myocutaneous flap

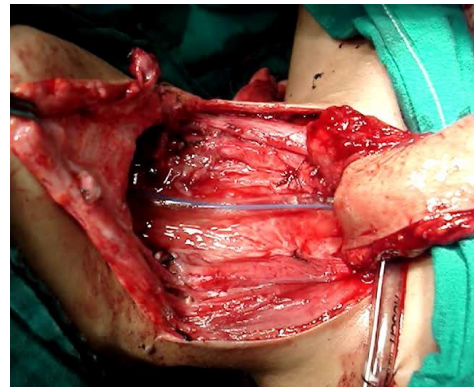


Fig.3: The neopharynx.

The reconstructive technique was based on the use of the prevertebral fascia for the posterior wall and the PMMCF for the lateral and anterior walls of the neohypopharynx. After completing the resection, the oropharyngeal and esophageal stumps of the alimentary tract were left open. The posterior wall of the esophagus and oropharynx were sutured crosswise into the prevertebral fascia, which thus represented the posterior wall of the neohypopharynx. A nasogastric tube was positioned. The flap was stitched to the esophageal stump and advanced upward along the prevertebral fascia with a Vicryl 4/0 continuous locked suture, to end above with oropharyngeal stump. (Figure 3). After completion of

reconstruction suction drains were applied and the cervical wound was closed with 3/0 Silk sutures.

### C. Postoperative care:

The patient stayed in the ICU with total parenteral nutrition in the 1st two postoperative days. Parental antibiotics: in the form of cephalosporin, clavulinated amoxicillin and metronidazole infusion were added for ten days. Postoperative analgesia with diclofenac intramuscular injection twice daily for one week. Nasogastric tube feeding was started from the third postoperative day. Supportive nutrients were added as multivitamins and minerals.

Thyroid replacement therapy was added after one week with Eltroxin 100-150 mg daily on an empty stomach. Calcium replacement therapy was added from the 1st postoperative day. The patient was instructed to tilt the neck toward the side of the flap in the first two postoperative days. Tracheostomy care was applied with frequent suctioning & humidification. Care of the neck & chest wound with sterilized dressing & local antiseptic betadine solution and observation of the suction drains were followed daily. Adjuvant postoperative radiotherapy or radiochemotherapy was started one month after surgery.

Postoperative evaluation included determination of the durations of tube feeding and hospital stay, character of diet and speech, persistent pharyngocutaneous fistula, recipient and donor site morbidity as seroma, hematoma or wound dehiscence, tumor recurrence and mortality.

Visits were done monthly after hospital discharge during the first postoperative year then on demand. The

patients were followed up for two years. They were followed up with clinical and radiological examination. The later was in the form of barium swallow (Figure 4) and multi slice CT neck & upper chest with contrast.

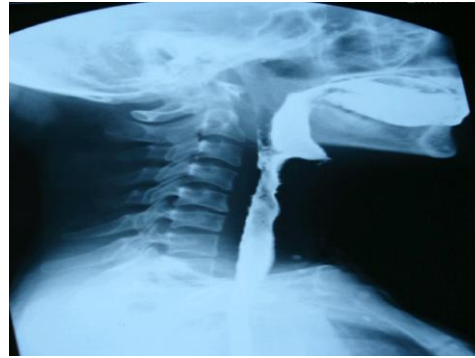


Fig.4: Postoperative barium swallow.

### Results

*Preoperative results:* The study was performed on ten patients proved to have hypopharyngeal squamous cell carcinoma (after histopathological examination of the endoscopically obtained biopsy), seven were females and three were males (Table 1). The age ranged from 20 to 55 years. According to the data obtained by clinical, radiological and endoscopic evaluation seven patients were in stage III and three were in stage IV.

Preoperative evidence of lymph node metastasis (clinical & radiological) was found in three patients, bilateral in one of them. One patient had a previous failure of a chemoradiotherapy course.

Operative results: resection was done without morbidity or mortality. In one patient it was necessary to resect much of the tracheal wall than usual to obtain adequate safety margin. Primary radical neck dissection was done primary in three patients with clinically palpable

(bilateral in one of them in whom a lymph node fixed to the internal carotid artery) and secondary radical neck dissection (after nine months) in the 4th patient. The lymph nodes affected are level II and III. Reconstruction was done with left PMMCF elevated. The PMMCF was elevated by the ablation team after completion of the resection in seven cases and by another team in three cases. The viability of the flap was detected by good capillary refilling and subdermal bleeding. Tunneling was done and the flap was sufficient for hypopharyngeal reconstruction without pedicle tension. The donor site was closed primarily without the need for skin grafting.

The drains were removed four to six days postoperative. The neck & chest stitches were removed seven to ten days postoperative. The first barium swallow was done after feeding tube removal.

Postoperative results: In seven out of ten patients, the duration of hospital stay after the reconstructive procedure ranged between 10 – 42 days (Average 22 days) while that of nasogastric tube feeding was 20 - 42 days (Average 28 days). Some of the patients were sent home with the nasogastric tube. Persistent pharyngotracheal fistula occurred in one patient and failed to heal conservatively, surgical closure with local flaps was done in association with secondary radical neck dissection after nine months. Persistent pharyngocutaneous fistula was detected in the patient with bilateral neck dissection and she was diverted for feeding gastrostomy and during the course of postoperative follow-up she died during chemotherapy course for a recurrent tumor. Cervical wound dehiscence was reported in one patient following total pharyngolaryngectomy and radical neck

dissection. This patient had a previous failure of a chemoradiotherapy course and had a bad nutritional and general condition. Healing attempts were poor, and the patient died because of carotid blow out although the PMMCF was observed to be viable.

Eight patients out of ten regained oral feeding. Swallowing was good (normal diet) in six patients, adequate (soft diet) in one patient and poor (liquid diet only) in one patient. All the patients had no satisfactory speech results. (Figure 5)

No morbidity was detected at the donor site, only a seroma was reported in one patient. There was a recurrence of the tumor in two patients one at the tongue base and the other at the oesophageal stump and were referred to chemoradiotherapy. Postoperative radiotherapy was applied for seven patients and chemoradiotherapy for two patients. Neopharyngeal stricture wasn't detected in the follow up period

Table (1) Preoperative results.

No	Age	Sex	Tumor subsite	TNM staging
1	30	Female	Posterior pharyngeal wall	T3N1M0
2	55	Male	Pyriiform sinus	T3N0M0
3	35	Female	Postcrioid region	T3N0M0
4	50	Female	Postcrioid region	T4aN2M0
5	47	Female	Postcrioid region	T3N0M0
6	43	Female	Posterior pharyngeal wall	T3N1M0
7	20	Male	Posterior pharyngeal wall	T3N0M0
8	45	Female	Postcrioid region	T3N1M0
9	45	Male	Pyriiform sinus	T3N0M0
10	55	Female	Postcrioid region	T3N0M0

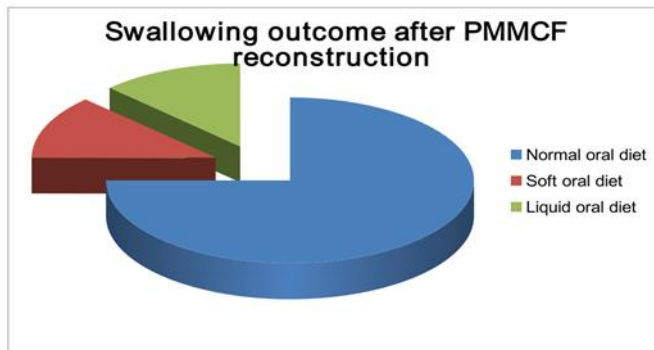


Figure 5: swallowing out come after PMMCF reconstruction.

## Discussion

Any reconstructive procedure after total laryngopharyngectomy should take into consideration that more than half of the patients will die from tumor recurrence or progression in a fairly short time<sup>8</sup>. The goal is therefore to perform an oncologically adequate procedure that guarantees a reasonable quality of life with the shortest postoperative course.

Procedures associated with a high rate of complications<sup>9</sup> would delay functional recovery and adjuvant therapies, which are almost always necessary. Furthermore, hypopharyngeal cancer is often associated with a poor general status, which may impair the healing process and reduce surgical stress tolerance, especially with procedures that require visceral transpositions in which the neck, thorax, and abdomen are violated. In this district, an ideal reconstructive technique should therefore meet some requirements: oncologically sound with resection and reconstruction in the same session, easy, short operative time, and low complications rate and with satisfactory functional results.

Analysis of the most recent literatures showed that free vascularized flaps are currently considered to be the gold standard for hypopharyngeal reconstruction. Among them, the jejunal free flap (JFF) & the radial forearm free flap (RFFF) are probably the methods of choice. However, the main disadvantages of microvascular surgery are their costs, long time surgery, require two surgical team, needs microvascular experience, possibility of total flap loss and the high rate of complications at the donor site.

The use of pectoralis major myocutaneous flap (PMMCF) in hypopharyngeal reconstruction solves most of these problems. Different techniques were used as suggested by Theogaraj et al.,<sup>10</sup> as tubulaization and partial tubulaization. Its tubulization has a drawback of stenosis of the lumen due to the significant bulk of the myocutaneous unit<sup>11</sup>.

Fabian<sup>7</sup> described the use of the PMMCF for reconstruction of the lateral and anterior walls of the hypopharynx, while a skin graft placed over the prevertebral fascia was used to reconstruct the posterior wall. In this way it was possible to reduce the flap thickness and obtain an adequate lumen caliber.

Compared to the free flaps which are most commonly used for hypopharyngeal reconstruction the PMMCF is technically easier and much faster to harvest, one surgical team and does not require microvascular experience. This is particularly important in elderly patients and in those affected by severe medical comorbidities in which the extended surgical time and stress of free flap reconstruction are contraindicated. Furthermore, harvesting of the free flaps leads to higher donor site morbidity with a limited quantity of tissue for reconstruction<sup>12</sup>.

The pectoralis major myocutaneous flap (PMMCF) is in the same surgical field with no reported total flap loss and it still viable even in the patient died due to poor healing and wound dehiscence from previous chemoradiotherapy. Also, it has a great advantage of no or minimal morbidity at the donor site<sup>12</sup>.

In comparison, in this study no reported total flap loss, but the incidence with jejunal free flap reconstruction

approaches 6%<sup>13</sup> and 2% with radial forearm flap<sup>14</sup>.

The mean rates of pharyngocutaneous fistula and stricture were 9% and 11% respectively with JFF<sup>15, 16</sup> and 26% and 20% respectively for the RFFF<sup>14, 17</sup>. In this study the rate of pharyngocutaneous fistula was 20% with no stricture reported in the two year follow up period but long term follow up is necessary.

As regards complications at the donor site in this study no morbidity was reported only seroma in one patient, but the incidence with JFF reconstruction 5.8% of cases in the form of the need for abdominal surgery, which brings additional complications such as fistulas, gastrointestinal obstruction, or gastrointestinal bleeding<sup>16,18</sup>.

Eight out of ten patients in this study regained oral feeding which considered to be good; in JFF the rate of oral feeding in the published studies ranged from 73%<sup>19</sup> to 92%.<sup>18</sup> and with RFFF were 82%<sup>13</sup>. The quality of voice was good for patients who received a tracheo-oesophageal puncture in RFFF<sup>14,17</sup> worse voice quality in JFF due to presence of mucous<sup>20,21</sup> but in this study all patients were not satisfied with speech. The quality of phonation with voice prosthesis is better with the fasciocutaneous flaps than with the JFF and the PMMCF<sup>22,23</sup>.

The mortality rate is between 2.4%<sup>20</sup> and 4.5%.<sup>15</sup> with JFF and less than 1% with RFFF<sup>14,17</sup>. In this study two out of ten patients died.

Using the PMMCF sutured directly to the prevertebral fascia is similar to that proposed by Fabian but the difference is the using of the prevertebral fascia itself as the posterior neohypopharyngeal wall. The surgical technique is easy, and the frequent use of PMMCF in reconstruction of the head and neck area makes it available to most surgeons in

any setting. Operative time and costs are better than most of the other options, some of which require the involvement of a general surgeon and microvascular experience. There were acceptable local complications, a fairly short postoperative hospitalization and fairly functional results. No donor site morbidity was reported only a seroma in one patient. Adequate swallowing outcome (Ability to maintain adequate nutrition with oral feeding) was achieved in eight out of ten patients. Two of the patients had tumor recurrence and it should be stressed that the rate is related to the efficacy of the ablation procedure and/or adjuvant therapy and does not depend on the method of reconstruction. Overall, the poor prognostic of these tumors is an argument to consider the quality of life surrounding the treatment.

#### **Conclusion:**

Hypopharyngeal reconstruction using the PMMCF sutured directly to the prevertebral fascia is a simple and rapid surgical procedure, with low morbidity. The flap is reliable, near the site of the defect, a single surgical team is sufficient without total flap loss. So, the PMMCF represents a suitable option and maintains its validity with accepted functional results even in these days with the increased use of free-tissue transfer.

This technique is an alternative to free flaps for hypopharyngeal reconstruction but long term follow-up is necessary for fear of neopharyngeal stenosis and stricture formation.

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