

Research Article

Refinement and Modification of Free Jejunal Graft for Pharyngeal Reconstruction after Total Laryngopharyngectomy for Post Cricoid Carcinoma

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Submitted: 05 January 2015

Accepted: 15 January 2015

Published: 19 January 2015

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OPEN ACCESS**Keywords**

- Hypo pharyngeal carcinoma
- Free jejunal flaps
- Micro vascular surgery

Abstract

Hypo pharyngeal carcinoma is relatively uncommon. No single surgical technique is superior in achieving the best oncologic and functional results. Reconstruction of the digestive tract to restore postpharyngectomy continuity is challenging. Free jejunum transfer remains the most reliable option. Micro vascular techniques minimize partial flap necrosis and the subsequent salivary fistula and are superior to pedicled flaps. Improving the results of free jejunum pharyngeal substitute is thus of utmost importance to the success of treatment of patients with hypo pharyngeal carcinoma.

Methods:

Refinement plan: Considerations for organ preservation determine the choice of therapy in the majority of cases. Most patients present with stage III or resectable stage IV tumors. Combined surgery and chemo-irradiation is essential for these patients. A few of our patients present as early cancers (stage I, II).

Surgical ablative phase: the majority of patients need formal total laryngectomy, pharyngectomy, thyroidectomy and bilateral modified block dissection (i.e. neck emptying).

Reconstructive phase

The jejunal loop is harvested through an abdominal midline incision. Careful dissection of the mesentery exposes the primary branches of the superior mesenteric artery (SMA). The free flap is based on the second and third branches of SMA. Refinement in the technique includes

- 1- The distal jejuno-esophageal anastomosis is performed with a circular (EEA) stapler.
- 2- Double vascular pedicle is used in the irradiated neck.
- 3- A jejunal window is always used in the irradiated neck.

Results: In total, mortality rate was 8.3% (4 patients). The most common causes of operative death were pulmonary embolism and sepsis syndrome. Hospital stay ranged from 10-22 days. Three flaps were lost out of 28 traditional flaps and the remaining 25 flaps were evaluated for technique-related morbidity. One flap was lost after 20 modified procedures and 19 patients were evaluated for technique-related morbidity.

Conclusion: Free jejunal transfer remains the most effective method of reconstruction of the hypopharynx. Several modifications have been recently introduced to refine the technique and maximize the chance of rapid recovery and improved function of these debilitated patients.

INTRODUCTION

Hypo pharyngeal carcinoma is a relatively uncommon cancer. The tumor is often associated with smoking, anemia and/or malnutrition. No single surgical technique is superior in achieving the best oncologic and functional results after pharyngectomy [1]. Few studies give clear comparative data [2]. Reconstruction of the digestive tract to restore postpharyngectomy continuity is challenging. Free jejunum transfer remains the most reliable

option in cases where the distal resection limit does not extend below the clavicle. The jejunal loop is non-bulky, hairless, pliable and propulsive tube that offers the best possible function in terms of swallowing. Micro vascular techniques minimize partial flap necrosis and the subsequent salivary fistula and are superior to pedicled flaps in this regard. Rapid postoperative recovery and timely administration of postoperative radiotherapy (PORT) are valuable advantages for free flap transfer [3]. Although

fascio-cutaneous free flaps have been successfully utilized for reconstruction of pharyngeal defects [4], the hairy tough non motile and dry skin has inferior qualities to the jejunum which is a near physiological pharyngeal substitute. Improving the results of free jejunum pharyngeal substitute is thus of utmost importance to the success of treatment of patients with hypo pharyngeal carcinoma. In this report, we introduce our refinement steps on the classic procedure of free jejunal flap.

METHODS

Refinement plan

Considerations for organ preservation determine the choice of therapy in the majority of cases. Most patients present with stage III or resectable stage IV tumors. Combined surgery and chemo-irradiation is essential for these patients. A few of our patients present as early cancers (stage I, II). Many of these patients opt for primary radiotherapy to avoid surgical morbidity. Thus, a large percentage of our operations are performed in an irradiated surgical field.

Surgical ablative phase

Although partial pharyngectomy can be used in selected cases of T1 tumors, the majority of patients need formal total laryngectomy, pharyngectomy, thyroidectomy and bilateral modified block dissection (i.e. neck emptying). The distal extent of resection depends on the location of the inferior tumor limit and the state of the surgical cut margin. Clear esophageal margin above or at the clavicle is essential to safe utilization of the free jejunal flap. Meticulous technique during the block dissection procedure is important to ensure proper oncologic dissection while preserving adequate stumps of the facial and superior thyroid arteries and the common facial and external jugular veins.

Reconstructive phase

The jejunal loop is harvested through an abdominal midline incision. Careful dissection of the mesentery exposes the primary branches of the superior mesenteric artery (SMA). The free flap is based on the second and third branches of SMA. This allows the utilization of a long segment of the jejunum for the reconstruction. Adequate haemostasis in the neck bed is performed and the recipient vessels are prepared. Refinement in the technique includes

- 1- The distal jujeno-esophageal anastomosis is performed with a circular (EEA) stapler. This step ensures a secure anastomotic line and serves to fix the free flap in the surgical field prior to the vascular anastomosis. (Figure 1)
- 2- Double vascular pedicle is used in the irradiated neck. The second and third jejunal vessels are anastomosed to the facial and superior thyroid arteries. The common facial and external jugular veins are used for the venous anastomosis (Figure 2&3).
- 3- A jejunal window is always used in the irradiated neck. Since the jejunal segment based on two jejunal vessels is lengthy, the distal jejuna-esophageal anastomosis is performed side-to-end. The free distal end of the jejunal loop is exteriorized to monitor the flap perfusion and

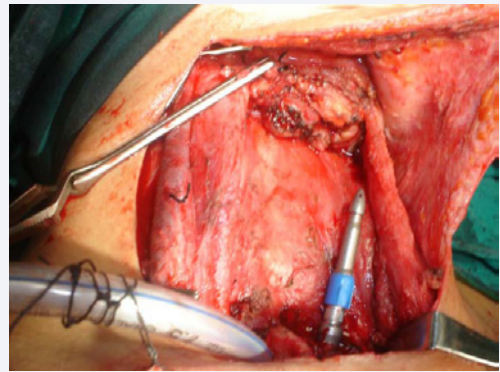


Figure 1 Harvesting the jujenal flap using double pedicle.

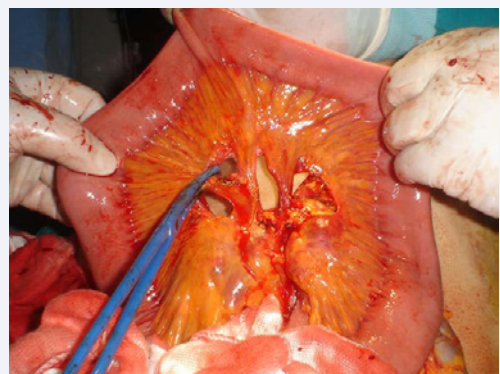


Figure 2 Operative bed after inserting the free jujenal flap with double pedicle.

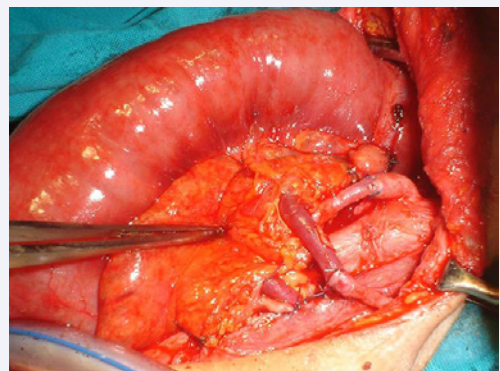


Figure 3 Operative bed after inserting the free jujenal flap with double pedicle.

to allow prompt interference in case of compromised vascular pedicle. The jejunal window is staple-closed 15 days after the surgery and the skin incision is closed (Figure 4&5).

RESULTS

In this report we compare the modified free jejunum flap procedure according to the refinements described above with historical control of a matched cohort operated in the same institution by the same surgeon. (Table 1) shows the baseline criteria of both groups. In total, mortality rate was 8.3% (4



Figure 4 Jujenal window in the neck in the third day post operative.

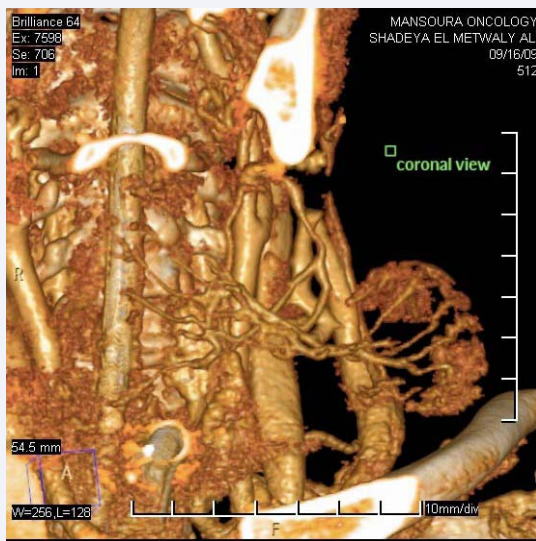


Figure 5 CT angiography showing both jejunal free flap with jejunal window with their vessels after 2 weeks.

Table 1: Baseline criteria of the patients.

			Traditional	Modified
Number			28	20
Gender	Male		23	15
	Female		5	5
Mean age (range)			49 (38-69)	47 (42-67)
Stage	T	T ₃	15	
		T ₄	13	
	N	N ₀	6	4
			8	3
			14	13

patients). The most common causes of operative death were pulmonary embolism and sepsis syndrome. Hospital stay ranged from 10-22 days. Three flaps were lost out of 28 traditional flaps and the remaining 25 flaps were evaluated for technique-related morbidity. One flap was lost after 20 modified procedures and 19 patients were evaluated for technique-related morbidity. (Table 2) shows the incidence of fistulization, stricture formation and solid food intolerance in both groups.

Table 2: Operative outcome.

	Traditional	Modified
Mean operative time in minutes (range)	360 (270-540)	380 (280-550)
Mean blood loss in ml (range)	270 (230-450)	280 (230-510)
Total flap loss	3/28 (10.7%)	1/20 (5.0%)
Fistula formation	2/25 (8.0%)	1/19 (5.3%)
Late stricture	1/25 (4.0%)	0/19 (0.0%)
Intolerance of solid diet	5/25 (20.0%)	2/19 (10.5%)

DISCUSSION

Advances in surgical techniques of reconstruction have greatly reduced morbidity of ablative surgery and virtually eliminated the need for multistage reconstruction. Free jejunum transfer offers the best functional results and should be the first option for lesions confined to the cervical region [5,6]. The reconstruction is often at risk due to the associated comorbidity in this group of patients who are often heavy smokers, malnourished and/or heavily irradiated. In spite of the excellent results achieved with free jejunal transfer, cases with prior irradiation have often impaired results [7]. Hence, continuous refinement of the techniques is crucial to maximize the chance of cure and improve the quality of life for these patients. Stapled jejunum-esophageal anastomosis is safe and feasible. Schneider et al. used circular stapler in 12 jejunal transfers compared to 17 hand-sewn transfers. Overall the fistula formation and stricture rates were similar in both groups [8]. Stapling technique has been widely investigated in cases of esophago-gastric anastomosis. The technique is generally safe with less operative time and minimal leakage rate [9-11]. The possibility of increased stricture rate has not been confirmed in most trials [8,12]. In view of the reduced operative time which is advantageous in this traumatizing ablative surgery and the additional benefit of rapidly anchoring the flap prior to starting the vascular anastomosis, we highly recommend using the circular stapler to restore the bowel continuity during free jejunum transfer. In irradiated neck, anticipation and early management of arterial compromise of the free flap can help rescue the jejunum transfer and spare these often moribund patients a protracted postoperative course. Thus having an exteriorized segment of the jejunum through the neck incision as a watch window, has been adopted as a method of early detection of flap vascular compromise [13,14]. Using an extra length of jejunum greatly facilitate the construction of the sentinel segment to be exteriorized and may prove helpful should secondary refashioning of the tube deemed necessary as the extra length will provide enough tissue for the refashioning [14]. We recommend using the sentinel window in all cases of post-radiotherapy reconstruction. The use of an extra-lengthy jejunal flap depends on the adequacy of the perfusion through the vascular anastomosis. Although double arterial anastomosis was described before, it did not improve the long-term results of the procedure [15]. This can be explained by the fact that the venous anastomosis has been found the most critical factor for a successful free jejunal transfer [16]. So we advocate the routine application of two venous as well as two arterial anastomoses in all irradiated patients.

CONCLUSION

Free jejunal transfer remains the most effective method of reconstruction of the hypopharynx. Several modifications have been recently introduced to refine the technique and maximize the chance of rapid recovery and improved function of these debilitated patients.

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Cite this article

Denewer A, Khater A, Hussein O, Shahatto F, Roshdy S, et al. (2015) Refinement and Modification of Free Jejunal Graft for Pharyngeal Reconstruction after Total Laryngopharyngectomy for Post Cricoid Carcinoma. *Ann Otolaryngol Rhinol* 2(1): 1019.