

Free Flap Reconstruction in Head and Neck Cancer Surgeries – Analysis and Results from A Single Institution

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Abstract

Background: This study describes all of the cases of free flap reconstruction performed in our institution and aims to analyze the results, causes of success or failure of these cases and to summarize and analyse the results. **Methods:** This retrospective analysis was done over a period 18 months with review of 25 cases who had undergone free flap transfer after tumour resection in the head and neck between April 2017 and March 2020. For each patient, data on age and sex, and anatomical location of the tumor, as well as reconstructive variables were collected. Flap monitoring is done every 2 hours in the first 24 hours and every 4 hours for the next 48 hours and every 6 hours for the later period. The main outcomes assessed were the types of flap used to reconstruct primary defects, success rates, flap results according to the primary defect and selected recipient vessels, results of the salvage operation, and the success or failure of the cases. **Results:** A total of 26 free flaps were used in 25 patients in the study period. Out of these 25 cases, 17 (68%) were males and 08 (32%) were females. The anterolateral thigh free flap (ALT) was most commonly used, being performed in 11 cases and accounting for 45% of the soft tissue reconstructive surgeries. The second most common flap was the radial forearm free flap (RFF), which was performed in 09 cases (36%). For the reconstruction of bony defects, mostly mandible, the osteocutaneous fibular free flap was chosen most frequently, and was used in 04 cases (16%). 02 cases required rectus abdominis flap. **Conclusion:** Microvascular flap surgery should be performed in quality manner with cautious anastomosis and vigorous monitoring which leads to better control of disease, because the possibility of bridging extended tissue defects can push surgeons to perform more aggressive resections and reconstructing the defect both anatomically and functionally without compromising oncological principle.

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Introduction

Free tissue transfer with microvascular anastomosis have been explored to great probabilities in reconstructing defects small and large after the excision of tumour in head and neck surgery. Over the decades, reconstruction in head and neck defects has advanced with evolution and this procedure is now widely used with good results. Defects in the head and neck after tumor resection results in both significant functional and cosmetic deformity and the free flap tissue transfer, which can provide various kinds of tissues, is ideal for reconstruction of head and neck defects. Most of the tertiary care centres have incorporated surgeons trained in free tissue transfer as part of the multidisciplinary team in treating head

and neck cancers. With improvements in technique and surgical devices, the reported overall rates of success of free flaps in the literature are as high as 95% to 97% in the case of experienced surgeons [1-4]. However, failures caused by vascular thrombosis are inevitable in some cases, and this frequently leads to devastating results. Sufficient surgical experience, good tissue handling, effective and patent vascular anastomosis, vigorous monitoring, and high standard of postoperative care has drastically changed the overall success rates of free flaps in head and neck cancer surgeries.

This study describes all of the cases of free flap reconstruction performed in our institution and aims to analyze the results, causes of success or failure of these cases and to summarize and analyse the results.

Materials And Methods

This retrospective analysis was done over a period 18 months in our institution. A review of 25 cases who had undergone free flap transfer after tumour resection in the head and neck between April 2017 and March 2020 was performed. For each patient, data on age and sex, and anatomical location of the tumor, as well as reconstructive variables were collected. All reconstructions were performed by a single surgeon in a single institute. Usually one vein and one artery is used for microvascular anastomosis of the pedicle. Heparinised saline is used during the course of anastomosis. Prophylactic LMW heparin and LMW dextran are used in the postoperative period. Flap monitoring is done every 2 hours in the first 24 hours and every 4 hours for the next 48 hours and every 6 hours for the later period. In case of vascular compromise if any, reexploration of the anastomosis is done immediately and all possible ways of salvaging the flap is explored. In extreme cases of non salvageable flaps, the debridement is carried out and other alternatives of regional flap and prosthesis if possible are accomplished. The main outcomes assessed were the types of flap used to reconstruct primary defects, success rates, flap results according to the primary defect and selected recipient vessels, results of the salvage operation, and the success or failure of the cases.

Results

A total of 26 free flaps were used in 25 patients in the study period. Out of these 25 cases, 17 (68%) were males and 08 (32%) were females. The anterolateral thigh free flap (ALT) was most commonly used, being performed in 11 cases and accounting for 45% of the soft tissue reconstructive surgeries. The second most common flap was the radial forearm free flap (RFF), which was performed in 09 cases (36%). For the reconstruction of bony defects, mostly mandible, the osteocutaneous fibular free flap was chosen most frequently, and was used in 04 cases (16%). 02 cases required rectus abdominis flap. (Fig 1.) summarizes the various flaps used in the study period.

Table 1 is summary of the defect location and the types of flaps used to reconstruct the defects. The majority of the defects were located in the maxillary and infratemporal region after total maxillectomy (n=10, 38.5%) and oropharyngeal region (n=10, 38.5%). The maxillary defects were reconstructed with ALT free flap which provided both bulk and contour to reconstruct the midface and hard palate. Rectus abdominis flap was used to reconstruct the maxillary defects in n=2 (7%) cases where ALT tissue was devoid of pedicle on both the sides. The other most common soft tissue defects were located in the oropharyngeal defects, the RFF was predominantly used. For mandibular reconstruction after a composite resection defect (n=4, 15%), osteocutaneous FFF was used to provide bony contour and to retain the physiological functions. ALT flaps were also used to fill the defects after temporal bone resection in n=2 cases (7%).

Of 26 cases, 03 cases (11.5%) of flap failure occurred and the overall success rate of free flap reconstruction was 88.5%. Table 2 shows the demographic data comparing for risk of

flap failure. There was no significant difference between patients with age, sex, previous radiation history and smoking. In addition, type of flaps did not affect to flap failure. Among the cases of failure, 1 case was caused by arterial insufficiency and 2 cases involved venous failure. A total of 4 cases underwent salvage operations, and one flap could be salvaged successfully which was due to suspicion of arterial insufficiency, intact arterial pulsation in the pedicle was confirmed and decompression of the tissues surrounding the pedicle was performed; the flap was found to be stable postoperatively. However, salvage was impossible in the remaining 3 cases. All the cases of flap compromise occurred in the first 48 hrs postoperatively (100%) and salvage operations were performed during the first 48 hrs. Although the failed flaps which were managed by local regional flaps on postoperative day 2 in one case and postponed 8 days later in other case due to the poor general condition of the patient.

The ALT flap, which was the most commonly used flap, showed a failure rate of 20% and free fibula flap showed 25% of failure rate, with a compromise rate of 50% and 100%, respectively. Differences in flap failure and salvage rate according to the primary defect site were explored. The most common site for defects was the maxilla and the oropharynx, where 20 flaps were used, with a failure of 2 cases (10%) and a salvage case (10%). The mandibular reconstruction (n=4) showed a failure of one case (25%) and nil salvaged. Although there were no statistically significant differences, the maxilla area showed the highest failure rate, while the oropharynx and temporal bone resection defects had the lowest failure rate.

For reconstruction of the maxilla, oropharynx, mandible and temporal bone, the facial artery and facial vein were used as the recipient vessels in 95% of cases. In some cases, the superior thyroid artery was used. In case of anastomosis for second vein, the external jugular vein and the superior thyroid vein were used. (Table 3.)

85% of cases had a single artery and vein anastomosis whereas, in 15 % of cases one artery and two veins were used for anastomosis. Other sequences of long term complications included, partial necrosis of the flap was seen in two patients after a period of 3 weeks. There were no cases of disease recurrence in the flap.

Table 1: Types of flap used according to primary site

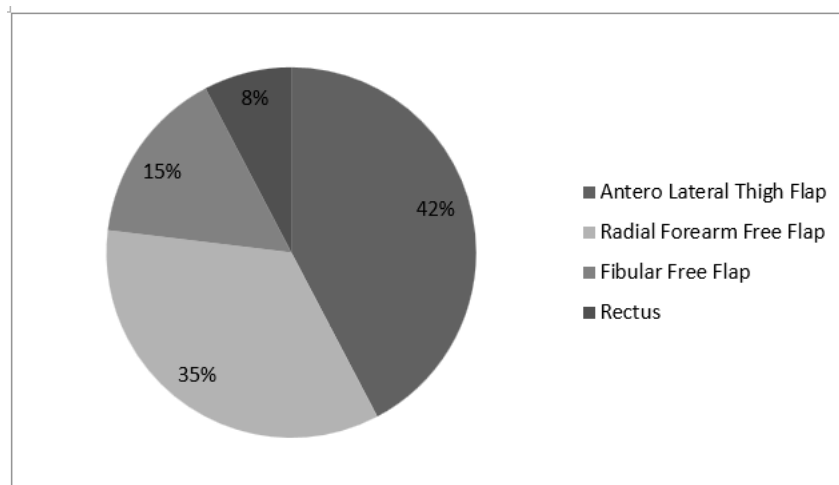
Defect	ALT	RFF	FFF	Rectus
Soft tissue defect				
Oropharynx (n=10)	01	09		
Bony defect				
Maxilla + orbit (n=10)	08			02
Mandible (n=4)			04	
Temporal bone (n=2)	02			
Total (n=26)	11	09	04	02
ALT, anterolateral thigh flap, RFF, radial forearm free flap, FFF, fibular free flap				

Table 2: Demographic data comparing the risk of flap failure.

Variable	Successful flaps n=23	Failed flaps n=3	P value
Age			
>60 years	08	01	
<60 years	16	02	
Sex			
Male	17	01	
Female	08	02	
Previous radiation	04	-	
Smoking	16	01	
ALT flap	10	02	-
FFF flap	04	01	-

Table 3: Vessels used for anastomosis.

Vessels	No (percentage)
Facial artery	22 (85)
Facial vein	19 (73)
Superior thyroid artery	04 (15)
Superior thyroid vein	06 (23)
External jugular vein	05 (19)

**Figure 1: Flaps used for reconstruction**

Discussion

In our series, the ALT free flap was the most commonly used flap among the cases. It is a versatile soft-tissue flap in which the thickness and volume can be adjusted to accommodate the extent of the defect, and is highly preferred for the reconstruction of large defects in the head and neck. The advantages of this flap includes easy harvest due to several perforators, the big diameter of the vascular pedicle of approximately 2 mm, potentially sensate because of the lateral femoral cutaneous nerve if used, the skin territory is very long and wide (about 25 cm long and 18 cm wide), the donor site is far from the head and neck region, and the donor site is hidden and therefore more acceptable to patients [5,6]. In our series, the selection of flap was mostly based on the size of the defect rather than the site. In spite of this

fact, all the maxillary defects and temporal bone resection defects were reconstructed with ALT flap according to our study. The reason behind this decision was that most of the maxillary tumours presented in advanced stage where a large defect after resection is inevitable.

The second most commonly used was RFF flap and most of the defects were of oropharyngeal resections. The advantages of RFF flap were thin pliable skin, consistent anatomy, good pedicle length, and two teams can operate simultaneously. Moreover the oropharyngeal defects are large and interfere with the essential functions of swallowing and speech for which radial forearm free flap was appropriate. Hence rehabilitation of these patients in the postop period was started early in the postop period in these patients.

Since other flaps were not as frequently used, the ALT and RFF fasciocutaneous flaps can be compared. Although the ALT flap had higher failure and compromise rates than the RFF. The variability in the anatomy of the pedicle and the requirement for more technical skill when raising the ALT flap may have contributed to this difference. In our series, two ALT flaps failed but all the RFF flaps were successful.

Conclusion

In our observations, when the resection of primary lesion is extensive as in maxillary tumours and temporal bone resection, bulky free flaps like anterolateral thigh flap and rectus muscle free flap should be considered. Primary lesions in oropharynx usually requires a friable and pliable radial free forearm flap, and if mandible is resected with the specimen, fibular free flap is a best alternative. Microvascular flap surgery should be performed in quality manner with cautious anastomosis and vigorous monitoring which leads to better control of disease, because the possibility of bridging extended tissue defects can push surgeons to perform more aggressive resections and reconstructing the defect both anatomically and functionally without compromising oncological principle.

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