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THE USE OF FREE FLAPS IN ADVANCED HEAD AND NECK MALIGNANCY

By
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Background: ***Free tissue transfer using microsurgical vascular anastomosis has added much to the ability of the reconstructive surgeon specially when dealing with a defect in the head and neck region. This study was conducted to assess the role of free flap transfer in restoration of tissue defects resulting from wide extirpation of advanced head and neck malignancies.***
Patients and Methods: ***The present study was conducted on 14 patients with proved head and neck cancers and who had surgical ablation of their cancers with reconstruction of the resulting defect with a free flap in a one-stage-operation. The flaps utilized included the free radial forearm flap (n=7), free scapular flap (n=5) and the free transverse rectus abdominis Myocutaneous (TRAM) flap (n=2).***
Results: ***There were eight men and six women. Their ages ranged from 35 to 67 years with a mean of. 47.67±2.3 years. Eleven patients had squamous cell carcinomas of their floor of mouth tongue, cheek, palate, and temple. The remaining patients had adenoid cystic carcinoma of parotid, recurrent basisquamous carcinoma of scalp and rhabdomyosarcoma of masseter muscle (one patient each). Thirteen flaps survived (92.9%) with good functional result. There was no operative mortality. Two patients had an orocutaneous fistula (14.29%). One patient died at 4 months postoperatively from local recurrence (7.14%).***
Conclusions: ***Free flap transfer is an essential tool in the field of head and neck cancer therapy. It can reliably provide one stage repair of sizable post-extirpation defects, with good functional outcome and acceptable esthetic result.***

Key Words: Head and neck, malignancy, free flaps, reconstruction.

INTRODUCTION

When operating on a lesion in the head and neck area that involves tissue loss or tissue sacrifice, the surgeon needs to reconstruct the defect primarily. The ideal method for reconstruction of head and neck defects should have the following characteristics: feasible technique, reliably vascularized tissue, good tissue volumes, minimal donor site morbidity and to be performed as a one stage operation[1-3].

The extent of possible excision has traditionally been limited by the ability of the surgeon to replace the excised tissues using skin grafting and local flaps. Microsurgical tissue transfer has offered new potentials for reconstructing such defects. Many flaps have been described to serve as donor sites for free flaps supplying skin, fascia, muscle and/or bone[4- 8]. Vascularized bone grafts were first reported in the seventies. They do not have the problems of resorption and infection, which commonly complicate non-vascularized autogenous bone grafts. They also can withstand irradiation. They therefore, replaced the autogenous bone grafting[9,10].

The present study was performed to assess the role of free flap transfer in restoration of tissue defects that result from wide extirpation of advanced head and neck malignancies.

PATIENTS AND METHODS

Study Population:

The present study included 14 patients with locally advanced head and neck cancer -as defined by the UICC staging classification system[11], and who needed reconstructive surgery using free tissue transfer to the head and neck. Patients were admitted to Alexandria Main University Hospital during the years 1998 – 2000. There were eight men and six women.

Patient Evaluation:

All patients were assessed preoperatively by thorough clinical examination the appropriate laboratory investigations, and by imaging techniques using a combination of ultrasonography and computed tomography and, when needed, intra-oral examination under anesthesia. All excised specimens where subjected to histopathological examination with special emphasis on the resection margins.

Reconstructive Procedures (Free Flaps):

Reconstruction was done as a one-stage operation in all patients. Excision of the lesion was performed simultaneously with raising of the flap whenever possible. Two independent surgical teams were involved in the surgery. The surgeon performing the excision was not involved in the reconstruction. The reconstructing team used three types of flaps for the 14 patients studied, namely; the free radial forearm flap (FRFF)[4] (Figure 1, n=7), the free scapular flap[5] (figs 6-8, n=5) and the free transversus rectus abdominis myocutaneous (TRAM) flap[12] (Figs 2-4, n=2).

Patient Data and Follow-up:

Patients' data were collected prospectively concerning demographics, indication for surgery, tumor stage, and operative details including the choice of the flap, operative time, extent of resection, type and composition of the flap used, and the technique of anastomosis performed. Patients were followed-up postoperatively at regular three monthly intervals for a mean of 27 months (range 14-51 months) for assessment of the flap survival, functional and esthetic outcome, as well as tumor recurrence. Patient morbidity and mortality encountered during the follow-up period were also recorded.

RESULTS

The study included 14 patients with locally advanced head and neck cancer. There were eight men and six women. Their ages ranged from 35 to 67 years with a mean of. 47.67±2.3 years. (Table 1) shows the pathology of the lesions affecting the study population. As may be seen, most patients had squamous cell carcinoma (SCC) (n=11). One patient had adenoid cystic carcinoma of the parotid. Another had a recurrent basi-squamous carcinoma of the scalp invading the calvarian bone, and the last patient had a rhabdomyosarcoma of the masseter muscle invading the overlying skin (Fig. 4).

The operative time ranged from 8:15 to 16:20 hours with an average of 12:40±4:05 hours. The ablative procedure, the corresponding reconstruction and outcome of patients are summarized in (Table 2.) As may be seen, there were no peri-operative deaths in the reported series. Overall flap survival was 92.9% with only one flap loss. The flap lost was a free osteocutaneous radial forearm flap (Fig. 5) that was used for the reconstruction of a post maxillectomy defect. A trial of flap salvage failed. The flap was excised and the defect was closed using a pedicled temporalis flap.

Arterial anastomoses were performed in an end-to-end fashion in all patients. Venous anastomoses were done as an end-to-end in nine patients and end-to-side in five. (Table 3) shows that the facial artery and vein were the recipient vessels most commonly used for anastomosis.

The functional outcome of the successful 13 flaps was acceptable. Five of the seven patients who had intra-oral reconstruction returned to near normal diet and could articulate well. Two patients suffered from an oro-cutaneous fistula, which closed spontaneously in three weeks in one patient; but persisted in the other. In the latter, the fistula resulted from local recurrence and the patient died with this recurrence at four months postoperatively. This accounts for the only mortality encountered during the admittedly short follow-up period, yielding an overall patient survival of 92.86%.

(Table 1): ***Pathology of the Lesions Affecting the Studied Patients.***

Pathology	*Number*	*Percentage*
Squamous cell carcinoma:		
• Floor of the mouth:	4	28.58
• Tongue:	3	21.43
• Cheek:	2	14.29
• Palate:	1	7.14
• Temple:	1	7.14
Adenoid cystic carcinoma of parotid:	1	7.14
Recurrent basisquamous carcinoma of scalp:	1	7.14
Rhabdomyosarcoma of masseter muscle:	1	7.14
Total	14	100.00

(Table 2):. ***Ablative Procedure, Corresponding Reconstruction and Outcome of Patients***

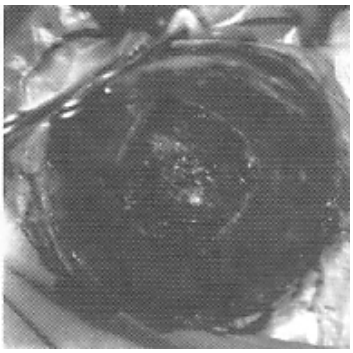
Ablative Procedure	*Reconstruction*	*Outcome*
Hemi-glossectomy + hemi-mandibulectomy.	FRFF	Orocut. Fistula, spontaneous closure After 2 weeks.
Total glossectomy + bilateral functional RND.	Free Scapula	Successful outcome
Near total maxillectomy	FRFF	Flap loss, salvage pedicled temporalis flap
Total cheek excision + commissure + partial maxillectomy + hemi-mandibulectomy.	TRAM	Orocutaneous fistula, recurrence at 4 months post-operatively, death.
Excision of the scalp + skull bones + sagittal venous sinus	TRAM flap + prosthetic calveric bone graft	Flap survived, partial wound dehiscence, late infection of prosthesis and subsequent removal.
Hemiglossectomy + partial mandibulectomy + RND.	FRFF	Successful outcome
Resection anterior part of the mandible	Osteocutaneous scapular flap	Successful outcome
Excision skin of face and scalp	Scapular flap	Successful outcome
Parotidectomy + facial skin	Scapular flap	Successful outcome
Excision of skin of face	Scapular flap	Successful outcome
Excision of the SCC at floor of mouth with safety margins + partial mandibulectomy (Four patients).	FRFF	Successful outcome in three, osteoradio-necrosis in one.

SCC: Squamous cell carcinoma, RND: Radical neck dissection.

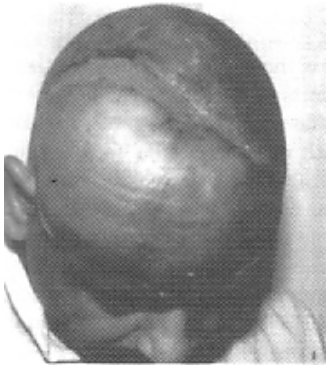
(Table 3)*: Recipient Vessels Used in the 14 Studied Patients*

Recipient Vessel	*Number*	*Percentage*
Recipient Artery:		
Facial artery	6	42.84
External carotid artery.	4	28.58
Superior thyroid artery	2	14.29
Superficial temporal artery	2	14.29
Recipient Vein:		
Facial vein	5	35.71
Internal jugular vein	5	35.71
External jugular vein	4	28.58

(Fig.1): Free radial forearm flap, isolated on its pedicle and ready for harvesting as a free flap.



(Fig.2): A defect that resulted from resection of a recurrent basisquamous carcinoma. A wide area of the scalp and skull bone had to be sacrificed.



(Fig.3): The postoperative view of the patient shown on Fig 2. TRAM flap was used to cover the defect. This has been complicated by wound dehiscence.

(Fig.4): A TRAM flap used for reconstruction of a full thickness cheek defect. The skin of the flap was split to give lining as well as cover to the cheek.

(Fig.5): An osteocutaneous FRFF used for reconstruction of palatal defect after maxillectomy. The flap was rigidly fixed by a plate.

(Fig.6): Pre-operative view of the patient with cancer parotid.

(Fig.7): Intraoperative view of the patient with cancer parotid showing the defect.

(Fig.8): Reconstruction by a free osteocutaneous scapular flap.

DISCUSSION:

Planning is the key to success. This is especially pertinent to head and neck reconstructive surgery. Good preoperative assessment; includes staging of the tumor, determining the extent of resection, the defect that will need reconstruction, the tissue volume and components needed for the repair. In addition, the reconstructive team should have enough experience to apply a variety of flaps that serve to solve the expected reconstructive problems. That is how they can apply the suitable flap for each patient.

Scapular flaps used for replacing skin of the scalp matched well with that of the face both in color and quality of the skin. This has also been observed by Upton et al[13]. The bone of the scapula has more bone than expected as truly noted by Coleman III[14]. It has the advantage of having the optimum height that matches the height of the mandible.

The radial forearm flap (FRFF) was found to supply a thin pliable skin that conforms well to the configuration of the oral cavity. It is thus thought of as the ideal flap for intra-oral reconstruction, especially for defects in the floor of the mouth and sides of the tongue. This conforms with the results reported by Soutar and colleagues[4]. The radial forearm flap can also supply enough bone to repair segmental mandibulectomy[4].

The TRAM flap used for reconstruction of scalp defect achieved good functional outcome but, being as bulky as it is, did not give a satisfactory esthetic result. Although the TRAM flap is generally not favored in the head and neck reconstruction as the quality of the skin and the bulk of the subcutaneous fat is less than ideal for the region, yet it has been used for one of the studied patients (Figs 2,3). That is because its muscle component was thought to be very useful in filling the defect in the calvarian bone and protecting the vulnerable central nervous system. This well vascularized muscle acts well to combat infection[12].

Flap loss remains the major complication that faces micro-surgeons. Reports of success rates above 90% are, however, becoming the rule[4,6,7]. There was one flap loss in this series (7.14%). It was a free radial forearm flap that was meant to reconstruct a post-maxillectomy defect. Other complications encountered were oro-cutaneous fistula in two patients (14.29%) and wound dehiscence (Fig. 3) after infection of the implanted silastic prosthesis in one (7.14%). The overall complication rate reported herein was thus 21.43% (3/14), which is comparable to that of published by other authors[7,8].

In conclusion, the free flap transfer has become an essential tool in the field of head and neck cancer therapy. It can reliably provide a one-stage repair of sizable post-extirpation defects, with a successful functional outcome and acceptable esthetic result in the majority of patients.

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