

FREE MICROVASCULAR TISSUE TRANSFER FOR RECONSTRUCTION OF MAJOR DEFECTS OF THE ORAL CAVITY AFTER TUMORS ABLATION.

BY

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Introduction and aim of the work: *In the last 20 years, microvascular free tissue transfer has been established, worldwide, as the method of choice in reconstructing oral and oropharyngeal defects. In this study we present our experience in using microvascular free flaps in oral and oropharyngeal cavity and outline the different flaps used. This is to evaluate the success and complications rates and the functional outcome.*

Material and methods: *This is a prospective study, included patients who had underwent immediate free tissue transfer for reconstruction of defects following resection of locally advanced oral and oropharyngeal cancer and treated at Sohag University and Kasr El-Ainy Hospitals, in the period from March 2002 to October 2003. The following data had been registered: surgical procedure; type of flap used for reconstruction; success rate; and local complications. Functional outcome was evaluated 6 months postoperatively.*

Results: *A total of 19 patients with age range from 35-72 years were included in this study. Free flaps used for reconstruction included: 13 free radial forearm flap; 2 free latissimus dorsi flap; 3 free fibula flap; and 1 vascularised iliac crest flap. Flaps were successful in 17 cases, one totally lost and one was partially lost. 2 cases developed Orocutaneous fistula, 2 cases developed wound sepsis and wound dehiscence occurred in one case. Functional outcome assessment revealed good or acceptable results in most of the domains used for evaluation.*

Conclusions: *These findings suggested that microvascular free tissue transfer is the optimum method of reconstructing major defects after extirpation of locally advanced oral cancer. Apart from providing a good bulk of tissues for closure of the defect, but also, helps in minimising the complications of such major surgery, and improving the functional and aesthetic outcome.*

Key Words: *Oropharyngeal cancer, Oropharyngeal defect, Free Microvascular Flap, Functional Outcome.*

INTRODUCTION

In the last 20 years, the introduction of microvascular surgery to head and neck cancer management, has revolutionised the treatment of cancer in this anatomically and physiologically critical area. Microvascular reconstruction has shortened hospital stay and reduced the cost of treatment. It has, also, improved functional and aesthetic outcomes resulting in significant improvements in quality of life.⁽³⁾ In the early 80s, Vaughan⁽¹⁾ reported serious problems in social adaptation and oral function following reconstruction by primary repair or pedicled flaps. Vascularised tissue aids healing in compromised situations and facilitates early postoperative radiotherapy if indicate.

There have been numerous reports extolling the virtues of many flaps in head and neck reconstruction. Of these flaps, the radial forearm flap.^(2,4,5,9) Its proven advantages include a consistent anatomy with generous vessel diameter and pedicle length, a thin and pliable skin components, and a convenient donor site location. An osseous component of the distal radius can be included as an osteofasciocutaneous flap for composite mandible and soft tissue reconstruction.⁽¹⁰⁾

Free fibula flap and vascularised iliac crest flap both considered as the flaps of choice in reconstructing the bony defects of the jaw and the major palatomaxillary defects.^(6,11,26) When soft tissue defect is large then bulky

flaps like latissimus dorsi flap and rectus abdominis flaps are good substitute for filling such big defects.

The use of microvascular free tissue reconstruction is a relatively recent facility in our departments. In this study we present our experience in using microvascular free tissue transfer in oral and oropharyngeal cavity for closing major defects following tumour surgery. We outlined the different flaps used, the success and the complications rate and we, also, evaluated the functional outcome.

PATIENTS AND METHODS

This is a prospective study, included 19 patients who had underwent immediate free tissue transfer for reconstruction of defects following resection of locally advanced oral and oropharyngeal cancer and treated at Sohag University and Kasr El-Ainy Hospitals, in the period from March 2002 to October 2003. The exclusion criteria included patients with proven distant metastasis, and those with bad general condition, who could not tolerate extensive surgery. All patients had been assessed for local extension of the tumour by plain x-ray, panoramic views and CT scan, and work up for distant metastasis.

Data was collected prospectively. It included: patients details; epidemiological data; a crude estimate of overall health according to the American Society of Anaesthesia (ASA) grading system; clinical staging (according to the Union Internationale Contre le Cancer [UICC], 1997); histopathological details; and treatment. Data concerning the treatment included: type of flap used for reconstruction; and recipient vessels. Complications encountered during or after surgery were recorded and included: flap loss whether partial or complete; haematoma or thrombosis formation; infection; wound dehiscence; fistula; and donor site morbidity.

Follow up for 6 months was done to evaluate chewing, swallowing, speech, pain, cosmetic appearance. This had been evaluated with questionnaire, which we designed to be used for evaluation of outcome of management in head neck cancer patients (Appendix 1). Each item of this questionnaire has several options, which allow the patient to describe his current functional status. Data of this questionnaire at pretreatment and 6 months post treatment were compared.

RESULTS

A total of 19 patients (12 men and 7 women) with age range from 35-72 years and mean of 56 ± 12 years were included and completed this study. Almost two-thirds of these patients presented at stage IV. The commonest tumour site

was the oral tongue (32%) followed by the floor of mouth (21%). The majority (85%) were diagnosed as squamous cell carcinoma. However, some less common types were encountered, which included: osteosarcoma, chondrosarcoma, and adenoid cystic carcinoma. Summary of these patients' characteristics has been shown in Table 1.

Table 2 shows details of the different free flaps used for reconstruction and the success and complications rate. Fasciocutaneous free radial forearm flap was the commonest flap (58%) used in our series. The most commonly recipient artery was the facial (63%), while the internal jugular vein was the most commonly used vein (74%).

Free flaps were successful in all cases but one osteofasciocutaneous radial forearm flap failed completely and partial flap loss was found in the vascularised iliac crest flap. The 2 orocutaneous fistulae, which developed were closed spontaneously. Wound sepsis developed in 2 cases and wound dehiscence in one of these cases and all treated conservatively.

Functional evaluation at 6 months postoperatively was possible in 16 out of the 19 patients, who started the study. The 3 discontinued patients; one died due to locoregional recurrence, one did not come for follow up, and the remaining one was unable to answer the questionnaire due to his bad general medical condition. Functional outcome of the 16 patients who had been evaluated revealed dramatic improvement by the end of 6 months with a good or acceptable overall results in the majority of cases of cases Table 3. Subgroup analysis of outcome evaluation of patients with moderate to severe functional deficits were done (data not shown due to the limited number of cases). The results, in general, were better in elderly, women, and those, who reconstructed with fasciocutaneous radial forearm flap, and those with no complications. Marked disfigurement was reported by women (3 out of 5), patients treated with flaps other than free radial forearm flaps (4 out of 5), and in those, who had been treated from lower jaw tumours (the whole five), and who had postoperative adjuvant radiotherapy (the whole five). Moderate and severe pain and swallowing impairment were, specifically reported in young patients, those with complications, and patients who received postoperative radiotherapy.

Table 1. Summary of the patients' characteristics

| Characters | Participating cases (%) |
|--|-------------------------|
| Total number: 19 | |
| Average age (range) | 56 years (35-72) |
| Age groups: | |
| 60 years or less | 11 (58%) |
| Over 60 | 8 (42%) |
| Patients sex: | |
| Male | 12 (63%) |
| Female | 7 (37%) |
| Job: | |
| Retired or Unemployed patients | 11(58%) |
| Employed patients | 8(42%) |
| ASA grade: | |
| Grade 1 | 10 (53%) |
| Grade 2 | 6 (31%) |
| Grade 3 | 3 (16%) |
| Tumour site: | |
| Oral tongue | 6 (32%) |
| Floor of mouth | 4 (21%) |
| Oropharynx | 3 (16%) |
| Inferior alveolus | 3 (16%) |
| Hard palate | 2 (10%) |
| Cheek | 1 (5%) |
| Tumour stage: | |
| Stage III | 6 (32%) |
| Stage IV | 13 (68%) |
| Histopathological diagnosis: | |
| Squamous cell carcinoma | 16 (85%) |
| Adenoid cystic carcinoma | 1 (5%) |
| Osteosarcoma | 1 (5%) |
| Chondrosarcoma | 1 (5%) |
| Treatment options: | |
| Surgery alone | 12 (63%) |
| Surgery and postoperative radiotherapy | 7 (37%) |
| Type of neck dissection: | |
| Selective ND level III | 2 (10%) |
| Selective ND level IV | 4 (21%) |
| Modified RND | 6 (32%) |
| RND | 6 (32%) |
| Bilateral ND | 1 (5%) |

ND = Neck Dissection, SND = Selective Neck Dissection, RND = Radical Neck Dissection

Table 2. Summary of the free flaps used in the study

| Characters | Number of cases (%) |
|--|---------------------|
| Total number: 19 | |
| Free faciocutaneous radial forearm flap | 11 (58%) |
| Free osteofaciocutaneous radial forearm flap | 2 (10.5%) |
| Free osteofaciocutaneous fibula flap | 3 (16%) |
| Free vascularised iliac crest flap | 1 (5%) |
| Free latissimus dorsi flap | 2 (10.5%) |
| Type of artery used for anastomosis: | |
| - Facial artery | 12 (63%) |
| - Lingual artery | 3 (16%) |
| - Superior thyroid artery | 3 (16%) |
| - External carotid artery | 1 (5%) |
| Type of vein used for anastomosis: | |
| - Internal jugular vein | 14 (74%) |
| - Facial vein | 3 (16%) |
| - External jugular vein | 2 (10%) |

Table 3. Summary of flap and local complications

| Complication | No of cases (%) |
|--|-----------------|
| - Complete flap loss | 1 (5%) |
| - Partial flap loss | 1 (5%) |
| - Thromboma/Haematoma- | 2 (10%) |
| - Wound sepsis | 2 (10%) |
| - Wound dehiscence | 1 (5%) |
| - Fistula | 2 (10%) |
| - Donor site morbidity | 1 (5%) |
| Total number of cases with complications | 6 (32%) |

One patient may had more than one complication

Table 4. Outcome evaluation, pre and 6 months postoperatively

| Item | Preoperative (19 patients) | Postoperative (16 patients) |
|--|-------------------------------|--------------------------------|
| Pain: | | |
| - No pain | | |
| - Mild pain does not need analgesics | 4 | 8 |
| - Moderate pain requires analgesics | 3 | 3 |
| - Severe pain requires potent regular analgesics | 6 | 4 |
| | 6 | 1 |
| Speech: | | |
| - Normal | 13 | 11 |
| - Ineligible with mild difficulty | 3 | 3 |
| - Ineligible but with Moderate difficulty | 3 | 2 |
| - Severe impairment that cannot be understood | 0 | 0 |
| Chewing: | | |
| - Normal as well as ever | 10 | 8 |
| - Chewing soft solids but cannot chew some food. | 7 | 4 |
| - Chewing only soft diet | 2 | 4 |
| - No ability to chew even soft solids | 0 | 0 |
| Swallowing: | | |
| - As well as ever | 10 | 9 |
| - Swallowing certain soft solids | 5 | 3 |
| - Swallowing only liquids | 4 | 3 |
| - Tube dependent | 0 | 1 |
| Cosmetic appearance: | | |
| - No change in the appearance | 17 | 8 |
| - Mild but acceptable change | 2 | 3 |
| - Moderate disfigurement | 0 | 4 |
| - Severe disfigurement | 0 | 1 |

Appendix 1. Questionnaire of outcome evaluation

Pain:

- No pain
- Mild pain does not need analgesics
- Moderate pain requires analgesics
- Severe pain requires potent regular analgesics

Speech:

- Normal
- Ineligible with mild difficulty
- Ineligible but with Moderate difficulty
- Severe impairment that cannot be understood

Chewing:

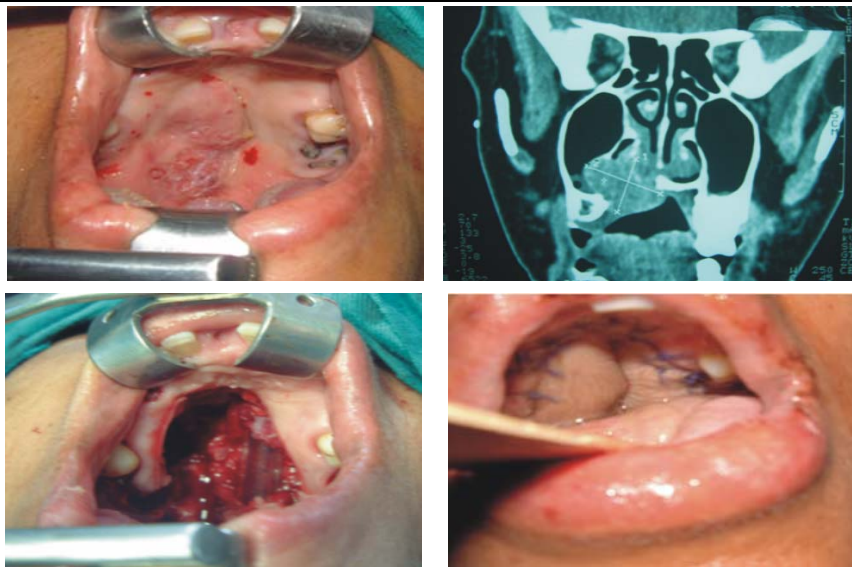
- Normal as well as ever
- Chewing soft solids but cannot chew some food.
- Chewing only soft diet
- No ability to chew even soft solids

Swallowing:

- As well as ever
- Swallowing certain soft solids
- Swallowing only liquids
- Tube dependent

Cosmetic appearance:

- No change in the appearance
- Mild but acceptable change
- Moderate disfigurement
- Severe disfigurement



*Fig:1-a. Adenoid cystic carcinoma of the hard palate, pre-operative.
b. CT of the same case shows palatal destruction.
c. Post surgical excision of central palate, with floor of the nose. and lower maxillary sinus the
d. Seven days post reconstruction with free forearm flap.*

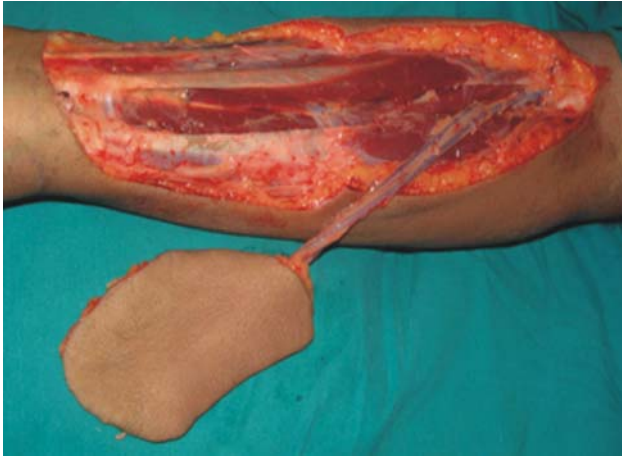
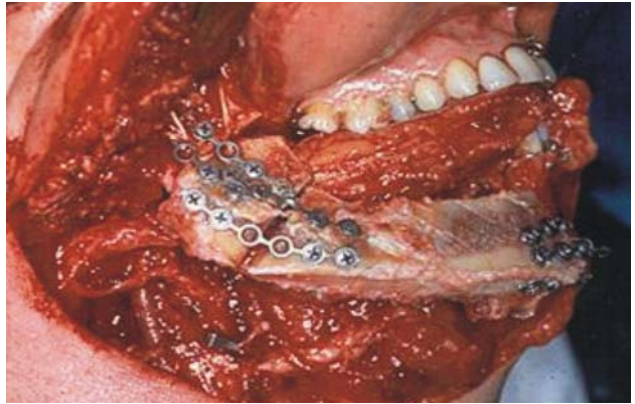
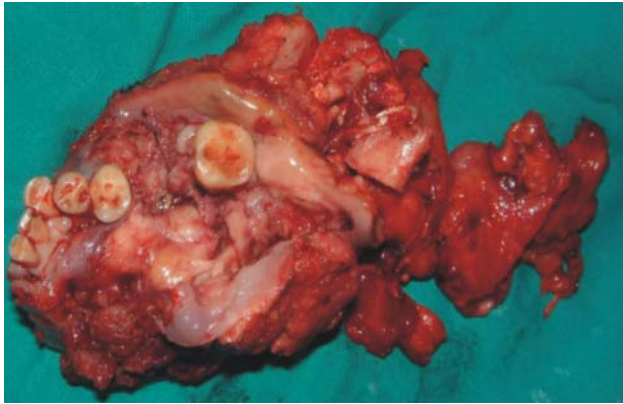


Fig. 2. Faciocutaneous radial forearm flap, raised and ready for disconnection.



Fig. 3. Three weeks post reconstruction with Faciocutaneous radial forearm flap, after left hemiglossectomy.



**Fig. -4a: Carcinoma of the inferior alveolus: Hemimandibulectomy and neck dissection specimen included.
4b: Reconstruction of the hemimandible and the soft tissues with a free vascular iliac crest flap.**

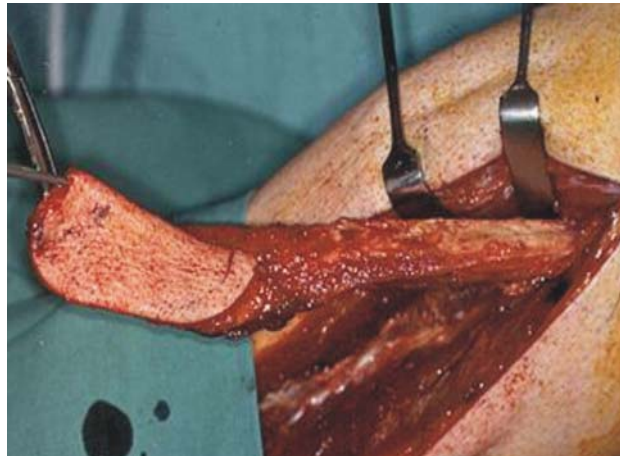


Fig. -5: Free osteofasciocutaneous fibula flap, during its elevation.

DISCUSSION

The explosion of new reconstructive surgical procedures that occurred during the late 1980s and early 1990 represent an era, where microvascular reconstructive surgery emerged as the method of choice in closing defects after head and neck cancer ablative surgery. There are many free microvascular flaps, that are suitable for reconstruction following treatment of oral cancer patients. The radial forearm flap has been considered the flap of choice in intraoral reconstruction by many authors.^(2,4,5,8,9) Its proven advantages include a consistent anatomy with generous vessel diameter and pedicle length, a thin and pliable skin components, and a convenient donor site location. It can be used for lining of the oral mucosa with or without mandibular reconstruction. The osseous component of the flap may be too small to be suitable for endosseous implants. However, it has been reported^(12,27) that endosseous implants can be used successfully in the radius. There is even the possibility of return of sensory function with the non innervated free radial forearm flap, when used for intraoral lining.⁽¹³⁾ For all these reasons, in our work the radial forearm flap was considered the first choice for reconstruction of the intraoral defects, whenever suitable. It had been used for reconstruction of the floor of mouth, tongue, cheek, and central palatal defects (Figs. 1a-d, 2,3). We found it the easiest one to be harvested and the most successful one, so we recommend it for surgeons, who are starting this option of reconstruction. However, the main major disadvantage of this flap is fracture of the radius at the donor site, when an osseous component is included.⁽⁴⁾ The only major complication that encountered due to flap harvesting in this flap was fracture radius that happened in a 50 years old lady and treated with plating of the fractured radius. We think that to minimise the incidence of fractured radius when an osseous element is harvested, preventive plating of the radius is desirable. Another way, to avoid this complication is to use another osseous flap, especially in postmenopausal women and those with thin radius.

Reconstruction of a composite defects of the oral cavity is more difficult. It does need composite free tissue transfer such as the fibula and the vascular iliac crest flaps. The donor site can be selected to provide sufficient bulk to allow complete rehabilitation with an implant-retained dental prosthesis at a later date.^(14,16) The free fibula flap has been used frequently.^(11,6,26,15) A prime advantage of the fibula is that up to 25 cm in length may be harvested, allowing reconstruction of any length of mandibular defect.⁽¹⁷⁾ We used free fibula composite flap in 3 cases to reconstruct the lower jaw (Fig. 5). While the fibula is the flap of choice in many centres,^(17,18,19,20) the iliac crest still has a role in mandibular reconstruction. There are certain specific situations in, which the iliac crest is the flap of choice. These include those patients with significant oedema of the extremities, an evidence of arterial or venous insufficiency,

or those with a history of significant leg trauma.⁽²⁰⁾ In our series, we used only one free vascularised iliac crest flap (Figs. 4a-b), which proved to be more demanding, and more time consuming. Partial flap loss was also a complication in this flap. While the fibula flap was relatively more easy to harvest and seemed to be more successful. However, no one in our cases, who had been treated with composite flap had an osseous implant because such service is not available at the moment, and some patients did not accept any further rehabilitation at another centres where this facility is offered to the patients. In the future, we hope this facility could be available.

Palatomaxillary reconstruction, in selected cases, using soft free tissue transfer has been found to be highly successful.⁽²¹⁾ That is compatible with our findings in cases, who had been treated for central palatal and lower maxillary defects, behind the canine. This strategy had been adopted since the free soft tissue flaps provide a good seal of the oral cavity with the least surgical procedures and at the same time the majority of the patients had most of their dentition preserved (Figs. 1a-d). However, in more extensive defects, the method of choice to close it with a vascularised free composite bone graft to achieve successful dental restoration and to close the palatal defect at the same time.

The incidence of local complications was very high (up to 80%) in previous reports before adopting microvascular techniques in reconstructing the oral defects after tumour surgery.⁽²⁴⁾ Total number of patients with local complications in our study was found in 6 (32%). Free flap loss was encountered in 2 cases, one was complete, while the other was partial. We failed to salvage the flap, which failed completely. Re-reconstruction was done using pectoralis major myocutaneous flap. The flap success rate was comparable with results of some researchers.^(8,15) However, some others reported higher success rate about 95% or more and the success rate of salvage ranged from 20% to 80%.^(19,23) The reason of the lower success rate in our study than that reported by the latter researchers is that we have a small number of cases and with time probably we will gain more experience and the successes rate may improve. Morbidity at the donor site was minimal in all cases except one, which was complicated with fracture radius.

Other reported local complications in our series was not so severe and all were improved conservatively. Its incidence was a comparable with most other reports.⁽⁸⁾ However, in a study by Amin,⁽¹⁵⁾ the incidence of orocutaneous fistula was high (23%). The explanation of that seems to be the nature of the defect needed to be closed in his series, which was the mandible and the floor of mouth. This kind of defects need a composite flaps to reconstruct the mandible and close the soft tissue defect as well, which

warrants meticulous surgery and water tight closure of the floor of mouth.

Functional outcome assessment revealed severe deterioration in patients with oral cancer, who had been treated with resection but with no microvascular tissue reconstruction. For example, Dhillon⁽²²⁾ reported that of his 14 patients, who were assessed 5 months to 14 years after commando procedure, substantial numbers complained of severe disabilities in the following areas: speech (21%), dribbling (100%), aspiration (7%), chewing (42%), dysphagia (36%), and cosmesis (29%). The results of our study showed that the overall number of patients who complained of moderate to severe impairment in speech, swallowing, chewing, was low. Nevertheless, higher percent of patients still complaining of moderate to severe problem with pain and disfigurement. This was, especially marked in women and young patients. Amin⁽¹⁵⁾ reported normal deglutition in 56%, soft diet in 44%, normal speech in 46%, easily intelligible speech in 23% and intelligible speech with effort in 31% of his study. Chana⁽²⁵⁾ advised rehabilitation with dental implants for ideal function.

In Conclusion these findings suggested that microvascular free tissue transfer is the optimum method of reconstructing major defects after extirpation of locally advanced oral cancer. It is not only provide us with the a good bulk of tissues for just closing the defects, but also, helps in minimizing the complications of such major surgery, and improving the functional and aesthetic outcome of those patients. However, it is a challenging, and demanding, surgery, and without its price.

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