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Case Series

Free Fibular Flap in Mandibular Reconstruction Following Oncological Resection: A Case Series

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Abstract:

Background: Reconstruction of post oncological resection defects in the oral cavity poses a unique challenge. Reconstructive methods aim not only repair of the tissues but giving a functional and aesthetic outcome. Various methods for head and neck reconstruction have been evolving over the past years from pedicled flaps (PMMC, Deltopectoral, Forehead, Temporalis, Sub mental flaps etc) to free flap reconstruction. Among which Free fibula flap provides a strong long segment of bone graft with low complication rate in post-oncological defect reconstruction.

Objective: This single center, hospital-based study aimed to determine the functional and aesthetic outcomes following vascularised free fibula flap surgery for mandibular reconstruction in post-oncological defects in oral malignancies.

Materials and Methods: An observational study was conducted in the department of general surgery at Sri Venkateshwaraa Medical College Hospital and Research Centre, Ariyur, Pondicherry, India for a period of two years from September 2021 to September 2023. Inclusion criteria was patients with oral malignancies having carcinoma buccal mucosa, carcinoma alveolus, and carcinoma floor of mouth who underwent composite resection with various types of segmental mandibulectomy based on clinical assessment and exclusion criteria was patients with lower leg abnormalities, extensive leg trauma, poor circulation or healing, cutaneous ulcers, and diabetes. Out of 12 patients, 8 had mucosal and bony defect which was treated with single paddle reconstruction and 4 had skin, mucosa and bony defect which was treated with double paddle reconstruction.

Result: The follow-up ranged from 6 months to 2 years. Out of 12 patients reconstructed with free fibular flap, one patient developed Total flap necrosis which was salvaged with PMMC flap and one patient developed Partial necrosis of skin which was managed conservatively. Good mouth opening, intelligible speech, satisfactory contour of lower jaw and facial profiles were achieved in all 12 patients who were treated with vascularised free fibular flap.

Conclusion: Free fibula flap was a versatile and reliable option for post oncological mandibular defect reconstruction. This reconstruction provides option for future implant based dental prosthetic restoration, making it the first choice for mandibular reconstruction.

Keywords: Mandible; Surgical Flaps; Fibula; Reconstructive Surgical Procedures.

Introduction

Mandibular reconstruction is a complex procedure and remains a challenge in plastic surgery. Although attempts of reconstruction have been described since the 19th century, the greatest experience took place during the First and Second World War. [1] Initial reconstruction attempts using bone grafts and pedicled osteocutaneous flaps were characterized by a high incidence of postoperative complications and poor long-term outcomes. [2] The advent of microsurgery has modified reconstructive plastic surgery. Microsurgical flaps have many advantages: complex and larger defects can be repaired in a single stage, reducing hospitalization time, hospital expenses, and morbidity, and it allows primary closure of the donor area. [3] There are several indications for mandibular reconstruction, including cancer resections, traumatic injuries, and

osteoradionecrosis. The ultimate goal is restoring form and function and improving chewing, swallowing, speech, and oral competence. [4]

Currently, the transfer of vascularized bone through microsurgical technique is the gold standard for mandibular reconstruction. [5] Fibula free flap was first described by Taylor, 1975 Apud Hidalgo, 2002 introduced it in mandibular reconstruction in 1989. [6] Despite the many advantages of microsurgical reconstructions, mastering this tool requires a long learning curve, and failure can lead to consequences proportional to the magnitude of technique. [7]

In view of the above, study aimed to determine the functional and aesthetic outcomes following vascularised free fibula flap surgery for mandibular reconstruction in post-oncological defects in oral malignancies in 12 patients.

Methods

This single center, hospital-based and observational study was conducted in the department of general surgery, plastic surgery and surgical oncology at Sri Venkateshwaraa Medical College Hospital and Research Centre, Ariyur, Pondicherry, India for a period of two years from September 2021 to September 2023. Inclusion criteria was patients with oral malignancies having carcinoma buccal mucosa, carcinoma alveolus, and carcinoma floor of mouth who underwent composite resection with various types of segmental mandibulectomy based on clinical assessment and exclusion criteria was patients with lower leg abnormalities, extensive leg trauma, poor circulation or healing, cutaneous ulcers, and diabetes. An informed consent was obtained from all the patients.

Statistical Analysis: The data was collected, coded and recorded on Microsoft Excel Spreadsheet program and descriptive statistical analysis was performed using Statistical Package for the Social Sciences (SPSS) software (version 23.0).

Results

The cases included 12 patients, six of whom were male (50%) and another six were female with mean age of the study population being 52.41 years. Characterizations of the cases are presented in below Table 1.

Table 1: Characterization of the cases

SN	Age	Sex	Diagnosis and Defect	Surgery	Reconstruction	Post- operative complications and management
1.	60	F	Carcinoma buccal mucosa-Mucosa+ central	Composite resection	Single paddle vascularised fibula	Good flap healing
2.	54	M	Carcinoma alveolus-Mucosa + lateral bone defect	Composite resection	Single paddle vascularised fibula	Good flap healing
3.	45	M	Adamantinoma- lateral bone defect	Surgical excision	Single paddle vascularised fibula	Good flap healing
4.	59	F	Carcinoma floor of mouth-Mucosa+central bone defect	Composite resection	Single paddle vascularised fibula	Good flap healing
5.	45	M	Carcinoma Alveolus-Mucosa+central bone defect	Composite resection	Single paddle vascularised fibula	Good flap healing
6.	48	F	Carcinoma Buccal Mucosa-Mucosa+, lateral bone defect	Composite resection	Single paddle vascularised fibula	Good flap healing
7.	61	F	Carcinoma alveolus-Mucosa+central bone defect	Composite resection	Single paddle vascularised fibula	Good flap healing
8.	44	M	Carcinoma buccal mucosa-Mucosa+ central bone defect	Composite resection	Single paddle vascularised fibula	Good flap healing
9.	45	M	Carcinoma alveolus-Mucosa+lateral bone+skin defect	Composite resection	Double paddle vascularised fibula	Flap failure for which serial debridement and PMMC flap done.
10.	49	F	Carcinoma floor of mouth-Mucosa+ central bone+skin defect	Composite resection	Double paddle vascularised fibula	Partial flap failure, which was managed conservatively.
11.	62	F	Carcinoma Alveolus-Mucosa+lateral	Composite resection	Double paddle vascularised fibula	Good flap healing

			bone+skin defect			
12.	57	F	Carcinoma floor of mouth-Mucosa+lateral bone+skin defect	Composite resection	Double paddle vascularised fibula	Good flap healing

Out of 12 patients, 8 patients with mucosal and bony defects were managed by composite resection and single skin paddle vascularised fibula reconstruction, and the remaining 4 with mucosal, bone and skin defects were managed by composite resection and double skin paddle vascularised fibula reconstruction. Around 6 patients had central bony defects and 6 patients had lateral bony defects. Simultaneously flap harvest was done and fabrication of flap, plating done according to the bone defect and flap insert was given. Arterial anastomosis using Facial artery and superior thyroid artery were done in 10 cases and 2 cases, respectively. Venous anastomosis to external jugular vein and branches of internal jugular vein were done in all 12 patients. Donor site was managed with primary closure in 2 patients and split thickness skin graft in 10 patients. Overall, the operative time was 8 to 10 hours with an average of 9 hours. Post-operatively the flap vascularity was monitored. Out of 12 patients, 4 patients needed re-exploration for vascularity compromise. Out of which two flaps were salvaged, one patient had complete necrosis of skin paddle which was salvaged with Pectoralis Major Myocutaneous flap and one patient had partial skin paddle necrosis which was managed conservatively. Patients were immobilized for 5 days and later weight bearing in donor leg started after 5 days. Ryles tube feeding started after 24 hours in all patients. Oral feeding started after 2-3 weeks. All patients had good leg wound healing with almost no morbidity associated with it. After discharge, the first postoperative visit was scheduled for 1-2 weeks and followed for 6 months to 2 years. Patients were evaluated by a speech therapist, physical therapist, and others as required. Good mouth opening, intelligible speech, the satisfactory contour of lower jaw and facial profiles were achieved for all the 12 subjects treated with vascularized free fibular flap. The range of hospital stay was 14-28 days with an average stay of 18 days, shown in Figure 1 to 5.

Figure 1: 54/M T-1 Stage

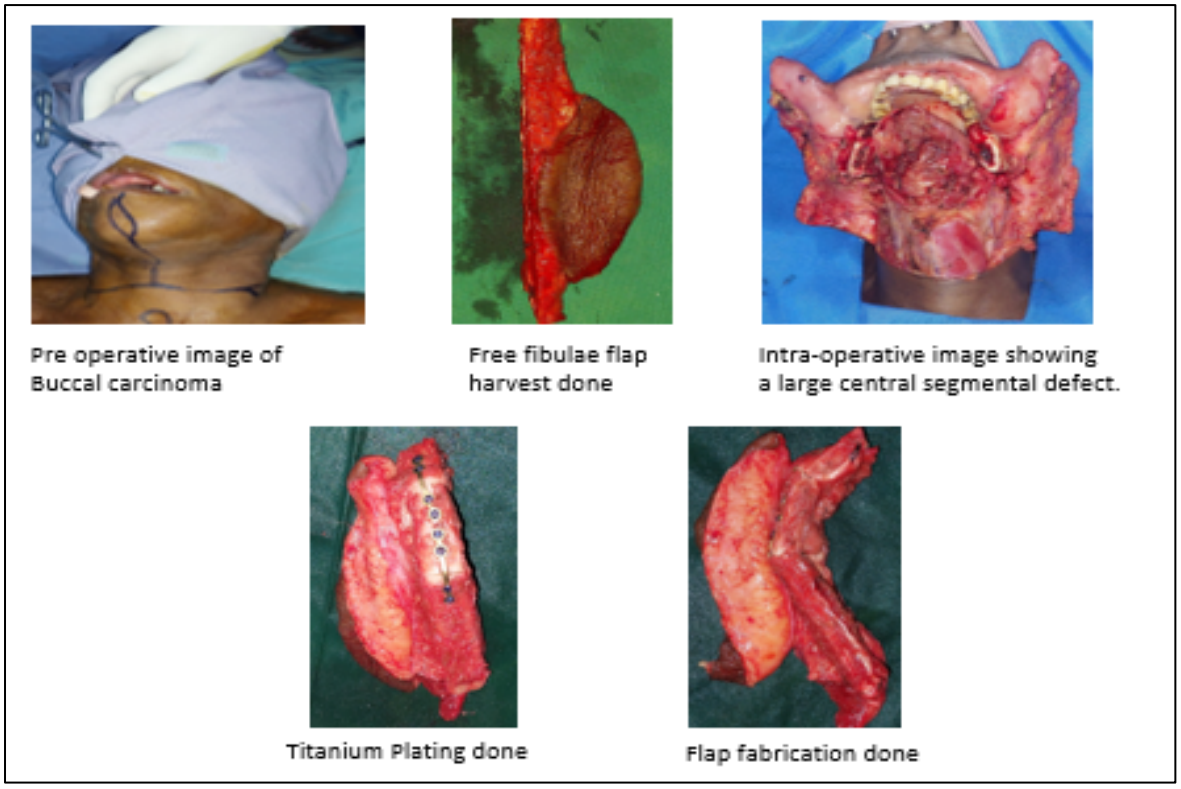

Figure 2: 48/F-T1 Stage

Figure 3: 45/A typical Case

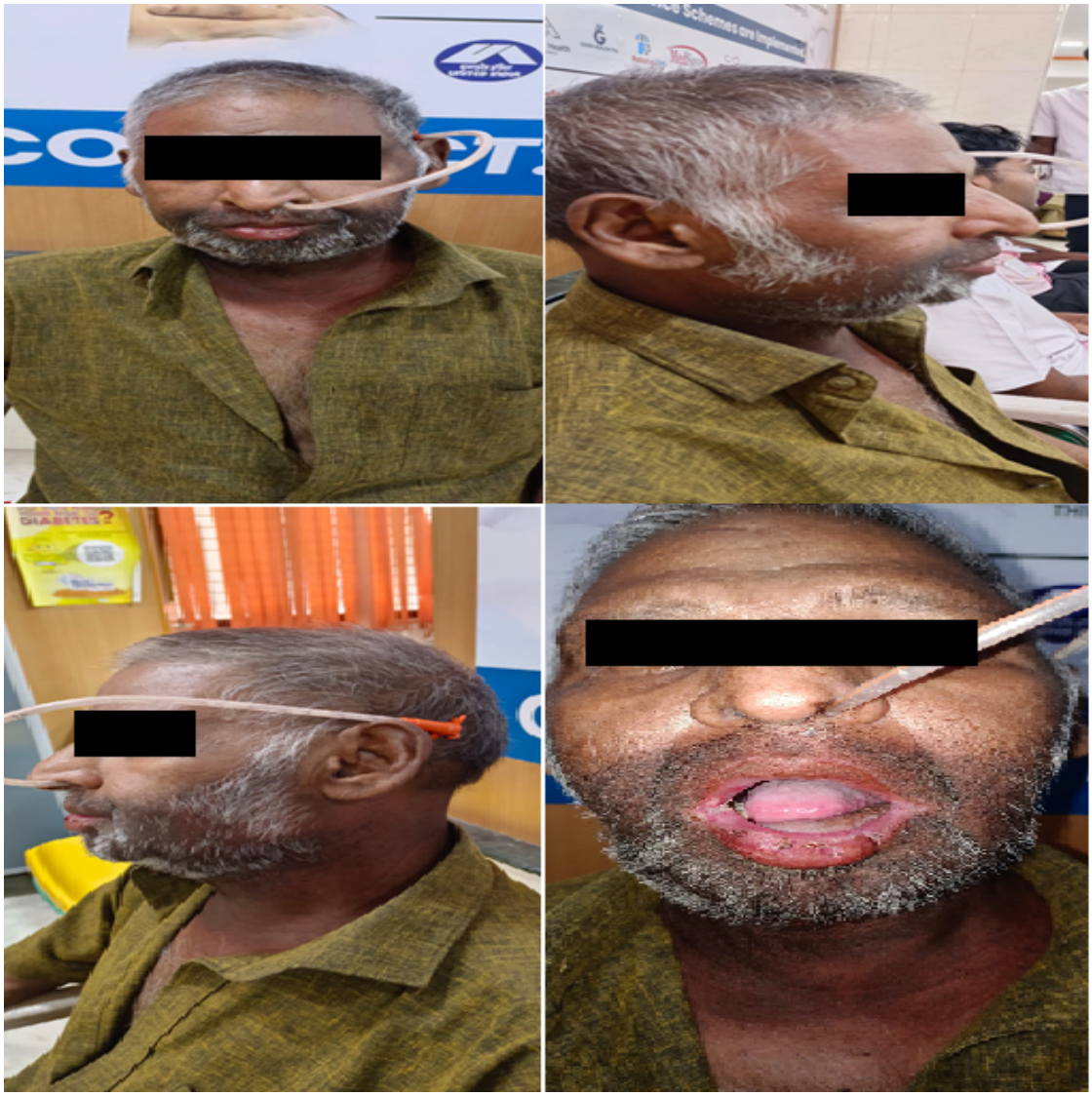

Figure 4: Status post composite resection with central mandibulectomy for Carcinoma lower gingiva with buccal mucosa extension having good mouth opening, good functional and aesthetic outcome

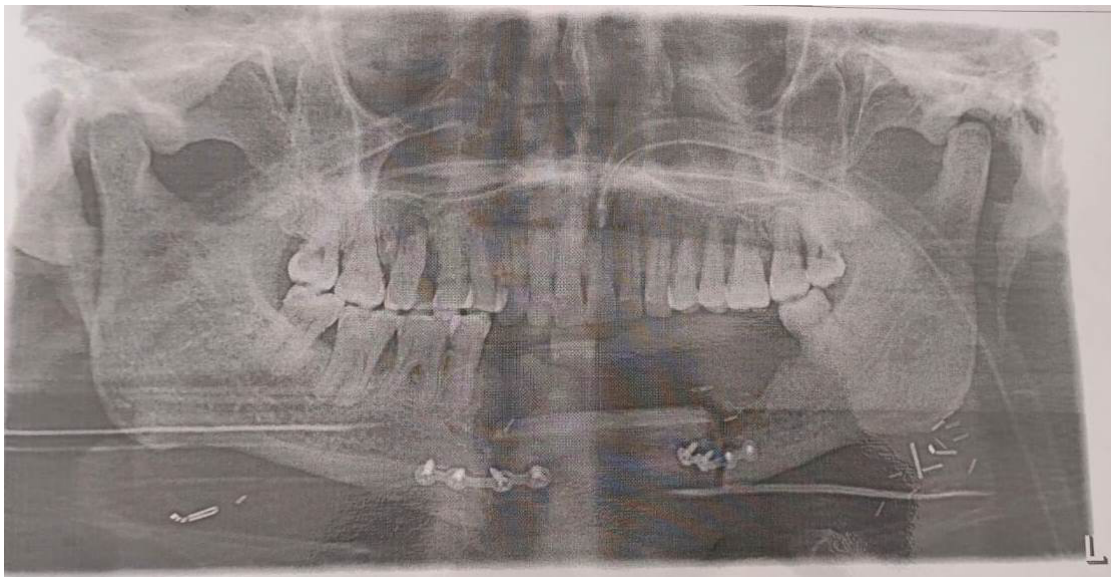

Figure 5: OPG of the Status post composite resection with central mandibulectomy Patient

Discussion

Microsurgical reconstructions are complex techniques needed at advanced reconstruction centers and are crucial in head and neck cancer surgeries. [8] Over the past 50 years, several advances in these techniques and several potential flaps have been described. [9] Three decades have passed since the introduction of the osteomyocutaneous fibula flap in 1986, and this flap remains the gold standard for reconstruction of bone defects in the mandible and extremities. [10-15] Mandibular rehabilitation is important because there are several functions performed by this bone, including participation in chewing, swallowing, oral competence, verbalization, and breathing support. [16-18] Moreover, it significantly contributes to the contours of the lower third of the face. In the sample analyzed, all patients' mandibles were reconstructed after resection of tumors in the mandible. [19]

After composite resection, there might be three types of defects, anterior (central), lateral and hemimandibulectomy, which when managed with free fibula flap has good and favourable long term functional and aesthetic outcomes compared to other types of flaps. [5] The fibula is very important for dental rehabilitation in implant dentistry. Osseointegrated implants should be placed between 4 and 6 months, in case of bone grafts, and longer waiting periods may cause bone resorption owing to lack of load. [20] Unfortunately, none of our patients have received osseointegrated implants owing to the unavailability of staff and material. Mandibular reconstruction has greater complications than reconstructions performed in other regions of the face. [20] In our study, we observed two cases with complications which were managed appropriately.

The absence of prototyping and single-center nature of this study is the major limitations. Hence, to endorse our findings, we recommend conducting appropriately designed prospective studies in the future.

Conclusion

The present study concludes that a free fibula flap is considered a versatile and reliable option for the reconstruction of the mandible and there were few complications in the studied subjects. In view of the same, our initial experience and literature show satisfactory results, therefore we recommend that free fibulas flap can be a first choice for the majority of mandibular reconstruction cases.

Ethical approval: The study was approved by the Institutional Ethics Committee

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