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ORGINAL ARTICLE

Reconstruction Plating In Oncological Arch Mandibular Resections Revisited With Technical Modifications

Dr Deepak Janardhan[1], Dr Shaji Thomas, Dr Bipin T Varghese[2],Dr Sandeep[3], Dr Shirish Patil[3]

Assistant Professor[1], Additional Professor[2], Fellowship trainee [3]
Department of Head and Neck Surgery, Regional Cancer Centre, Trivandrum 695011
**Corresponding author: Dr Shaji Thomas*

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ABSTRACT

Introduction.

Oral cancers make up a large oncological burden in most parts of the world. Extensive diseases mostly require reconstruction with free flap, which has become the gold standard. But this is not feasible in most clinical settings due to financial and technical issues. Though mandibular defect reconstructions post oncological resections, with reconstruction plates have been tried in the past , issues like osteomyelitis, extrusion, exposure , fracture and radionecrosis as early as 6 months post treatment, have reduced their usage in the recent years, especially when radiation is planned as adjuvant treatment.

Aim: Assess utility of titanium reconstruction plate in mandibular defects with shape modifications, following excision for squamous cell carcinoma with post op radiotherapy and analyse longterm outcome.

Methods. Prospective Observational study. An analysis of utilization of reconstruction plates with shape modifications for reconstructing central arch defects , post excision of squamous cell carcinoma (SCC) of floor of mouth and arch of mandible, for whom vascularised free fibula flap was not feasible were included.

Results: A total of 7 patients underwent arch segmental mandibulectomy. Defect was reconstructed with shaped or modified Titanium reconstruction plates and Pectoralis Major myocutaneous (PMMC) or nasolabial flap was used for soft tissue reconstruction . No complications were noted till date,with a mean followup of 13months. Functional and cosmetic outcomes were acceptable.

Conclusions: This technique seems to be a reasonably acceptable alternative for free flaps following composite resections in tertiary centres where long duration surgeries need to be avoided due to medical indications and resource constrains in the form of expertise or infrastructure, limiting the utility of free flap usage.

I. INTRODUCTION

In the present era of free flaps, oncological mandibular resections are often followed by adjuvant radiation. Here, free fibula flap is the choice of reconstruction. But lack of expertise, time and or equipment for the same, and rarely due to medical comorbidities of the patient or institutional infrastructure, a much easier and faster reconstruction options is warranted. Hence a technical modification in the reconstruction plate with soft tissue wrapping using locoregional flaps was used in the study for reconstruction, to restore aesthetic contour and functionality, when free fibula flap reconstruction is not feasible .Early hardware related failure like plate fracture, plate exposure, screw lossening warranting removal etc have been documented from as early as 6 months post surgery. This has been the reason for its reduced application, today. .

II. AIM

To assess applicability and survival of reconstruction plates in restoring mandibular continuity, after oncological resections for oral cancers with technical modifications, when free flap utility is contraindicated.

III. METHODS

Patients with oral cancers infiltrating or involving arch of mandible , who were not candidates for prolonged surgery due to comorbidities and anaesthetic considerations, and avoid prolonged surgery were included in the study. All the patients underwent resections as per oncological norms and reconstruction was planned with locoregional flaps as per defects. A total of 7 patients were included in the study and prospectively followed up .Plate complications like plate exposure, overlying skin breakdown, fracture, screw loosening and disease related relapse were assessed at 6 months and 1 year. Informed consent was attained from all patients. Post resection, the defects were classified based on Jergers classification .Titanium reconstruction plates (22

holed) with 1-2mm thickness were used to restore mandibular continuity.The plates were sculpted intraoperatively into M shape, with the V pointing into the tongue muscles and option of 3 holes for screw fixation on either of the mandibular stumps was ascertained. The entire plate was draped with the locoregional flap used for reconstruction, all around.

IV. RESULTS

A total of 7 patients were included in the study. There were 2 lower alveolus, 2 anterior Floor of mouth, 2 tongue and 1 lip carcinomas, involving arch of mandible (Table-1).Post resection, M design titanium plate reconstruction was done in all cases with PMMC flap draping in 6 and nasolabial flap draping in one case. All the patients had satisfiable aesthetic outcome. Functionally, they tolerated lying supine without tongue fall back in the immediate post operative day after extubation. Soft diet was tolerated orally from 2nd week. All 7 received adjuvant radiation and has been on a mean followup of 13months. None had recurrence till date or plate related issues.

V. DISCUSSION

Restoring mandibular defects in oncological scenario has moved away from the time tested and proven plate fixation techniques to free flap reconstruction modalities. The preferred option is free fibula flap. Even, other options like iliac crest and scapula free flaps exist. The reason for this transition have been well documented in literature. Plate related issues like fracture, screw loosening mandated early plate removal. Moreover survival rates of plates fell when patients needed adjuvant radiation. With the introduction of biocompatible titanium plates , the survival of plates have become far better.

Even though this is an era of free flaps, they are not feasible in some cases, due to patient factors or infrastructure related issues. Expertise, equipment and time is a major concern in free flap reconstruction. Comorbidities of patients like recent cardiac event, low ejection fraction, some physiological cardiac arrhythmias, poor general condition, renal failure etc mandate short duration surgeries to reduce perioperative and post operative mobidity and mortality. This does not ethically substantiate, deeming such patients for palliative treatment than subjecting them to radical curative treatment. As such , T4 oral cancers have a documented overall 5 year survival of around 25- 50% [1-3]. Hence, such technical modification to plating mandibular defects is worth consideration in patients not able to achieve free flap reconstruction.This will not only give aesthetic and functional advantage but also better quality of life.

M technique of plating

Depending on the remnant mandibular stumps, after resection, the titanium reconstruction plate is sculpted into M shape, with three screws on either mandible stumps and the "V" aspect pointing towards the intrinsic muscles of the tongue (Figure-1). If the resection is accompanied by full thickness excision as in one of our cases, the folded PMMC flap drapes the plate entirely(Figure2,3). If the defect is within the oral cavity, the depithelialised flap comes anteriorly and under the overlying facial skin so as to avoid plate exposure due to skin breakdown later(Figure 2b). The option of 3 screw fixation on either side is to reduce the shearing force at the fixation and to give consideration for the fact of radiation induced osteonecrosis at the terminal ends.

Plate related complications have been reported as early as within 6 months[4-6] in literature . Vertical stress by mastication on the plate and opposite shearing forces on them, causing bone resorption at the site of screw , leads to screw loosening, plate removal and plate fractures[7,8] In this view , there has been attempts of coronoidectomy, to avoid the shearing forces by the major masticatory muscle ;like temporalis to reduce the stress on the reconstruction plate, especially when mandibular angle defects are concerned.

Infection, screw loosening and plate fracture were the reasons that caused plate survival to drop from 65 to 45% in post radiated patients at first year of followup[1]. Subendothelial fibrinoid necrosis of mandibular vessels as a result of radiation followed by fibrosis of marrow and periosteum leading to tissue hypovascularity and osteoradionecrosis have been the pathological culprits attributed for plate and screw dislodgement [10,11,12]. Usage of bone grafts with plate reconstructions has reported controversial plate survival rates [13-15]. There has been a trend for plate fracture at 10 months and screw loosening at 30th month of followup.

However in a mean follow up of 13 months, none of our patients have developed plate related complications. Hence, though not an alternative to free flap reconstruction in composite orofacial resection, modified plating technique with locoregional flap draping can be considered when situation demands.

VI. CONCLUSION

Minimalising surgical manipulation and preserving the musculoperiosteum over the remnant mandible, except for the area of plating, along with the modification in the plate design with draping of the entire unit with locoregional flap, helps to ameliorate the plate survival while restoring mandibular continuity, even in adjuvant radiation scenarios.

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Table-1 Particulars of the patient with Jerger's classification of the arch defect.
C-Central defect, LCL- lateral central lateral defect,NLF- Nasolabial flap, PMMC- Pectoralis Major Myocutaneous flap, CLD- Chronic liver disease, CAD- Coronary artery disease, BPD- Bipolar Disease

Age	Defect type-Jerger class.	Site of primary	Titanium plate	Flap to reconstruct	Complications	Comorbidities
61	C	LOWER ALVEOLUS	2mm	NLF		Seizure disorder
65	LC	FOM	2mm	PMMC		
63	LCL	TONGUE	2mm	PMMC		CLD
56	C	FOM	2mm	PMMC		CAD
66	LCL	TONGUE	1.5mm	PMMC		
51	LCL	LIP	2mm	PMMC		CAD
54	LCL	LOWER GBS	2mm	PMMC	Minimal wound dehiscence-secondary suturing	BPD

Figure- 1. Intraoperative fixation of the mandible of the M- sculpted reconstruction plate (1.5mm) on the lingual cortex after near total glossectomy with arch segmental mandibulectomy and harvested left PMMC flap tunnelled under the cervical flap to the defect site

Figure -2a,b. Intraoperative picture of PMMC flap inset for tongue defect reconstruction and (Fig-2b) deepithelialised distal flap under the skin flap in the menton area.

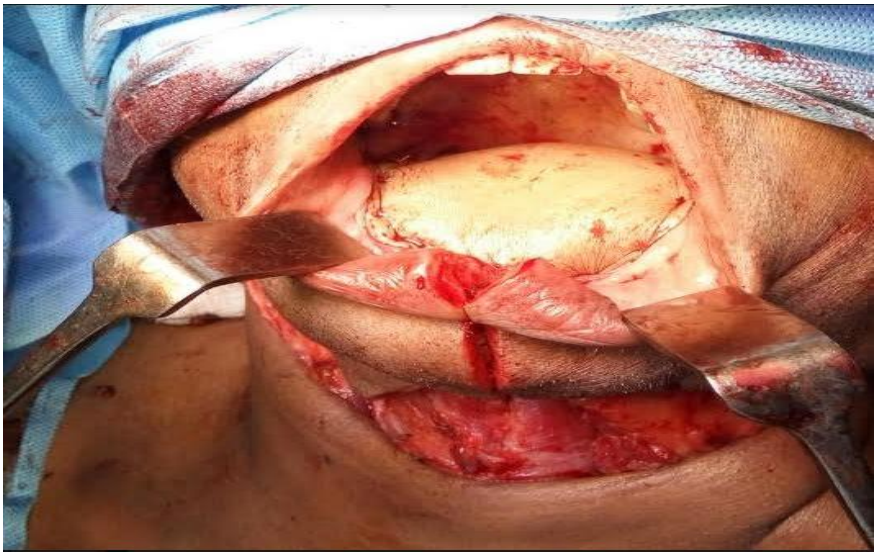


Figure-3 Patient with carcinoma of Lower alveolus after full thickness excision with arch mandibulectomy and plate reconstruction with folded PMMC reconstruction on Post operative day 4, tolerating lying supine and with adequate mouth opening.

Figure-4. Central arch mandibular defect , reconstructed with M design reconstruction plate and Nasolabial flap reconstruction at 12th month of followup

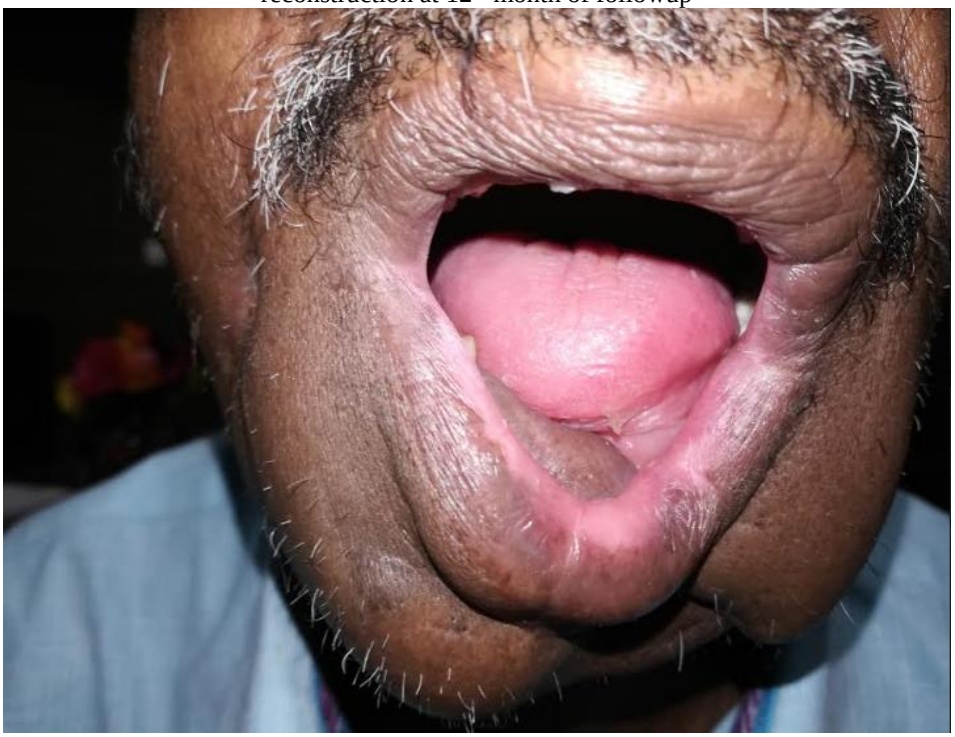
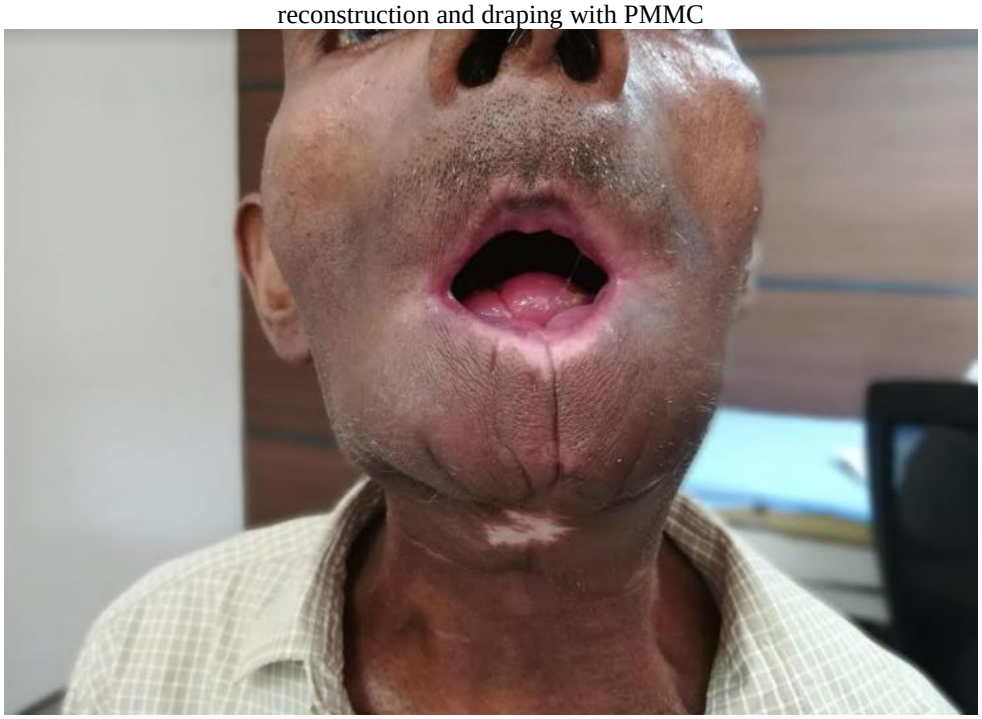


Figure-5. 8 months post treatment follow up picture of patient of carcinoma Floor of mouth after plate reconstruction and draping with PMMC



Corresponding author: Dr Shaji Thomas
Additional Professor[2], Department of Head and Neck Surgery,
Regional Cancer Centre, Trivandrum 695011