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ORIGINAL ARTICLE

Frequency of post-radiation plate extrusion in mini plate versus reconstruction plate for mandibular reconstruction in oncologic surgeries of mandible.

Muhammad Adil Iqbal[1], Obaid Ur Rahman[2], Mirza Shehab Afzal Beg[3], Hassan Tahir[4], Tauqeer Hussain[5], Remsha Sattar[6]

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ABSTRACT... Objective: To compare plate extrusion rates of mini-plates versus reconstruction plates in the fixation of vascularized fibula into segmental mandibular defects. **Study Design:** Retrospective Review. **Setting:** Department of Plastic and Reconstructive surgery, Liaquat National Hospital, Karachi, Pakistan. **Period:** January 2017 to December 2019. **Material & Methods:** In this retrospective review, 38 patients were included who underwent free fibular reconstruction of segmental mandibular defects after oncologic resection of bone and adjuvant radiotherapy. Patient data and post radiation plate extrusion rates were recorded; the results were compared between patients who had segmental fibular reconstruction of their mandibular defect with mini- plates (n = 18) with those who underwent repair using reconstruction plates (n = 20). Average follow up were 18 ± 3 week. **Results:** Statistically significant difference was identified in decrease number of extrusion of plate after post radiation in mini-plates group (5.5%) versus reconstruction plate (15%). Over all complication of both groups are same. **Conclusion:** After oncologic resection of mandible and reconstruction with free fibula flap patient underwent radiotherapy which result in scarring and shrinkage of facial skin that lead to wound dehiscence and exposure of underlying plate. By using mini plate this exposure of plate incidence is lower.

Key words: Oncologic Resection, Mandibular Reconstruction, Mini-plate, Reconstruction Plate, Free Fibula Flap.

INTRODUCTION

Mandible reconstruction with osseocutaneous fibula flap is common in oncologic surgeries of mandible.[1,2,3] Various technique of fixation has been described for it. Commonly used technique for fibula fixation is titanium reconstruction bar which stabilize the harvested fibula with mandible bone ends.[4] However mini-plates is a recent advance for bone fixation (Figure-1).[5]

Mini-plates are low profile, highly malleable plates that require less operative and causes less damage to vascular pedicle. In contrast, due to its smaller size and low profile it is likely to fracture that results in mal-union or nonunion of the mandible. These when compared to reconstruction plates found to offer load shearing which makes early return to function easier, also a single plate of adequate length with minimum screw requirement is advantageous. However, they have a high profile which predisposes the vascular pedicle to intra-operative damage, high risk of postoperative infection and post-radiation exposure. There is a documented evidence that reconstruction plates act as stress shielding plate therefore they cannot transfer force to the neo -mandible which act as a stimulus for maintaining bone, resulting in disuse atrophy and osteoporosis.[6] Post-radiation plate exposure is a worrisome and troublesome complication which delays wound healing, resulting in implant failure most commonly secondary to infection.[7,8] Prioritizing usage of one type of plate is controversial as both have their known advantages and disadvantages.

The aim of our study is to compare exposure of plate after radiation therapy in mini-plate and reconstruction plate.

1. MBBS, Resident Plastic Surgery, LNH.
2. MBBS, FCPS, Consultant Plastic Surgery, LNH.
3. MBBS, FRCS, Consultant Plastic Surgery, LNH.
4. MBBS, Resident Plastic Surgery, LNH.
5. MBBS, Resident Plastic Surgery, LNH.
6. MBBS, Resident Plastic Surgery, LNH.

Correspondence Address:
Dr. Mirza Shehab Afzal Beg
Department of Plastic Surgery, LNH.
shehabbeg@hotmail.com

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MATERIAL & METHODS

A retrospective review of 38 patients was performed at Department of Plastic and Reconstructive surgery, Liaquat National Hospital, Karachi, Pakistan, from January 2017 to December 2019 after approval of ethical committee (0803-2022 LNH-ERC) who underwent reconstruction of segmental mandibular defect with vascularized free fibula after oncologic resection of bone and adjuvant radiotherapy. Patients who underwent reconstruction with a straight mandible segment defect of 5cm were included. Patients needing complex reconstruction or not receiving adjuvant radiotherapy were excluded from the study. All record including patient data and post-radiation plate exposure rates were recorded and maintained on a designed proforma. The Comparison was done between the groups undergoing segmental mandibular reconstruction with vascularized free fibula secured with mini-plates (n = 18) with those secured with reconstruction plates (n = 20). Average follow up were 18 ± 3 week. Patients included were those who underwent reconstruction with free fibula bone reconstruction for single segment of fibula, after oncologic resection and have received adjuvant radiotherapy.

RESULTS

A total of thirty-patients were included in the study with a mean age of 35 years in the reconstruction plate group and 37 years in the min-plate group (Table-I). Out of 22 male patients, 12 had their fixation done with reconstruction plates and 10 done with mini-plates. Sixteen female patients were also part of the study of which 6 had their fixation done with reconstruction plates and 10 with mini-plates. A total of 7 patients had associated comorbid conditions with almost equal distribution between the two groups.

Statistically significant difference was identified, as decrease in number of post-radiation plate exposure in mini-plates group (5.5%) versus reconstruction plate (15%) (Figure-1) (Figure-2). Over all complication of both groups were same.

Similar profile plates were used in all patients with reconstruction plates i.e., 2.4mm and 1.3mm for mini-plates. All patients had 6 cycles of radiation of mean 30 (±2) gray. Mandibular defect size was 5.0cm (±1.0). There was a similar complication rate in both groups other than the plate exposure rate which was 15% in the reconstruction plate group and 5.5% in mini-plate group (Table-II). Our results demonstrated the superiority of the mini-plates over reconstruction plates for mandibular reconstruction.

		Reconstruction Plates	Mini Plates
Age		35 (±5 Years)	37(±4 years)
Gender	Male	12 (31.5%)	10 (26.31%)
	Female	6 (15.7%)	10 (26.31%)
Comorbid	DM	2 (5.26%)	1 (2.63%)
	HTN	1 (2.63%)	2 (5.26%)
	IHD	0	1 (2.63%)

Table-I. Demonstrating patient demographics

		Reconstruction Plates	Mini plates
Plate profile		2.4mm	1.3mm
Number of radiation cycles		6	6
Radiation (Gy)		30(±2)	30(±2)
Size of mandibular defect (cm)		5.0(±1.0)	5.0(±1.0)
No. of Patients		18 (47.36%)	20 (52.63%)
Complications	Infection	1 (2.63%)	1 (2.63%)
	Hematoma	1 (2.63%)	1 (2.63%)
	Flap loss	0	0
	Plate exposure	3 (7.89%)	1 (2.63%)

Table-II. Demonstrating comparison of reconstruction plates versus min-plates

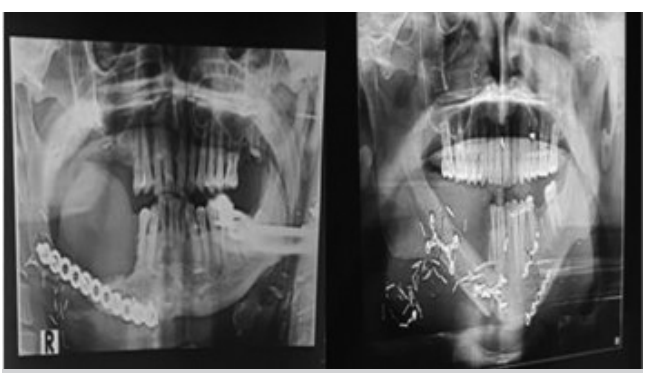

Figure-1. Demonstrating different types of plates a) Reconstruction plate, b) Mini plates

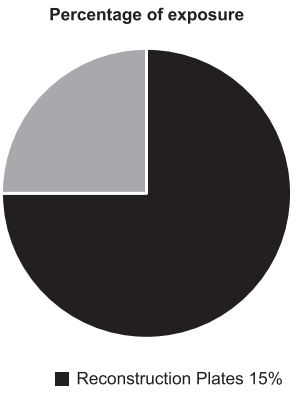

Figure-2. Demonstrating percentage of plate exposure in each group

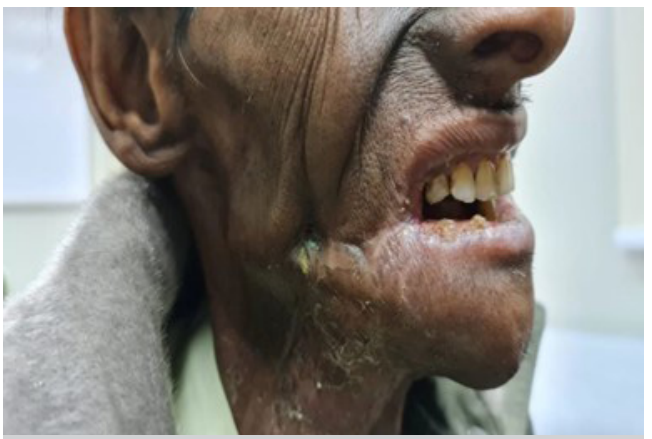

Figure-3. Demonstrating exposure of reconstruction plate

DISCUSSION

Mandibular reconstruction with vascularized osseocutaneous fibula flap has been a widely accepted management.[2,3,9] Complication after reconstruction should be discussed in detail with patient preoperatively.[10] However, with development and recent advances in surgical technique the incidence of postoperative complications is reduced to a remarkable extent. One important complication usually encountered in post-operative period is the post-radiation exposure of the plate whether it be mini plate or reconstruction plate. Both are made up of titanium plate and have their own advantages and disadvantages. Despite the fact that both are in use for a quite long time, there is no consensus that which titanium is the best choice. Hidalgo et al utilized mini-plates for fixation of the osteocutaneous flap.[11,12,13] This approach was first mentioned by J M Chow[3], who evaluated mini-plate fixation in free flap mandibular reconstruction. In a previous study it was published that reconstruction plates are more likely to be exposed.[14,15,16] In a meta-analysis published in JPRAS mini-plates were associated with higher rates of plate related complications and fistula formation.[17] Another study published in J. Maxillofac. Oral Surg mini plates were superior for mandible fixation especially in the para-symphysial region.[18] A recent advances in mini-plate based mandibular reconstruction is utilizing CAD/CAM system for designing patient specific 3D printed plates.[19]

Our study evaluated postoperative plate extrusion after radiation therapy in oncologic reconstruction of mandible with vascularized fibula flap. Thirty-eight patients were included in this study out of which 22 male and 16 female patient, average age was 35 year in reconstruction group and 37 year in mini-plate group. 3 patient had diabetes mellitus, 3 patient had hypertension and 1 patient had ischemic heart disease (Table-I). All patients received radiation and all reconstruction were nearly of same size, being it segmental reconstruction in all cases. No additional factors were observed that could have predisposed to plate exposure in both groups. We found that due to the higher profile of the reconstruction plates these are more susceptible to post radiation exposure when compared to mini-plates. Plate extrusion is the most common cause of plate removal secondary to infection. Our result show extrusion of plate in 3 patients out of 20 (15%) reconstructed with reconstruction plate and 1 patient out of 18 (5.5%) reconstructed with mini-plate. Size of reconstruction plate used was 2.4 mm and 1.33mm for mini-plates. Our results, revealed decrease number of plate extrusion in mini-plate likely due to its low profile nature.

The limitations of our study include the small sample size and patients include in this study are those who reconstructed for straight mandible segment defect of 5cm. Patient with hemi-mandibulectomy were excluded from the study.

CONCLUSION

After oncologic resection of mandible and

reconstruction with free fibula flap patient underwent radiotherapy which result in scarring and shrinkage of facial skin that lead to wound dehiscence and exposure of underlying plate. By using mini plate this exposure of plate incidence is low, hence based on our experience we recommend using mini-plate for mandibular reconstruction.

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AUTHORSHIP AND CONTRIBUTION DECLARATION

No.	Author(s) Full Name	Contribution to the paper	Author(s) Signature
1	Muhammad Adil Iqbal	Drafting of article, Analysis & Critical review.	
2	Obaid Ur Rahman	Concept of article, Analysis & Interpretation.	
3	Mirza Shehab Afzal Beg	Final approval, concept of article.	
4	Hassan Tahir	Data analysis & Interpretation.	
5	Tauqeer Hussain	Data analysis & Interpretation.	
6	Remsha Sattar	Data collection.	