



Plastic Surgery

EFFECT OF PLATELET RICH PLASMA IN ILIAC CREST/RIB BONE GRAFT RECONSTRUCTION OF MANDIBLE: A RETROSPECTIVE STUDY

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ABSTRACT

Objectives: To assess the efficacy of Platelet Rich Plasma in mandibular defect in combination with Iliac Crest/rib Bone Graft. **Material and Methods:** The study was conducted on 20 patients (13 males and 7 females, age range 17 to 60 year) from march 2024 to march 2025 at Amaltas medical college & hospital dewas mp. Patients with benign mandible tumor and cyst, defects resulting from chronic osteomyelitis and trauma were included. Bone defect 6 to 9 cm were included. All procedures of excision and curettage were done under general anaesthesia, intra or extraoral approach with iliac crest / rib bone grafting and titanium implant fixation whenever required. All patients had immediate reconstruction. PRP sessions were given 1st (during stay), 2nd, 4th, 8th and 12 week (followup) by standard procedure protocols. Observations were done by x rays. Bone graft take was defined radiographically as maintenance of >75% of the graft based on comparison of preoperative, immediate postoperative and last postoperative visit., clinical examinations, restoration of mandibular continuity, and CT scan and plain film panoramic radiographic consolidation. Criteria for radiographic consolidation included progressive ossification of the junction between native mandible and graft, no increased radiolucency at the graft/native mandible interface, no increase in radiolucency around fixation or other signs of hardware failure to indicate lack of continuity and decreased bone resorption. Clinical success was defined as absence of infection, complete mucosal closure, no interfragmentary mobility on examination restoration of mandibular form, and intelligible speech. **Results:** all wound healed completely. There was no recurrence in cases of tumors or cyst. No wound infection. Complete bone formation was seen at the end of 1 year in all cases. Good osteointegration was noted in Patient with dental implant. **Conclusion:** Application of PRP enhances bone formation in mandible defects when admixed with autologous bone graft harvested from the iliac crest/rib graft as it leads to early bone formation, increased bone density, decreases bone resorption, low infection rate and least post-operative complications.

KEYWORDS : Platelet Rich Plasma, Iliac Crest Bone Graft, Rib Bone Graft, Mandible Defects

INTRODUCTION

surgical treatment of mandible tumor, cysts, trauma, osteomyelitis results in a continuity defects. This defect requires replacement with either a vascularized or non vascularized tissue or bone. mandible is important structure for function like speech and mastication, esthetics and quality of life. Both vascularized and non-vascularized techniques are well- accepted treatment strategies for reconstruction of the mandible. Several criteria to help identify the type of bone graft reconstruction that is optimal for mandibular reconstruction.¹

In cases of primary reconstruction for segmental defects, patient's with preoperative radiation therapy, defects >6 cm, and where composite hard/soft tissue is required, vascularized bone flap (VBF) is indicated. Despite the great advantages they offer, free tissue transfer is time-consuming, associated with donor site morbidity, require longer hospital stay, require larger surgical dissection and surgical airways, necessitate monitoring in intensive care unit and place a heavy burden on hospital resources²

In cases of shorter defects (<6 cm), non-continuity defects, defects with no soft tissue requirement, and ability for secondary reconstruction, many defects are amenable to reconstruction with non-vascularized bone grafts (NVBG)^{3,4}

These procedures are shorter, allow for faster recovery, and better facilitate reconstruction with dental implants. The anterior and/or posterior iliac crest is a commonly used donor site as it offers a large amount of bone and high concentration of osteocompetent cells to be transferred NVBG are preferred for most defects due to benign pathology, trauma, and non-continuity defects.

Platelet rich plasma is a volume of autologous plasma that has a platelet concentration above baseline. It has been acknowledged that several components in blood platelets, which are part of the natural healing process, if added to wounded tissues or surgical sites as a concentrate have the potential to accelerate healing.

With the advent of blood factor fractionation in hematology and the search for hemostatic agents, interest has increased in platelet-rich plasma (PRP) fractions. PRP is a volume of autologous plasma that has a platelet concentration higher than normal. In general, PRP contains > 1 x 10⁶ platelets/pl. In clinical practice, PRP is applied to the site of a bone graft to deliver a high concentration of growth factors from

platelets. The platelets then synthesize additional amounts of growth factors for about 8 days until they are depleted and die. The precise content and concentration of growth factor has yet to be fully elucidated. The α -granules of platelets release at least seven growth factors, including platelet derived growth factor, TGF-13, platelet-derived epidermal growth factor, platelet derived angiogenesis factor, insulin-like growth factor-1, and platelet factor-4.

With our study we have include slight larger defect and use non vascularized bone graft (6 to 9cm) and use PRP. Platelet Rich Plasma (PRP) is widely used in various surgical fields, including head and neck surgery, otolaryngology, cardiovascular surgery, and maxillofacial surgery.

MATERIAL AND METHOD

The study was conducted on 20 patients (13 males and 7 females, age range 17 to 60 year, mean age...) from july 2022 to june 2023. Patients with benign or malignant mandible tumor and cyst, defects resulting from chronic osteomyelitis and trauma were included.

Defect more than 9 cm, diabetic and unfit patient for surgery were excluded from the study.

After proper history taking, examination, radiology and blood investigations patients were evaluated. With proper consent patient were elected for surgery.

Pre-operative radiographs: including panoramic view and dental C.T (axial, coronal and 3 dimension reconstruction) to evaluate the defect size and diagnosis. Laboratory investigations: including biopsy assessment if needed (incisional or aspirated biopsy), complete blood picture, bleeding profile, random blood sugar, kidney function, liver function and chest X-ray

Operative techniques: This includes surgical techniques for enucleation / excision of the lesion, method of obtaining the iliac crest graft/rib graft, and finally reconstruction. Followup with the preparation of Platelet Rich Plasma (PRP) and application.

All procedures of excision and curettage were done under general anaesthesia, intra or extraoral approach with iliac crest / rib bone grafting and titanium implant fixation whenever required. All patients had immediate reconstruction.

Preparation of PRP: During the procedure 20cc of blood was withdrawn from the patient with Citrate Phosphate Dextrose (CPD) at a volume ratio of 9 to 1 for anticoagulation. PRP was produced through centrifugal separation of whole blood. After the first centrifugation (2500rpm, 5 minutes), the blood was separated into plasma and red blood cells. The red blood cells were discarded, and after a further centrifugation (3500rpm, 10min) of the remaining plasma, the bottom layer, which is rich in platelets and constituted approximately 10% of the total withdrawn blood volume, was collected for use as PRP time of the solution was mixed with 2% calcium chloride at a volume ratio of 7 to 1 to activate platelets to release growth factors and 1cc of patient serum as a source of thrombin to achieve PRP.

Platelet rich plasma was made with all aseptic precautions by aspirating 20 ml blood and centrifuging it twice at speed of 2500 rpm and 3500rpm as 1st week during hospital stay and thereafter on OPD basis Prp sessions and were given on 1 week, 2 week and 4 week 8 week and 12 week through extraoral approach with all aseptic precautions.

All patients had similar surgical protocol including perioperative and postoperative antibiotics, surgical approach, and postoperative care.

Patients were followed up for 1 week, 2 week, 4 week, 2 month, 6 month and 1 year.

RESULTS

All wound healed completely. There was no recurrence in cases of tumors or cyst. No wound infection. Complete bone formation was seen at the end of 1 year in all cases. Good osteointegration was noted in Patient with dental implant. Graft loss was more for bigger defects.

Bone graft take was defined radiographically as maintenance of >75% of the graft based on comparison of preoperative, immediate postoperative and last postoperative visit clinical examinations, restoration of mandibular continuity, and CT scan and plain film panoramic radiographic consolidation. Criteria for radiographic consolidation included progressive ossification of the junction between native mandible and graft, no increased radiolucency at the graft/native mandible interface, no increase in radiolucency around fixation or other signs of hardware failure to indicate lack of continuity and decreased bone resorption. Clinical success was defined as absence of infection, complete mucosal closure, no interfragmentary mobility on examination restoration of mandibular form, and intelligible speech.

DISCUSSION

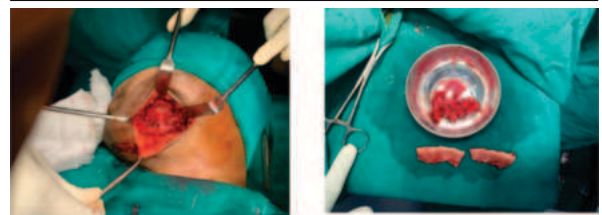
Ultimate reconstruction of mandibular defects is a great challenge as many bone graft materials have been evolved in the literatures as autogenous, allogenic, xenogenic, and alloplastic grafts, autogenous iliac crest bone graft is the gold standard among other graft materials. However, the procedure associated with a potential risk of early complications such as graft resorption, graft leakage, infection, or graft failure. In our retrospective analysis of a limited number of patients. The strengths of the study are that it highlights the benefits of non-vascularized grafts in conjunction with platelet rich plasma use demonstrating good success. It is critical to have multiple tools in the reconstructive armamentarium and this study offers many considerations, advantages, and factors to weigh in choosing mandibular reconstruction with <8cm defect with iliac crest along with platelet rich plasma.

The effects of PRP on bone graft are of beneficial issue. It has been reported that PRP improving bone regeneration in bone grafting, also maturity of grafted bone combined with PRP is significantly greater than that without PRP, and that grafted bone combined with PRP shows a mature Harversian system and a greater proportion of lamellar phase Marx and coworkers evaluated the effect of PRP on bone graft reconstructions of mandibular continuity defects 5 cm or greater, showing a maturity index of about twice actual maturity at 2 and 4 months.

CONCLUSION

Application of PRP enhances bone formation in mandible defects when admixed with autologous bone graft harvested from the iliac crest as it leads to early bone formation, increased bone density, decreases bone resorption, low infection rate and least post-operative complications. Application of platelet-rich plasma (PRP) to an autogenous cancellous bone graft caused a faster maturation rate and greater amount of new bone formation in an mandibular defect.

Sr no	Age	Sex	Defect size (cm)	Bone graft	Osteointegration	% of graft loss
1	30	M	6.5	iliac	Good	5
2	35	M	8	rib	Good	10
3	42	M	9	rib	Good	10
4	40	F	6.5	iliac	Better	5
5	32	M	6	iliac	Better	5
6	17	F	7	iliac	Good	5
7	34	M	8	rib	Good	10
8	44	F	6	iliac	Good	5
9	23	M	7.5	iliac	Good	5
10	36	F	8	iliac	Good	10
11	39	M	8	rib	Good	15
12	33	M	6	iliac	Better	5
13	41	M	7.5	rib	Satisfactory	10
14	26	F	7	iliac	Good	5
15	28	M	7	iliac	Good	5
16	31	F	9	rib	Good	10
17	39	M	6.5	iliac	Good	5
18	43	M	6	iliac	Good	5
19	27	M	8	rib	Good	10
20	29	F	7	iliac	Good	10



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