

FUNCTIONAL OUTCOME OF PATIENTS OPERATED FOR AMELOBLASTOMA WITH ILIAC BONE VERSUS TITANIUM RECONSTRUCTION PLATE

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Abstract

Objective: "To compare the outcomes of iliac bone versus titanium reconstruction plate for surgical management of ameloblastoma." Study Design: Quasi experimental trial Place and duration of study: Department of Oral and Maxillofacial Surgery, Faryal Dental College, Lahore, from 1st September 2024 to 28.02.2025 Methodology: After meeting selection criteria total 42 patients were enrolled. Informed consent and demographic detail was taken. After that patients were randomly divided into two groups. In group A, patients underwent surgical procedure by using Bone graft with iliac bone. In group B, patients underwent surgical procedure by using titanium reconstruction plate. All patients were followed-up post-surgical wards for 5 days and then were discharged after prescribing standard antibiotics course. Aesthetic outcomes were also noted. Results: In iliac bone graft group the mean age of the patients was 36.14 ± 13.54 years while in titanium plate group was 42.71 ± 14.84 years. Out of 42 patients, excellent aesthetic outcome was noted in 20(47.62%) patients. In Iliac bone graft group excellent aesthetic outcome was noted in 16(76.2%) patients and in titanium group it was noted in 4(19%) patients (p -value=0.001). Conclusion: On the basis of this study we concluded that iliac bone graft showed significantly better aesthetic outcome as compared to titanium reconstruction plate group for surgical management of ameloblastoma

INTRODUCTION

Most often seen in the jaws, ameloblastoma is a benign but locally aggressive odontogenic tumour. Due to its ability to imitate other benign tumours, ameloblastoma can be challenging to detect. Imaging information, histological examination, and molecular testing are all necessary for its diagnosis. From simple enucleation with bone curettage to extensive surgical resections, its therapeutic options vary¹. Reconstruction of mandibular defects is crucial for enhancing patients' quality of life, since such bony deficiencies affect face harmony and aesthetics². Ameloblastoma has a worldwide incidence of 0.92 cases per million person-years, with varying regional frequency³. Ameloblastoma is either the most frequent or the second most common benign odontogenic tumour, according to the majority of epidemiological research. 185 (3%) of the 6231 oral lesions in a Brazilian research were odontogenic tumours, all of which were benign. The most common lesions among them were odontomas (19%), keratocystic odontogenic tumours (28%), and ameloblastomas (29%)⁴.

A biopsy and computerised tomography (CT) imaging are necessary for the diagnosis of ameloblastoma. A biopsy can help distinguish ameloblastoma from myeloma, sarcoma, giant cell tumour, osteomyelitis, ossifying fibroma, and cystic fibrous dysplasia. Aggressive en bloc resection combined with concurrent repair is the most effective therapy for ameloblastoma⁵.

The dread of ugliness, poor phonation, and difficulties masticating and swallowing following mandibular resection have been eliminated by advancements in cosmetic and reconstructive surgery as well as the growing use of prosthetic equipment⁶. Surgery, either resective or non-resective, is the treatment option for ameloblastoma. There are two alternative approaches to surgical treatment: conservative and radical⁷. Reconstruction plates, non-vascularized anterior iliac crest grafts, and vascularised fibula flaps are used to repair mandibular abnormalities. Non-vascularized iliac crest grafts continue to be used only for lateral mandibular defects, despite the significant mandibular abnormalities observed in our growing environment². 3D titanium plates have recently been employed in patients who refuse or are not candidates for free flaps

⁸. For reconstruction, a titanium implant customised for each patient was 3D printed and inserted intraoperatively. The procedure had positive postoperative outcomes with no problems⁸.

Autologous iliac bone grafts and titanium reconstruction plates are commonly used reconstructive techniques, each with its own advantages and limitations. However, despite their widespread application, there is limited comparative data on their effectiveness, particularly within our local population. This study aims to address this gap by evaluating both techniques, ultimately helping to determine the more suitable option for our patient demographics. So, the objective of this study was to compare the outcome of iliac bone versus titanium reconstruction plate for surgical management of ameloblastoma.

METHODOLOGY

This quasi experimental trial was carried out at : Department of Oral and Maxillofacial Surgery, Faryal Dental College, Lahore, from 1st September 2024 to 28.02.2025 after taking approval from ethical review committee.

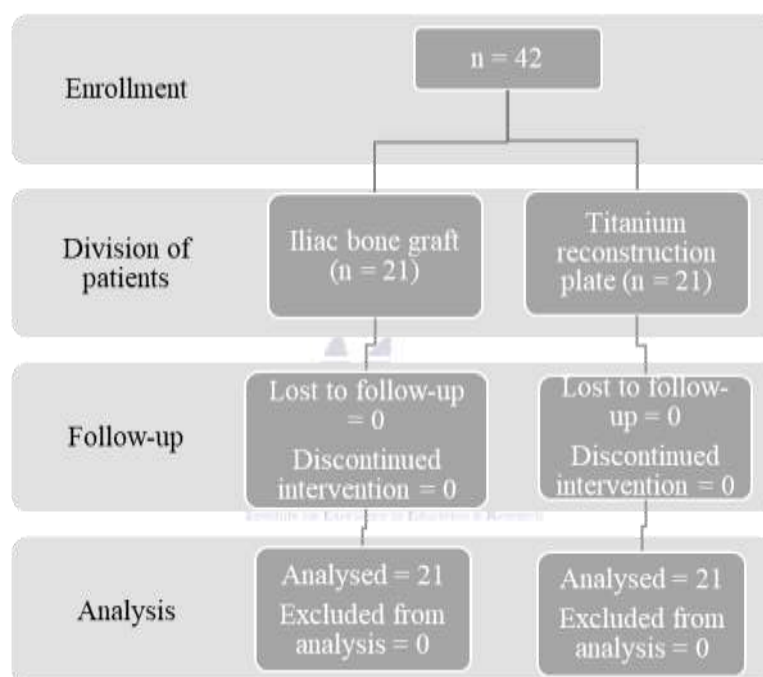
Inclusion criteria: Patients diagnosed with ameloblastoma, regardless of gender, and aged 16–65 years were eligible to participate. Ameloblastoma was defined as presence of tumor around the tooth roots confirmed on CT scan.

Exclusion criteria: Patients with recurrent tumor, evidence of progressive or complicated disease, already received trial treatment, or enrolled in another trial, metastatic disease, were fall in exclusion criteria. Sample size of 42 cases is calculated with 5% significance level, 80% power of study and percentage of ameloblastoma i.e. 41.9% among all odontogenic tumors⁹. All the cases were enrolled by applying Non-Probability, consecutive sampling technique after filtering the patients for selection criteria. Patients were enrolled in the trial from surgical wards. Informed consent was obtained. Demographics (name, age, sex, duration of diagnosis, residence, occupation, socioeconomic status, history of smoking, alcoholism, tobacco chewing, tooth brushing history, diabetes, hypertension and anemia) were noted. Then patients were admitted and divided in two groups. In group A, first 21 patients underwent surgical

procedure by using Bone graft with iliac bone. In group B, next 21 patients underwent surgical procedure by using titanium reconstruction plate. During procedure, operative time was noted. All patients were followed-up post-surgical wards for 5 days and then were discharged after prescribing standard antibiotics course. If fever developed within 5 days (body temperature $>99^{\circ}\text{F}$ and remain stable for at least 2 days), along with pain and tenderness at

wound site, then infection was noted. During follow-up, X-ray was performed to check the graft resorption. Pain, drooling of saliva, eating solids/liquids, tongue movements, speech and deglutition were also noted. Aesthetic outcomes were also noted. In this study, aesthetic outcome was measured in terms of excellent, good, fair and poor. All this information was recorded on Proforma.

Figure-1: Patient Flow Diagram (n= 42)



All the collected data was entered and analyzed on SPSS version 23. All the quantitative data was presented in the form of mean $\pm$ SD and all the qualitative data was presented in the form of frequency and percentages. For comparison of qualitative data between both groups Chi square test was applied. $P\text{-value} \leq 0.05$ was taken as significant.

RESULTS:

In this study total 42 patients were enrolled. In iliac bone graft group the mean age of the patients was 36.14 ± 13.54 years while in titanium plate group its mean value was 42.71 ± 14.84 years ($p\text{-value} = 0.142$). In iliac bone graft group the mean operating time and duration of carcinoma was 15.047 ± 2.94 & 2.95 ± 1.39 while in titanium plate group its mean value was 16.00 ± 3.68 & 2.67 ± 1.53 ($p\text{-value} = 0.360$ & 0.530).

In iliac bone graft group 10 (47.6%) patients were male and in titanium group 10 (47.6%) patients were male ($p\text{-value} = >0.999$). In iliac bone graft group 4 (19%) patients were diabetic and in titanium group 7 (33.3%) patients were diabetic ($p\text{-value} = 0.292$). In iliac bone graft group 6 (28.6%) patients were hypertensive and in titanium group 9 (42.9%) patients were hypertensive ($p\text{-value} = 0.334$). Similarly smoking and alcoholic status was statistically insignificant

when compared between study groups (p-value = >0.999). **Table-I**

In Iliac bone graft group infection was present in 0 (0%) patients and in titanium group it was present in 4 (9.5%) patients (p-value = 0.107). In Iliac bone graft group graft resorption was present in 21 (100%) patients and in titanium group it was present in 15 (71.4%) patients (p-value = 0.021). In Iliac bone graft group pain was noted in 9 (42.9%) patients and in titanium group it was noted in 17 (81%) patients (p-value = 0.011). In Iliac bone graft group drooling saliva was noted in 6 (28.6%) patients and in titanium group it was noted in 15 (71.4%) patients (p-value =

0.005). In Iliac bone graft group eating solid liquid was noted in 21 (100%) patients and in titanium group it was noted in 8 (38.1%) patients (p-value = <0.001). In Iliac bone graft group tongue movement was noted in 18 (85.7%) patients and in titanium group it was noted in 8 (38.1%) patients (p-value = 0.001). In Iliac bone graft group speech was observed in 21 (100%) patients and in titanium group it was observed in 19 (90.5%) patients (p-value = 0.488). In Iliac bone graft group excellent aesthetic outcome was noted in 16 (76.2%) patients and in titanium group it was noted in 4 (19%) patients (p-value = 0.001). **Table-II**

Table-I: Comparison of demographic and clinical parameters of the patients (n = 42)

		Study Groups	
		Iliac bone graft (n=21)	Titanium plate (n=21)
Age (Years)		36.14 ± 13.54	42.71 ± 14.84
Gender	Male	10 (47.6%)	10(47.6%)
	Female	11 (52.4%)	11(52.4%)
Diabetes	Yes	4 (19.0%)	7(33.3%)
	No	17 (81.0%)	14(66.7%)
Hypertension	Yes	6 (28.6%)	9(42.9%)
	No	15 (71.4%)	12(57.1%)
Anemia	Yes	15 (71.4%)	15(71.4%)
	No	6 (28.6%)	6(28.6%)
Smoker	Present	5 (23.8%)	6(28.6%)
	Absent	16 (76.2%)	15(71.4%)
Alcoholic	Present	3 (14.3%)	4(19.0%)
	Absent	18 (85.7%)	17(81.0%)
Duration of carcinoma		2.95±1.39	2.67 ± 1.53
Operating time		15.047± 2.94	16.00 ± 3.68

Table-II: Comparison of outcome variables between study groups

		Study Groups		p-value
		Iliac bone graft	Titanium plate	
Infection	Present	0 (0.0%)	4 (19.0%)	0.107
	Absent	21 (100.0%)	17 (81.0%)	
Graft Resorption	Present	21 (100.0%)	15 (71.4%)	0.021
	Absent	0 (0.0%)	6 (28.6%)	
Pain	Yes	9 (42.9%)	17 (81.0%)	0.011
	No	12 (57.1%)	4 (19.0%)	
Drooling Saliva	Yes	6 (28.6%)	15 (71.4%)	0.005
	No	15 (71.4%)	6 (28.6%)	
Eating Solid Liquid	Yes	21 (100.0%)	7 (33.3%)	<0.001

	No	0 (0.0%)	14 (66.7%)	
Tongue Movement	Yes	18 (85.7%)	8 (38.1%)	0.001
	No	3 (14.3%)	13 (61.9%)	
Speech	Yes	21 (100.0%)	19 (90.5%)	0.488
	No	0 (0.0%)	2 (9.5%)	
Deglutition	Yes	21 (100.0%)	15 (71.4%)	0.021
	No	0 (0.0%)	6 (28.6%)	
Aesthetic Outcome	Excellent	16 (76.2%)	4 (19.0%)	0.001
	Good	2 (9.5%)	8 (38.1%)	
	Fair	3 (14.3%)	5 (23.8%)	
	Poor	0 (0.0%)	4 (19.0%)	

DISCUSSION:

The cornerstone of ameloblastoma therapy is surgical management. The degree of involvement, the tumor's size, its anatomical location, and its histologic type all influence the ameloblastoma treatment plan. Ameloblastoma can be treated with segmental or en-block excision of the tumour with reconstruction, or with simple enucleation. The surgical margins must be at least 1-2 cm from radiologically normal margins in order to avoid recurrence. However, one school is promoting more conservative surgical treatment using enucleation with nearby bone¹⁰⁻¹².

In this trial, in Iliac bone graft group excellent aesthetic outcome was noted that in 16(76.2%) patients and in titanium group it was noted in 4(19%) patients (p-value=0.001). In iliac bone graft group mean operating time and duration of carcinoma was 15.047±2.94 while in titanium plate group its mean value was 16.00±3.68 (p-value=0.360). The next section discusses a few of the investigations and presents their findings as.

A study by Kanankira A. Nnko et al Meloblastomas are uncommon, benign, and locally invasive odontogenic jaw tumours with a high recurrence rate, as their investigation showed. Because of the extent of the lesion, the preferred course of therapy is radical surgery and quick repair. Since the autologous bone graft approach is a straightforward, uncomplicated, affordable, and dependable way to restore mandibular continuity problems, it is enough for rapid mandibular reconstruction. Radiography tests and long-term monitoring are crucial¹.

Zhiyang Zhao et al demonstrated that the 3D-printed titanium mesh implant may enhance the patient's face symmetry, and that the use of computerised surgical

planning and 3D-printed templates can help surgeons execute surgery properly. For significant mandibular repair, 3D printed titanium mesh in conjunction with a posterior iliac cancellous bone transplant may be the best option¹³.

The most advised method for repairing soft tissue abnormalities and the mandible following tumour removal is vascularised free bone flaps, such as iliac crest flaps (ICF) or fibular free flaps (FFF)¹⁴. The iliac crest is considered better for mandibular reconstructions, however the fibula is the recommended choice for autogenous bone transplants for long bone or angle-to-angle jaw reconstructions¹⁵. When repairing alveolar height deficiencies in maxillofacial reconstruction, the posterior iliac cancellous bone might be used as a donor location¹⁶. It minimises changes to the iliac bone profile while providing additional cancellous bone to restore the alveolar height of the afflicted region¹⁷. An earlier investigation into the healing of alveolar defects revealed an iliac cancellous bone loss rate of 48.91%¹⁸. However, this study's rate of 32.15% indicates that iliac cancellous bone can be a good choice for fixing bone abnormalities.

According to one study by Shaheen Anjum et al., iliac bone grafts, either by itself or in conjunction with rib grafts, are a great way to rebuild individuals who have mandibular abnormalities¹⁹.

CONCLUSION

On the basis of this study we may conclude that Iliac bone graft showed significantly better aesthetic outcome as compared to titanium reconstruction plate group for surgical management of ameloblastoma

CONFLICT OF INTEREST

None.

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