EGYPTIAN DENTAL JOURNAL
www.eda-egypt.org
VOL. 71, 2929:2942, OCTOBER, 2025
PRINT ISSN 0070-9484 • ONLINE ISSN 2090-2360
ORAL SURGERY
Submit Date : 26-05-2025 • Accept Date : 23-07-2025 • Available online: 01-10-2025 • DOI : 10.21608/edj.2025.397689.3527

EVALUATION OF DECORTICATION COMBINED WITH APRF AND GBR ON IMMEDIATE IMPLANT PLACEMENT OUTCOMES IN THE POSTERIOR MANDIBULAR REGION - A PROSPECTIVE CLINICAL AND RADIOGRAPHIC STUDY

Omar Emad Hamdi*, Amr Mohamed Shaarawi**, Elham Mosallam*** *and* Hosam E Said****

ABSTRACT

Aim of the study: The current study aimed to evaluate decortication combined with APRF and GBR on immediate implant placement outcomes in the posterior mandibular region.

Materials and Methods: This randomized clinical study included 14 patients were requiring implant placement at the posterior mandibular region with insufficient bone volume. Patients were randomly assigned to two groups (n=7 per group). The non-decorticated Group (Group A) received GBR with a xenograft and A-PRF. The decorticated Group (Group B) received the same treatment combined with buccal cortical bone decortication. Outcomes were evaluated at baseline and after 4 months. Radiographic outcomes included changes in bone height and bone density (Hounsfield Units) measured using Cone Beam Computed Tomography. Clinical outcomes included implant stability, Probing Pocket Depth, and Modified Sulcus Bleeding Index.

Results: The Decortication Group (Group B) demonstrated significantly greater bone deposition on the buccal surface ($p=0.031$) and significantly higher bone density across all measured surfaces (mesial, distal, apical; $p<0.01$) compared to Group A. Clinically, Group B showed a significantly greater increase in implant stability ($p=0.025$), significantly lower probing pocket depths ($p<0.05$), and a lower bleeding index at all surfaces except the mesial surface.

Conclusion: The adjunctive use of cortical decortication with A-PRF and GBR in posterior mandibular implant sites significantly enhanced bone density, improved implant stability, and promoted healthier peri-implant soft tissues. This combined approach appears to be a valuable technique for optimizing the quantity and quality of regenerated bone and overall clinical and radiographic outcomes.

KEYWARD : Mandibular decortication, A-PRF, Xenograft, GBR, Dental implant

* Msc Student, Oral and Maxillofacial Surgery, Oral and Dental Medicine, Delta University For Science And Technology: Al Mansurah, Dakahlia, Eg
** Assistant Professor, Periodontology Department, Faculty of Oral and Dental Medicine, Delta University For Science and Technology, Daqahlia, Egypt
*** Lecturer Oral and Maxillofacial Surgery at Must
**** Associate Professor, Oral and Maxillofacial Surgery Department, Faculty of Dentistry, Delta University, Egypt

INTRODUCTION

Bone abnormalities at human jaws frequently arise, mostly due to early tooth loss caused by periodontal disease or due to trauma. Frequently, these disorders result in a decrease in alveolar bone volume, potentially compromising rehabilitation with osseointegrated implants. [1-3] The successful placement of a dental implant necessitates a recipient place with sufficient width as well height of the alveolar bone that liable to be of the main challenges in the posterior mandibular region for implant placement. [4-7]

Bone regeneration, or augmentation, is frequently considered essential for permitting the insertion of implants in a prosthetic- guided methodology. This entails employing diverse materials and grafting techniques. Xenografts exhibit significant predictability and success rates.[8] This establishes consistent guidelines for endosseous implant placement in regenerative dentistry.[9-12]

Surgical guides are crucial tools for precise prosthetically driven dental implant placement. They are available in several varieties according to their support that include tooth support, tissue support, or tooth and tissue support types.[13-15]

Bone decortication is a surgical procedure that includes the puncture or venting of the cortical bone layer, which is frequently employed in combination with bone grafting as well Guided Bone Regeneration (GBR) for enhancing osseous healing. The goal of this procedure is to induce bleeding from the marrow that enhance vascularization at the graft site, which is essential for bone repair.It leads to release growth factors and progenitor cells, and improve physical integration between the graft material and the host bone, substantially facilitates a more favorable environment for bone integration by enhancing vascularization, and offering a stable surface for graft anchorage. Consequently, the probability of successful bone healing and union may be enhanced, resulting in improved overall outcomes in bone grafting surgeries.[16-26]

Advanced platelet-rich fibrin (A-PRF) constitutes a third generation in the use of platelet concentrates. The development involved alterations to the PRF preparation method, chiefly by employing reduced G-forces relative to conventional PRF. [27, 28]. The advanced-PRF (A-PRF) approach involves centrifuging blood through a sterilized, simple glass vacuumed tubes at a speed of 1,500 rpm for a time of 14 minutes.[27]

The integration of decortication, A-PRF, and GBR may provide a synergistic technique to augment bone regeneration in difficult posterior mandibular regions, therefore enhancing implant stability and osseointegration. [29, 30] The justification for this integrated methodology involves: Decortication enhances vascularization and facilitates access to the bone marrow component.[31] A-PRF promotes tissue regeneration and attracts osteogenic progenitor cells.[32] GBR provides space preservation and eliminates soft tissue interference.[31]

There is a current knowledge limitation about the use of mandibular decortication in combination with A-PRF and GBR on immediate implant placement. The aim of this research was to evaluate decortication combined with APRF and GBR on immediate implant placement outcomes in the posterior mandibular region which is a novel study as rare reliable data are available at present time. Null hypothesis of this research is that it has not effect on the management method results.

PATIENTS AND METHODS

Study Design and Patient Selection: This clinical and radiographic prospective study was conducted at the outpatient dental clinic of the Department of Oral and Maxillofacial Surgery, Delta University for Science and Technology.

A total of 14 Patients with a mean age of 30-60 years old, medically free, with good physical condition, non-smokers, not suffering from any parafunctional habits as bruxism, with good oral hygiene state, who presented with insufficient volume of jaw bone of type ш or Iv bone density, and with minimum amount of 6 mm height above mandibular canal and 4 mm ridge width width exists as measured on preoperative cone beam computed tomography (CBCT), good restorative and inter-arch spaces, and at least 6 months elapsed after last extraction at the posterior mandibular region for implant placement were selected. The exclusion criteria are; 1) systemic diseases that contraindicate implant placement, 2) patients with radiotherapy or chemotherapy, 3) patients with diabetes mellitus, 4) patients underwent immunosuppressive drugs or intravenous bisphosphonates, 5) patients with a history of untreated periodontitis, 6) patients with bad habits as bruxism or smoking, 7) presence of any active periodontal disease, and 8) any signs of inflammation involving residual dentition, or mucosal disease in the treated region.

Patients were explained and informed about the protocol and objectives to this research before obtaining informed consent. This research protocol was accepted by the local ethical committee of the faculty of dentistry, Delta University.

Patients were randomly assigned to one of two groups, Group A, non-decorticated n=7 involved GBR with xenograft and A-PRF, and Group B, decorticated n=7 involved GBR with xenograft and A-PRF, combined with buccal cortical bone decortication.

Each group contained 7 patients as 4 females and 3 males, and age mean in group A was 38y but in group B was 46y. The restored teeth, and implant dimensions are recorded in table 1.

TABLE (1) Patients data in the two treatment groups

GROUP TYPE	Age mean in years	Gender mean	Restored Tooth number	Dental implant dimensions (Diameter* length) (mm)
Group A	38	4 females+ 3 males	4teeth 2nd molar+2 teeth 1st molar +1 tooth 2nd premolar	3 implants = 4*10 mm 4 implants = 3.7*8 mm
Group B	46	4 females+ 3 males	3teeth 2nd molar+3 teeth 1st molar +1 tooth 1st premolar	5 implants = 3.7*8 mm 2 implants = 4*10 mm

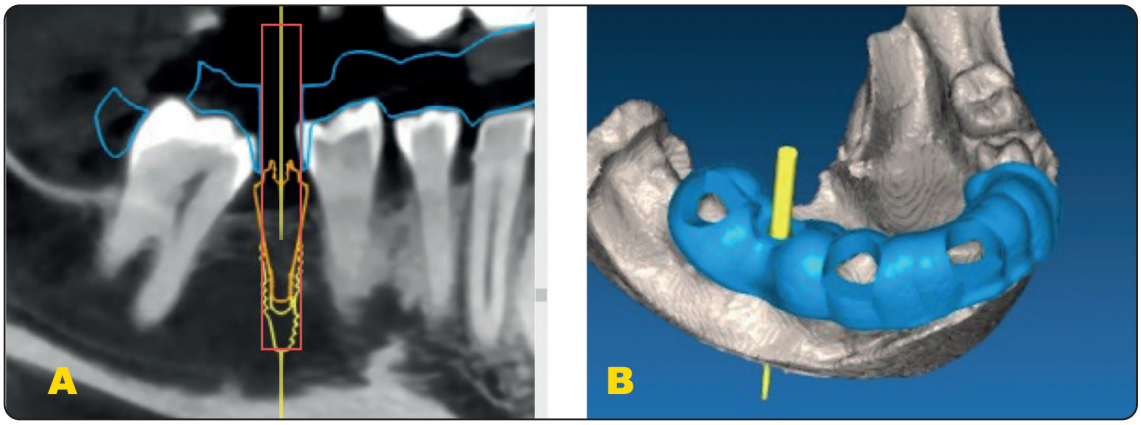

Fig. (1) Shows surgical guide planning and design using data obtained from CBCT and scanned impression. A) shows implant position, B) shows surgical guide design

Preoperative Phase:

All participants underwent medical history review, clinical assessment that includes (blood pressure measurement, complete blood count, calcium and phosphorous level, vitamin D level, thyroid and parathyroid function tests) and Cone Beam Computed Tomography (CBCT) imaging. Surgical guides were fabricated by use of Cone Beam Computed Tomography data that superimposed with dental impressions and so 3D printed by use of (Anycubic Photon mono X (MSLA))* 3D printer that use poly lactic acid (PLA) to ensure precise implant positioning.

Surgical Procedures:

Local anesthetic solution (Articaine HCl 4% with epinephrine 1:100,000)** was administered via inferior alveolar nerve block and buccal infiltration. Surgical sites were prepared with a 0.12% Chlorhexidine as antiseptic rinse.***. A mid-crestal incision was done at the posterior mandibular edentulous area, and a full thickness mucoperiosteal flap reflection was done to expose the alveolar bone.

After implant osteotomy, in accordance to the manufacturer's protocol, and using a surgical guide for precise insertion of Neo CMI implant IS-II active fixtures from NeoBiotech****. Buccal bone was decorticated in group B with a low-speed surgical bur under copious saline irrigant, and 1.5 to 2 mm in depth until fresh bleeding oozed. Hence the implant was placed.

For both groups, after the osteotomy and implant placement, a healing cap was used for attachment to the dental implant and used to assess the primary stability of the implant (IST)at baseline using AnyCheck.*****Device. Then, 10 mL of venous blood was drawn into glass tubes without anticoagulant and centrifuged at 1500 rpm for 14 minutes to prepare advanced platelet-rich fibrin (A-PRF). The A-PRF was harvested, minced, and mixed with a bone substitute.

Onegraft****** Xenograft Cortico-cancellous bovine powder was mixed with the minced A-PRF to create a graft mixture, which was placed around the implant and in the decorticated area. Then collagen membrane Hypro-Sorb******* was trimmed to cover the graft and decorticated area, secured using a tent suture method with (Vicryl, 0000)******** To prevent soft tissue ingrowth. The mucoperiosteal flap was repositioned for primary closure without tension and sutured with (Vicryl, 0000).

Postoperative-Care:

All patients received Augmentin1 ********g tablet twice daily for 5 days, Ibuprofen******** 400mg tablet every 6 hours as needed for pain control, and Dexamethasone******** 8mg/2ml amp for control of edema and swelling. Patients were instructed on good oral hygiene and the use of Orovex. ******** Mouthwash 4 times daily, use of a soft diet for a week, and oral activity limitations. Suture removal occurred at 7-10 days.

Outcome Measures:

Radiographic Outcomes (CBCT Analysis):

* Hongkong Anycubic Technology co., China
** Art Pharma for Drug Industries , Egypt
*** from The Company of Arab Drug (ADCO) ,Egypt
**** NeoBiotech USA2700 E. Foothill Blvd. #121 Pasadena, CA 91107 213-387-7704
***** NeoBiotech USA.
****** lama medical- mansoura Farouk Radwan Building, El Tera Street, in front of El-Wekala was
******* from Bioimplon GmbH,Friedrich-List-Str. 27,35398 Gießen
******** 1st industrial zone|Block 13023 |Building 8 |29 Obour city|Cairo-Egypt
******** GSK Egypt Boomerang Building No. 46, Zone (J)١ st District٥ thTagammoe Town Centre, second floor New Cairo City١١٨٣٥ , Po. Box 41
******** Kahira Pharmaceuticals & Chemical Industries Company
******** International drug Industries Co of Egypt. (EIPICO), Egypt
******** Macro Group Pharmaceuticals 83, Al Moltaka Al Arabi, Sheraton Cairo, Egypt.

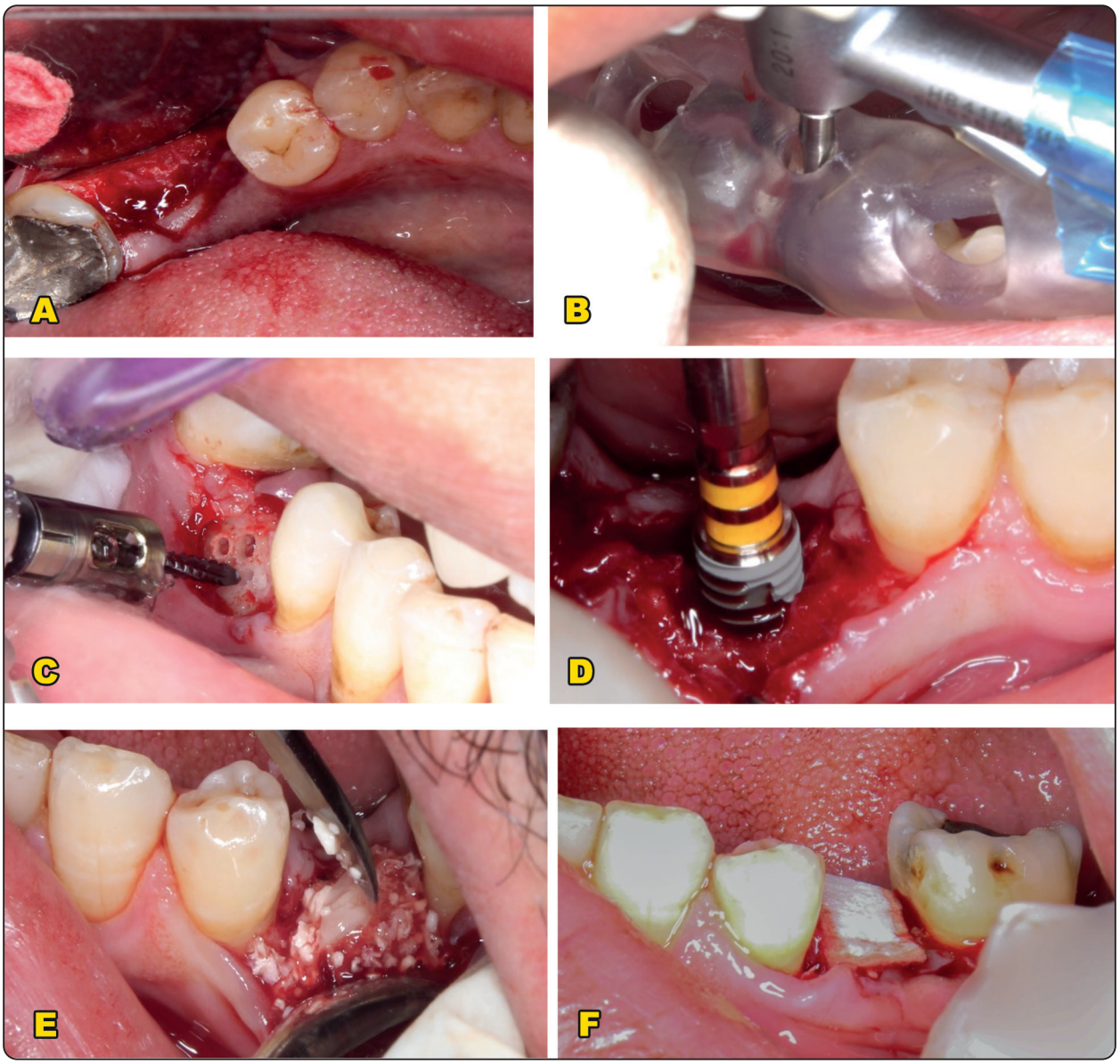

Fig. (2). This figure shows a surgical procedure A) shows the ridge after full thickness mucoperiosteal flap reflection B) shows the use of surgical guide to prepare the implant bed C) shows decortication of buccal surface D) implant in it place E) shows the bone substitute mixed with A-PRF and cover the implant and decorticated area F) show the collagen membrane in place to cover the graft and decorticated area.

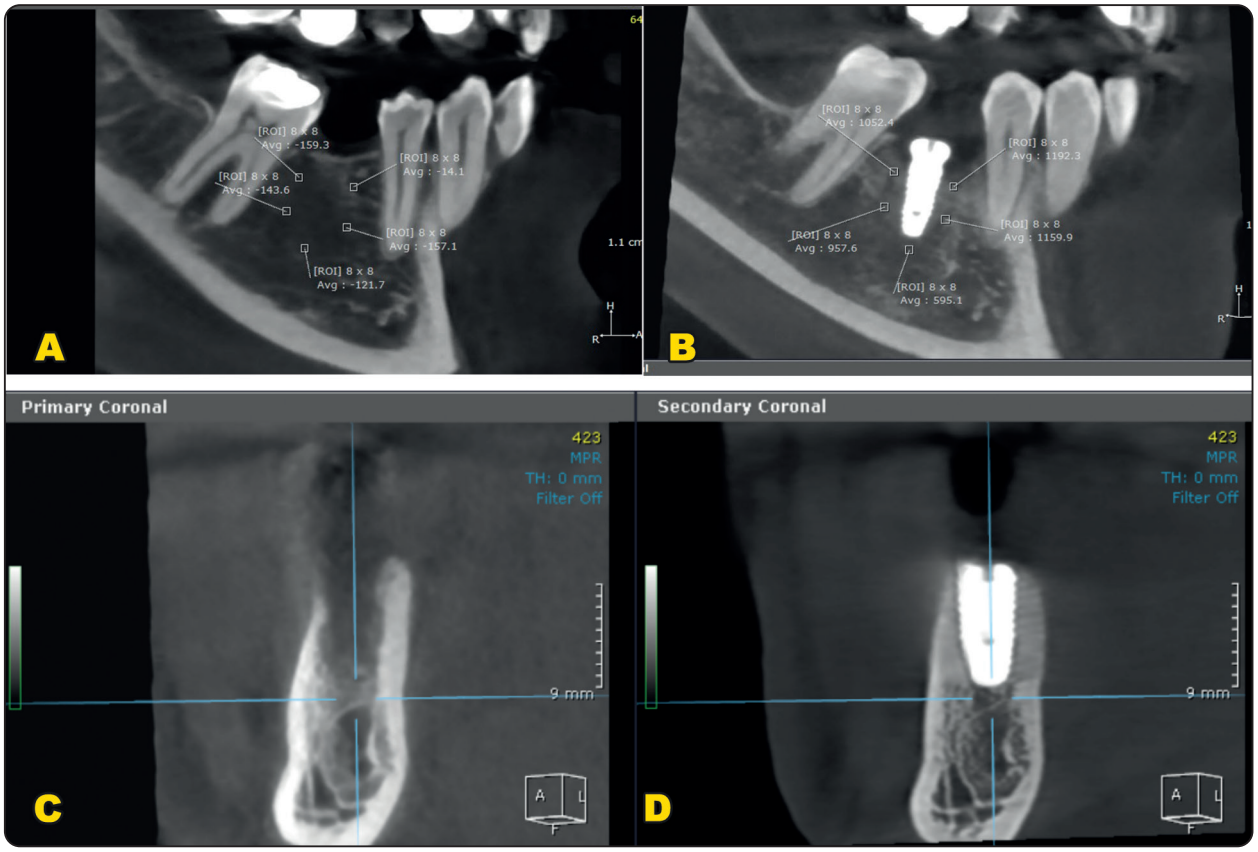

Fig. (3) Shows radiographical analysis A) preoperative density measures in HU. B) 4 months postoperative density measurement in HU. C) shows preoperative with buccal surface defect. D) shows 4 months postoperative changes in buccal surface.

Fig. (4) Shows the final prosthetic crown at 4 months post-operative

Bone Height Changes in alveolar bone height were measured from pre-operative CBCT to 4-month post-operative CBCT. Negative values expressed bone deposition, as well positive values showed bone resorption. Bone density around the implant was measured using CBCT analysis at 4 months post-implantation (expressed in Hounsfield units).

Clinical Outcomes: Implant Stability Tester (IST) Implant stability was measured immediately post-placement and at 4 months post-operatively using the AnyCheck device. Values ranged from 30 to 90. Modified Sulcus Bleeding Index (MSBI) and Probing Pocket Depth (PPD) for Peri-implant mucosal health were assessed at 4 months and 1 year post-operatively . All patients were followed up clinically for one year, and clinical data showed good results in addition to absence of any clinical

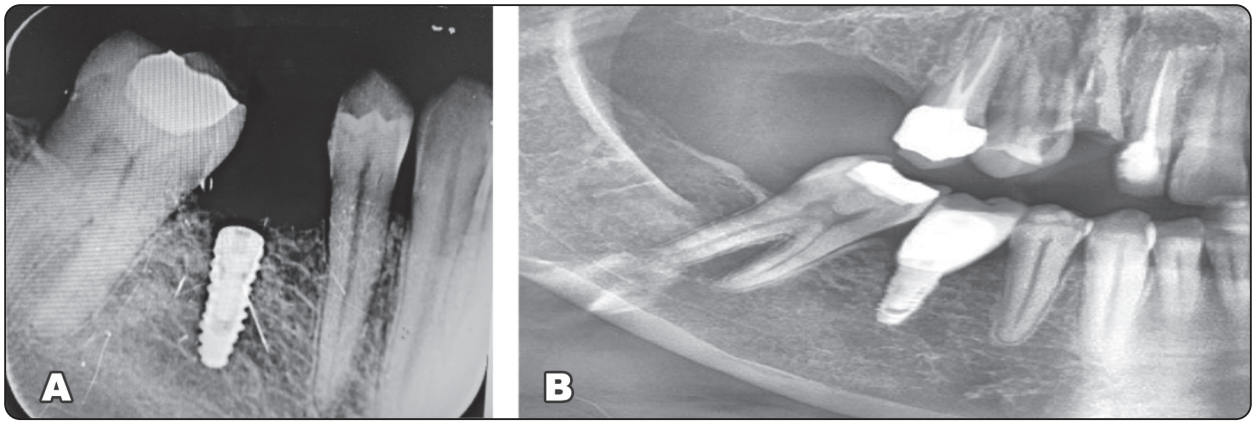

Fig. (5) A radiograph shows the implant immediate after placement at base line(A) , and implant with final prosthetic crown at 4 months post-operative(B).

complications or deterioration, so there was no need for another radiological examination at 1 year to minimize hazards of radiological exposure to the patients .

Statistical analysis

The data analysis were done by use of SPSS® 25 version of software (SPSS Inc., USA). One-Sample Kolmogorov as well Shapiro investigatory tests had utilized to study distribution at data normality for the whole variables. Bone height, bone density, implant stability, and pocket depth were parametric and presented as mean ± standard deviation. Bleeding index was a non-parametric data and so expressed as median, minimum as well maximum. Comparison of bone height, bone density, implant stability, and pocket depth between groups was performed using independent samples, t-test, while comparison of these parameters between surfaces were made using One way ANOVA followed by Bonferroni correction for multiple post hoc tests. Comparison of bleeding index between groups was performed using Mann-Whitney t-test, while comparison of bleeding index between surfaces were made using Kruskall Wallis test, followed by Mann Whiteny test for multiple post hoc tests. A graphic that is showing presentation of data was obtained by use of clustered bar charts. P less than 5% were chosen to be of significance.

RESULTS

Preoperative clinical assessments data for all patients in the 2 groups were within normal range and they had good general condition and health state.

A) Radiographic assessment

Effect of group "Group-based evaluation of changes in bone height and density"

Comparison of mean change in bone height and bone density between groups for each surface is introduced in both table 2 and table 3, respectively as was obtained for each group by distraction of that at base line from other one at 4 month and mean was obtained for each group ,then compared for both groups. There had a significant difference at mean change in bone height between group types at the buccal and mesial surfaces only. At the buccal surface, the Decortication group (group B) introduced significantly higher bone deposition more than non-decortication group (group A). At mesial surface, the non-decortication group expressed significantly higher bone loss more than decortication group. At all surfaces, the Decortication group showed significantly higher bone density than the non-decortication group

Effect of surface (on change in bone height)

For the buccal surface only, the change in bone height denotes bone deposition (negative sign), and for other surfaces (mesial, distal, and lingual), the change in bone height denotes bone resorption (positive sign). For the two groups, there had a significant difference at mean change for jaw bone height among surfaces. For non-decortication group, the highest bone loss was observed at the mesial surface, followed by the distal surface, then the lingual surface and buccal surface, which demonstrated bone deposition. For the decortication group, the highest bone loss was observed at the mesial surface, followed by the distal surface, then the lingual surface and buccal surface, which demonstrated bone deposition.

For the decortication group only, there was a significant difference in mean change in bone density between surfaces. The highest bone density was observed at the mesial surface, followed by the distal surface, and the lowest density was noted at the apical surface.

B) Clinical evaluation

Effect of group"Group-based evaluation of changes in implant stability,pocket depth,and bleeding scores "

Comparison of the mean change in implant stability between groups is presented in Table 4 .For both groups stability of implant increased from baseline to 4 months, then significantly increased the form 4 months to 12 months. Study group

TABLE (2) Comparison of change in bone height between groups and surfaces

		Buccal	Lingual	Mesial	Distal	One way analysis of variance, P
Group A	X1	-.188a	.313b	.580c	.370b	<1%*
(Non decortication)	SD1	.076	.166	.071	.047	
Group B	X1	-.295a	.266b	.300b	.296b	<1%*
(Decortication)	SD1	.055	.077	.098	.055	
Independent samples t-test P value		.031*	.366	<.001*	.159	

X1; mean, SD1; standard deviation, *p is of significance at less than 5% level. Dissimilar letters at the same horizontal line show significant differences among surfaces (Bonferroni post hoc , and p less than 5%). Identical letters at the one horizontal row express a non-significance differences among surfaces (Bonferroni post hoc , and p more than 5%)

TABLE (3) A change in bone density among group types and surfaces

		Mesial	Distal	Apical	One way ANOVA test P value
Group A (Non-decortication)	X1	355.63a	377.40a	351.87a	.894
	SD1	35.11	42.06	75.17	
Group B (Decortication)	X1	726.53a	709.20a	520.33b	.002*
	SD1	118.88	149.98	125.42	
Independent samples student(t) -test P		<.001*	<.001*	.007*	

X1; mean, SD1; standard deviation, *p-value is of significance at level of 0,005. Dissimilar letters at the same horizontal raw show a significant differences among surfaces (Bonferroni post hoc , p-value less than 0.05). Identical letters at horizontal one row indicate nonsignificant differences between surfaces (Bonferroni post hoc test, p>.05)

recorded significant higher implant stability than control group at all observation times. Comparison of mean pocket depth and median bleeding scores between groups for each surface is presented in table 5 and table 6, respectively. The decortication group showed significantly higher mean change in implant stability than the non-decortication group at all follow-up intervals. At all surfaces, the non-decortication group expressed a significantly higher pocket depth than decortication group. In both groups, pocket depth significantly increased from baseline to 4 months, then significantly increased form 4 months to 12 months .At distal, buccal, as well lingual surfaces, the non-decortication group introduced significantly higher bleeding index than decortication group. At the mesial surface, there had a non-significant difference through median bleeding index in-between groups through all follow-up periods

Effect of surface (on probing depth, and pocket depth)

For the two groups, there had a significance at mean probing depth among surfaces. For non-decortication group, the highest pocket depth was noted with the buccal surface, followed by the lingual surface, then the distal surface, and the mesial surface recorded the lowest pocket depth. For the decortication group, the highest pocket depth was noted with the lingual surface, followed by distal side, then buccal surface, but mesial side recorded the lowest pocket depth. In both groups, pocket depth significantly increased from baseline to 4 months, then significantly increased the form 4 months to 12 months, however there was no significant difference in pocket depth between surfaces at 12 months

For both groups, there had a significance at median index of bleeding among surfaces. At the non-decortication (group A), the highest bleeding index was noted with the distal surface, followed by buccal side, then lingual surface, but mesial side recorded the lowest bleeding index. For the decortication group, the highest bleeding index was noted with the distal surface, followed by the lingual surface, then the buccal surface, and the mesial surface recorded the lowest bleeding index. Gingival index did not differ between different observation times (p=.027). Gingival scores increased significantly from baseline to 4 months, then decreased significantly at 12 months for both groups.

Clinical follow-up for patients in both groups till one year showed no failures or complications were noticed.

TABLE (4) A comparison of the change for implant stability between groups

	Control group X±SD	**Study group X±SD**	**Repeated measures ANOVA (p value)**
		Implant stability	
At baseline	56.42±4.4 a	57.61±3.8 a	.002*
At 4 months	57.14±3.8 b	65.64±3.1b	.016*
12 months	70.45±3.1c	76.47±3.1 c	.011*
Repeated measures ANOVA (p value)	.005*	.022*	

X1; mean, SD1; standard of deviation, *p is of significance at 5% .

TABLE (5) Pocket depth comparison between groups and surfaces

		Buccal	Lingual	Mesial	Distal	One way analysis of variation test (P)
Group A (Non- ecorticaion)	X1	4.67a	4.33a,b	3.67c	4.00b	.013*
	SD1	.52	.46	.51	.63	
Group B (Decortication)	X1	2.33a	3.67b	2.32a	3.17c	<.001*
	SD1	.52	.47	.49	.41	
Student t-test (P)		<.001*	.032*	<.001*	.008*	

X1; mean, SD1; standard deviation, *p-value is of significance at 0.05 level . Dissimilar letters of one horizontal raw show a significance of differences in-between sites (Bonferroni post hoc , as p<5%.). Identical letters of one horizontal row expressed non-significance of differences among surfaces (Bonferroni post hoc , p>5%)

TABLE (6) Bleeding index comparison among groups as well sites At T0

		Buccal	Lingual	Mesial	Distal	Kruskal Wallis test P value
Group A (Non- ecortication)	Me	1.00a	1.00a	.00a	2.00b	.005*
	Mi	.00	1.00	.00	1.00	
	Ma	1.00	2.00	1.00	2.00	
Group B (Decortication)	Me	.00a	1.00a	.00a	1.00b	.008*
	Mi	.00	.00	.00	.00	
	Ma	.00	1.00	.00	1.00	
Mann Whiteny test P value		.019*	.049*	.134	.014*	

Me; median, Mi; minimum, Ma; maximum.*p-value is of significance at 0.05. Non-identical letters of the one horizontal raw express significance of differences among sites (Mann Whitney hoc test, p< 5%). Identical letters in the one horizontal row express non-significance of differences among sites (Mann Whitney test, p>.05)

TABLE (7) Bleeding index comparison among groups as well sites At T4

		Buccal	Lingual	Mesial	Distal	Kruskal Wallis test P value
Group A (Non-decortication)	Me	1.00	0.00	0.00	1.00	.328
	Mi	0.00	0.00	0.00	0.00	
	Ma	1.00	0.00	0.00	1.00	
Group B (Decortication)	Me	1.00	0.00	0.00	0.00	.656
	Mi	0.00	0.00	0.00	0.00	
	Ma	1.00	0.00	0.00	1.00	
Mann Whiteny test P value		.951	1.00	.134	.648	

Me; median, Mi; minimum, Ma; maximum.*p-value is of significance at 0.05. Non-identical letters of the one horizontal raw express significance of differences among sites (Mann Whitney hoc test, p< 5%). Identical letters in the one horizontal row express non-significance of differences among sites (Mann Whitney test, p>.05)

DISCUSSION

The aim of this research was to evaluate decortication combined with APRF and GBR on immediate implant placement outcomes in the posterior mandibular region and null hypothesis of this research was rejected as there was significant effect in results between the 2 management groups mainly regarding changes in bone deposition , density, and all clinical data as positive towards decortication group.

One of the main principal findings of this study was the significantly higher bone density across all measured surfaces (mesial, distal, and apical) in the decortication group compared to the non-decortication group. This increased bone density could be attributed to the cortical fenestration inducing a regional acceleratory phenomenon, which enhances blood supply and the influx of osteoprogenitor cells from the marrow.[33] These results align with previous studies that have demonstrated the efficacy of decortication in enhancing bone formation and quality. Similarly,[34,35] Reported improved bone regeneration and higher radiographic density in decorticated sites.

Regarding bone height, Decorticated group (B) expressed a significant higher bone deposition on the buccal surface and less mesial bone loss. However, no statistically significant differences in mean change in bone height were observed at the lingual and distal surfaces. That may be related to the increase of vascularity and cellularity effects at the mentioned increased bone height sites, in addition to patient attention to oral hygiene in these areas. This is consistent with multiple other previous human clinical trials, such as [17,36,37] Which have highlighted the scarcity of strong evidence for universal volumetric gain from decortication.

Clinically, the decortication group exhibited significantly higher implant stability values at the 4-month follow-up. This increase in implant stability can be attributed to the superior quality, quantity, and density of the regenerated bone in the decorticated sites, which provides a more robust mechanical foundation for the implant. In line with this, a study was done by Işık, Özden Yüce [38] Reported that GBR with xenograft resulted in high implant stability values. Another study on PRF by Öncü and Alaaddinoğlu [29] Had also reported a positive influence on implant stability.

In the current study, the decortication group was associated with significantly lower probing pocket depths and a reduced bleeding index. The improved soft tissue may be due to the healthier underlying bony architecture. A well-vascularized, dense bony foundation is better able to support a stable and resilient soft tissue seal.[39]Despite the aim of decortication to induce bleeding, the long-term bleeding index was lower. This may indicate a more efficient and earlier establishment of a stable, well-vascularized clot, which is crucial for effective bone regeneration. [40]Also, that agrees with Sharma, Manjunath [41] Which found that use of A-PRF and Intra-marrow penetration expressed a significant reduction in measurements of probing pocket depth.

A study by Lundgren, Lundgren [42] stated a non-significant difference in bone formation between corticated and decorticated areas in a rabbit skull model, concluding that routine decortication does not enhance bone growth. This conclusion contradicts our data, which indicated that the decortication group exhibited significantly enhanced bone deposition on the buccal surface and increased bone density at all assessed sites. This discrepancy may arise from the Lundgren study's use of an unfilled, isolated titanium cylinder model without any graft material in an animal context, whereas our clinical experiment incorporated a particulate xenograft in conjunction with A-PRF and a collagen membrane in a human clinical environment. The advantage of decortication is particularly pronounced in facilitating quick vascular and cellular access for the revascularization of transplant material. This condition was absent in their empty-chamber model. Moreover, the study's authors hypothesised that mild surgical damage in the control group

would have been adequate for stimulating a healing response, thereby masking any advantages derived from decortication. Consequently, our findings demonstrate that the decortication process, when used alongside GBR and graft materials, significantly enhances both the quality as well quantity of bone regeneration, resulting in enhanced clinical outcomes.

The results of the current investigation are corroborated by a recent clinical trial conducted by Richa, Osman [43], which examined guided regenerated bone in the atrophied posterior mandibular region. Their methodology employed a combination of decortication, a xenograft/A-PRF mixture, as well a barrier membrane. The authors documented a notable enhancement in bone amount and a substantial improvement in implant stability metrics at 6 months following implantation. This conclusion aligns with our data, indicating that the decortication group had a substantial increase in bone quantity at buccal and mesial sites, enhanced bone density, and improved implant stability. Moreover, their observation of favorable soft tissue healing with an A-PRF membrane aligns with the improved peri-implant characteristics, including diminished probing depths and reduced bleeding scores, also noted in our decortication group. This indicates that the integrated method of decortication to improve vascular supply as well A-PRF to provide growth factors fosters an advantageous environment for the regenerative process of both hard as well soft tissues.

The limitations of present research involve a small number of patients sample size (n=14), short-term follow-up time for one year is relatively short and did not provide insight into long-term bone remodeling or implant survival rates. Finally, as a single-center study, the results may be influenced by operator-specific factors, although this was mitigated by using a single, experienced surgeon for all procedures.

CONCLUSION

Within limitations at the current research, it showed that supplementary use of alveolar decortication alongside Advanced Platelet-Rich Fibrin (A-PRF) with Guided Bone Regeneration (GBR) at posterior mandibular locations has yielded superior clinical and radiographic results compared to GBR alone without decortication. This integrated method resulted in markedly improved bone density, increased implant stability, as well healthier peri-implant mucosal tissues, hence noticed as diminished probing depth and reduced bleeding scores. Although its effect on absolute volumetric gain may differ by location, decortication seems to be an effective method for enhancing both the biological quality and quantity of regenerated bone, as well as overall clinical success, in complex posterior mandibular patients.

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