

# Enhancing Anterior Esthetics with Alveolar Ridge Preservation And Guided Implant Placement – A Case Report

Rana A<sup>1</sup>, Pradhan S<sup>2</sup>, Gorkhali RS<sup>3</sup>, Koirala PK<sup>4</sup>, Bartaula B<sup>5</sup>

<sup>1</sup>Resident, Periodontology and Oral Implantology, National Academy of Medical Sciences, Kathmandu, Nepal

<sup>2</sup>Professor, Periodontology and Oral Implantology, Kathmandu Medical College Public Limited, Kathmandu, Nepal

<sup>3</sup>Associate Professor, Periodontology and Oral Implantology, National Academy of Medical Sciences, Kathmandu, Nepal

<sup>4</sup>Associate Professor, Periodontology and Oral Implantology, National Academy of Medical Sciences, Kathmandu, Nepal

<sup>5</sup>Resident, Periodontology and Oral Implantology, National Academy of Medical Sciences, Kathmandu, Nepal

## ABSTRACT

Alveolar ridge preservation procedures are utilized to prevent loss of tissue volume in an extraction site following tooth removal. Guided implant placement utilizes surgical templates to ensure the precise positioning of implants, leading to optimal alignment and integration with the surrounding bone. This case report aims to demonstrate the effectiveness of combining alveolar ridge preservation with guided implant placement for enhancing outcomes in the anterior maxillary region following tooth extraction in a 25-year-old patient with satisfactory results.

**Key words:** Alveolar Ridge Preservation, Anterior Maxilla, Cone-beam Computed Tomography, Deproteinized Bovine Bone Mineral With Collagen, Guided Implant Surgery

## INTRODUCTION

Tooth extraction often results in varying degrees of horizontal and vertical alveolar ridge resorption,<sup>1</sup> posing a significant challenge for implant placement especially in the anterior maxilla, owing to its high esthetic demands and susceptibility to resorption. Alveolar Ridge Preservation (ARP) is a surgical procedure employed to alter the contour of residual alveolar ridge. The primary goals include minimizing post-extraction ridge changes, promoting tissue healing, and facilitating ideal implant placement without additional augmentation. Deproteinized

Bovine Bone Mineral containing 10% collagen (DBBM-C) in socket aids in maintaining space and promotes bone growth owing to its osteoconductive activity.<sup>2</sup> Similarly, a collagen matrix serves as an effective alternative for enhancing peri-implant soft tissue volume, reducing patient morbidity and surgical duration. Guided implant surgery is the process of digital planning, custom-guide creation, and implant placement using a custom guide and implant system-specific guided surgery kit.<sup>3</sup>

This case report aims to highlight the effectiveness of alveolar ridge preservation with guided implant placement in the esthetic zone.

## CASE REPORT

A 25-year-old systemically healthy male patient presented with a fractured right maxillary central incisor due to trauma sustained six years back. After a comprehensive clinical and radiographic evaluation, delayed implant placement was planned and executed in two steps.

*Conflict of Interest: None*

### \*Corresponding Author

Dr. Ashna Rana, Resident,  
National Academy of Medical Sciences,  
Kathmandu, Nepal  
Phone no: +977 9867002767  
E-mail: ashnarlrana@gmail.com

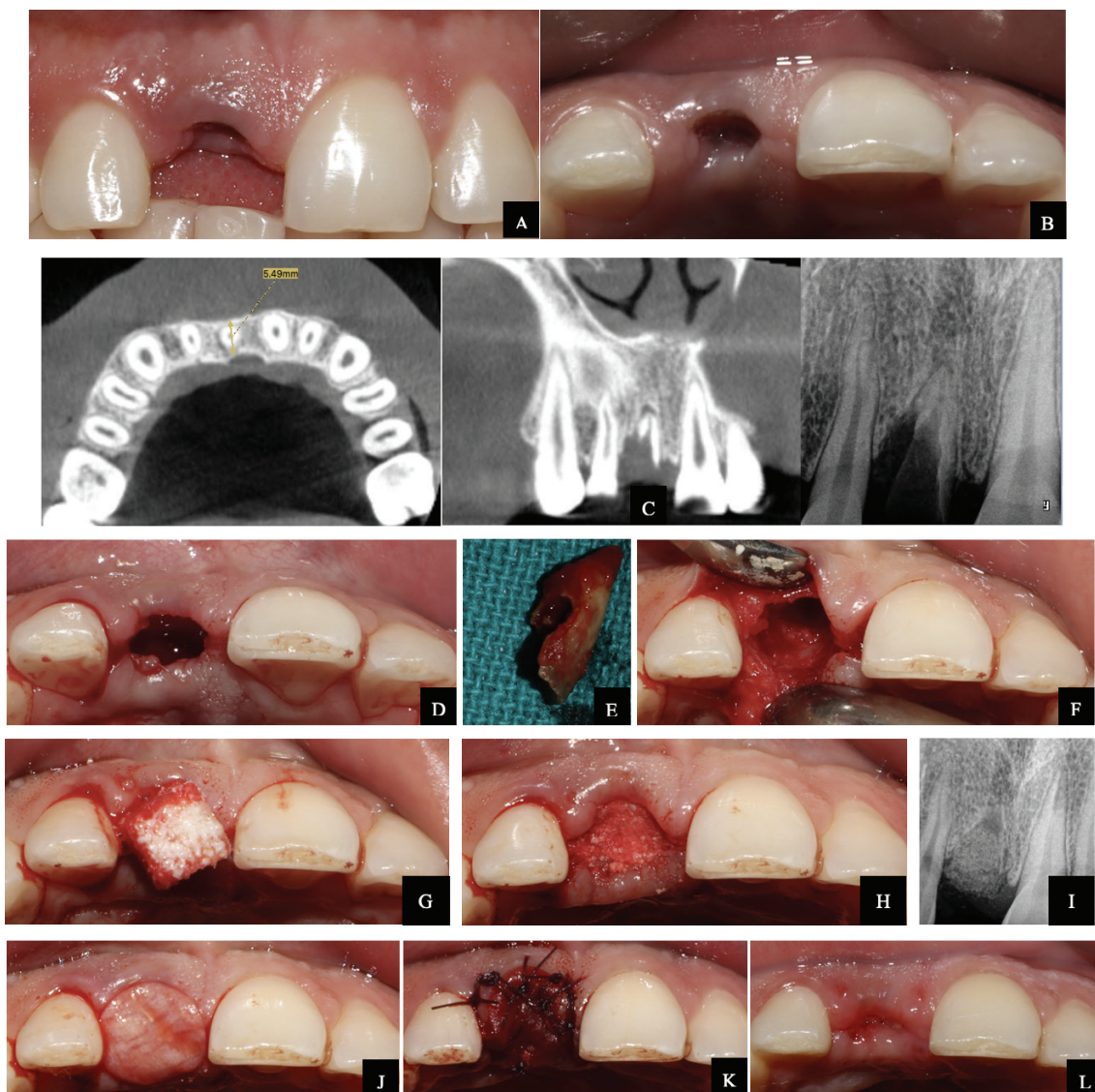
### Step I: Extraction with ARP

Under local anesthesia, a minimally traumatic extraction was performed, and the socket was thoroughly debrided. ARP was achieved by filling the socket with Deproteinized Bovine Bone Mineral with 10% collagen (Geistlich Bio-Oss Collagen®). An absorbable collagen matrix (Mucograft®) was then adapted and sutured over the socket opening. A five-day course of antibiotics (500 mg amoxicillin and 400 mg metronidazole every eight hours) and

0.2% chlorhexidine mouthwash were prescribed for seven days. Sutures were removed after one week. After 16 weeks, the ridge's volume and architecture were found to be well-preserved. Periapical radiographs and CBCT confirmed consolidation of the graft material, indicating successful bone regeneration at the site.

### Step II: Guided Implant Placement

Cone-beam computed tomography was utilized to assess the bony foundation at the ridge preservation site and its proximity to vital



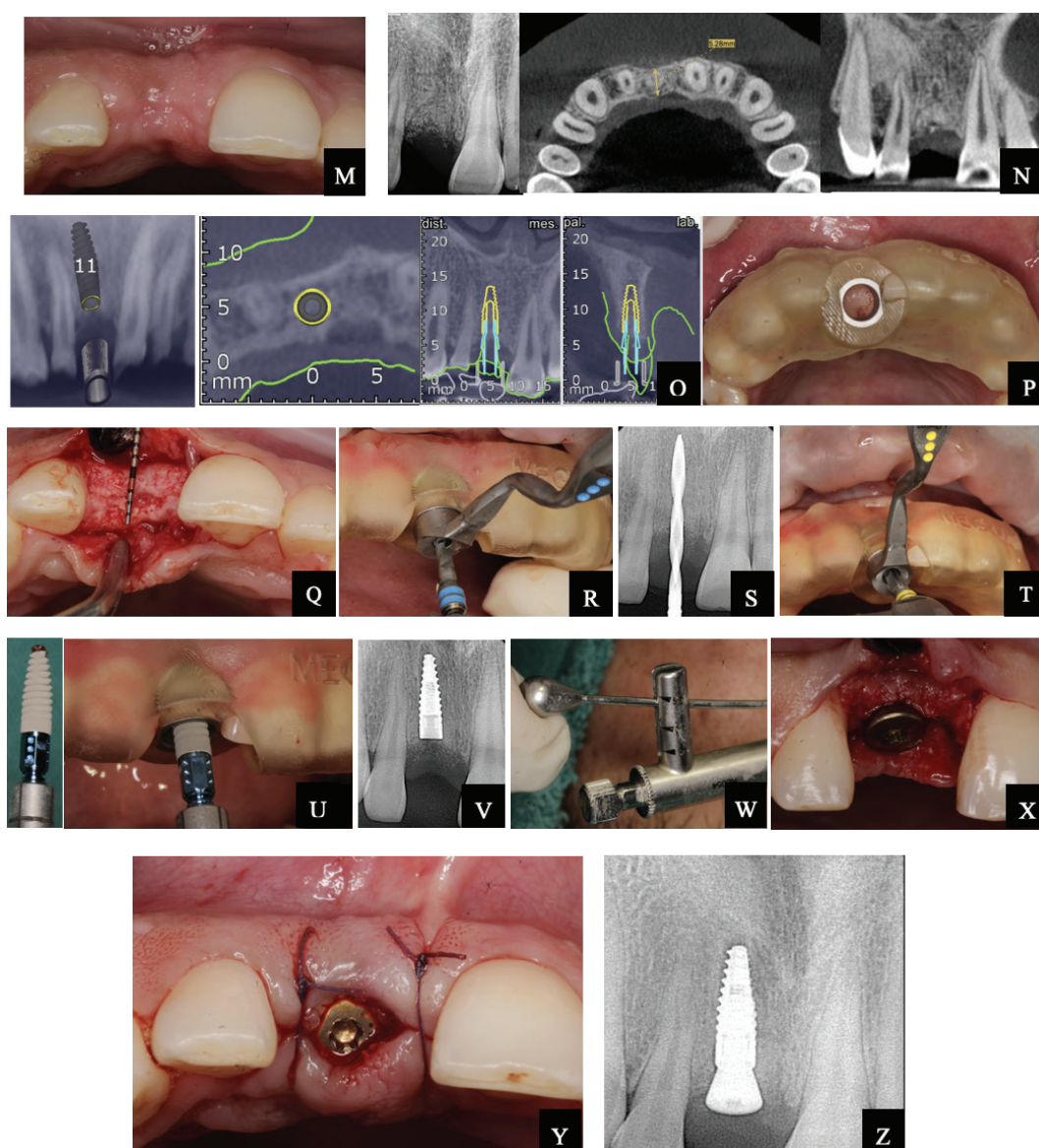
**Figure: A-L** - Alveolar Ridge Preservation; A-B: Fractured right maxillary CI, C: CBCT depicting the Labio-palatal dimension #11 and the retained tooth structure, D-F: Minimally traumatic extraction performed with periosteal elevator with debridement of extraction socket, G: ARP with Xenograft (Geistlich Bio-Oss Collagen®), H: Xenograft packed until complete filling, I: IOPA of the extraction socket with Xenograft, J-K: Soft tissue substitute (Mucograft®) over the site and closure with 5-0 PGA sutures, L: Sutures removal after 7 days



structures. Site dimensions were confirmed, and diagnostic impressions of maxilla and mandible were used to fabricate a cast. CBCT data and the cast were merged using reference points for accurate planning of the implant's size and angulation, with Exoplan software by Exocad optimizing its position. A 3.3 × 10 mm Straumann bone-level tapered Roxolid SLA implant was selected, and a surgical guide was fabricated using a stereolithographic 3D printer.

The surgical guide was verified for fit intraorally, and implant surgery was performed following Straumann® Guided Surgery protocol. A fully guided technique was utilized for osteotomy preparation and implant placement. A 3.3 × 10 mm implant was inserted, followed by gingival former placement and sutured.

Three months later, after confirming successful osseointegration, the final prosthesis (Monolithic Zirconia) was placed, completing the treatment.



**Figure M:** Healing after 4 months, N: CBCT depicting the Labio-palatal dimension at the site of ARP, O: software analysis for guided implant surgery, P: Surgical guide for precise implant positioning, Q-T: Drilling through the template to the predetermined depth and angulation, U-V: Insertion of Straumann® BLT 3.3\*10 mm implant through guide with final position, W: torque >35 Ncm, X: placement of gingival former, Y-Z: Closure with sutures and postoperative radiograph to confirm the optimal alignment



**Figure ZA-ZC:** 3 months later: Impression made, ZD-ZF-Final prosthetic restoration and IOPA with prosthesis

## DISCUSSION

Tooth extraction typically leads to a marked loss of bone volume in the residual alveolar ridge, with significant reductions in height and thickness. Tan et al. reported an average decrease of 3.8 mm in width and 1.24 mm in height within the first six months post-extraction.<sup>4</sup> The treatment plan before tooth removal for maintaining bone volume, involves three potential strategies: spontaneous healing of the socket, immediate implant placement, or ARP techniques.<sup>5</sup>

Various studies have shown that ARP is effective in limiting physiologic ridge reduction compared to tooth extraction alone. Ortiz et al., 2020 in a Randomized Controlled Trial, concluded that ARP was superior to extraction with unassisted socket healing.<sup>6</sup> A collagen matrix at the coronal site serves as a seal against food impaction and saliva, promoting a favorable recovery.

Similarly, when comparing ARP with immediate implant placement (IIP), IIP had lower survival rates than ARP but had similar esthetic results as demonstrated by a recent systematic review and meta-analysis.<sup>7</sup> ARP with the placement of

xenogeneic bone substitute and non-autogenous resorbable socket sealing material is efficacious in reducing post-extraction bone and ridge changes in the esthetic region.

Guided implant surgery can be an accurate and clinically advantageous procedure during implant placement. Kuhl et al.<sup>8</sup> stated that a high accuracy can be achieved using printed templates for guided implant surgery. A systematic review on guided dental implant surgery reported that implant survival obtained with the use of guided implant surgery shows high percentages.<sup>9</sup>

ARP might be an effective strategy to promote bone growth for future implant placement, according to a recent Cochrane study by Atieh et al.<sup>10</sup> However, graft materials and membranes did not differ in any clinically meaningful ways. The selection of surgical techniques for tooth extraction sockets and alveolar ridge conditions is influenced by multiple factors such as patient and clinician preferences, financial factors, and cultural or educational backgrounds. Therefore, evidence-based criteria for ARP are essential to guide treatment decisions.

## CONCLUSION

The integration of alveolar ridge preservation with guided implant placement can improve implant stability, esthetic results, and overall success rates, effectively addressing both functional and esthetic concerns in the anterior maxilla.

## REFERENCES

1. Araújo MG, Lindhe J. Dimensional ridge alterations following tooth extraction. An experimental study in the dog. *J Clin Periodontol*. 2005;32(2):212-8.
2. Buch F, Albrektsson T, Herbst E. The bone growth chamber for quantification of electrically induced osteogenesis. *J Orthop Res*. 1986;4(2):194-203.
3. Tatakis DN, Chien HH, Parashis AO. Guided implant surgery risks and their prevention. *Periodontol 2000*. 2019;81(1):194-208.
4. Tan WL, Wong TL, Wong MC, Lang NP. A systematic review of post-extraction alveolar hard and soft tissue dimensional changes in humans. *Clin Oral Implants Res*. 2012;23 Suppl 5:1-21.
5. Jung RE, Ioannidis A, Hämmerle CHF, Thoma DS. Alveolar ridge preservation in the esthetic zone. *Periodontol 2000*. 2018;77(1):165-75.
6. Avila-Ortiz G, Gubler M, Romero-Bustillos M, Nicholas CL, Zimmerman MB, Barwacz CA. Efficacy of Alveolar Ridge Preservation: A Randomized Controlled Trial. *J Dent Res*. 2020;99(4):402-9.
7. Mareque S, Castelo-Baz P, López-Malla J, Blanco J, Nart J, Vallés C. Clinical and esthetic outcomes of immediate implant placement compared to alveolar ridge preservation: a systematic review and meta-analysis. *Clin Oral Investig*. 2021;25(8):4735-48.
8. Kühl S, Payer M, Zitzmann NU, Lambrecht JT, Filippi A. Technical accuracy of printed surgical templates for guided implant surgery with the coDiagnostiX™ software. *Clin Implant Dent Relat Res*. 2015;17 Suppl 1:e177-82.
9. Dioguardi M, Spirito F, Quarta C, Sovereto D, Basile E, Ballini A, et al. Guided Dental Implant Surgery: Systematic Review. *J Clin Med*. 2023;12(4).
10. Atieh MA, Alsabeeha NH, Payne AG, Ali S, Faggion CMJ, Esposito M. Interventions for replacing missing teeth: alveolar ridge preservation techniques for dental implant site development. *Cochrane Database Syst Rev*. 2021;4(4):Cd010176.