

# A REVIEW ON ALVEOLAR RIDGE PRESERVATION FOLLOWING TOOTH EXTRACTION

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## ABSTRACT

**Context** The question that clinicians face is whether the use of bone replacement grafts and/or barrier membranes enhance their ability to provide for the future placement of a dental implant or to maximize ridge dimensions following the extraction of a tooth versus no additional treatments.

**Evidence Acquisition** The evidence was obtained by search of Entrez PubMed and manual search of *The International Journal of Oral and Maxillofacial Implants*, *The International Journal of Periodontics & Restorative Dentistry*, *Clinical Oral Implant Research*, *The Journal of Periodontology*, *The Journal of Clinical Periodontology*, and *The Compendium of Continuing Education in Dentistry*. Key search words included Guided Bone Regeneration, Dental Extraction, Tooth Extraction, Bone Replacement Graft, Alveolar Ridge. The years of search included from January 2011 through February 2012.

**Evidence Synthesis** The recurring theme was that there was considerable heterogeneity to study designs, time periods, and methods of evaluation. This created great difficulty in trying to answer with good high-quality evidence questions about the techniques and materials to be used for maximizing regeneration at the time of tooth extraction or in which situations this ought to be used.

**Conclusions** There appears to be consensus from the reviewed literature supporting ridge preservation techniques as a whole. Multiple studies demonstrated less ridge resorption occurring when alveolar ridge preservation procedures were used versus the placement of no graft material in fresh alveolar sockets. The analysis did not show any grafting materials demonstrating a clear benefit over any others or that a barrier membrane is necessary. The evidence is also too premature about whether socket preservation efforts require primary closure. In the emerging area of growth factors, there is no high-quality evidence to either support or refute their use.

**Background** Tooth extraction is one of the most widely performed procedures in dentistry today and it has been historically well documented that this procedure may induce significant dimensional changes of the alveolar ridge. The dilemma that clinicians face is how to manage tooth extractions to provide for the future placement of a dental implant or to maximize ridge dimensions for the fabrication of a fixed or removable prosthesis. If performed inadequately, the resulting deformity can be a considerable obstacle to the esthetic, phonetic, and functional results that both our patients and we clinicians expect at this current time.

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**Figure 1. Site collapse after traumatic injury as seen clinically demonstrating bone and gingival loss.**



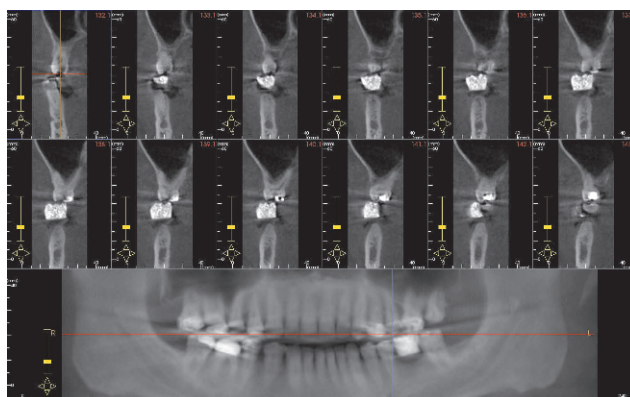
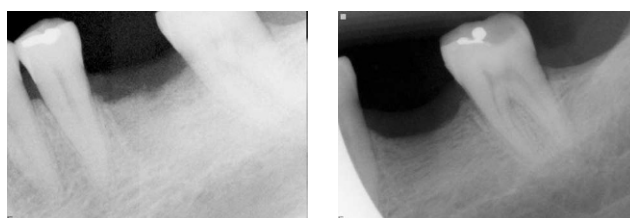
**Figure 2. Diagnostic cast showing ideal gingival location of restoration for anterior maxillary teeth.**



The key processes of tissue modeling and remodeling after tooth extraction have been well documented in both animals<sup>1</sup> and humans.<sup>2,3</sup> Horizontal buccal bone resorption has been shown to reach as much as 56% (Fig. 1), lingual bone resorption has been reported to be up to 30%,<sup>4</sup> and the overall reduction in width of the horizontal ridge has been reported to reach up to 50%.<sup>5</sup> With this horizontal ridge resorption, the alveolar housing assumes a more lingual/palatal position, with possible negative effects on esthetics, phonetics, and function (Fig. 2). Although the bone resorption continues over time, the most statistically significant loss of tissue contour occurs during the first month after tooth extraction and can average up to 3 to 5 mm in width by 6 months.<sup>6</sup>

A systematic review of the existing literature was recently performed by Tan et al<sup>7</sup> to assess the magnitude of dimensional changes for both the hard and soft tissues of the alveolar ridge up to 12 months after tooth extraction in humans. A total of 20 studies were included that reported on undisturbed postextraction dimensional changes relative to a fixed reference point over a clearly stated time period having searched and reviewed 3954 titles and 238 abstracts. The authors concluded that human reentry studies showed horizontal bone loss of 29% to 63% and vertical bone loss of 11% to 22% after 6 months following tooth extraction.

**Figure 3. Clinical view after removal of failed right posterior mandibular fixed restoration showing soft tissue collapse, altered mucogingival junction.**



These studies demonstrated rapid reductions in the first 3 to 6 months that was followed by gradual reductions in dimensions thereafter.

Placing a graft material into a socket has been one proposed method of preserving the natural tissue contours at extraction sites for possible reconstruction with an implant-supported prosthesis.<sup>8</sup> As implants serve as an aid for prosthetic devices, they need to be placed in a 3-dimensionally perfect location to achieve the appropriate esthetic, phonetic, and functional demands of the patient. This is particularly important in the esthetic zone where the gracile natural contours of the periodontium are quite evident and their absence can be devastating.<sup>9</sup> To optimize implant positioning, placement of grafting materials has been advocated as either a combined procedure with a barrier membrane or in some instances with a barrier membrane alone to

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