**Critically Appraised Topic (CAT)**

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| **Project Team:**  |
| **8B-3** |
| **Project Team Participants:**  |
| **Ethan Town, George Johnson, Maria Roque, Lauren Locy, Nicole Sygieda** |
| **Clinical Question:** |
| **What factors are considered when assessing an anterior tooth for extraction and implant?** |
| **PICO Format:** |
| **P:** |
| **Patients undergoing extraction prior to implant placement** |
| **I:** |
| **Socket bone grafting** |
| **C:** |
| **Extraction alone** |
| **O:** |
| **Treatment outcome** |
| **PICO Formatted Question:** |
| **In patients undergoing extraction prior to implant placement, does socket bone grafting at time of extraction compared to extraction alone affect the treatment outcome?** |
| **Clinical Bottom Line:** |
| **Alveolar ridge preservation should be considered in conjunction with minimally traumatic tooth extraction in clinical scenarios involving a hopeless tooth indicated for extraction in the esthetic zone to improve functional and esthetic outcomes of implant therapy** |
| **Date(s) of Search:**  |
| **9/18, 9/19** |
| **Database(s) Used:** |
| **PubMed, NCBI** |
| **Search Strategy/Keywords:** |
| **Socket bone grafting, socket preservation, dental implant, tooth extraction, treatment outcome** |
| **MESH terms used:** |
| **Alveolar ridge augmentation, dental implant, tooth extraction, tooth socket, bone graft, treatment outcome** |
| **Article(s) Cited:** |
| 1. Vignoletti F, Matesanz P, Rodrigo D, Figuero E, Martin C, Sanz M. Surgical protocols for ridge preservation after tooth extraction. A systematic review. *Clin. Oral Impl. Res.* 23(Suppl. 5), 2012, 22–382. Avila‐Ortiz, G,  Chambrone, L,  Vignoletti, F.  Effect of alveolar ridge preservation interventions following tooth extraction: A systematic review and meta‐analysis. *J Clin Periodontol*.  2019; 46(Suppl. 21): 195– 223.3. Mardas, N,  Trullenque‐Eriksson, A,  MacBeth, N,  Petrie, A,  Donos, N.  Does ridge preservation following tooth extraction improve implant treatment outcomes: a systematic review. *Clin. Oral Impl. Res.*  26 ( Suppl. 11),  2015,  180– 201 |
| **Study Design(s):** |
| Systematic review, meta-analysis |
| **Reason for Article Selection:** |
| 1. This article was selected because it addressed the P, I, and C of our PICO question

**2. This article was selected because it addressed all aspects of our PICO question. Additionally, the article provided information regarding the performance of ARP treatment modalities compared to tooth extraction alone based on significant endpoints that could be used to make clinical decisions****3. This article was selected because it addressed all aspects of our PICO question. In addition, this review exclusively evaluated implant-related outcomes** |
| **Article(s) Synopsis:** |
| 1. The purpose of this systematic review and meta-analysis was to evaluate the efficacy of surgical interventions aimed at preserving the alveolar ridge following tooth extraction. The primary outcome variable, defined as bone dimensional changes (measured as the change in height and width of alveolar process) following extraction, was analyzed and compared between a test and control group. The test group represented different socket preservation therapies and the control group represented spontaneous socket healing. Socket preservation therapy was defined as “any therapeutic approach carried out immediately after tooth extraction aimed to preserve the alveolar socket architecture and to provide the maximum bone availability for implant placement.” Overall, results from the meta-analysis demonstrated statistically significant greater reduction in height and width of alveolar crest in the control group when compared to the test group with a weighted mean difference of –1.47mm for bone height and a weighted mean difference of –1.83mm for bone width.2. The aim of this systemic review was to analyze the effect of alveolar ridge preservation (ARP) compared to extraction alone in terms of clinical, radiographic, and patient-centered outcomes. For the purposes of this review, ARP was defined as “any local therapeutic intervention in addition to standard of care tooth extraction carried out immediately after complete tooth extraction and primarily aimed at preserving alveolar ridge contours to provide maximum bone and/or soft tissue availability for future implant placement or delivery of a tooth-supported FPD.” Qualitative assessment of outcomes revealed ARP therapy rendered more favorable results in terms of horizontal bone changes, vertical bone changes, and linear/volumetric soft tissue changes. In addition, ARP was strongly associated with a higher change of reducing the need for subsequent bone grafting prior to or at time of implant placement (55-100% vs. 33.3-66%). No difference between groups was observed for implant survival/success rate, marginal bone changes, or patient-reported outcome measures of interest (i.e. reported discomfort, perceived benefit, and quality-of-life scores). Feasibility of implant placement between the control and test group was investigated, but a high level of subjectivity was noted and the comparison was deemed unreliable. Quantitative analysis of alveolar bone resorption following extraction revealed strong evidence of a reduced amount of resorption for ARP-SG using a bone substitute compared to control therapy in regard to horizontal, vertical mid-buccal, and vertical mid-lingual dimensions (MD = 1.99mm, 1.72mm, and 1.76mm respectively).3. The primary focus of this systematic review was to evaluate the effect of alveolar ridge preservation (ARP) on implant-related outcomes (implant feasibility, need for further augmentation, survival/success rates, and marginal bone loss) compared with unassisted socket healing (USH). Alveolar ridge preservation was defined as “any procedure developed to eliminate or limit the negative effect of post-extraction resorption, maintain soft and hard tissue contour of the ridge, promote bone formation within the socket, and facilitate placement in a prosthetically driven position.” Qualitative and quantitative analysis of the included studies demonstrated that the application of ARP procedures will significantly decrease the likelihood of the need for further ridge augmentation in comparison with unassisted socket healing. No statistical difference was found between ARP and USH in terms of implant feasibility, implant success/survival, or marginal bone levels. |
| **Levels of Evidence:** (For Therapy/Prevention, Etiology/Harm) See <http://www.cebm.net/index.aspx?o=1025>[x]  **1a** – Clinical Practice Guideline, Meta-Analysis, Systematic Review of Randomized Control Trials (RCTs)[ ]  **1b** – Individual RCT[ ]  **2a** – Systematic Review of Cohort Studies[ ]  **2b** – Individual Cohort Study[ ]  **3** – Cross-sectional Studies, Ecologic Studies, “Outcomes” Research[ ]  **4a** – Systematic Review of Case Control Studies[ ]  **4b** – Individual Case Control Study[ ]  **5** – Case Series, Case Reports[ ]  **6** – Expert Opinion without explicit critical appraisal, Narrative Review[ ]  **7** – Animal Research[ ]  **8** – In Vitro Research |
| **Strength of Recommendation Taxonomy (SORT) For Guidelines and Systematic Reviews**See article **J Evid Base Dent Pract 2007;147-150**[x]  **A** – Consistent, good quality patient oriented evidence[ ]  **B** – Inconsistent or limited quality patient oriented evidence[ ]  **C** – Consensus, disease oriented evidence, usual practice, expert opinion, or case series for studies of diagnosis, treatment, prevention, or screening |
| **Conclusion(s):** |
| 1. The potential benefit of socket preservation therapy is demonstrated by significantly less vertical and horizontal resorption of the alveolar bone. Bone resorption following extraction is an important factor to consider in treatment planning because it may affect the outcome of therapies aimed at restoring lost dentition including limiting bone availability for ideal implant placement and compromising the esthetic result of the prosthetic restoration. Although this systematic review clearly demonstrates the benefit of socket preservation therapy in terms of maintaining alveolar bone, its fails to provide data to draw conclusions on the significance of such benefits on the long-term clinical outcomes of implant therapy.
2. On the basis of the qualitative and quantitative analyses performed in this systematic review, it can be concluded that ARP is an effective method at lessening dimensional reduction of the alveolar ridge (especially in the horizontal dimension) that normally occurs following tooth extraction compared to sockets left to heal spontaneously. Despite the outlined favorable results that occur with ARP therapy, no definitive conclusions can be drawn on the benefits of ARP on implant-related outcomes, such as implant survival/success rates, marginal bone level changes, and feasibility of implant placement.
3. Although ARP was demonstrated to decrease the need for further ridge augmentation prior to or at implant placement, there is limited evidence to support the clinical benefit of ARP compared to USH in regard to other implant-related outcomes. Subsequent bone and/or soft tissue augmentation procedures are an important factor to consider when treatment planning because they can add to treatment cost and time as well as increase the risk of morbidity. An attempt to reduce resorptive events that follow tooth extraction should be made to minimize the need for additional ridge augmentation procedures.
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