THE ROLE OF RIDGE PRESERVATION IN IMPLANT THERAPY SUCCESS

EVIDENCE BASED DENTISTRY ROUNDS
PERIODONTICS
GROUP 8B3
9/28/2020

Rounds Team

Group Leader: Dr. Toburen

Specialty Leader: Dr. Kofina

Project Team Leader: Ethan Town

Project Team Participants:

D1: Lauren Locy, Nicole Sygieda

D2: Maria Roque

D3: George Johnson

Patient

- Female
- 84 year old caucasian
- CC: “I knew it was time to have a check up”

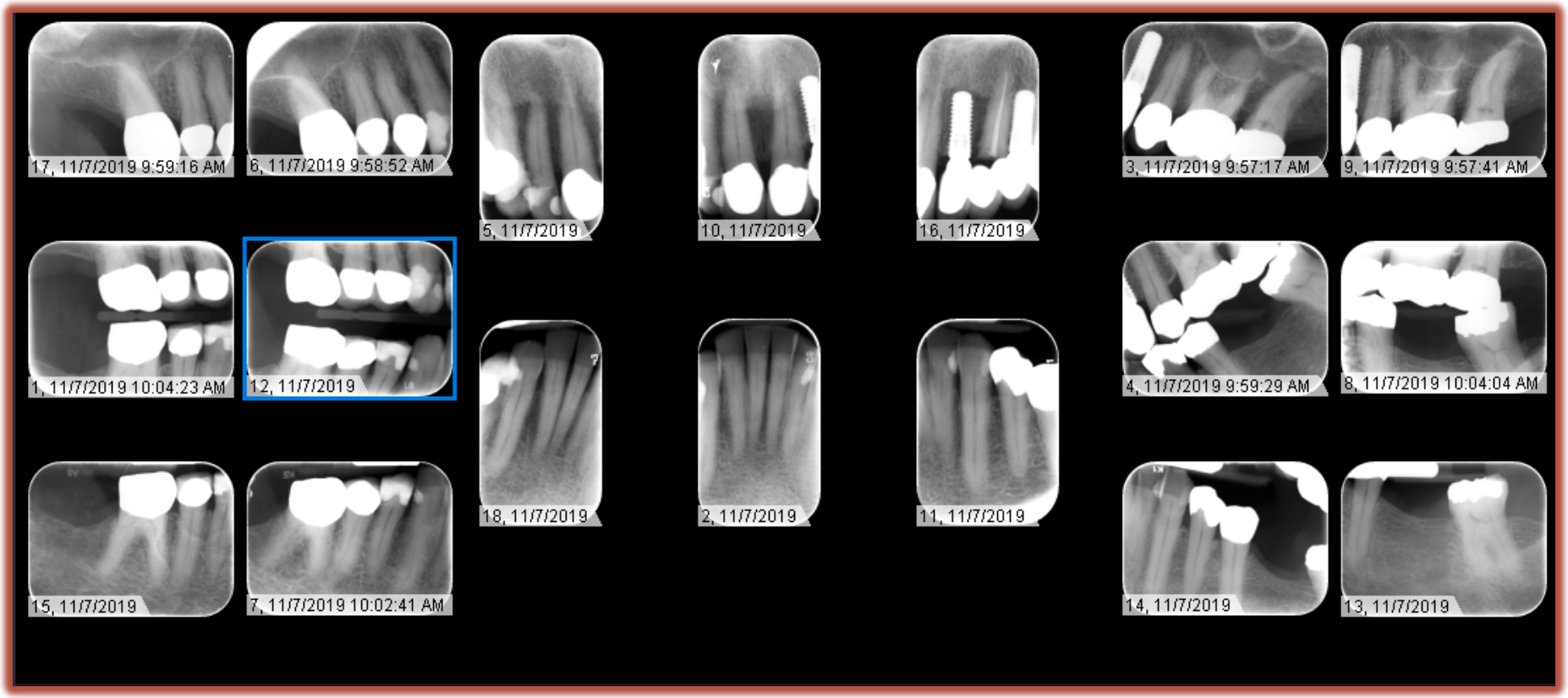
Medical History

- High blood pressure
- Heart murmur
- History of cancer
  - Non-hodgkins lymphoma(2000), breast(2000), bladder(2014), and BCC(2017)
- Allergies: None
- Medications: Lipitor, atorvastatin, amlodipine

Dental History

- Patient at Marquette before leaving in Oct 2017
- Returned in Nov 2019
- History of extractions, caries, implants
- Fair oral hygiene overall
- Dental Anxiety

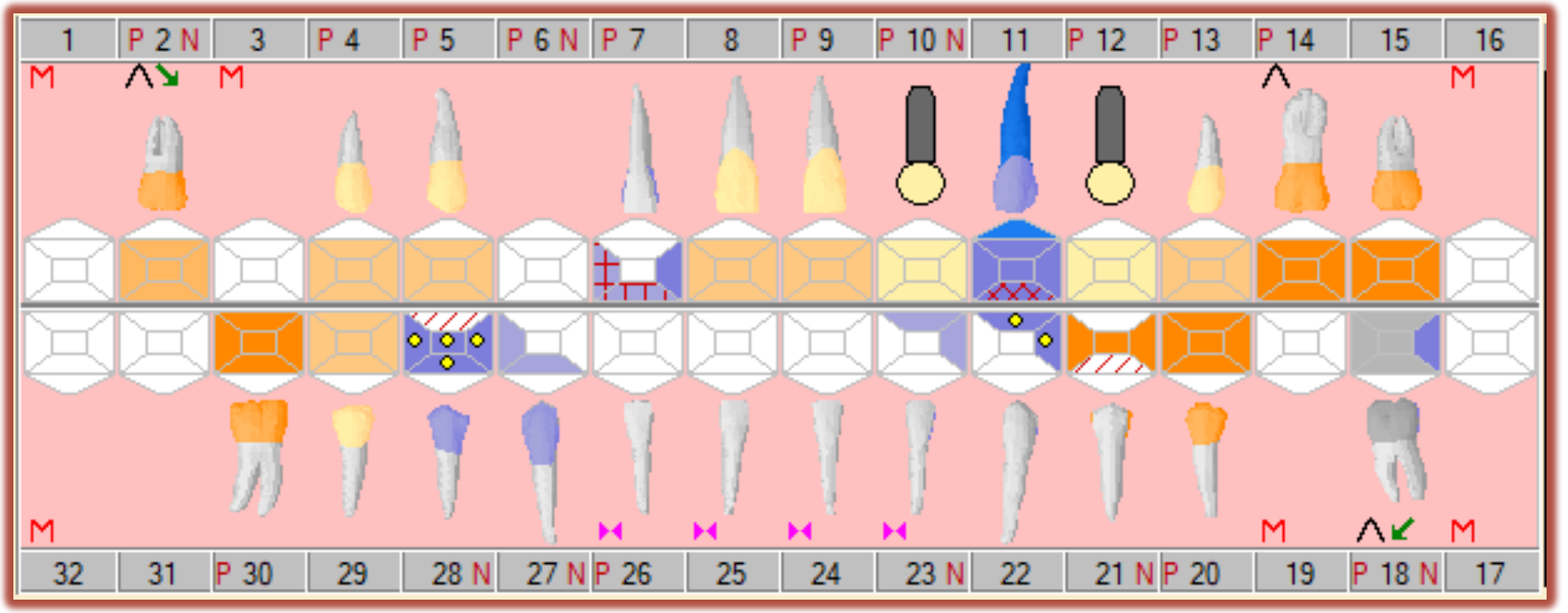
Radiographs



Radiographic Findings

- Missing teeth #1,3,16,17,19,31,32
- Recurrent decay #6,7
- Retained, RCT root tip of #11
- Implants #10,12

Odontogram


1 P 2 N 3 P 4 P 5 P 6 N P 7 8 P 9 P 10 N 11 P 12 P 13 P 14 15 16
32 31 P 30 29 28 N 27 N P 26 25 24 23 N 22 21 N P 20 19 P 18 N 17

Clinical Findings

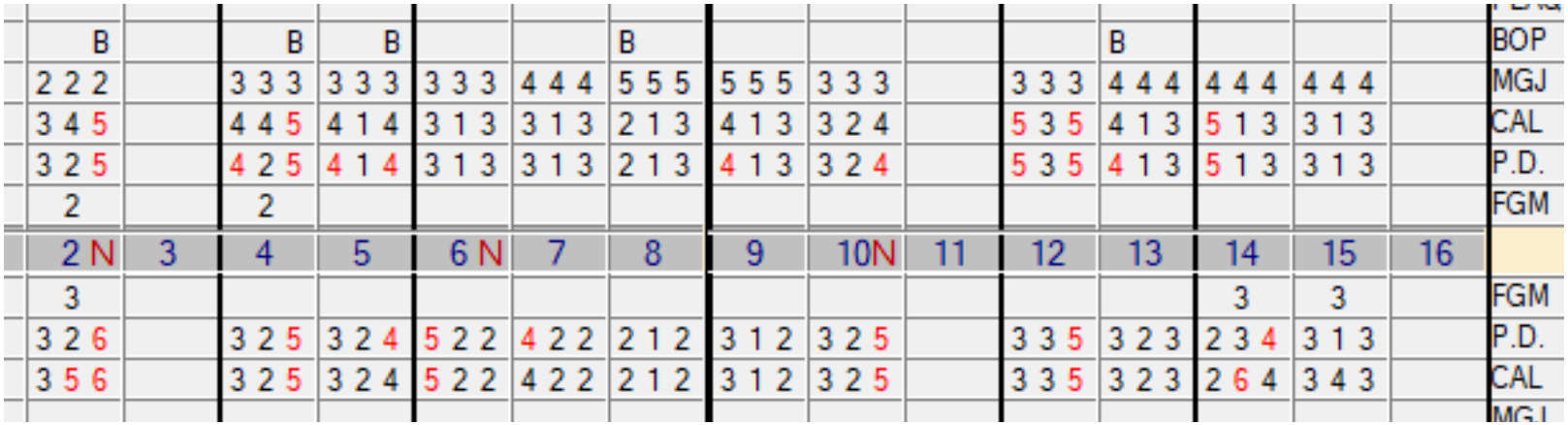
Comp exam (11/19)

- Defective MO amalgam #18
- Recurrent decay #6,7

Tx Plan Addendum (7/20)

- #21 onlay recurrent decay
- #22 defective DL resin
- #28 MOD defective resin
- #5 recurrent decay

Periodontal Charting



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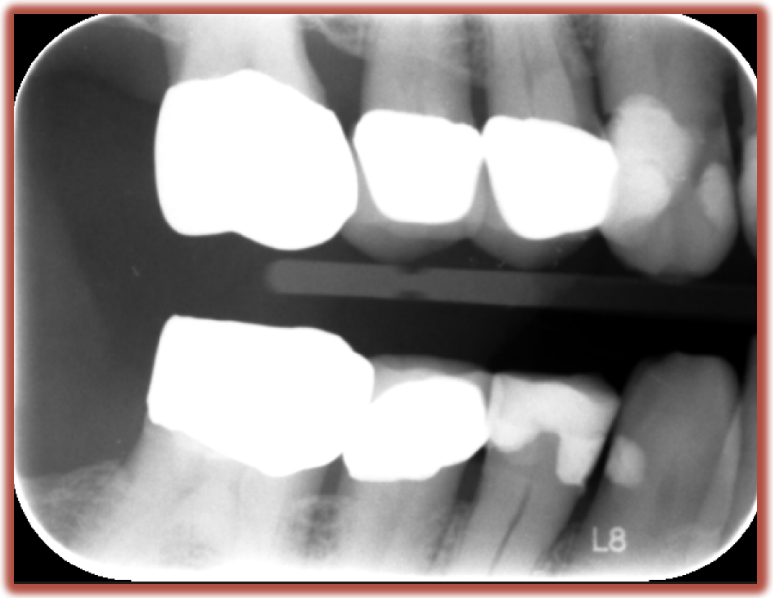
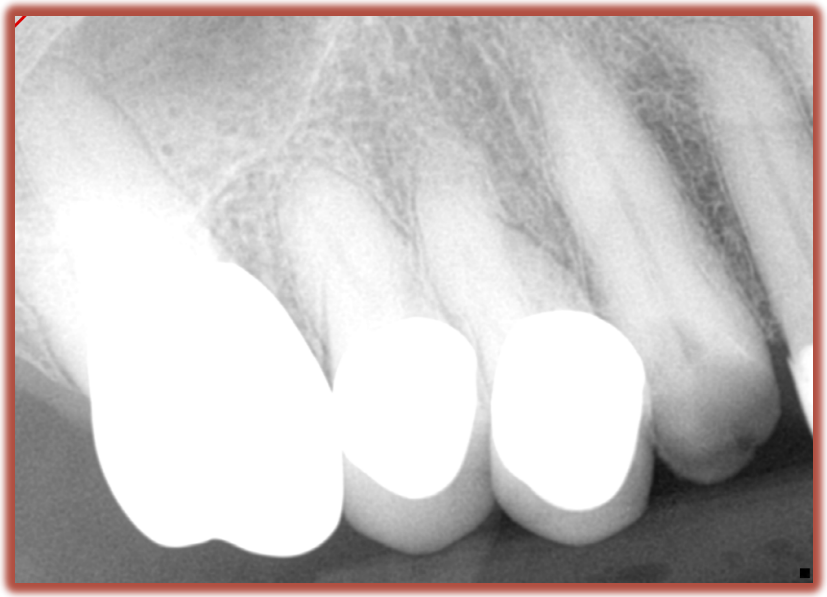
Specific Findings - #6

Original Tx Plan: Elective endo, post and core, crown



Specific Findings - #6

New Tx Plan: Extraction, socket preservation with bone graft and membrane, implant and crown



Diagnosis

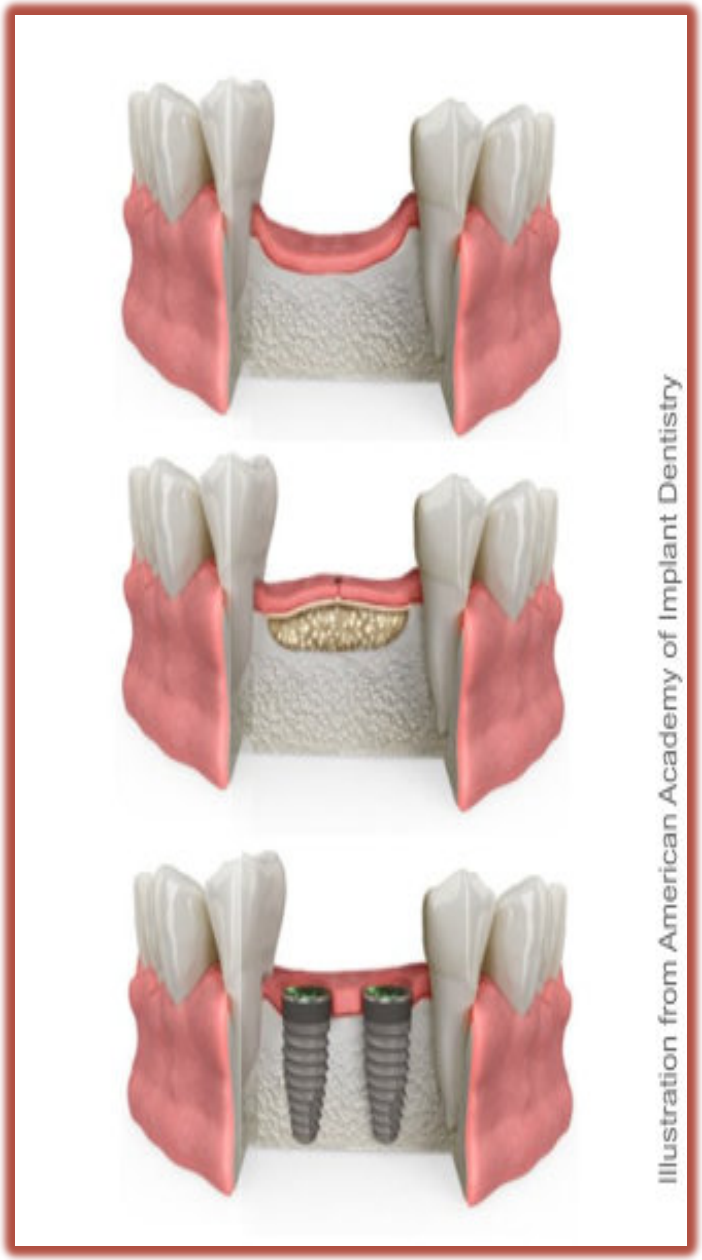
- Moderate Chronic Periodontitis
- #6 – Deemed non-restorable

Problem List

- Missing teeth
- Recurrent decay
- Non-restorable #6
- Crown Lengthening

What is a Bone Graft?

- Transplanted Bone
  - Autograft
  - Allograft
  - Synthetic
- Osteoinduction
- Osteogenesis
- Risks
  - Infection
  - Bleeding
  - Ineffective



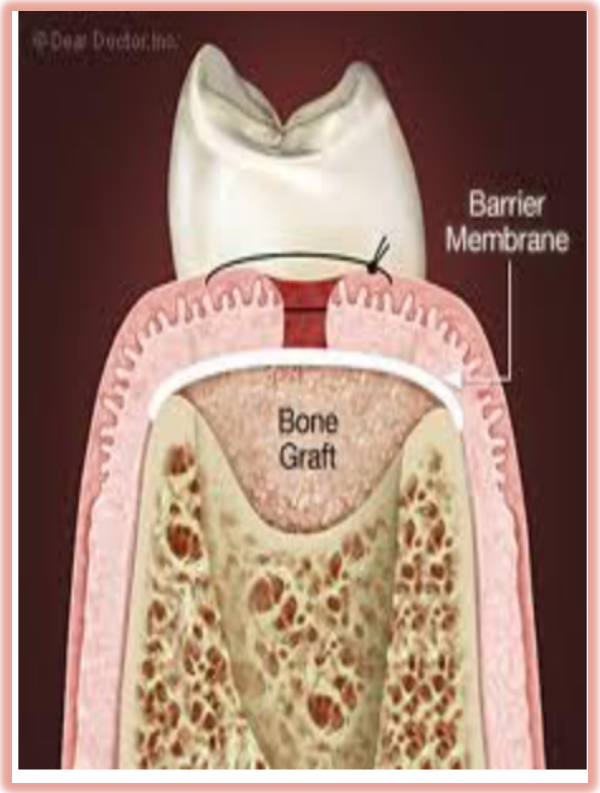
What are the different types of grafting materials?

5 Main Types:

- Allograft-based bone grafts
  - Human
- Factor-based bone grafts and Cell-based bone grafts
  - Recombinant DNA
- Ceramic-based bone grafts
  - Calcium phosphate
  - Most common
- Polymer-based bone grafts

Guided Bone Regeneration with a Membrane

- Helps maintain the space between the periosteum and bony defect.
- Allows osteoprogenitor cells to have more time to grow and colonize this space.
- Prevents epithelial and connective tissue cells from invading the space.
- 2 types of membranes:
  - Resorbable
  - Non-Resorbable



Wessing, Bastian et. Al. “Guided Bone Regeneration with Collagen Membranes and Particulate Graft Materials: A Systematic Review and Meta-Analysis” *Official Journal Of The Academy Of Osseointegration*. Vol 33, Issue 1, 87-100 (2018). http://quintpub.com/journals/omi/fulltext.php?article_id=17762

Image: https://www.gholsonperio.com/services/guided-bone-and-tissue-regeneration/

PICO Format

- P: Patients undergoing extraction prior to implant placement
- I: Socket bone grafting at time of extraction
- C: Extraction alone
- O: 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

Search Background

- Date(s) of Search: 9/18/20, 9/19/20
- 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 1

- Citation: 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, 22–38
- Study Design(s): Systematic Review and Meta-Analysis
- Study Purpose: 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 and to assess the potential benefit of these interventions when compared to spontaneous socket healing

Article 1 Synopsis

- Methods: Nine of 14 publications meeting eligibility criteria were used in the meta-analysis. The primary outcome variable, defined as bone dimensional changes (height and width of alveolar process), was analyzed and compared between test (socket preservation therapy) and control group (spontaneous socket healing)
- Results: The meta-analysis demonstrated statistically significant greater reduction in height and width of alveolar ride in control group when compared to test group with a weighted mean difference of -1.47mm for bone height and -1.83mm for bone width

Article 1 Synopsis

- Conclusion: The potential benefit of socket preservation therapy it demonstrated by significantly less vertical and horizontal resorption of alveolar bone following tooth extraction, but it fails to provide data to draw conclusions on the significance of such benefits on the long-term treatment outcomes of implant therapy
- Limitations:
  - High degree of heterogeneity between studies (e.g. surgical protocol used, socket integrity following extraction, biomaterials used)

Article 1 Selection

- This article was selected because it addressed the P, I, and C of our PICO question
- Applicability to our patient: Bone resorption following extraction is an important factor to consider when treatment planning an implant because it may affect outcome of implant therapy including limiting bone availability for ideal implant size and placement as well as compromising the esthetic result of the prosthetic restoration

Article 2

- Citation: 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 and Meta-Analysis
- Study Purpose: The primary objective of this systemic review and meta-analysis was to evaluate the effect of alveolar ridge preservation (ARP) on implant-related outcomes compared with unassisted socket healing (USH)

Article 2 Synopsis

- Methods: Ten studies (8 RCTs, 2 CCTs) were selected based on eligibility criteria and included in the meta-analysis. Outcome variables evaluated included feasibility of implant placement, need for further augmentation, implant survival/success, and marginal bone levels
- Results: Quantitative analysis of the included studies demonstrated that ARP procedures performed at extraction sites demonstrated a statistically significant decrease in 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.

Article 2 Synopsis

- Conclusion: Although ARP procedures were shown 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
- Limitations:
  - Failed to explore role of possible confounding factors, such as smoking, reason for extraction, tooth type and location, integrity of buccal plate, flap reflection and closure
  - Lack of universally accepted success and survival criteria for implant-supported restorations was noted

Article 2 Selection

- This article was selected because it addressed all aspects of our PICO question. In addition, this review exclusively evaluated implant-related outcomes
- Applicability to our patient: Subsequent bone and/or soft tissue augmentation should be considered when treatment planning implants 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.

Article 3

- Citation: 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.
- Study Design(s): Systematic Review and Meta-Analysis
- Study Purpose: The aim of this systematic review and meta-analysis was to evaluate the effect of alveolar ridge preservation (ARP) immediately after tooth extraction compared to extraction alone when delayed implant placement is intended

Article 3 Synopsis

- Methods: A total of 25 randomized clinical trials (RCTs) that met the eligibility criteria were selected. Nine different ARP modalities were identified and compared to the control therapy (spontaneous socket healing) in terms of clinical, radiographic, and patient-reported outcome measures.
- Results: 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 chance of reducing the need for subsequent bone grafting prior to or at time of implant placement. It was also observed that sites exhibiting a buccal bone thickness of more than 1mm at baseline was associated with more favorable results. 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). Quantitative analysis of alveolar 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 176mm respectively).

Article 3 Synopsis

- Conclusion: 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 and soft tissues (especially in the horizontal dimension) that normally occurs following tooth extraction. Despite the outlined favorable results that occur with ARP therapy, no definitive conclusions can be drawn on the advantages of ARP on implant-related outcomes, such as implant survival/success rates, marginal bone level changes, and feasibility of implant placement. The article also highlighted the importance of intact or well-preserved extraction sites.
- Limitations:
  - Potential influence of local and systemic factors on outcomes of interest could not be evaluated due to marked discrepancies in the study protocols

Article 3 Selection

- 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
- Applicability to our patient: Post-extraction dimensional changes of the alveolar ridge and surrounding soft tissue have serious esthetic implications especially in the anterior ridge where bone resorption is most noticeable. Adequate management of the extraction site may help to achieve predictable and satisfactory outcomes

Levels of Evidence

☒ **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

☒ **A** – Consistent, good quality patient oriented evidence

☐ **B** – Inconsistent or limited quality patient oriented evidence

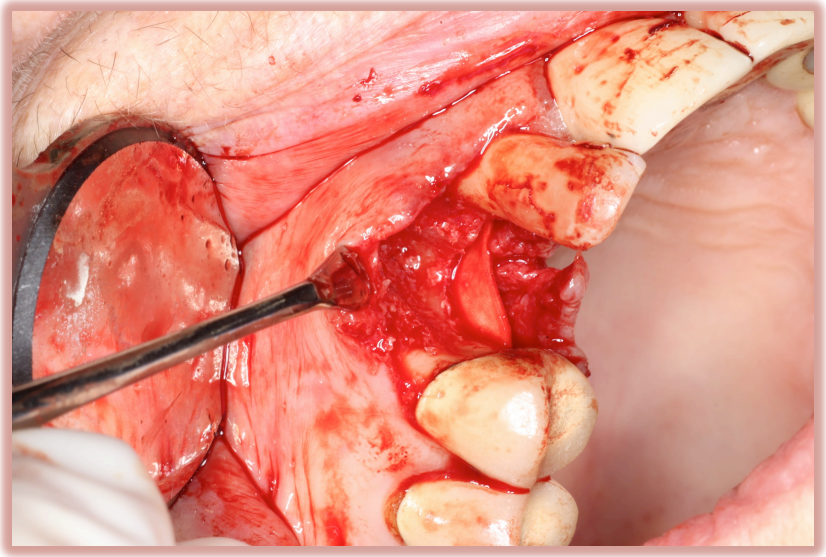
☐ **C** – Consensus, disease oriented evidence, usual practice, expert opinion, or case series for studies of diagnosis, treatment, prevention, or screening

Conclusion

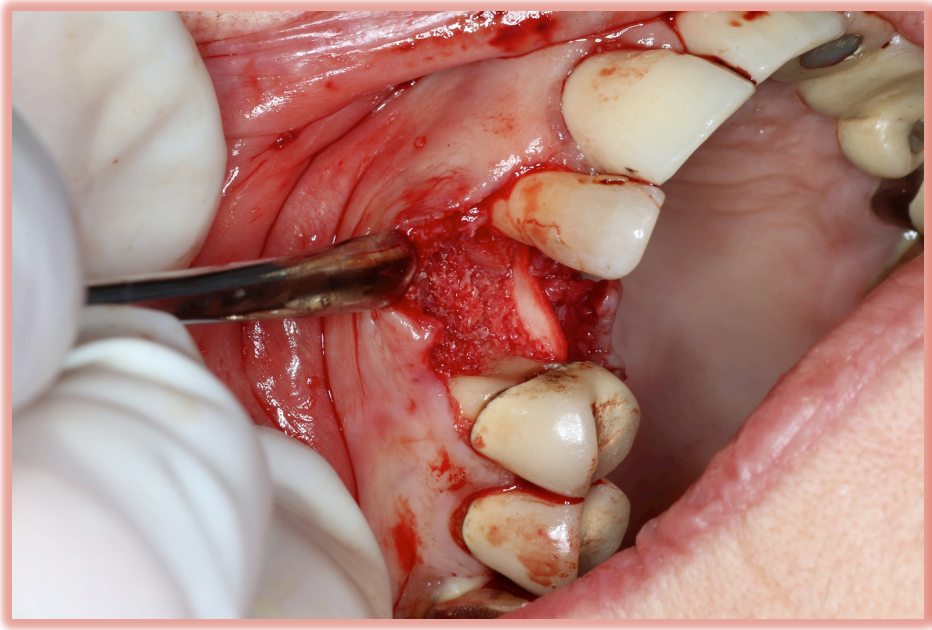
- Although there is limited evidence for routine extraction socket grafting, in clinical scenarios when implant placement is planned, alveolar ridge preservation techniques can help achieve optimal esthetic and functional outcomes by facilitating a more prosthetically-driven implant placement protocol. As a clinician, it is important to evaluate the potential effect of local and systemic factors on treatment outcomes.

Case Conclusions

- Extraction #6
- Membrane placed on account of lingual defect
- Crown lengthening for #5, #7
- Placement of alloplast bone grafting material
- Wait for optimal healing for new CBCT
- Place and restore implant



Case Conclusions



Discussion Questions

- Ask a question if you feel like it
- You can even ask more than one