Evidence-Based Dentistry Rounds
Group 5B-4
Specialty: Prosthodontics
Date: 10/7/2020

Rounds Team

- **Group Leader:** Dr. Dix
- **Specialty Leader:** Dr. Keesler
- **Project Team Leader**
  - Ryan Cyriac
- **Project Team Participants:**
  - **D1:** Brady Sarauer
  - **D2:** Ardita Ajvazi
  - **D3:** Jacob Hagmayer

Patient

- 42-year old
- African American Male
- CC: “I want my front teeth fixed” (11/2018)

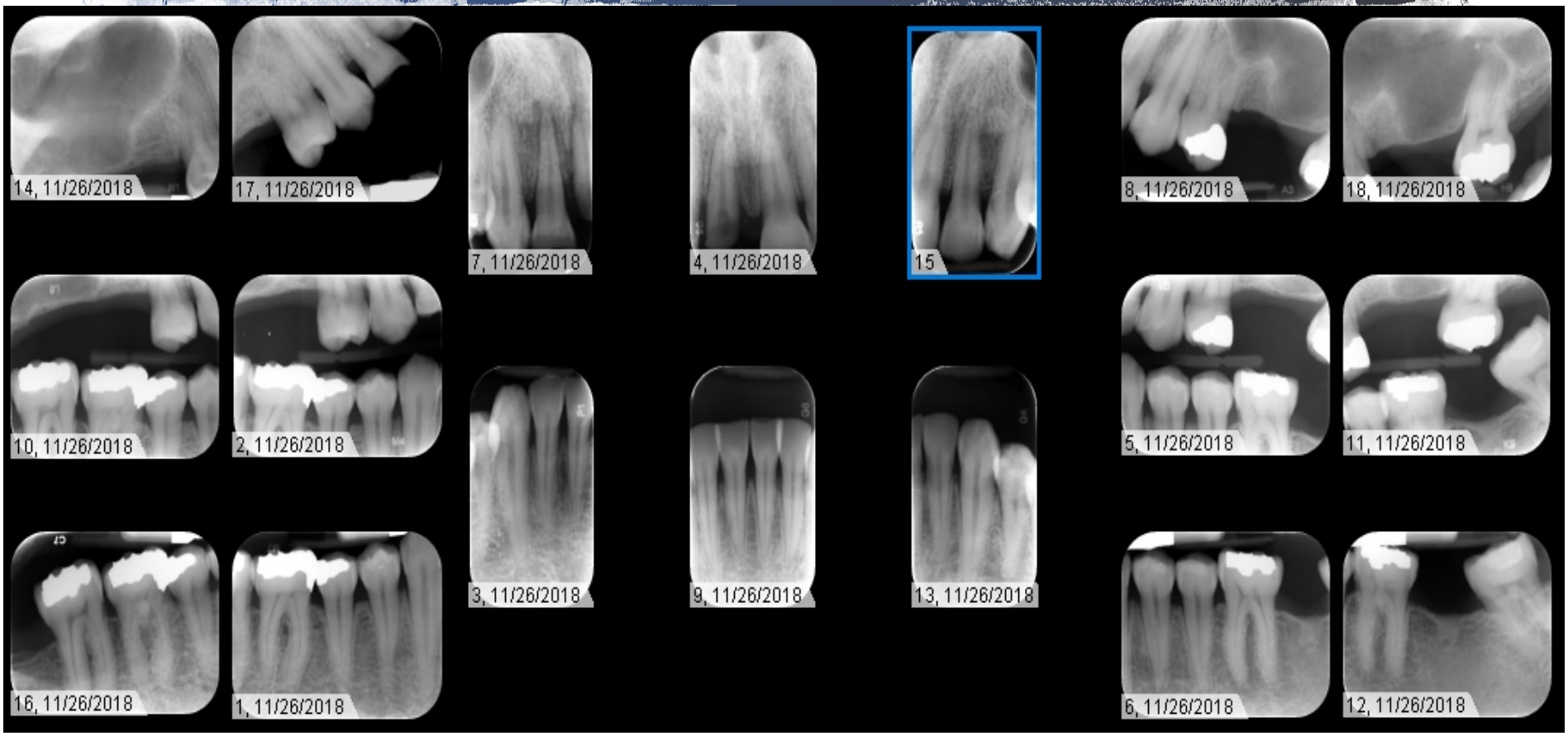
Medical History

- No medical conditions
- No medications
- No allergies
- Tobacco smoker, in the process of quitting

Dental History

- Last dental visit was 5 years prior to the comp exam
- Patient is unhappy with appearance of his smile
- Fractured #7 and #8 in a sports related injury

FMX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Radiographic Findings

- Fractured #7 and #8
- #7 PARL
- Widened PDL on #7 and #8
- Bilateral pneumatized maxillary sinus

Clinical Findings

- Missing #s 2, 3, 4, 13, 14, and 18
- Cervical abfractions on #5, 12, 19, 21, 30
- Diastema between #8 and #9
- #7 and #8 are slightly mobile
- #9 class IV fracture
- Supra-erupted #19, #20, #30 and #31
- Anterior end to end occlusion

Specific Findings

- #7 necrotic with SAP
- #8 non-restorable
- #9 class IV fracture

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Diagnosis

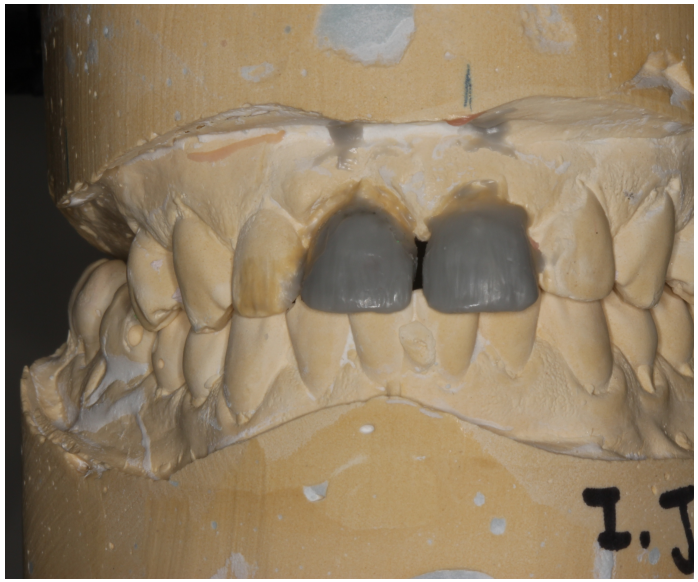
- #7 necrotic pulp with symptomatic apical periodontitis
- #8 non-restorable due to extent of fracture, widened PDL, and mobility
- #9 fractured incisal edge

Treatment plan

- Pros consult done with Dr. An
  - #7 = RCT, P+C, and crown
  - #8 = Extract + implant with custom abutment
  - #9 = Layered zirconia crown

Problem List

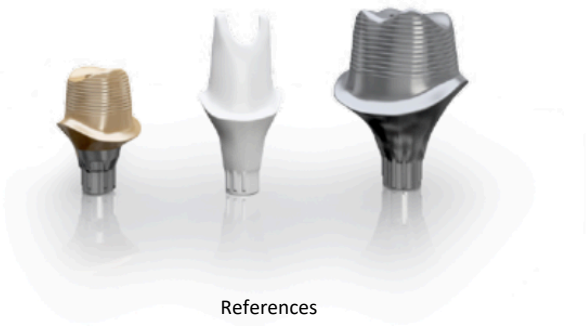
- Esthetics
- Missing teeth
- PARL (8)
- Mobility (7+8)
- Supra-eruption (19/20 + 30/31)



Pre-treatment photos

What is a custom abutment?

- **Implant Structure**
  - **Implant** - Osseointegration of the prosthesis to bone
  - **Abutment** – "Connection" between implant itself and the visible crown
    - Healing abutment – Not permanent – present in between implant placement and completion of the procedure
    - Stock/Prefabricated abutment
      - Natural emergence profile is not matched by the abutment
      - Esthetics are not ideal for anterior teeth
    - **Custom abutment**
      - Afforded the ability to customize the height of the abutment in relation to the surrounding gingival margin
      - Function
        - Healthier tissue – less likelihood for implant failure because of easier cement clean up
      - Esthetics
        - Allows for ideal emergence profile of crown
        - Various materials to aid in esthetics
  - **Crown** – The visible aspect of the prosthesis



References

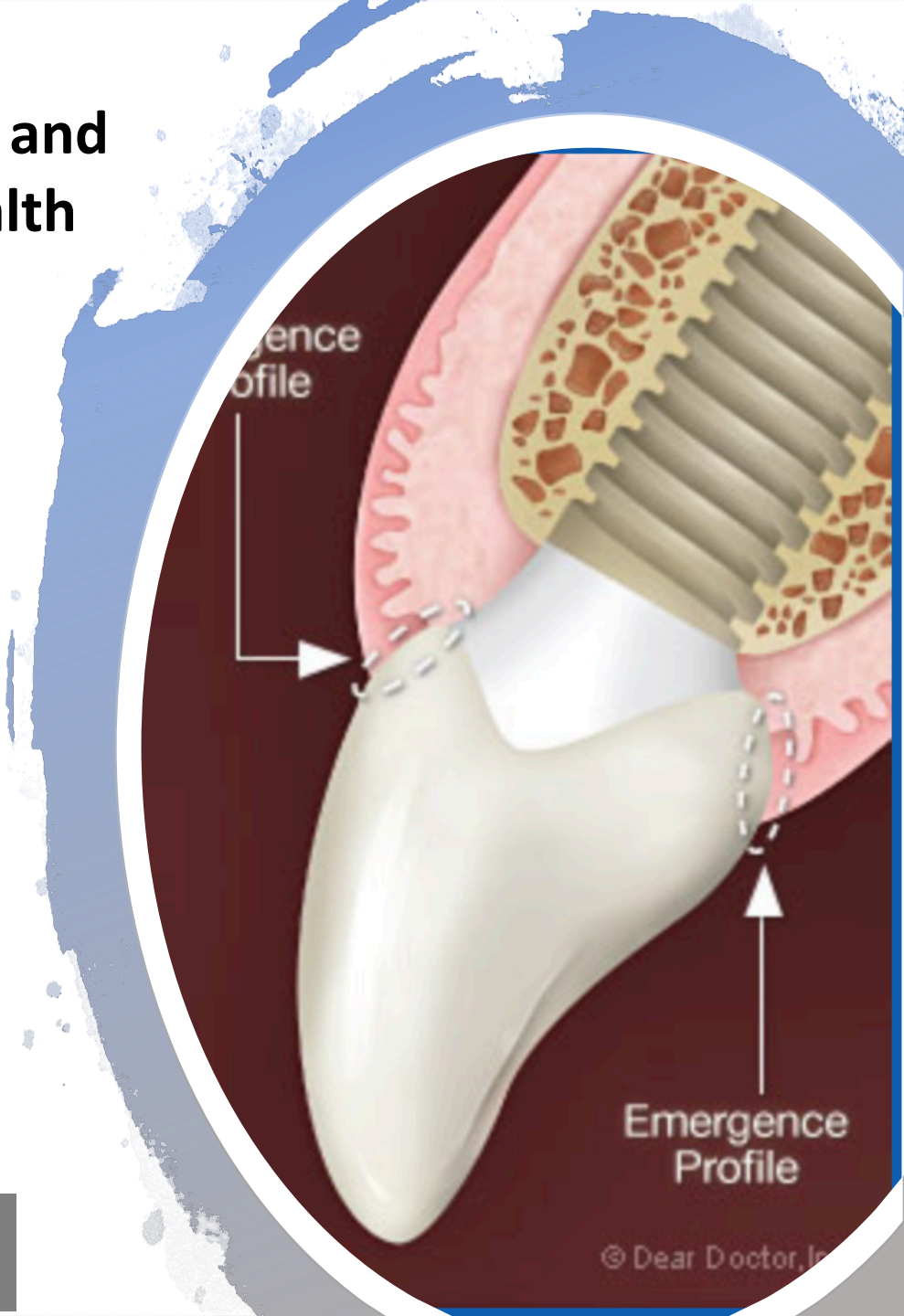
Bishara, M., DDS, Kurtzman, G., DDS, & Krause, E., DDS. (2020). Implant Restorations: Establishing a Proper Emergence Profile. *Compendium of Continuing Education in Dentistry, 41*(8)

Lops D, Bressan E, Parpaiola A, Sbricoli L, Cecchinato D, Romeo E. Soft tissues stability of cad-cam and stock abutments in anterior regions: 2-year prospective multicentric cohort study. Clin Oral Implants Res. 2015 Dec;26(12):1436-42.

Dentsply Sirona. (2020). Atlantis Design Guide: For Patient Specific Abutments and Crowns.

What is an emergence profile, and how does it affect gingival health and esthetics?

- Contour of a restoration as it “emerges” from the gingival tissue.



Chu, Stephen, and Dennis Tarnow. “Matching Teeth & Dental Implants.” Aug. 2010,

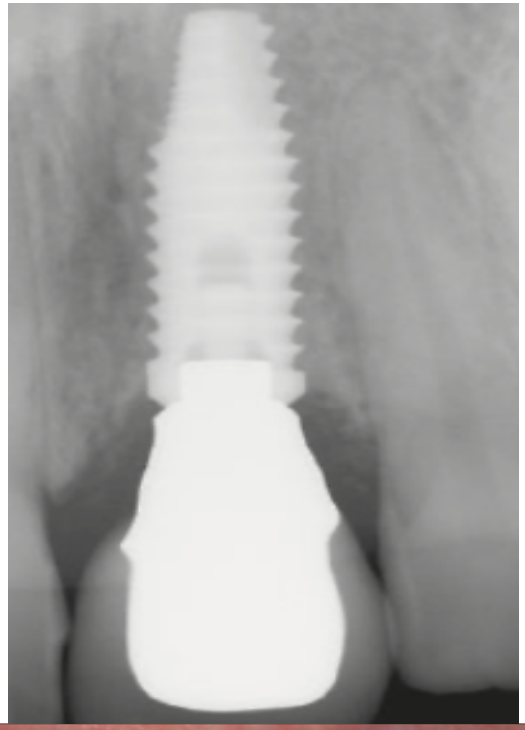
Proper Emergence Profile

ESTHETICS

- Ideal esthetics for recreating a natural profile

GINGIVAL HEALTH

- Optimal periodontal health of the surrounding tissue



Chu, Stephen J., et al. *Restorative Emergence Profile for Single-Tooth Implant*

Bishara, Mark, et al. *Implant Restorations: Establishing a Proper Emergence Profile: Compendium*

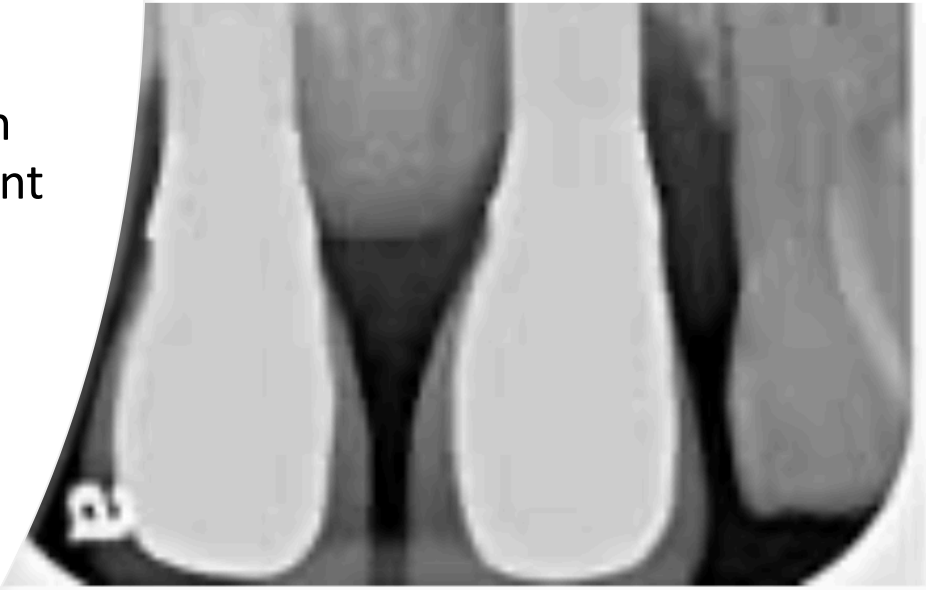
Improper Emergence Profile

ESTHETICS

- Poor size, shape and contour of implant crown, results to inadequate esthetics

GINGIVAL HEALTH

- Compromised gingival health that could lead to peri-implant disease



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D3 PICO

- **Clinical Question**: When deciding between a pure zirconia or titanium base custom abutment, is there any difference in the structural integrity?

PICO Format

- **P:** People needing anterior dental implants
- **I:** All zirconia custom abutment
- **C:** Titanium base custom abutment
- **O:** Structural integrity

PICO Formatted Question

- In patients who need an anterior dental implant restored, when using an all zirconia vs titanium base custom abutment, is there any difference in structural integrity?

Clinical Bottom Line

- Zirconia is a great alternative to titanium in the anterior region, especially if the patient is in search of better esthetics.

Search Background

- Date(s) of Search: 09/25/2020
- Database(s) Used: Pubmed
- Search Strategy/Keywords: Anterior, Dental Implant, Zirconia, Titanium

Search Background

- MESH Terms:
  - Dental Implants
  - Zirconia
  - Titanium
  - Structural Integrity

Article 1

- Fracture Resistance of Titanium, Zirconia, and Ceramic-Reinforced Polyethereketone Implant Abutments Supporting CAD/CAM Monolithic Lithium Disilicate Ceramic Crowns After Aging.
- Study Design: Case-Control Study
- Study Need/Purpose: To test and compare the fracture resistances of titanium, zirconia and ceramic-reinforced PEEK implant abutments.

Article 1 Synopsis

- **Method:** Thirty-six commercially available titanium, zirconia and ceramic-reinforced PEEK implant abutments were used. Each specimen was exposed to 4.8 x 10^5 loading cycles using 100-N dynamic loading force and 1.6 Hz chewing frequency in a chewing simulator. Stainless steel ball of 6 mm diameter was the antagonist.
- **Results:** The study revealed the fracture strengths were significantly different among groups. The mean fractures for each group were: 787.80 $\pm$ 120.95 N for Ti, 623.93 $\pm$ 97.44 N for Zr, 602.93 $\pm$ 121.03 N for RPEEK.

Article 1 Synopsis (cont)

- **Conclusions:** Titanium abutments with monolithic lithium disilicate crowns had the highest fracture resistance (787.90 ± 120.95 N), while the zirconia (623.93 ± 97.44 N) and RPEEK (602.93 ± 121.03 N) had similar fracture resistances. The location and modes of failure were also addressed. The titanium group showed more screw fracture and deformation at the implant connections site, the zirconia group showed abutment and crown fracture, screw fracture and fracture at the implant abutment site.
- **Limitations:** Did not have a large sample base, and only did a small amount of thermocycling and chewing simulation.

Article 1 Selection

Reason for selection: Shows the differences in structural integrity of titanium and zirconia.

Applicability to the patient/Implications: Fracture resistances for titanium were higher, if patient has higher biting forces titanium may be a better option in the long run.

Article 2

- Zirconia Abutments in the Anterior Region: A Systematic Review of Mechanical and Esthetic Outcomes.
- **Study Design:** Systematic Review
- **Study Need/Purpose:** To assess the mechanical and esthetic outcomes of implant zirconia abutments used in the anterior region, considering the design evolution in the past 5 years.

Article 2 Synopsis

- **Method:** The question of “In patient’s requiring a single, anterior implant, what are zirconia abutments’ survival, mechanical and esthetic outcomes?” The researchers made sure all studies were published after 2013, and the literature search was conducted until May 2018. Once the articles were selected, one review author would extract the data and the other would check it.
- **Results:** All types of zirconia were used in the reviewed studies. Only 5 of the studies found fractures, with fracture rates ranging from 1.2% to 8%. In total of 659 abutments, 15 fractures were reported. The reviewers concluded from the article that implant diameter did not have an effect on the abutment, as fractures occurred with both narrow (3.5 mm) and regular (4.0 mm) diameter implants. 2 studies considered longer follow-up times, and reported higher percentages of abutment fracture (4 and 6.7%). All articles reviewed reported ”very good to excellent esthetics” based on patient feedback.

Article 2 Synopsis (cont)

- **Conclusions:** The reviewers found that zirconia abutments provide better matching and integration of the color and surface of soft tissues than titanium abutments, and zirconia abutments are particularly indicated when the patient has thin peri-implant mucosa due to the tissue not being able to mask the discoloration of a titanium implant. Some authors reported less marginal bone loss with zirconia than with titanium implants. However, the reviewers also concluded that zirconia abutment fractures are still very prevalent, and they suggested indications of < 20 – 30 degrees to prevent fracture.
- **Limitations:** Limited information concerning mechanical and esthetic outcomes of zirconia abutments in the anterior region, not many long-term studies used.

Article 2 Selection

- **Reason for selection:** Article directly reviews the esthetics and mechanical properties of zirconia in the anterior region.
- **Applicability to the patient/Implications:** If patient is concerned about discoloration of their tissues, or if the patient has thin peri-implant tissues, this study can be used to show them that zirconia can be a more preferable option to an all-titanium implant. Also lists that there is still a higher risk of zirconia abutment fracture than an all-titanium implant, if the patient is more concerned about long-term survival.

Article 3

- Long-Term Survival and Peri-Implant Health of Titanium Implants with Zirconia Abutments: A Systematic Review and Meta-Analysis
- **Study Design:** Systematic Review and Meta-analysis
- **Study Need/Purpose:** To evaluate the long-term implant survival rate of titanium implants with zirconia abutments, and the effects of implants with zirconia abutments on marginal bone loss (MBL) and pocket probing depth (PPD) compared with all titanium implants.

Article 3 Synopsis

- **Method:** The article reviewers searched electronic databases that included the Cochrane Central Register of Controlled Trials, MEDLINE, EMBASE and the Chinese Biomedical Literature Database. Two types of studies were included, clinical studies reporting the outcomes of patients treated with titanium implants and zirconia abutments and articles comparing zirconia abutment MBL and PPD with that of all titanium implants.
- **Results:** The studies were split up into two parts. Part 1 to evaluate the long-term survival of titanium implants with zirconia abutments. Part 2 to estimate the effects of zirconia abutments on peri-implant health compared with all titanium implants. Part 1 found the overall survival rate of titanium implants with zirconia abutments estimated to be 96%. Part 2 results significantly favored zirconia abutments over titanium with respect to MBL and PPD.

Article 3 Synopsis (cont)

- **Conclusions:** The reviewers concluded that zirconia has acceptable performance compared to titanium abutments considering peri-implant health. However, they also noted that all titanium implants is still higher when compared to titanium implants with zirconia abutments in the long-term.
- **Limitations:** The reviewers noted a high risk of bias throughout the studies. Also this review did not include rate of fracture, chipping, screw loosening or cement remnant.

Article 3 Selection

Reason for selection: Compares the long-term survival and peri-implant tissue health of both all titanium implants and titanium implants with a zirconia abutment.

Applicability to the patient/Implications: Shows the patient that tissue health is acceptable and sometimes preferable with an implant abutment. Also lets the patient know that even low, there is still a higher risk of fracture with a zirconia abutment than with an all titanium implant.

Layman's Article

- Ceramic vs Titanium Implants: When to Choose Which?
- Study Design: Blog
- Study Need/Purpose: To compare and contrast ceramic (zirconia) and titanium implants.

Layman's Article Synopsis

- **Methods:** None
- **Results/Conclusions:** Zirconia implants are not a replacement for titanium implants, but are a great alternative in specific cases. If the patient prefers metal free materials, ceramic implants give them that option.
- **Limitations:** Not an actual study.

Layman's Article Selection

- **Reason for selection:** Compares zirconia and titanium implants. Was one of the first google hits when searching.
- **Applicability to patient:** The article gives benefits and challenges regarding both ceramic and titanium implants. However, a more scientific research article should be used when applying these concepts to the patient.
- **Implications:** A quick google search can result in articles showing an average patient comparisons between titanium and zirconia, whether that be beneficial or harmful.

Levels of Evidence

- [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
- [x] **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)

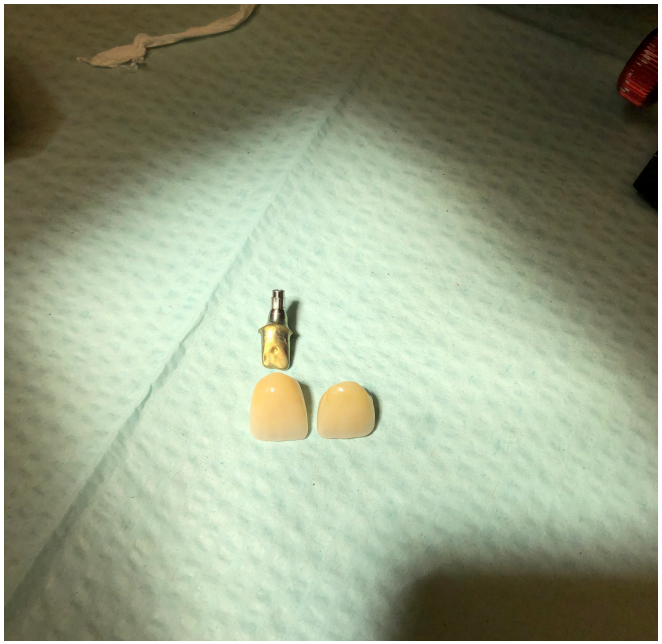
☒	**A** – Consistent, good quality patient oriented evidence
☐	**B** – Inconsistent or limited quality patient oriented evidence
☐	**C** – Consensus, disease oriented evidence, usual practice, expert opinion, or case series for studies of diagnosis, treatment, prevention, or screening

Conclusions

- How does the evidence apply to this patient?
  - The evidence shows that zirconia abutments are an acceptable alternative for titanium implant in the anterior region. A zirconia abutment can be more favorable in the case of esthetics, since the zirconia is able to match and integrate the color of soft tissues better than that of titanium. If the patient wants something that will last them for the longest time possible, an all-titanium implant may be the better option to go with as it has a higher fracture resistance and higher survival rate than zirconia abutments.

Conclusions: (continued)

- Gave both options, pros/cons, and risk/benefits to the patient
- Low/medium smile line, thick biotype, patient indifference
- NuArt experience
- Gold anodized titanium abutment → middle ground



Immediately after delivery

Questions?

Thank You