**Critically Appraised Topic (CAT)**

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| **Project Team:**  |
| **5B-4** |
| **Project Team Participants:**  |
| **Ryan Cririac, Jacob Hagmayer, Aridita Ajavzi, Brady Sarauer** |
| **Clinical Question:** |
| **Is the structural integrity of zirconia better or worse for a patient needing an anterior dental implant than a titanium base hybrid?** |
| **PICO Format:** |
| **P:** |
| **Person needing an anterior implant.** |
| **I:** |
| **All zirconia custom abutment.** |
| **C:** |
| **Titanium hybrid custom abutment.**  |
| **O:** |
| **Best material structural integrity.** |
| **PICO Formatted Question:** |
| **In patients who need an anterior dental implant restored, when using an all zirconia vs titanium base hybrid, are there any differences in structural integrity?** |
| **Clinical Bottom Line:** |
| **In the anterior region, there are not structural differences between zirconia and titanium.**  |
| **Date(s) of Search:**  |
| **September 25, 2020** |
| **Database(s) Used:** |
| **Pubmed** |
| **Search Strategy/Keywords:** |
| **Dental Implant Abutments, Anterior, Zirconia, Titanium**  |
| **MESH terms used:** |
| **Dental Implant Abutments, Zirconia, Titanium, Structural Integrity** |
| **Article(s) Cited:** |
| 1. **Fracture Resistance of Titanium, Zirconia, and Ceramic-Reinforced Polyethereketone Implant Abutments Supporting CAD/CAM Monolithic Lithium Disilicate Ceramic Crowns after Aging**
2. **Zirconia Abutments in the Anterior Region: A systematic Review of Mechanical and Esthetic Outcomes**
3. **Long-term Survival and Peri-Implant Health of Titanium Implants with Zirconia Abutments: A Systematic Review and Meta-Analysis**
4. **Ceramic vs titanium implants: When to choose which? (Leymans article)**
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| **Study Design(s):** |
| 1. 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.
2. **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.**
3. **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.**
4. **Compared the differences between zirconia and titanium abutments.**
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| **Reason for Article Selection:** |
| 1. This article shows the different structural integrity between titanium and zirconia related to fracture resistances.
2. **The article directly reviews the esthetics and mechanical properties of a zirconia abutment in the anterior region.**
3. **Compares the long-term survival and peri-implant tissue health of both all titanium implants and titanium implants with a zirconia abutment.**
4. **Layman’s article to compare the articles found on pubmed.**
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| **Article(s) Synopsis:** |
| **(1) 36 comercially available titanium, zirconia and ceramic-reinforced PEEK implant abutments were used under load of an opposing stainless steel ball. The materials were then inspected for fracture resistance to the load. All of the samples survived after the researchers “aging” tests, and the fracture strengths of each were recorded. Titanium was seen to have the highest fracture strength compared to zirconia. Failures for titanium were generally due to fracture of the screw, while failures for zirconia was fracture of the abutment and crown.** **(2) 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.****(3) 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. 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.****(4) This article goes through benefits and challenges of both titanium implants and zirconia (ceramic) implants.**  |
| **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[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) 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):** |
| **Although zirconia does not have as high of a fracture resistance of titanium, in the anterior region, zirconia is a viable alternative to titanium and results in better aesthetics and biocompatibility.**  |