**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 Implants, Anterior, Zirconia, Titanium** |
| **MESH terms used:** |
| **Dental Implants, 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. **Is zirconia a viable alternative to titanium for oral implant? A critical review** 3. **Zirconia compared to titanium dental implants in preclinical studies – A systematic review and meta-analysis** 4. **Ceramic vs titanium implants: When to choose which? (Leymans article)** |
| **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. **Formulated a focus question which was, “Is zirconia a viable alternative to titanium fo oral implant?” In order to answer this, the researchers used search terms such as; “Zirconia implants”, “titanium implants”, “osseointegration”, and “compatability”.** 3. **Electronic and hand searchers were used to obtain preclinical studies comparing zirconia and titanium implants. Primary search included bone-to-implant contact (BIC) and removal torque out (RTQ).** 4. **Compared the differences between zirconia and titanium abutments.** |
| **Reason for Article Selection:** |
| 1. This article shows the different structural integrity between titanium and zirconia related to fracture resistances. 2. **This article compares and shows differences with zirconia and titanium implants.** 3. **This article shows differences between zirconia and titanium implants, specifically looking at BIC, RTQ, push-in (PI) measurments and secondarily biologic width dimensions.** 4. **Leymans article to compare the articles found on pubmed.** |
| **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) The study aims to analyze the credibily of Zirconia as an alternative to replace Titanium based implant systems. In order to do this, the researchers formulated a focus questions which was “Is zirconia a viable alternative to titanium for an oral implant?” The researchers then used specific search terms such as “zirconia implants” and “titanium implants” to answer their questions. It was found that zirconia is more aesthetic and biocompatible than titanium, but is more sensitive to early fracture in the posterior region than titanium and this was found to be the critical factor regarding its use in clinical situations.**  **(3) This study aims to evaluate whether zirconia implants demonstrate differences in hard and soft tissue integration compared to titanium implants. In order to do this, the researchers hand picked and electronically searched for studies which differences in the two, specifically looking at bone-to-implant contact, rotating torque out, push-in measurements and biologic width dimensions. The researchers found statistically significant differences between titanium and zirconia in respect to BIC. They related these findings to a high osseointegrative/osseoconductive capacity of zirconia implants, especially when they were micro-roughed. However, the researchers also noted that titanium tended to show a faster initial osseointegration process compared to zirconia.**  **(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>  **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**  **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.** |