

## Critically Appraised Topic (CAT)

<b>Project Team:</b>
1A-5
<b>Project Team Participants:</b>
Kendal, Brandon, Kimberly, Aliyah
<b>Clinical Question:</b>
Does an implant supported bridge or two single implants on either side of a natural tooth have a higher success rate?
<b>PICO Format:</b>
<b>P:</b>
A patient with two edentulous spaces on each side of a natural tooth
<b>I:</b>
Two single implants
<b>C:</b>
Extract a natural tooth and place a 3 unit implant supported bridge
<b>O:</b>
What would have a higher success rate
<b>PICO Formatted Question:</b>
In a patient with two edentulous spaces on each side of a natural tooth, does two single implants, or extracting the natural tooth and placing a 3 unit implant supported bridge have a higher success rate?
<b>Clinical Bottom Line:</b>
Both the bridge or single implants are a viable option. Which option is best for the patient depends on factors such as bruxism and caries risk.
<b>Date(s) of Search:</b>
10/1-10/6
<b>Database(s) Used:</b>
Pubmed,
<b>Search Strategy/Keywords:</b>
Implants, occlusal overload, implant occlusion, three-unit implant, three unit bridge stress, three unit implant posterior maxilla
<b>MESH terms used:</b>
Bite force, dental implantation, dental implants, dental occlusion, dental prosthesis retention, three unit fpd, stress distribution
<b>Article(s) Cited:</b>
Sannino G, Pozzi A, Schiavetti R, Barlattani A. Stress distribution on a three-unit implant-supported zirconia framework. A 3D finite element analysis and fatigue test. <i>Oral Implantol (Rome)</i> . 2012;5(1):11-20.

Sheridan RA, Decker AM, Plonka AB, Wang HL. The Role of Occlusion in Implant Therapy: A Comprehensive Updated Review. *Implant Dent*. 2016 Dec;25(6):829-838. doi: 10.1097/ID.0000000000000488. PMID: 27749518.

**Study Design(s):**

Implant occlusion article: Two reviewers completed a literature search using the PubMed database and a manual search of relevant journals. Relevant articles from January 1950 to September 20, 2015 published in the English language were considered.

Three unit implant article: authors used an FEA model (3d) reproducing a 3-unit FPD to evaluate stress levels in the components under several loading conditions using a Y-TZP coping. The model simulated an ideal osseointegration. Three loads from different directions (0,15,35) were selected. Axial and oblique loads of 100 N and 300 N were applied to points on the fpd.

**Reason for Article Selection:**

Implant occlusion: this article explains the problems and solutions of occlusal overload that affects both implants and implant supported FPDs.

Three unit implant article: the article simulated pressure points with various angles on an FPD.

**Article(s) Synopsis:**

Implant occlusion article: Occlusal overload may cause implant biomechanical failures, marginal bone loss, or even complete loss of osseointegration. Thus, it is important for clinicians to understand the role of occlusion in implant long-term stability. This systematic review updates the understanding of occlusion on dental implants, the impact on the surrounding peri-implant tissues, and the effects of occlusal overload on implants. Additionally, recommendations of occlusal scheme for implant prostheses and designs were formulated.

Three unit FPD article: The purpose of this study was to investigate, by finite element analysis (FEA) and fatigue analysis, the influence of different loading conditions on the stress distribution in a 3-unit implant-supported Y-TZP fixed partial denture (FPD).

**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):**

**Implant:** Recommendations for occlusal schemes for single implants or fixed partial denture supported by implants include a mutually protected occlusion with anterior guidance and evenly distributed contacts with wide freedom in centric relation. Suggestions to reduce occlusal overload include reducing cantilevers, increasing the number of implants, increasing contact points, monitoring for parafunctional habits, narrowing the occlusal table, decreasing cuspal inclines, and using progressive loading in patients with poor bone quality. Protecting the implant and surrounding peri-implant bone requires an understanding of how occlusion plays a role in influencing long-term implant stability.

**Bridge:** Within the limitation of FEM three dimensional analysis, the following conclusions may be drawn: maximum von Mises stress values were concentrated around the gingival area of the Y-TZP frameworks, in the connector regions and in the cervical regions of abutment; the connector regions presented the highest tensile stress values with risk of fracture; there is a significant change on the stress distribution and on the tensile stress values when the loading condition is changed. Tension values increased when the angles of oblique load became larger (35°). Fatigue tests give accurate information about reliability of YTZPas framework material in 3-unit posterior

region FPD. Further tests must be performed to simulate the real clinic condition and to ensure that the FEM results are transferable to clinical situations.