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RE: Biomechanical comparative analysis of temporomandibular joint, glenoid fossa and head of the condyle of conventional models prothesis with new PEEK design

A B S T R A C T

This is a Letter to the Editor that describes some of the biomechanical concerns with the statements made in This is a LTE that raises some biomechanical statements made in Genovesi W, Comenale IC, Genovesi Filho W, Veloso Fernandes M. Biomechanical comparative analysis of temporomandibular joint, glenoid fossa and head of the condyle of conventional models prothesis with new PEEK design. J Oral Biol Craniofac Res. 2022 Sep–Oct; 12(5):529–541.

To the Editor

First, we would like to commend the authors' attempts to improve the field of alloplastic temporomandibular joint replacement (TMJR). Exhaustive preclinical biomechanical studies are necessary for improvement of the current TMJR device embodiments, materials, design, and manufacturing. In the current era of metal-on-polyethylene (MoP) TMJR devices, it is important to build on the long-term clinical data available to improve future device embodiments. In addition, given the storied history of catastrophic embodiment failures (e.g., Proplast Teflon), paired with the clinical success of the newer generation of MoP TMJR devices, the bar is now set high, and it is the surgical communities responsibility to ensure that extensive preclinical biomechanical and robust clinical trials occur and are reported before a new TMJR device is widely implemented, particularly when new elements of embodiment are being considered. While this paper has novel biomechanical information, we respectfully disagree with some of the assumptions and conclusions in this paper.

We disagree with the statement that "All glenoid fossas have the same design." It should be noted that the differences in the Stryker/TMJ Concepts (Ventura, CA) and Zimmer Biomet (Jacksonville, FL) TMJR fossa designs with unclear clinical significance. This includes the presence and size of the posterior stop, the size of the lateral flanges, and the depth and curvature of the articulating surfaces. In this article the authors' primary concern is fossa design and dislocation. It is noteworthy that this has not been a clinically significant cause for either TMJR device revision or removal.[1,2] In fact, generally a dislocated device can be salvage with reduction and a brief period of maxillomandibular fixation.

Concerning screw fixation and position of the mandibular components, we appreciate the authors' detailed evaluation of screw position and lever arm forces assessment between the current MoP devices. However, it is worth noting that many other known and unknown factors contribute to device stability, including the number, position, pattern, and distance of the fixation screws from the rotation force at the most superior screw. As reported by Hsu J-T et al., once beyond three fixation screws there is limited impact on device stability with more screws.[3] While the best position and number of screws is still an important question, device loosening and failure in current MoP devices remains an insignificant contributor to device failures. [1,2]

The present MoP devices show survivorship at 10 years >95%.,[1,2] Therefore, prior to TMJR devices with new embodiments introduction into human trials, it is essential that wear rates from preclinical biomechanical studies of be conducted and reported. The authors state, "A prototype TMJ prosthesis was developed with this material (PEEK) and after exhaustive testing done in a laboratory, performed exceptionally well and had no damage on its surfaces after multiple laboratory tests." Inclusion or citation of this data would be important for the readers to make proper conclusions about the feasibility of PEEK TMJR devices.

Finally, PEEK and CFR-PEEK materials were explored as an alternative for polyethylene in a low conformity knee replacement through an experimental wear study. Extremely high wear rates were reported for both materials with evidence of cracking and material failure seen within the wear region. It is likely the low conformity geometry resulted in high contact stress conditions caused localized mechanical failure of the material.[4]

[1] Granquist EJ, Bouloux G, Dattilo D, Gonzalez O, Louis PJ, McCain J et al. Outcomes and Survivorship of Biomet Microfixation Total Joint Replacement System: Results from an FDA Postmarket Study. J Oral Maxillofac Surg. 2020; 78:1499–508.

[2] Zahid A, Mercuri LG, Warburton G, Umorin M. Results of the TMJ Concepts Post Market Surveillance Study. J Oral Maxillofac Surg (In preparation for publication).

[3] Hsu JT, Huang HL, Tsai MT, Fuh LJ, Tu MG. Effect of screw fixation on temporomandibular joint condylar prosthesis. J Oral Maxillofac Surg. 2011; 69:1320–8.

[4] Brockett CL, Carbone S, Fisher J, Jennings LM. PEEK and CFR-PEEK as alternative bearing materials to UHMWPE in a fixed bearing total knee replacement: An experimental wear study. Wear. 2017; 374–375:86–91.

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Update

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Erratum regarding missing declaration of competing interest statements in previously published articles

Declaration of Competing Interest statements were not included in published version of the following articles that appeared in previous issues of *Journal of Oral Biology and Craniofacial Research*.

Hence, the authors of the below articles were contacted after publication to request a Declaration of Interest statement:

1. "A single-blinded assessment of the effect of communication on psychological burden among oral cancer and oral potentially malignant disorder patients" [Journal of Oral Biology and Craniofacial Research, Volume 12, Issue 4, July–August 2022, Pages 427–430] https://doi.org/10.1016/j.jobcr.2022.05.005
2. "Depigmenting effect of banana stem and flower on melanocytes" [Journal of Oral Biology and Craniofacial Research, Volume 12, Issue 4, July–August 2022, Pages 454–457] https://doi.org/10.1016/j.jobcr.2022.05.015
3. "Biomechanical comparative analysis of temporomandibular joint, glenoid fossa and head of the condyle of conventional models prothesis with new PEEK design" [Journal of Oral Biology and Craniofacial Research, Volume 12, Issue 5, September–October 2022, Pages 529–541] https://doi.org/10.1016/j.jobcr.2022.06.006
4. "Comparative evaluation of aesthetic outcome of direct polychromatic composite layering and the "index cut-back technique" for restoring class IV defects using a newly patented simulated 3D printed mould: An in vitro study" [Journal of Oral Biology and Craniofacial Research, Volume 12, Issue 5, September–October 2022, Pages 552–556] https://doi.org/10.1016/j.jobcr.2022.07.007
5. "The outcome of conventional open reduction approach vs endoscopic approach for orbital floor repair" [Journal of Oral Biology and Craniofacial Research, Volume 12, Issue 5, September–October 2022, Pages 589–592] https://doi.org/10.1016/j.jobcr.2022.06.007
6. "The temporo-mandibular joint: Reconstruction of the condyle post-ablation" [Journal of Oral Biology and Craniofacial Research, Volume 12, Issue 5, September–October 2022, Pages 593–598] https://doi.org/10.1016/j.jobcr.2022.07.003
7. "An In vitro study of biomechanical comparison between titanium 4-hole 3D plates and titanium conventional 4-hole miniplates for internal fixation of mandibular angle fractures" [Journal of Oral Biology and Craniofacial Research, Volume 12, Issue 5, September–October 2022, Pages 683–686] https://doi.org/10.1016/j.jobcr.2022.08.022
8. "Effect of various malocclusion on maximal bite force-a systematic review" [Journal of Oral Biology and Craniofacial Research, Volume 12, Issue 5, September–October 2022, Pages 687–693] https://doi.org/10.1016/j.jobcr.2022.08.009
9. "Radiographic factors associated with inferior alveolar nerve exposure during mandibular third molar surgery and their influence on neurosensory deficit: A prospective study" [Journal of Oral Biology and Craniofacial Research, Volume 12, Issue 6, November–December 2022, Pages 818–822] https://doi.org/10.1016/j.jobcr.2022.08.025
10. "Management of the secondary growth defect" [Journal of Oral Biology and Craniofacial Research, Volume 12, Issue 6, November–December 2022, Pages 833–837] https://doi.org/10.1016/j.jobcr.2022.08.006
11. "Hybrid tracer - A modified novel extra oral tracer" [Journal of Oral Biology and Craniofacial Research, Volume 12, Issue 6, November–December 2022, Pages 859–862] https://doi.org/10.1016/j.jobcr.2022.09.013
12. "Evaluation of the effect of local administration of PRP vs vitamin D3 on the rate of orthodontic tooth movement and the associated external apical root resorption" [Journal of Oral Biology and Craniofacial Research, Volume 12, Issue 6, November–December 2022, Pages 879–884] https://doi.org/10.1016/j.jobcr.2022.09.011
13. "Comparison of chorion allograft and subepithelial connective tissue autograft in the treatment of gingival recession- A randomized controlled clinical trial" [Journal of Oral Biology and Craniofacial Research, Volume 13, Issue 2, March–April 2023, Pages 104–110] https://doi.org/10.1016/j.jobcr.2022.12.002
14. "Undergraduate students' perception of the Indian dental curriculum: A focus-group based, multi-centric questionnaire survey" [Journal of Oral Biology and Craniofacial Research, Volume

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13, Issue 2, March–April 2023, Pages 230–235] https://doi.org/10.1016/j.jobcr.2023.01.012

15. “Detection of SARS-CoV-2 IgG antibodies and inflammatory cytokines in saliva-a pilot study” [Journal of Oral Biology and Craniofacial Research, Volume 13, Issue 2, March–April 2023, Pages 267–271] https://doi.org/10.1016/j.jobcr.2023.02.008