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Biomechanical properties of a novel cervical spine implant with elastic deformation: A cadaveric study

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Title: Biomechanical properties of a novel cervical spine implant with elastic deformation: a cadaveric study.

Background: There is concern about the high ASD rate after ACDF. We creatively designed an elastically deformable cervical implant to reduce the postoperative stress concentration.

Research question: To investigate the biomechanical performance of this novel cervical implant.

Design: A cadaveric study.

Methods: Biomechanical test was conducted on twelve fresh-frozen human cadaveric cervical spines and randomly divided into four groups according to implant types: intact group, Zero-P VA ACDF group, the novel cervical implant group and Pretic-I ACDR group. An optical tracking system was used to evaluate the segmental ROM of the C4/C5, C5/C6, and C6/C7 segments and micro pressure sensor was used to record the maximum facet joint pressure (FJP), maximum intradiscal pressure (IDP) at the C4-5 and C6-7 segments.

Results: There were no significant differences in the ROM of adjacent segments between the groups. Compared with the intact group, the ACDR group essentially retained the ROM of the operated segment. The novel cervical implant decrease some ROM of the operated segment, but it was still significantly higher than in the fusion group; The maximum FJP and IDP at the adjacent segments in the ACDF group were significantly higher than those values in the other groups, and there were no differences in the other groups.

Discussion: While the newly developed elastically deformable cervical implant does not completely maintain ROM like the artificial disc, it surpasses the fusion device with regards to biomechanical attributes. After further refinement, this novel implant may be suitable for patients who are prone to severe ASD after fusion surgery but no indication for artificial cervical disc surgery.

Fig. 1

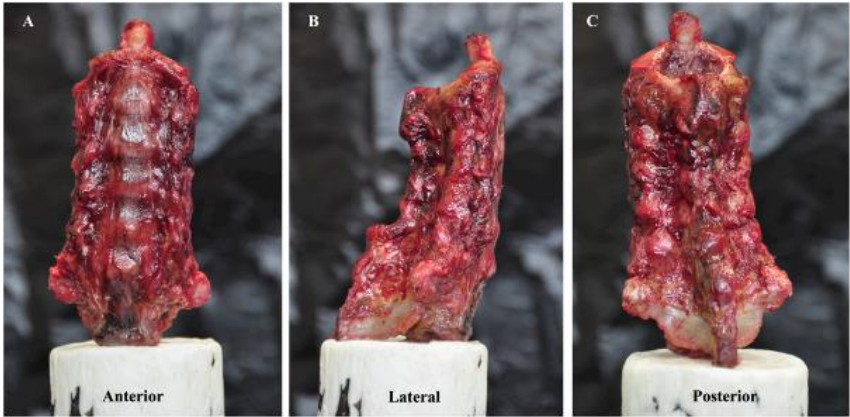


Fig. 2

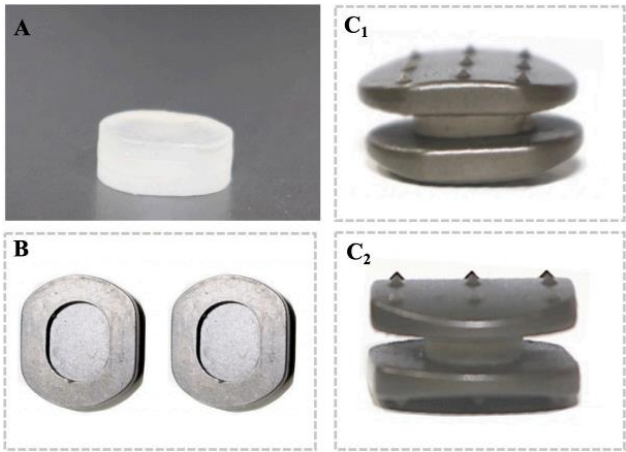


Fig. 3

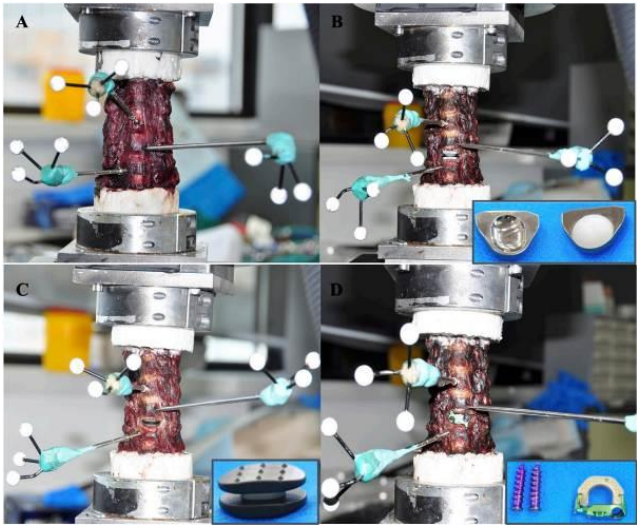


Fig. 4

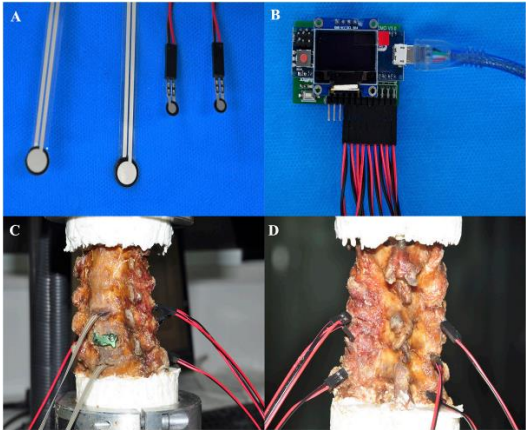


Fig. 5

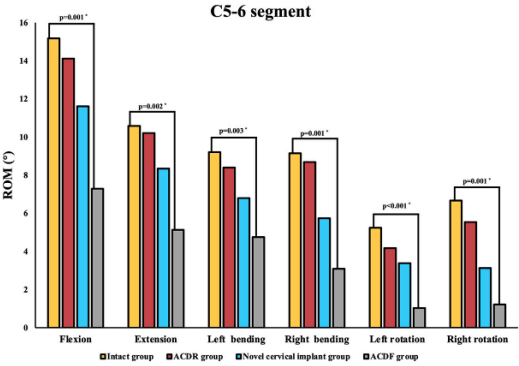


Fig. 6

