Artificial atlantoaxial joint


The authors are correct in stating that the atlantoaxial joint is a highly mobile joint, and while the preservation of stability is paramount, attempts must be made toward retaining the movements of the region. Thus, any implant or device that provides both stability and mobility to the region is most appropriate.

The craniovertebral junction is a structural masterpiece of nature designed to be the most stable and the most mobile region of the body and architected to provide an uncompromising and safe passage to the most critical neural and vascular structures. The atlantoaxial joint is the most mobile joint of the body and is active in saying both “yes” and “no” by virtue of its circumferential movements and moves tirelessly and flawlessly throughout its life. Our long-term experience in the field indicates that complexities of the region are so huge, the natural design so intricate and flawless, that any human effort to mimic the atlantoaxial joint can only be an unrealistic dream.

Shen et al. have conducted a biomechanical analysis on cadavers and have identified instrumentation that provides both stability and mobility to the atlantoaxial joint. The usefulness of such a device will have to be identified on the basis of subsequent studies. The more critical issues in the conduct of the surgery and its success are that the procedure should be technically simple and the implant needs to be physically sturdy and long-lasting. The movements permitted by the device should be optimum and not more than the normal range. The devastating effects of failed treatment should also be realized.

As the authors have mentioned, efforts to restore stability and retain mobility are rarely discussed. In this context, I invite the authors to view our description of an artificial atlantoaxial joint, which I believe to be the first described in the literature. We designed an artificial joint in the form of a ball-and-socket construct (Fig. 1). We believe that our design of the artificial joint is rather simple and possibly effective. Biomechanical analysis of the feasibility of the proposed artificial atlantoaxial joint is in progress. However, our current impression is that our construct and that described by the authors are only experimental and far from being ready for any clinical use. It is premature to state that the artificial atlantoaxial joint can ever be as as effective in its function as an artificial knee or hip joint. However, it is also true that such efforts can only serve as motivation for further innovations and developments.

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FIG. 1. A: The ball-and-socket articulation is visible. The serrated surface of the implant will be in proximity to the surface of the bone of the facet. B: The fixed implant on the undersurface of the facet of the atlas. The ball on the implant will articulate with the socket in the implant on the axis bone. C: The implant fixed to the facet of the axis bone. The socket is meant for the ball-and-socket articulation. D: The fixed implant and the articulation. Reprinted from Goel A: J Craniovertebr Junction Spine 6:147–148, 2015. CC BY-NC-SA 4.0. (https://creativecommons.org/licenses/by-nc-sa/4.0/). Figure is available in color online only.
Therefore, the NPAAJ may be useful for treating atlan- normal lateral C1–2 joints to achieve motor function, we 
pedicle screw implantation. Because the NPAAJ requires to implant our device is based on the technology used for 
achieve motion in different planes, and the surgery used (NPAAJ) is designed to stabilize the C1–2 complex and 
as his advice.

profound insights into artificial atlantoaxial joints, as well 
live animal experiments, we intend to increase the range 
been implanted in patients. In future studies, including 
preliminary study of cadavers, and our device has not yet 
believe that he will obtain very good results through his 
and ligaments.

In addition, we propose that osteotomy of the upper and 
achieve better C1–2 lateral bending and axial rotation. 
would be based on the trajectory of the lateral C1–2 joints 
to improve the design of the NPAAJ. Dr. 
C1–2 joints. Therefore, we intend to further study the tra-
and the relative trajectories of C1–2 are also complex and 
the trajectory of the lateral joint. Cur-
cess: 1) Its biomechanical properties should include not 
only the preservation of stability and mobility in the de-
ire designs, but also the minimization of forces at the 
surgical techniques for implantation should 
carry a reasonable risk profile to the patient and technical skill requirement amenable to most surgeons. 3) For better or worse, even the most perfect design needs to be evalu-
ated for cost-effectiveness. The appropriate patient popu-
ulation that could benefit from such a mobility-preserving surgery has yet to be defined, but given the importance of this spinal segment, such an implant could significantly improve surgery in the complex atlantoaxial region. 

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