6th World Congress on
Spine and Spinal Disorders

December 06-07, 2021 | Dubai, UAE

Patient-specific drill guide template for pedicle screw insertion into the Atlantoaxial Cervical Spine utilizing Stereolithographic Modelling: An *in vitro* study

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Introduction: Pedicle screw fixation is a recognized treatment option for cervical instabilities. However, the use of cervical pedicle screw fixation is limited by its demand on technical skill and risks owing to injury to the neurovascular structures. Hence, the accuracy of screw placement is vital in the success of the procedure. In the recent decade, attention has been given to 3D printing to create drill guide templates in cervical spine stabilization. While various literatures have described the accuracy of using a patient-specific drill guide in the subaxial cervical spine, limited studies explored its role in the atlantoaxial spine.

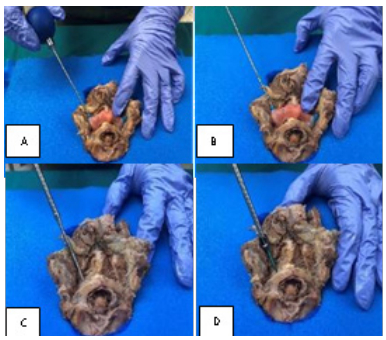
Objectives: To assess the accuracy of atlantoaxial cervical pedicle screw insertion using a patient-specific drill guide template from stereolithographic modeling.

Design: *In vitro* (cadaveric) study

Methods: Seventeen atlantoaxial cervical vertebrae specimens were collected from the University of the Philippines Manila, College of Medicine, and Department of Anatomy. Out of 17, two C1 and two C2 vertebrae were excluded. 3D reconstruction of cervical models was done using CT scan images of the specimens. These images were formatted to .stl file and were subsequently used to produce cervical plastic models. Using acrylic cement, drill guide templates were molded. Pedicle screw insertion was done on cadaveric specimens using the specific drill guide templates. The accuracy of screw placement was evaluated by an independent evaluator.

Results: A total of 60 pedicles (combined C1 and C2) from 15 cadaveric axial cervical vertebrae were evaluated. Pedicle screw insertion in the atlantoaxial cervical vertebrae has a total accuracy of 93.33%. One- hundred percent accuracy was achieved in the C1 vertebrae compared to 86% in the C2 vertebrae.

Conclusion: Patient-specific drill guide template using stereolithographic modeling is accurate in the pedicle screw insertion of cadaveric atlantoaxial specimens



Biography

Harjoland L Obenieta is currently a 3rd year Orthopedic Surgery Resident in the University of the Philippines Manila, Philippine General Hospital. He has particular interest in Spine Surgery and Research.

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