A safe cervical pedicle screw insertion technique using a direct C-arm view of the pedicle medial cortex during a dangerous probe insertion procedure.

Tadanori Ogata, MD¹, Tadao Morino¹, MD, Hideki Horiuchi¹, MD, Shintaro Yamaoka¹, MD, and Hiromasa Miura², MD

¹Spine Center, Ehime University Hospital
²Department of Bone and Joint Surgery, Ehime University Graduate School of Medicine, Tohon-city, Ehime 791-0295, Japan
Introduction

Pull-out strength of pedicle screws have been reported to be two-times or nearly 4 times greater than that of the lateral mass screws. However, the cervical pedicle screw insertion procedure involves serious risk to the vertebral arteries and the spinal cord.

Therefore, it is necessary to develop a safe procedure for the insertion of the probe into the isthmus of the pedicle.

In the present paper, we propose a safe probe insertion technique using a C-arm oblique view.
Medial cortex of the pedicle is clearly seen in the 45° oblique view.

Methods

The unique straight probe used for our technique. The tip of probe is blunt and the relatively thick stem prevents misdirection during the procedure.
Schematic drawing of the relationship between the prone-positioned patient and the C-arm.

In most cervical vertebrae, the angle of the cervical pedicle in the transverse plane ranges from about 40° to 50°. Prior to the beginning of the operation, the C-arm view is tested to reveal pedicle axis on the left and right sides.
At the beginning of probe insertion, the tip of probe cannot be observed in the C-arm oblique image. When the surgeon applies force to the probe, the vertebra rotates and the tip of probe becomes visible in the C-arm view.

Surgeons should control the tip of probe so that it is inserted along the medial cortex of the pedicle throughout the probe insertion procedure.
Results: Postoperative axial CT view assessment

Grading of the screw position

Grade I: The screw is centered in the pedicle.
Grade IIa: The screw threads or less than one-fourth of the screw cross-section penetrate the cortex.
Grade IIb: More than one-fourth of the screw cross-section penetrates the cortex but no contact with neurovascular structures.
Grade III: The screw position according to grade II, however, in contact with neurovascular structures.

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Conclusions

1) In the present paper, we introduce a safe technique for cervical pedicle screw insertion using C-arm imaging.
2) Using this method, we can prevent serious misdirection of the pedicle screws which exposes the vertebral artery to danger.
3) Inserting screws under direct observation is the most reliable method of screw insertion as it always has been in the past.

Conflict of interest
The authors declare no conflict of interest.