

Extreme Lateral Cervical Foraminotomy with an Anterior-Oblique Minimally Invasive Approach: Feasibility Cadaveric and Radiologic Study

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Introduction

With the proposal of decrease the upper airways and esophagus manipulation we analyze the feasibility of a minimally invasive anterior extreme-lateral approach for decompression of the cervical subaxial foramina.

Methods

We performed a review of one hundred cervical MRI of a radiological data-base of patients from one university hospital. We described distances, angles, and anatomical relationships of a thirty degrees to the sagittal plane angled approach to the neuroforamina in the cervical spine. After that we performed a cadaveric approach following the radiologically defined surgical way to the cervical foramina for decompression.

Results

There are different anatomical considerations for the superior and inferior cervical levels. The initial planned approach was medial to the ECM muscle. However, at the lower cervical disc spaces this proposal could be difficult to attain because of the medial position of the ECM muscle inferior attachment in the sternum. On average, for the direct approach to the uncinete process the angulation is about 30 degrees (47.3 - 22.1) to the sagittal plane.

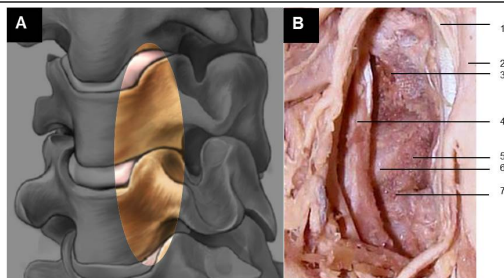


Fig. 2. A. Artist representation of the approach 15 degrees to the sagittal plane. B. The same approach in cadaver dissection. 1. Lateral longus colli 2. Common Carotid artery 3. C4 vertebral body 4. Medial longus colli 5. Left uncinete process of C5 6. C4C5 intervertebral disc 7. C5 vertebral body. The vertebral artery and the foramen are hidden to the surgical view.

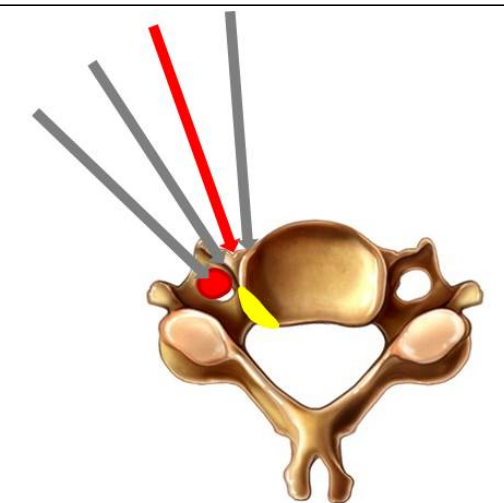


Fig. 3. Extreme lateral approach to the neural foramen, 15 degrees to the sagittal plane (red arrow). Only is visible the anterior half of the uncinete process. The target is the posterior one (yellow shadow).

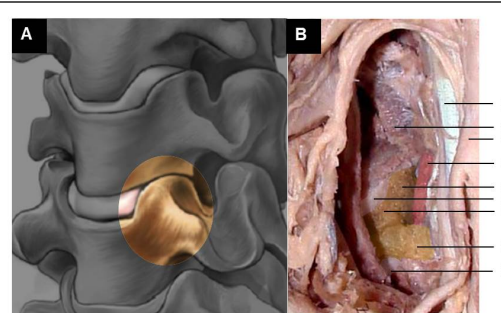


Fig. 4. A. Artist representation of the approach 30 degrees to the sagittal plane. B. The same approach in cadaver dissection. 1. Lateral longus colli 2. C4 vertebral body 3. Common Carotid artery 4. Vertebral artery 5. Left uncinete process of C5 6. C4C5 intervertebral disc 7. C5 vertebral body 8. Anterior transverse tubercle 9. C5C6 intervertebral disc. The vertebral artery and the foramen are exposed to the surgical view.

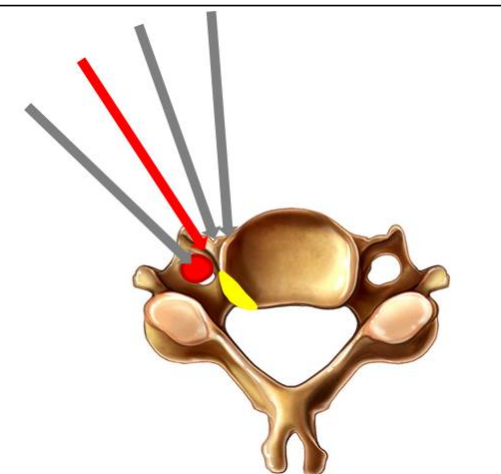


Fig. 5. Extreme lateral approach to the neural foramen, 30 degrees to the sagittal plane (red arrow). The uncinete process, the vertebral artery, and the neural foramen are all visible. The target is the posterior half of the uncinete process (yellow shadow). The neural root is protected by the vertebral artery.

Example Case

A 55 yo woman with right arm radicular pain, and numbness in the first two fingers of the hand. X-ray and MRI showed cervical lordosis preserved with C5C6 C6C7 degenerative disc diseases, and a extruded foraminal disc fragment at the C5C6 level on the right side. We performed the extreme-lateral anterior approach to the foramen. We resected just the rear quarter of the uncinete process and achieved a satisfactory decompression without neural or vascular damage. The patient remains asymptomatic three months after surgery.

Conclusions

A thirty degrees from midline anterior approach targeted to the anterior transverse tubercle, allowed us to expose directly the uncinete process. The decompression of the neural foramen would be attained by resection of the posterior half of the uncinete process and the piece of disc on the way. We think that this approach is feasible in the clinical setting. We have to adapt now the approach for endoscopic and/or MIS tubular surgical instruments, while considering the inherent risks associated to the manipulation of the neurovascular structures of the zone.



Fig. 6. Cervical MRI. A. Axial view at the C5C6 level. The red arrow points the extruded disc fragment. B. Sagittal view. There is no deformity.

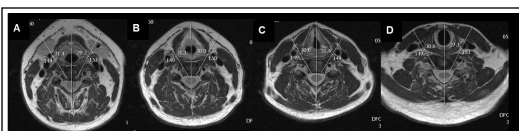


Fig. 1 A. C3C4 B. C4C5 C. C5C6 D. C6C7. In this case, the vascular cervical structures are lateral to the planned approach at any level.