



Application of a Far-Lateral Approach to the Subaxial Spine: Application, Technical Difficulties, and Results

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■ **OBJECTIVE:** The far-lateral approach has traditionally been used as an approach to ventral foramen magnum pathologies. Ventral pathologies in the cervical spine and cervicodorsal regions also provide unique surgical challenges. Traditional posterior surgical approaches to the ventral cervical pathologies require significant cord retraction, and anterior approaches require significant bone removal with implant stabilization. We approached these lesions using a modification of the far-lateral approach for lesions in the subaxial spine.

■ **METHODS:** Four patients underwent operations using this approach for ventral intradural pathologies in the subaxial spine. Two of the patients had recurrence of the lesions and underwent previous operations using a traditional midline approach.

■ **RESULTS:** All 4 patients underwent operations using this approach. This provided a unique view of the ventral pathologies and a scarless field in recurrent cases. All 4 patients improved neurologically after the surgery and had no deterioration or complications related to the surgery.

■ **CONCLUSION:** We propose extension of far-lateral approach to ventral intradural extramedullary lesions in the subaxial spine up to the cervicothoracic junction. The far-lateral approach can be extended safely to the ventral and ventrolateral lesions of the subaxial cervical spine, especially for recurrent or residual lesions previously approached from the midline posteriorly.

INTRODUCTION

The far-lateral approach was first described by Heros for approaching vertebral and vertebra-basilar aneurysms in 1986.¹ In 1988, George et al.² used this approach for lesions involving the ventral aspect of the foramen magnum (FM). Since then, a far-lateral approach or some modification of it has been used for different pathologies of the lower clivus and cervicomedullary region. The far-lateral approach has a steep learning curve, but provides a unique corridor for the neurosurgeons.

Similar to the challenge of approaching ventral lesions at the FM, intradural extramedullary (IDEM) pathologies ventral to the cord in the subaxial and cervicothoracic regions provide unique technical challenges. Traditional posterior surgical approaches to the ventral cervical pathologies require significant cord retraction, and anterior approaches require significant bone removal with a need for instrumented stabilization.

Pathologies that can occur ventral to the cord in the subaxial spine include meningiomas, schwannomas, neurenteric cysts, and arachnoid cysts. Partial resections in these lesions, especially in neurenteric cysts is associated with a high incidence of recurrence.³ In this study, we present our experience of using the far-lateral approach to ventral and ventrolateral IDEM pathologies of the subaxial spine in a mini-open, muscle-splitting manner.

MATERIALS AND METHODS

Patient Population

From 2014 to 2015, 4 patients with pathologies ventral to the cord in the subaxial spine and at the cervicothoracic junction underwent and operation using this modification of the far-lateral approach at the Fortis Memorial Research Institute (**Table 1**). The patients were 2 males and 2 females, with ages ranging

Key words

- Arachnoid cyst
- Far-lateral approach
- Recurrent neurenteric cyst
- Subaxial spine

Abbreviations and Acronyms

- FM:** Foramen magnum
- iCT:** Intraoperative computed tomography
- IDEM:** Intradural extramedullary
- MRI:** Magnetic resonance imaging

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Table 1. Clinical Overview of Patients in Study

Patient Number	Age at Surgery	Segmental Levels	Pathology	Preoperative Nurick Grade	Follow-Up (months)	Postoperative Nurick Grade	Complications
1	18 months	C7-D1	Neurenteric cysts	3	6	0	None
2	17 years	C5-6	Recurrent arachnoid cyst	4	14	1	None
3	10 years	C2-3	Recurrent arachnoid cyst	5	8	2	None
4	36 years	C7-D1	Meningioma	2	15	1	None

from 18 months to 36 years. All the patients underwent detailed neurologic assessment, and magnetic resonance imaging (MRI) of the cervical spine. In patients with recurrence, previous radiology, operative details, and histopathology were reassessed. Follow-up was done clinically, and repeated MRI scans were obtained at 3, 6, and 12 months.

EQUIPMENT

Retractor System

MAST Quadrant (Medtronic, Sofamor Danek, Minneapolis, Minnesota, USA) was used for 3 patients, and a simple malleable retractor system attached to a fixed arm was used for 1 patient.

Drill

Midas Rex Legend (Medtronic, Sofamor Danek) with an angled 9-cm attachment was used with a 2.4-mm burr in all 4 patients for bone work.

Microscope

OPMI Pentero (Carl Zeiss, Jena, Germany) was used in all 4 cases in this study.

Neuronavigation

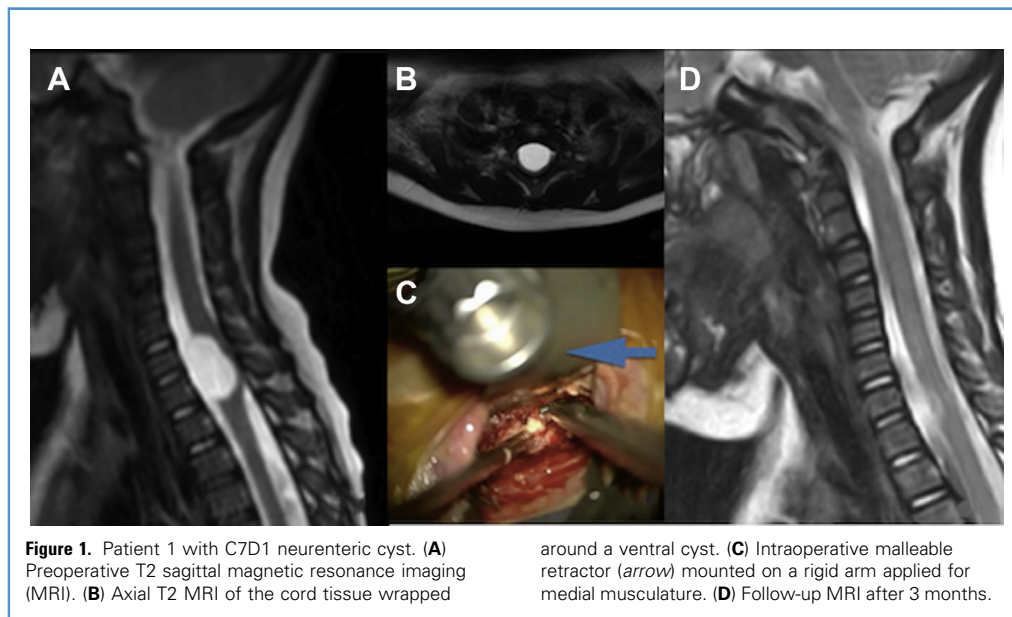
Brainlab Vector-vision with intraoperative computed tomography (iCT; Brainlab AG, Feldkirchen, Germany) was used in all 4 cases in the study to guide to the spinolaminar junction of the cervical vertebra.

RESULTS

Technique

The patient is positioned prone under general anesthesia with the head fixed in a Mayfield, iCT-compatible 3-pin head holder. Navigation is set up using iCT with automatic registration. The C-arm is positioned to take lateral exposures during the procedure. The microscope is brought in from the side opposite to the site of incision and approach. The surgical assistant also stands on the side opposite to the site of incision. The scrub nurse assists from the right of the surgeon.

The side of the surgical approach is chosen on the basis of laterality of the pathology, or whichever side has worse neurologic deficits. The incision is 4–5 cm lateral and parallel to midline. A 3-cm long incision can easily expose up to 3 cervical spinal levels.



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