





360-Degree Cervical Arthrodesis in Severe Stenosis: Case Series And Literature Review

Pedro Nogarotto Cembraneli¹ , Julia Brasileiro de Faria Cavalcante¹ , Italo Nogarotto Cembraneli² , Renata Brasileiro de Faria Cavalcante¹, José Edison da Silva Cavalcante¹, Rodrigo Correia de Alcântara¹, Marcos Daniel Xavier¹, Vitor Cesar Machado¹, Alessandro Fonseca Cardoso¹ and Chrystiano Fonseca Cardoso¹

¹Department of Neurosurgery, Hospital of Neurology Santa Mônica, Goiânia, Goiás, Brazil

²Department of Medicine, University Center of Mineiros, Mineiros, Goiás, Brazil

*Correspondence

Pedro Nogarotto Cembraneli

Department of Neurosurgery, Hospital of Neurology Santa Mônica, Goiânia, Goiás, Brazil

Abstract

Cervical stenosis is a progressive degenerative condition that can lead to severe and disabling myelopathy. In complex cases involving deformities, instability, or prior surgeries, a combined anterior and posterior approach (360-degree arthrodesis) may be indicated. This study presents a series of six cases of severe cervical stenosis treated with circumferential arthrodesis, discussing clinical, anatomical, and strategic aspects based on current literature.

Introduction

Cervical spinal stenosis is a common condition, especially in elderly patients, and is one of the main causes of spinal myelopathy. Complex cases are often marked by a history of prior surgeries, segmental instability, cervical kyphosis or straightening, and OPLL [1,2]. In such scenarios, isolated anterior or posterior approaches may be insufficient. A 360-degree arthrodesis is an option to ensure complete decompression and robust stability [3,4].

Methods

Between 2023 and 2024, six patients with severe cervical stenosis underwent 360-degree cervical arthrodesis at a tertiary care hospital. Inclusion criteria included clinical signs of myelopathy, radiological evidence of severe spinal cord compression, instability, OPLL, or previous surgical failure. Surgeries were performed either in a single session or in two stages. All procedures utilized continuous intraoperative neurophysiological monitoring. Follow-up ranged from 17 to 30 months.

Case presentations

Case report 1

A 72-year-old woman with no known comorbidities presented with a one-year history of cervicgia radiating to the right upper limb. Six months before surgery, she developed progressive right arm weakness that evolved into functional tetraparesis.

Cervical MRI revealed disc herniations at C3–C4 and C4–C5, associated with ossification and severe spinal canal stenosis. Findings were consistent with cervical myelopathy and

marked spinal cord compression (Figure 1).

Due to progressive neurological decline and risk of irreversible damage, single-stage 360-degree cervical arthrodesis was performed. The anterior approach included C4 corpectomy, interbody cage placement, and anterior plating. In the same session, a posterior approach was performed with laminectomy from C3 to C5 and lateral mass screw fixation (Figure 2).

The surgery was uneventful under continuous neurophysiological monitoring. The patient had no postoperative neurological deficits and showed favorable recovery. At 2-year follow-up, she remained neurologically stable with mild residual right upper limb weakness.

Case 2

A 43-year-old man with no comorbidities presented with progressive upper and lower limb weakness, resulting in functional tetraparesis. Despite being ambulatory, he had significant motor impairment and gait disturbance. Symptoms worsened over the two weeks preceding evaluation.

Cervical MRI showed a calcified disc herniation at C5–C6 with associated OPLL, causing severe spinal cord compression (Figure 3).

Given the severity, anterior cervical arthrodesis was performed with C5–C6 discectomy, interbody cage placement, and anterior plate. Clinical improvement was minimal, and functional recovery was limited. Six months later, posterior decompression with laminectomy and lateral mass fixation

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Keywords

Cervical stenosis; Myelopathy; Cervical arthrodesis; Combined surgery; Ossification of the posterior longitudinal ligament (OPLL)

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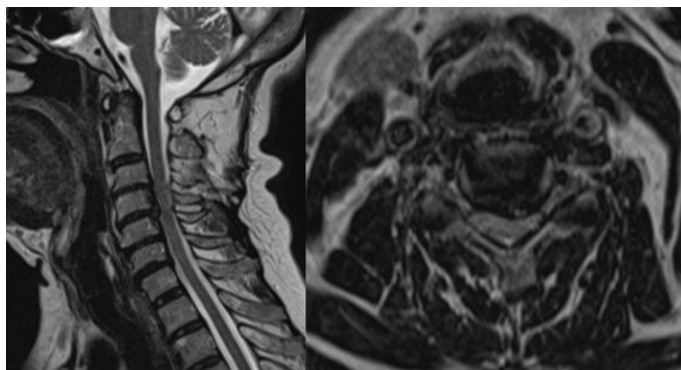


Figure 1. T2-weighted cervical spine MRI in sagittal (left) and axial (right) planes shows posterior disc herniation at C3–C4 and C4–C5 with significant spinal cord compression. There is evidence of severe canal stenosis and T2 hyperintense intramedullary signal suggestive of chronic myelopathy. The axial view reveals markedly reduced perimedullary CSF space, confirming spinal cord compression.



Figure 2. Postoperative lateral cervical spine X-ray showing 360-degree arthrodesis with anterior and posterior instrumentation. Anteriorly, C4 corpectomy with interbody cage and cervical plate with screws is evident. Posteriorly, laminectomy from C3 to C5 with lateral mass screw fixation is seen. Cervical alignment is preserved with appropriate sagittal reconstruction and implant positioning.



Figure 3. T2-weighted cervical MRI (sagittal left, axial right) shows a calcified C5–C6 disc herniation with OPLL. There is marked spinal canal narrowing and reduced perimedullary CSF space. The axial view confirms circumferential spinal cord compromise, consistent with advanced cervical myelopathy.



Figure 4. Postoperative lateral cervical X-ray showing combined anterior and posterior instrumentation. C5–C6 interbody cage and anterior plate are visible. Posteriorly, laminectomy and lateral mass screw fixation with rods are evident. Cervical alignment and stabilization appear satisfactory.

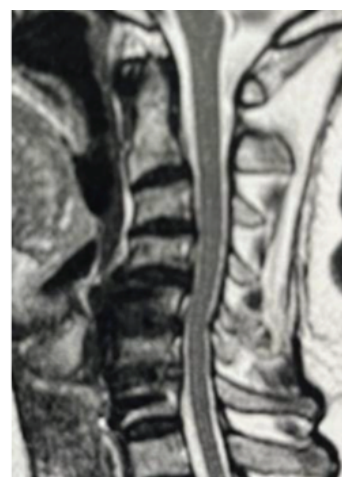


Figure 5. Postoperative lateral cervical X-ray showing 360-degree arthrodesis. Anterior implants include a C3–C4 cage and plate, and a C4–C5 standalone cage. The previous C5–C7 plate remains. Posterior fixation from C3 to T1 uses cement-augmented lateral mass screws. Proper alignment and implant positioning are noted.

was performed (Figure 4), without further neurological gains.

At 30-month follow-up, the patient was ambulatory with functional limitations.

Case 3

A 67-year-old woman with osteoporosis and previous ACDF (C5–C7, 7 years prior) presented with severe pain and progressive weakness in all four limbs. Current imaging showed degenerative changes, spinal cord compression, segmental instability, and emerging kyphosis (Figure 5).

360-degree arthrodesis was performed, starting with anterior discectomy and fusion at C3–C4 using cage and plate, and a standalone cage at C4–C5. The previous anterior implant was



Figure 6. Postoperative lateral cervical X-ray showing 360-degree arthrodesis. Anterior implants include a C3–C4 cage and plate, and a C4–C5 standalone cage. The previous C5–C7 plate remains. Posterior fixation from C3 to T1 uses cement-augmented lateral mass screws. Proper alignment and implant positioning are noted.

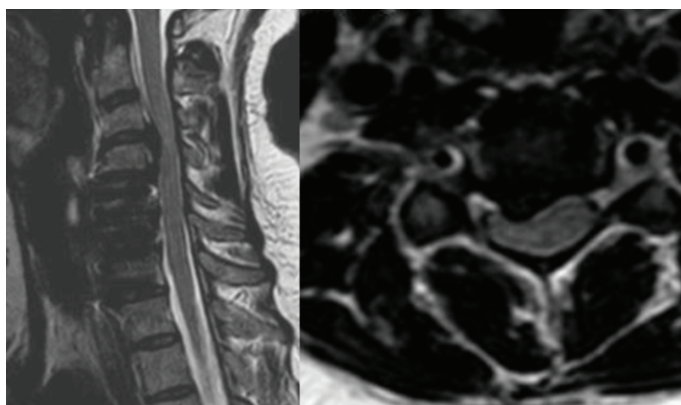


Figure 7. T2-weighted cervical MRI (sagittal left, axial right) shows extruded disc herniations at C3–C4 and C4–C5, with marked spinal canal stenosis and spinal cord compression. Intramedullary T2 hyperintensity indicates myelopathy. There is cervical straightening, early kyphosis, and segmental instability.

preserved. Posteriorly, fixation from C3 to T1 using lateral mass screws and cement augmentation ensured stability (Figure 6).

Surgery was uneventful under monitoring. Transient dysphagia resolved in two weeks. At 20 months, the patient was neurologically intact and functionally independent.

Case 4

A 49-year-old man with previous ACDF (C5–C7, 10 years prior) presented with neck pain radiating to the right arm and progressive tetraparesis.

MRI revealed extruded herniations at C3–C5, with severe stenosis, spinal cord compression, cervical misalignment, and emerging kyphotic deformity (Figure 7).

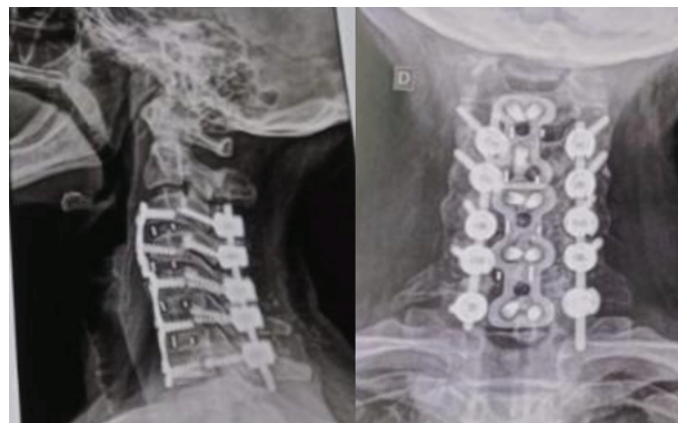


Figure 8. Postoperative cervical spine radiographs (lateral and AP) show anterior cages at C3–C4 and C4–C5, new cervical plate, and retained prior C5–C7 implant. Posterior fixation spans C3–C5 with lateral mass screws. Good alignment and implant placement indicate stable reconstruction.



Figure 9. T2-weighted sagittal MRI reveals multiple cervical disc herniations and extensive OPLL. There is critical canal stenosis, severe spinal cord compression, and loss of cervical lordosis, consistent with multifactorial compressive myelopathy.

Combined approach was used: anterior discectomies at C3–C4 and C4–C5 with cages and a new plate (old plate preserved), and posterior laminectomy with fixation from C3 to C5 (Figure 8).

Surgery was uneventful with intraoperative monitoring. Transient dysphagia resolved spontaneously. The patient improved partially but continued to report pain and radiculopathy.

Case 5

A 51-year-old man presented with progressive tetraparesis over two months. MRI showed multiple disc herniations and multilevel OPLL, with severe stenosis and loss of cervical lordosis (Figure 9). No segmental instability was noted.



Figure 10. Postoperative AP and lateral cervical X-rays show anterior C5 corpectomy with interbody cage and cervical plate. Posteriorly, laminectomy from C4 to C6 with lateral mass screws is visible. Alignment and implant positioning are satisfactory.

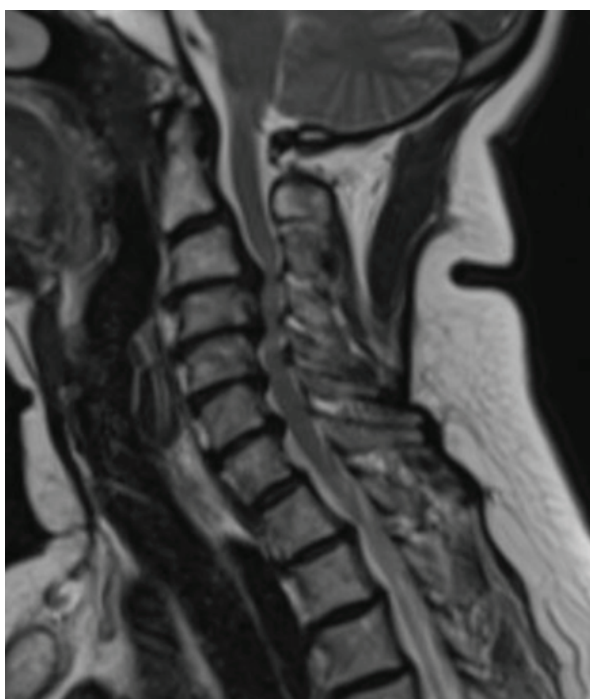


Figure 11. T2-weighted sagittal cervical MRI shows multiple disc herniations with multilevel OPLL and critical stenosis. Intramedullary T2 hyperintensity indicates severe myelopathy. Spinal canal morphology is severely compromised.

A single-stage 360-degree fusion was performed: C5 corpectomy with anterior cage and plate, and posterior laminectomy from C4 to C6 with lateral mass screw fixation (Figure 10).

The patient improved functionally and remained ambulatory with partial assistance.

Case 6

A 71-year-old woman with progressive motor and sensory deficits over six months presented with functional tetraparesis. She was ambulatory with support and had osteoporosis.

MRI showed multilevel herniations from C3–C4 to C6–C7, with OPLL, severe stenosis, and intramedullary hyperintensity indicating advanced myelopathy (Figure 11).

360-degree arthrodesis was performed: anterior C4 corpectomy and C5–C6 discectomy with interbody cage,

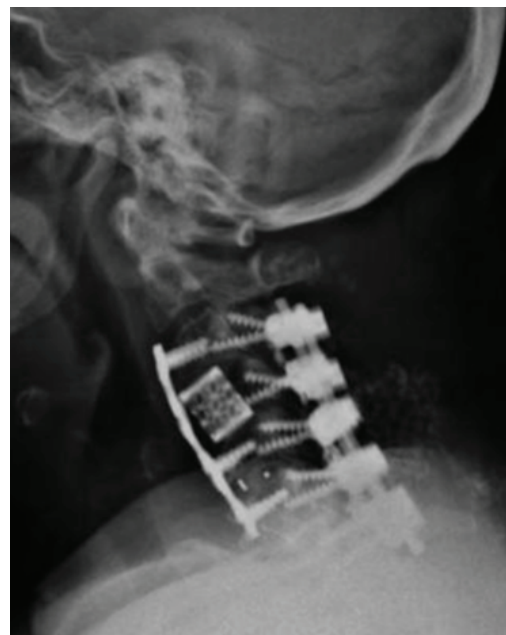


Figure 12. Postoperative lateral cervical X-ray shows anterior C4 corpectomy and C5–C6 discectomy with cage, vertebral substitute, and anterior plate. Posteriorly, laminectomy from C3 to C7 with lateral mass screw fixation is evident. The alignment is satisfactory with stable reconstruction.

vertebral replacement, and anterior plate; and posterior laminectomy from C3 to C7 with lateral mass screw fixation (Figure 12).

The patient recovered progressively and was walking unaided at 18 months, with mild residual cervical pain and right arm radiculopathy. Transient dysphagia resolved spontaneously.

Discussion

360-degree cervical arthrodesis represents a comprehensive approach to complex cervical stenosis. The combination of anterior and posterior decompression addresses both ventral and dorsal spinal cord compression, corrects misalignment, and provides stronger biomechanical stability [5,6].

Multilevel OPLL, as seen in several of our cases, is associated with worse neurological outcomes when managed by limited approaches. Studies show that combined surgery results in better decompression and reduced progression of residual ossification [10,11]. Moreover, in patients with cervical kyphosis, a posterior-only approach may worsen the deformity, making anterior reconstruction essential to restore sagittal alignment [12].

Another critical aspect involves revision surgeries. The presence of fibrosis, old plates, and altered anatomy increases the risk of anterior reapproach. As seen in Cases 3 and 4, posterior complementation allows implant preservation and reduces complications such as esophageal injury or fistulas [8,13].

Osteoporosis, present in two patients, is a challenging factor, particularly for posterior fixation. Cement augmentation of lateral mass screws proved safe and effective in achieving stability in these cases, as supported by recent studies [14].

Complications such as dysphagia were observed but transient, resolving within days. The absence of CSF leaks or postoperative neurological injuries suggests that despite its

complexity, 360-degree arthrodesis can be safe when performed with neurophysiological monitoring and individualized planning [15–17].

Finally, the extended operative time and the need for multidisciplinary expertise justify centralizing these cases in tertiary centers. Literature reinforces that outcomes are superior when these procedures are performed by experienced teams [18].

Conclusion

360-degree cervical arthrodesis is an effective technique for treating complex cases of cervical stenosis, especially those with severe myelopathy, OPLL, instability, or previous surgical failure. Despite its higher operative risk, it yields good outcomes when properly indicated and performed by an experienced team.

Conflict of interest

The authors have no conflict of interests to declare.

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