

Dynamic paraspinal muscle impingement causing acute hemiplegia after C1 posterior arch laminectomy

A case report

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Abstract

Rationale: Acute neurological deficits following spinal surgery commonly result from epidural hematoma, surgical trauma, vascular compromise, and graft or hardware impingement, with the cause identified by magnetic resonance imaging (MRI). We present a rare case of dynamic paraspinal muscle impingement after C1 posterior arch laminectomy, which was diagnosed by myelography, with no significant findings on MRI.

Patient concerns: An 81-year-old, severely obese male, was referred to our department for the treatment of vertebral disease of the lumbar spine. The patient presented with bilateral weakness and numbness of the upper extremities and gait disturbances. Based on MRI, a diagnosis of retro-odontoid pseudotumor was made, and C1 posterior arch laminectomy, in combination with C4 partial laminectomy and C5 to C6 laminoplasty, was performed. On postoperative day 3, the patient's neurological status deteriorated, with right upper extremity and right lower extremity weakness increasing with neck extension. Although there was no evidence of epidural hematoma formation on MRI, obstruction of the flow of contrast medium by an external posterior compression in neck extension at the level of C1 was identified by myelography. Revision surgery was performed and local muscle swelling at the surgical site identified with no hematoma formation. Occiput to C3 fixation, with instrumentation, was performed.

Outcomes: Muscle strength of the right upper extremity and lower extremities recovered postsurgery, and the patient has continued to improve function 3 years after surgery, with no further neurological episodes.

Lessons: Dynamic paraspinal muscle impingement following C1 laminectomy in a muscular man was diagnosed by myelography, with no significant findings on standard MRI.

Conclusion: The possibility of dynamic paraspinal muscle impingement should be considered in patients developing acute, progressive, neurological deficits after posterior cervical decompression, with myelography being the imaging method of choice for diagnosis.

Abbreviation: MRI = magnetic resonance imaging.

Keywords: MRI, myelography, posterior cervical decompression, postoperative neurologic deficit, upper cervical spine

1. Introduction

Acute neurological deficits following spinal surgery commonly result from epidural hematoma, surgical trauma, vascular compromise, and graft or hardware impingement,^[1–4] with the

cause identified by magnetic resonance imaging (MRI). We present a rare case of spinal cord compression resulting from dynamic paraspinal muscle impingement after C1 posterior arch laminectomy. The dynamic compression was identified by myelography, with no significant findings on standard MRI.

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2. Case report

An 81-year-old man, with a 1-year history of upper extremity weakness and progressive involvement of the lower extremities, including appearance of gait disturbances, was referred to our hospital for the treatment following a diagnosis of lumbar spine vertebral disease. The past medical history was unremarkable, except for angioplasty after acute myocardial infarction with ongoing anticoagulant therapy.

The patient was obese (height, 172 cm; weight, 90.9 kg; and body mass index, 30.7). Positive neurological findings included: gait disturbances, requiring assistance; Romberg test; general bilateral decrease in strength of the upper and lower limbs, with manual muscle testing (MMT) score of 4/5 for all muscle groups distal to, and including, the deltoid muscle of the right upper

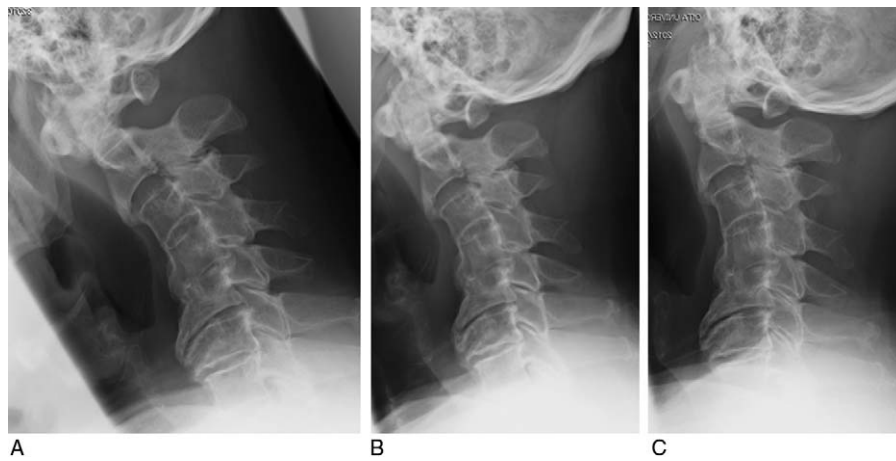


Figure 1. Dynamic plain radiographs of the cervical spine in flexion (A), neutral (B) and extension (C) positions, with no evidence of atlanto-axial instability.

extremity; and bilateral upper extremity numbness, with associated impairments of fine motor skills. On plain radiographs, kyphotic alignment of the cervical spine, with C2–C5 ankylosis, was evident, with no indication of atlanto-axial instability (Fig. 1A–C). On MRI, a retro-odontoid mass formation, with associated local compression of the spinal cord, was identified, with C4–C5 and C5–C6 stenosis (Fig. 2A and B). A retro-odontoid pseudotumor was diagnosed and C1 posterior arch laminectomy, in combination with C4 partial laminectomy and C5 to C6 laminoplasty, performed. In the surgery, rectus capitis posterior minor, rectus capitis posterior major, and obliquus capitis minor were resected and not reconstructed. On the other hand, semispinalis cervicis was preserved.

Neurological symptoms recovered on postoperative day 1, with 5/5 MMT of the right upper extremity and independent ambulation with a walker. However, neurological status

deteriorated on postoperative day 3, with 3/5 strength of the upper and lower extremity and independent ambulation no longer possible. Neurological symptoms improved with neck flexion. Dysarthria and facial paralysis were not observed and brain MRI was unremarkable. Cervical MRI revealed no evidence of epidural hematoma formation (Fig. 3A), confirming successful osseous decompression (Fig. 3B–E). The patient opted for conservative treatment of bed rest and immobilization with a cervical collar. Considering the nonresolution of symptoms and dynamic effects of neck posture on symptomology, myelography was performed on postoperative day 13, indicating a flow obstruction of the contrast medium by an external compression at the level of C1 with neck extension (Fig. 4A and B). Halo-vest immobilization was started, providing temporary recovery of muscle weakness. Revision surgery was performed on postoperative day 28, through the same posterior approach, with evidence

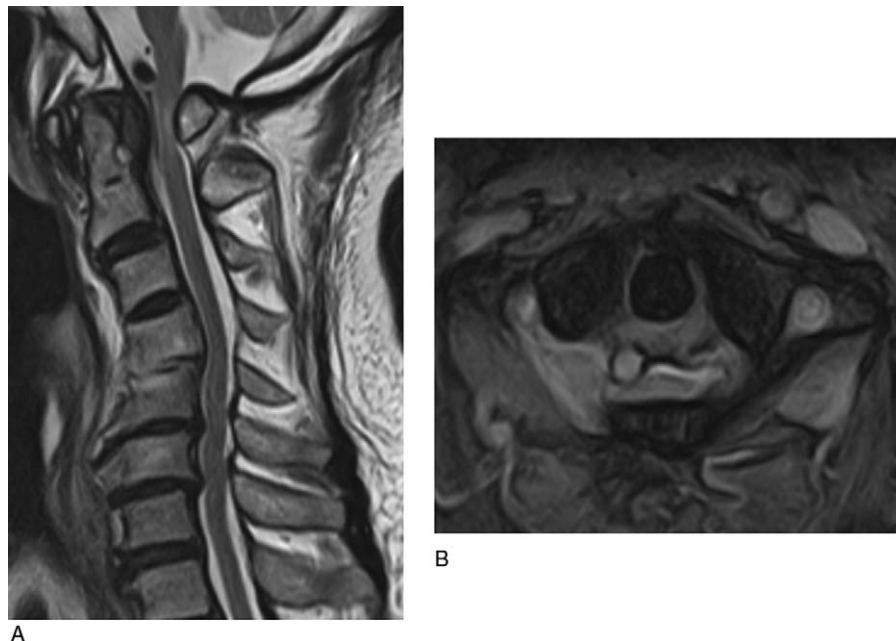


Figure 2. Pre-operative T2-weighted magnetic resonance images, in the sagittal (A) and axial (B) planes showing a retro-odontoid pseudotumor compressing the spinal cord.

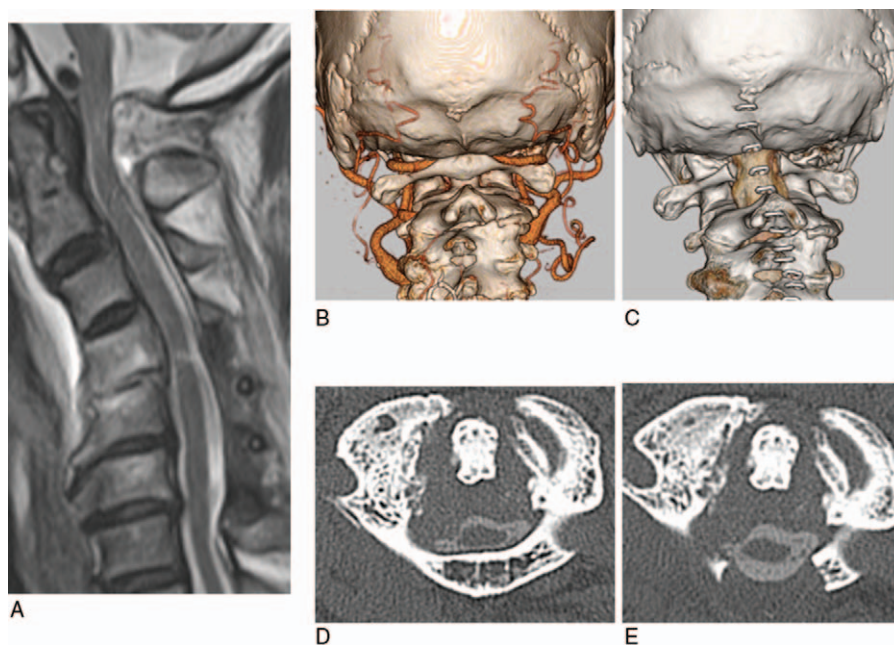


Figure 3. Post-operative T2-weighted magnetic resonance image in the sagittal plane (A), with no evidence of epidural hematoma formation. Successful osseous decompression was confirmed by comparison of 3-dimensional computerized tomography (CT) images obtained pre-operatively (B) and postoperatively (C), as well as CT myelography images obtained in the pre- (D) and postoperative (E) axial planes. CT=computerized tomography.

of local swelling of muscles but no hematoma formation. Instrumented occiput-to-C3 fixation was performed and secured posterior decompressive space (Fig. 5A and B).

Postoperatively, neurological symptoms recovered, with full muscle strength and ambulation using a walking frame. The patient was transferred to a different hospital on day 26 for outpatient follow-up. Three years after surgery, the patient has recovered function, with no recurrence of neurological symptoms.

The patient signed informed consents. In our case the patient accepted regular and proved therapy, so the ethical approval was not necessary.

3. Discussion

Although retro-odontoid pseudotumors are commonly managed by direct resection, using a transoral approach, and posterior fixation, with or without decompression,^[5-7] favorable outcomes

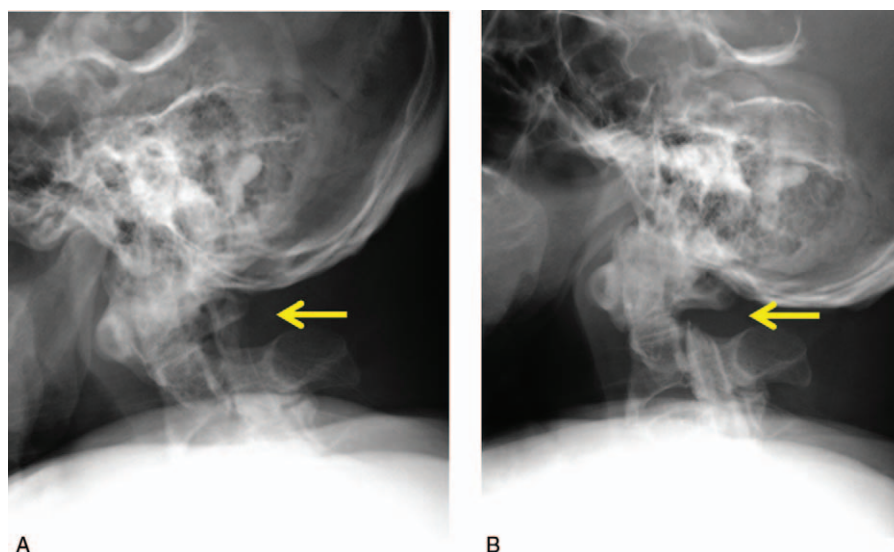


Figure 4. Postoperative myelography in flexion (A) and extension (B), showing a continuous flow of contrast medium in neck flexion position and obstructed flow in extension position by an external compression at the level of C1.

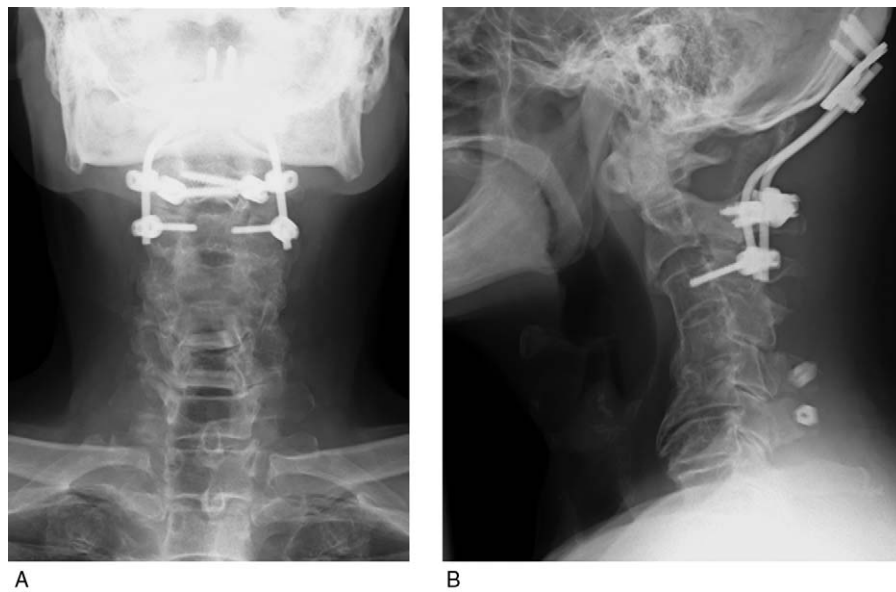


Figure 5. Postoperative plain radiograph, anteroposterior (A) and lateral (B) views, showing posterior spinal fixation from the occiput to C3.

of posterior decompression alone have been reported for patients with no evidence of atlanto-axial instability.^[8,9] We selected this minimally invasive approach based on our patient's age, past history of heart disease, and no evidence of instability despite a kyphotic alignment of the cervical spine. However, C1 posterior arch resection creates a space through which the posterior muscles and soft tissues can impinge the spinal cord. This space is further narrowed by kyphotic alignment, obesity, which increases the volume of soft tissue, and neck extension postures, risk factors which were all present in our patient. Although Jost et al^[10] reported a case of paraspinal muscle impingement following C3-C5 laminectomy in a muscular man, we did not identify any other report of muscle impingement involving the upper cervical vertebrae. Suetsuna et al^[11] reported favorable outcomes of C1 laminoplasty for the treatment of retro-odontoid pseudotumor. As this method preserves the posterior arch, it should be considered for patients at risk for posterior impingement following C1 posterior arch resection.

Although MRI is the method of choice to identify postoperative causes of spinal cord compression,^[1-4] muscle impingement in our case was only identifiable on myelography. Therefore, although myelography is recommended for preoperative assessment of stenosis and instability, it can also be a useful to detect dynamic spinal cord compression on postoperative status.

Acute neurological deficits after spinal surgery are often reversible, and permanent functional disorders prevented, by rapid diagnosis and early treatment. We recommend that dynamic paraspinal muscle impingement be considered for patients with acute, progressive neurological deficits after

posterior cervical decompression, in the presence of negative MRI assessment on supine and neutral neck position.

References

- [1] Lee JY, Schwartz DM, Anderson DG, et al. Epidural hematoma causing dense paralysis after anterior cervical corpectomy. A report of two cases. *J Bone Joint Surg Am* 2006;88:198–201.
- [2] Flynn TB. Neurologic complications of anterior cervical interbody fusion. *Spine* 1982;7:536–9.
- [3] Hans P, Delleuze PP, Born JD, et al. Epidural hematoma after cervical spine surgery. *J Neurosurg Anesthesiol* 2003;15:282–5.
- [4] Jones SJ, Buonamassa S, Crockard HA. Two cases of quadriplegia following anterior cervical discectomy, with normal perioperative somatosensory evoked potentials. *J Neurol Neurosurg Psychiatry* 2003;74:273–6.
- [5] Crockard HA, Sett P, Geddes JF, et al. Damaged ligaments at the craniocervical junction presenting as an extradural tumour: a differential diagnosis in the elderly. *J Neurol Neurosurg Psychiatry* 1991;54:817–21.
- [6] Barbaqallo GM, Certo F, Visocchi M, et al. Disappearance of degenerative, non-inflammatory, retro-odontoid pseudotumor following posterior C1-C2 fixation: case series and review of the literature. *Eur Spine J* 2013;22:879–88.
- [7] Yoshida K, Hanyu T, Takahashi HE. Progression of rheumatoid arthritis of the cervical spine: radiographic and clinical evaluation. *J Orthop Sci* 1999;4:399–406.
- [8] Kakutani K, Doita M, Yoshikawa M, et al. C1 laminectomy for retro-odontoid pseudotumor without atlantoaxial subluxation: review of seven consecutive cases. *Eur Spine J* 2013;22:1119–26.
- [9] Chikuda H, Seichi A, Takeshita K, et al. Radiographic analysis of the cervical spine in patients with retro-odontoid pseudotumors. *Spine* 2009;34:E110–4.
- [10] Jost PW, Marawar S, O'Leary PF, et al. Paraspinal muscle impingement causing acute Brown-Sequard syndrome after posterior cervical decompression. *Spine* 2010;35:E260–3.
- [11] Suetsuna F, Narita H, Ono A, et al. Regression of retroodontoid pseudotumors following C-1 laminoplasty. *J Neurosurg Spine* 2006;5:455–60.