

Intraforaminal cervical gas cyst with vacuum disc treated by anterior cervical discectomy and fusion: illustrative case

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BACKGROUND The authors report an extremely rare presentation of a patient with an intraforaminal cervical gas cyst with radiculopathy. The patient's condition was refractory to conservative treatment, and he was treated by anterior cervical discectomy and fusion (ACDF). Several intraspinal gas cysts with lumbar disc herniation have been treated surgically. However, no cases of intraforaminal cervical gas requiring ACDF have been reported.

OBSERVATIONS A 70-year-old male patient presented with right-sided neck and shoulder pain, aggravating in the supine position. Cervical radiography showed vacuum disc phenomenon at C4–5, and multiplanar computed tomography showed intraforaminal gas along the right C5 nerve root. The patient experienced severe pain with impaired sleep and daytime fatigue. After confirming C5 radiculopathy using an echo-guided technique using ultrasonography guidance, the authors performed C4–5 ACDF. Postoperatively, the patient's neck and shoulder pain disappeared immediately. There was no recurrence at the 2-year follow-up.

LESSONS This is the first case report of an intraspinal cervical gas cyst with radiculopathy treated by ACDF surgery. The vacuum disc had been implicated as the genesis of the intraforaminal cervical gas cyst, leading to radiculopathy. ACDF surgery provides favorable outcomes in cases of intraspinal gas refractory to conservative therapy.

<https://thejns.org/doi/abs/10.3171/CASE21638>

KEYWORDS intraforaminal gas cyst; vacuum disc phenomenon; intraspinal gas cyst; multiplanar computed tomography; anterior cervical discectomy and fusion; cervical disc herniation

Vacuum disc phenomena resulting from the collection of gas into the intervertebral disc tissue are seen frequently with aging and disc degeneration; however, these do not always correlate with clinical symptoms.¹ Although the clinical influence of the vacuum disc phenomenon is small, the intraspinal gas cyst may have a distinct significance. Patients with intraspinal gas cysts present with localized or radicular pain because of the dural sac and nerve root compression. These symptoms are rare in the lumbar spine^{2,3} but even rarer in the cervical spine. We report a case of one patient with an unusual presentation of cervical neuropathy with an intraforaminal gas cyst associated with a degenerated vacuum disc.

Illustrative Case

A 70-year-old man presented with right-sided neck to shoulder pain that had persisted for 3 weeks. He complained of severe neck

to shoulder pain, which was aggravated in supine, with difficulty sleeping at the time of admission to our hospital. There was no history of neck surgery, cervical puncture, or epidural anesthesia. Neurological examination revealed no muscle weakness or sensory deficit. The patient's laboratory values were within normal limits. Cervical radiography revealed spondylotic changes, including the vacuum disc phenomenon at C4–5 (Fig. 1A). Magnetic resonance imaging revealed a mass lesion around the right C5 spinal nerve root (Fig. 1B). After myelography, multiplanar computed tomography showed an intraforaminal gas cyst along with the right C5 spinal nerve root (Fig. 2A–C). We confirmed right C5 radiculopathy using an echo-guided block technique with direct visualization of the nerve root. After a temporarily promising response to the block therapy, the patient experienced severe pain again. Then, anterior

ABBREVIATION ACDF = anterior cervical discectomy and fusion.

INCLUDE WHEN CITING Published March 21, 2022; DOI: 10.3171/CASE21638.

SUBMITTED November 9, 2021. **ACCEPTED** January 27, 2022.

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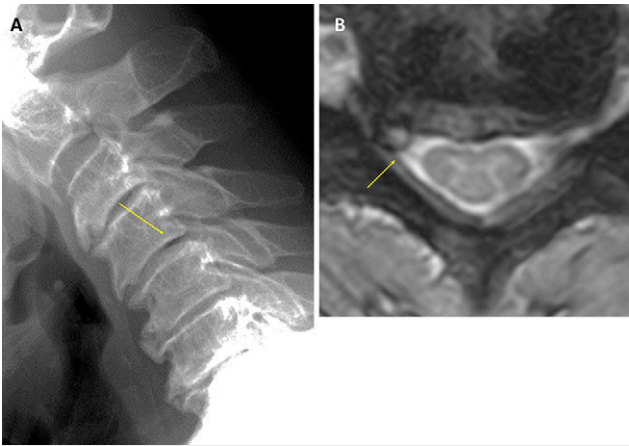


FIG. 1. Preoperative cervical images. **A:** Lateral cervical flexion radiograph. *Yellow arrow* indicates the intradiscal vacuum. **B:** T2-weighted axial magnetic resonance imaging scan at C4–5. *Yellow arrow* indicates low-intensity mass compressing the right C5 nerve root.

cervical discectomy and fusion (ACDF) was performed at C4–5 (Fig. 3). During surgery, no visible structures such as cysts or a fibrous annulus were noted after resecting the posterior longitudinal



FIG. 3. Postoperative lateral cervical image showing ACDF at C4–5.

ligament. After the operation, the neck and shoulder pain showed an immediate improvement. Bone union without an intraforaminal gas cyst was observed 1 year after the surgery (Fig. 4A and B). The patient did not report a recurrence of his preoperative pain at the 2-year follow-up.

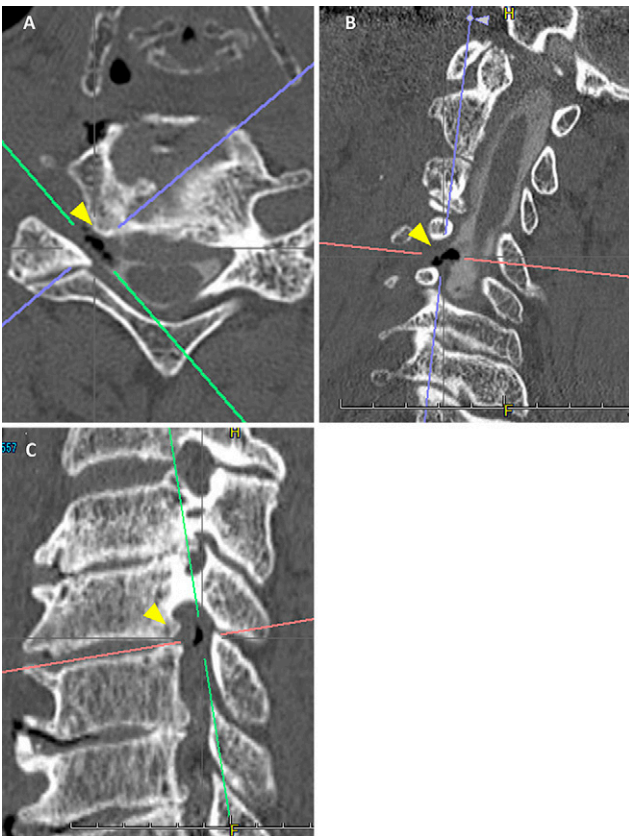


FIG. 2. Preoperative cervical multiplanar computed tomography (CT). The yellow arrowheads indicate gas collection at the right C4–5 foramen. **A:** Axial CT at C4–5. **B:** Anterior oblique CT. **C:** Posterior oblique CT.

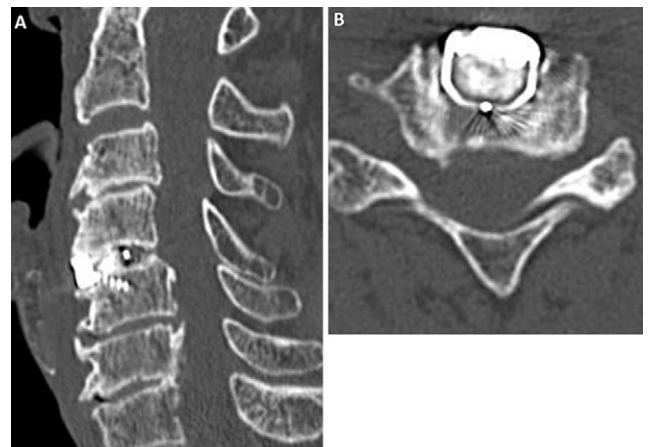


FIG. 4. One-year postsurgical computed tomography (CT) showing bony union at C4–5. **A:** Coronal CT. **B:** Axial CT showing the disappearance of the intraforaminal gas.

Discussion

The incidence of vacuum disc phenomenon increases with age and has been reported in approximately 50% of patients over the age of 40.⁴ Although vacuum phenomenon is commonly paralleled with the presence of disc degeneration, other conditions of the disc and adjacent spine, such as trauma, infection, neoplasia, osteonecrosis, injection therapy, and spine surgery, may also be associated with the collection of gas.^{5,6}

Observations

In our case, the patient had not experienced any puncture procedures or traumatic episodes, suggesting that disc degeneration caused the vacuum disc phenomenon. The motion of the lumbar spine leads to the migration of gas into the intraspinal space by imposing extravagant pressure on the intervertebral disc and extruding gas.^{7,8} However, this happens rarely in the cervical spine because the intervertebral range of motion of the cervical spine is smaller than that of the lumbar spine. The most likely explanation for the generation of an intraforaminal gas cyst associated with the vacuum disc is a check valve mechanism. The intradiscal gas bubbles travel from the disc through small tears in the annulus fibrosus to the spinal canal.^{6,7,9,10} Interestingly, gas cyst herniation manifests as a characteristic pain and is worse in the supine position, where disc volume increases.¹¹ In our case, the patient's symptom was exacerbated in the supine position. This feature allowed us to distinguish it from ordinary cervical disc herniation, in which pain increases with axial pressure.

Lessons

To the best of our knowledge, very few cases of cervical intra-spinal or intraforaminal gas cysts have been treated with surgery. Elster and Jensen selected a posterior approach, laminectomy, and foraminotomy for cervical epidural gas cyst herniation cases with neurological deficits.⁹ However, we believe that ACDF surgery would be more reasonable than the posterior approach in terms of anatomy and the genesis mechanism of gas cyst herniation. As the mechanism and origin of gaseous disc degeneration of the cervical spine, chronic cervical spine in extension causes partial anterior disc avulsion.¹² This suggests that selecting other surgical procedures, such as posterior decompression, might lead to recurrence of gas cyst herniation through a residual vacuum disc. Our report highlights that ACDF surgery is a favorable indication for intraforaminal gas cysts resistant to conservative treatment and that the gas-filled disc should be preferably dissected out by fusion surgery to prevent further recurrence.

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Disclosures

The authors report no conflict of interest concerning the materials or methods used in this study or the findings specified in this paper.

Author Contributions

Conception and design: T Yamada, H Yamada, Yukawa. Acquisition of data: T Yamada, H Yamada, Yukawa. Drafting the article: T Yamada, Matsuyama. Critically revising the article: Yukawa. Reviewed submitted version of manuscript: T Yamada, Yukawa. Approved the final version of the manuscript on behalf of all authors: T Yamada. Administrative/technical/material support: Ueno, Kato, Matsuyama, H Yamada. Study supervision: Kato, H Yamada.

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