

Direct Endoscopic Visualization of Gas Release in a Lumbar Disc Herniation: A Case Report

Stephanie Mendez¹, Mark Polemidiotis^{1,2,3}, Cyrus Nasr^{1,4}, Allen Justin^{1,4}, Anahan Joshua Baptist^{1,4}, Yoshihiro Katsuura^{1,4}

Learning Point of the Article:

Gas-filled lumbar disc herniation, though rare, should be considered in radiculopathy cases where computed tomography shows intradiscal gas, and endoscopic decompression offers both diagnosis and effective treatment.

Abstract

Introduction: Gas within a degenerated lumbar disc is common on computed tomography (CT), but a gas-filled disc herniation producing radiculopathy is uncommon. Recognition usually depends on CT rather than magnetic resonance imaging (MRI). Gas-containing disc herniation produces symptoms through mass effect rather than extrusion of disc material.

Case Report: A 62-year-old man presented with chronic right S1 radicular pain, sensory loss, reduced Achilles reflex, and weakness of the gastrocnemius. Imaging showed severe degeneration at L5–S1 with a lesion containing intradiscal gas. Endoscopic inspection demonstrated a tense diverticular outpouching of the disc compressing the descending nerve root. Puncture of the lesion released gas under direct vision, followed by removal of residual pathology. Symptoms improved immediately and remained improved at review.

Conclusion: CT is the most reliable modality for detecting intradiscal gas and should be carefully reviewed when symptoms and MRI findings do not align. Gas-filled disc herniation should be included in the differential diagnosis of lumbar radiculopathy when CT demonstrates intradiscal gas adjacent to a nerve root. Endoscopic decompression provides definitive diagnosis and effective treatment.

Keywords: Vacuum disc phenomenon, intradiscal gas, endoscopic spine surgery, gas-filled disc, lumbar disc herniation.

Introduction

Lumbar disc herniations are the most common degenerative abnormality of the lumbar spine, affecting two to three percent of the population and often resulting in spinal surgery [1]. The vacuum phenomenon is a radiological finding on CT characterized by the presence of gas, predominantly nitrogen, in the intervertebral disk space and is associated with advanced disc degeneration [2,3]. While the vacuum phenomenon is relatively common, a gas-containing lumbar disc herniation resulting in compressive radiculopathy is rare [4,5].

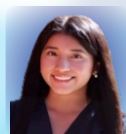
Diagnosing this pathology can be challenging as it is typically not identifiable on magnetic resonance imaging (MRI) or during open decompression surgery [1,4]. In a standard surgical environment, the gas typically escapes into the atmosphere or is obscured upon entering the disc space [4]. To confirm the presence of gas in traditional open procedures, surgeons have previously had to fill the surgical field with saline and precisely manipulate the disc fragment with a probe to observe the release of air bubbles [4]. Consequently, without the specific maneuvers endoscopic technique allows, the vacuum content is frequently

Access this article online

Website:
www.jocr.co.in

DOI:
<https://doi.org/10.13107/jocr.2026.v16.i09.8092>

Author's Photo Gallery



Miss. Stephanie Mendez



Dr. Mark Polemidiotis



Mr. Cyrus Nasr



Mr. Allen Justin



Mr. Anahan Joshua Baptist



Dr. Yoshihiro Katsuura

¹Surgical Fitness Research Pod, Novato Community Hospital, Novato, California, United States of America,
²Department of Surgery, Royal College of Surgeons in Ireland, Dublin, Ireland,
³Department of Surgery, Hospital for Special Surgery, New York, United States,
⁴Department of Neuroscience and Bioengineering, University of California, Berkeley, California, United States of America.

Address of Correspondence:

Miss. Stephanie Mendez,
Research Assistant Stephanie Mendez, Surgical Fitness Research Pod; Novato, California, Novato Community Hospital, 165 Rowland Way, Suite 208, Novato, California - 94945, United States of America.
E-mail: stephanie@katsuuramd.com

Submitted: 25/06/2026; Review: 03/07/2026; Accepted: August 2026; Published: September 2026

DOI: <https://doi.org/10.13107/jocr.2026.v16.i09.8092>

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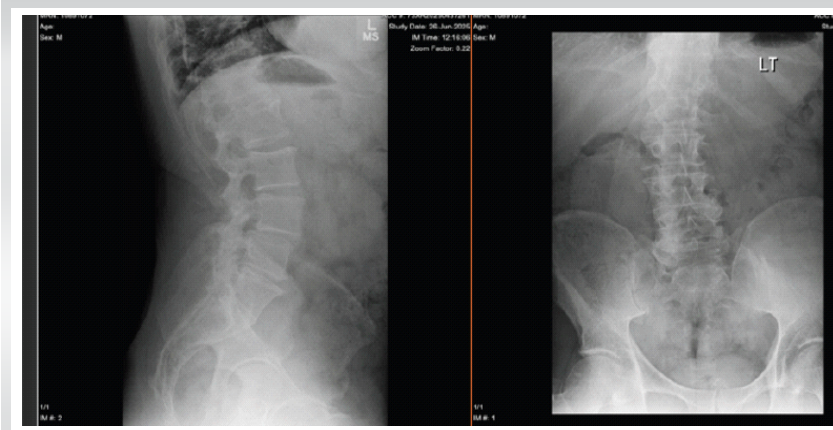


Figure 1: Anterior-posterior and lateral plain radiographs of the lumbar spine showing transitional lumbosacral morphology as well as advanced degenerative disc disease, particularly at the L5-S1 segment.

missed or dismissed during standard open surgery.

This case demonstrates direct endoscopic visualization of a gas-filled diverticulum compressing a nerve root, with visual confirmation of gas release during decompression, something not achievable with traditional open approaches. The observations in this case contribute meaningful clinical insight into a rare variant of disc herniation and reinforce the diagnostic value of CT. This report adds to the growing but still limited body of literature on gas-filled lumbar disc herniation and highlights the diagnostic and therapeutic advantages of minimally invasive endoscopic spine surgery for this pathology.

Case Report

A 62-year-old male with a medical history of hypertension, migraines, anxiety, and prior right shoulder surgery presented with a 3-year history of progressive right-sided low back and leg pain. Symptoms were sharp and electrical with radiation to the posterior thigh, calf, and foot. He reported sensory loss, weakness, and loss of coordination. Conservative management, including non-steroidal anti-inflammatory drugs, gabapentin, physical therapy, chiropractic care, and exercise, provided only temporary relief. On examination, the patient demonstrated diminished sensation in the S1 distribution. Key findings include a reduced right Achilles reflex, diminished sensation at the lateral heel to both light touch and pinprick, and decreased strength of the gastrocnemius muscle.

Plain radiographs demonstrated transitional lumbosacral anatomy with minor degenerative

scoliosis and severe disc degeneration between the L4 and L5 vertebrae, which in this case corresponded to L5-S1 due to transitional anatomy (Fig. 1). MRI initially showed a disc herniation on the right at L5-S1 (Fig. 2). While the gas phenomenon was not clearly defined on MRI, it was easily identified on computed tomography (CT), which demonstrated a paracentral extension containing intradiscal gas within the right lateral recess, consistent with a vacuum phenomenon.

The patient underwent a right-sided endoscopic interlaminar microdiscectomy decompression at L5-S1 (Fig. 3). After gentle retraction of the nerve root, a balloon-like diverticulum of the disc was visualized (Fig. 4). Unlike a typical herniation that extrudes disc material, the lesion contained gas

consistent with a gas-filled disc outpouching [A2]. The presence of gas within the lesion was confirmed during operation when the diverticulum was punctured under endoscopic visualization. This resulted in the immediate egress

Table 1: Summary of cases reporting gas-containing disc herniation

Reference	Study design	Spinal level	Pathology	Surgical approach
[9]	1 case	L5-S1	Gas-containing herniated nucleus pulposus.	Endoscopic
[11]	1 case	L5-S1	Intraoperative findings of gas leakage from the intervertebral disc.	Endoscopic
[4]	18 cases	L5-S1	Spondylolisthesis, scoliosis, instability, or spinal stenosis.	Open
[10]	2 cases	L4-L5, L5-S1	Gas-containing lumbar disc herniation causing nerve root compression.	Open
[12]	12 cases	L4, L5, or S1 nerve root	Gas in the epidural space compressing nerve roots.	Conservative treatment



Figure 2: A lumbar computed tomography scan showing clearly the gas-filled diverticular-appearing disc herniation in the right lateral recess.



Figure 3: A T2-weighted magnetic resonance imaging scan again showing the disc herniation and compression of the descending nerve root at L5-S1. Noticeably, this herniation is not clearly differentiated from a standard disc material-filled herniation.

of gas bubbles and the subsequent decompression of the nerve root (Fig.4). The remaining redundant annulus was resected endoscopically.

In the immediate post-operative period, the patient reported marked relief of right-sided radicular pain. At a 2-week post-operative follow-up, he continued to report substantial improvement in his pain without any new neurological deficits. Since the patient remained completely asymptomatic, post-operative imaging was not performed. However, long-term clinical success was documented using the Katsuura Mini Outcomes (KMO) questionnaire. Preoperatively, the patient's KMO score was 46 out of 100, reflecting severe impairment with his overall symptoms and mobility disability at a level of nine out of ten, with right leg pain at eight out of ten. At an 8-month follow-up on February 3rd, 2026, the patient's KMO score improved to 0/100. This score indicated a total resolution of all axial and lower extremity symptoms, as well as the complete disappearance of numbness and functional disability.

Discussion

Micro decompressions may be performed through various surgical approaches. Techniques range from traditional open methods to endoscopic surgery. Vacuum discs are relatively common, and [6] (i.e., the radiolucent visualization of gas within the intervertebral disc space) is observed in 1–3% of lumbar spinal radiographs and most frequently in older adults (20%) [7]. This case enabled direct visualization of the decompression of the gas-filled lesion.

A traditional open microdiscectomy may be effective at treating this pathology; however, because the surgery is open to the air, it cannot visually capture the egress of gas. The advancement of endoscopic spine surgery enables easy access to the spine through small incisions, reducing complications associated with the traditional open technique [8]. In addition, as in this

case, it allows for an interesting and satisfying visual confirmation of the egress of the gas-filled pathology, which is not possible in open surgery.

Several cases of gas-containing disc herniation have been reported (Table 1) [4,9,10,11,12], and other reports describe successful treatment with a minimally invasive approach using a small incision [9,10] or the occurrence of intradiscal gas bubbles during endoscopic disc removal [11]. Similarly, our case was performed in an aqueous environment that provided a video to document the gas that was venting from the disc space.

Since the disc herniation is not filled with disc material, but rather gas, it bears resemblance to a gastric diverticulum. Commonly, the removal of

extruded disc material is required for a typical discectomy [1.1][9]. In this case, the gas-filled diverticulum was compressing the nerve root, pinched against bone. After the surgery, the patient expressed relief from his radicular pain. This case raises the idea that for a gas-filled compression, simple deflation may be a practical approach to relieve symptoms.

This case describes a variant of lumbar disc herniation: A gas-filled diverticulum phenomenon. It highlights a crucial diagnostic lesson that a gas-containing herniation should be considered in the differential diagnosis and may be easily identified on a pre-operative CT scan. In this case, we successfully performed an endoscopic microdiscectomy at L5–S1 for a lateral gas-containing disc herniation confirmed by MRI and CT, consistent with the vacuum phenomenon. This case highlights the unique visualization properties of endoscopic spine surgery and presents an interesting visual

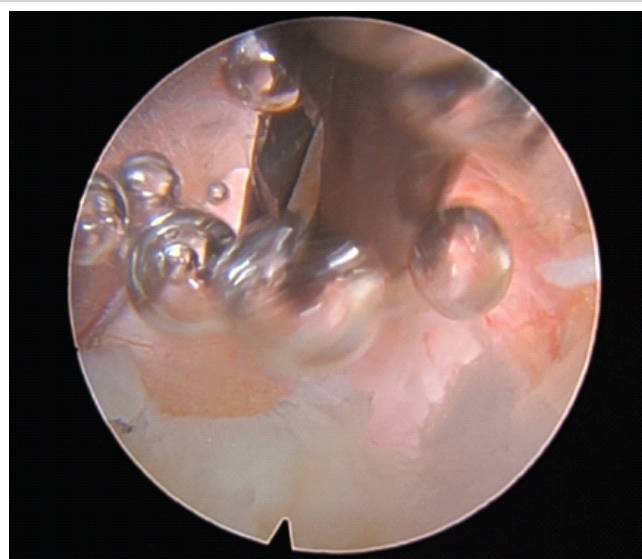


Figure 4: A micropituitary is shown biting into the discal diverticulum and the subsequent release of gas.

representation of a gas-filled diverticulum rarely caught on film.

Conclusion

Gas-filled lumbar disc herniation is a rare but important cause of radiculopathy that may be missed on MRI. This case demonstrates that CT plays a key diagnostic role in identifying intradiscal gas associated with the vacuum phenomenon and reinforces the need to consider this condition in patients with degenerative disc disease. Endoscopic decompression provides direct visualization of the gas-filled diverticulum, allows controlled deflation and removal of residual pathology, and results in effective symptom relief with minimal morbidity. This

case adds to the limited literature by showing that minimally invasive endoscopic microdiscectomy can serve as both a diagnostic and definitive therapeutic approach, advancing our understanding of the clinical presentation and management of gas-containing disc herniation within the field of spine surgery.

Clinical Message

In patients with lumbar radiculopathy, the presence of intradiscal gas on computed tomography should raise suspicion for a gas-filled disc herniation, and endoscopic decompression offers a minimally invasive approach that allows direct visualization, definitive diagnosis, and effective symptom relief.

Declaration of patient consent: The authors certify that they have obtained all appropriate patient consent forms. In the form, the patient has given the consent for his/ her images and other clinical information to be reported in the journal. The patient understands that his/ her names and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

Conflict of interest: Nil **Source of support:** None

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Conflict of Interest: Nil
Source of Support: Nil

Consent: The authors confirm that informed consent was obtained from the patient for publication of this article

How to Cite this Article

Mendez S, Polemidiotis M, Nasr C, Justin A, Baptist AJ, Katsuura Y. Direct Endoscopic Visualization of Gas Release in a Lumbar Disc Herniation: A Case Report. *Journal of Orthopaedic Case Reports* 2026 September;16(09):357-360.

