J Korean Radiol Soc 2006;54:309 - 312

Symptomatic Spinal Epidural Gas-Containing Cystic Lesions: Reports of 2 Cases[1]

Byung-June Jo, M.D., Sang-Ho Lee, M.D.[2], Jee-Young Park, M.D., Hyeon Seon Park, M.D., Deug-Hee Yoon, M.D., Seung-Eun Chung, M.D.

Symptomatic spinal epidural gas-containing cystic lesion is a rare clinical disease entity. We recently experienced two cases of symptomatic epidural gas-containing cysts that were the main cause of the patients' radiculopathy and the cysts were removed surgically. These lesions were actually gas containing ruptured disc herniations from the vacuum discs at the same level. We report herein on the radiological findings along with conducting a review of the related literature.

Index words : Herniated lumbar disc
Epidural gas
Epidural cystic lesion
Spine
Magnetic resonance (MR)
Computed tomography (CT)

Compared with the well-known vacuum phenomenon of the intervertebral disc space, a gas-containing cyst in the epidural space is a rare disease entity. Intervertebral gas can migrate to the epidural space through ruptures in the annulus fibrosus, and it manifests as squeezed air in the herniated disc, as contained air in the pseudocyst that is without a larger amount of disc material, or as free air. There have been several reports about gas collections in the spinal canal that are associated with disc degeneration (1 - 7). These intraspinal gas collections were actually gas-containing disc herniations or collections of epidural leaked gas from the adjacent disc. However, a symptomatic epidural gas-containing cyst has been rarely reported on. The reason for this scarcity of reports is attributed to the fact that most of the epidural gas collections are related to interventional procedures like epidural pain block, and many radiologists neglect small amounts of epidural gas collections as being natural things. We recently experienced two cases of epidural gas-containing cysts with concomitant radiculopathy. Herein, we present the radiographic findings of these 2 cases of epidural gas-containing cysts.

[1]Department of Diagnostic Radiology, Wooridul Spine Hospital,
[2]Department of Neurosurgery, Wooridul Spine Hospital, Seoul, Korea
Received August 4, 2005 ; Accepted October 24, 2005
Address reprint requests to : Byung-June Jo, M.D., Department of Diagnostic Radiology, Woordul Spine Hospital, 47-7 Chungdam-dong, Gangnam-gu, Seoul 135-100, Korea.
Tel. 82-2-513-8732 Fax. 82-2-513-8175 E-mail: jbj135@gmail.com
This study was supported by a grant from the Wooridul Spine Foundation.

Case Reports

Patient 1

This 66-year-old housewife was admitted to our neurosurgery department with complaints of a 16-month duration of back and right leg pain and also numbness. The MRI taken at another hospital showed marked disc space narrowing, right subarticular disc herniation and neural foraminal stenosis at the L5-S1 level. There was a round, signal-void lesion at the right paracentral portion of the L5-S1 level. The CT scan showed a 9.5×7.1 mm gas-containing cystic lesion at the right paracentral portion of the L5-S1 level. This gas-containing cystic lesion

was compressing the right S1 nerve root. Her electromyographic analysis revealed the presence of right S1 radiculopathy. CT myelography showed that the right S1 nerve root was compressed by the gas-containing cyst (Fig. 1A), and there was no myelographic contrast filling into the right S1 nerve root sleeve compared with the normal left side (Fig. 1B). During performance of partial hemilaminectomy, this gas-containing cystic lesion was actually a bluish colored ruptured disk herniation and it was adherent to the right subarticular disc herniation; this lesion was removed microsurgically. Her symptoms markedly improved after surgery and she was living without any residual symptoms during the 6 months follow-up.

Patient 2

A 63-year-old male was admitted to our hospital for the abrupt left foot drop that developed 1 week previous to the hospital visit. His pain was alleviated upon assuming the supine position. The standing AP and lateral lumbar spine plain images showed disc degeneration of the L4-5 and L5-S1 discs, and there was disc space narrowing of L5-S1 of about 3.9 mm in height. Slight retrolisthesis of the L5 vertebral body on the S1 vertebra was also noted. The initial CT scan showed an 8.9×5.7 mm gas-containing cystic lesion at the left neural fora-

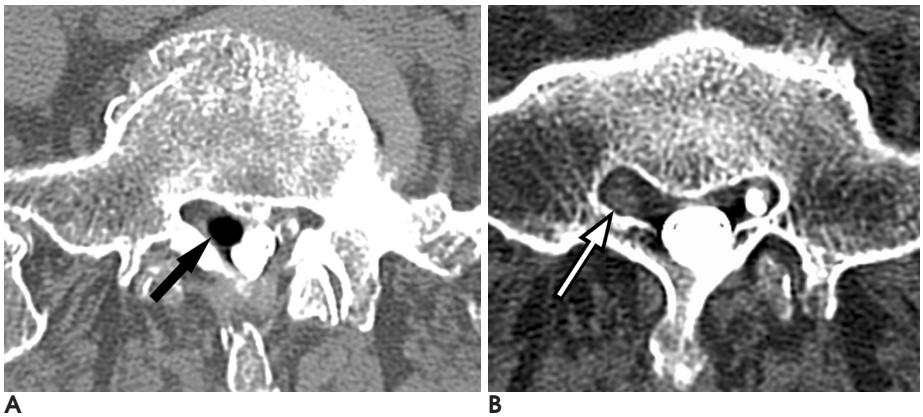

Fig 1. A 66-year-old woman with right S1 radicular pain.
A. Transaxial CT myelography obtained at the L5-S1 level shows a round, air-containing cystic lesion compressing the right S1 nerve root (arrow).
B. Lower than above level, there is no contrast filling into the right S1 nerve root sleeve (arrow).

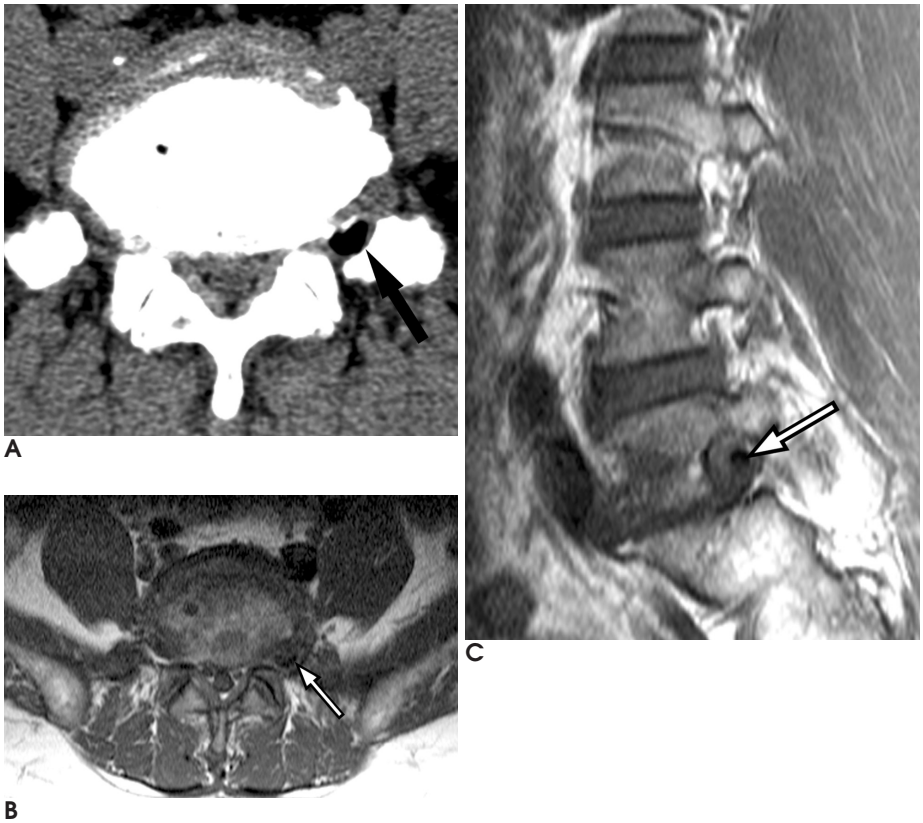

Fig. 2. A 63-year-old man with left L5 radicular pain and an acute onset of foot drop.
A. Transaxial CT scan at the L5-S1 level shows an oval shaped gas collection at the neural foramen (arrow).
B, C. Axial (**B**) and sagittal (**C**) T1-weighted MR images show ruptured disc herniation at the L5-S1 neural foramen. The much darker signal area (arrow) in the ruptured disc herniation is well correlated with the CT images.

men (Fig. 2A). On the T1 weighted axial MRI, we found a ruptured disc herniation at the left L5-S1 neural foramen (Fig. 2B); the much darker signal area in the ruptured disc herniation correlated with the gas collection that was visible on CT scan. The sagittal T1 weighted image at the level of the neural foramen showed that this ruptured disc herniation with a signal-void area was compatible with a gas-containing cyst (Fig. 2C). After left L5-S1 partial laminectomy, the ruptured disc materials were removed for achieving decompression. After surgery, the patient recovered from his neurologic deficit and he is now living symptom free.

Discussion

Intraspinal gas has been associated with disc degeneration, infection, invasive procedures and trauma. Degenerative disc change is the most frequent cause among the various causes of gas formation.

The vacuum phenomenon of an intervertebral disc is commonly noted in the older age groups. About 50% of patients over 40 years of age show the vacuum phenomenon on CT scans (1, 2). Contrary to this common radiological disease entity, epidural gas-containing cystic lesion associated with the degenerative vacuum phenomenon is a rare disease entity. There have been only a few case reports about this disease entity. The reason for this scarcity of report is attributed to its rare clinical manifestations, and in some part, to the increasing number of needle penetrating procedures such as epidural anesthesia or nerve block: these procedures can hinder the clinician's attention to this rare disease entity.

The cause of developing a gas containing cyst in the epidural space is still unknown. Hidalgo-Ovejero, et al (3) have reported on 19 cases of intraspinal gas related to disc herniation. Salpietro, et al (4) reported on one case of epidural gas cyst associated with lateral disc herniation with radicular compressive symptoms. In that report, the author hypothesized a mechanism of an outflow of gas from the disc space through a tear in the annulus fibrosus and pneumatic squeezing of gas from the intervertebral space into the encapsulated sac by the soliciated L4-L5 segment motion.

The two patients in our series had not undergone any interventional procedures such as nerve root block or epidural block. The first patient showed right subarticular disc herniation with a right paracentral gas-containing cystic lesion on the radiological findings. During surgery, we were able to confirm the existence of a gas-containing cystic lesion with a fibrotic wall that was associated with the subarticular protruded disc herniation, and it was removed microsurgically. The second patient demonstrated an unusual finding of a gas pocket with the foraminal ruptured disc herniation. Considering his abrupt neurological deterioration, i.e., foot drop and the aggravation of left leg pain, this gas was probably accompanied via the ruptured disc herniation. The surgeon found a foraminal ruptured disc herniation on the surgical field and the manipulation of this lesion during the surgery led to the leakage of air from the ruptured disc herniation.

Cheng, et al (5) reported on one case of pneumatic nerve root compression by epidural gas that was associated with lateral disc herniation. In a similar manner, they suggested the mechanism of pneumatic nerve root compression by an epidural gas-containing cystic lesion in their case, and they focused on the air squeezing of out into the sac through the direct communication from the vacuum disc space during the standing position.

There are several different diseases that can manifest with intraspinal gas. The differential diagnoses are gas-containing synovial cyst, ganglion cyst and symptomatic free air. The presence of gas within a synovial cyst has been reported, and it most likely originated from the contiguous vacuum in the facet joint. This gas-containing synovial cyst is typically posterolateral in location. This finding is different from the typical ventral location of our case, and gas-containing synovial cyst usually shows severe degenerative facet arthropathy (8). A ganglion cyst can develop in virtually any spinal ligament or area of connective tissue; it has been reported to occur at the interspinous ligament, facet joints, the ligament flavum, the dura mater and the posterior longitudinal ligament. Microscopic examination of the ganglion cyst shows a collagenous fibrous wall with no particular type of lining cells and there is usually myxoid content. Only rarely will ganglion cyst shows a gas content instead of mucinous materials. The gas collected within a ganglion cyst is thought to be due only to the contiguous vacuum in the facet joints or in the intervertebral disc (9). However, if a gas-containing ganglion cyst is located ventrally and adjacent to the disc space, its differentiation from the gas-containing disc herniation or pseudocyst is very difficult. However, the surgical findings like its close anatomic relation to ligamentous structures and the revealed mucinous content in the cystic lesion might be supportive clues for the correct diagnosis.

On rare occasion, intraspinal free air can be a cause of

radiculopathy. In these cases, there are definite causative factors like recent surgery or interventional procedures and multiple gas collections are usually revealed. Because of the low resistance of the epidural space, the gas bubbles usually spread into multiple vertebral levels rather than forming a single larger gas bubble (10). Raynor, et al (11) have reported one case of a symptomatic postoperative gas bubble. In their report, gas leaked into the spinal canal after performing microdiscectomy, which caused a foot drop 10 days after surgery. The distraught patient improved after 10 days of oral steroid therapy. The follow up MRI taken 6 weeks after his symptom onset revealed complete resolution of the gas bubble and the patient was asymptomatic.

There have been several reports about the potential association between epidural gas and intradural disc herniation. Hidalgo-Ovejero, et al (12) have reported that intradural disc herniations were found in 2 of the 118 cases in which gas within the spinal canal was detected, and this rate (1.7%) is six times higher than that of disc herniations in which no gas was detected in the spinal canal. The mechanism that causes a disc herniation to penetrate into the dura mater is unclear, but certain adhesions associated with local inflammatory processes, congenital union between the dura mater and the posterior spinal ligament, or alterations caused by previous surgery are the proposed reasons. The potential presence of an intradural disc herniation must always be considered when the CT scan shows the presence of epidural gas. However, in our case, there was no intradural disc herniation.

In conclusion, we report here on two cases of gas-containing epidural cystic lesions that caused radicular symptoms. Gas-containing cyst can be a cause of radiculopathy by direct nerve root compression. For those cases with very small gas collections in the spinal canal without any history of invasive procedures, we should be alert to discover any nerve compression by the gas bubble.

References

1. Knutsson F. The vacuum phenomenon in the intervertebral discs. *Acta Radiol* 1942;23:173-179
2. Larde D, Mathieu D, Frija J, Gaston A, Vasile N. Spinal vacuum phenomenon. CT diagnosis and significance. *J Comput Assist Tomogr* 1982;6:671-676
3. Hidalgo-Ovejero AM, Martinez-Grande M, Garcia-Mata S. Disc herniation with gas. *Spine* 1994;19:2210-2212
4. Salpietro FM, Alafaci C, Collufio D, Passalacqua M, Puglisi E, Tripodo E, et al. Radicular compression by lumbar intraspinal epidural gas pseudocyst in association with lateral disc herniation. *J Neurosurg Sci* 2002;46:93-95
5. Cheng TM, Link MJ, Onofrio BM. Pneumatic nerve root compression: epidural gas in association with lateral disc herniation. Report of two cases. *J Neurosurg* 1994;81:453-458
6. Mortensen WW, Thorne RP, Donaldson WF. Symptomatic gas-containing disc herniation. Report of four cases. *Spine* 1991;16:190-192
7. Pierpaolo L, Luciano M, Fabrizio P, Paolo M. Gas-containing lumbar disc herniation. A case report and review of the literature. *Spine* 1993;18:2533-2536
8. Firth RL. Lumbar intraspinal synovial cyst containing gas as a cause for low-back pain. *J Manipulative Physiol Ther* 2000;23:276-278
9. Lin RM, Wey KL, Tzeng CC. Gas-containing "ganglion cyst" of lumbar posterior longitudinal ligament at L3. Case report. *Spine* 1993;16:2528-2532
10. Gaur V, Gupta RK, Agarwal A, Tripathi M, Gaur A. Air or nitrous oxide for loss-of-resistance epidural technique? *Can J Anaesth* 2000;47:503-505
11. Raynor RB, Saint-Louis L. Postoperative gas bubble foot drop. A case report. *Spine* 1999;24:299-301
12. Hidalgo-Ovejero AM, Garcia-Mata S, Gozzi-Vallejo S, Izco-Cabezon T, Martinez-Morentin J, Martinez-Grande M. Intradural disc herniation and epidural gas: something more than a casual association? *Spine* 2004;29:E463-467

대한영상의학회지 2006;54:309 - 312

증상있는 척추 경막외 기낭성병변: 증례 보고[1]

[1]우리들병원 영상의학과
[2]우리들병원 신경외과

조병준 · 이상호[2] · 박지영 · 박현선 · 윤득희 · 정승은

척추경막외 위치한 기낭성 병변에 의한 신경근병증을 보이는 경우는 매우 드물어 아직 정확한 발생기전이 알려져 있지않다. 저자들은 최근 경막외 기낭성 병변에 의한 신경근병증으로 수술하여 진공디스크에서 유래된 파열성디스크로 확인된 두 증례를 경험하였기에 문헌고찰과 함께 보고하는 바이다.