

Case Report

Gas-Filled Intradural Cyst within the Cauda Equine

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A case of radicular pain that resulted from a gas-filled intradural cyst in an 80-year-old male is described. Temporary improvement of radicular pain was observed after CT-guided aspiration. However, recurrent radicular pain led to surgical treatment. In this report, the authors document the radiologic and intraoperative features of a gas-filled intradural cyst that migrated into the nerve root, and propose an optimal treatment plan based on a review of the literature.

Key Words : Intradural · Gas · Cyst · Treatment plan.

INTRODUCTION

There have been several reports of gas in the spinal canal, with or without disc material, causing nerve root compression^{2-5,8,12,14,16}. However, gas-filled intradural cysts are rare. Only 8 cases of gas-filled intradural cysts of the spine have been reported to date^{1,6,7,9-11,15}. Among these, two cases of gas-filled intradural and intraneural cysts have been reported¹¹. All of these cysts were due to intradural herniation of disc material and gas in the vacuum disc. In this report, we describe a case of severe radicular pain caused by a gas-filled intradural cyst within the cauda equine and illustrate the course of treatment.

CASE REPORT

History

An 80-year-old man presented with pain in both legs, which was dominant on the left side. The onset of symptoms had been gradual, starting one year earlier, and had no obvious cause. His symptoms had been aggravated for the 3 months prior to presentation. Although he had received various conservative treatments, the pain persisted.

Examination and procedure

Physical examination revealed radiating pain on the lateral aspect of the left leg and the anterolateral side of the right calf. In addition, the patient had motor weakness of the great toe and ankle

dorsiflexion on the left side (respective grade 4). The straight-leg raising test was negative.

Radiographic examination of the lumbar spine showed diffuse degenerative changes and intervertebral disc space narrowing with vacuum phenomena at the L2-3 and L3-4 levels. A computed tomography (CT) scan revealed not only vacuum phenomena at the L2-3 and L3-4 levels but also intradural gas collection at the L2-3 level (Fig. 1A). Magnetic resonance (MR) image identified an intradural cystic lesion at the L2-3 level. There was very low signal intensity on both T1 and T2-weighted images, and an enhanced MR image showed a peripheral enhancement of the cyst (Fig. 1B).

In consideration of the patient's age, a CT-guided aspiration of the gas-filled cyst was performed. The procedure was successful, and after the aspiration, only a scanty amount of air remained in

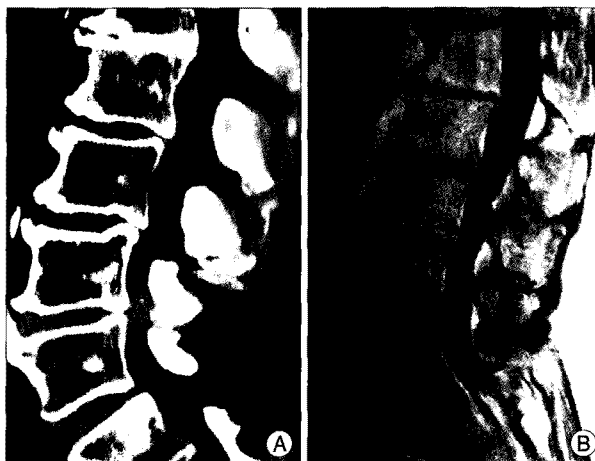


Fig. 1. A : Computed tomography scan reveals not only the vacuum phenomena at the L2-3 and L3-4 levels but also intradural gas collection at the L2-3 level. B : Enhanced magnetic resonance image shows a peripheral enhancement of the cyst (arrow).

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the cyst (Fig. 2A, B). Approximately 90% of the patient's symptoms were relieved. Unfortunately, his symptoms recurred one month later, and the CT showed reaccumulation of gas in the intradural cyst (Fig. 2C).

Operation and postoperative course

After intraoperative discogram at the L2-3 disc space, the patient underwent open intradural surgery via the posterior approach at the L2-3 level. While performing the discography, the contrast medium flowed into the intradural cyst and partially filled the cyst (Fig. 3). Therefore, the authors could see the communication between the L2-3 disc space and the cyst. Following a hemilaminectomy from L2 to the cranial half of L3, the dura mater was incised dorsally, and within the dura, a gas-filled cyst that had migrated into the nerve root of the cauda equine was found. There was also communication with the L2-3 disc space via a fistula at the ventral dura mater and the nerve root of the cauda equine was bulging like a fully-inflated balloon (Fig. 4A, B). The authors incised the intraneural cyst of the cauda equine longitudinally and subtotally removed the cyst. Then, the fistula was filled with fibrin glue and sutured with non-absorbable thin nylon thread (Fig. 4C). Finally, the dorsal side of the dura was sutured and the wound was closed in the usual manner.

Pathological examination of the cyst showed degenerative cartilage with fibrosis and multifocal infiltration of chronic inflammatory cells with granulations (Fig. 5). Postoperatively, the patient's radicular pain resolved completely, although mild hypesthesia on the left lateral side of the thigh developed, this was tolerable and did not require medication. The patient has not experienced recurrent symptoms at the 14 month follow-up examination.

DISCUSSION

The causes of gas-filled intradural cysts include infection, tumor, and intradural puncture¹³⁾. However, as in this case, there is a possibility of gas-filled intradural cysts originating from the vacuum disc^{1,6,7,9-11,15)}. Many cases of gas-filled intraspinal cysts due to disc herniation have already been reported and, to the best of our knowledge, 8 cases of gas-filled intradural cysts have been documented to date (Table 1)^{1,6,7,9-11,15)}. Among them, there has only been one report documenting two cases of gas-filled intradural and intraneural cysts¹¹⁾.

In the present case, the patient was successfully treated with open intradural surgery, although the gas-filled cyst recurred after CT-guided aspiration. Moreover, we demonstrated a gas-filled intradural and intraneural cyst due to intradural herniation of the vacuum disc at the L2-3 level with discography, pathology, and intraoperative findings.

In the literature, some reports suggested that disc herniation



Fig. 2. A : Computed tomography-guided needle aspiration of the intradural gas-filled cyst. The needle tip is located in the gas-filled cyst. B : There is the remarkable reduction of the cyst and only a scanty amount of air in the cyst after the aspiration. C : A month later, axial computed tomography scan shows reaccumulation of the gas-filled intradural cyst.

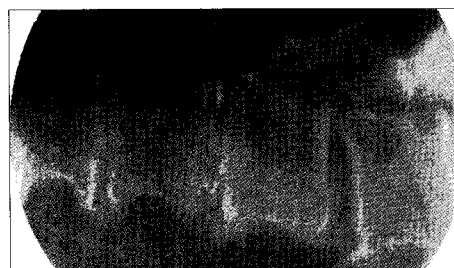


Fig. 3. Intraoperative discography demonstrates the contrast medium flow into the intradural cyst, and partially fills the cyst. Additionally, it shows the air-fluid level in the cyst.

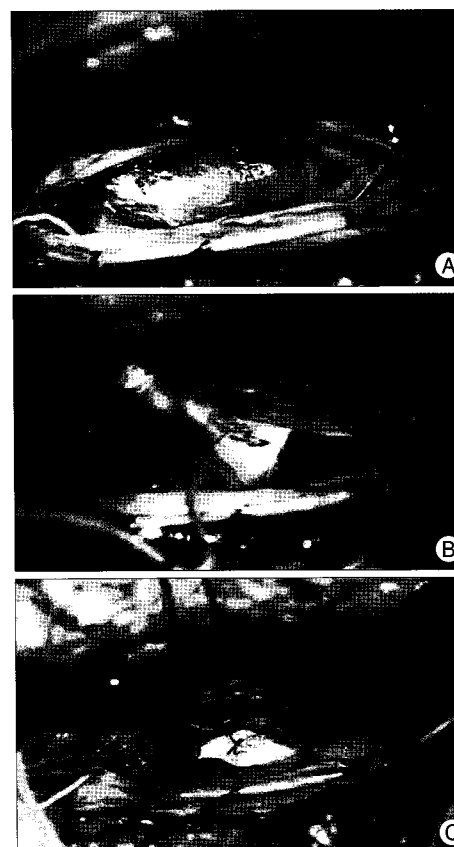


Fig. 4. Intraoperative photographs after opening of the dural sac. A : The terminal portion of the intradural nerve root is severely bulging out. B : After removal of the cyst, there is a communication with the L2-3 disc space via a fistula at the ventral dura mater. C : The fistula is sutured with non-absorbable thin nylon thread.

Table 1. Data on the 8 reported cases of a gas-filled intradural cyst

Reference, case	Level	Vacuum disc	Pathology	Proof of fistula	Significance
Kaiser	L5/S1	+	Degenerated cartilage	-	
Anda	L4/5	+	?	-	
Harvey	L3/4	+	Degenerated cyst with inflammation	-	
Kawaguchi	L3/4	+	Fibrous connective tissue with bone trabecule	-	
Hidalgo-ovejero	L2/3	+	?	-	
Kudo					
Case1	L3/4	+	Fibrous connective tissue	Discography	
Case2	L4/5	+	Fibrosis and hyalinized tissue	Discography	Report of intraneural cysts
Sei	L2/3	+	Fibrocartilage with granulations	Discography	Suggestion of pathogenesis

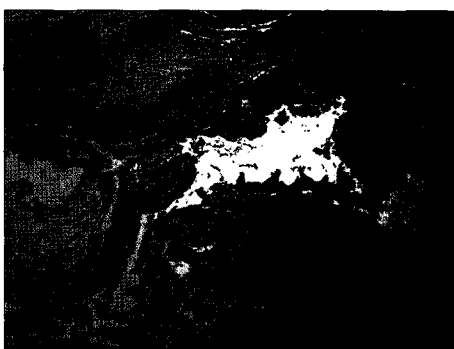


Fig. 5. Histological examination reveals multifocal infiltration of chronic inflammatory cells and fibrosis within degenerative fibrocartilage (H & E, ×100).

might result in the release of free air from the vacuum disc and direct nerve compression^{2,5,7-9,11,15,16}. Kudo et al.¹¹ insisted that discography is the only means of acquiring a precise diagnosis and there was clear evidence of communication between the vacuum disc and the gas-filled cyst. In their reports, as in ours, discography revealed the flow of contrast media between the intervertebral disc and the cyst, which clearly demonstrated communication between the intervertebral disc and the cyst. As in previous reports (Table 1), the microscopic findings in our case revealed degenerative disc material with fibrosis and inflammatory cells with granulations. Sei et al.¹⁵ explained this finding as spontaneous absorption of the herniated disc material, and concluded this process might be a significant step in the pathogenesis of gas-filled intradural cysts.

Our intraoperative findings showed swelling of the intradural nerve root due to migration of the gas-filled cyst into the nerve root of the cauda equine and its connection with the fistula. In 2008, Kudo et al.¹¹ reported the only known intradural and intraneural gas-filled cyst (Table 1). This is only the second report of an intradural and intraneural gas-filled cyst since Kudo's report and we, for the first time, were able to verify the fistula, not only by discography, but also with intraoperative findings.

Although discography was recommended to diagnose the gas-filled intradural cyst^{11,15}, we assumed the intradural cyst formation and gas accumulation originated from the resolving intradural disc fragment in light of the peripheral enhanced gas-filled intradural cyst and the vacuum disc at the index level. Furthermore, since increased intradiscal pressure due to discography

could worsen the fistula between the cyst and vacuum disc, we did not initially perform the discography.

In the few reported cases of gas-containing cysts, some doctors performed intraoperative or percutaneous needle aspiration of the gas^{14,16}, but the majority recommended surgical removal of the gas-filled cyst^{2,5,10,11}. We considered the patient's advanced age and decided to perform CT-guided aspiration as the first line treatment. In this case, the patient improved after CT-guided aspiration. This phenomenon explained that the main etiology of the disease was not a herniated, resolving disc fragment but was gas accumulation. In terms of treatment of the disease, gas removal only would not be a sufficient method and it was apparent that cyst removal and obstruction of the fistula were also required.

CONCLUSION

To our knowledge, there have been no previous reports with direct proof of a fistula between the vacuum disc and the gas-filled intradural cyst migrating into the nerve root. In this report, we have identified that the main etiology of the gas-filled intradural cyst was a herniated, resolving disc fragment with gas accumulation. Surgical removal of the cyst and obstruction of the fistula provided a cure without the risk of recurrence.

Acknowledgements

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