Cervical Intradural Disc Herniation and Intradural Gas on CT Scan

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Intradural disc herniation has been reported as a rare type of intervertebral disc herniation, comprising less than 0.3% of all herniated discs. They can develop in any location but seem to be relatively more frequent at lumbar level, but relatively rare at cervical level\(^1\). A review of the world literature reveals a total of 32 intradural disc herniations at the cervical\(^2\). It remains difficult to definitively diagnose the disease before surgery. Among the 32 cervical intradural disc herniation cases reported in the literature, none of the existing reports can provide a preoperative diagnostic criteria of intradural cervical disc herniation. Choi et al thought that abrupt discontinuity of PLL and “hawk-beak sign” on MRI indicated the potential presence of intradural disc herniation in the lumbar spine\(^3\). Hidalgo- Ovejero et al found that the presence of epidural gas on CT scan might suggest the potential presence of an intradural disc herniation in the lumbar spine\(^4\). However, whether it is the same with the cervical spine is not reported in the literature before. In this report, a case of high cervical intradural disc herniation at C3-C4 level with intradural gas on CT scan is presented. To our knowledge, this is the first case described in the literature.

**Key words:** Cervical disc herniation, Intradural herniation, Intradural gas

**INTRODUCTION**

Intradural disc herniation has been reported as a rare type of intervertebral disc herniation, comprising less than 0.3% of all herniated discs. It remains difficult to definitively diagnose the disease before surgery. Among the 32 cervical intradural disc herniation cases reported in the literature, none of the existing reports can provide a preoperative diagnostic criteria of intradural cervical disc herniation. Choi et al thought that abrupt discontinuity of PLL and “hawk-beak sign” on MRI indicated the potential presence of intradural disc herniation in the lumbar spine\(^3\). Hidalgo- Ovejero et al found that the presence of epidural gas on CT scan might suggest the potential presence of an intradural disc herniation in the lumbar spine\(^4\). However, whether it is the same with the cervical spine is not reported in the literature before. In this report, a case of high cervical intradural disc herniation at C3-C4 level with intradural gas on CT scan is presented. To our knowledge, this is the first case described in the literature.
CASE REPORT

A 55 year-old female patient complaints of headache, neck stiffness and nuchal pain after a trauma accident in a high speed water sport activity five months ago. At first, she didn’t pay much attention to it. However, the symptom got aggravated with radiating to bilateral shoulder and scapular since one month ago before admission. Besides, numbness over both arms and hands was also noted, she has received traditional treatment and rehabilitation, but it was in vain after that. Clumsy hand and weakness of both thighs occurred that she has trouble walking faster.

Clinical examination revealed a significant decrease motor function at the bilateral triceps and biceps, hyperesthesia below the C4 dermatome, bilateral positive of Hoffman sign and Babinski sign, hyperreflexia of upper extremities and bilateral active patellar reflex.

The C-spine MRI showed focal central disc extrusion at C3-C4 with presence of intradural material, a high signal intensity was observed in the spinal cord and low signal intensity behind the posterior margin might indicate rupture of the annulus or posterior longitudinal ligament, T1-weighted MRI revealed a C3-C4 herniated intervertebral disc (HIVD) with a “hawk-beak sign.” (Figure 1). Cervical spinal CT scan was performed and a marked posterior central HIVD at C3-C4 with severe thecal sac compression and two small gas bubbles with less than 0.3 cm in size in the intradural with location just below the posterior extrusion lesion was found (Figure 2 and 3). These neuro radiological findings was a strong indication of an intradural herniation.

Figure 1 MRI study: Left sagittal and axial view: T2-weighted MRI: The cervical cord was severely compressed by an extruding disc with a hypodensity signal at C3-C4 level, indicating rupture of annulus or PLL. Right sagittal and axial view: T1-weighted MRI revealed a C3-C4 herniated inter-vertebral disc (HIVD) with a “hawk-beak sign.”
Figure 2 Sagittal view of CT scan image revealing two small gas bubbles in the spinal canal and intradural at C3-C4 level

Figure 3 Axial view of CT scan image revealing two small gas bubbles in the spinal canal and intradural at C3-C4 level

Figure 4 Intraoperative figure showed a perforation of the posterior longitudinal ligament and dura was found.

Under the impression of C3-C4 intradural herniated disc with myelopathy, surgical intervention with microdiscectomy and anterior fusion with CAGE was suggested and arranged. During operation, a standard anterior approach to cervical spine from the right side was undertaken. After exposure of C3-C4 was accomplished, an operating microscope was used, the disc space was incised and the contents removed using curettes, Kerrison and disc punch. There was no adhesion between posterior longitudinal ligament and dura mater. A perforation of the posterior longitudinal ligament and dura was found and leakage of a large amount clear cerebrospinal fluid was seen, and with the help of suction over a cotton pledget, cautiously with a blunt nerve hook into the subarachnoid space. Within the intradural space, we found two fragments of the herniated disc, subsequently the herniated disc was removed using a disc punch and Kerrison, until failed to reveal any other intradural disc fragment. The dura defect was repaired by a sandwich method, where packed intradural with a small Neuropatch, then extradural packed with histoacryl blue and Duraform, respectively. Finally, an interbody cage was placed in C3-C4 and the incision was closed in standard fashion.

The post operation outcome has been excellent, the patient was free of complaints, motor function improved rapidly within 2 days, and the patient regained full muscle power. She was discharged one week after the operation without any complication.
DISCUSSION

Intradural disc herniation is defined as displacement of the nucleus pulposus of the intervertebral disc in an intradural site. The first case of this pathology in the lumbar spine was reported by Dandy in 1942[5]. Cervical intradural disc herniation is relatively rare, we reviewed the world literature, In 1959, Marega et al reported the first case of cervical intradural disc herniation[6]. Iwamura et al reviewed the literature and found 17 cases of cervical intradural disc herniation have been reported in 2001[7]. Then Neroni et al summarized 21 cases before 2007, including the case they reported[8]. Two additional cases are presented by J Pan, there have been a total of 29 intradural cervical disc herniations in the world literature in 2011[9]. Including this case, only 33 cases of cervical intradural disc herniation have been reported[2].

The pathogenesis of intradural cervical disc herniation is uncertain. Trauma is consistently listed by previous authors as a probable cause[1]. Warade et al claimed to have reported the first patient with a spontaneous cervical intradural disc herniation[10]. Our patient developed a herniation in a sport activity. The mechanism that causes disc herniations to penetrate the dura mater is unclear, but several theories have been proposed[11-12]: 1. Certain adhesions associated with local inflammatory processes may develop between the common posterior vertebral ligament and the dura mater, leading to spontaneous perforation or rupture; 2. congenital union between the dura mater and the common posterior vertebral ligament; 3. alterations caused by previous surgery, or 4. chronic adhesions between the ligamentous structures and dura secondary to traumatic injury may promote rupture through the dura, usually associated with overload of the spine, such as heavy labor, sports activities, or manipulation.

The potential presence of an intradural disc herniation in the lumbar spine must always be considered preoperatively on a patient whose magnetic resonance imaging study demonstrates the "hawk-beak sign" on axial imaging as well as abrupt discontinuity of the posterior longitudinal ligament (PLL)[3].

Sasaji et al. described what they called the “Y-sign” in the lumbar spine[13]. In the case of intradural extra-arachnoid disc herniation, the arachnoid was peeled from the dura by the disc herniation. One line representing the combined dura and arachnoid was divided into two lines of the dura and the arachnoid. The branching of the ventral dural line appeared as a “Y.”

In previous lumbar spine herniated disc study, the potential presence of an intradural disc herniation should be considered if the CT scan shows epidural gas[4]. These neuro radiological findings suggested intradural disc herniation and guided us reference at the intradural examination during operation. Nevertheless, whether it is the same with the cervical spine is not reported in the literature before. We report the first case of cervical intradural disc herniation at C3-C4 level with intradural gas on CT scan, which was a strong indication of an intradural herniation. The present findings further support the potential association between epidural gas and intradural disc herniation. Thus, in the presence of a gas bubble in the spinal canal, and especially in the case of large bubbles, preoperative imaging should be used to rule out the existence of potential intradural fragments.
CONCLUSIONS

Our cases highlight the importance of preoperative diagnosis in the treatment of intradural cervical disc herniations. The presence of air within the spinal canal and intradural on CT scans, and a "hawk-beak sign" image on MRI, is almost certain evidence of a herniation. This association results in an adequate surgical approach, thereby reducing the chance of postoperative neurologic deficit.

REFERENCES


頸椎硬膜內椎間盤突出症及 CT 掃描硬膜內氣泡

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已知文獻僅 32 例頸椎硬膜內椎間盤突出症，至今難以在術前明確診斷。本報告病人為 55 歲女性於運動後頸部疼痛，且轉移至雙肩及上臂，並雙手麻木無力。經 MRI 檢查顯示頸椎 3-4 節有後縱韌帶中斷及「鷹喙徵」椎間盤突出，在 CT 掃描發現頸椎 3-4 節椎間盤突出及椎管有氣泡的現象。曾有報告腰椎硬膜內椎間盤突出症有出現過 CT 掃描椎管有氣泡的現象，但是在頸椎椎管出現氣泡這現象本報告是第一例。病人經過椎間盤切除，硬膜修補及前融合術後術後良好。

關鍵字：頸椎椎間盤突出症，硬膜內突出症，硬膜內氣泡

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