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Non-traumatic acute myelopathy due to cervical disc herniation in contiguous two-level disc spaces: a case report

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Abstract Non-traumatic acute myelopathy caused by cervical disc herniation is rare, and no case has been reported which the disease was caused by the extrusion or migration of a cervical disc herniation of contiguously-located two-level disc space. In this report, the disease is described, and the direction of migration and surgical treatment of the disease are discussed.

Keywords Acute myelopathy ·
Cervical vertebra ·
Cervical disc herniation

Introduction

Non-traumatic acute myelopathy caused by disc herniation is found mostly in the thoracic vertebra, and only about 19 cases have been reported [1–10] in the cervical vertebra. Among these 19 reported cases, cervical disc herniation in one-level disc space was found in 17 cases [1, 3–9]; the other two cases [2, 10] were caused by cervical disc herniation in two-level disc spaces. Even though these cases involved two-level disc spaces found in adjoining joints, they were mainly the result of extrusion or migration from one-level disc space. However, we present this case of acute myelopathy caused by a single huge disc behind the C6 body which was formed by extrusion and migration of the adjacent two-level discs in C5–6 and C6–7.

Case report

A 44-year-old female visited our department complaining of weakened muscle strength in the upper and lower extremities, and of difficulty in walking. Six weeks prior to this visit, the patient reported pain in the posterior neck, and conservative treatment was performed at a local clinic; however, there was no improvement of her symptoms. One day prior to visiting our department, when she awoke in the morning the pain in her posterior neck and both shoulders had worsened, and she had difficulty walking, as well as bilateral fatigue and numbness in the upper and lower extremities.

At the time of her visit, the muscle power was proven to be 5/5 for shoulder abductors, 5/5- for elbow extensor, 5/5 for elbow flexor, 4/4 for wrist extensor, 5/5 for

wrist flexor, 5/4 for finger flexor, 4/4 for iliopsoas, 4/4 for quadriceps, 4/4 for tibialis anterior, 4/3 for extensor hallucis longus, and 5-/5- for flexor hallucis longus. Neurological examination revealed numbness in both hands and in both lower extremities, and hypesthesia in the dermatome below the fifth thoracic vertebrae. The hand grip and release test was eight times in 10 s, and both the finger escape sign (+/+) and myelopathic gait were found. Bladder dysfunction was not noted. Pathologic reflexes were (+/+) for the Babinsky reflex, (+/+) for the Hoffman sign, (+/+) for Ankle clonus, (-/-) for the inverted radial reflex, (increased/increased) for the biceps-tendon reflex, (increased/increased) for the triceps-tendon reflex, (increased/increased) for the patellar-tendon reflex, and (normal/normal) for the Achilles-tendon reflex.

A plain cervical spine lateral radiograph showed C5–6, 6–7 disc-space narrowing, loss of the lordotic curve, and local kyphosis. The Pavrov ratio was 0.7, which contributed to our opinion that there was narrowing of the cervical canal (Fig. 1). According to the T2-weighted sagittal MR image, C5–6 disc extrusion and distal migration, along with the C6–7 disc extrusion and proximal migration, resulted in the formation of a single, large mass located posteriorly on the C6 vertebral body (Fig. 2a). The spinal cord was compressed, and the signal intensity of the cord had increased slightly (Fig. 2b). According to a T2-weighted axial MR image, the spinal cord was significantly deviated to the right due

Fig. 1 Preoperative lateral plain radiograph shows C5–6, 6–7 disc-space narrowing, loss of lordotic curve, local kyphosis, and narrowing of the cervical canal

to the extruded cervical disc in the cervical canal (Fig. 2c).

As an emergency treatment, the fifth and sixth, and the sixth and seventh cervical discs were removed; the disc extruded and migrated to the posterior region of the sixth cervical body was also removed. Fusion was performed using the cage filled with autogenous iliac

Fig. 2 **a** Preoperative T2-weighted sagittal image shows severe cord compression resulting from the rupture, and distal migration to the C5–6 space and proximally to the C6–7 space, **b** Preoperative T2-weighted sagittal image shows a slight increase of signal intensity in the cord, **c** Preoperative T2-weighted axial image shows the significant volume of disc material resulting from the rupture, and migration to the posterior aspect of the C6 vertebral body which is compressing and deviating the spinal cord

Fig. 3 Postoperative lateral plain radiograph reveals an anterior cervical discectomy and fusion using carbon cage with autogenous cancellous bone and plate fixation

cancellous bone and metal plate fixation for C5–7 (Fig. 3). In operative findings, degenerative changes had been observed in the fifth and sixth and the sixth and seventh cervical discs. Also, there was severe compression of extruded and migrated disc on the spinal cord, caused tenting phenomenon of the dura mater. Once the

Fig. 4 Postoperative T2-weighted sagittal images show sufficient removal of disc material on the posterior aspect of the C6 vertebral body and the remaining high-signal change in the spinal cord

disc was removed, tenting was no longer observable, and the discs removed from the posterior area of the sixth cervical body were varied in size and fragments.

At 2 weeks after surgery, the patient's muscle power had improved to 5/5- for her wrist flexor, 5/5- for the finger flexor, 5/5- for the iliopsoas, and 5-/5- for the extensor hallucis longus. Hypesthesia was still observed below the dermatome of the fifth thoracic vertebra, but the patient was able to walk on her own feet without any assistance. Postoperative T2-weighted sagittal MR image showed all discs had been completely removed. The severe compression on the spinal cord disappeared, but the signal change in the cord still remained (Fig. 4). At 6 months after surgery, motor function was nearly normal, tingling sense and hypesthesia were improved, and the pathologic reflex had disappeared, but hyper-reflexia of patellar tendon still remained.

Discussion

Spinal-cord disorders caused by disc herniation include myelopathy and spinal cord injury (incomplete or complete), both of which are known to occur relatively often in thoracic vertebra compared to cervical vertebra. To date, 19 cases have been reported involving the cervical spine; these include two cases of acute paraplegia [9, 10], one case of C5 tetraplegia [4], and 16 cases of Brown-Sequard syndrome [1–3, 5–7]. Of these 19 cases, 17 occurred in one-level disc space and two cases in two-level disc spaces. In the latter two cases, the symptoms were found in adjacent regions without any connection between the extruded discs. However, in the case reported in this paper, the ruptured, migrated, huge disc material is located in the posterior space to the C6 vertebral body which was formed due to the rupture and distal migration of the C5–6 disc and the rupture and proximal migration of C6–7. As we observed in our case, the acute myelopathy was caused by the migration to one area (the posterior space of the C6 vertebral body) of cervical disc extruded from two contiguous areas; this has never before been reported. The reason why this case attracted the authors' attention is that migration of extruded disc from the proximal area (the 5–6th cervical disc) to the distal area, and of extruded disc from the distal area (the 6–7th cervical spine) to the proximal area, result in the huge disc material on the posterior of the C6 vertebral body which produces severe cord compression. There have been no previous reports of an accurate theory regarding the pathomechanism of the direction of extruded disc material migrating to areas within the cervical spine. According to Schellinger et al. [11], the migrating path of a disc fragment is determined by the anatomy of the anterior epidural space. The configuration of the anterior epidural space is identical at the superior and inferior half of a vertebral body.

Therefore, herniations of nucleus pulposus appear to have an equal chance of moving up or down. However, the authors thought that if the annulus had been torn from the superior endplate of the disc and extruded, it would migrate to the proximal area of the disc level. Alternatively, if the annulus had been torn from the inferior endplate of the disc, the disc material would migrate to the distal area of the disc level.

The authors considered it to be an emergency to reduce the pressure on the cord, and that it would be necessary to remove migrated disc material, and therefore considered the following two methods. The first method required removal of the 6th cervical body and migrated disc material. The second method involved the removal of the C5–6 disc, which would then make it possible to remove the disc material that had migrated to the distal area through the space made by the removed C5–6 disc. Then followed the removal of the C6–7 disc, allowing the removal of the disc material that had migrated to the proximal area through this space. A negative aspect of the first method was that cervical body had to be removed, even though the disc material that had migrated to the posterior of the C6 vertebral body could be removed in a comparatively safe manner. As for the second method, a positive aspect was that cervical body remained. However, it would be difficult to completely remove the disc material migrated in the posterior of the cervical body. However, according to the MRI the migrated cervical disc was not isolated, and the authors therefore thought there would be some connection between the two extruded discs. Initially, the

5–6th cervical disc was removed, and, using a small probe (microprobe), disc material in the proximal area of the posterior of the 6th cervical body was identified and removed. As a result, a significant amount of disc material was extracted from the posterior of the cervical body. This procedure was repeated until the tenting phenomenon in the dura mater found in the 5–6th cervical disc was no longer present. We were able to extract a great amount of disc material without any difficulty. Also for the 6–7th cervical disc, a significant amount of disc material was extracted from the posterior of the 6th cervical body using the same method.

Conclusion

While treating acute myelopathy, the authors experienced an atypical case in which the acute myelopathy was caused by extruded and migrated cervical disc herniation in two contiguous locations. Considering that in such a case large volumes of disc material, producing enormous pressure on the spinal cord, could be created during migration to a single specific location, the authors believe that although surgery to reduce pressure on the spinal cord can be safely performed by removing the cervical body and cervical disc, it is possible to remove the cervical disc in the posterior of the cervical body by removing the cervical disc in each area.

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