Single-level Calcified Cervical Disk Herniation in a 13-year-old Girl

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abstract

Full article available online at Healio.com/Orthopedics. Search: 20120725-40

This article describes a case of a 13-year-old girl with single-level calcified cervical disk herniation. The patient was treated conservatively for a symptomatic intervertebral calcification that caused neurological compression, and the data were reviewed retrospectively. Previous reports have shown that the natural history of the disease is self-limiting with a benign course and an excellent prognosis. However, on rare occasions when the calcified nucleus pulposus herniates into the spinal canal and compresses the spinal cord or its roots, neurological abnormalities can occur, such as radiculopathy and myelopathy. This also raises the question of whether operative therapy will eventually be necessary.

In the current case, conservative treatment was applied. Plain radiographs are usually sufficient to determine the presence and extent of a calcified cervical disk, and computed tomography or magnetic resonance imaging can detect an associated disk herniation. Conservative treatment with antalgics, muscle relaxants, neurotrophic drugs, and a cervical collar were applied. The patient was completely free of symptoms 3 weeks after the initial treatment. Magnetic resonance imaging indicated complete vertebral canal clearance at final follow-up.

Cervical intervertebral disk calcification and herniation is a rare disorder in children with an obscure etiology but a good prognosis. Conservative therapy produces satisfactory results, even if clinical symptoms due to nerve root or spinal cord compression are present. Surgical treatments are only suitable in rare cases with severe progressive radicular pain or neurological deficit.

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Messrs Li and Rong and Drs Pan and Yu have no relevant financial relationships to disclose.

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doi: 10.3928/01477447-20120725-40
Calcification of intervertebral disks is an uncommon clinical syndrome in children. Since Baron’s first description of this disease in 1924, three hundred cases have been reported in the literature. The etiology of this disease is unclear, but its natural history is self-limiting, with a benign course and an excellent prognosis. However, on rare occasions, the calcified nucleus pulposus herniates into the spinal canal and compresses the spinal cord or its roots if the annulus fibrosus is ruptured. This potentially serious complication can lead to neurological abnormalities, such as radiculopathy and myelopathy. This also raises the question of whether operative therapy will eventually be necessary. Surgical interventions have been reported in a few cases with a progressive neurologic deficit. However, other studies have stressed that the remission of symptoms occurred with conservative treatments in several cases.

This article describes a case of a girl with a single-level calcified cervical disk that had herniated into the spinal canal and caused nerve root compression. A conservative treatment course was followed, and symptoms completely disappeared.

**CASE REPORT**

A previously healthy 13-year-old girl with no skeletal deformities presented with neck pain and an electric shock–like pain in the right forearm when moving her neck. The neck pain had started 2 weeks previously with no history of trauma or infection. She was slightly febrile when the neck pain onset occurred. Her temperature spontaneously returned to normal within 2 to 3 days. However, the neck pain persisted and became intense. The pain soon radiated into the right forearm.

Physical examination demonstrated that her neck range of motion (ROM) was significantly decreased, particularly flexion-extension. The cervical movement-induced pain had no specific tender point. Neurologic examination was normal, except for a slight hyperesthesia in the region of the C6 nerve root and mild activity of the bilateral deep tendon reflexes in the lower extremities. Laboratory findings were within normal limits, and no significant elevations were noted in the erythrocyte sedimentation rate, C-reactive protein, or leukocyte count.

Initial lateral radiographs demonstrated a slight straightening of the cervical alignment. At C5-C6, a calcified density was observed in the central and posterior border of the intervertebral space. A slight decrease in the height of the C5 and C6 vertebral bodies was also observed (Figure 1). A computed tomography (CT) scan confirmed the presence of a C5-C6 calcified nucleus pulposus herniation and showed that it had herniated into the spinal canal from the right posterolateral region of the C5-C6 intervertebral space (Figure 2). Cervical magnetic resonance imaging (MRI) detected a decreased signal intensity at the C5-C6 intervertebral disk on T1- and T2-weighted MRIs. In the sagittal and axial planes, the herniated calcified nucleus pulposus had contacted the right C6 nerve root. The dura and spinal cord was also contacted by the calcified nucleus pulposus at C5-C6 (arrow), with a slight decrease in the height of the C5 and C6 vertebral bodies.

Conservative treatments included non-steroidal anti-inflammatory drugs, muscle relaxants, and neurotrophic drugs. The girl was advised to take bed rest, and a cervical collar was applied to limit cervical spine movement. One week after she received the conservative treatments, her cervical and radiating pain disappeared. Two weeks later, she regained full neck ROM, and the cervical collar was discontinued 1 month later. Four months after the cessation of all treatments, she remained asymptomatic, and clinical examination was normal with no findings. A CT scan at 4-month follow-up detected small areas of calcification in the center of the C5-C6 disk, but the herniated region of the nucleus pulposus had completely resolved (Figures 4A, B). Magnetic resonance imaging 4 months later revealed diminished spinal canal compression and no spinal cord or nerve root compression, although a residual posterolateral herniation of the C5-C6 disk was present (Figures 4C, D).

**DISCUSSION**

Disk calcification is uncommon in children. The average age at diagno-
sis is 7 to 8 years (range, 7 days to 20 years). The cause of this disease remains unclear. Disk calcification in some children is preceded by trauma; therefore, trauma has often been implicated as a predisposing factor. However, preexisting disk calcification has also been observed in children with no history of injury. Thus, its relationship with trauma has not been clearly demonstrated. Recent theories suggest that its pathogenesis may involve inflammatory and infectious processes because many patients often experienced a fever at the onset of the neck pain. Some cases present with an elevated erythrocyte sedimentation rate, white blood cell count, and C-reactive protein level. However, this relationship is weakened by the fact that asymptomatic disk calcifications have been diagnosed in several children, including newborns, although many children recover with no need for antibiotic therapy. More credible hypotheses regarding the etiology of the syndrome include elevated hydrostatic pressure in the disk, nutritional disturbances in the nucleus pulposus due to vascular impairment, disk inflammation, and protrusion of the intervertebral disk into the spinal canal. A further plausible hypothesis is that viral-induced vasculitis leads to the disruption of the blood and nutrition support for the intervertebral disk and vertebral body complex.

Calcification in children is different from the degenerative calcification observed in adults. This is because the calcified deposits found in adults are mainly degenerative in nature, and they occur at the midthoracic or upper lumbar spine, which are relatively immobile. Furthermore, it more frequently affects the nucleus pulposus and the annulus fibrosus in adults. Thus, it may indicate numerous systemic diseases. In contrast to adults, the calcification is concentrated in the nucleus pulposus in children. It is located at the cervical level in 70% of cases and involves more than 1 disk space in 35% of cases. Thoracic disks are rarely involved, and the lumbar spine is almost never involved, but disk calcifications may occur at any spine levels that are not necessarily contiguous. The calcified nucleus pulposus can herniate through a rupture in the annulus fibrosus and may be displaced in different directions. However, posterior and posterolateral extrusion into the spinal canal with neurological signs in the spinal cord or nerve root compression occasionally occur.

The clinical symptoms of disk calcification vary in children. Most of these symptoms are nonspecific when calcification occurs in the cervical spine. Neck pain and stiffness are the most common symptoms, which may be associated with an increase in intradiskal pressure and

Figure 3: Sagittal T1- (A) and T2-weighted (B) magnetic resonance images showing a reduced signal intensity at C5-C6 with the mass of an intraspongious herniation touching the dura and spinal cord (arrow). Axial plane magnetic resonance imaging showing the herniated calcified nucleus pulposus making contact with the right C6 nerve root (arrow) (C).

Figure 4: Sagittal (A) and axial (B) computed tomography scans showing complete resolution of the calcified disk herniation of C5-C6 after 4 months of follow-up, except for a small areas of calcification at the center of C5-C6 disk (arrow). Sagittal (C) and axial (D) magnetic resonance images 4 months later showing a diminished spinal canal compromise and no spinal cord or nerve root compression.
paraspinal muscle spasm. Low fever and limited neck ROM also occur frequently. Torticollis is another fairly common symptom present in 40% of symptomatic patients, but it was not present in the current patient. In children, this acquired torticollis is a benign paroxysmal torticollis. Other diagnoses of torticollis include cervical adenitis or abscess, fracture of the cervical spine, and spinal cord tumors. If the calcification herniates through the fibrous annulus, neurological complications in the nerve root or spinal cord compression may occur. The neurological deficits, such as signs of focal weakness, sensory loss, or hyperesthesia, are usually not severe. However, their presence is always associated with local spinal symptoms. Dysphagia during spinal cord compression associated with an anterior protrusion has rarely been described. With conservative treatment, the prognosis is excellent, and symptom resolution can be expected within 3 weeks in 66% of patients and within 6 months in 95% of patients. With this approach, the current case was completely free of symptoms 3 weeks after the initial treatment.

Imaging findings of calcific diskitis are initially determined using plain radiographs. Frontal and lateral radiographs are usually sufficient to determine the presence and extent of a calcified cervical disk protrusion. The calcified disks are usually observed radiographically as dense round or oval masses in the nucleus pulposus. In addition, the disks involved are often swollen and bulging into adjacent vertebral bodies in the initial lateral radiographs. A loss in vertebral height also exists. These symptoms have been observed in most cases. This may be supporting evidence for the hypothesis that the blood and nutrition supply to the intervertebral disk or vertebral body complex is disrupted in some cases, which induces vasculitis.

Computed tomography or MRI can detect an associated disk herniation. Further investigations are recommended only for patients with neurological deficit. Computed tomography scans can detect disk protrusions, which are present in 38% of patients with symptomatic calcification. Computed tomography scans may confirm dense calcification, detect edema, and reveal an eventual herniation of the nucleus pulposus, its migration into the neural foramen, and its effects on the spinal cord. In the current patient, MRI detected regions with edema, and revealed an eventual herniation of the nucleus pulposus. In addition, the disks involved are usually sufficient to determine the presence of the disease. Computed tomography and MRI can be used to detect an associated disk herniation. Conservative symptomatic treatment and clinical supervision are sufficient for patients with mild neurological symptoms due to calcified disk protrusion. Given the young onset age in these patients, it is unlikely that degenerative disks are present. The current authors consider that nonfusion techniques and spinal fusion are inappropriate for the restoration of spinal function in these patients. However, surgical treatments may be suitable for rare cases with severe progressive radicular pain or neurological deficit.

**CONCLUSION**

Cervical intervertebral disk calcification is a rare disorder in children with a good prognosis. Its etiology remains unclear, but disk calcification appears to be linked to vasculitis, which has many causes and leads to a disruption of the blood and nutrition support to the intervertebral disk and vertebral body. The clinical symptoms vary, but it is usually a benign condition. Frontal and lateral radiographs are usually sufficient to diagnose this disease. Computed tomography or MRI can be used to detect an associated disk herniation. Conservative symptomatic treatment and clinical supervision are sufficient to moderate neurological symptoms if the calcification herniates through the fibrous annulus with neurological complications.

**REFERENCES**


