Multilevel Pediatric Cervicothoracic Intervertebral Disc Calcifications

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Intervertebral disc calcifications, not uncommon in adults, are a very rare entity in children.[1,2] Pediatric calcifications are entirely different from the usual degenerative calcifications seen in adults. Children present clinically with fever, pain, and limited range of motion. Potential laboratory abnormalities include leukocytosis and elevated erythrocyte sedimentation rate (ESR).[3,4] Infection and trauma have been proposed as possible etiologies. However, the cause remains obscure.[2] Metabolic causes have been demonstrated in adult calcifications but not in pediatric calcifications. Symptoms most often manifest between the ages of 7 and 10 years, with most reports indicating a greater prevalence in males.[5] The most common location is the cervical spine.[3,4,6]

Case Study

A 6-year-old girl was brought to the emergency department with neck pain of 2 weeks' duration and symptoms worsening over the past few days. She had been rigorously participating in gymnastics at school, but there was no evident antecedent trauma history. Physical and neurologic examinations were within normal limits, except for mild lower cervical and upper thoracic tenderness to palpation, and slight disruption of spinal rhythm on flexion and extension. Laboratory and clinical tests were obtained. The patient was afebrile (98.2°F). ESR was 12 mm/h (normal range, 0-30 mm/h), [calcium was 9.3 mg/dL (normal, 8.9-10.6 mg/dL), alkaline phosphatase was 202 U/L (normal, 50-136 U/L), and white blood cell (WBC) count was 12.0×10^9/L (normal, $4.5\text{-}11.0\times10^9$/L).

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Am J Orthop. 2008;37(7):E126-E128.

A radiograph and a sagittal reformatted computed tomography (CT) scan of the cervical spine showed multiple intervertebral disc calcifications predominantly of the lower cervical and upper thoracic spine with mild anterior wedging and no listhesis (Figures 1, 2). Magnetic resonance imaging (MRI) scans of the cervical spine showed intervertebral calcifications, with no disc bulge or herniation identified (Figure 3).

Ultimately, the patient was discharged from the emergency department and managed conservatively with analgesics and rest. At her 18-month follow-up examination, she had full, painless range of motion and no symptoms; neurologic examination was normal; and a radiograph (Figure 4) showed persistence of the calcifications.

Discussion

Intervertebral disc calcifications in the pediatric population, though not common, remain an essential part of the differential diagnosis in pediatric spinal pain. The first pediatric case was reported by Baron[7] in 1924. Patient history may include remote trauma, but calcifications also may occur

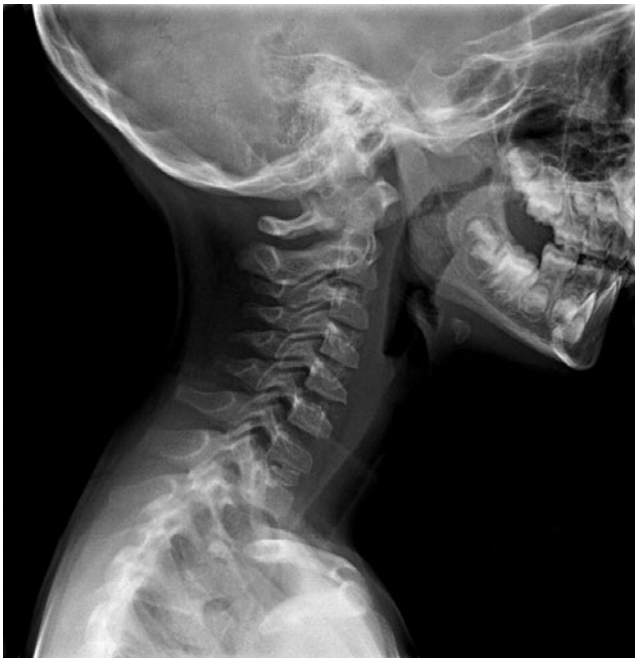

Figure 1. Plain radiograph of 6-year-old girl's cervical spine shows intervertebral disc calcifications at C5–C6, C7–T1, and T2–T3 levels. Mild anterior wedging of the C4, C5, and C6 anterior vertebral bodies is present, with no retrolisthesis or disc space narrowing.

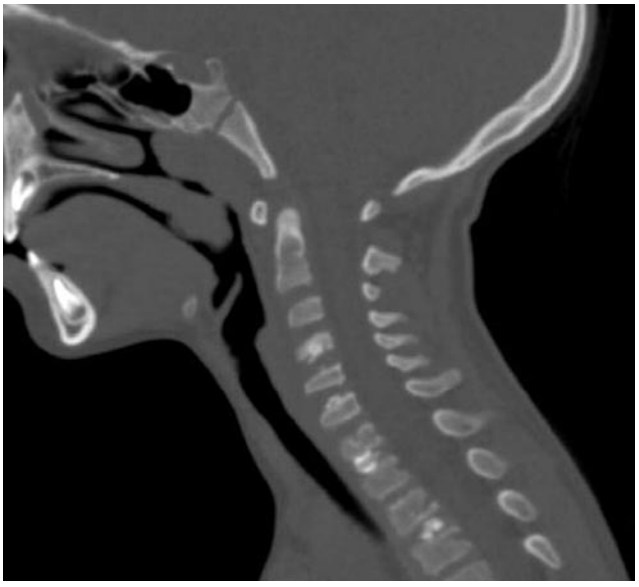

Figure 2. Sagittal reformatted computed tomography scan of cervical spine shows intervertebral disc calcifications at C5–C6, C7–T1, and T2–T3 levels. Mild anterior vertebral body narrowing of C4, C5, and C6 vertebral bodies is identified.

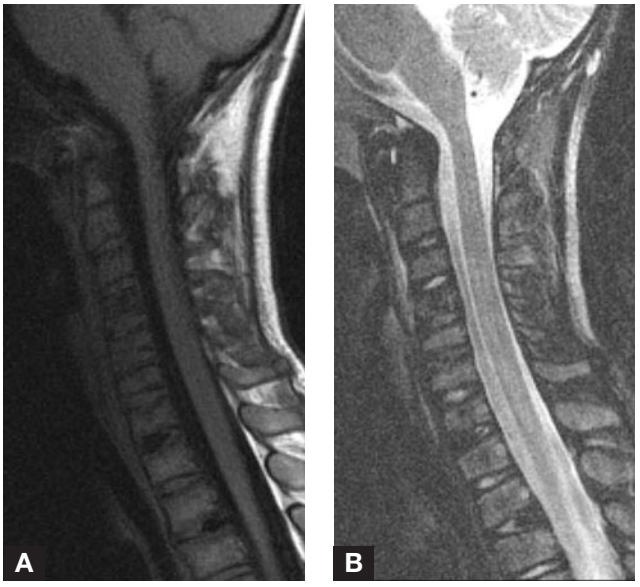

Figure 3. Sagittal T_1-weighted (A) and T_2-weighted (B) magnetic resonance imaging scans of cervical spine. Focal low intensity in the C5–C6, C7–T1, and T2–T3 disc spaces consistent with calcifications are present. Low T_1 and T_2 signal consistent with sclerosis of the C4 vertebral body is seen. A C7 superior endplate Schmorl node is noted. Mild anterior wedging of C5 and C6 is seen. No disc bulge or herniation is identified.

with no history of injury. Other postulated pathophysiologic mechanisms include inflammatory and infectious processes.[1,8] However, these proposed mechanisms remain largely unproved. Pediatric patients with intervertebral disc calcifications may present with elevated ESR or WBC count.[4,9] In our patient's case, WBC count was borderline elevated, and ESR was within normal limits.

The clinical presentation of pediatric intervertebral disc calcifications is varied and may include torticollis, neck stiffness, muscle spasm, tenderness, fever, occasional neurologic deficit, and dysphagia.[4] By far, however, the most common presentation is neck pain.[2,5] Symptoms, more frequent with calcifications of the cervical spine,[9] are often precipitated when the calcifications begin herniating or resorbing.[6,10] One third of symptomatic patients have an associated anterior or posterior herniation of a calcified disc.[5] Anterior displacement can lead to dysphagia,[11] and posterior displacement can lead to corresponding neurologic signs and symptoms.

In general, conditions associated with adult disc calcifications include metabolic disorders in which calcium is deposited in soft tissues. These disorders include hyperparathyroidism, hemochromatosis, homocystinuria, and alkaptonuria.[4,9,12] None of these diagnoses is associated with disc calcifications in children. Hypervitaminosis D is associated with calcification of the annulus fibrosis but is not typically associated with childhood nucleus pulposus calcification.[6] Our patient's calcium levels were within the normal range. Ochronosis also can lead to calcification of the disc space. However, this calcification likewise usually occurs in adults.[8] Other associated pediatric conditions include block vertebrae[6] and spondyloepiphyseal dysplasia tarda.[12]

The cervical spine is the most common location for pediatric intervertebral disc calcifications. However, they

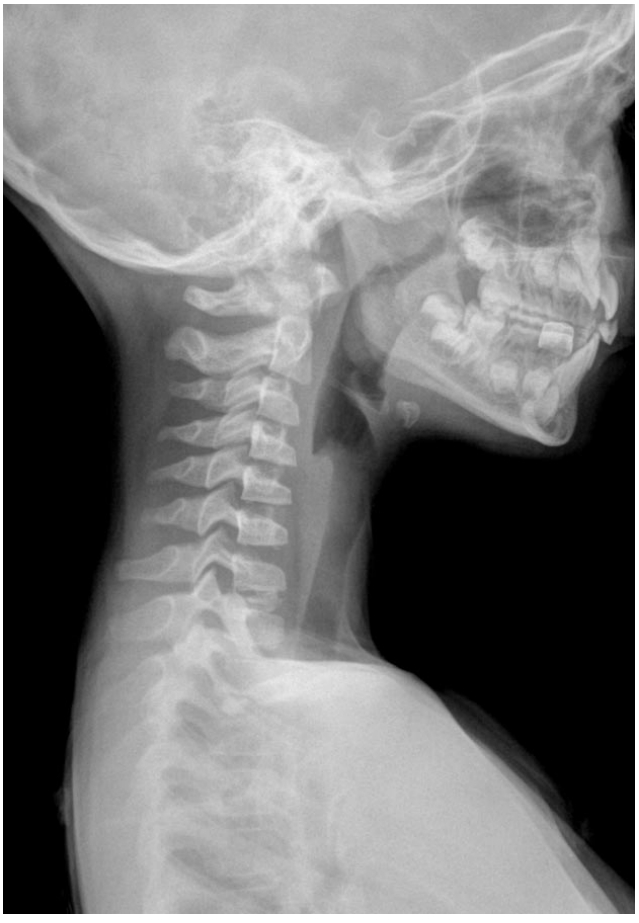

Figure 4. Eighteen-month follow-up plain radiograph of cervical spine shows persistent disc calcifications at C7–T1 and T2–T3.

may occur at any level of the spine and are not necessarily contiguous. Single-level involvement is much more frequent than multilevel involvement. Our patient's case is even more unusual in that more than 2 disc spaces were involved.[2,13]

The radiologic presentation with plain radiographs shows hyperdense ovoid masses within the disc space. On CT, high-density calcifications involving the disc spaces are present. Endplate irregularity adjacent to the involved disc is sometimes seen. Disc spaces are maintained or increased. Adjacent vertebral body sclerosis or resorption may be present. On MRI, diminished regions of T_1 and T_2 signal are seen in the disc spaces consistent with calcifications. In addition, MRI is especially useful in identifying occasional associated disc herniation and perhaps in detecting additional levels of disc calcification not appreciated on plain radiograph.[9] However, plain radiographs are diagnostic, and use of MRI in the absence of neurologic compromise is not mandatory.[2,13]

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The prognosis of disc calcifications in children is excellent, with symptom resolution expected within a few weeks.[1] Radiologic resorption of pediatric intervertebral disc calcifications, with persistent punctuate calcification deposits, is usually seen within 3 months.[9] In contrast, adult calcifications are permanent.[5] On rare occasions, long-term pediatric calcifications may lead to disc space narrowing and mild loss of vertebral body height.[14]

The mainstay of treatment is symptomatic and conservative, with use of analgesics and nonsteroidal anti-inflammatory drugs, bed rest, and judicious use of cervical orthoses.[2,3,5] Surgical intervention secondary to a herniated calcified disc is reserved for the extremely rare patient who has progressive neurologic deficit or intractable pain.[3]

In their review of the natural history of pediatric disc calcifications, Dai and colleagues[2] documented the benign course of this disease. All patients in their series were treated nonoperatively—including 5 patients with nonprogressive objective neurologic deficits. The signs, symptoms, and calcific deposits all disappeared within a few weeks. Dias and colleagues[15] documented a case of frank myelopathy attributed to disc calcification. Their case rapidly resolved with only expectant management. The need for surgical discectomy is certainly rare, as the clinical course is generally benign with spontaneous resorption of the intervertebral disc calcifications and resolution of the clinical symptoms.

The first step in making a correct medical diagnosis is to be aware of all plausible explanations. Calcifications of the intervertebral disc, though rare, must remain in the differential diagnosis with pediatric spinal pain. Our patient's unusual case should serve as a reminder that pediatric spinal pain is not to be disregarded and may, though infrequently, be caused by disc calcifications.

Authors' Disclosure Statement

The authors report no actual or potential conflict of interest in relation to this article.

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