

Discussion

Intervertebral disc herniation is generally regarded as a consequence of a long-term degenerative process in the disc tissue. Over the years, the annulus fibrosus is exposed to increasing stress as the nucleus pulposus loses volume and elasticity. The integrity of the annular ring may then be lost, rendering possible the extrusion of disc material. The contribution of traumatic events as potential causes of intervertebral disc herniation is debatable. Only in a few cases of disc herniation has a preceding traumatic episode been identified (Ando and Mimatsu 1993).

Based on *in vitro* experiments, disc extrusions can be caused by hyperflexion or hyperextension injuries of the intervertebral disc (Adams and Hutton 1982). Harrington et al. (1991) have shown that cervical disc herniations are common in patients with cervical fracture subluxations. In their series of 37 consecutive patients with cervical fracture subluxation, disc herniation was demonstrated at the level of the injury in one third of the cases. Herniated disc was seen most frequently in flexion fracture dislocation and flexion compression injuries. Our patient provides further evidence of the role of mechanical trauma as one potential cause of cervical disc herniation. This case also shows that a traumatic herniation may develop even

in the absence of fracture subluxation. Alternatively, the impingement in our patient could have been present before the accident, with or without minor symptoms. In that case the symptoms may have been aggravated by the retroflexion injury. In accordance with previous findings (Hall et al. 1993), the value of MRI proved most useful here in distinguishing cervical disc herniation from other causes of spinal cord compression and contusion. We recommend that all patients suffering from neurological symptoms after a cervical trauma, who have no evidence of a fracture or luxation on routine radiological examinations, should also be examined by MRI in order to detect soft tissue injuries.

References

- Adams M A, Hutton W C. Prolapsed intervertebral disc. A hyperflexion injury. *Spine* 1982; 7: 184-91.
- Ando T, Mimatsu K. Traumatic lumbar disc herniation. A case report. *Spine* 1993; 18: 2355-7.
- Hall A J, Wagle V G, Raycroft J, Goldman R L, Butler A R. Magnetic resonance imaging in cervical spine trauma. *J Trauma* 1993; 34: 21-6.
- Harrington J F, Likavec M J, Smith A S. Disc herniation in cervical fracture subluxation. *Neurosurgery* 1991; 29: 374-9.

Spontaneous premature closure of the tibial tubercle—report on 2 boys with a new disorder?

Lars G Danielsson

Department of Orthopedics, Malmö University Hospital, S-205 02 Malmö, Sweden. Tel +46 40-33 10 00. Fax -33 62 00
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Case 1

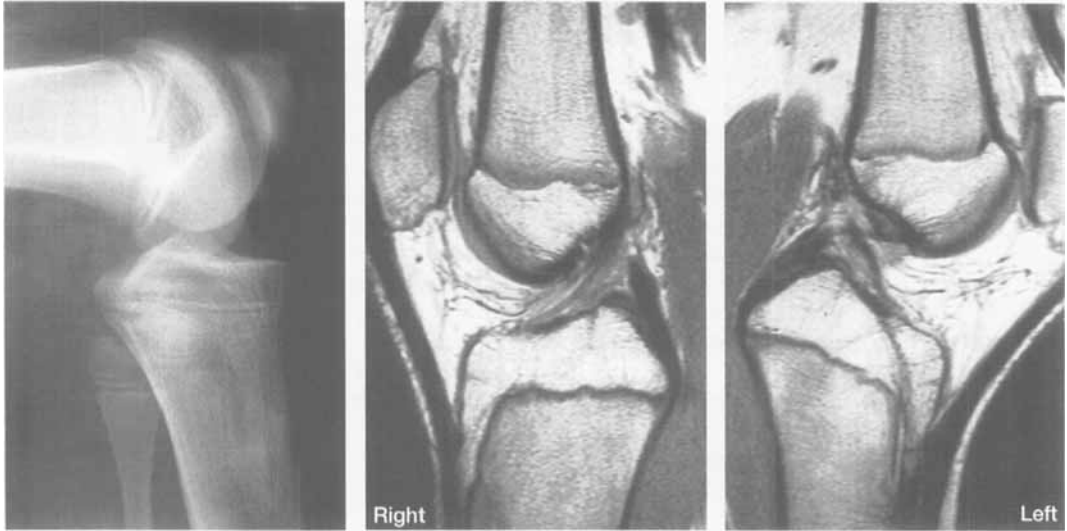
A boy, aged 13.5 years, had for 6 months noticed an increasing deformity of his left knee. He had no history of trauma or infection. The normal eminence of the tibial tubercle had disappeared and the knee had the appearance of a posterior cruciate ligament injury, but was stable with normal flexion and a hyperextension of 25°. There was a tibial shortening of 0.5 cm. The right knee was normal.

Radiographs showed fusion of the distal part of the tibial tubercle, which was atrophic. The rest of the proximal tibial physis was normal. The proximal tibial joint surface was angulated anteriorly 12°. MRI revealed closure of the distal part of the tibial tubercle,

whereas the rest of the proximal tibial physis remained open. The closure was located more laterally than medially. The anterior slope of the tibial joint surface was steeper centrally than medially and laterally, and was steeper laterally than medially. The right knee was normal.

3 months later, a slight atrophy of the right tibial tubercle was noticed. Radiographs and MRI at age 14 years and 2 months showed the same type of fusion as on the left side. The anterior slope, however, was only 2°.

The axis of the left tibia at age 14 years and 9 months was displaced posteriorly in relation to the femur and the slope of the tibial physis had increased.



Case 1. Left knee at age 13.5 years, showing fusion and atrophy of the tibial tubercle and anterior angulation of the tibial joint surface.

Case 1. MRI of the right normal knee and the left knee at age 13 years and 9 months. In the left knee the distal part of the tibial tubercle is closed, while the rest of the tibial physis is open. There is an anterior angulation of the tibial joint surface.



Case 1. At age 14 years and 2 months. The left knee is considerably deformed, while only slight atrophy of the right tibial tubercle can be seen.



Case 1. The left knee at age 14 years and 9 months, showing increased anterior angulation of the tibial joint surface. The longitudinal axis of the tibia is displaced posteriorly to the longitudinal axis of the femur.

Initially, a resection of the bony bridge (Langenskiöld 1975), combined with posterior stapling, was suggested, but the patient was anxious about an operation and wished to wait.

Case 2

The mother of the boy in case 1 was Vietnamese, his father Swedish. The mother had 9 siblings. One of the brothers had at age 12 years, without trauma or infection, noticed an increasing deformity of his left knee.



Case 2. The left knee at age 48 years, showing atrophy of the tibial tubercle and increased anterior angulation of the tibial joint surface. (Published by courtesy of Dr. Gunnar Lausten, Herlev Hospital, Copenhagen, Denmark)

At age 31 years, he was examined because of instability and pain in the knee. The position of his left knee was 10–15° of valgus and 25° of recurvation. His right knee was normal. The left leg was 3 cm shorter than the right, partly real and partly functional shortening. Radiographs showed a normal right knee, but a growth disturbance of the proximal left tibia, with underdevelopment of the anterior part and also, to some extent, of the lateral condyle. The tibial joint surface was anteriorly angulated 20°. The axis of the tibia was displaced posteriorly in relation to the axis of the femur (according to a written report, radiograms not preserved). At age 32, a varus osteotomy was done, correcting the valgus deformity. Due to the remaining hyperextension of the knee, he had to use a knee brace.

Because of instability and increasing pain, arthroscopy was done at age 46, which showed normal cartilage, except a minimal degeneration of the cartilage on the lateral tibial condyle.

Radiographs at age 48 showed atrophy of the tibial tubercle and an anterior angulation of 20–25° of the proximal tibial joint surface. The axis of the tibia was slightly displaced posteriorly to the longitudinal axis of the femur.

He was operated on with a tibial closing wedge osteotomy. Postoperatively, he managed well without his previous knee brace. At the last examination, 1 year postoperatively, the knee joint was stable, with normal range of motion and no hyperextension.

The patient has 5 children, aged 16–23 years, without knee problems.

Discussion

Growth disorders in the proximal tibial physis are nearly always characterized by a medial angulation, with or without medial rotation of the tibia. Blount's disease, trauma or osteomyelitis are the commonest etiologic factors (Blount 1937). Normally, the closure of the physis of the proximal tibia starts centrally and proceeds centrifugally. The physis under the tibial tubercle appears to be the last to close and closure proceeds in a proximal-distal direction (Ogden et al. 1980).

Blount's disease (1937), first described by Erlacher (1922), is a medial angulation and internal rotation of the tibia in the proximal physis-metaphysis. Valgus deformity secondary to growth disorders in the proximal tibial physis has also been described (Marselli 1932). Langenskiöld and Riska (1964) found in stage VI of the infantile type of Blount's disease and in the adolescent type, a bony bridge in the medial part of the physis. In the adolescent type, the leg was usually 2–3 cm shorter than the normal one and the varus deformity usually did not exceed 20°.

Sevastikoglou and Eriksson (1967) have suggested heredity as a possible etiological factor and reported 4 cases of Blount's disease in the same family, two were identical twins.

I have found no previous case of familial, spontaneous premature closure of the tibial tuberosity, with secondary anterior angulation of the tibia in the literature. The reported two cases are most similar to the adolescent type of Blount's disease (age at debut, bony fusion of the physis, slight shortening of the tibia and an angulation seldom exceeding 20°).

References

- Blount W P. Tibia vara. Osteochondrosis deformans tibiae. *J Bone Joint Surg* 1937; 19: 1-28.
- Erlacher P. Deformierende Prozesse der Epiphysengegend bei Kindern. *Arch Orthop Unfallschir* 1922; 20: 81-96.
- Langenskiöld A. An operation for partial closure of an epiphyseal plate in children, and its experimental basis. *J Bone Joint Surg (Br)* 1975; 57: 325-30.
- Langenskiöld A, Riska E B. Tibia vara (osteochondrosis deformans tibiae). *J Bone Joint Surg (Am)* 1964; 46: 1405-20.
- Marselli V. Contributo allo studio dell'epifisite deformante tibiale giovanile in ginocchio valgo. *Chir Organi Mov* 1932; XVII: 267-80.
- Ogden J A, Tross R B, Murphy M J. Fractures of the tibial tuberosity in adolescents. *J Bone Joint Surg (Am)* 1980; 62: 205-15.
- Sevastikoglou J A, Eriksson I. Familial infantile osteochondrosis deformans tibiae. Idiopathic tibia vara. *Acta Orthop Scand* 1967; 38: 81-7.