Intraneural ganglion cyst of the tibial nerve in a child

A 13-year-old girl presented with intermittent knee pain for 2 years, especially during gymnastics at school and dancing. On physical examination, there was no weakness or neurological deficits.

Imaging Findings:

MRI demonstrated a multilobulated lesion with internal septations, extending along the tibial nerve, from the popliteal fossa to the level of the proximal tibial metaphysis. A thin tubular component of the lesion extended anterolaterally to the posterior aspect of the tibiofibular joint. T1-images showed low-intermediate signal intensity. PD- and T2-fat-saturated images showed fluid signal within the mass (Fig. 1-3). Postcontrast T1-fat-saturated images demonstrated only faint thin peripheral enhancement (Fig. 4). Based on these images a diagnosis of intraneural ganglion of the tibial nerve was made.

Surgical exploration revealed a lobulated longitudinal mass with overlying nerve fascicles (Fig. 5). Along the 'articular' branch of the tibial nerve the lesion could be followed towards the proximal tibiofibular joint. Pathological evaluation revealed a cyst with mucoid content and a fibrous wall without epithelial or synovial lining consistent with a ganglion cyst.

Discussion:

An intraneural ganglion cyst is a lesion of the peripheral nerve typically seen in adults. The most common type is the peroneal intraneural ganglion cyst. Involvement of the tibial nerve is much less common, about 15 cases have been reported [1-3, 9]. The first case of intraneural ganglion cyst of the tibial nerve was described in 1967 [2]. There are only two reported cases of tibial intraneural ganglion cysts in children [3, 4]. Intraneural ganglia are non-neoplastic cysts caused by the accumulation of thick mucinous fluid within the epineurium of peripheral nerves, encased in a dense fibrous capsule [5]. The pathophysiology of an intraneural ganglion cyst of the tibial nerve can be explained by the unifying articular theory [6]. The cyst arises from the posterior aspect of the superior tibiofibular joint. The responsible articular branch is derived from the oblique descending branch innervating the popliteus muscle. By leakage of joint fluid into the epineurium via the articular branch perforating the joint capsule, mucoid fluid accumulates within the neural sheath.

These cysts can cause compression of the adjacent nerve fascicles, resulting in pain, paresthesias, weakness, muscle denervation and atrophy [5]. They are commonly manifested by local and radiating pain, but motor and
sensory deficits have also been described. Intraneural ganglion cysts of the tibial nerve can be diagnosed by ultrasound and/or MRI. Several signs on MRI have been described [7, 8]. The 'signet ring sign' (Fig. 3a) is caused by eccentric displacement of the tibial nerve fascicles by an intraneural cyst. The 'tail sign' (Fig. 3b) reflects a narrow neck or pedicle connecting the intraneural cyst to the joint. The 'popliteus sign' (Fig. 3b) refers to denervation oedema of the popliteus muscle and fatty atrophy.

Minimally invasive decompression is a possible treatment of symptomatic intraneural ganglion cysts to reduce tibial nerve compression and secondary muscle denervation in patients who want to avoid an open surgical approach. Ultrasound-guided aspiration can be performed after taking careful measures to avoid injuring the nerve fascicles and adjacent popliteal artery [9].

Surgical treatment involves decompressing the intraneural ganglion cyst, identifying and disconnecting the articular branch and resecting the synovium [4].

An intraneural ganglion cyst of the tibial nerve should be considered when a non-enhancing cystic structure with intra-articular extension is identified along the course of the tibial nerve posterior to the knee joint.

**Differential Diagnosis List:** Intraneural ganglion cyst of the tibial nerve., Cystic nerve sheath tumour, Atypical Baker's cyst, Extranuclear ganglion

**Final Diagnosis:** Intraneural ganglion cyst of the tibial nerve.

**References:**


Figure 1

Description: PD-images show a high intensity lesion along the tibial nerve with connection to the proximal tibiofibular joint. Origin: Brandt Corstius H, Department of Radiology, Slotervaarthospital, Amsterdam, The Netherlands.
Description: PD-images show a high intensity lesion along the tibial nerve with connection to the proximal tibiofibular joint. Origin: Brandt Corstius H, Department of Radiology, Slotervaarthospital, Amsterdam, The Netherlands.
Description: T2FS-images show a high intensity lesion along the tibial nerve with connection via the articular branch to the proximal tibiofibular joint. Origin: Brandt Corstius H, Department of Radiology, Slotervaarthospital, Amsterdam, The Netherlands.
**Description:** T2FS-images show a high intensity lesion along the tibial nerve with connection to the proximal tibiofibular joint. **Origin:** Brandt Corstius H, Department of Radiology, Slotervaarthospital, Amsterdam, The Netherlands.
Figure 3

Description: T1FS+c image shows a non-enhancing lesion along the tibial nerve with only faint rim enhancement. Origin: Brandt Corstius H, Department of Radiology, Slotervaarthospital, Amsterdam, The Netherlands.
**Description:** Axial T2FS-image demonstrates a cyst in the tibial nerve with eccentric displacement of the tibial nerve fascicles ('signet ring sign'). **Origin:** Brandt Corstius H, Department of Radiology, Slotervaarthospital, Amsterdam, The Netherlands.
**Description:** Axial T2FS demonstrates the joint connection ("tail" sign) to the posterior aspect of the superior tibiofibular joint.
Also note high signal in the popliteus muscle corresponding to denervation oedema ("popliteus sign").

**Origin:** Brandt Corstius H, Department of Radiology, Slotervaarthospital, Amsterdam, The Netherlands.
Description: Exposure of the popliteal space, with dissection of the tibial/ sural nerves and their close relation with a multilobular process, identified as the intraneural ganglion cyst. Origin: Nandoe Tewarie RDS, Department of Neurosurgery, Slotervaarthospital, Amsterdam, The Netherlands