

Short Illustrated Review

Intraneural ganglion cyst of the tibial nerve

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Summary

Intraneural ganglion cyst of the tibial nerve is very rare. To date, only 5 cases of this entity in the popliteal fossa have been reported. We report a new case and review the previously reported cases. A 40-year-old man experienced a mild vague pain in the medial half of his right foot for 3 years. Magnetic resonance imaging scan demonstrated a soft-tissue mass along the right tibial nerve. At surgery, an intraneural ganglion cyst was evacuated. After 12 months, the patient was pain-free with no signs of recurrence. Trauma might be a contributing factor to the development of intraneural ganglion cysts. Application of microsurgical techniques is encouraged.

Keywords: Tibial nerve; intraneural ganglion; cyst.

Introduction

Intraneural ganglion cysts are benign compressive collections in the peripheral nerves. They are most commonly manifested by local and radiating pain, but motor deficit and sensory loss are not rare. The most frequently reported location is the common peroneal nerve [5, 14, 15, 18]. Involvement of the tibial nerve is rare and to date, to the best of the authors' knowledge, only five cases of intraneural ganglion of the tibial nerve within the popliteal fossa have been reported [4, 7, 13, 14, 18]. We present a new case with a review of the literature to draw some conclusions about the predisposing factors, clinical context where it should be suspected, and its surgical treatment.

Literature review

A Medline search via Pubmed was performed to find all available articles on intraneural ganglion cysts of the posterior tibial nerve. The key words [*intraneural*

ganglion and *tibial nerve*] were used. All publications from 1966 up to June, 2005 were reviewed. The manuscripts were reviewed and their references analyzed for further articles.

Analysis

A total of 117 articles with key words [*intraneural ganglion*], 11 articles with key words [*intraneural cyst* and *tibial nerve*], and 10 articles with key words [*intraneural ganglion* and *tibial nerve*] were found. Since the study concerns the tibial nerve far from the articular elements (in the popliteal fossa and distally, proximal to the ankle joint), the cases of tibial nerve ganglions in the tarsal tunnel were excluded. Analysis of the references of the articles found showed some related articles before 1966 which were reviewed but there were no reported cases of tibial nerve ganglion. Our review of the literature finally yielded five cases of intraneural ganglions involving the tibial nerve (formerly posterior tibial nerve), excluding tarsal canal level [4, 7, 13, 14, 18].

Case illustration

A previously healthy 40-year-old man was seen in the department of neurosurgery in September 2001 for an ill-defined pain in the medial half of dorsal and plantar aspects of his right foot which had been present for more than one year. He was a physically active man who worked in public services and played football regularly. He had a continuous mild pain in his right foot with episodes of painful attacks usually following heavy physical effort which made him stop his sporting activities. There was no nocturnal variations of the pain. The patient had been treated with anti-inflammatory and analgesic drugs with



Fig. 1. Magnetic resonance images of the right lower limb at the mid-level between the knee and the ankle, showing the ganglion cyst (arrow Fig. 1B) displacing the tibial artery and vein medially (arrow head Fig. 1B and arrow Fig. 1C). On T1-weighted images, the signal intensity is low (A), whereas on T2-weighted images, the signal density is high (B), and the cysts appear homogenous. A T2 weighted sagittal MR image showing the length of the ganglion (C)

moderate improvement. On physical examination the right foot had a full range of movement with no disturbances in motor functions. However, there was an area of hypoesthesia on the anterior two third of the sole of the right foot sparing its lateral border. There was also a large easily palpable ovoid longitudinal mass in the right calf region. It was firm and movable. There was no Tinel sign but the mass was sensitive to direct compression. The rest of the physical examination was unremarkable. A magnetic resonance imaging (MRI) revealed a homogenous well-circumscribed soft tissue mass extending along the course of the right tibial nerve measuring approximately 8 cm in length and 1.5 cm in maximum diameter. There was no enhancement of the mass after contrast study but the borders became more identifiable with contrast medium images. The mass displaced the tibial artery and vein medially (Fig. 1). There were neither bony nor articular disorders. The patient declined the suggested surgical treatment. In February 2003 the patient sought medical attention again because of the persistence of pain in his right foot. The neurological examination was unchanged, though the mass had grown larger. A repeat MRI was performed which showed an increase in the volume of the presumably cystic lesion measuring 11 cm long. There were no other changes in the radiological aspect of the cystic mass. Two preliminary diagnoses were considered: first a mucoid ganglion cyst of the tibial

nerve, and second a benign peripheral nerve tumor like a schwannoma (with cystic degeneration). In March 2003 the patient was operated on. During the operation the entire length of the cystic lesion along the tibial nerve was well exposed (Fig. 2A). Under optic magnification no evidence of a communication with a neighbouring joint space was seen. The content of the cyst (a thick mucoid substance) was evacuated through a longitudinal incision of the cyst (Fig. 2B) without excision of the cyst wall to preserve nerve function. During the post-operative period the patient experienced a rapid and remarkable improvement, with no new functional abnormalities. At one year follow up, the patient was pain free and he did well in his physical activities. Nevertheless, he continued to experience hypoesthesia in the same regions of the plantar aspect of his right foot as he did before the operation.

Discussion

An intraneural ganglion cyst is an accumulation of mucoid material within a dense adherent fibrous capsule dissecting for some distance through a peripheral nerve

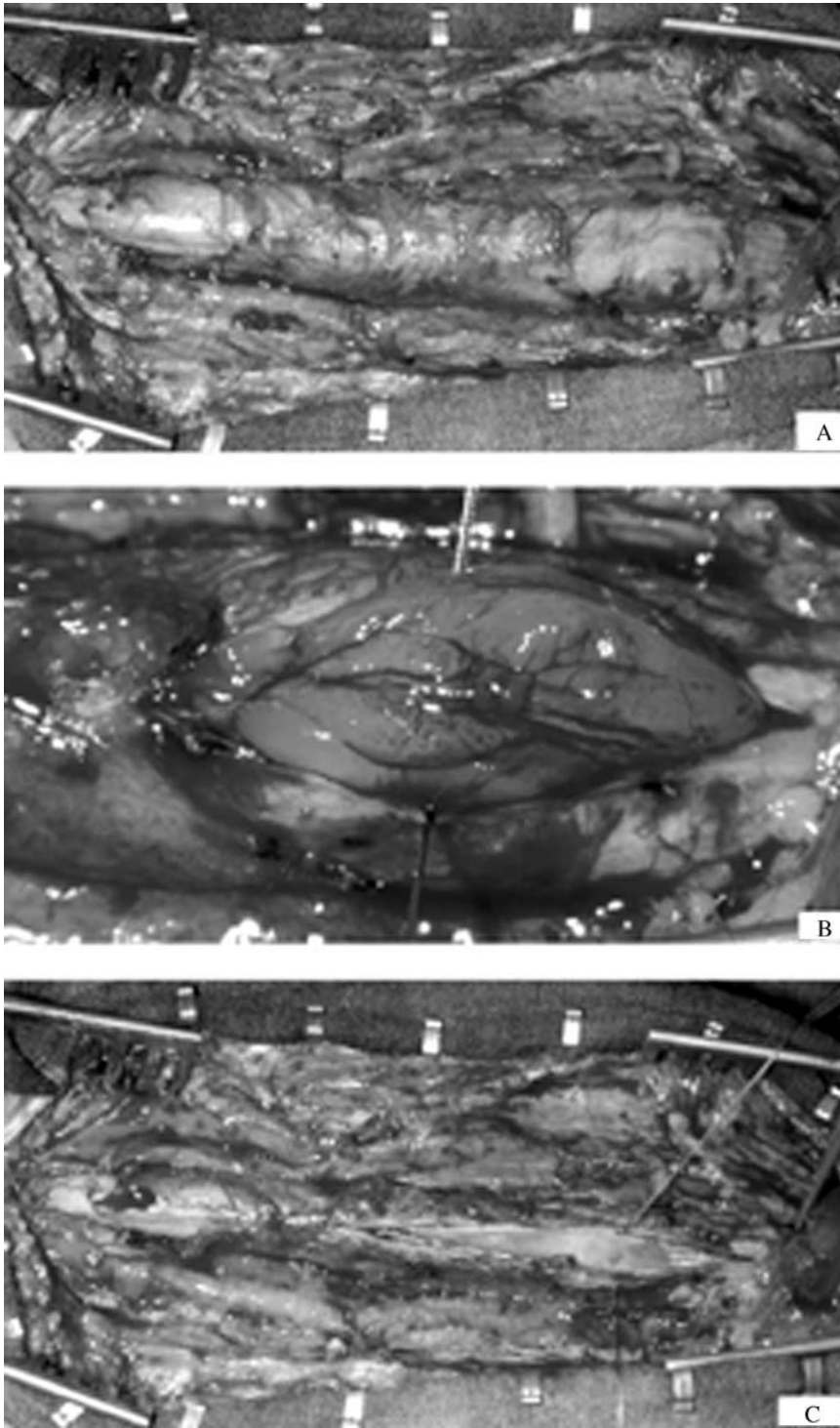


Fig. 2. Intraoperative photographs showing the fusiform ganglion of the tibial nerve (A). Mucoïd material emerging from the incised ganglion (B). The appearance of the tibial nerve after evacuation of contents of ganglion through a longitudinal incision (C)

[18]. It is a relatively rare disorder of peripheral nerves, with the common peroneal nerve being the most frequently involved [3, 5, 14, 15, 18]. The other reported sites of involvement are radial, ulnar, median, sciatic, tibial, and posterior interosseus nerves [1, 7, 8, 10–12, 15, 20]. A common feature is that the sites of involvement are very often near articular spaces.

Since 1967 that Friedlander [7] has reported the first case of intraneural ganglion of the tibial nerve, a few other cases have been reported. Our review of the literature yielded five cases of intraneural ganglions involving the tibial nerve (formerly posterior tibial nerve), excluding tarsal canal level [4, 7, 13, 14, 18]. Analyzing the reported cases (Table 1), it seems that the disorder is

Table 1. Summary of the reported cases of intraneural ganglion cyst of the tibial nerve

| Authors (Ref. No.) | Patient age/sex | Duration of symptoms | Initial symptoms | Occupation/ sports | Presumptive diagnosis | Location of ganglion cyst | Imaging modality | Operative aspect | Recurrence |
|----------------------------|-----------------|----------------------|--|--------------------|-----------------------------------|-------------------------------------|-------------------------------|---|-----------------------------|
| Friedlander [7] | 22 y/M | 10 months | pain (knee), Inc. size of calf | nd | Baker's cyst | tibial n. in popliteal fossa | roentgenograms, arteriography | 3 × 8 cm cystic mass. | no recurrence |
| Mahaley <i>et al.</i> [14] | 20 y/M | 14 months | pain (post. thigh & leg), Paresthesia (sole) | football player | lumbosacral nerve root irritation | tibial n. in popliteal fossa | nd | No artic. communication 3 × 13 cm cystic mass. No artic. Communication | nd |
| Lang <i>et al.</i> [13] | 36 y/M | 6 years | pain (calf), Paresis (toe flexors) | state officer | lumbar disc hernia | Proximal to sciatic n. bifurcation | B-scan ultrasound, CT Scan | a spindle like multiloculated cyst of 3 × 2 × 15 cm | nd |
| Deluca <i>et al.</i> [4] | 67 y/F | 2 years | pain (knee) | nd | Baker's cyst | tibial n. in popliteal fossa | MRI | 2.5 cm diameter cystic mass in continuity with the tibial nerve | no recurrence |
| Spinner <i>et al.</i> [18] | 40 y/M | 1 year | pain (post. leg, calf, sole) | manual laborer | nd | tibial n. in popliteal fossa | MRI | 1st operation: a cystic mass. No artic. Communication. 2nd operation: a communication found | yes (in less than one year) |
| Present case | 40 y/M | 3 years | pain (foot) | football player | tibial nerve cyst/tumor | tibial n. in the middle 1/3 of calf | MRI | 1.5 × 11 cm cystic mass. No artic. Communication | no recurrence |

y. Year, M male, F female, Inc increased, nd no data, n nerve, post posterior, artic articular.

more frequent in men in their third and fourth decades of life although from such a small group it is not possible to draw definite conclusions. A noteworthy point is the misdiagnosis of this entity as lumbar disc disease. This was well illustrated by Lang *et al.* [13] in a case where an initial clinical diagnosis of lumbar disc hernia led to surgical treatment with no clinical improvement. The clinical inclusion of lumbar disc disease involving S1 root in the initial differential diagnosis is logical, but the absence of spinal signs should favour a diagnosis against lumbar spinal disease. The presence of local tenderness in the lower limbs even concomitant with low back pain can be a hint for elucidation of the main cause of the pain. A careful physical examination will usually reveal a large mass in the popliteal fossa or posterior tibial region. Ultrasound provides valuable information about the solid or fluid nature of the mass [5, 6, 16]. However, after a mass has been discovered by palpation or recognized on ultrasonography, MRI appears to be the modality of choice for precise anatomical evaluation [5].

Different hypotheses have been proposed on the pathogenesis of these ganglia. The synovial theory which is currently the most favoured regards these cysts as of articular synovial origin [15, 19]. It is suggested that the ganglion originates from the articular or periarticular tissue of neighbouring joints and subsequently tracks along the sheath of a small articular nerve and migrates up to its final position in the sheath of a major nerve [7, 15, 18]. A stalk connecting the cyst with a nearby joint is reported to be present in about 40% of all the reported cases of intraneural ganglia [17, 19, 20] but in only one case of the tibial nerve (Table 1). Spinner *et al.* [18] emphasized the importance of searching for a joint communication in every patient with intraneural ganglion cyst both preoperatively and intraoperatively.

A localized degenerative process of connective and perineural tissue secondary to chronic mechanical irritation (the metaplasia of irritated connective tissue) has also been proposed [4, 13]. This could explain the rarity of these ganglia in the popliteal fossa where there is ample room for the neural elements compared to the common peroneal nerve where it could easily be compressed against the fibular neck [7]. Another theory, although less convincing, states that some cysts could arise from mucoid or cystic degeneration of a formerly solid tumour (e.g. schwannoma) [12, 17].

Concerning the role of trauma in the pathogenesis of the ganglion cysts, a past history of local trauma has been reported in approximately 25% of cases and it is

tempting to implicate this factor when the nearby joint is subjected to more than ordinary movements [14]. We believe that trauma might be considered as a contributory rather than principal causative factor. For instance, regular trauma by chronic forced contact may facilitate integration of the synovial cells into the neural tissue of the adjacent nerves through small communicating branches. This way the high frequency of this entity in the common peroneal nerve is more conceivable. The importance of these communicating branches in the common peroneal nerve is well illustrated by Spinner *et al.* [18]. Reviewing the previously published cases of tibial nerve ganglia, including our patient, 4 out of 6 patients either had or at least were exposed to trauma in their past histories (Table 1). Although tempting, with the small number of patients and the absence of histological evidence, the effect of trauma remains a hypothesis based on limited clinical cases.

The possibility of an intraneural haemorrhage secondary to trauma and formation of cysts after resorption of the intraneural haemorrhage has been raised [8]. However, the presence of haemosiderin deposits within the lesion has not been a usual finding.

The treatment of intraneural ganglia is surgical, with both simple drainage of the nerve ganglion and resection of the involved segment as possible alternatives [14]. As stated before, an articular connection is to be looked for attentively during the surgery preferably under microscopic magnification, and when found, eliminated completely. Concerning the excision of the cyst wall, it sounds logical to make every effort to avoid postoperative dysfunction of the concerned extremity. Leaving the cyst wall in place in the case of a large or unresectable cyst seems a reasonable option. When the reported risk of recurrence of the completely excised cysts can be as high as 20% [2, 9, 18, 19] iatrogenic dysfunction of the concerned extremity seems unjustified.

In conclusion. We believe that surgical evacuation of the cyst is the preferred surgical alternative in order to maximize the functional outcome and the postoperative quality of life. We also stress to give consideration to the ganglion cyst in the differential diagnosis and therapeutic decision-making of lumbar nerve root complaints.

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Comments

The authors report an interesting case of an intraneural ganglion cyst. Most of the ganglion cysts arise from joints and do not involve nerves. Sometimes they can compress nerves and eventually can be located inside a nerve. The intraneural ganglia may arise from an adjacent joint and grow into the nerve or arise already inside the nerve without connection to a joint. The most frequent site for these lesions is the peroneal nerve in the region of the fibular head.

In this case report Adn and colleagues describe a rare intraneural ganglion cyst of the tibial nerve, without communication with an adjacent joint space. Differently from the peroneal cases which origin is explained by an attractive theory [1], the pathogenesis of the rare ganglion in this report is unknown and the many theories presented are highly speculative.

I thank the authors for sharing with us their experience in this nicely written report.

The rarity of a synovial cyst involving the tibial nerve justifies this case report. The documentation is excellent. The evidence that trauma is involved in this entity is not compelling.

Prof. Peter Richardson
London

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