

Recurrent ganglion cyst of the peroneal nerve: radiological and operative observations

Case report

ANNIE S. DUBUISSON, M.D., AND ACHILLE STEVENAERT, M.D., PH.D.

Department of Neurosurgery, University Hospital of Liège, Liège, Belgium

✓ This 34-year-old man presented with right leg pain and foot drop of 1-month duration. The preoperative diagnosis of a 10-cm-long ganglion cyst of the peroneal nerve was achieved using ultrasonography (US), computerized tomography and, particularly magnetic resonance (MR) imaging. Surgical exploration disclosed a lobulated cystic mass filled with gelatinous material, which intermingled with the nerve substance of the deep peroneal nerve. The lesion was completely resected, with the sacrifice of some electrically nonfunctioning fascicles. No connection with the knee joint was found. A good postoperative recovery of motor function was obtained. However, routine postoperative MR imaging disclosed a recurrent ganglion cyst that was slightly less extensive than the original. A careful radiological examination of the knee joint was performed, including arthrography. A communication of the cyst with the tibiofibular joint was clearly demonstrated and was meticulously closed at reoperation. The patient's postoperative course was uneventful, and a third MR image, obtained 5 months after reoperation, showed no sign of cyst recurrence. The patient remained free of symptoms 11 months postoperatively.

This case illustrates the value of US and MR in diagnostic imaging. The diagnostic efficacy of US and MR imaging in identifying and characterizing a ganglion cyst is described. Close contact between a ganglion cyst and the tibiofibular joint should raise the possibility of an existing cyst–joint communication and lead to an aggressive radiological workup and/or a surgical search for such a communication.

KEY WORDS • ganglion cyst • peroneal nerve • foot drop • ultrasonography • magnetic resonance imaging • arthrography

PERONEAL nerve neuropathy can be induced by several conditions, such as mononeuritis, external compressive neuropathy, and tumors. Intraneural synovial cyst of the peroneal nerve, another possible cause, has been described in single case reports or in small series of two or three cases. In the current report, we recount our experience with an additional case of peroneal nerve neuropathy. The case is of particular interest with regard to its etiology, and to the value of using ultrasonography (US) and, particularly, magnetic resonance (MR) imaging for specific diagnosis and to determine the causes of recurrence.

Case Report

This 34-year-old man, an amateur drummer, presented with a 4-week history of right foot drop. The condition had been preceded by some back discomfort, followed by pain in the lateral aspect of the right leg.

Examination. Physical examination showed moderate wasting of the tibialis anterior and hallux extensor muscles with complete paralysis of the right foot dorsiflexion

although eversion was preserved. Deep tendon reflexes were normal on both lower limbs. Sensory testing revealed hypesthesia over a small area at the dorsal aspect of the right foot. No mass could be located by palpation in the popliteal space, over the head of the fibula, or along the lateral leg, and no paresthesia was elicited on palpation and percussion. Examination of the patient's back and the straight leg raising test yielded negative results. Because of the patient's complaints of back discomfort, lumbar plain x-ray study, myelography, and computerized tomography were first performed; these ruled out a radicular lesion. On the right leg, electromyography revealed many fibrillations in the tibialis anterior muscle and none in the peroneus lateralis longus muscle; conduction velocity was markedly diminished at the proximal deep peroneal nerve. Plain x-ray films of the right knee and leg were normal. On US a fusiform, markedly hyperechogenic mass, measuring 3 cm × 10 cm, was seen in the lateral muscle compartment between the fibula and the tibia (Fig. 1). Computerized tomography confirmed that the mass was well defined and indicated a course within the deep peroneal nerve. Magnetic resonance imaging showed the mass to

Recurrent ganglion cyst of the peroneal nerve

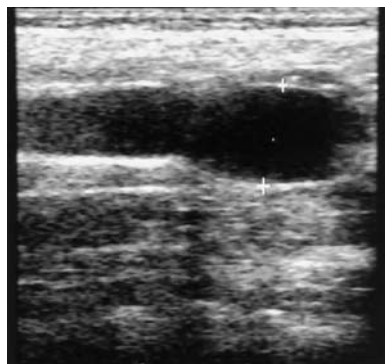


FIG. 1. Ultrasonography scan showing an hypoechoic mass, measuring 3 cm \times 10 cm, located deep in the lateral muscle compartment of the right leg.

be homogeneous and lobulated; it was markedly hypointense on T_1 -weighted and hyperintense on T_2 -weighted images and was not enhanced by administration of gadolinium (Fig. 2). The proximal portion of the mass made some contact with the head of the fibula but none with the upper tibiofibular joint. An intraneural synovial cyst of the right peroneal nerve was diagnosed.

Operation. After making a skin incision laterally from the lateral aspect of the knee down to the lower third of the leg, we identified the peroneal nerve by using electrical stimulation and followed the nerve distally. A fusiform dilation of the deep peroneal nerve was found. An intraneural lobulated cystic mass containing a yellowish, glue-like material had developed over a distance of 11 cm from the external aspect of the popliteal space over the head and shaft of the fibula. There was no evident connection to the tibiofibular joint. Using microsurgical techniques the mass was totally removed along with the perineurial tissue to which it firmly adhered. The nerve fascicles were markedly compressed. Some of them were grossly invaded and nonresponsive to electrical stimulation; these had to be sacrificed to ensure total removal of the cyst walls.

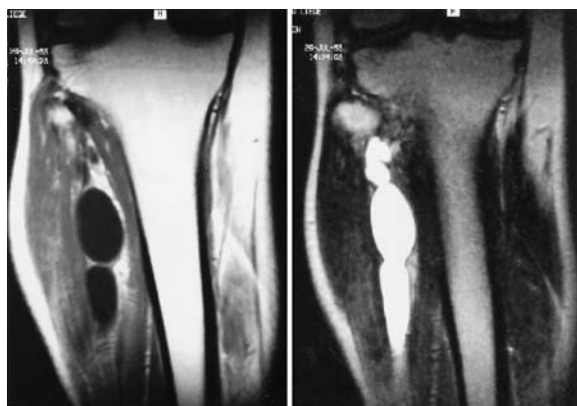


FIG. 2. Preoperative magnetic resonance images, coronal view. A T_1 -weighted image obtained after injection of gadolinium (left) and a T_2 -weighted image (right) demonstrating a lobulated homogeneous cyst that has attained some contact with the head of the fibula but none with the tibiofibular joint.

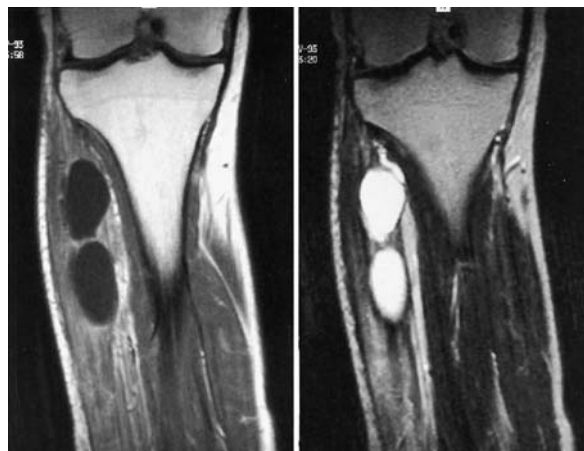


FIG. 3. Magnetic resonance images, coronal view, obtained after the first operation. A T_1 -weighted image obtained after injection of gadolinium (left) and a T_2 -weighted image (right) show the recurrent cyst. A narrow extension to the tibiofibular joint is now visible.

Postoperative Course. The postoperative course was uneventful. The right foot motor deficit progressively improved and the patient regained nearly normal gait within 3 months. At that time a control MR image revealed a recurrent cyst, slightly smaller than that found at initial presentation (Fig. 3). Knee arthrography diagnosed a communication between the tibiofibular joint and the cyst (Fig. 4).

Reoperation. By using the same approach as the first operation, the recurrent cyst was excised without sacrificing any nerve fascicles. Dissection was continued to the tibiofibular joint, discovering a narrow slit penetrating into the joint. This hole was hermetically plugged using a piece of muscle maintained by a running suture. The knee joint was immobilized for 10 days and then flexion was progressively allowed.



FIG. 4. Anteroposterior (left) and lateral (right) plain x-ray films of the right knee obtained after intraarticular injection of Hexabrix. A small connection is seen between the joint and the intraneural cyst.

Follow-Up Review. After reoperation the patient did well, retaining good function of his right foot. No signs of recurrence were seen on MR imaging performed 5 months after surgery. The patient remained free of symptoms after 11 months.

Pathological Examination. Histological examination of the cyst wall showed a fibrous tissue organized in lamellae. The cyst content was made of a mucoid material with few inflammatory cells.

Discussion

A nerve ganglion cyst is characterized by the accumulation of a mucoid substance in or around the nerve, which leads to the formation of a pseudocyst. The peroneal nerve is by far the most frequently involved nerve. Ganglion cysts are generally considered to originate from an adjacent tendon or joint. Some cysts, particularly those forming within the nerve sheath, could arise from a localized degenerative process of connective and perineurial tissue secondary to chronic mechanical irritation. In our case, the patient's hobby of drumming probably played an important role in the occurrence of the cyst.

Symptoms of nerve compression caused by a ganglion cyst include localized pain and varying degrees of motor and sensory deficits. A review of the literature by Robert, *et al.*,¹² showed that in 35 of 37 cases the nerve compression caused a motor deficit while sparing the peronei lateralis. The motor loss in such cases is always greater than the sensory loss. Many cases arise after a patient suffers an acute injury or a chronic positional, mechanical irritation.¹ One reported case came to the attention of physicians when a foot drop occurred after a tentative intraarticular injection of betamethasone.²

The differential diagnosis of a peroneal nerve palsy includes mononeuritis, schwannoma, neurofibroma, ganglion cyst, and idiopathic peroneal palsy. In many cases of ganglion cysts, a mass is palpable. When there is none, as in our case, it is difficult to make a reliable diagnosis. Operative exploration has been recommended when a foot drop lasts more than 6 weeks to 3 months.¹ In the past, the diagnosis of many peripheral nerve tumors was thus made at the time of surgical exposure. Nowadays, imaging techniques are very helpful in establishing the diagnosis and extent of a lesion preoperatively. For peroneal nerve palsy, x-ray films of the knee joint usually yield little information. With US examination, however, a ganglion cyst appears anechoic and well circumscribed. Ultrasonography thus appears to be a useful screening technique.^{6,8} Being harmless, widely available, and rapidly obtainable, US is advised in any patient who presents with a painful foot drop,⁶ whether a mass is palpable or not. Ultrasonography may reveal a deeply located soft-tissue mass that requires rapid surgical exploration, as occurred in our case; or it may show no mass, in which case the foot drop may be conservatively managed.

Ultrasonography provides valuable information about the solid or fluid nature of a mass lesion, but it does not provide a good definition of the surrounding tissues. Moreover, differential diagnosis on the basis of US findings cannot be made between a cystic schwannoma and a ganglion cyst. Computerized tomography may help to

delineate the nature of the cyst, the extent of its mass, and its relationship to surrounding bone, muscle, and nerve structures. However, after a mass has been discovered by palpation or recognized on US, MR imaging appears to be the modality of choice for precise anatomical evaluation. Magnetic resonance imaging typically displays ganglion cysts as hypointense on T₁-weighted and hyperintense on T₂-weighted images, with no enhancement after gadolinium administration. Well-defined attenuation values permit an accurate diagnosis. With its unique ability to image the anatomy in several planes, MR imaging can demonstrate any close contact of the cyst with an adjacent joint.^{7,8} Such a radiological finding may need further study by knee arthrography^{4,5} as a final part of the workup, but the invasiveness of this technique must be taken into account, at least at initial presentation.

Early operative treatment consists of evacuation of the cyst and interfascicular neurolysis. The involved nerve usually must be exposed along a lengthy segment. The length of the cyst varied from 2 to 15 cm in 40 reported cases.¹² As in the case of peripheral nerve tumors, removal of the involved nerve fascicles may result in total cyst excision without added neurological deficit because the involved fascicles often are nonfunctional at the time of clinical presentation. A communication with an adjacent joint should be carefully looked for but is rarely found at surgery. Prognosis depends on the preoperative status of the patient and also on the extent of longitudinal involvement of the nerve. In 1974, Cobb and Moiel¹ reviewed 28 cases of ganglion of the peroneal nerve reported in the literature: function was partially or completely recovered in 19 of these cases. A worse postoperative function and recurrence each occurred in four patients. Recurrence of ganglion cysts is a well-known problem; it is not infrequent and is difficult to manage. Almost 10% of the 40 cysts reviewed recurred.¹² Probably not all ganglion cysts communicate with an adjacent joint;³ some may arise from cystic degeneration of perineurial tissue. When a cyst recurs, however, especially if it recurs soon after operation, a communication probably does exist with an adjacent joint. To increase the chances of finding the communication at reoperation, a careful preoperative workup, including arthrography, may be of value. Some authors advocate arthrography at initial presentation.^{4,5} Knee arthrography not only will confirm the cyst-tibiofibular joint communication by showing progressive filling of the cystic cavity; in some cases, it will also show the pedicle itself, which is an articular branch of the peroneal nerve. In our case, the risk factors exhibited by our patient as a drummer, the large size of the cyst, and its close relationship with the tibiofibular joint, which was very clear on MR images, perhaps should have led us to perform a knee arthrography at the initial presentation. Other authors insist on a careful operative search and ligation of the pedicle along with a section of the articular branch to prevent recurrence.⁹⁻¹¹

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Recurrent ganglion cyst of the peroneal nerve

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Address reprint requests to: Annie S. Dubuisson, M.D., Department of Neurosurgery, Centre Hospitalier Universitaire (B35), Domaine Universitaire du Sart Tilman, 4000 Liège, Belgium.