Intraneural Peroneal Ganglion Cyst Excision in a Pediatric Patient

A Case Report

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Abstract

Case: A 14-year-old female presented with a profound foot drop after trauma to the right leg. Clinical examination and electrodiagnostic studies demonstrated a dense palsy of the common peroneal nerve. Magnetic resonance imaging revealed an intraneural peroneal ganglion cyst at the fibular neck. Surgical treatment included decompression and transection of the articular branch to the proximal tibiofibular joint. At the 1-year follow-up, the patient demonstrated complete recovery of peroneal nerve function.

Conclusions: This case demonstrates a rare finding of a pediatric intraneural peroneal ganglion cyst. The presentation and treatment is well-documented and adds depth to the literature on a sparsely reported condition.

Peroneal intraneural ganglia are rare cystic formations that occur when fluid tracks from a synovial cyst in the proximal tibiofibular joint into the subepineurial space of the peroneal nerve. The articular branch of the peroneal nerve functions as a conduit that siphons synovial fluid from the joint. Ganglion cysts are common in the upper and lower extremities. They are composed of synovial lining with a serous cystic fluid content suggesting some degree of arthrocentesis of the peroneal nerve. They can occur due to trauma or spontaneous synovial fluid extravasation from the knee joint via the subepineurial space of the peroneal nerve; however, spontaneous peroneal ganglion cysts are rare.

Fig. 1
The patient walks with a profound right foot drop. Preoperative clinical photographs demonstrate (Fig. 1-A) the affected foot and (Fig. 1-B) the contralateral foot.

Disclosure: The Disclosure of Potential Conflicts of Interest forms are provided with the online version of the article (http://links.lww.com/JBJSCC/A1000).
extremities, and they are typically asymptomatic\(^2\). However, in rare cases, a ganglion cyst can result in nerve compression, causing motor deficits, peripheral neuropathy, or both. The typical complaint of a patient with a symptomatic peroneal nerve ganglion cyst is a foot drop with associated sensory deficits\(^3-5\).

Peroneal intraneural ganglia most frequently occur in middle-aged men\(^6\). To date, there have been very few reported cases of excision of a pediatric peroneal intraneural ganglion cyst\(^3,5,7-17\). Only 4 of those reports detail the outcomes of the patients with a follow-up of 1 or more years after ganglion cyst excision\(^7-10,15\). In adults, peroneal intraneural ganglion cyst excision is a generally successful procedure with most patients obtaining full recovery with low rates of recurrence\(^18\).

The patient and her parents were informed that data concerning the case would be submitted for publication, and they provided consent.

**Case Report**

**Evaluation**

The patient was a 14-year-old female who presented to our clinic with a complaint of right leg pain and foot drop. Three months before presentation, she had suffered trauma to the right leg when performing a cheerleading stunt. She fell onto a concrete floor and another cheerleader fell on her leg. She was treated for a distal humerus fracture at that time. She subsequently had an insidious onset of pain in the lower leg.

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**TABLE I Nerve Conduction Studies***

<table>
<thead>
<tr>
<th>Nerve Tested</th>
<th>Peak (ms)</th>
<th>Normal Peak (ms)</th>
<th>Amplitude (µV)</th>
<th>Normal Amplitude (µV)</th>
<th>Velocity (m/s)</th>
<th>Normal Velocity (m/s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>SPN</td>
<td>UR</td>
<td>UR</td>
<td>UR</td>
<td>UR</td>
<td>UR</td>
<td>UR</td>
</tr>
<tr>
<td>Sural nerve</td>
<td>4.2</td>
<td>&lt;4.0</td>
<td>25.2</td>
<td>&gt;5.0</td>
<td>33</td>
<td>&gt;35</td>
</tr>
</tbody>
</table>

*SPN = superficial peroneal nerve, and UR = unresponsive.

**TABLE II Electromyography***

<table>
<thead>
<tr>
<th>Muscle Tested</th>
<th>Nerve Root</th>
<th>Insertional Activity</th>
<th>Fibs</th>
<th>PSW</th>
<th>Amplitude</th>
<th>Duration</th>
<th>Recruitment</th>
<th>Int Pat</th>
</tr>
</thead>
<tbody>
<tr>
<td>TA</td>
<td>Deep peroneal</td>
<td>L4-5</td>
<td>Increased</td>
<td>4+</td>
<td>Normal</td>
<td>Normal</td>
<td>Rapid</td>
<td>25%</td>
</tr>
<tr>
<td>EHL</td>
<td>Deep peroneal</td>
<td>L5,S1</td>
<td>Increased</td>
<td>4+</td>
<td>Normal</td>
<td>Normal</td>
<td>Reduced</td>
<td>25%</td>
</tr>
<tr>
<td>Peroneus longus</td>
<td>Superficial peroneal</td>
<td>L5-S1</td>
<td>Increased</td>
<td>2+</td>
<td>Normal</td>
<td>Normal</td>
<td>Normal</td>
<td>75%</td>
</tr>
<tr>
<td>Gastrocnemius</td>
<td>Tibial</td>
<td>S1-2</td>
<td>Normal</td>
<td>Normal</td>
<td>Normal</td>
<td>Normal</td>
<td>Normal</td>
<td>Normal</td>
</tr>
<tr>
<td>Vastus medialis</td>
<td>Femoral</td>
<td>L2-4</td>
<td>Normal</td>
<td>Normal</td>
<td>Normal</td>
<td>Normal</td>
<td>Normal</td>
<td>Normal</td>
</tr>
</tbody>
</table>

*EHL = extensor hallucis longus, Fibs = fibrillations, PSW = positive sharp waves, and TA = tibialis anterior.

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**Figs. 2-A and 2-B** Magnetic resonance imaging of the affected leg. **Fig. 2-A** Axial view and **Fig. 2-B** coronal view of the affected leg. White arrows demonstrate the location of the intraneurial ganglion cyst on the common peroneal nerve.
difficulty with raising the right foot while walking, and numbness in the dorsum of the foot.

Gait examination demonstrated that she walked with a profound right foot drop, as demonstrated in Video 1. The deficits in the dorsiflexion of the affected foot as compared to the contralateral foot are also shown in Figure 1. There were no obvious external abnormalities of the right lower extremity. On palpation, she was insensate on the dorsum of the foot, unable to identify pressure. Motor testing demonstrated paralysis (0/5 muscle strength) in the extensor hallucis longus (EHL), tibialis anterior (TA), and pronator longus and pronator brevis. The patient had a positive Tinel sign over the peroneal nerve at the level of the fibular neck, with radiation of symptoms into the dorsum of the foot.

Electrodiagnostic testing, including electromyography (EMG) and nerve conduction velocity (NCV) testing, was performed on the right lower extremity. There was evidence of a very severe right peroneal neuropathy at the level of the fibular head. On NCV testing, the superficial peroneal nerve (SPN) was completely unresponsive to electrical stimulation. There was no need to compare with the contralateral side because of the lack of response from the SPN. EMG demonstrated increased insertional activity in TA, EHL, and peroneus longus, with increased fibrillations and positive sharp waves in all 3 of these muscles. There was also abnormal recruitment of the TA (rapid recruitment) and the EHL (reduced recruitment). The pertinent electrodiagnostic findings are summarized in Table I and Table II.

Magnetic resonance imaging was performed to assess for any abnormalities in the right lower extremity. Imaging showed evidence of a cyst in or immediately adjacent to the peroneal nerve at the level of the fibular neck. The cyst emanated from the proximal tibiofibular joint and extended posterolaterally, compressing the peroneal nerve at the level of the neck of the fibula. Pertinent axial and coronal slices are shown in Figure 2.

Based on the clinical examination, electrodiagnostic evidence, and imaging evidence, the patient was diagnosed with an intraneural ganglion cyst of the common peroneal nerve (CPN). Surgery to excise this ganglion cyst was recommended to the patient. She and her parents agreed to this plan.

**Treatment**

A lateral incision over the fibular neck was used. There was a large intraneural ganglion cyst emanating from the articular branch of the fibula. Pertinent axial and coronal slices are shown in Figure 2.

Based on the clinical examination, electrodiagnostic evidence, and imaging evidence, the patient was diagnosed with an intraneural ganglion cyst of the common peroneal nerve (CPN). Surgery to excise this ganglion cyst was recommended to the patient. She and her parents agreed to this plan.

**Figs. 3-A and 3-B** Intraoperative photographs from the ganglion cyst excision. **Fig. 3-A** Dissection and exploration revealed an intraneural ganglion cyst on the CPN. **Fig. 3-B** The CPN is shown after excision of the intraneural ganglion cyst. CPN = common peroneal nerve.

**Fig. 4**

Intraoperative pathology sample. This sample is from a segment of the articular branch to the proximal tibiofibular joint that was excised intraoperatively.
the CPN, as shown in Figure 3-A. The articular branch was followed up to the joint and isolated from the deep peroneal nerve (DPN) and SPN. The articular branch was transected to decompress the ganglion cyst. On transection, we were able to milk out gelatinous fluid from the CPN, SPN, and DPN; all 3 nerves were internally decompressed. We then removed a segment of the articular branch to the proximal tibiofibular joint, and this was sent to pathology. Finally, we used the #15 blade and rongeur to excise a small portion of capsule and cartilage from the proximal tibiofibular joint at the site where the articular branch emanated in an effort to reduce the risk of recurrence. We were very conservative with the resection so as not to destabilize the proximal tibiofibular joint. Less than 2 mm of cartilage was resected from the tibiofibular joint using the scalpel (No. 15 blade). The purpose of this resection was to ensure that the capsule was removed entirely to prevent recurrence of the ganglion. The final result of the surgical procedure is shown in Figure 3-B.

Pathology
The pathology is shown in Figure 4. This reveals a cystic space lined by a fibrous wall of variable thickness without an epithelial lining. Mucinous material is focally notable in the cyst lumen, confirming the mass to be a ganglion cyst. At the periphery of the cystic space is the otherwise unremarkable peripheral nerve.

Follow-Up
The patient was followed up postoperatively at 2 weeks, 8 weeks, 5 months, and 1 year. She had no complaints of complications other than moderate pain in the operative knee during the 8 weeks after surgery.

At 1-year postoperative follow-up examination, the patient reported that she had no pain or lack of function in the right lower extremity. The patient reported that she had returned to cheerleading. On examination, the patient’s gait demonstrated no evidence of foot drop (Video 2). There were no palpable prominent masses or fullness over the lateral right knee. Motor testing demonstrated that the patient had full strength and complete recovery of her preoperative deficits, as shown in Table III. The patient was intact to sensation throughout the lower extremity, although she did state that this sensation was “different,” reflecting a dysesthesia in the SPN distribution.

Discussion
This case demonstrates an extremely rare diagnosis of a pediatric intraneural peroneal ganglion cyst. Preoperatively, the patient had a profound clinical deficit with denervation. However, she did have some evidence of neuromuscular continuity on electrodiagnostic testing. Imaging showed a discrete identifiable anatomic lesion. These represent encouraging indications for a successful surgical treatment. Surgical treatment provided the patient with an excellent outcome. Pathology confirmed the diagnosis of intraneural peroneal ganglion cyst. Minimal tibiofibular joint resection was performed and appears adequate to prevent recurrence.

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References