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Case Report

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Intraneural Ganglion cyst of The Deep Peroneal Nerve Causing Rapidly Progressive Foot Drop

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Abstract

Intraneural ganglion cysts are a relatively uncommon cause of peroneal nerve palsy. Patient's typically present with weakness or absent ankle dorsiflexion, knee or leg pain, and paresethesia. Surgical decompression is widely accepted as the first line treatment for intraneural ganglion cysts of the peroneal nerve, with earlier intervention associated with better functional outcomes. Here, we describe the case of a 57-year-old male found to have a intraneural ganglion cyst of the peroneal nerve, three months after the onset of symptoms, including eventual complete foot drop. He underwent surgical decompression of the cyst. The intraneural ganglion cyst was found to be intricately involved with the nerve fibers, and the patient still does not have the ability to dorsiflex the affected ankle one month post-operation.

Introduction

Intraneural ganglion cysts are relatively rare, benign, mucinous tumors that develop in the epineurium of peripheral nerves. The most widely accepted etiology of intraneural ganglion cysts is the articular (synovial) theory [1-5]. The theory postulates that a synovial defect allows joint fluid to dissect along the epineurium beginning in the articular nerve and eventually reaching the parent nerve, allowing a cystic structure to form [1-3]. The newly formed intraneural ganglion cyst then compresses the nerve and leads to symptoms of peripheral neuropathy. This commonly occurs in the common peroneal nerve (CPN) with origination at the superior tibiofibular joint [3,6] and can produce a peroneal nerve palsy consisting of weakness with ankle dorsiflexion, leg pain, and paresthesia. These symptoms can imitate lumbosacral disc pathology and lead to a delayed diagnosis [7,8]. Diagnosis of intraneural ganglion cysts can be made on MRI with visualization of the cystic lesion and its direct connection to the adjacent joint space [8-10]. This allows for prompt treatment and effective preoperative surgical planning to maximize functional retention and minimize the risk of recurrence [10, 11].

We report the case of a 57-year-old male with an intraneural ganglion cyst of the V1 branch of the peroneal nerve.

Case Report

A previously healthy 57-year-old male presented to our institution at the end of October 2020, and was found to have a intraneural ganglion cyst of the V1 branch of the right peroneal nerve with complete function loss. He reports that he was in his normal state in July of 2020 when he was standing at work and slightly hyperextended both knees, and noted instant pain in his lateral right knee. The pain progressively increased along with a burning and tingling sensation. He was seen by his family medicine provider in July 2020 and was started on 7 days of prednisone, which resolved his pain completely.

He was symptom free until late September 2020 when during a work meeting he felt as though his right foot "was falling asleep" and later developed pain along the lateral knee. By the end of the day, he had complete right foot drop. Returning to his family medicine physician, he was worked up for a L5 nerve issue with a lumbar x-ray and MRI of the lumbar spine. Imaging of the lumbar spine demonstrated no abnormality of the lumbar spine, which could explain his symptomology. He also underwent an EMG, which demonstrated conduction deficits in the CPN, after which he was referred to an orthopedic surgeon, whom ordered an MRI.

MRI demonstrated a cystic, multilobed lesion originating in close proximily to the CPN with moderate-severe entrapment at the fibular head and descending along with the deep branch of the peroneal, concerning for tumor (Figure 1). Given concern for tumor, he was referred to our department for evaluation by an orthopedic oncologist. On physical exam, the patient had a complete foot drop with decreased sensation over the superficial and deep peroneal nerve ditributions. He also demonstrated a a positive Tinel's sign

over the peroneal nerve. Otherwise his exam wasn unremarkable. The patient was counseled that surgical resection would give him the best chance of prevention of progression and possible restoration of function. He elected to proceed with surgical resection.

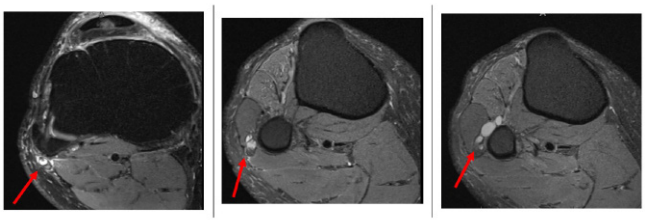

Figure 1: Sequential axial T2-weight MRI imaging demonstrated a cystic lesion imminating from the common peroneal nerve.

The surgery was performed with the patient under general anesthetic and in the left lateral decubitis position. An incision was was made 1cm off the anterior border of the proximal fibula coursing from posterior to anterior along the course of the CPN. The CPN nerve was exposed and dissected distally. The division between the deep and superficial branch of the CPN was (Figure 2). Visible inspection showed that the deep branch was completely involved within the tumor and indistinguishable from tumor. As such, the lesion was resected with careful dissection to maintain what appeared to be an non-involved superifical branch. The intra-articular branch was ligated in this case to lower the chance of recurrence. The lesion was found to be 7 cm in length and 1cm in width and contained mucoid material internally (Figure 3).

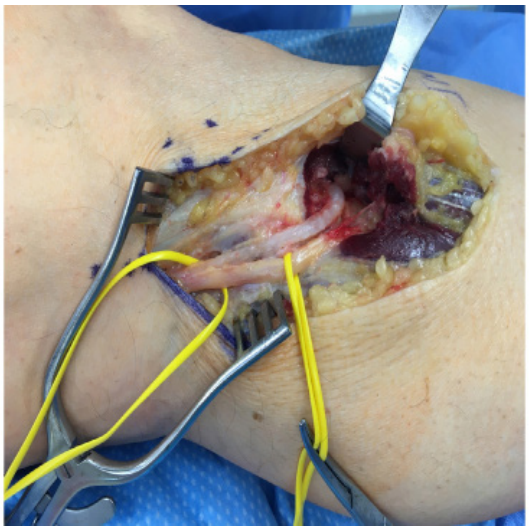

Figure 2: Intra-operative imaging demonstrating the tumor completely involving the deep branch of the common peroneal nerve, but sparing the superficial peroneal nerve.

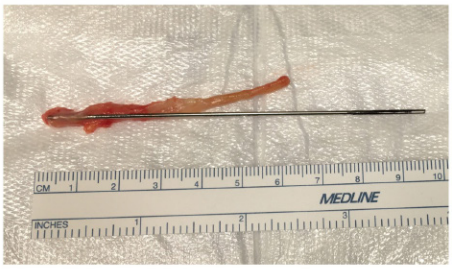

Figure 3: Intra-operative photograph demonstrating the lesion, indistinguishable from the nerve.

The resected specimen was sent for pathology. Final pathology report revealed: benign fibroconnective tissue with multiple pseudo-cystic spaces filled with myxoid material, most consistent with a ganglion cyst. One month post-operation, this patient has still not recovered dorsiflexion of the ankle.

Discussion

Extrinsic compression of the peroneal nerve remains the most common cause of peroneal nerve palsy including: Traumatic injuries, direct blunt trauma, metabolic diseases, prolonged bed rest, and casting and bracing [12]. The most common location for compressive pathology is at the fibular head, presenting with acute complete or partial foot drop [12]. An intraneural ganglion cyst, as seen in this case, is an unusual and uncommon cause of peroneal nerve palsy.

Intraneural ganglion cysts are described as non-neoplastic mucinous cysts that develop in the epineurium of a peripheral nerve, the most common location being the peroneal nerve [1]. A ganglia is defined as a cystic structure lined by flat spindle-shaped cells that contain mucid or fluid. They arise from joint capsules, ligaments, tendon sheaths, bursae, or subchondral bone [13]. The etiology of intraneural ganglion cysts is still being explored, however the articular theory is widely accepted [6]. In this theory, it is thought that a synovial defect forms that allows joint fluid to dissect along the epineurium beginning in the articular nerve and eventually reaches the parent nerve, allowing a cystic structure to form [1-3]. Other theories that have been suggest trauma as a possible cause. In this theory, trauma induces myxoid degeneration of connective tissue within the nerve, which forms a ganglion cyst. Our patient had no known history of trauma.

Studies suggest that surgical treatment is the first line intervention for intraneural ganglia and that early surgical intervention leads to more successful outcomes, given the risk for progression [14, 15]. Surgical intervention was used in our patient, due to progressive worsening of his symptoms. Surgical complications include permanent nerve damage, injury to vasculature, and infection [12]. Recurrence rates after surgical decompression in past studies depends on the

extend of surgical resection. A recurrence rate of 13% is reported following isolated cyst decompression without articular branch disconnection. This rate drops to 6% when the articular branch is ligated or disconnected [16]. In comparison, it has been reported that there is a 30% risk of recurrence with aspiration alone [5].

Proposed by Muramatsu et al. the five key points that lead to successful treatment of peroneal intraneural ganglion cyst are as follows: Early diagnosis by MRI, surgical decompression within four months of foot drop, simple exoneural dissection, disruption of the articular branch during decompression, and epineurotomy and drainage of the cyst during decompression [5]. Our patient started displaying symptoms in July and wasn't operated on until the end of October, with progressively worsening symptoms during that duration. Ideally, an MRI would have been obtained of the knee in more rapid fashion. It is unclear if this could have prevented his evental footdrop, but is an area for potential improvement. Discover of the compressive tumor and eventual treatment, may have preserved function.

Conclusion

Early MRI imaging leads to earlier surgical intervention of a peroneal intraneural ganglion cyst. Although an uncommon cause of peroneal nerve palsy, intraneural ganglion and MRI imaging of the knee extending to below the level of the fibular head should be considered in a patient with otherwise unexplained peroneal nerve palsy.

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