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CASE SERIES

Recovery of Longstanding Painful Drop Foot Following Common Peroneal Nerve Neurolysis: A Case Series

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Abstract: A drop foot is characterized by the inability to lift the foot. If caused by common peroneal nerve (CPN) compression and conservative treatment is unsuccessful, a neurolysis may be considered. Studies suggest that a short period of time between start of symptoms and neurolysis is related to success. Aim of the present study is to report on 3 patients who underwent CPN neurolysis up to 72 months after the onset of a drop foot. The first patient was a 22-year-old female who sustained a painless left-sided drop foot after prolonged kneeling that was treated with a brace. One year later she developed severe anterolateral neuropathic lower leg pain not responding to medication. CPN neurolysis 14 months after the event resulted in complete pain relief and normal foot function that persists after two years of follow up. The second patient was a 58-year-old female with a 6-year history of chronic left-sided neuropathic lower leg pain and drop foot due to CPN damage following multiple knee surgeries. Three months after surgical CPN decompression, she reported pain relief and partial foot drop recovery. However, the painful drop foot recurred 5 months later, likely due to ongoing knee instability. Two years later, her situation is unchanged. The third patient was a 65-year-old male with spontaneous right-sided drop foot and severe neuropathic lower leg pain that had developed following intense walking for body weight reduction. As conservative treatment was unsuccessful, he chose to undergo CPN decompression 8 months later. Foot function recovered with total pain relief within the first 3 months postoperatively. Ten years later, he is still without symptoms. These cases illustrate that surgical decompression for drop foot may reduce symptoms, even in chronic cases. Neurolysis should be considered in selected cases, particularly if the drop foot is associated with unacceptable neuropathic pain.

Keywords: CPN, common peroneal nerve, nerve entrapment, neurolysis, foot drop

Introduction

A drop foot is a condition characterized by the inability to lift the front part of the foot resulting in a characteristic steppage gait. The etiology includes muscular dystrophies, central nervous system disorders, or peripheral nerve injuries.[1] A drop foot may be due to compression or traction of the common peroneal nerve (CPN), likely due to its unfavorable location in proximity of a greatly mobile knee joint and fibular head.[1] CPN injuries are the most common nerve injuries of the leg.[2] Firstly, as results of its anatomy.[1,3] Other causes of injury are trauma, external pressure (leg crossing, weight loss), or systematic illnesses (diabetes mellitus, inflammatory conditions).[3] A drop foot following trauma such as knee dislocation, direct blows or severe ankle inversion injuries is associated with a poor prognosis.[4–7]

CPN neurolysis may be considered as a final resort treatment option in patients with a drop foot secondary to CPN compression. This procedure aims to relieve pressure on the nerve thus restoring its normal function.[8] Previous studies have reported variable outcomes following neurolysis highlighting the need for identifying indications and limitations of this surgical intervention.[9] Success rates of decompression surgery may approximate 80% when considering functional outcome measures.[10–13] However, time from injury to neurolysis likely plays a role but is frequently not reported. One study found that the optimal timing of CPN decompression is 5.5 months after the initial trauma. Conversely, surgery beyond 9.5 months after

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the trauma is often unsuccessful.[14] There is, however, one case report describing a patient experiencing anterolateral leg pain and numbness of his lower leg after left lateral meniscus repair. This patient reported to have had a drop foot 25 years earlier after another knee surgery.[15] During surgery, a lot of scar tissue and a popliteal cyst were found and removed successfully. Because of our experience and the example above, we hypothesize that in specific cases neurolysis can be considered even in more chronic cases. Therefore, the current study reports on three patients who underwent CPN neurolysis for a painful drop foot far beyond this 5.5 months' window-of-opportunity.

Methods

During the period of 2013 till 2023, three patients with chronic drop foot underwent peroneal nerve neurolysis in Maxima Medical Centre Veldhoven. These cases were selected for the current small case series to evaluate results. Due to the small number of patients, no formal statistical analyses are performed. Patient work-up prior to inclusion are discussed for each case separately in the following sections.

The Cases

An overview of baseline patient characteristics for each of the three cases and performed diagnostic tests during physical examination and imaging are given in Table 1.

Case 1

A 22-year-old female without a medical history was referred by a regional sports physician to our department of sports medicine with an increasingly painful left lower leg. Her history revealed a painless drop foot that had developed 12 months previously after 3 days of prolonged kneeling while installing a wooden floor. The neurologist confirmed a left sided drop foot. Imaging, including MRI of the brain and the vertebral column and CPN ultrasound, was normal. An EMG indicated that peroneal muscle reinnervation was present. The patient had accepted the situation over the months and wore a brace during daytime. Physical therapy did not improve the drop foot.

Although the lower leg was painless in the first year, she developed severe lower leg pain in the 13th month, which prompted referral to us. At intake, she reported that she had no idea why the pain had started. However, her current situation was unacceptable with severe restrictions during all daily activities. She was not able to work or engage in sports activities. Pain and loss of lower leg power were reported as very severe but cramps were absent. Tingling sensations during rest and at night were also severe as reflected by her drawing in Figure 1.

On examination, a young woman was seen who was clearly in severe pain. Atrophy of the left anterior lower leg muscles was visible. Function of left hip and knee was normal, but dorsiflexion of the left foot was diminished (MRC scale 1–5, grade 3). Palpation of the popliteal fossa just medial to the biceps tendon was painful. Anterolateral skin sensation tested with a swab was diminished. Pinching of the skin in the CPN territory was disproportionally painful. Palpation of the anterior tibial and peroneal muscles was also painful. Tinel's test at the fibular head was positive. Pedal pulsations were present. Patellar and Achilles reflexes were normal. All these tests were normal on the right leg.

A combined CPN lesion with early onset motor and late onset sensory dysfunction was diagnosed. Presence of a chronic exertional compartment syndrome (CECS) was excluded, as dynamic intracompartmental pressures of the anterior and lateral compartment were normal, both during rest and following a provocative walking test (negative Pedowitz criteria).[16] She was informed on a possible CPN lesion due to compression or traction following prolonged kneeling. Although the chances of recovery following a neurolysis were considered low after more than one year, she chose to undergo surgery. She received extensive counselling and provided verbal and written consent.

Fourteen months after the onset of the drop foot, she underwent CPN decompression via a curvilinear 2-inch incision just distal to the fibular head. The nerve appeared normal as shown in Figure 2.

Operative time was 27 minutes. Postoperatively, she wore a single layer tubigrip exerting minimal pressure for two weeks. Wound recovery was uneventful. Six weeks postoperatively she reported total pain relief while her foot movements were gradually returning. An intensive physical therapy program was implemented. Six months postoperatively, there was a 5 mm smaller lower leg diameter in the effected leg compared to the other side. Skin sensation was still

Table 1 Summary of Patient Characteristics

Characteristics												
	Age	**Gender**	**Most Likely Cause**	**Diabetes in Clinical History**	**Inflammatory Conditions in Clinical History**	**MRC* Score Dorsiflexion**	**Pinch Test**	**Tinel's Test**	**MRI**	**Ultrasound**	**EMG**	**ICP ****
Case 1	22	Female	Injury due to kneeling	No	No	3	+	+	No MRI of CPN	Yes, no abnormalities found	Yes, reinnervation of the CPN	Yes, no abnormalities found
Case 2	58	Female	Injury after multiple knee surgeries	No	No	3	+	+	No	Yes, edema surrounding CPN at fibula head	Yes, denervation CPN starting at the fibula head	No
Case 3	65	Male	Weight loss	No	No	3	N.a.	N.a.	Yes, no abnormalities	No	Yes, isolated axonal damage CPN	No

Notes: *Medical Research Council scale (1–5). **Intracompartmental pressure.

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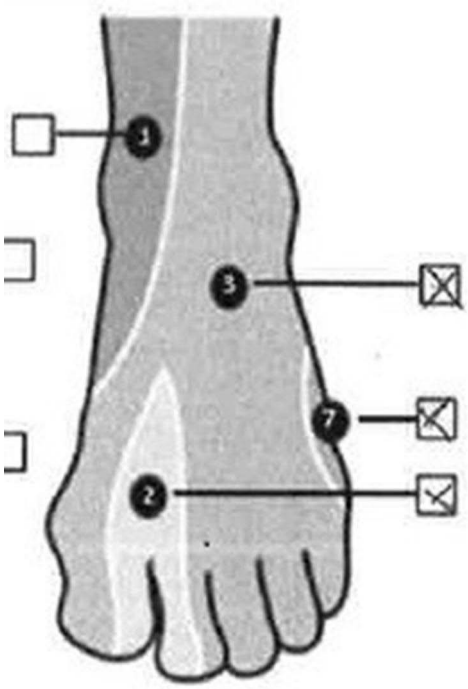

Figure 1 Localization of pain and altered sensations reported by patient.

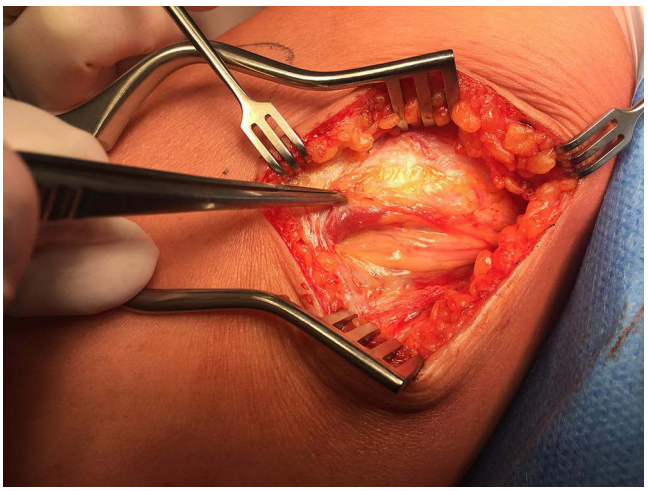

Figure 2 A normal common peroneal nerve.

slightly less compared to the other side. Her gait had normalized. She reported total recovery and absence of pain during follow up by telephone two years later.

Case 2

A 58-year-old female was referred with left lower leg pain and drop foot. Her medical history revealed a hernia at the level of L5-S1 that was treated twice with a laminectomy. She had undergone four operations for severe left knee arthrosis including a total joint replacement with a revision for ongoing instability. Immediately following knee surgery in 2015, she had developed a painful drop foot. Analysis by a neurologist in 2020 confirmed chronic CPN damage, likely due to traction during the knee operations. EMG and CPN ultrasound suggested nerve damage at the level of the fibular

head. The neurologist advised the patient to refrain from CPN decompression after all these years but to continue conservative treatment including pain medication and physical therapy.

At intake in our department of surgery in 2022, she reported that for over 6 years she was dependent on a wheelchair due to pain in the left knee and the lower leg. She also reported ongoing instability of the left knee, despite multiple surgeries. Inspection revealed multiple scars around the left knee. Function of the hip was normal. Active dorsiflexion of the left foot was diminished indicating a drop foot (MRC scale, grade 3). She could not extend her toes. Anterolateral skin sensation using a swab was diminished. Tests of the contralateral leg were normal.

A left CPN lesion due to traction during surgery was considered likely. It was thought that nerve damage was maintained due to ongoing knee instability. As symptoms were now present for over 6 years, the chances of a successful neurolysis were considered very low. Nevertheless, following extensive counselling she opted for CPN decompression. During exploration and neurolysis, the nerve looked normal. The procedure was uneventful.

Two week later she reported that the lower leg pain had disappeared while she could extend all her toes. She required needle drainage once for a wound seroma 3 weeks postoperatively. After six weeks, she could walk without pain whereas lower leg and foot mobility had improved. Three months postoperatively, her condition had improved by a self-reported 60%. Five months postoperatively however, she communicated that her painful drop foot had reappeared and that she was back to square one. Her knee was very unstable and gave way, leading to frequent falling and necessitating the use of a wheelchair again. The surgeon confirmed an instable knee during physical examination. After extensive counseling on additional stabilizing knee surgery by an orthopedic surgeon, she decided to accept the situation. One year later, lower leg pain and foot paresis are still present.

Case 3

A 65-year-old healthy male was referred by a regional neurologist to our department of sports medicine with a four months' history of a spontaneous painful right drop foot. Over the preceding year, he had walked 10 kilometers per day as he aimed to lose body weight. The x-ray and MRI of the lower leg were normal. Analysis by a neurologist, including an EMG, suggested the presence of right sided CPN damage. It was thought that the drop foot was possibly due to a chronic exertional compartment syndrome (CECS) associated with intense brisk walking.

At intake, the sports physician found that active dorsiflexion of the right foot was greatly diminished indicating a drop foot (MRC scale, grade 3). Anterolateral skin sensation was reduced. The lateral portion of the popliteal fossa was painful upon palpation. Patellar and Achilles reflexes were normal. Tests on the left leg were normal. A right CPN lesion was confirmed, but a concurrent CECS could not be ruled out. Since muscles could not contract intracompartmental pressure measurements after provocation were not considered relevant. The pain and cramps lessened following two sessions of muscle injections of 15% of glucose (prolotherapy). However, the painful drop foot did not recover following this regimen.

As the drop foot was present for over 8 months, the chances of a successful neurolysis were considered slim. However, as the pain was severe, the patient opted for CPN decompression, together with a fasciotomy of the anterior and peroneal compartments. During exploration, both the superficial and profundal peroneal nerve were normal. However, the CPN just proximal to the fibular head was clearly edematous suggesting entrapment. This is shown in Figure 3.

The fasciotomies were uneventful. Two weeks later, the lower leg pain had disappeared with complete normalization of foot function after 3 months. Wound healing was normal. Ten years later, function and skin sensation of the leg are normal.

Discussion

Patients with foot drop due to common peroneal nerve (CPN) compression often benefit from conservative management including pain medication, avoidance of (external) pressure and physical therapy.[1] However, some patients do not recover following this regimen. Literature suggests that foot drop resulting from (macro) traumatic events is associated with a poorer prognosis.[4–7] Research has also indicated that neurolysis may occasionally be beneficial in selected patients.[8,9] The likelihood of unsuccessful surgical decompression is probably related to a prolonged presence of

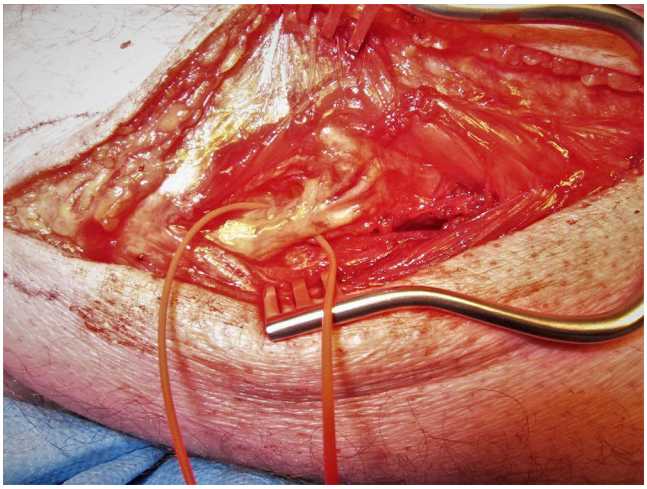

Figure 3 An edematous common peroneal nerve.

symptoms prior to the procedure.[10–14] The current three cases indicate that surgical decompression for painful foot drop can be effective, even when symptoms are chronic. Neurolysis should therefore be considered even in cases with years of symptoms, especially when foot drop is accompanied by severe neuropathic pain. However, three cases may not adequately reflect results of neurolysis in all patients with chronic neuropathic pain and drop foot due to CPN entrapment.

It is unclear whether the presence of pain in patients with foot drop may indicate more severe nerve damage. If so, a poorer outcome following CPN decompression may be expected. A recent meta-analysis found a trend suggesting that patients with a painful drop foot indeed fare less well after a neurolysis.[12] One case series confirmed that surgical success rates in patients with sensory deficits are lower.[13] However, it is important to note that surgical intervention can still be successful in individual cases.[13] These findings are consistent with the present small case series indicating complete pain relief and recovery in two of our three patients. Although the likelihood of success may be lower in drop foot with sensory deficits, other unidentified factors may play a role in predicting the ongoing success (or failure) of a surgical intervention.

Detailed history taking and an accurate physical examination are crucial for diagnosing type of CPN entrapment. Potential causes of nerve entrapment may thus be identified. CPN damage can be due to events such as blunt trauma, surgery, or prolonged sitting with crossed legs.[6,7] Conversely, an unidentified ongoing cause for compression may adversely affect postoperative outcome. For instance, sleeping on the affected side, prolonged squatting or knee braces are to be avoided at all times. The probable cause of CPN damage in cases one and three was external pressure or traction (excessive kneeling, increased intensity of brisk walking with possible weight loss, respectively). The foot drop in the second patient was likely due to a combination of multiple knee surgeries and ongoing joint instability. Although recovery of drop foot and less pain were experienced in the months after CPN decompression, ongoing instability likely resulted in continuous intermittent nerve traction with recurrence of symptoms. Although stabilizing orthopedic surgery was advised, the third patient decided not to undergo additional surgery. These findings highlight the importance of extensive patient evaluation and counselling before and after decompression. Especially since causes of neuropathy can be diverse,[3] which might make that decompression is not favorable for all patients.

A thorough physical examination is crucial for diagnosing CPN entrapment and for distinguishing this condition from other diagnoses such as anterior chronic exertional compartment syndrome (ant-CECS).[6] Tinel's sign may differentiate between these entities as it is more frequently observed in patients with CPN entrapment, along with pain during forced ankle inversion.[6] Furthermore, invasive intracompartmental pressure measurements may be indicated for ruling out ant-CECS as a potential cause. Other imaging techniques such as MRI, ultrasound, and EMG can be of great value to find nerve injuries that might be operable, as was done in another case report.[15] However, normal imaging does not rule out CPN damage completely, since in case 1 no abnormalities were found on ultrasound, but the patient did have successful

decompression. This also accounts for patient 3 were no abnormities were found on the MRI. Therefore, not only imaging but also physical examination is essential for accurate diagnosis. Our experienced sports physician suspected a combination of CPN entrapment and ant-CECS in our third patient, leading to simultaneous surgical intervention with a favorable outcome. It is uncertain whether all symptoms would have resolved after a fasciotomy only or with just a CPN decompression. This case underscores the difficulty in differentiating between these two conditions. It is advised to always consider CPN entrapment in the differential diagnosis of patients with suspected CECS. This case illustrates that both conditions may coexist in one patient.

It is more the rule than the exception that referral of a patient with painful drop foot to a sports physician or surgeon occurs in a late stage. However, literature suggests that the optimal window for decompression surgery is around 5.5 months after symptom onset, but ideally within 12 months.[12,14] Our cases demonstrate that success may even be achieved after this period suggesting that surgical intervention may be a viable option for patients with long-standing chronic foot drop. A multicenter, randomized parallel-group controlled trial investigating this issue is currently ongoing.[17]

In conclusion, surgical decompression of the common peroneal nerve for drop foot may be effective, even if symptoms are chronic. Neurolysis may be considered in selected cases, in particular if the drop foot is associated with unacceptable neuropathic pain. Since there is no diagnostic gold standard for CPN entrapment, it is essential that research focusses on the role of different diagnostic tests and the role of imaging in diagnosing CPN entrapment accurately. Furthermore, studies evaluating surgical outcomes compared to further conservative treatment are needed to determine effects of surgery and optimize the treatment for patients with chronic drop foot and neuropathic pain.

Consent

The authors have obtained spoken and written informed consent to publish the case report of all individuals in this case series. No institutional approval was required to publish the case details.

Disclosure

The authors report no competing interest in this work.

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