The effect of surgical decompression on symptoms in peroneal nerve entrapment neuropathy

Serdar Ercan (✉ sdrercn@gmail.com)

Eskisehir City Hospital <https://orcid.org/0000-0002-8299-1789>

Zeki Serdar Ataizi

Research

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Abstract

Objective

CPN entrapment neuropathy is a form of lower extremity entrapment, most commonly seen at the level of the fibula head, often presenting with foot drop findings. We aimed to investigate whether decompressive surgical intervention contributes to neuropathy clinic.

Materials and methods

Patients who were admitted to our clinic with a preliminary diagnosis of peroneal entrapment neuropathy and underwent surgical intervention were included in the study. Preoperative and postoperative motor functions and pain were evaluated.

Results

Postoperative significant changes in pain and muscle strength scores were observed. A significant decrease was observed in the postoperative VAS score.

Conclusion

Surgical decompression is the right option for the recovery of motor function in the treatment of peroneal nerve entrapment neuropathy.

Introduction

Common Peroneal Nerve (CPN) neuropathy is the most common entrapment neuropathy in the lower extremity and accounts for 15% of all peripheral entrapment neuropathies[1, 2]. CPN trapping is most often at the level of the fibula head. The nerve at the level of the fibular head is superficial under the skin and is surrounded by facial bands. Because of this anatomic location, it is more susceptible to compression and injury[2]. It can be seen in all age groups but tends to be higher in adults and men[3]

The most common etiologic factor is compression of CPN. Traumatic factors that causes entrapment are dislocation of the knee, serious ankle inversion injuries, lacerations and traumas directly on the nerve. The consequences of these traumas are poor[4, 5]. Apart from mechanical compression, many other factors contribute to the formation of CPN neuropathy. The link between diabetes mellitus and lower extremity neuropathies is well known[6]. Iatrogenic injury is also a common cause. Acute foot drop, which is frequently seen during hip, knee and ankle surgery, develops due to neuropathy of CPN. Other causes of iatrogenic injury include position during anesthesia, prolonged bed rest, orthoses, tight wrapping per knee and fibula, and the use of pneumatic compression devices[7–9]. Recently, studies have shown that CPN

at the level of the fibular head becomes more susceptible with the reduction of subcutaneous fat tissue due to excessive weight loss[10]. Lesions such as ganglion cysts and schwannomas cause compression of the CPN with a mass-occupying effect on the head of the fibula. In addition, the habit of crossing legs and prolonged kneeling leads to an increased risk of peroneal palsy and acute miscarriage[11].

The most common symptoms of CPN neuropathy are weak ankle and toe dorsiflexion, difficulty in ambulation, loss of sensation in the dorsum of the forefoot and foot. The resulting low foot and gait problems can significantly affect an individual's quality of life. In 90% of cases, findings are seen in only one extremity[1, 2]

The first choice of treatment is the use of anti-inflammatory drugs. Patients are advised to avoid compression and activities that may aggravate the problem, such as crossing their legs. Physical therapy practices contribute to the healing process of symptoms. Surgical neuroplasty or decompression is needed if symptoms do not regress within 3 or 6 months and persistent or worsening motor deficits occur[3].

The aim of this study was to present the results of surgical intervention performed in patients with CPN entrapment neuropathy in the last 5 years.

Materials And Methods

Patients who were admitted to our clinic with a preliminary diagnosis of peroneal entrapment neuropathy and underwent surgical intervention were included in the study. Patients whose symptoms improved with medical treatment and patients with incisor-penetrating injuries did not undergo surgery and were excluded from the study. Electrophysiological study and lumbar MRI imaging were performed in all patients. All patients were given anti-inflammatory treatment and followed up for 3 months.

Motor functions before and after treatment were graded on a scale of 0–5 according to the British Medical Research Council (MRC) classification system. Pain was evaluated according to the visual analogue score (VAS). Surgical intervention was performed in patients who did not improve according to MRC and VAS scores or whose symptoms were increased.

Surgical procedure

Surgical intervention was performed under general or spinal anesthesia. A curved skin incision was made distally from the fibular neck, starting proximal to the biceps femoris tendon. With the help of automatic retractors, subcutaneous fat and fascia were passed through vertically and CPN was found just below. The nerve was freed as much as possible from tight facial bands and perineural adhesions that wrapped around it with fine-tipped scissors. The procedure was continued distally up to the level of bifurcation of the superficial and deep peroneal nerve branches. This decompression was completed along the medial direction of the upper biceps femoris tendon of the popliteal fossa of CPN and down to the point where

the peroneus longus muscle of the CPN and the peroneal tunnel entered. The patients were followed-up at the outpatient clinic for an average of 3 years.

Statistical evaluation

Postoperative MRC and VAS scores were evaluated. The paired t-test was used to evaluate changes in VAS and MRC scores. All statistical analyses were performed using the SPSS statistical software, version 17.0 (SPSS Inc., Chicago, IL, USA).

Results

The age range of 20 patients who were diagnosed as peroneal nerve for the last five years and admitted for decompression surgery was 17–76 (mean 50) and consisted of 8 female and 12 male patients. All patients underwent conservative medical treatment and FTR treatment prior to surgery. 14 patients had symptomatic complaints on the right and 6 patients on the left. In EMG, CPN was trapped at fibula level in all patients. Blunt trauma was detected in 9 patients and no trauma was observed in 11 patients. CPN entrapment neuropathy was associated with diabetic neuropathy in 5 patients (Table 1). The mean preoperative VAS score was 9.4, while a significant decrease was observed in the postoperative period (VAS = 4.3, $p < 0.05$). The same results were similar in muscle strength scoring. The mean preoperative MRC was 3.4 and postoperative 4.6 ($p < 0.05$, Fig. 2).

Discussion

CPN entrapment neuropathy is a form of lower extremity entrapment, most commonly seen at the level of the fibula head, often presenting with low foot clinical findings. CPN is a terminal branch of L4-S2 spinal nerves separated from the sciatic nerve[12]. After separating from the popliteal fossa, it enters the fibrotendinous fibular tunnel at the level of the peroneus longus muscle and fibular head. Because the site of nerve is superficial and surrounded by facial fibrous bands, this region is more sensitive to compression and trauma and is vulnerable to trauma. These facial bands extending from the gastrocnemius and soleus muscles surround the CPN in the lateral region of the fibula head and neck. Especially when the knee is bent, it can compress the nerve[2, 3, 13].

Apart from iatrogenic causes in the etiology, pressure effects of mass, penetrating or compressive injuries, positional pressure causes, excessive weight loss can be recognized. The presence of diabetic neuropathy contributes to the formation of the clinic.

The most important method in diagnosis is electromyography (EMG). EMG can detect whether there is a significant decrease in conduction block, amplitude or a significant slowdown in conduction velocity throughout the fibular head. The presence of active or chronic denervation in the muscles innervated by CPN makes the diagnosis[3]. Therefore, EMG is the guiding factor in surgical decision making.

Some researchers argue that surgical intervention is unnecessary and that treatment with steroid injection and conservative approach is sufficient. It is recommended to wait at least 6 months after the onset of clinical symptoms[2]. However, according Dallari et al., they recommended early surgery immediately after the diagnosis, regardless of the cause[14]. In a similar study, Ismael et al. Changed and reported that functional recovery increased when the decision was made early[15].

In our study, CPN was decompressed by surgical intervention in patients whose foot muscle strength did not improve or worsened after conservative treatment. Postoperative increase in motor strength and decrease pain were observed.

Conclusion

In conclusion, surgical decompression is the right option for the recovery of motor power in the treatment of peroneal nerve entrapment neuropathy.

Declarations

Ethical Publication Statement: We confirm that we have read the Journal's position on issues involved in ethical publication and affirm that this report is consistent with those guidelines. The study was approved by Institutional Review Board, Eskişehir Osmangazi University Ethical Committee (25403353-050.99-E.76044)

Consent for publication: The patients were given detailed information on the procedure and informed written consent was obtained from all of them.

Availability of data and materials: Data sharing not applicable to this article as no datasets were generated or analysed during the current study.

Competing interest: All authors declare that they have no conflict of interest.

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Authors' contributions: SE participated in the design of the study and performed the statistical analysis. ZSA conceived of the study, and participated in its design and coordination and helped to draft the manuscript. All authors read and approved the final manuscript.

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Table

Demographic distribution of peroneal nerve entrapment neuropathy		
Age (mean)		50
Sex	male	12
	female	8
Side	right	14
	left	6
Trauma	yes	9
	no	11
Diabet		5

Figures

Figure 1

The nerve was freed as much as possible from tight facial bands and perineural adhesions that wrapped around it with fine-tipped scissors.

Figure 2

The VAS score was decreased while MRC scores improved significantly after surgery. (VAS: Visual analogue score, MRC: British Medical Research Council)