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Case Report

Common Peroneal Nerve Entrapment Complicated with Fracture of Fibular Neck Without Displacement: A Case of Delayed Treatment

Hongtao Xiong*

Department of Hand, and Microvascular Surgery, Shenzhen People's Hospital, Guangdong, China

***Corresponding author:** Hongtao Xiong, Department of Hand, and Microvascular Surgery, Shenzhen People's Hospital, Guangdong, China.

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Abstract

Background: Compression of peroneal nerve is a common complication after fibular neck fracture. The peroneal nerve entrapment symptoms are easy to find, but sometimes the indications for surgical treatment are difficult to be recognized. It results in delayed surgical release treatment and reduced recovery effect after long conservative treatment and observation time for some patients. **Material and Methods:** A case and treatment of common peroneal nerve paralysis for 6 months, which was caused by a fracture of the fibular neck without displacement, was reported. The fiber sheath of patient was completely cut, and the common peroneal nerve was completely released. **Results:** One year later, the extensor muscle strength of the ankle joint and 2-5 toes was restored to 4 / 5, and the extensor muscle strength of the toes was restored to 4 / 5 grade. The clinical symptoms, diagnosis, differential diagnosis of imaging methods, neurology, pathology and more extensive surgical and non-surgical treatment were discussed. **Conclusions**: The sources of common fibular compression neuropathy were clarified. It is important to diagnose and treat in time for the better outcome.

Keywords: Fibular Neck; Fracture; Common Peroneal Nerve Compression; Common Peroneal Nerve Releases; Delayed Diagnosis and Treatment; Case Report.

Introduction

Compression of the common peroneal nerve (CPN) is the most common compression neuropathy of lower limbs. The causes can be divided into traumatic and non-traumatic, which includes long-term external force compression, nerve contusion caused by direct impact of the fibular neck, open nerve cutting injury, nerve strain caused by knee dislocation, proximal fibular fracture, weight loss, etc. [1,2]. The diagnosis is usually made by symptoms and physical examination of decreased strength, sensory changes and gait abnormalities. The foot ptosis, lower limb pain, or lower limb numbness are the representative symptoms for the patients with compression of the common peroneal nerve. Motor nerve conduction, electromyography and diagnostic nerve block are also valuable for diagnosis and prognosis. The symptoms of common peroneal neuropathy need to be distinguished from the compression of superficial peroneal nerve (SPN) or deep peroneal nerve (DPN). Accurate and timely diagnosis of any peroneal neuropathy is very important to avoid the progression of nerve injury and permanent nerve injury. Due to the lack of large-scale studies to report outcomes on various treatments, it is difficult to accurately perform the clinical evaluation of common peroneal nerve compression therapy [3,4].

In this report, a case and treatment of the compression of common peroneal nerve without displacement of the fractured fibular neck, which resulted in nerve dysfunction, was introduced. Because the operation was too late, ankle and toe paralysis and sensory function of the dorsum of the foot were not well recovered. The roles of multidisciplinary teams in the evaluation, treatment and management of patients with such injury were described. The patient agreed to submit this case for publication.

Case Report

The middle and upper tibia and fibular neck of the left leg of 41-year old male were fractured 6 months ago. X-ray examination showed that the middle and upper tibia were comminuted and displaced, and the fibular neck fracture was not displaced. The dysfunction was found at left ankle joint, toe dorsiflexion, and left foot dorsiflexion. On the 11th day after the injuries, open reduction of tibia and internal fixation of bone plate were performed in the local hospital. After 6 months of conservative treatment, the motion of left ankle joint and toe dorsiflexion and left foot dorsiflexion was unsatisfactory. Therefore, he was admitted our hospital for " left foot dorsum extension movement and foot dorsum sensory dysfunction after the operation for 6 months". The admission physical examination showed that the anterolateral arc-shaped surgical scar at the middle and upper leg was about 20cm long, extending from the outer side of the tibia anterior crest to the upper part of the fibular head. The extensor muscle strength of the ankle joint was 3 / 5 +, the extensor muscle strength of the toe was 3 / 5, the extensor muscle strength of the toe was 3 / 5 +, and the sensory function of the foot was decreased. The plantar sensory function was normal, and the plantar flexor strength of each toe and ankle joint was grade 5 / 5. Nerve conduction studies confirmed that the latency of the common peroneal nerve on the left side of the knee joint increased and the amplitude decreased, while EMG showed denervation of the tibialis anterior muscle and extensor digitorum brevis. The common peroneal nerve entrapment was diagnosed.

To avoid further loss of limb function, the patient was advised to perform surgical exploration. During the operation, the common peroneal nerve at the peroneal neck was routinely taken to explore the common peroneal nerve. No apparent abnormality in the common peroneal nerve at the peroneal neck was observed. The tunnel wall around the nerve was smooth, there was no obvious scar, the nerve compression was not obvious, and the nerve branch continuity of the peroneal long and short muscles was good. During the operation, the electrical stimulation of the common peroneal nerve, and the obvious contraction of the peroneal long and short muscles could be seen, but the back extension of the ankle joint was not obvious. The incision was extended to further explore the common peroneal nerve upward. It was observed that the common peroneal nerve behind the fibular head was obviously enlarged, and the common peroneal nerve was relatively thin at the fibular neck, with a dark color. The cause of the disease was the common peroneal nerve entrapment. The adventitia of the common peroneal nerve was released under the microscope and the intraoperative electrical stimulation was performed. After hemostasis, the wound was rinsed and triamcinolone acetonide was applied locally to prevent adhesion. The drainage sheet was left in the wound for 24 hours. The wound was covered with sterile dressings with the application of bandages. Finally, the ankle was fixed at 90° angle with plaster splint for 3 weeks.

Figure 1: The common peroneal nerve at the neck of fibula was normal. The tunnel wall around the nerve was smooth, and there was no obvious compression.

Figure 2: The common peroneal nerve behind the fibular head was enlarged, and the common peroneal nerve was relatively thin at the fibular neck, with a dark color.

In the subsequent treatment, the ankle was placed in Walker's boots for 6 weeks and completely loaded. The examinations were performed after 2, 6, and 12 weeks. After the operation for 6 months, the patient had a full range of plantar flexion and ankle

movements. Ankle dorsiflexion decreased by 10 degrees compared with the healthy side. There were no obvious malformations, although some muscle atrophy persisted in this region. The patient has resumed physical activity without pain or discomfort.

Results

At 1-year follow-up after common peroneal nerve lysis, the extensor dorsalis muscle strength of ankle joint and 2-5 toes was restored to 4 / 5, and that of the extensor dorsalis of the third toe was restored to 4 / 5. Patients satisfied the treatment.

Discussions

Common peroneal nerve injury is the most common single neuropathy in the lower extremities and the third most common focal neuropathy after median nerve (carpal tunnel syndrome) and ulnar neuropathy (cubital tunnel syndrome) [5]. Traumatic injury of the common peroneal nerve (CPN) is most common in young sports patients (such as football) and adult patients after high-energy trauma (combined with tibial fracture displacement) [5,6]. Other less common causes include intraneural cyst, osteochondroma of the head of the fibula, muscle protrusion, and compression of the nerve [7-9]. In addition, it has been reported that common peroneal nerve injury caused by long-term squatting, weight loss and diabetes [10-12].

This report introduced a case of common peroneal nerve paralysis caused by fibular neck fracture. The common peroneal nerve is easy to be injured when it bypasses the neck of the fibula, so the injury site is mostly on the lateral side of the knee. Due to the lack of prospective data, the overall incidence rate of peroneal nerve injury secondary to closed fractures is difficult to elucidate. Tibial (including tibial plateau) and/or fibular fractures have been reported to be associated with a peroneal nerve injury rate of about 1% to 2% [13,14]. The common peroneal nerve paralysis in this case is mainly caused by the compression of the common peroneal nerve caused by the fracture of the fibular neck. In addition, as the tibial head) shifted to the tibial side, the common peroneal nerve was pulled and injured, resulting in acute neuroedema and subsequent common peroneal nerve compression and injury symptoms. After injury, attention should be paid to the neurophysical examination to avoid missed diagnosis [15,16]. At the same time, the common peroneal nerve could be further damaged during the operation of tibial fracture internal fixation. Therefore, attention should be paid to intraoperative operation to improve the consciousness of neuroprotection.

The neck of fibula is wrapped by bone and dense fibrous tissue. The common peroneal nerve is edematous in the acute stage after injury. Due to limited space, the rise of pressure leads to secondary ischemic injury and nerve entrapment. Therefore, from the perspective of pathogenesis, dense connective tissue fasciotomy should be performed as early as possible to expand the space and volume around the nerve to avoid the development of chronic nerve injury and muscle atrophy [17,18]. Early operation is particularly important for patients to accurately judge the surgical indications. If the recovery is not ideal, the recovery of nerve function after injury should be carefully observed. One month after the injury, the nerve concussion injury goes to the end. At this time, if there is no good recovery of nerve function, the effect of surgical release is better. Prolonged observation and conservative treatment may delay the recovery of neurological function. It is reported that the application of microsurgical techniques to release nerves obtained better recovery effects [19-21].

Conclusions

In conclusion, this report introduced the common peroneal nerve compression caused by fibular neck fracture after high-energy trauma. The author summarized a kind of consciousness and technology to identify and judge nerve compression injury. It is important to suspect severe nerve injury if the patient has paralysis disproportionate to the initial injury, even if the fracture is not displaced. This case emphasizes the importance of understanding the anatomical relationship of the common peroneal nerve and the pathological process of entrapment. Preoperative identification of common nerve injuries is very important to correctly explain symptoms and avoid misjudgment during the operation. Imaging examination of nerves (such as Doppler ultrasound) is useful for judgment [22,23]. During exploring the common peroneal nerve at the neck of fibula, the shape and color of the nerve should be compared with that of the proximal segment for the better evaluation of the degree and location of nerve injury. Intraoperative EMG examination is helpful to determine the location and degree of nerve injury, and more direct electrical stimulation treatment can be performed on the injured nerve [24,25].

Conflict of Interest Statement: The authors declare that no conflicts of interest exist.

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Ethical Approval: All procedures were in accordance with the ethical standards of the institution and the National Research Council, as well as the 1964 Declaration of Helsinki and its subsequent amendments and comparable ethical standards.

Informed Consent: Informed consent was obtained from the patients included in this study.

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