DOI:10.4274/tnd.2020.87846
Turk J Neurol 2020;26:359-361

Case Report / Olgu Sunumu

An Unusual Case of Footdrop: Bilateral Common Peroneal Nerve Palsy by One Bullet Gunshot Injury

Sıradışı Bir Düşük Ayak Olgusu: Tek Kurşun Yaralanması ile Bilateral Peroneal Sinir Paralizisi

Gonca Sağlam

Erzurum Regional Training and Research Hospital, Clinic of Physical Therapy and Rehabilitation, Erzurum, Turkey

Abstract

Common peroneal nerve injuries represent the most common nerve lesions of the lower limbs. Peroneal palsy might be due to traumatic origin. However, bilateral peroneal nerve involvement in an injury is rarely seen in clinical practice. Here, the first case report of a bilateral peroneal nerve paralysis after gunshot injury is presented.

Keywords: Common peroneal nerve, gunshot injury, foot drop, peripheral neuropaty, rehabilitation, bilateral common peroneal nerve injury

Öz

Peroneal sinir yaralanmaları, alt ekstremitede en sık görülen sinir lezyonlarıdır. Peroneal sinir paralizisi travmatik kökene bağlı olabilir ancak peroneal sinirin bir yaralanmaya bağlı bilateral tutulumu klinik olarak nadiren görülür. Burada, ateşli silah yaralanmasından sonra gelişen bilateral peroneal sinir felcinin ilk olgusunu sunmaktayım.

Anahtar Kelimeler: Peroneal sinir, ateşli silah yaralaması, düşük ayak, periferal nöropati, rehabilitasyon, peroneal sinir hasarı

Introduction

Foot drop is an index symptom with a broad differential diagnosis including cerebral, spinal, and peripheral causes. By history taking and careful clinical examination, neurotopographic classsification is usually possible. Peroneal palsy is a frequent cause of foot drop, mostly due to pressure on the fibular neck just below the knee (1). The peroneal nerve is located superficially in a 4 cm area of the head and neck of the fibula and innervates the short head of the biceps femoris in the thigh, travels down the leg to the lateral cutaneous nerve at the knee, before it passes through the fibular tunnel and the peroneus longus muscle and the fibula. Acute injury to the peronel nerve is a rare occurence due to trauma, surgery or postural entrapment of the nerve at the fibular head (2,3,4,5). Traumatic nerve injury results from the application of kinetic energy to the nerve with consequent compressive and tensile forces applied to the nerve.

Case Report

A 34-year-old man was admitted to our inpatient clinic with a diagnosis of bilateral foot drop reporting weakness in his feet and difficulty in walking. He had a gunshot injury at knee level one month ago in which a single bullet penetrated both knees respectively (Figure 1). Foot drop and numbness over the lower anterolateral aspect of the legs and the dorsum of the feet had immediately developed following the gunshot injury. His inital evaluation had been performed in the emergency room and no vascular injury or bone fracture had been detected. Other physical examination and labarotory findings were unremarkable.

In the clinical examination, he had prominent steppage gait caused by a weakness of 2/5 muscle strength in ankle dorsiflexion, and eversion and extension of toes in both legs in manual muscle testing without loss in deep tendon reflexes and sensation. Plantar flexion and invertion was normal. Besides these, bilateral Achilles contracture was identified in the neutral

Address for Correspondence/Yazışma Adresi: Gonca Sağlam MD, Erzurum Regional Training and Research Hospital, Clinic of Physical Therapy and Rehabilitation, Erzurum, Turkey
Phone: +90 505 452 56 88 E-mail: goncasaglam@hotmail.com ORCID: orcid.org/0000-0001-7713-4435
Received/Geliş Tarihi: 14.09.2019 **Accepted/Kabul Tarihi:** 27.08.2020

position. Electromyography (EMG) was studied one month after the injury, which revealed a decreased amplitude of the compound motor action potential on stimulation of the common peroneal nerves, confirming bilateral severe common peroneal nerve axonal degeneration (Tables 1, 2).

A physical therapy and rehabilitation program including neuromuscular electrical stimulation of denervated muscles and exercises were directed to increase range of motion (ROM) and muscle strength. The exercise program, progressing from passive ROM to passive assistive, active, active resistant, and strengthening exercises for the lower limbs were initiated. Toe curls, toe-to-heel rock, foot stretch, isometric dorsiflexion, and cycling were also added to the program. Achilles stretching exercises and walking adaptation were guided by a therapist. For the Achilles contracture, superficial and deep heating modalities were also added to the program. Therapeutic ultrasound was performed 1 w/cm^2 for five minutes per day. The patient was adapted to bilateral rigid plastic ankle foot orthoses (AFO) and the positining of the ankles was described to keep the foot dorsiflexed. After five weeks of the rehabilitation, muscle strength for dorsiflexors and evertors improved to 3/5 with a wider ROM in the ankles. He had a better walking pattern with AFO in both legs.

Figure 1. Scars corresponding the penetrance of the bullet

Follow-up EMG was performed three months after the gunshot injury. EMG of the anterior tibial muscle revealed moderate to profuse denervation at rest and a few small polyphasic motor unit potentials on volitional contraction, demonstrating findings indicative of reinnervation of the motor units. There was moderate atrophy of the anterior compartment of the lower legs. A physical examination revealed that muscle strength for dorsiflexors and evertors remained 3 out of 5. We recommended an evaluation for surgical treatment within six months.

Discussion

The mechanisms of foot drop are various such as neurologic, muscular, and anatomic, and the treatment is directed at the specific cause. Numerous injury mechanisms including stretch/contusion, traction, laceration, entrapment, and compression can play a role in bilateral common peroneal nerve palsy. As a traumatic nerve injury, the bullet passing through the tissues with high velocity caused a gunshot wound with associated kinetic energy to the nerve and a cavitation effect (6).

Acute footdrop is described as difficulty of dorsiflexing the foot against gravity. Patients may also have sensory loss over the dorsum of the foot (4). Symptoms of pain are also rare at rate of 17% (7). Electrodiagnostic studies assist with confirming the diagnosis of peroneal neuropathy and evaluating prognosis. Motor nerve conduction studies of the peroneal nerve and tibial nerve, and sensory nerve conduction studies of the sural and superficial peroneal nerves are recommended. Motor nerve conduction studies are most often performed to the extensor digitorum brevis. The lesion may be better localized using needle EMG. Demyelinating nerve injuries have a better prognosis than axonal lesions (8).

The initial treatment of a peroneal neuropathy is typically conservative management and includes a variety of interventions such as stretching, ROM exercises, and strength training. Proper

Table 1. Nerve conduction study of the right and left extremity nerves

		Right			Left		
Nerve	**Stimulation**	**Latency (ms)**	**Amplitude (mV)**	**CV (m/s)**	**Latency (ms)**	**Amplitude (mV)**	**CV (m/s)**
Motor Peroneal at EDB	Ankle	NR	NR	-	NR	NR	-
	Below the fibular head	NR	NR	-	NR	NR	-
	Above the fibular head	NR	NR	-	NR	NR	-
Peroneal at TA	Below the fibular head	NR	NR	-	NR	NR	-
	Above the fibular head	NR	NR	-	NR	NR	-
Tibial	Ankle	3.55	10.5	-	3.55	10.6	-
	Popliteal fossa	11.5	6.3	40	11.2	7.1	41
Sensory							
Sural	Calf	3.7	11.9	36	3.40	12.8	36
Superficial peroneal	Lateral leg	NR	NR	-	NR	NR	-

EDB: Extensor digitorum brevis, TA: Tibialis anterior, NR: No response, CV: Conduction velocity

Table 2. Needle electromyography study in the left and right lower extremity

Muscle	IA	ASA	MUAP	Recruitment pattern
Paraspinal muscles (L3-S1)	R: Normal L: Normal	R: None L: None	- -	- -
Gluteus medius	R: Normal L: Normal	R: None L: None	R: Normal L: Normal	R: Full L: Full
Vastus medialis	R: Normal L: Normal	R: None L: None	R:Normal L: Normal	R: Full L: Full
Biceps femoris (short)	R: Normal L: Normal	R: None L: None	R: Normal L: Normal	R: Full L: Full
Tibialis anterior	R: Normal L: Normal	R: +++ L: ++	R: + L: ++	R: No activity L: No activity
Peroneus longus	R: Normal L: Normal	R: + L: +	R: - L: -	R: No activity L: No activity
Peroneus brevis	R: Normal L: Normal	R: + L: +	R: - L:-	R: No activity L: No activity
Tibialis posterior	R: Normal L: Normal	R: None L: None	R: - L: -	R: Full L: Full
Gastrocnemius (medial)	R: Normal L: Normal	R: None L: None	R: Normal L: Normal	R: Full L: Full

IA: Insertional activity, ASA: Abnormal spontaneous activity, MUAP: Motor unit action potential, R: Right, L: Left

physical therapy exercises can strengthen ankle muscles and improve symptoms. AFOs are also important devices for patients who have severe foot drop of any reasons, they enable patients to walk better and more safely. Therapeutic ultrasound and streching exercises may be helpful because Achilles contracture is expected to develop (9). Surgical decompression with a meticulous approach should be preserved for failed cases 3-7 months following injury (10). A one-stage procedure of nerve repair and tibialis tendon transfer can enhance neural regeneration and result in a fixed equinism. However, nerve regeneration after common peroneal nerve repair is poorer when compared with other peripheral nerves because the mobility and elasticity of the peroneal nerve is lower than in other peripheral nerves (11,12).

Acute peroneal nerve injury was diagnosed in our patient through clinical and electrophysiologic studies. Conservative treatment was initially considered under follow-up with EMG and physical examination. In the following three months, electrophysiologic and clinical healing was observed.

In conclusion, there are many causes and treatments for foot drop, and each individual patient requires different procedures depending on their specific cause and conditions.

Ethics

Informed Consent: Informed consent was given by the patient.

Peer-review: Externally peer-reviewed.

Financial Disclosure: The author declared that this study received no financial support.

References

1. Stewart JD. Foot drop: where, why and what to do? Pract Neurol 2008;8:158-169.
2. Preston DC, Shapiro BE. Peroneal neuropathy. Electromyography and neuromuscular disorders. Philadelphia: Elsevier; 2005:343-354.
3. Watemberg N, Amsel S, Sadeh M, Lerman-Sagie T. Common peroneal neuropathy due to surfing. J Child Neurol 2000;15:420-421.
4. Bendszus M, Reiners K, Perez J, Solymosi L, Koltzenburg M. Peroneal nerve palsy caused by thrombosis of crural veins. Neurology 2002;58:1675-1677.
5. Robinson LR. Traumatic injury to peripheral nerves. Muscle Nerve 2000;23:863-873.
6. Katirji MB, Wilbourn AJ. Common peroneal mononeuropathy: a clinical and electrophysiologic study of 116 lesions. Neurology 1988;38:1723-1728.
7. Stewart JD. Foot drop: where, why and what to do? Pract Neurol 2008;8:158-169.
8. Baima J, Krivickas L. Evaluation and treatment of peroneal neuropathy. Curr Rev Musculoskelet Med 2008;1:147-153.
9. Draper DO, Anderson C, Schulthies SS, Ricard MD. Immediate and residual changes in dorsiflexion range of motion using an ultrasound heat and stretch routine. J Athl Train 1998;33:141-144.
10. Kim DH, Murovic JA, Teil RL, Kline DG. Management and outcomes in 318 operative common peroneal nerve lesions at the LSU Health Sciences Center. Neurosurgery 2004;54:1421-1428; discussion 1428-1429.
11. Garazzo D, Ferraresi S, Buffatti P. Surgical treatment of common peroneal nerve injuries: indications and results: a series of 62 cases. J Neurosurg Sci 2004;48:105-112; discussion 112.
12. Murovic JA. Lower-extremity peripheral nerve injuries: a Louisiana State University Health Sciences Center literature review with comparison of the operative outcomes of 806 Louisiana State University Health Sciences Center sciatic, common peroneal, and tibial nerve lesions. Neurosurgery 2009;65(4 Suppl):A18-A23.