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Olgu Sunumu / Case Report

Spiral Groove Entrapment Neuropathy Due to Overuse of the Triceps: A Case Report

Triceps Aşırı Kullanımına Bağlı Gelişen Spiral Oluk Tuzak Nöropatisi: Bir Olgu Sunumu

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Abstract

Spiral groove entrapment neuropathy is a compression neuropathy that can occur for various reasons due to the superficial course of the radial nerve at the level of the spiral groove. Since repetitive movements play a role in the development mechanism of compression neuropathy, compelling and repetitive movements of the triceps muscle may predispose to spiral groove entrapment neuropathy. In this case, a 61-year-old male patient who developed a low hand after long-term use of a lawnmower is presented. The patient was diagnosed with spiral groove entrapment neuropathy as a result of the physical examination findings performed in our clinic and the requested electroneurophysiological test, magnetic resonance imaging. The patient's motor and sensory deficit completely recovered after 6 weeks as a result of physical therapy and acupuncture treatment.
Keywords: Radial nerve, Entrapment neuropathy, Radial nerve neuropathy

Özet

Spiral oluk tuzak nöropatisi, radial sinirin spiral oluk seviyesinde yüzeyel seyretmesinden dolayı çeşitli nedenlerle meydana gelebilen bir kompresyon nöropatisidir. Kompresyon nöropatisi gelişim mekanizmasında tekrarlayıcı hareketler rol oynadığı için triceps kasının zorlayıcı ve tekrarlayıcı hareketleri spiral oluk tuzak nöropatisine zemin hazırlayabilmektedir. Bu olguda uzun süreli çim biçme makinası kullanımı sonrasında düşük el gelişmiş 61 yaşında bir erkek hasta sunulmaktadır. Hasta kliniğimizde yapılan fizik muayene bulguları ve istenen elektronörofizyolojik test, manyetik rezonans görüntüleme sonucu spiral oluk tuzak nöropatisi tanısı almıştır. Hastanın motor ve duyu defisiti, verilen fizik tedavi ve akupunktur tedavisi sonucunda 6 hafta sonra tamamen iyileşti.
Anahtar Kelimeler: Radial sinir, Tuzak nöropatisi, Radial sinir nöropatisi

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1. Introduction

The radial nerve is the most frequently injured nerve in the upper extremity due to its long and curved structure and its proximity to the humeral shaft posteriorly (1). The radial nerve neuropathy occurs as compressive and noncompressive (2). Non-compression injury of the radial nerve can occur anywhere along its course, but the most common cause is fractures of the humeral shaft (3).

Compressive neuropathy of the radial nerve is more common and is usually caused by occupational or recreational repetitive movements (4). Compression neuropathy develops due to microvascular damage to the nerve and the myelin sheath that is directly related to pressure (1,4,5). Prolonged compression can result in fibrosis, demyelination and even axonal damage(5). The radial nerve often tends to be pinched in the following areas: between the heads of the triceps brachii muscle, in the spiral groove of the humerus, when piercing the lateral intermuscular septum and at the entrance of the supinator muscle (arcade of Frohse) (1,2,6). Compression of the radial nerve in the spiral groove (spiral groove syndrome) accounts for 21% of entrapment neuropathies (7). In short-term mild compression of the radial nerve in the spiral groove, loss of sensation and pain occur in the sensory dermatome areas of this nerve, which are lateral to the elbow, dorsal forearm and dorsoradial of the hand. Pain is exacerbated when traction is applied to the nerve, particularly with elbow extension, forearm pronation, and wrist flexion. With a prolonged compression of the nerve, motor losses also begin to appear. At this level, the triceps muscle function is normal, but the muscles innervated by the radial nerve in the forearm are paralyzed. Although there is paralysis in the supinator and brachioradialis muscles, there is no restriction in elbow flexion and supination movement because the biceps muscle with the innervation of the musculocutaneous nerve is active. The wrist drop deformity characterized by loss of strength in wrist and finger extensors, thumb abductor and extensor is seen (8,9). Diagnosis is mainly established by clinical examination, but electroneuromyographic studies are also used (1,10).

2. Case Presentation

A 61-year-old male patient was admitted to our clinic with the complaint of weakness in the left wrist and fingers, and inability to lift the wrists and fingers suddenly two days ago. The patient did not describe trauma, but she stated that she had been working with a lawnmower for a long time without interruption the day before her complaint stated. He had a history of gastrectomy operation.

On physical examination, there was no active extension of the left wrist and all fingers. Left wrist and whole finger extensor muscle strength was 0/5, left hand 1st finger abductor 0/5, there was no loss of left shoulder and elbow group muscle strength. The patient described hypoesthesia of the left forearm dorsolaterally and dorsal to the first third finger of the hand. The patient's triceps reflex was normoactive.

No abnormal results were detected in the blood tests (hemogram, sedimentation C-reactive protein, biochemistry, vitamin B 12, TSH, tumor markers) of the patient. Electroneuromyography (ENMG) was performed 2 weeks later, and total damage to the radial nerve was detected at the level of the spiral groove. Magnetic resonance imaging (MRI) evaluations for cervical, left arm and forearm were performed. There was a right foraminal disc protrusion in C5-6 and central protrusions on the bulging floor at all other levels on cervical MRI, but no nerve root compression or myelopathic changes were observed. No bone and soft tissue pathologies were detected in left arm and forearm MRI.

The patient was included in the physical therapy program. As physical therapy, passive range of motion exercises and electrical stimulation to the wrist and finger extensors were applied. Master tung acupuncture was applied to the patient once a week for a total of 3 sessions using the points located in the 33rd region of the forearm. At the end of the 6th week of the patient's wrist and finger extensor muscle strength was 5/5 and there was no sensory deficit. In the 5th month

follow-up ENMG, it was consistent with chronic axonal degeneration with mild involvement of the radial nerve under the left triceps muscle.

3. Discussion

The radial nerve emerges from the posterior cord of the brachial plexus with the junction of the C5-T1 roots and courses behind the humerus between the lateral and medial head of the triceps. It passes through the spiral groove on the posterolateral side of the distal 1/3 of the humerus to the forearm by piercing the lateral intermuscular septum (1). The radial nerve innervates the brachioradialis, extensor carpi radialis longus, and anconeus at elbow level. The extensor carpi radialis brevis is innervated by either the radial nerve or the posterior interosseous nerve, depending on the anatomical variation (11). It is divided into superficial and deep in the forearm. The superficial branch passes under the brachioradial muscle and descends to the back of the hand (1-3). The posterior interosseous nerve (PIS), which is the deep motor branch, runs deep and passes through the arcade of Frohse, which is a fibrous structure on the surface of the supinator muscle. The PIS innervates the supinator muscle, the abductor pollicis longus and all of the wrist and finger extensors, except the extensor carpi radialis longus and brachioradialis (12,13).

Knowing the anatomical course of the radial nerve and the muscles it innervates is very useful in patient evaluation. For example, if there is a loss of strength in the triceps muscle and a decrease in the triceps reflex, a root or plexus lesion may be considered. A lesion at the level of the humeral shaft or spiral groove can be considered in the presence of a drop wrist deformity and sensory deficit when the triceps muscle strength is normal. The drop finger development without sensory loss is typical for PIS syndrome (6). In our case, sensory deficit in the lateral left elbow and dorsal to the first third finger of the hand, drop wrist deformity due to complete loss of wrist and finger extension, being no motor deficit in the triceps and normoactive triceps reflex were suggestive of radial nerve neuropathy at the humerus level.

Injuries of the radial nerve at the level of the humerus; It occurs due to reasons such as humerus fractures, exposure of the arm to external pressure by staying in a bad position for a long time (armrest to the edge of the chair after alcohol or drug use - Saturday night syndrome, use of crutches), repetitive overuse of the triceps muscle, long tourniquet application, compression due to tumoral lesions. In this case, there was no history of crutches, alcohol or drug use and did not describe trauma. In the anamnesis, the patient had long-term use of lawn mowers on the same day.

Nerve conduction studies with ENMG are useful in detecting the anatomical localization of nerve damage. In this way, it can be distinguished between cervical radiculopathies, brachial plexopathies and peripheral nerve lesions and the severity of the damage can be determined (14). The result of the ENMG study performed in this case was consistent with a complete lesion of the radial nerve at the level of the spiral groove.

Plain radiography can be used to detect fractures, dislocations, and bone tumors and pathologies that cause compression (1). With ultrasonography, the structural integrity of the nerve can be evaluated along the nerve course, especially in the area where the nerve is superficial at the level of the spiral groove (15). Magnetic resonance imaging is useful in locating pathologies and neurological diseases associated with nerve damage (16). We also used imaging methods in order not to ignore additional pathologies that may cause radial nerve total damage in the case. Cervical, left arm and forearm MRI evaluations were performed. No etiological pathology was found to explain the low hand deformity.

Conservative treatments are primarily applied in the treatment of compression neuropathy of the radial nerve. Rest, splinting, activity modification, non-steroidal anti-inflammatory drugs (NSAIDs), steroid injections, acupuncture, vitamin treatments can be applied initially as conservative treatment (17,18). Dynamic splints that keep the fingers in extension are recommended during the day, while the use of static rest splints is

recommended at night. Range of motion exercises for preventing the development of contracture, and exercise programs ranging from active assistive exercises to resistance exercises according to muscle strength are given. The patient should be trained to avoid prolonged, repetitive elbow extension, forearm pronation, and wrist flexion (19). Surgery is considered for patients who do not respond to treatment despite conservative treatment for three months (20). Decompression surgery and tendon transfer surgeries can be applied in surgical treatment (9,21). In our clinic, the patient was given a static resting splint. Physical therapy and acupuncture were applied to the patient. The patient did not have any motor and sensory deficits at the end of the treatment.

4. Conclusion

The superficial course of the radial nerve at the level of the spiral groove paves the way for the development of spiral groove entrapment neuropathy. In patients with a complete lesion at the level of the spiral groove of the radial nerve, after excluding other pathologies in the etiology, overuse of the triceps muscle should be questioned and not be ignored. We think that it is important to know that repetitive excessive muscle use may also cause the development of complete compression neuropathy.

REFERENCES

1. Bumbasirevic M, Palibrk T, Lesic A, Atkinson H. Radial nerve palsy. *EFORT Open Rev.* 2016 ;1:286-94.
2. Dong Q, Jacobson JA, Jamadar DA, et al. Entrapment neuropathies in the upper and lower limbs: anatomy and MRI features. *Radiol Res Pract.* 2012:230679.
3. Bodner G, Huber B, Schwabegger A, Lutz M, Waldenberger P. Sonographic detection of radial nerve entrapment within a humerus fracture. *J Ultrasound Med.* 1999 ;18:703-6.
4. Neal SJ, Fields KB. Peripheral nerve entrapment and injury in the upper extremity. *Am Fam Physician*. 2010;81:147–5.
5. Rempel DM, Diao E. Entrapment neuropathies: pathophysiology and pathogenesis. *J Electromyogr Kinesiol*. 2004;14:71–5.
6. Demiryürek B. E, Emre U, Demirel E. A, et al. Radial sinir nöropatilerinin retrospektif değerlendirilmesi. *İstanbul Med J.* 2015; 16: 116-8.
7. Chhabra A, Deune GE, Murano E, et al. Advanced MR neurography imaging of radial nerve entrapment at the spiral groove: a case report. *J Reconstr Microsurg*. 2012; 28: 263–266.
8. Lowe JB, Sen SK. Current approach to radial nerve paralysis. *Plastic and Reconstructive Surgery*. 2002; 110: 1099-112.
9. Öksüz Ç. Üst ekstremite tuzak nöropatilerinde rehabilitasyon. *Totbid Dergisi.* 2015; 14: 529-36.
10. Alba C. Therapist's management of radial tunnel syndrome. In: Mackin EJ, Callahan AD, Skirven TM, Schneider LH, Osterman AL, Hunter JM, editors. Rehabilitation of the hand and upper extremity, 5th ed. *St. Louis: Mosby;* 2002 p.696–700.
11. Abrams RA, Ziets RJ, Lieber RL,et al. Anatomy of the radial nerve motor branches in the forearm. *J Hand Surg Am.*1997 ;22:232-7.
12. Güdemez E. Üst ekstremitelerde görülen periferik sinir kompresyon nöropatileri. *Türk Aile Hekimleri Dergisi.* 2007; 11: 5-12.
13. Verhaar J, Spaans F. Radial tunnel syndrome. An investigation of compression neuropathy as a possible cause. *J Bone Joint Surg Am*. 1991; 73: 539-44.
14. Bevelaqua AC, Hayter CL, Feinberg JH, Rodeo SA. Posterior interosseous neuropathy: electrodiagnostic evaluation. *HSS J*. 2012;8: 184-189.
15. Lo YL, Fook-Chong S, Leoh TH, et al. Rapid ultrasonographic diagnosis of radial entrapment neuropathy at the spiral groove. J Neurol Sci. 2008 ;271:75-9.
16. Furuta T, Okamoto Y, Tohno E, et al. Magnetic resonance microscopy imaging of posterior interosseous nerve palsy. *Jpn J Radiol*. 2009;27:41-44.
17. Hammert WC. Radial nerve palsy. Orthopaedic Knowledge Online Journal. http:// orthoportal.aaos.org/oko/article.aspx?article=OKO_HAN026. (date last accessed 6 July 2016.
18. Millea PJ. Acupuncture treatment of compression neuropathy of the radial nerve: a single case report of" Saturday Night Palsy". Journal of Alternative & Complementary Medicine. 2005; 11: 167-169.
19. Cleary CK. Management of radial tunnel syndrome: A therapist's clinical perspective. *J Hand Ther.* 2006;19:186–91.

20. van den Ende KI, Steinmann SP. Radial tunnel syndrome. *J Hand Surg Am*. 2010;35:1004–6.
21. Ng AB, Borhan J, Ashton HR, Misra AN, Redfern DR. Radial nerve palsy in an elite bodybuilder. *Br J Sports Med.* 2003;37:185-6.

Ethics

Informed Consent: The authors declared that informed consent form was signed by the patient.

Copyright Transfer Form: Copyright Transfer Form was signed by the authors.

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