



Isolated Traumatic Musculocutaneous Distal Branch Neuropathy

İzole Travmatik Muskülokutanöz Distal Dal Nöropatisi

Yaprak Seçil¹, Nazlı Gamze Bülbül¹, Gaye Eryaşar Yıldırım², Yeşim Beckmann¹

¹Katip Çelebi University Faculty of Medicine, Atatürk Training and Research Hospital, Clinic of Neurology, İzmir, Turkey

²Eskişehir Public Hospital, Clinic of Neurology, Eskişehir, Turkey

Summary

Isolated musculocutaneous neuropathy is frequently associated with superior truncus lesions of brachial plexus and appears rarely. Musculocutaneous nerve palsy may occur in two patterns: proximal and distal injury. Proximal injury may cause motor and sensory deficits, but distal injury primarily causes sensory deficits. In our patient, neurologic symptoms were insignificant and electrophysiologic methods were very helpful for locating the lesion. Herein, we report a case of isolated distal branch musculocutaneous nerve injury with very occult clinical symptoms that resulted from a surgical procedure.

Keywords: Musculocutaneous nerve, traumatic injury, neuropathy

Öz

İzole muskülokutanöz nöropati, sıklıkla brakial pleksus süperior trunkus lezyonlarına bağlı olarak ortaya çıkmakta ve nadir görülmektedir. Muskülokutanöz sinir paralizisi proksimal ve distal olmak üzere iki Figurede karşımıza çıkmaktadır. Proksimal hasar motor ve duysal kayba yol açarken, distal hasar öncelikli olarak duysal kayıpla sonuçlanır. Burada, cerrahi işlem sonrası oluşan ve silik klinik semptomlarla ortaya çıkan izole distal muskülokutanöz sinir hasarı saptanan bir olgu sunulmuştur. Hastamızda nörolojik semptom ve bulgular oldukça silik iken elektrofizyolojik çalışmaların lezyon lokalizasyonunun saptanmasında son derece yardımcı olması benzer durumlarda elektrofizyolojik değerlendirmenin önemini göstermektedir.

Anahtar Kelimeler: Muskülokutanöz sinir, travmatik hasar, nöropati

Introduction

The brachialis muscle is proximally attached to the lower half of the anterior humoral aspect from the deltoid tuberosity, which it embraces, to within 2.5 cm of the cubital articular surface (Figure 1a) (1,2). The nerve supply of the muscle is provided by the musculocutaneous nerve (C5-6) and radial nerve (C7) to a small lateral part of the muscle. Its action is flexion of the elbow joint with the forearm prone or supine with or without resistance (1).

The musculocutaneous nerve arises from the lateral cord of the brachial plexus and contains fibers from the C5, C6, and C7 spinal nerve roots. However, the most important contributions come from the C5 and C6 levels (3,4). It passes through the

coracobrachialis muscle and descends between the biceps and brachialis muscles, which it innervates (4). The musculocutaneous nerve emerges between these muscles by the lateral margin of the biceps aponeurosis as the lateral antebrachial cutaneous nerve (LACN) (2,5) (Figure 1b) and supplies cutaneous branches to the skin over the lateral cubital region before dividing into anterior and posterior terminal cutaneous branches that innervate the skin of the lateral forearm (4). Isolated injury of the musculocutaneous nerve is a very rare disorder, and isolated distal branch musculocutaneous neuropathy is seen even less frequently. In previous cases reported in the literature, both biceps and brachialis muscles were affected together without a disturbing pain (6,7,8). If there is an injury to the terminal branch of the nerve, the lateral cutaneous nerve

of the forearm, pain is the major symptom and radiates to the radial part of the forearm (9). Isolated musculocutaneous nerve injuries have been reported to be caused by strenuous activity or exercise, playing various sports, and poor surgical positioning, usually prolonged abduction, extension, and external rotation at the shoulder (10,11). We report a case of isolated distal branch musculocutaneous nerve injury with very occult symptoms that resulted from a surgical procedure.

Case Report

A man aged 21 years who was doing his military service was examined because he could not bear any strenuous stretching exercise (horizontal bar) for extended periods. He had scar tissue in his left arm because he had undergone surgery because of a broken ulnar and radial bones in the left elbow when he was aged nine years (Figure 2). After that operation, he had broken his bones twice more within a one-year period. Another small scar was observed on the elbow in the brachialis muscle location that was not related with the first operation. Eight months after the first operation a platinum bone implant was removed through a small incision in the brachialis muscle. In the neurologic examination, there was localized brachialis muscle atrophy in the medial part of the left elbow (Figure 3). The right brachialis muscle was normal (Figure 4, 5). The biceps, triceps, and deltoid muscle strengths were normal bilaterally. Left elbow flexion was slightly weaker than the right arm and no other motor or sensory deficit was detected. In the electrophysiologic examination, nerve conduction studies were conducted on the left arm (Table 1) and all muscles except the left brachialis muscle were normal (Table 2). In the left brachialis muscle there were neurogenic motor unit potentials and loss of motor units; the right brachialis muscle was normal. This was considered as isolated musculocutaneous distal branch neuropathy (brachialis branch).

Discussion

Isolated musculocutaneous neuropathy is very rare, it is usually associated with superior truncus lesions of brachial plexus.

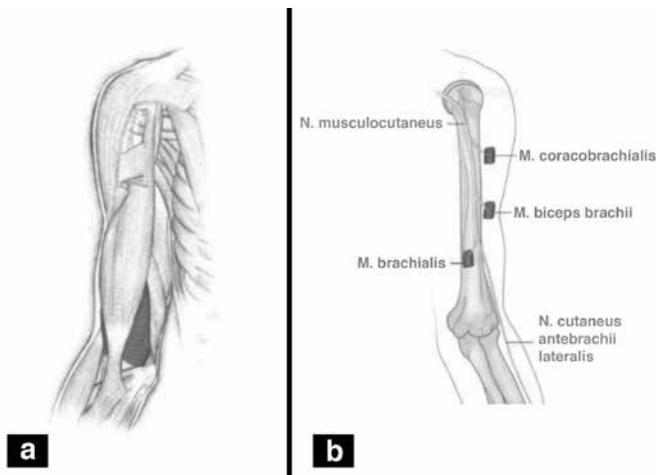


Figure 1. a) Location of the brachialis muscle on the lower half of humerus, b) Musculocutaneous nerve and brachialis muscle innervation (The figures were taken from reference 2)

Nontraumatic causes are weight lifting, strenuous physical activity, surgery, and pressure during sleep (6,12). There is one report of proximal humeral exostosis that caused isolated musculocutaneous neuropathy (13). The mechanism for nontraumatic exercise-related cases is entrapment within the coracobrachialis, as well as traction between a proximal fixation point in the coracobrachialis and a distal fixation point in the deep fascia at the elbow. Musculocutaneous neuropathies more commonly occur as part of widespread traumatic lesions of the shoulder (14) and upper arm, especially fractures of the proximal humerus. In our case, isolated distal branch musculocutaneous nerve injury was detected with very occult symptoms that resulted from a surgical procedure.

Table 1. Nerve conduction studies of the patient

Nerve	Latency (msec) Distal/ proximal	Amplitudes (mV)	Conduction velocity (m/sec)
Motor nerves			
Medianus (left)	3.2/7.7	8.0/7.0	55.6
Ulnaris (left)	2.3/7.9	8.8/7.4	53
Radialis (left)	1.6/3.4/4.8	4.5/3.6/5.2	81/75
Brachial plexus			
-Deltoid	3.2	16.9	
-Biceps	3.8	9.5	
-Triceps	4.4	13.3	
Sensory nerves			
Medianus (left) 1. dig.	2.5	16	48
Ulnaris (left)	2.3	17	61
Radialis (left)	1.9	25	57.9
Lat. Ant. Brac. Cut. n. (left)	1.6	8	68

msec: Millisecond, mV: Milivolt, Lat. Ant. Brac. Cut. n: Lateral antebrachial cutaneous nerve, dig.: Digitalis

Table 2. Needle electromyography results of the patient

Muscles	Interpretation
Left	
Ext. Dig. Comm.	Normal
Triceps	Normal
Deltoideus	Normal
Brachialis	Neurogenic MUPs and loss of MUPs
Biceps	Normal
Abd. Dig. Min.	Normal
Flex. Carp. Ulnaris	Normal
Abd. Poll. Brevis	Normal
Right	
Brachialis	Normal

Ext. Dig. Comm: Extensor digitorum communis, Flex. Carp.: Flexor carpi, MUP: Motor unit potential, Abd. Poll.: Abductor pollicis, Abd. Dig. Min.: Abductor digitorum

The usual result of damage to the nerve is a reduction in the power of flexion of the elbow and of supination of the forearm (15). Clinically, elbow flexion weakness, absent biceps reflex, and sensory loss in the lateral arm can be observed. When the injury is below the coracobrachialis muscle, the predominant symptom is said to be weakness of the biceps brachii and the brachialis muscles associated with paresthesias over the LACN distribution (6,16). Injury to the lateral antebrachial nerve at the elbow region has also been reported due to strenuous exercise and predominantly presents with pain and paresthesias (12).

In summary, musculocutaneous nerve palsy may occur in two patterns: Proximal injury, which results in motor and sensory deficits, or distal injury, primarily with sensory deficits. Proximal injury to the musculocutaneous nerve causes a painless syndrome of weakness in the biceps and numbness in the lateral forearm and may be caused by compression within the coracobrachialis muscle or compression of the muscle or nerve by the humeral head. Distal injury to the musculocutaneous nerve can occur near the bicipital aponeurosis and only the sensory branch is affected, this results in a painful, pure sensory syndrome (10). In our case, isolated

distal branch of musculocutaneous neuropathy (brachialis branch neuropathy) was determined. Clinically, there was no real weakness but the patient was not able to do activities that required more strength in flexion of the elbow, such as with the horizontal bar. He could not bear to continue the exercise after he did horizontal bar twice. Even the patient had not realized the flexion weakness before coming the military service. In the electrophysiologic examination, only the brachialis muscle was neurogenic and atrophy of this muscle was obvious; the other muscles were all normal.

Personage-Turner syndrome can also present with isolated brachialis wasting (17). However, we did not consider this syndrome because of our patient's operations and his clinical history. Current treatments for musculocutaneous neuropathy and its branches are limited to rest, NSAIDs, a posterior elbow splint to prevent full extension, and physical therapy. If symptoms persist beyond 6 weeks, injection of steroid and local anesthetic into the musculocutaneous tunnel may be performed in order to possibly alleviate the inflammatory component of the pain. If after 12 weeks nonoperative treatment for these neuropathies are unsuccessful, surgical



Figure 2. Scar tissue caused by previous surgical interventions



Figure 4. The right arm of the patient was normal



Figure 3. The left arm of the patient. Significant muscle wasting on the medial aspect of the elbow can be seen



Figure 5. Both arms of the patient together

decompression is often advised (18). Isolated musculocutaneous distal branch neuropathies can easily be overlooked in clinical practice. Insignificant neurologic symptoms cannot be apparent if a patient does not use the brachialis muscle specially, or does not do strenuous exercises that use this muscle. Electrophysiologic methods are very helpful for locating lesions in this situation.

Ethics

*Informed Consent: Consent form was filled out by all participants.
Peer-review: External and internal peer-reviewed.*

Authorship Contributions

Surgical and Medical Practices: Yaprak Seçil, Nazlı Gamze Bülbül, Yeşim Beckmann, Concept: Yaprak Seçil, Gaye Eryaşar Yıldırım, Nazlı Gamze Bülbül, Design: Yaprak Seçil, Yeşim Beckmann, Data Collection or Processing: Yaprak Seçil, Nazlı Gamze Bülbül, Gaye Eryaşar Yıldırım, Analysis or Interpretation: Yeşim Beckmann, Yaprak Seçil, Literature Search: Yaprak Seçil, Gaye Eryaşar Yıldırım, Nazlı Gamze Bülbül, Writing: Yaprak Seçil, Gaye Eryaşar Yıldırım, Nazlı Gamze Bülbül, Yeşim Beckmann.

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