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NEÜ YAYINEVİ

# An EMG Case Report with Shoulder Injury Presenting with Isolated High Ulnar Neuropathy

## *İzole Yüksek Ulnar Nöropatiyle Prezente Olan Bir Omuz Lezyonuna Ait EMG Olgu Bildirimi*

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### *Öz*

Ulnar tuzak nöropatiler en sık dirsekte görülür. Ulnar sinir tuzaklanması en sık dirsekte görülmekle birlikte, farklı etiyolojiler ulnar nöropatilerin oluşumunda yer alır C5 ve T1 spinal sinirlerin anterior ramuslarından oluşan Brakiyal pleksus, üst ekstremite kaslarını inerve eder. Brakiyal pleksusun medial kordundan oluşan ulnar sinir, liflerini C8 ve T1 köklerinden alır. Ulnar nöropatilerin tanısı önemli ölçüde elektromyografi bulgularına dayanır. Ulnar tuzak nöropatiler sırayla dirsek, bilek ve elde görülür. Nadiren, aksilla seviyesinde bir lezyona bağlı olarak da hasarlanabilir.
Burada omuz lezyonu sonrasında elin ulnar kısmında duyu ve motor kayıpla prezente olan nadir bir olguyu bildirdik. Bu olgunun bildirilme amacı, brakiyal pleksustan çıkan sinirlerin literatür bilgisi dışında izlenebilen hassasiyetine dikkat çekmekle beraber, periferik sinir hasarı bulgularıyla başvuran hastaların değerlendirilmesinde ayırıcı tanıları kapsayan detaylı anatomik yapı ve varyasyonlarına ait bilginin önemini hatırlatmaktır.

**Anahtar Kelimeler:** Yüksek ulnar nöropati, omuz lezyonu, brakiyal pleksopati, elektromyografi

### *Abstract*

Compression of the ulnar nerve usually occurs at elbow. Although the most common site of ulnar nerve compression at the elbow, various etiologies may give rise to ulnar neuropathy. The brachial plexus, formed by the anterior rami of C5 through T1 spinal nerves, supply the muscles of the upper limb. Ulnar nerve arises from the medial cord of the brachial plexus, derives its fibers from the C8 and T1 roots. Diagnostic approach to ulnar neuropathy mainly depends on electromyographic findings. Most common places for ulnar entrapment neuropathy are elbow, wrist or hand respectively.) Occasionally, it may be damaged due to a lesions across the axilla. We are reporting a rare case of shoulder injury with immediate loss of sensation and motor functions of the ulnar half of the hand. This case report aims to highlight the susceptibility of nerves arising from brachial plexus to injuries varies beyond the literature knowledge and also illustrate the importance of detailed anatomical knowledge with their variations and a differential diagnosis when evaluating a patient with signs and symptoms of a peripheral neuropathy.

**Key words:** High ulnar neuropathy, shoulder injury, brachial plexopathy, electromyography

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## INTRODUCTION

Ulnar nerve compression is one of the typical entrapment neuropathies among upper extremity. Medial cord of the brachial plexus gives rise to ulnar nerve (1) which innervates the muscles in the forearm and hand with sensory innervation to the medial aspect of the hand (2). Most common places for ulnar neuropathy are elbow, wrist or hand respectively (3). Occasionally, it may be damaged due to a lesions crossing the axilla (4,5,6). Patient assessment relies on neurologic examination of upper extremity sensory and motor function, radiological studies and electrodiagnostic studies (7).

Needle electromyography is essential for localization of lesion site with burden of differential diagnoses. It is important to assess that whether the muscles innervated by median and radial nerves arising from C8T1 roots are affected or not. Some limitations to make the exact localization with needle EMG can be concerned. We are reporting a case with isolated high ulnar neuropathy secondary to penetrating shoulder injury which is uncommon in literature. The site of lesion, which is just distal to the medial cord of the brachial plexus is the major differentiating feature of this case. This case report aims to highlight the susceptibility of nerves arising from brachial plexus to injuries varies beyond the literature knowledge.

## CASE

The patient was right-handed, 19 year-old male refugee who is referred by orthopedics and traumatology outpatient clinic. Penetrating injury on his right shoulder with a steel bar crossing the axilla was the main reason (Figure-1) for two years. His chief complaints were numbness in the medial aspect of hand and inability to use his ring and little finger after the injury. The radiograph and magnetic resonance imaging of shoulder and plexus was normal without any signs of fracture or dislocation. Physical examination was revealed severe wasting of first dorsal interosseous muscle (FDI) and weakness on resting interosseous muscles. Muscle power assessment on Abductor Digiti Minimi (ADM) and FDI was grade-1 according to Medical Research Council Manual Muscle Testing (MRC). Claw hand was one of the physical sign of ulnar neuropathy.

Touch and pain sensation were severely impaired over dorsal and palmar aspects of ulnar border of hand, over little and ring finger sparing deep tendon reflexes.

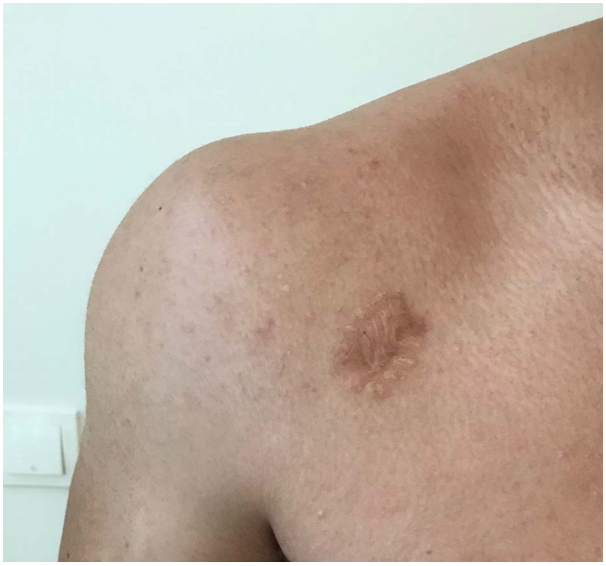

**Figure 1.** Penetrating Shoulder Injury

The electrophysiologic evaluation was critical for definite lesion diagnose. The outcome after EDX examination: recording from little and ring finger ulnar sensory nerve action potentials (SNAP) and mixed antebrachial ulnar SNAP between wrist and ankle. Dorsal ulnar cutaneous sensory nerve (DUC) was absent on the lesion site sparing the other sensory nerves. Ulnar motor compound muscle action potential (CMAP) recorded from Abductor Digiti Minimi (ADM) muscle was inevitable. Ulnar CMAP recorded rom Flexor Carpi Ulnaris (FCU) was showing decrease in amplitude from all points of stimulation, with a marked decrease along with elbow (4,80mV), axilla (6,53mV) and Erb point (4,93mV) stimulation respectively (Table-1). Concentric needle electromyography revealed fibrillation potentials (FP) and positive sharp waves (PSW) at rest and decreased recruitment in ADM and FDI. Right FCU showed motor unit potentials with long durations, suggesting regeneration in the motor unit. Obvious weakness in ulnar nerve innervated muscles, visible evidence of atrophy in the ulnar aspect of hand with active denervation on needle EMG are corresponding to severe ulnar neuropathy. Diagnostic imaging exposed neuropathic changes points out to the peripheral branches of brachial plexus confirming the electromyographic findings.

**Table 1.** Compound muscle Action Potentials

| CMAP | Latency msn | NCV m/s | Amp mV |
|---|---|---|---|
| R N Median | 2.92 | 68.5 | 4 |
| R N Radial (antebrachial- spiral G) | 2.64 | 64.2 | 5 |
| R N Radial(spiralG-Erb) | 3.64 | 67 | 5 |
| R N Ulnar ADM | Absent | | |
| R N Ulnar Elbow-FCU | 3.84 | | 4.80 |
| R N Ulnar Axilla-FCU | 4.16 | | 6.53 |
| R N Ulnar Erb-FCU | 7.44 | | 4.93 |
| R N musculocut Erb- Biceps | 4.08 | | 5.87 |
| R N radial Erb-Triceps | 3.48 | | 7.73 |
| L N ulnar | | | |

## DISCUSSION

The brachial plexus, formed by the anterior rami of C5 through T1 spinal nerves, supply the muscles of the upper limb. The anterior division of the lower trunk, forming the medial cord, gives off the ulnar nerve, medial antebrachial cutaneous nerve and the inner branch of the median nerve. Ulnar nerve arises from the medial cord of the brachial plexus, derives its fibers from the C8 and T1 roots (8).

Peripheral nerve injury in the upper extremity is common. Certain peripheral nerves are at an increased risk of injury because of their anatomic location. There also some exceptional cases like this one.

There is one prospective electromyography (EMG) study addressing the incidence and the clinical consequences of nerve lesions found that nerve injury is the most possible result of shoulder dislocation. The axillary nerve injury is the most common result of this kind of trauma (42%) according to this study and median and ulnar nerves seem to be less vulnerable (9) which can be criticized. According to this case, decreased ulnar CMAP amplitudes sparing the median motor components reflect isolated ulnar neuropathy and makes the plexus lesion less likely. In ulnar neuropathy, medial antebrachial SNAP is extremely helpful to rule out trunkus lesion. Normal MAC sensory action potential (SNAP) rules out the lower brachial plexus lesion. Absent DUC- SNAP is extremely helpful to rule out ulnar nerve lesion on the wrist. All these findings can be interpreted as a quite evidence of proximal involvement. Ulnar CMAP recording from Flexor Carpi Ulnaris (FCU) was showing substantial decrease in amplitude for all stimulation points on elbow (4,80mV), axilla (6,53mV) and Erb (4,93mV) respectively. For individuals with a decrease in ulnar motor amplitude across these three points, it is critical to find a conduction block with incremental stimulation. The patient avoided to attend resting of the test since Erb stimulation was painful. Focal slowing or substantial decrease in amplitude between these two consecutive sites rarely contributes to localization of ulnar neuropathy. Needle EMG is the gold standart for this cases. Finally, muscles inervated by median and radial nerves with cervical paraspinal muscles should be sampled to exclude radicular lesion which was unremarkable.

According to needle EMG findings, there was moderate reduction in recruitman in FCU and FDP (ulnar part) with increased duration and amplitude, with increase polyphasia. In contrast, all C8/T1-innervated muscles via the median (APB and FPL) and radial (EIP) nerves were unremarkable, excluding lower brachial plexopathy. Diagnostic imaging revealed neuropathic changes of the peripheral branches of right brachial plexus.

Needle EMG findings and its interpretations in patients with ulnar neuropathies may prone to error. Since the ulnar nerve has no motor branches in the arm, definite localizing procedure needs to be more complicated in patients with pure axon-loss lesions (without conduction block and segmental slowing). It is essential to perform EMG at any time during the first three weeks of injury. Follow-up needle examination will need to be done periodically to investigate the recovery of nerve injury and prognosis.

## CONCLUSION

Shoulder damage giving rise to isolated ulnar nerve injury may be underrated. We are aiming to highlight the susceptibility of nerves to injuries varies beyond the literature knowledge. Electrodiagnostic study is still the most powerful tool for confirming the diagnosis with suspected neuropathic disorders. Overseeing the findings through the entire EMG process is essential. The lesion site can misguide you

when the subject is brachial plexus.

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