Cubital tunnel syndrome caused by hypertrophic burn scarring: Sonographic envisage

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ABSTRACT

In nerve entrapment syndromes, an electrodiagnostic study during physical examination would usually suffice to assess localization of injury. However, in daily clinical practice, sometimes it may be necessary to depict the insight; in other words to use an imaging tool. From this point of view, with its manifold advantages, ultrasound (US) is superior to other imaging technologies such as magnetic resonance imaging (MRI). According to a study, US increased the sensitivity of electrodiagnostic studies from 78% to 98%. By presenting a patient with cubital tunnel syndrome caused by hypertrophic scarring, we wanted to highlight the complementary role of US in nerve entrapment syndromes in confirming the entrapment, as well as the usefulness of it in the follow-up period of burn patients.

Key words: Burn, hypertrophic scar, ulnar nerve, entrapment, ultrasound

Introduction

Postburn nerve entrapment syndromes can cause significant morbidity. They can be seen acutely by direct compression due to edema; however, they may also occur after a period of latency due to scar tissue formation and/or heterotopic ossification [1, 2]. While acute cases can often be diagnosed and managed easily, in delayed cases it is less clear, which makes the diagnosis and treatment difficult. In a study involving 1460 burn patients during a nine-year period, the prevalence rate was computed to be 2% [3].

Cubital tunnel syndrome (CUTS) is the second-most common peripheral nerve entrapment neuropathy in the upper limb, following carpal tunnel syndrome [4]. The ulnar nerve travels through the cubital tunnel, which is an osteofibrous tunnel between olecranon and medial epicondyle of the humerus. The floor of the tunnel is formed by the capsule and the posterior band of the medial collateral ligament of the elbow joint [5].

The diagnosis of nerve entrapment syndromes is mainly based on clinical findings combined with electrodiagnostic tests. But ultrasonography (US) can confirm the diagnosis morphologically and eliminate secondary causes such as space-occupying lesions (ganglion cyst, synovial cyst, lipoma, hemangioma tenosynovitis) or a fibrous band. Thus, we present a patient with a late onset cubital tunnel syndrome caused by hypertrophic burn scarring, along with its sonographic features.

Case Report

A 22-year-old man presented with numbness in the fourth and fifth fingers of the left hand for the previous two months. On detailed questioning, he declared that he had experienced an elbow burn injury on the same side two years ago. He stated that his complaint was getting worse with prolonged elbow flexion. The medical and family histories were otherwise non-contributory. On inspection, hypertrophic scar tissue was...
observed on the medial aspect of the left elbow (Figure 1). On physical examination, there was no limitation in the elbow range of motion. The patient experienced mild pain on palpation of the cubital tunnel and positive Tinel’s sign. No muscle weakness could be detected. The radiograph of the elbow was normal, with no heterotopic ossification observed. Electrodiagnostic findings were consistent with CUTS. Musculoskeletal US, with a high-frequency linear transducer, revealed edema and enlargement of the ulnar nerve proximal to and inside the tunnel on the affected side compared with the healthy side (Figure 2). The patient described tenderness over the cubital tunnel during US examination, which is called sonopalpation or sonotinel [6]. He was prescribed activity modification that prevents elbow flexion, a non-steroidal anti-inflammatory drug (NSAID), an elbow pad and physical therapy. After one month, conservative treatment was unsuccessful and he underwent release surgery.

Discussion

There are five main sites where the ulnar nerve may be compressed around the elbow: Arcade of Struthers, medial intermuscular septum, medial epicondyle, cubital tunnel and deep flexor aponeurosis. The most common of these is the cubital tunnel [7]. The compression site of the reported case is also the cubital tunnel.

The mechanism of entrapment has been discussed extensively in the literature. With elbow flexion, the shape of the tunnel changes from an oval to an ellipse, narrowing by 55%. Further, elbow flexion increases intraneural pressure six-fold. In addition, with previous injuries, burn injury in the presented case, the nerve or the adjacent tissue may be tethered, thus preventing normal sliding and ultimately predisposing a patient to entrapment. Likewise, a narrow tunnel may cause friction and compression [7].

In nerve entrapment syndromes, an electrodiagnostic study during physical examination would usually suffice to assess localization of injury. However, seeing is believing [8]. In daily clinical practice, sometimes it may be necessary to depict the insight; in other words to use an imaging tool. From this point of view, US is superior to other imaging technologies such as magnetic resonance imaging (MRI), with its manifold advantages (higher spatial resolution, rapidity, cost-effectiveness, capacity for comparison and dynamic evaluation) [6]. Therefore, we chose US to depict the entrapment in the presented patient. Furthermore, according to a study, US increased the sensitivity of electrodiagnostic studies from 78% to 98% [9].

In nerve compression, epi/endoneural edema occurs because of local interruption in microcirculation and venous congestion. A fusiform enlargement of
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the nerve develops proximal to the compression site caused by swelling of the fascicles due to edema. Such pathological changes can readily be demonstrated by US. But comparison with the healthy side is vital to the overall imaging process [10].

In a study on burn patients, it was reported that patients developed symptoms of nerve entrapment syndrome 4-14 months after discharge, which were relieved with surgery [11]. In a retrospective study by Ferguson et al., the average time for decompression was found to be 296 days for CUTS after the initial burn [1]. We hypothesize that the hypertrophic scarring that occurred at the burn site resulted in direct compression and tethering on the ulnar nerve, and we demonstrated the congestion in the nerve using US.

The main and earliest complaint of patients with CUTS is usually paresthesia throughout the small and ring fingers, which may result in motor dysfunction as the compression of the nerve becomes more severe and chronic. In more advanced stages, weakness in intrinsic muscles and flexor digitorum profundus muscles of the small and ring fingers ensues, which ultimately manifests as clawing [12].

Early detection and appropriate treatment are important for the rehabilitation of these patients. In mild cases, conservative treatment should be chosen. Rest and NSAIDs may be beneficial. Activity modification that prevents prolonged and repetitive elbow flexion and night splinting in mild flexion may be helpful. Direct contact with the nerve should be decreased; use of an elbow pad that protects the elbow from contact with hard surfaces has been suggested with good results. Strengthening and flexibility exercises can be instituted as tolerated [12, 13]. Surgical intervention should be considered if there is a failure in conservative care.

Herein, we would like to highlight the complementary role of US in nerve entrapment syndromes in confirming said conditions, as well as the usefulness of it in the follow-up assessment of burn patients.

Conflict of Interest: None.

References
1. Ferguson JS, Franco J, Pollack J, et al. Compression neuropathy: a late finding in the postburn population: a four-year institutional review. J Burn Care Res 2010;31:458-61.
2. Bossche LV, Vanderstraeten G. Heterotopic ossification: a review. J Rehabil Med 2005;37:129-36.
3. Evans EB. Heterotopic bone formation in thermal burns. Clinical Orthop 1991;263:94-101.
4. Gumustas S, Tosun HB, Agir I, Uludag A. Cubital tunnel syndrome due to heterotrophic ossification caused by radial head fracture: A case report. Hand Microsurg 2014;3:24-8.
5. O’Driscoll SW, Horii E, Carmichael SW, et al. The cubital tunnel and ulnar neuropathy. J Bone Joint Surg 1991;73:613-7.
6. Kara M, Özçakar L, De Muynck M, et al. Musculoskeletal ultrasound for peripheral nerve lesions. Eur J Phys Rehabil Med 2012;48:665-74.
7. Cutts S. Cubital tunnel syndrome. Postgrad Med J 2007;83:28-31.
8. Willyard C. Imaging: Seeing is believing. Nature 2011;480:52-3.
9. Beekman R, Schoemaker MC, Van Der Plas JP, et al. Diagnostic value of high-resolution sonography in ulnar neuropathy at the elbow. Neurology 2004;62:767-73.
10. Kara M, Özçakar L, Tiftik T, et al. Sonographic evaluation of sciatic nerves in patients with unilateral sciatica. Arch Phys Med Rehabil 2012;93:1598-602.
11. Frank DH, Robson MC. Carpal and Guyon tunnel syndrome. J Hand Surg 1981;6:412.
12. Wojewnik B, Bindra R. Cubital tunnel syndrome - Review of current literature on causes, diagnosis and treatment. J Hand Microsurg 2009;1:76-81.
13. Stokes W. Ulnar neuropathy (Elbow). In: Frontera WR, Silver JK, (eds.) Essentials of Physical Medicine and Rehabilitation. Hanley & Belfus Inc Philadelphia, PA, 2002; 139-42.