ported tenderness in the hypothenar eminence. A neurologic examination revealed weakness in the abductor digiti minimi and first dorsal interosseous muscles, whereas the right forearm and arm muscles were strong. A slightly decreased sensation was noted in the fourth and fifth fingers of the right hand. The Tinel sign was present over the elbow.

In the electrodiagnostic examination, nerve conduction studies were performed on bilateral upper limbs, and needle electromyography was performed on the right upper limb. The ulnar compound muscle action potential amplitude was low, and a decrease in conduction velocity over the elbow focal lesion was observed by the inching technique. The right ulnar sensory nerve action potential (SNAP) was normal, but the dorsal ulnar cutaneous SNAP amplitude decreased slightly, compared with the left side. Electromyography revealed spontaneous activity in the first dorsal interosseous muscle, whereas the flexor carpi ulnaris, the other non-ulnar innervated right arm, and hand muscles were normal. Electrophysiologic findings were consistent with an ulnar nerve lesion around the elbow; however, ultrasonographic findings showed that the anconeus epitrochlearis muscle lay between the medial epicondyle and olecranon in a close proximity with a swollen ulnar nerve around the elbow (Fig. 1A), and that a hypoechoic ganglion cyst had displaced the ulnar artery and compressed the ulnar nerve around the wrist.

INTRODUCTION

Upton and McComas first reported double crush syndrome in 1973, postulating that proximal compression could render the distal nerve more susceptible to a second compression. In clinical practice, we often observe cervical radiculopathy and carpal tunnel syndrome occurring together in what is known as double crush syndrome.

Double compression of the ulnar nerve, including Guyon’s canal syndrome associated with cubital tunnel syndrome caused by the anconeus epitrochlearis muscle, is a very rare condition. We present a case of double crush syndrome of the ulnar nerve at the wrist and elbow in a 55-year-old man, as well as a brief review of the literature. Although electrodiagnostic findings were consistent with an ulnar nerve lesion only at the elbow, ultrasonography revealed a ganglion compressing the ulnar nerve at the hypothenar area and the anconeus epitrochlearis muscle lying in the cubital tunnel. Careful physical examination and ultrasound assessment of the elbow and wrist confirmed the clinical diagnosis prior to surgery.

Key Words: Double crush syndrome · Ulnar nerve · Ultrasound · Anconeus epitrochlearis.

CASE REPORT

A 55-year-old man presented with a 3-month history of a tingling sensation and weakness in the right hand. He also reported tenderness in the hypothenar eminence. A neurologic examination revealed weakness in the abductor digiti minimi and first dorsal interosseous muscles, whereas the right forearm and arm muscles were strong. A slightly decreased sensation was noted in the fourth and fifth fingers of the right hand. The Tinel sign was present over the elbow.

In the electrodiagnostic examination, nerve conduction studies were performed on bilateral upper limbs, and needle electromyography was performed on the right upper limb. The ulnar compound muscle action potential amplitude was low, and a decrease in conduction velocity over the elbow focal lesion was observed by the inching technique. The right ulnar sensory nerve action potential (SNAP) was normal, but the dorsal ulnar cutaneous SNAP amplitude decreased slightly, compared with the left side. Electromyography revealed spontaneous activity in the first dorsal interosseous muscle, whereas the flexor carpi ulnaris, the other non-ulnar innervated right arm, and hand muscles were normal. Electrophysiologic findings were consistent with an ulnar nerve lesion around the elbow; however, ultrasonographic findings showed that the anconeus epitrochlearis muscle lay between the medial epicondyle and olecranon in a close proximity with a swollen ulnar nerve around the elbow (Fig. 1A), and that a hypoechoic ganglion cyst had displaced the ulnar artery and compressed the ulnar nerve around the wrist.
Double compression of a peripheral nerve is not rare in medical practice. Other researchers have reported series of patients showing the frequent association of proximal and distal nerve compression syndrome, including carpal tunnel syndrome, as associated with cervical radiculopathy or brachial plexus compression. Double compression of the ulnar nerve is a very rare condition, however. The most important finding of the present study is that the double crush syndrome occurred in the ulnar nerve, including Guyon’s canal syndrome associated with cubital tunnel syndrome caused by the anconeus epitrochlearis muscle. Furthermore, this study demonstrated that double crush syndrome cannot be fully diagnosed by electrodiagnostic findings.

To the best of our knowledge, there is only 1 report in the literature on ulnar nerve neuropathy along the elbow and wrist segments; however, the ulnar nerve neuropathy of the elbow was not caused by the anconeus epitrochlearis muscle in that case.

Ulnar nerve compression in the cubital tunnel can have different causes, including the arcade of Struthers, medial intermuscular septum, cubital tunnel retinaculum, humeroulnar aponeurotic arcade, ligament of Osborne, and an anatomic elbow deformity. In the present report, compression neuropathy of the ulnar nerve was caused by the anconeus epitrochlearis muscle, as we have previously reported.

DISCUSSION

The term “double crush” is appropriate in cases in which a nerve is compressed at 2 separate levels. Multiple compressions can produce vague, nonspecific, or atypical symptoms. The diagnosis and treatment of variable compression at multiple levels is difficult, as multiple compressions along a nerve have a cumulative effect on both antegrade and retrograde conduction. Double compression of a peripheral nerve is not rare in medical practice. Other researchers have reported series of patients showing the frequent association of proximal and distal nerve compression syndrome, including carpal tunnel syndrome, as associated with cervical radiculopathy or brachial plexus compression.

During surgery, the anconeus epitrochlearis muscle (Fig. 2A), extending from the medial epicondyle to the olecranon, was found to be compressing the ulnar nerve at the elbow level. The muscle was tight in flexion, and it significantly compressed the ulnar nerve. The aberrant muscle and flexor retinaculum were split longitudinally, and an anterior subfascial transposition of the ulnar nerve was performed. There was a 2.5×2.0-cm, well-defined, encapsulated, cystic mass compressing the motor branch of the ulnar nerve at the wrist (Fig. 2B). The mass was excised, and histopathology confirmed a ganglion. Symptoms improved immediately after surgery, and the patient was symptom free 1 year later.
the ulnar nerve at the elbow was caused by the anconeus epito-
chlearis muscle. The anconeus epitochlearis muscle was
first described by Wood in 1868 as an accessory muscle of the
medial elbow that originates from the medial epicondyle of the
humerus and inserts onto the olecranon process of the ulna. The
prevalence of an anconeus epitochlearis muscle is 4–34% in cad-
aver studies. Although it is rarely seen in clinical practice, ulnar
tenderness at the elbow is caused by the anconeus epitrochlearis
nerve compression due to the anconeus epitrochlearis muscle is
reported to range from 5% to 16% in the operative series.

In the present report, the electrodiagnostic findings of our
patient were compatible with ulnar nerve neuropathy around
the elbow. However, the patient presented with symptoms of ul-
nar nerve neuropathy around the elbow, and tenderness in the
hypotenar area. Ultrasonography revealed anatomic changes,
showing that the Guyon’s canal syndrome was caused by a gan-
glion cyst and that the cubital tunnel syndrome was caused by
the anconeus epitochlearis muscle. Although electrodiagnostic
studies are the main tools for localizing and assessing nerve in-
juries, they do not reveal the exact location, intensity, or cause
of the lesions, nor do they provide spatial information on the
nerve and the surrounding structures. Flak et al. proposed that
evaluation of double crush syndrome requires both structural
and functional diagnosis of the peripheral nerve by imaging
studies and electrophysiologic examination. Indeed, if phys-
ical examination had not been carefully performed, we could
not have identified double crush syndrome of the ulnar nerve.
Therefore, imaging studies may play an important role as an
additional accurate diagnostic test.

Ultrasonography is a useful diagnostic tool when the results
of electrodiagnostic studies are unclear, such as clinical ulnar
neuropathy around the elbow or carpal tunnel syndrome. Sensitiv-
ity increases when ultrasonography is added to the electrodiagnostic
test with ulnar neuropathy around the elbow. Ultrasonography can
complement the electrodiagnostic examination, and it is readily available, painless, inexpensive, and does not involve radiation exposure. Therefore, we emphasize that
to establish diagnosis of the double crush syndrome of the ulnar nerve may be diagnosed by
careful clinical, electrodiagnostic, and ultrasonographic studies.

In summary, we describe a case of double crush syndrome of
the ulnar nerve, including Guyon’s canal syndrome associated
with cubital tunnel syndrome caused by the anconeus epito-
chlearis muscle, which has not been reported before. Careful physi-
ological examination and awareness of the double crush syndrome
of the ulnar nerve with the use of preoperative diagnostic ultra-
sonography can improve the accuracy of the clinical diagnosis
and prevent possible operative complications.

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