

Anconeus Epitrochlearis Muscle Causing Ulnar Neuropathy at the Elbow: Clinical and Neurophysiological Differential Diagnosis

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abstract

Ulnar neuropathy at the elbow is the second most frequent entrapment neuropathy and is considered idiopathic in most patients. However, several anatomic variations, including the anconeus epitrochlearis muscle, have been reported to cause ulnar nerve compression. The anconeus epitrochlearis muscle is a common anatomic variation, with a prevalence of up to 34%, but the clinical diagnosis of ulnar neuropathy of the elbow as a result of this variation is rare, with an unknown prevalence. It is a congenital accessory muscle between the medial humeral epicondyle and the olecranon that covers the posterior aspect of the cubital tunnel and is usually an operative finding, not a preoperative diagnosis. Ulnar neuropathy as a result of the anconeus epitrochlearis muscle usually has different characteristics than idiopathic disease, including younger age at onset, more rapid progression with a short duration of symptoms, distinct neurophysiology with velocity drop or conduction block of the ulnar nerve, and edema of the anconeus epitrochlearis muscle on magnetic resonance imaging. Neurophysiologic findings in anconeus epitrochlearis-associated ulnar neuropathy indicate subacute onset of symptoms rather than the chronic demyelinating process that is seen in idiopathic ulnar neuropathy. Medial elbow pain may be more exacerbated in these patients rather than the more common sensorial symptoms. This is probably the result of static compression of the nerve and increased cubital tunnel pressure, even when the elbow is in extension. This article describes a case of ulnar nerve entrapment of the elbow in a 28-year-old woman as a result of compression by the anconeus epitrochlearis muscle and includes magnetic resonance imaging findings, surgical correlations, and clinical and neurophysiologic findings. [*Orthopedics*. 20xx; xx(x):exxx-xxxx.]

compression.¹⁻³ Cadaveric,² ultrasound,⁴ and magnetic resonance imaging (MRI)⁵ studies showed that the anconeus epitrochlearis muscle is a common variation, with a prevalence of up to 34%.² However, clinical diagnosis of ulnar neuropathy of the elbow as a result of this variation is rare, and the prevalence is unknown.³ This article describes a case of ulnar nerve entrapment at the elbow in a 28-year-old woman secondary to compression by the anconeus epitrochlearis muscle, with MRI, surgical correlation, and clinical and neurophysiological differential diagnosis from idiopathic cubital tunnel syndrome.

CASE REPORT

A 28-year-old right-hand-dominant woman presented with sudden onset of disturbing medial pain of the right elbow and tingling of the little finger of the right

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Ulnar neuropathy at the elbow, the second most frequent entrapment neuropathy, is typically idiopathic. However, several anatomic variations, including the anconeus epitrochlearis muscle, have been reported to cause ulnar nerve

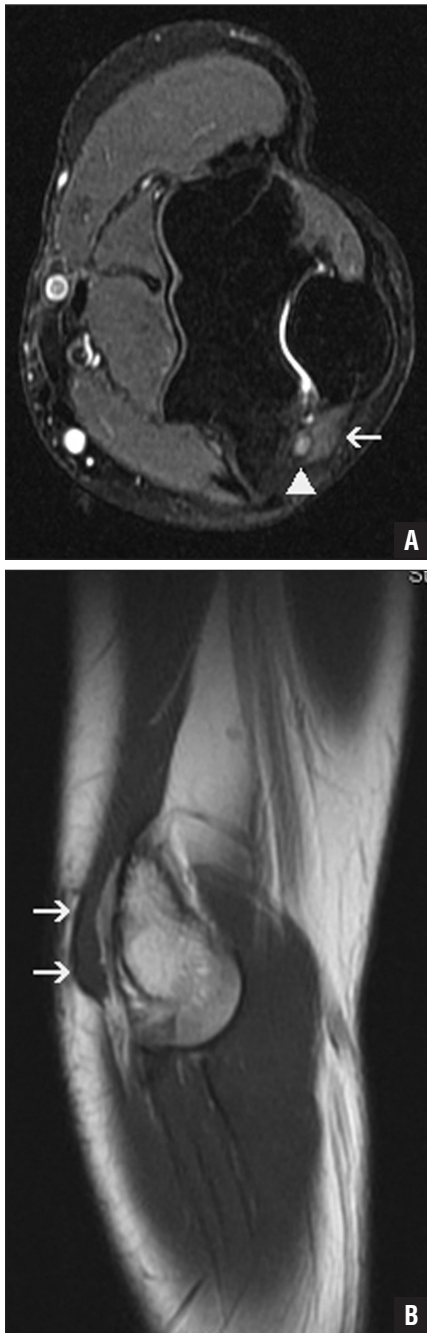


Figure 1: Axial T2-weighted fat-saturated (A) and sagittal T1-weighted (B) magnetic resonance images of the left elbow showing an anconeus epitrochlearis muscle (arrows) compressing the ulnar nerve (arrowhead), with increased signal intensity of the nerve, implying intraneural edema.

hand of 2 months' duration. She had no history of trauma and was otherwise healthy. On physical examination, the medial side of the right elbow was very painful on pal-

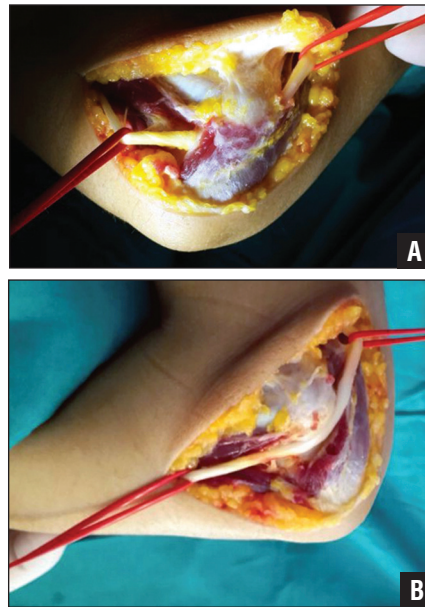


Figure 2: Intraoperative photograph showing the anconeus epitrochlearis muscle spanning the medial epicondyle and the olecranon and the ulnar nerve underneath the muscle belly (A). The muscle belly was dissected off the medial epicondyle, and the compressed and thinned ulnar nerve was exposed (B).

pation, the little finger of the right hand was hypesthetic, and Tinel's sign over the cubital tunnel was significantly positive. The patient had no muscle atrophy or loss of fine motor skills, but grip strength was reduced compared with the contralateral hand. Wartenberg's and Froment's signs were absent. The patient had a score of 90 on the visual analog scale.

Neurophysiologic tests were performed, including nerve conduction studies and needle electromyography. Ulnar antidromic sensory and ulnar orthodromic motor stimulation at the wrist, and below and above the elbow, were performed and recorded from the abductor digiti minimi muscle. Nerve conduction studies showed conduction slowing of ulnar motor nerve fibers at the elbow (43 m/s on the right vs 56 m/s on the left side; normal, >50 m/s). Muscle compound amplitudes in the abductor digiti minimi were low (0.7 mV; normal, >10 mV), with temporal dispersion. Conduction block of the ulnar nerve was present. Findings of sensory nerve conduction studies were normal. Needle

electromyography showed fibrillation activity, decreased motor unit recruitment, positive sharp waves, and abnormalities in the configuration of the motor unit action potential in the intrinsic muscles of the hand, consistent with denervation. The contralateral upper extremity was neurophysiologically intact.

Although pain at the elbow rather than the more common sensorial symptoms in the ulnar nerve distribution was more pronounced, clinical and neurophysiological evaluation suggested cubital tunnel syndrome. According to the modified McGowan classification, the patient had grade 2A (good intrinsic strength [4/5] without intrinsic atrophy) ulnar neuropathy.⁶ Magnetic resonance imaging of the right elbow was obtained to reveal a morphological etiology and it showed an anconeus epitrochlearis muscle compressing the ulnar nerve and increased signal intensity of the ulnar nerve implying intraneural edema and entrapment (**Figure 1**).

Given the rapid progression and severity of symptoms, surgical decompression was chosen over conservative treatment. A large anconeus epitrochlearis muscle compressing the ulnar nerve was observed intraoperatively (**Figure 2A**). It was dissected off the medial epicondyle, and the ulnar nerve was released. No other anatomic structures were seen compressing the ulnar nerve proximally or distally. Because the compressed segment of the nerve under the anconeus epitrochlearis muscle was thinner and pale, thorough neurolysis was performed, with subcutaneous anterior transposition of the ulnar nerve to prevent nerve dislocation. The anconeus epitrochlearis muscle was left in place (**Figure 2B**).

The patient reported immediate relief of all symptoms. At 4 weeks postoperatively, she was asymptomatic and had fully returned to her normal activities. At the latest follow-up at 2 years, physical examination showed no muscle atrophy, sensory impairment, or loss of fine motor skills as well as normal strength, and the

patient reported a score of 0 on the visual analog scale. Postoperative grading of ulnar neuropathy with modified Wilson and Krout⁷ criteria was excellent, with minimal motor and sensory changes and no tenderness at the incision site.

DISCUSSION

Among numerous other causes, ulnar nerve compression is a common cause of medial elbow pain.⁸ Ulnar nerve entrapment at the elbow, cubital tunnel syndrome, is a well-recognized compression neuropathy of the upper extremity that causes sensory and motor symptoms. It is usually idiopathic because a definite cause cannot be detected in most patients. However, several space-occupying lesions and anomalous muscles have been described to cause ulnar nerve entrapment at the elbow.^{2,8-10} The anconeus epitrochlearis muscle has been reported to cause ulnar nerve entrapment at the elbow as well; however, its existence is usually an operative finding, not a preoperative diagnosis.^{1,2,8}

Cadaveric,² ultrasound,⁴ and MRI⁵ studies showed a prevalence of anconeus epitrochlearis muscle of up to 34% in the general population.² However, the clinical diagnosis of ulnar neuropathy at the elbow as a result of this muscle variation is rare, with an unknown prevalence.³ The anconeus epitrochlearis muscle is a congenital accessory muscle between the medial humeral epicondyle and the olecranon that covers the posterior aspect of the cubital tunnel. It is probably an atavistic structure.^{2,11}

Anconeus epitrochlearis-associated ulnar neuropathy, however, usually has different characteristics than idiopathic cubital tunnel syndrome, including onset at a younger age and more rapid progress.^{3,8,12} A group of patients who had anconeus epitrochlearis-associated ulnar neuropathy had a shorter duration of symptoms.¹² Some authors noted that medial elbow pain is more pronounced than sensory symptoms in these patients, and that was the case in the current patient.^{8,10} This is probably

the result of static compression of the nerve and increased cubital tunnel pressure, even when the elbow is in extension. These findings were present in the current patient as well. Duration of symptoms was only 2 months, the patient was 28 years old, and medial elbow pain was very pronounced.

Neurophysiologic tests are used for the diagnosis and confirmation of ulnar neuropathy at the elbow. However, in anconeus epitrochlearis-associated ulnar neuropathy, the neurophysiologic findings are different than those in patients with idiopathic disease.^{1,12} In a comparative study with idiopathic ulnar neuropathy, velocity drop of the ulnar nerve was significantly associated with the presence of an anconeus epitrochlearis muscle.³ Velocity drop was calculated by dividing the difference in velocity by distance and classified into grade + (0-2.99 m/s/cm) and grade ++ (>3.00 m/s/cm). Another study reported that ulnar nerve motor conduction studies showed conduction block, which is defined as a reduction of area/amplitude of at least 50% at a proximal site vs a distal site of stimulation, in anconeus epitrochlearis-associated ulnar neuropathy. This finding indicated subacute onset of symptoms rather than the chronic demyelinating process that is seen in idiopathic ulnar neuropathy.¹² Conduction block was also found in the current patient. However, the authors were not aware of the concept of velocity drop at the time of this patient's evaluation.

Neurophysiologic tests do not provide morphologic information about the cubital tunnel or the ulnar nerve. Ultrasound⁴ and MRI¹⁰ are reliable modalities to show structural abnormalities of the cubital tunnel and can show the causes of secondary ulnar neuropathy as well as anatomic variants, as in the current patient. Edema of the anconeus epitrochlearis muscle also was reported to be associated with medial elbow pain.¹⁰

Different surgical treatments are recommended for anconeus epitrochlearis-associated ulnar neuropathy, and the most frequent is simple excision of the muscle. The

authors performed anterior subcutaneous transposition of the ulnar nerve to prevent nerve dislocation because extensive neurolysis was needed. Because transposition resolved the compression of the nerve, the anconeus epitrochlearis muscle was left in place.

CONCLUSION

Anconeus epitrochlearis-associated ulnar neuropathy usually shows different characteristics than idiopathic disease. These include younger age at onset, more rapid progression with a short duration of symptoms, distinct neurophysiology with velocity drop or conduction block of the ulnar nerve, and edema of the anconeus epitrochlearis muscle on MRI. Medial elbow pain may be more exacerbated in these patients rather than the more common sensorial symptoms.

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