PAIN MEDICINE CASE REPORTS

ISSN 2768-5152

Volume 5, Number 6, pp. 313-317

Treatment of Anconeus Epitrochlearis-Induced Cubital Tunnel Syndrome With Ultrasound-Guided Hydrodissection

George C. Chang Chien, DO[1], Austin Marcolina, DO[2], and Jeimylo C. de Castro, MD[3]

Background: Cubital tunnel syndrome is the second most common cause of peripheral nerve entrapment in the upper extremity, trailing only carpal tunnel neuropathy. While the roof of the cubital tunnel is most often formed by Osborne's ligament, the anomalous, evolutionary remnant muscle, the anconeus epitrochlearis, has been previously identified as a potential cause of cubital tunnel syndrome.

Case Report: A 45-year-old female physical education coach noted bilateral upper extremity pain, numbness, paresthesias, and early onset exercise fatigue originating at the medial elbow and radiating down the ulnar nerve distribution. Sonographic evaluation showed evidence of a hypertrophic anconeus epitrochlearis in the right upper extremity causing compression of an enlarged, bifid ulnar nerve. The patient was treated with 3 separate ultrasound-guided hydrodissection injections, which resulted in complete resolution of her symptoms and a decrease in the ulnar nerve cross-sectional area on sonographic evaluation at 24-week follow-up.

Conclusion: A hypertrophic anconeus epitrochlearis can cause cubital tunnel syndrome and ultrasound-guided hydrodissection is a potentially efficacious surgery-sparing treatment option.

Key words: Cubital tunnel syndrome, hydrodissection, ulnar neuralgia, ultrasound

BACKGROUND

Cubital tunnel syndrome is the second most common cause of peripheral nerve compression in the upper extremities, trailing only carpal tunnel neuropathy (1). Symptoms of cubital tunnel syndrome arise from compression of the ulnar nerve (UN) and include numbness, paresthesias, and potential pain along the medial elbow, forearm, and hand, and the fourth and fifth digits, as well as weakness of the intrinsic muscles of the hand, fourth digit, and fifth digit (1,2). Due to its frequent occurrence and potentially significant functional compromise, cubital tunnel syndrome is of utmost importance to clinicians and patients alike.

The cubital tunnel is an anatomic structure at the medial elbow that is formed medially by the medial epicondyle of the humerus and laterally by the olecranon process of the ulna. The floor of the tunnel is comprised of the posterior capsule and medial collateral ligament of the elbow joint, while the roof is usually formed by Osborne's ligament. Most notably, the UN resides within the tunnel and its compression is what results in the symptoms associated with cubital tunnel syndrome (1,2). While Osborne's ligament is the most common etiology of the roof of the tunnel, in approximately 1% to 34% of cases, the roof is formed by an anomalous, evolutionary remnant muscle known as the anconeus epitrochlearis (AE) (1,3).

From: [1]Director Physical Medicine and Rehabilitation, Director Pain Medicine, Ventura County Medical Center, Ventura CA, Director of Regenerative Medicine and Medical Aesthetics, GCC Institute, Irvine CA; [2]Department of Physical Medicine and Rehabilitation, University of Texas Southwestern Medical Center, Dallas, TX; [3]Medical Director, SMARTMD Philippines, Chair, Physical Medicine and Rehabilitation Department, The Medical City-South Luzon, Philippines

Corresponding Author: Austin Marcolina, DO, E-mail: austin.marcolina14@gmail.com
Disclaimer: There was no external funding in the preparation of this manuscript.
Conflict of interest: Each author certifies that he or she, or a member of his or her immediate family, has no commercial association (i.e., consultancies, stock ownership, equity interest, patent/licensing arrangements, etc.) that might pose a conflict of interest in connection with the submitted manuscript.
Accepted: 2021-07-20, Published: 2021-08-31

Commonly seen in reptiles, amphibians, and other mammals such as primates, the AE serves as a weak extensor of the elbow (3). In humans, the AE runs from the inferior region of the medial epicondyle and inserts posteromedially on the olecranon, similar to the path of Osborne's ligament (3,4). While the AE is innervated by the UN, it is uncommon to find signs of muscle denervation, as its innervation typically arises proximal to the medial epicondyle (5). Though anatomic variations are not conclusively pathologic, the AE has been identified as a potential cause of cubital tunnel syndrome, especially in cases of muscle hypertrophy (3,4,6). Currently, the definitive treatment for ulnar neuropathy caused by a hypertrophic AE is myotomy with or without transposition of the UN (4,7).

The authors present a case of AE-induced cubital tunnel syndrome, identified by diagnostic ultrasound (US), and treated with UN hydrodissection.

CASE

A muscular, 45-year-old female physical education coach initially presented with bilateral elbow pain, numbness, and paresthesias with symptoms radiating down the medial aspects of her bilateral upper extremities into her fourth and fifth digits. The symptoms on her right were worse than the left. The patient also noted early-onset exercise fatigue in her forearms and hands that was worsened by weightlifting or prolonged activity. On physical exam, there were no motor or sensory deficits elicited, but a high suspicion for UN compression remained.

A diagnostic US evaluation of the right elbow demonstrated an enlarged, bifid UN with a combined cross-sectional area (CSA) of 10 mm^2, a significant UN notching in longitudinal view, and an overlying AE (Figs. 1 & 2). Evaluation of the contralateral side also demonstrated similar findings, without the AE muscle. Dynamic imaging of the UN did not reveal subluxation of the nerve out of the cubital tunnel.

As the patient wanted to avoid surgical intervention, the decision was made to trial hydrodissection of the symptomatic right UN away from the medial epicondyle and AE. Utilizing aseptic technique and a 25-gauge, 1.5-inch needle, the UN was identified under US at the point of maximum compression by the AE under the short-axis view. An injection was made with 3 mL of 0.5% bupivacaine, 1 mL of normal saline, and 4 mg of dexamethasone. Specific effort was made to place the injectate at the interface between the AE and the UN. Immediately following the procedure, the patient had relief of her pain and symptoms. However, at the 3-week follow-up, her symptoms were noted to only have 30% improvement when compared to her preinjection baseline.

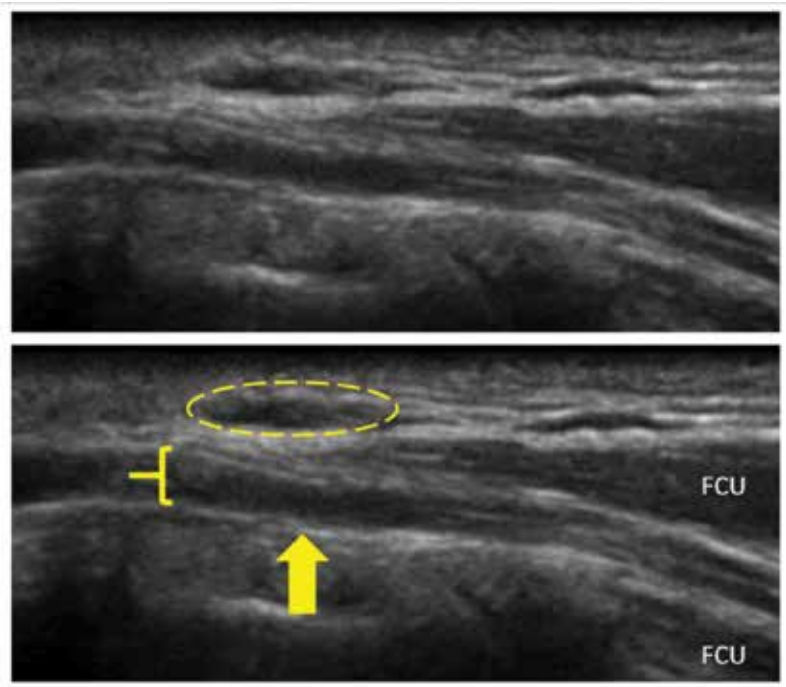

Fig 1. The ulnar nerve in long-axis. The nerve (bracket) is shown passing proximal to distal. As it is compressed under the anconeous epitrochlearis muscle (dashed circle), the focal impingement causes a "notch" in the nerve (arrow). Distally, the nerve travels between the 2 heads of Flexor Carpi Ulnaris.

As the patient noted some relief with the previous hydrodissection, a repeat procedure was performed using the long-axis approach (in-plane) to the UN with the same injectate. At 5 weeks post procedure, the patient reported greater than 80% improvement of symptoms compared to baseline. Encouraged by her progressive improvement, a third hydrodissection was requested by the patient. Due to concerns for an additional corticosteroid administration within the same location, the repeat injection was performed utilizing 5 mL of 5% dextrose solution as a form of neural prolotherapy.

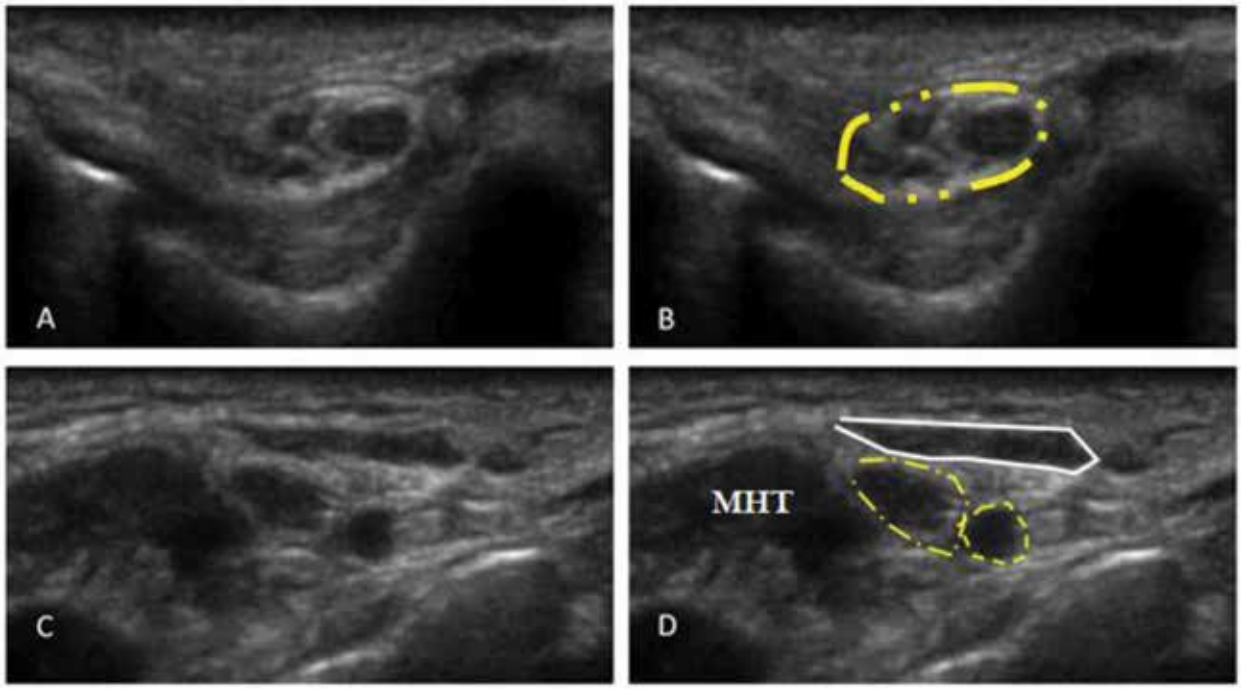

Fig. 2. The ulnar nerve in short-axis. The bifid nerve nerve is shown from both sides. A/B) demonstrate an enlarged, bifid ulnar nerve (yellow dashed circle) in the cubital tunnel. Combined CSA of 10 mm^2. C/D) Demonstrate bifid ulnar nerve (yellow dashed circle) compressed under an overlying anconeous epitrochlearis muscle (white outline). The medial head of the triceps muscle is identified by the acronym MHT.

At 24 weeks after the initial presentation and 12 weeks after the last dextrose neural prolotherapy procedure, the patient's symptoms have remained 100% resolved. Interestingly, repeat diagnostic US demonstrated reduced UN notching deep to the AE and reduced UN CSA from 10 mm^2 to 8 mm^2 (Fig. 3) with a distinct fascicular pattern characteristic of a normal peripheral nerve. The relative proximity of the structures remained grossly unchanged. Of note, the patient's left-sided symptoms were able to be effectively managed conservatively without the need for an intervention.

DISCUSSION

While the AE is primarily an evolutionary remnant more commonly seen in non-human primates, its location at the medial elbow can be a source of UN compression and subsequent cubital tunnel syndrome, especially in cases of muscle hypertrophy (3,4). As the hypertrophic AE can cause UN compression, exhibited by the case presented, it should be on the differential of clinicians evaluating patients with signs and symptoms of cubital tunnel syndrome.

Furthermore, diagnostic evaluation of the medial elbow using US provides a real-time, static, and dynamic evaluation that can quickly transition from diagnosis to management depending on the source of compression (8,9). In addition to the common symptoms of cubital tunnel syndrome, including numbness, paresthesias, and potential pain at the medial elbow and along the distribution of the ulnar nerve, diagnostic US also allows for precise evaluation of the cross-sectional area of the ulnar nerve, which provides an objective evaluation of an otherwise primarily subjective constellation of symptoms (10). Previous literature has shown a cross-sectional area of greater than or equal to 10 mm^2 to be most sensitive and specific regarding abnormal findings in cubital tunnel syndrome (11). This was consistent with our findings in which the patient had an enlarged, bifid UN with a combined CSA of 10 mm^2 at the time of initial presentation; however, the authors also recognize the typical margin of error in the sonographic measurement of UN CSA to be +/- 1 mm^2 (11,12).

The use of US-guided peripheral nerve hydrodissection for the management of cubital tunnel syndrome

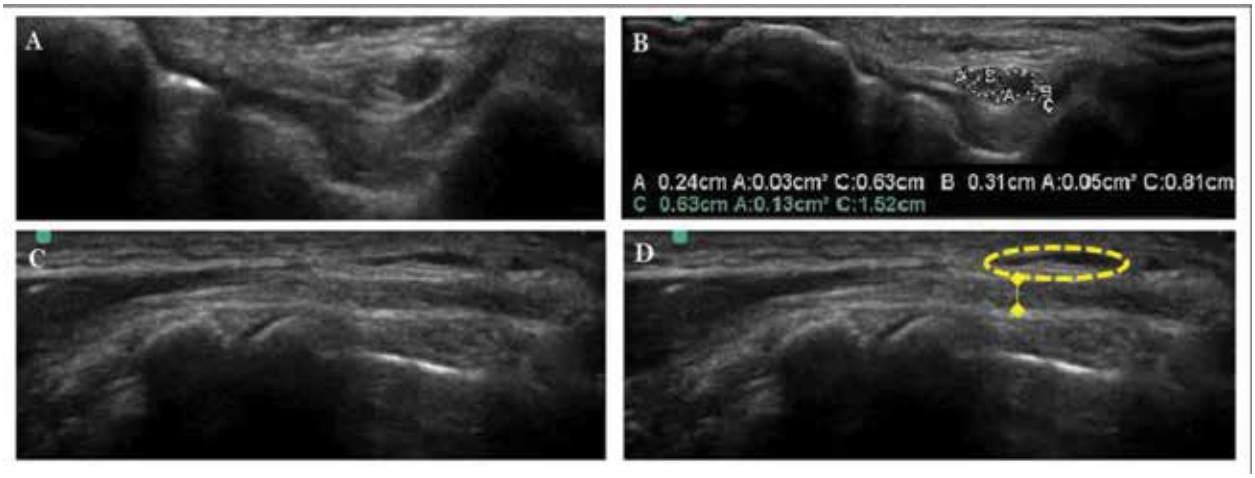

Fig. 3. A/B) The ulnar nerve in short-axis at 24 week follow-up. The bifid nerve in CSA is an aggregate of 8 mm^2 although total CSA for the bifid UN including connective tissue is 13 mm^2. C/D) The ulnar nerve in long-axis at 24 week follow-up. Note the reduced notching of the UN (double-headed arrow) with the overlying AE (dashed-oval).

has previously been described in the literature, though only in cadaveric studies or single case reports and never in the case of AE-induced cubital tunnel syndrome (13,14). While the definitive management of AE-induced cubital tunnel syndrome is myotomy, there remain a number of patients who may prefer to avoid surgery when effective, less invasive treatment options are available. The case presented illustrates the potential efficacy of US-guided hydrodissection for the treatment of AE, as there was a resolution of the patient's symptoms, a decrease in UN CSA from 10 to 8 mm^2, and diminished nerve notching with a retained fascicular pattern consistent with normal peripheral nerve tissue following a series of 3 injections. There is further literature support for peripheral nerve hydrodissection in cases of carpal tunnel syndrome (15). Additionally, as the treating physician in our case wanted to avoid the risks associated with repeated corticosteroid injections, a 5% dextrose solution was utilized for the final hydrodissection and produced efficacious results (16,17). While not previously published for cubital tunnel syndrome, previous literature comparing 5% dextrose solution to triamcinolone for carpal tunnel syndrome suggests similar efficacy between the 2 injectates and our case report supports this observation for cubital tunnel syndrome (18).

CONCLUSION

Similar to the evidence produced in previous literature, our case report provides further evidence that hypertrophic AE can lead to UN compression and symptoms consistent with cubital tunnel syndrome. We also surmise that the utilization of US-guided UN hydrodissection with a corticosteroid injectate was successful in reducing acute inflammatory changes around the UN that improved with repeated injection. Additionally, 5% dextrose solution produced similar efficacy in the improvement of symptoms when compared to the corticosteroid injectate and may provide an additional treatment option for patients with cubital tunnel syndrome.

REFERENCES

1. Cutts S. Cubital tunnel syndrome. *Postgrad Med J* 2007; 83:28-31.
2. Chauhan M, Anand P, J MD. Cubital Tunnel Syndrome. In: StatPearls. Treasure Island (FL)2020.
3. Nascimento SRR, Ruiz CR. A study on the prevalence of the anconeus epitrochlearis muscle by magnetic resonance imaging. *Rev Bras Ortop* 2018; 53:373-377.
4. Kim N, Stehr R, Matloub HS, Sanger JR. Anconeus epitrochlearis muscle associated with cubital tunnel syndrome: A case series. *Hand (N Y)* 2019; 14:477-482.
5. Grewal SS, Collin P, Ishak B, et al. Innervation of the anconeus epitrochlearis muscle: MRI and cadaveric studies. *Clin Anat* 2019; 32:218-223.
6. Park IJ, Kim HM, Lee JY, et al. Cubital tunnel syndrome caused by anconeus epitrochlearis muscle. *J Korean Neurosurg Soc* 2018; 61:618-624.
7. Cammarata MJ, Hill JB, Sharma S. Ulnar nerve compression due to anconeus epitrochlearis: A case report and review of the literature. *JBJS Case Connect* 2019; 9:e0189.
8. Wiesler ER, Chloros GD, Cartwright MS, Shin HW, Walker FO. Ultrasound in the diagnosis of ulnar neuropathy at the cubital tunnel. *J Hand Surg Am* 2006; 31:1088-1093.
9. Draghi F, Bortolotto C. Importance of the ultrasound in cubital tunnel syndrome. *Surg Radiol Anat* 2016; 38:265-268.
10. Agarwal A, Chandra A, Jaipal U, Saini N. Imaging in the diagnosis of ulnar nerve pathologies-a neoteric approach. *Insights Imaging* 2019; 10:37.
11. Chang KV, Wu WT, Han DS, Ozcakar L. Ulnar nerve cross-sectional area for the diagnosis of cubital tunnel syndrome: A meta-analysis of ultrasonographic measurements. *Arch Phys Med Rehabil* 2018; 99:743-757.
12. Campbell WW, Carroll C, Landau ME. Ulnar neuropathy at the elbow: Five new things. *Neurol Clin Pract* 2015; 5:35-41.
13. Stoddard JM, Taylor CR, O'Connor FG. Ulnar nerve entrapment at the cubital tunnel successfully treated with ultrasound-guided peripheral nerve hydrodissection: A case report and further evidence for a developing treatment option. *Curr Sports Med Rep* 2019; 18:382-386.
14. Kim JM, Oh HM, Kim MW. Real-time visualization of ultrasonography guided cubital tunnel injection: A cadaveric study. *Ann Rehabil Med* 2012; 36:496-500.
15. Wu YT, Chen SR, Li TY, et al. Nerve hydrodissection for carpal tunnel syndrome: A prospective, randomized, double-blind, controlled trial. *Muscle Nerve* 2019; 59:174-180.
16. Holland C, Jaeger L, Smentkowski U, Weber B, Otto C. Septic and aseptic complications of corticosteroid injections: An assessment of 278 cases reviewed by expert commissions and mediation boards from 2005 to 2009. *Dtsch Arztebl Int* 2012; 109:425-430.
17. Buchman AL. Side effects of corticosteroid therapy. *J Clin Gastroenterol* 2001; 33:289-294.
18. Wu YT, Ke MJ, Ho TY, Li TY, Shen YP, Chen LC. Randomized double-blinded clinical trial of 5% dextrose versus triamcinolone injection for carpal tunnel syndrome patients. *Ann Neurol* 2018; 84:601-610.