Cubital Tunnel Syndrome

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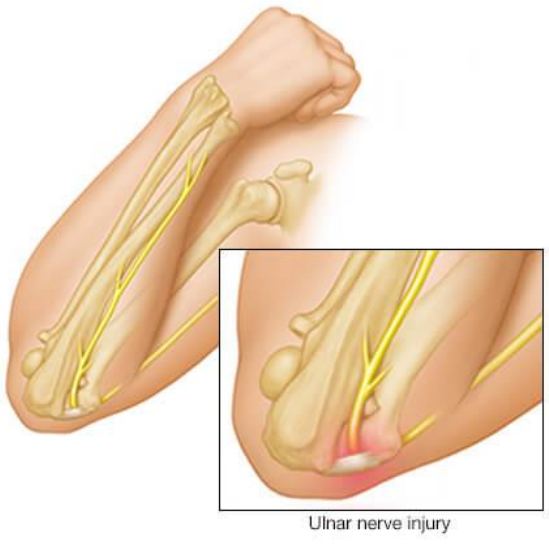
The more common peripheral nerve compression in the upper extremity is the carpal tunnel syndrome at the level of the carpal tunnel (wrist). Not too many have heard about a cubital tunnel syndrome a little less common. This topic will be the theme of our discussion today.

Sport commentators have been talking about the syndrome because an American, shot-put world record holder Ryan Crouser, participating in the track and field competitions as 16 ponds shot put and discus thrower, at the 2024 Paris Olympics, is trying to obtain his third gold medal. He is recovering from injury to the right ulnar nerve, he has suffered while throwing, to a point that it was doubtful that he may be unable to compete for his third gold medal.

Like the carpal tunnel syndrome, the cubital tunnel, at the elbow, may be the site of a peripheral neuropathy interesting another large nerve coming from the brachial plexus in the upper extremities, notably the ulnar nerve.



Medial aspect of the elbow.

Three large nerves originate from the brachial plexus and run down the upper extremities. They are the median, the ulnar and the radial nerves. The ulnar nerve passes across the medial (inside) side of the elbow. It lies very near to the medial ulnar collateral ligament. As it approaches the elbow joint itself, the ulnar nerve enters a small tunnel referred to as the cubital tunnel, made up of bone on one side and ligament on the other. This tunnel is tight and can facilitate the compression of any structure. The ulnar nerve may become compressed at that level, creating symptoms of pain and discomfort which refer to the "cubital tunnel syndrome" with pain, weakness, numbness, and when neglected, even muscle atrophy to the upper extremity.

While nerve compression is one cause of ulnar nerve symptoms, nerve instability (meaning the tunnel is too loose and the nerve moves more than it should) can also cause similar symptoms of irritation. What is then the Cubital tunnel syndrome.

Cubital tunnel syndrome is the second most common peripheral nerve compression in the upper extremities. A conservative treatment is generally offered consisting in avoiding excessive or direct pressure over the medial aspect of the elbow as well as in avoiding excessive flexion at the elbow at night and during the day. Symptoms of an ulnar nerve entrapment at the elbow are with paresthesia expressed through tingling and numbness or loss of sensibility mainly over the little and ring fingers. This process in time may progress to weakness and atrophy of the intrinsic muscles of the hand, affecting mainly the lumbrical and the interossei muscles of in relation to

these two fingers. With early symptoms, the use of a splint may help avoiding flexion of the elbow while sleeping.

The hallmark symptom of an ulnar neuropathy is an intermittent tingling defined as a paresthesia depending of the level of compression of the ulnar nerve at the elbow (cubital tunnel). If left untreated, progressive loss of sensibility will follow as well as muscle weakness and loss of dexterity.

In presence of any peripheral neuropathy, assessment of the specific nerve is performed via an electrodiagnostic testing for the specific nerves. In this case, the site and the reason of the entrapment of the ulnar nerve can be elucidated at the level of the cubital tunnel of the elbow.

It is imperative to initiate conservative treatment for this pathology and if later surgical treatment become necessary, a simple decompression of the nerve at the level of the cubital tunnel can be easily performed. We may also assess the nerve for a transposition or a re-routing. In my hands, once the decompression is performed, visualization of the nerve at the elbow, will generally help me in deciding if transposition is necessary. This pathology is commonly seen among patients with long-standing diabetes.

Among surgeons, it exists a little controversy to transpose or not the ulnar nerve and for this reason, we like to assess the nerve for hypermobility behind the medial epicondyle. Studies have shown that 30% of patients may present this hypermobility bilaterally. Surgeons have their difference in opinions for re-routing and re-positioning the nerve or leave it alone after the simple decompression and when it subluxated over the medial epicondyle. Other studies have also shown that it was not necessary to re-route the nerve or re-transpose it. Satisfaction is encountered equally in both groups.

In chronic and severe cases of cubital tunnel syndrome, a surgical treatment is necessary to restore a normal sensibility to the ring and little fingers. It is not always sure that a full recovery of the intrinsic muscles to the ring and little fingers of the affected upper extremity, can be promoted after surgical treatment. As hand surgeons, we have used occasionally a digital nerve transfer from the anterior interosseous nerve to the ulnar motor branch at the wrist level to enhance or improve hand function. We will need to wait for long-term results to evaluate the beneficial effects of such procedure.

It is not always possible to claim a successful outcome after surgical release and transposition, perhaps because the mechanical compression lasted so long before being diagnosed. Often a revision surgery and re-exploration may not change the outcome of the previous surgical treatment.

Recently, wrapping the ulnar nerve with autologous vein tissue has been reported in an effort to decrease scar tissue at the level of the previous exploration of the nerve. We will have to wait the vulgarization of this procedure to find out if better outcome may be expected in patient with recurrent or persistent symptoms. Finally, studies performed of rat specimen have demonstrated an increase in growth factor production allowing a reduction in nerve pain with the mentioned above vein wrapping around the nerve.

Many of us have adopted our own routine in approaching such patients suffering from ulnar nerve entrapment. I like to be conservative in offering B6 vitamins and avoiding pressure over the medial aspect of the elbow, offer additional splinting devices to control the motion of the elbow.

The ulnar nerve can also show signs of neuropathy at the wrist level affecting motor and sensory branches (ulnar tunnel syndrome) which brings a different symptomatology. In this clinical entity, one may observe an ulnar claw hand from an imbalance between muscles innervated by the ulnar nerve in the forearm which persist in their function and those muscles in the hand becoming weak, while a normal sensation to the back of the hand is observed. I will focus the discussion only to the compression of the ulnar nerve at the level of the elbow (cubital tunnel syndrome) with it intermittent paresthesia and loss of sensibility, progressing to an intrinsic muscle atrophy with weakness and progressive paralysis to the ring and little fingers (intrinsic muscles).

An ulnar neuropathy at the elbow (cubital tunnel) can be diagnosed on typical symptoms and signs simulating intermittent or static numbness to the little finger as well as the ulnar half border of the ring finger with associated weakness or atrophy of the first dorsal interosseous muscle. Proximally to the cubital tunnel, a Tinel sign can be appreciated as well as a positive elbow

flexion test, demonstrating paresthesia in the small and ring finger directly related to the elbow flexion. This can asset a clinical diagnosis but it will be confirmed by electrophysiological studies called “Nerve conduction velocity and electromyography”. Others may rely on MRI or Ultrasound studies demonstrating the enlargement of the ulnar nerve proximally to the cubital tunnel. Anatomists have described anomalies and variations in shape of the Anconeus muscle at the epitrochlear area, commonly seen with the ulnar neuropathy.

Trauma can be responsible of an ulnar neuropathy, although transient after blunt trauma but consistent or after a laceration. The nerve can dislocate passing over and anteriorly to the medial epicondyle of the humerus, resulting in an Ulnar neuropathy. The neuropathy can be mild with intermittent paresthesia or moderate with intermittent paresthesia and mild weakness or severe with persistent paresthesia and weakness according to Mc Gowan.

Dellon and Godberg revise the classification in adding a component of motor compromise where there is subjective sensory loss without muscular atrophy or loss of two-point sensibility or muscle atrophy and a more severe form where sensory symptoms and weakness of the pinch and grip is seen without muscle atrophy. Sensory symptoms with mild atrophy or weakness of the intrinsic muscle’s strength 3/5, without loss of the two-points discrimination. Finally, a late stage where there is a profound muscular atrophy mixed with sensory disturbance.

The most common site of compression for the ulnar nerve at the elbow is, at the level of the cubital tunnel, limited by the medial epicondyle of the humerus, the olecranon process of the ulna and the tendinous arch joining the humeral and the ulnar heads of the Flexor Carpi Ulnaris muscle. This structure is called by many the “Cubital tunnel retinaculum or the Osborne ligament”. The compression of the nerve over the medial aspect of the elbow has been seen also with an “epitrochlear-anconeus muscle” which represent an anatomical variant described by the anatomists. But it is not known how often this structure is present rendering the relation to the syndrome, difficult to prove.

The ulnar nerve maybe compressed more distally, also at the wrist level, through an anatomical space called Ulnar canal or Guyon canal (Ulnar tunnel or Guyon canal syndrome) following trauma or compression at the wrist, post trauma, ganglion cysts formation, fractures etc. It is often encountered among cyclists due to repetitive trauma against the handlebars or among construction work-related to the use of a hammer after repetitive impacts on the wrist. This characterizes another ulnar neuropathy also called "Hypothenar Hammer Syndrome" which can be the topic of an another presentation. To prevent such neuropathies at the wrist or the elbows, one needs to maintain a good posture with proper use of the elbow and the arms and even wearing arm splints while sleeping in order to avoid profuse bending at the elbows and this is why the new concept of telephone hand set and game hand have been popularized.

The best treatment for a cubital tunnel syndrome which failed conservative treatment, is through a surgical approach with a decompression of the ulnar nerve with possible anterior transposition at the elbow or extra-ordinarily, through the removal of the medial epicondyle… which I perform rarely. This is a safe and effective operation in which attention is always given to spare any intra-articular or muscular ramifications of the nerve. But in fact, I would always offer a conservative treatment first, consisting in anti-inflammatory medication, Vitamin B6 and rarely with amitriptyline. Elbow joint splinting and stretching exercises avoiding pressure over the elbows, have shown to bring beneficial effects in relieving the symptoms of pain and numbness especially during sleep. The use of telephone head-sets has shown also beneficial.

I use a posterolateral incision to approach the medial epicondyle, avoiding any injury to the medial antebrachial cutaneous nerve branches, then the ulnar nerve is identified and released proximally and distally up to the flexor carpi ulnaris muscle heads. Once the release performed, I would take the elbow in a range of motion to check on the stability of the nerve. If a subluxation is observed, I may interpose the ulnar nerve anteriorly.

Most patients will feel relieved of their symptoms unless they were at an advanced stage of the disease with pre-operative atrophy, static numbness,

weakness reflecting more permanent nerve damage to the nerve enabling them to recover after surgical treatment. Otherwise, an improvement in the symptoms is expected.

Most people at risk of developing a peripheral neuropathy and ulnar nerve entrapment, suffer of diabetes Mellitus. Others may spend more time keeping their elbows bent while holding by example a telephone to their ears, or pressing the elbows over a hard surface like the edges of a table. Many construction workers using vibrating tools or performing in repetitive motions work, may increase the risks. Even in sport activities, constant throwing of a baseball can affect the ulnar nerve. An old injury of a fracture of the shoulder or the elbow with subsequent mal-union can also be a cause of irritation and can encourage an ulnar nerve entrapment. Some studies have shown the special bra-straps have also contributed to such pathology, especially in very large-breasted women. Other ulnar nerve sites of compression can be found in cervical neuropathy, especially with cervical ribs.

I wanted to review this topic following discussions with one of our orthopedic residents back home and bring some lights to our discussions on compressive pathologies affecting the ulnar nerve in the upper extremity. What a nice opportunity to bring in the discussion facts of the on-going Olympics in Paris. Indeed, the 2024 Paris Olympics exposed to us, the Olympian Ryan Crouser who may not have been able to beat his own world record but will return to the United States, again, with his third Olympic gold medal following a throw of 22 .90 meters.

After fighting an ulnar nerve entrapment at the right elbow, Ryan Crouser came out victorious in his third Olympics. His dominance in the discipline of shut-put thrower started in 2016, when he won Gold at the Rio Olympics with a throw of 22.52 meters, an Olympic record. He repeated again in the 2021 Tokyo Olympics winning his second gold medal with a throw of 23.30 meters, another Olympic record. He detains also the World record with a throw of 23.56 meters on May 27, 2023 at the Los Angeles Gran Prix Competition. Felicitations are in order. It is not necessary to mention that he has benefited from a conservative treatment in dealing with his ulnar nerve entrapment at the right elbow.

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References:

1- Miller TT, Reinis WR (September 2010). “Nerve entrapment syndromes of the elbow, forearm. and wrist”. American Journal of Roentgenology. 195 (3): 585-94.
2- Shea JD, McClain EJ (1969). Ulnar-nerve compression syndromes at elbow and below the wrist. J Bone Joint Surg Am. 51 (6):51(6): 1095-1103.
3- Patterson JM, Jaggars MM, Boyer MI (2003). “Ulnar and median nerve palsy in long-distance cyclists. A prospective study”. Am J Sport Med, 31 (4): 585-589.
4- Thomas Jennifer (2 June 2009).: Cell Phone Elbow- A new III for the Wired Age”. HealthDay News. 5 April 2017.
5- Guardia, Charles F (24 August 2014).” Ulnar Neuropathy Treatment and Management of Non-Surgical therapy”. Medscape.
6- IIyas A, Herman Z, Cubital Tunnel Release. J Med Ins. 2017.