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Study Of Cubital Tunnel

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Abstract. *Ulnar nerve is very vulnerable to damage at the level of elbow. While passing through the cubital tunnel it is liable to compression producing an entrapment neuropathy called as* ***Cubital Tunnel Syndrome.*** *Thus, there is tardy ulnar nerve palsy when there are variations in the musculo-fascial structures in the cubital tunnel. Ulnar nerve undergoes considerable proximo-distal excursion with the movements at the elbow joint and pressure by fibrous bands at the origin of flexor carpi ulnaris, prolonged flexion of elbow, encroachment of neighbouring muscles in the tunnel; shallow ulnar groove, etc. can produce this condition. Fifty upper limbs from 25 cadavers were carefully dissected to study the anatomy of cubital tunnel. The groove on the posterior surface of medial epicondyle was deep in 90% cases. A broad transverse ligament was found roofing the tunnel in 66%. An arcuate ligament in the origin of flexor carpi ulnaris was found in 18% Epitrochlearis anconeus muscle was present in 16% and the floor of the tunnel was found to be encroached by an extension of medial head of triceps in 6% cases. Ulnar nerve shows a distinct thickening and flattening while it passes through the tunnel and in 30% limbs it is covered by a sleeve of fibrous sheath.*

Key words *: Ulnar nerve, entrapment neuropathy, Cubital tunnel syndrome.*

Introduction :

While dealing with the applied anatomy of the peripheral nerves we usually talk about avulsion or direct injuries. When discussing entrapment neuropathy the common examples cited are that of median nerve (carpal tunnel syndrome), lateral cutaneous nerve of thigh (meralgia paraesthetica) and common peroneal nerve, etc.; but less emphasis is laid on the ulnar nerve which may be compressed at the level of elbow while passing behind the medial epicondyle of humerus (cubital tunnel) or at the wrist while passing through ulnar carpal tunnel (Guyon's canal). Compression of ulnar nerve in the cubital tunnel can produce 'tardy ulnar nerve palsy' which can be attributed to the variations in the musculo-fascial structures around the cubital tunnel *(Dobyns, 1983).*

As is usual at joint levels the nerves crossing the joints are restrained in certain confined areas. The need for considerable proximo-distal excursions combined with constraints of bone, firm soft tissues or scars result in a group of nerve entrapment problems. Ulnar nerve while crossing the elbow may also be similarly affected. Congenital anomalies in the region and fibrous bands can also produce entrapment *(Dobyns, 1983; Hollinshead, 1982).* Although functional anatomy of the cubital tunnel is very well documented in clinical literature there is paucity of information on this in Anatomy text books. There is no systematic study available on cubital tunnel in Indian subjects, hence, a detailed study of this region was carried out.

Material and Methods :

Fifty upper limbs from 25 cadavers were used in the present study.Ulnar nerve was carefully exposed for a distance of about 5 cm above the bend of elbow. Its entry into the cubital tunnel was dissected and displayed. Presence or absence of fibrous bands, ligaments, epitrochlearis anconeus muscle, supracondylar process, Struther's ligament were noted. Origin of flexor carpi ulnaris was observed and then the roof of the tunnel was split open.Presence of thickening or flattening of ulnar nerve, as also the presence of fibrous sheath surrounding the nerve were noted. Depth of cubital tunnel was graded. The floor was observed for any encroachment by soft tissues. All the details were systematically recorded.

Observations and Discussion :

Cubital tunnel is bounded anteriorly by medial epicondyle of humerus, laterally it is formed by medial ligament of elbow joint and the roof is formed by the aponeurosis between the two heads of flexor carpi ulnaris *(Campbell, 1998).* As described by *Williams et al. (1995)* in 'Cubital tunnel Syndrome" elbow joint is normal, ulnar nerve feels normal and does not subluxate; there is a compression neuropathy about the elbow with no antecedant trauma. It was in 1958 that Feindel and Straford coined the term **'Cubital Tunnel Syndrome'**

(Cambell, 1998). A Shallow ulnar groove predisposes to ulnar nerve injury *(Williams et al., 1995)* Inadequate fibrous arch or recurrent subluxation of ulnar nerve can lead to **'Tardy ulnar nerve palsy'** *(Campbell, 1998).* Progressive deformity of cubitus valgus may precipitate this condition *(Joshi and Kotwal, 1999).* The nerve may be compressed if the fascial roof formed by flexor carpi ulnaris gets tightened resulting in numbness in the little finger and ulnar half of ring finger. There is motor weakness of intrinsic muscles of the hand supplied by ulnar nerve. The surgical treatment for this condition may be i) decompression of cubital tunnel, and/or ii) anterior transposition of ulnar nerve, or iii) medial epicondylectomy *(Joshi and Kotwal, 1999).*

Tardy ulnar nerve palsy can be tested by following methods :

(a) **Tinel's Test** –There is positive percussion test over the ulnar nerve at the level of medial epicondyle *(Dobyns, 1983; Campbell, 1998)*

(b) **Positive elbow flexion text :** With the elbow fully flexed patient will complain of numbness and tingling in the little and ring fingers within one minute *(Dobyns, 1983; Campbell, 1998).*

(c) *Buchler and Thayer in 1988* described another method of testing in which the patient sits with both arms and shoulder in anatomical position. Then he is asked to flex fully both the elbow joints with the wrist joints maintained in full extension. The test is positive if any symptoms occur within 3 minutes. The symptoms are resolved by elbow extension *(Joshi and Kotwal, 1999)*. Complete anaesthesia in the area of middle and distal phalanges of little finger (Autonomous zone of the ulnar nerve) strongly suggests total division of this nerve *(Campbell, 1998).*

Symptoms can also appear if the elbow is kept flexed for a long period, or ulnar groove is shallow, or the cubital tunnel region is kept on some unyielding surface for a long period *(Dobyns, 1983)*. Congenital anomalies like supracondylar process and its associated ligament of Struther; other variations in the musculofascial structures viz. epitrochlearis anconeus or encroachment by medial head of triceps can produce ulnar nerve entrapment.

Schafer et al.(1923) and Schaeffer (1953) have described epitrochlearis anconeus (also known as anconeus internus or epitrochleo-olecranonis) which arises from medial epicondyle of humerus and arches across the groove for the ulnar nerve to insert on to the olecranon process of ulna. It is seen in 25% cases. This muscle represents adductor of the olecranon of lower mammals. Normally it is replaced by transversely placed fibrous band in the fascia. We found it in 16% cases. It was bilaterally present in 12% cases. *Dellon (1986)* found this muscle only in 11% (Fig. 2).

In the present series a well defined transverse band was observed (Fig. 1) in the roof of cubital tunnel in 66% cases, whereas *Dellon (1986)* reported it in 77%. A distinct arched band (arcuate ligament) of fibrous tissue between the two heads of flexor carpi ulnaris was observed in 18%. *Campbell (1998)* has reported its presence in 93%. It seems probable that he is considering the transverse band and the arcuate ligament as one and the same entity. In 6% an extension of medial head of triceps was observed in the floor of cubital tunnel in our series. Figures given by *Dellon (1986)* are quite high (28%).

We did not find any supracondylar process in the limbs dissected; *Dellon (1986)* reported its incidence as 1.5%. Neither *Dellon (1986)* nor we could find any struther's ligament. A shallow ulnar groove can predispose to ulnar nerve injury *(Williams et al., 1995; Campbell, 1998).* In our series in 90% specimens the groove for ulnar nerve was deep. While negotiating through the tunnel ulnar nerve showed slight flattening and thickening and in 30% cases a distinct fibrous sheath surrounded the nerve at this location.

Thus, we found that in majority of cases ulnar nerve lies in a deep groove at the elbow, well protected by a musculo fascial roof. Variations in the structures forming the walls of cubital tunnel can lead to entrapment neuropathy of ulnar nerve.

Summary and Conclusion :

- N Cubital tunnel was deep in 90% cases.
- N Within the tunnel ulnar nerve is well protected and enjoys considerable proximo-distal excursion during movements of elbow.

- Roof of the tunnel was formed by a broad transverse ligament (66%), or epitochlearis anconeus (16%) or arcuate ligament in the origin of flexor carpi ulnaris (18%).
- The nerve was surrounded by a fibrous sheath in 30% limbs which probably provided additional protection to the nerve during excursions.
- From the present study we can conclude that entrapment neuropathy of ulnar nerve in the cubital tunnel will result if there is direct pressure or trauma involving the nerve; a shallow ulnar groove or a pressure due to constricting effects of various musculo-fascial structures forming the cubital tunnel.

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Showing :

A : Ulnar nerve, B : medial epicondyle, C : olecranon process, D. : two heads of flexor carpi ulnaris, E : thick transverse band forming roof of cubital tunnel, F : medial intermuscular septum, G : thin sheet of muscle-epitrochlearis anconeus.

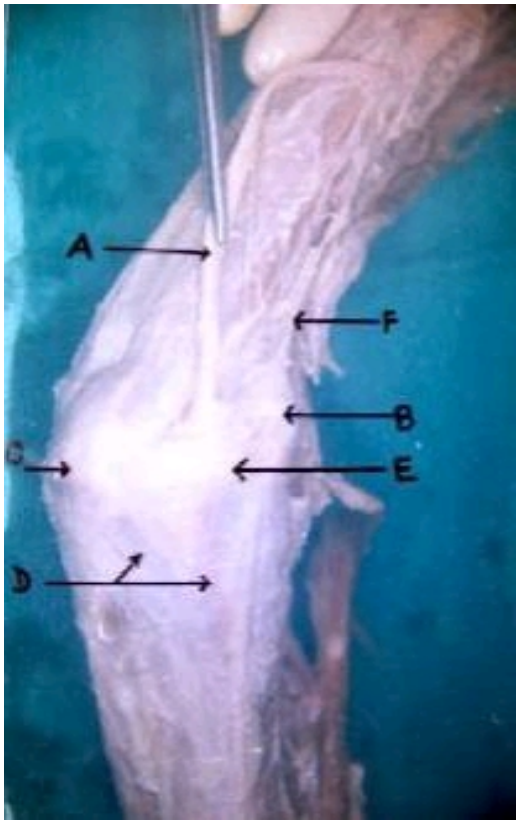

Fig. 1 (Dissection of Left elbow region

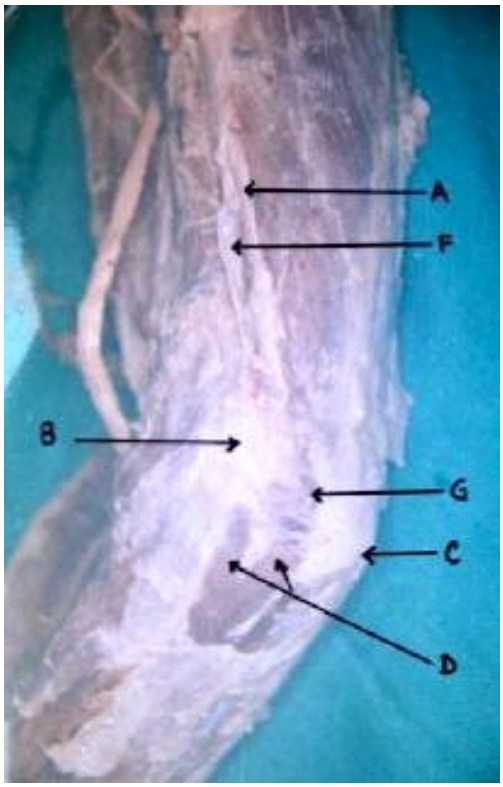

Fig. 2 (Dissection of Right elbow region.)

The present study evaluates the anatomy of the cubital tunnel. Eighteen upper limbs were analysed in unembalmed cadavers using ultrasound examination in all cases, dissection in nine cases, and microscopic study in nine cases. In all cases, thickening of the fascia at the level of the tunnel was found at dissection. From the microscopic point of view, the ulnar nerve is a multifascicular trunk (mean area of 6.0 Â± 1.5 mm(2)). The roof of the cubital tunnel showed the presence of superimposed layers, corresponding to fascial, tendineous and muscular layers, giving rise to a tri-laminar structur Cubital tunnel syndrome is one of the common peripheral entrapment nerve syndromes affecting a fair amount of people today. This condition occurs when the ulnar nerve is injured leading to its inflammation and irritation. The cubital tunnel consists of ligaments, bones, and muscles and itâ€™s where the ulnar nerve passes through into the elbow. Cubital tunnel syndrome causes A LOT of pain. This is my story and how I was able to overcome cubital tunnel syndrome.Â This commentary addresses strengths and weaknesses of the clinical trial study protocol designed by Liu et al., in particular with regard of the methodology, taking into consideration the commentary article "Assessing surgical methods for more. The cubital tunnel is the space between two heads of the flexor carpi ulnaris muscle on the posterior side of the elbow. From: Orthopedic Massage (Second Edition), 2009. Related termsÂ However, normal electrodiagnostic studies do not exclude a diagnosis of cubital tunnel syndrome, nor prevent consideration of surgery. Radiological examination will indicate the presence of degenerative changes. A cubital tunnel projection provides good imaging of the cross-section of the tunnel.