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The Ulnar Nerve In The Tunnel of Guyon

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ABSTRACT

The ulnar nerve (C8, T1) of the upper limb innervates the forearm and palm. In its course it is subject to entrapment / lesion at bottleneck sites. Among the more distal ones is the compression / injury to the nerve at the wrist – where its deep branch traverses an osseo-ligamentous canal, referred to as Guyon's tunnel. As the nerve supplies many 'educated' intrinsic muscles of the palm associated with manually dexterous actions, lesions to the nerve often lead to a major loss of functional efficiency of the hand. Ulnar nerve injuries are claimed to be the biggest cause to loss to the number of man-days in the industrial sector.

This study examines the more distal anatomical relations of the nerve and lists the locales of the branches given off by the nerve and the sites of possible compression along its carpal route.

Key words*: ulnar nerve, Guyon's tunnel, compression syndromes, lesions*

INTRODUCTION

The ulnar nerve is more frequently injured or deranged than any other peripheral nerve in the body[1,2,3], the careless surgeon's scalpel contributing in no mean degree to the distinction. Lesions or compression syndromes affecting the nerve, especially in its more distal extremity can lead to, what can be best termed, as 'manual illiteracy' through the loss of function of the so-called educated muscles intrinsic to the hand.

The quantum of motor loss, coupled with the fact that recovery time for coordinated action of the involved musculature is longer than that described in other peripheral nerve lesions, require the clinician to be anatomically familiar with the course and relations of the ulnar nerve in the hand. One of the more frequent distal sites of compression of the ulnar nerve is at the carpus where it passes through an osseo-ligamentous-muscular canal first described by Felix Guyon in 1861.

The excursion of the nerve in the carpal region has been subject to much debate and disagreement, the contradictions in descriptions may be ascribed to the plethora of structures the nerve is related to in the region. In the hand, the ulnar nerve crosses five joints (ulnocarpal triquetro – pisiform, triquetro - hamate, hamato-metacarpal, V and IV, supplies fifteen muscles, provides cutaneous innervations to one and a half fingers and through articular twigs, all related joints, the nerve also courses two osseo-fascial tunnels and accompanies a major artery. All this in addition to its comparative superficiality, subject it to a multiplicity of derangements involving of number of related structures.

In this paper is presented observations made in a series of 22 dissections of the nerve in the hand from upper limbs from either sex and of both sides to expose the ulnar nerve as it traverses the Guyon's tunnel.

MATERIAL & METHODS

A total of 22 dissections on the wrists and hands in adult cadavers of both sexes were performed. The distal carpal segment of the ulnar nerve as it traverses over flexor retinaculum over the carpal bones. The deep branch of the nerve as it courses the tunnel of Guyon was exposed. Observations were made on the branching pattern, relations and anatomy of the osseo- ligamentous- fascio- mausclar ulnar canal (tunnel)

OBSERVATION

In 57% of the dissections the ulnar nerve divided into its superficial and deep components proximal to, or at the level of the pisiform. In the remaining 43% the nerve split within the tunnel of Guyon or beyond. In more than 50% of dissections articular twigs were given off within the tunnel. In 40% of hands muscular branches were seen coming from the tunnel. (Table 1). No anomalous muscles excepting a much larger than normal palmaris brevis was observed in one of the dissections. Fig: 1, and Fig: 2 show the course of the nerve in the carpus.

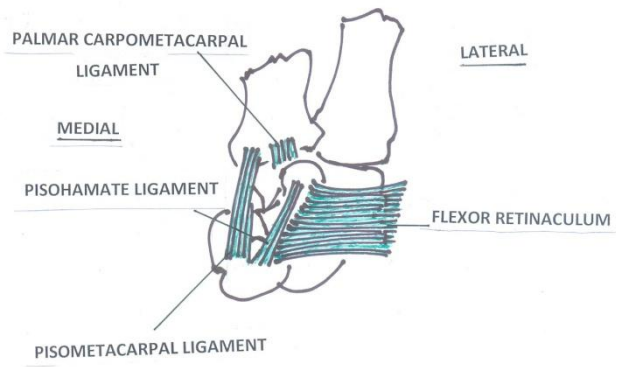

Fig. 1: The bones and ligaments along the carpal course of the ulnar nerve and its deep branch

Table: I - Branching in tunnel (22 dissections)

	LEFT			RIGHT		
Ser. No.	Division	Muscular	Articular	Division	Muscular	Articular
1	0	0	1	0	0	1
2	1	0	1	1	0	1
3	1	1	1	0	1	1
4	0	0	1	-	-	-
5	0	0	0	1	0	0
6	0	0	0	1	1	1
7	1	0	1	0	0	1
8	1	1	1	0	1	1
9	1	1	1	-	-	-
10	0	1	1	-	-	-
11	0	1	1	0	1	1
12	1	1	0	0	0	0
13	-	-	-	1	0	-

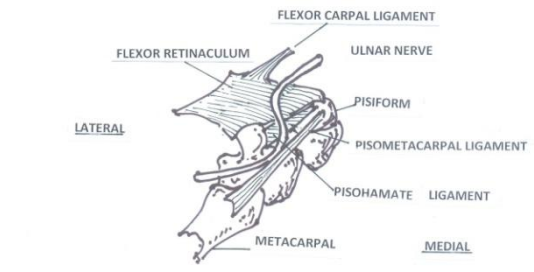

Fig. 2: Course of the deep branch of the ular nerve in the tunnel of Guyon

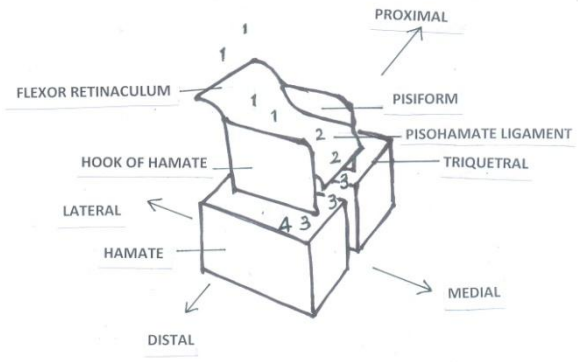

Fig. 3: Schematic representation of the four sites of compression of ulnar nerve at wrist

DISCUSION

The distal ulnar tunnel, or the Guyon canal, is a 4 - 4.5 cm in length and begins at the proximal edge of the flexor carpal ligament and ends at the fibrous arch of the hypothenar muscles. The distal ulnar tunnel of Guyon is defined by the flexor carpi ulnaris, the pisiform, and the abductor digiti minimi as its medial wall and by the transverse carpal ligament and the hamate as its lateral margin. The floor of the tunnel consists of the flexor digitorum profundus tendons in the distal forearm, the transverse carpal ligament, the pisohamate and pisotriquetral ligaments, and the opponens digiti minimi. The roof of the tunnel includes the flexor carpal ligament, palmaris brevis muscle and hypothenar fat[4].

Conflicting descriptions of the anatomy of the ulnar tunnel are given by different and often differing authors. The pisohamate trough has been said to be roofed by the pisohamate ligament by some, yet others claim this ligament forms the floor. While a few describe that the anterior wall is from the antebrachial fascia, others mention the dorsal fascia from the palmaris brevis forms the same boundary.

The posterior wall is the pisohamate ligament opine some, here too some differ, claiming the anterior carpal ligament form this wall. The only consensus amongst the varied descriptions is that the pisiform and hook of hamate are the carpals over and between which the nerve courses. Here too amazingly a major specialist publication on hand anatomy errs (CIBA). The nerve is depicted passing not between but lateral to the carpals.

More specialised workers further subdivide the length of the tunnel into three components the proximal Guyon's, the intermediate pisohamate and the distal opponens. What adds to the confusion however, is not so much the structures, their composition or interrelationships but the astounding multiplicity of differing nomenclatures used for identical or same components.

The possible sites of compression that the ulnar nerve may be subject to are proximo- distally enumerated (Figure: 3.) Sites: 1 and 2 are deep to the volar (flexor) carpal ligament and the palmaris brevis. Site: 3 is within the Guyon's Tunnel and Site 4 lies just beyond it. (Fig: 3) Ulnar tunnel compression syndromes are

notorious in that they compromise activity and efficiency of the many vital intrinsic muscles of the palm – many of which are required for dextrous and 'educated' exertions.

It is obvious that any anomalous muscle or bellies, ganglia or occupation induced stress / pressure syndromes could lead to compression neuropathies.[5,6,7] External factors, as traumas or fracture / dislocations and intrinsic factors like synovitis or rheumatoid arthritis also predispose to formation of clinically diagnosable compression syndromes.[8,9,10]

Though the series presented in this study is small it is felt considering the increasing paucity of cadavers even a series is minuscule as this one, will in the long run aid in our understanding of the complexity of the ulnar nerve in the hand of with special reference to the tunnel of Guyon[11].

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