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Original article

Ulnar nerve lesion at the wrist and sport: A report of 8 cases compared with 45 non-sport cases

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ABSTRACT

Objective: Reporting clinical and electrodiagnostic characteristics of sport-related ulnar neuropathies at the wrist.
Patients and methods: Eight sport-related and 45 non-sport-related cases from 53 ulnar neuropathies at the wrist cases over 14 years.
Results: Sport-related ulnar neuropathies at the wrist cases were due to cycling (5 cases), kayaking (2 cases), and big-game fishing (1 case). No patient had sensory complaints in ulnar digits, and all had motor impairment. Conduction across the wrist with recording on the first dorsal interosseous muscle was impaired in all cases, with conduction block in 5. Two cyclists showed bilateral ulnar neuropathies at the wrist. All cases recovered within 2 to 6 months with sport discontinuation. Distal lesions of the deep motor branch were more frequent in sport- than non-sport-related cases.
Conclusions: The 8 sport-related ulnar neuropathies at the wrist cases involved the deep motor branch. Conduction study to the first dorsal interosseous muscle across the wrist is the key to electrodiagnostics. Bilateral cases in cyclists does not require wrist imaging.

1. Introduction

Ulnar neuropathy at the wrist (UNW) is rare and cases occurring in patients who practice sport are exceptional [1–9]. UNW may impair the whole nerve (sensory and motor fibres) or only the ulnar deep motor branch (UDMB) and may have progressive or acute onset. Clinically, differential diagnosis is always difficult with ulnar neuropathy at the elbow (UNE), which is more frequent; C_8T_1 root disease, which is usually more painful; and lower plexus lesion, which is infrequent. In some cases, anterior horn disease has been suggested [10]. Electrodiagnostics (EDX) of an UNW is easy when sensory and motor ulnar conductions at the wrist are impaired but can be difficult when only the UDMB is impaired and very difficult when the UDMB is partially impaired. Improving the UNW diagnosis requires systematic study of the ulnar motor conduction to the first dorsal interosseous (FDI) across the wrist to search for conduction block (CB) [4,8,11–14]. The frequency of papers focused on sport-related UNW compared to those focused on "entrapment neuropathies" ($n = 18{,}818$) found by a MEDLINE search, varies from 0.11% to 0.18% according with the terms used ["ulnar neuropathy wrist sport" ($n = 21$) or "ulnar nerve wrist sport" ($n = 34$)].

We reviewed our 60 cases of UNW diagnosed from 1997 to 2011 [8] and describe 8 sport-related cases and compare these to non-sport-related cases.

1.1. Anatomy of the ulnar nerve course at the wrist and classification of types of UNW

In 1969, Shea and McClain [15] were the first to identify 3 different types of ulnar nerve lesion at the wrist, which were confirmed and detailed by Gross and Gelberman, in 1985 [16] (Fig. 1). Also in 1985, Wu et al. [17] identified 5 different types of UNW: type 1 is a motor and sensory neuropathy related to a lesion located just outside of or within the proximal end of Guyon's tunnel. Type 2 is a pure sensory neuropathy that involves the superficial branch at the wrist but distal to the branch to the palmaris brevis muscle. Types 3, 4 and 5 are pure motor neuropathies that involve the UMDB. In type 3, the lesion is located just distal to the superficial branch but proximal to the branch to the hypothenars. In type 4, the lesion is located distal to the branch to the hypothenars, and in type 5, the lesion is located just proximal to the branches to the FDI and

Abbreviations: ADM, Adductor digiti minimi; CB, Conduction block; CMAP, Compound motor action potential; DML, Distal motor latency; EDX, Electrodiagnosis or electrodiagnostics; OSCV, Orthodromic sensory conduction velocity; SNAP, Sensory nerve action potential; FDI, First dorsal interosseous muscle; UDMB, Ulnar deep motor branch; UNW, Ulnar neuropathy at the wrist.

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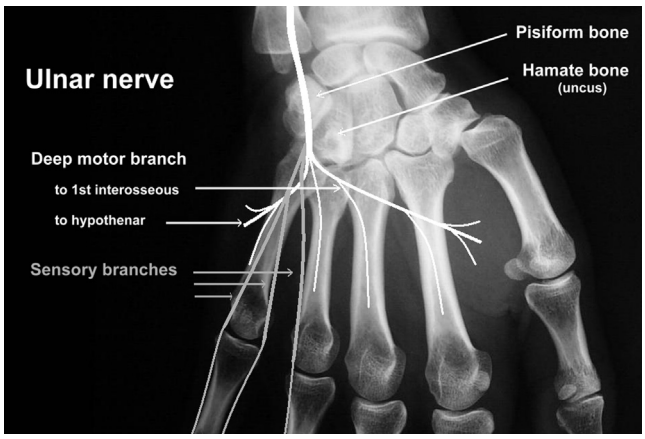

Fig. 1. Schematic representation of the ulnar nerve course at wrist superimposed on a wrist radiogram.

adductor pollicis muscles. In the present study, we used the Wu et al. classification (Table 1).

2. Patients and methods

2.1. Patients

Between January 1997 and July 2011, we prospectively recorded clinical and EDX data for 60 cases with a main diagnosis of UNW. Clinical examination and EDX tests were performed by the same investigator. All subjects gave their informed consent to the use of their EDX data for this study. The study was approved by the local committee on research ethics.

The diagnosis of UNW was based on clinical and EDX criteria. Clinical manifestations varied from mild to severe, intrinsic hand-muscle weakness (sparing the abductor pollicis brevis [APB]) and paresthesiae or hypoesthesia involving 1.5 ulnar digits (sparing the dorsum and palmar aspect of the hand). EDX criteria for UNE and UNW were detailed in 2 recent papers [8,14]. No patient had signs or symptoms of generalized axonal or demyelinating polyneuropathy.

2.2. Methods

2.2.1. Clinical data

For each case, data were available on sex, age, body mass index, lesion side, presence of paresthesia of digits 4 and 5, weakness, and wasting of the FDI and hypothenar muscles.

2.2.2. EDX data

Each patient underwent complete EDX of both upper limbs according to a previously detailed protocol [8]. Tests included needle examination of the impaired upper limb muscles, as well as bilateral motor and sensory conduction studies of median and ulnar nerves. Skin temperature was measured and hands were warmed before testing if $< 32^{\circ}$ C.

2.2.2.1. Ulnar nerve conduction study and criteria for abnormality [8,14]. The motor conduction tested distal motor latency (DML) to both the adductor digiti minimi (ADM) and FDI. ADM recording was used to study motor conduction velocity (MCV) in the forearm, across the elbow, and in the arm. FDI recording was used to study conduction across the wrist. Recordings were performed with a pair of disposable surface electrodes. The main aim of the across the wrist conduction study was to demonstrate one motor CB, which necessitates stimulating the UDMB distal to Guyon's tunnel.

The orthodromic sensory conduction velocity (OSCV) was studied from digit 5 to above the wrist.

The needle examination of the ADM, FDI, APB, triceps and sometimes flexor and extensor carpi ulnaris muscles of the impaired upper limb were performed in each case.

2.2.2.2. Abnormality criteria for UNW diagnosis. EDX criteria for UNW were:

- DML to the ADM $>$ 3.1 ms and/or FDI $>$ 3.4 ms;
- CB across the wrist ($\geq$ 50% decrease in CMAP, without temporal dispersion);
- OSCV $<$ 47 m/s and 10 m/s less than on the healthy side;
- absence of criteria for ulnar nerve at the elbow [8].

UNW diagnosis required a combination of at least one of the first 3 criteria and the 4th criterion. Non-specific findings were considered low CMAP amplitude for both the ADM and FDI ($<$ 6.1 and 6.2 mV, respectively, or a 50% decrease as compared with the healthy side), a low sensory nerve action potential (SNAP) amplitude ($<$ 7 μV and/or 55% decrease as compared with the healthy side), and abnormal needle examination results in one or more ulnar hand intrinsic muscles.

2.2.2.3. Median nerve conduction study. The median nerve conduction study involved DML to the APB, motor conduction velocity in the forearm, and OSCV from digit 3 to the wrist. A median nerve lesion at the wrist was diagnosed with $>$ 3.9 ms DML to the APB and/or OSCV $<$ 47 m/s and 10 m/s less than that for the healthy side. If results for the 2 previous tests were normal, the difference

Table 1
Anatomical classification of the types of ulnar neuropathy at the wrist (UNW) and corresponding electrodiagnostic features. Shea and McClain and Gross and Gelberman identified 3 types of UNW [15,16]. Wu et al. proposed 5 types of UNW: type 1 is sensory and motor; type 2 is purely sensory; types 3 to 5 are purely motor. Type 3 involves complete UDMB; type 4 spares the hyporthenar muscles; and type 5 involves only the first dorsal interosseous muscle (FDI) and pollicis adductor. The present study used the Wu et al. classification [17].

Different types of UNW	Sensory + motor	Pure sensory	Pure motor lesion (UDMB lesion)		
			Complete	Sparing hypothenar	Distal
Shea and McClain, 1969 [15]	1	3	2		
Gross and Gelberman, 1985 [16]					
Wu et al. 1985 [17]	1	2	3	4	5
EDX abnormalities by anatomical classification					
DML to ADM	↗	Nl	↗	Nl	Nl
DML to FDI	↗	Nl	↗	↗	↗
Conduction block to FDI	+	No	+++	+++	+++
OSCV	↘	↘	Nl	Nl	Nl
Sensory dorsal cutaneous branch	Nl	Nl	Nl	Nl	Nl

EDX: electrodiagnostic; DML: distal motor latency; ADM: adductor digiti minimi; FDI: first dorsal interosseous muscle; OSCV: orthodromic sensory conduction velocity digit 5 to wrist; UDMB: ulnar neuropathy at the wrist; Nl: normal; ↗: increased; ↘: decreased.