SURGICAL MANAGEMENT OF GUYON’S CANAL SYNDROME

AN ULNAR NERVE ENTRAPMENT AT THE WRIST

Report of two cases

Paulo Henrique Aguiar1, Edson Bor-Seng-Shu1, Fernando Gomes-Pinto1, Ricardo Jose de Almeida-Leme1, Alexandre Bruno R. Freitas2, Roberto S. Martins1, Edison S. Nakagawa1, Antonio J. Tedesco-Marchese1

ABSTRACT - Guyon’s canal syndrome, an ulnar nerve entrapment at the wrist, is a well-recognized entity. The most common causes that involve the ulnar nerve at the wrist are compression from a ganglion, occupational traumatic neuritis, a musculotendinous arch and disease of the ulnar artery. We describe two cases of Guyon’s canal syndrome and discuss the anatomy, aetiology, clinical features, anatomical classification, diagnostic criteria and treatment. It is emphasized that the knowledge of both the surgical technique and anatomy is very important for a satisfactory surgical result.

KEY WORDS: Guyon’s canal syndrome, ulnar nerve, anatomy, electromyography.

Síndrome de compressão do nervo ulnar a nível do punho (síndrome do canal de Guyon): relato de dois casos

RESUMO – A síndrome do canal de Guyon, um encarceramento do nervo ulnar a nível do punho, é bem conhecida. Ela é causada por neurite ocupacional traumática, doenças e traumas do arco músculo-tendíneo e doença de artéria ulnar. Descrevemos dois casos de síndrome do canal de Guyon e discutimos os aspectos anatômicos e etiológicos, suas características clínicas, classificação anatômica e critérios de diagnóstico, bem como fazemos uma análise crítica do tratamento imposto. Enfatizamos também que, para obter um resultado cirúrgico satisfatório, é importante conhecer bem tanto as técnicas cirúrgicas como sua anatomia.

PALAVRAS-CHAVE: síndrome do canal de Guyon, nervo ulnar, anatomia, eletromiografia.

Guyon’s canal syndrome, an ulnar nerve entrapment at the wrist, is a well-recognized entity. The ulnar carpal tunnel (Guyon’s canal) was first described by Felix Guyon in 1861. Gessler (1896) described a peculiar form of muscle atrophy in the hands of gold polishers but did not recognize the lesion as an ulnar neuropathy. Later, authors reported various occupations or hobbies as predisposing to ulnar neuropathy. A detailed review of the syndrome was presented by Shea and McClain based on 136 reported cases in 1969.

The most common causes that involve the ulnar nerve at the wrist are compression from a ganglion, occupational traumatic neuritis, presence of musculotendinous arch and disease of the ulnar artery. Some authors have described the presence of accessory or anomalous muscles traversing Guyon’s canal and variations in the anatomy of the ulnar nerve, some of which can rarely lead to entrapment neuropathy.

The objective of this study is to bring a better knowledge of the surgical techniques and the anatomy in view of the importance of both in obtaining satisfactory surgical results. The anatomy, aetiology, clinical features, diagnostic criteria and treatment of the Guyon’s canal syndrome were reviewed.

1M.D., Peripheral Nerve Group of Division of Neurosurgery of São Paulo University Medical School, São Paulo, Brazil; 2M.D., Neurosurgical Clinic of Pinheiros, São Paulo, Brazil.

Received 21 March 2000, received in final form 19 September 2000. Accepted 23 September 2000.

Dr. Paulo Henrique Aguiar – Rua Maestro Torquato Amore 332/12 Bloco I – 05622-050 São Paulo SP – Brasil. FAX 11 282 6822. E-mail: pha-neuro@hotmail.com
CASES

Case 1. This 36-year-old woman presented with a three year history of intermittent dull aching and burning pain in the right palm and 6 months with progressive weakness of the right hand. She tended to drop objects and she noticed a slow onset weakness while working at home as a housewife.

On examination, there was a weakness of abductor digiti quinti and a marked weakness of the opponent digit quinti, interossei, and adductor pollicis. There was sensory impairment to light touch or pinprick. Tinel’s sign was positive. Rheumatological and endocrinological blood tests and exams presented normal values.

Electromyographic examination showed fibrillation and positive sharp waves at rest and weakness in ulnar muscles of the hand (lumbricals, abductor digit quinti, abductor pollicis brevis, flexor carpi ulnaris). Conduction velocity studies of the right ulnar nerve for motor fibers of the ring finger, both on the palmar surface only and sensory abnormalities; weakness in all intrinsic hand muscles innervated by ulnar nerve and sensory deficit in the hypothenar eminence and ulnar half of the hand (lumbricals 3 and 4 and all interossei).1,16

The ulnar nerve may be compressed anywhere along the course of the Guyon’s canal causing sensory, motor, or only sensory abnormalities.

Shea and McClain (1969) divided lesions of the ulnar nerve in Guyon’s canal into three types, depending on the anatomical site at the wrist at which the ulnar nerve is compromised6 (Fig 6).

In type I, the ulnar nerve is involved just proximal to or within Guyon’s canal and there are both motor and sensory abnormalities; weakness in all intrinsic hand muscles innervated by ulnar nerve and sensory deficit in the hypothenar eminence and ulnar half of the ring finger, both on the palmar surface only but not at the dorsum that is innervated by the dorsal cutaneous nerve.

In type II, the location of compression is along the deep branch and there is only weakness in

Surgery with microsurgical technique was performed as in the first case, however with a minor skin incision of about 3.0 cm. An extra-neural neurolysis of ulnar nerve at the wrist was totally performed with section of the volar wrist crease. The patient was discharged from the hospital at the second postoperative day without pain but she did not return for a follow up.

DISCUSSION

Guyon’s canal syndrome refers to compression neuropathy of the ulnar nerve at the wrist. The ulnar tunnel, or Guyon’s canal, is an oblique fibro-osseous tunnel that lays within the proximal part of the hypothenar eminence; it is confined by the pisiform and hook of the hamate and is covered proximally by the palmar carpal ligament and distally by the short palmar muscle (Fig 4). The canal contains the ulnar nerve, the ulnar artery with their venae comitantes and loose fibrofatty tissue. Within the canal, the ulnar nerve divides into superficial sensory and deep motor branches (Fig 3).

The superficial branch proceeds distally in line with the main trunk of the nerve and, on exit from the canal, it supplies a small branch to the palmaris brevis muscle. Its terminal branches provide sensation to the little finger and the ulnar half of the ring finger. The deep motor branch along with the ulnar artery takes an acute lateral turn about the hook of the hamate. At this point it passes under a fibroten- donous arch (pisohamate hiatus), which in part gives origin to the muscles of the hypothenar eminence. This is the most vulnerable site for compression of the deep motor branch of the ulnar nerve. The deep motor branch innervates hypothenar muscles, lumbricals 3 and 4 and all interossei.1,16

The ulnar nerve may be compressed anywhere along the course of the Guyon’s canal causing sensorimotor, only motor, or only sensory abnormalities.

Shea and McClain (1969) divided lesions of the ulnar nerve in Guyon’s canal into three types, depending on the anatomical site at the wrist at which the ulnar nerve is compromised6 (Fig 6).

In type I, the ulnar nerve is involved just proximal to or within Guyon’s canal and there are both motor and sensory abnormalities; weakness in all intrinsic hand muscles innervated by ulnar nerve and sensory deficit in the hypothenar eminence and ulnar half of the ring finger, both on the palmar surface only but not at the dorsum that is innervated by the dorsal cutaneous nerve.

In type II, the location of compression is along the deep branch and there is only weakness in
Fig 1. The curvilinear skin incision that we perform as a routine for Guyon canal syndrome.

Fig 2. Case 1 - Surgical and anatomical view showing the main trunk of ulnar nerve at wrist and hand (opened arrow shows the motor deep ulnar branch and closed arrow shows the superficial sensitive ulnar branch. N, ulnar nerve; A, ulnar artery; V, venae.

Fig 3. Anatomical drawing demonstrating the main four points for compression of the ulnar branches in the hand (1, palmar carpal ligament; 2, transverse carpal ligament; 3, deep motor ulnar branch; 4, superficial sensory ulnar branch).

Fig 4. Coronal section of the hand showing the relation between the ulnar nerve and artery with the palmar fascia, transverse carpal ligament and pisiform bone.

Fig 5. Case 2 - The intense hypotrophy of the thenar and hypothenar eminence could be easily seen.
muscles innervated by the deep branch; depending on the location, it may spare hypothenar muscles.

In type III, the location of compression is distal in the end of the Guyon’s canal and only sensory abnormalities on palmar ulnar distribution; there is no motor deficit. It is the most rare of the three syndromes.

Types I and II are always associated with atrophy of the first dorsal interosseous muscle.

Hirooka et al. reported a case with a different clinical presentation caused by an atypical fibrous band, which passed from the pisiform bone to the palmar carpal ligament; a nerve constriction, proximal to the musculotendinous arch, was observed on the superficial sensory branch and a part of the deep branch, which carried the branch supplying abductor digiti minimi. Claw-finger deformity of the little finger, abductor digiti minimi atrophy without atrophy of the first dorsal interosseous muscle and hypoesthesia on the ulnar side of the little finger were observed. In this case the syndrome could not be classified into one of three classical types (I, II, III).

Shea and McClain listed 19 different lesions causing compression of the ulnar nerve at the wrist and hand; the most frequent cause was ganglion (28.7%), occupational neuritis (23.5%), laceration (10.3%), ulnar artery disease (8.1%), fracture of carpal bones (5.9%). Most of lesions (52%) were type II, 30% were type I and 18% were type III.

The causes of involvement of the ulnar nerve in the vicinity of Guyon’s canal are: congenital (anomalous muscles, accessory ossicles), trauma (closed or penetrating), inflammation (rheumatoid arthritis), mass lesions (intrinsic or extrinsic), vascular (thrombosis of the ulnar artery) and degenerative (osteoarthritis). Trauma can be penetrating (stab wounds) or acute closed (with or without fracture-dislocation) or chronic closed-multiple repetitive trauma from occupation or hobby, lifestyle or anecdotal events as bicycle riding, motorcycle riding, amateur gardener, manually cracking large sacks of nuts. Mass lesions can be neoplastic extrinsic (lipoma), non-neoplastic extrinsic (ganglion, benign giant cell tumour, neoplastic intrinsic (neurofibroma) or non-neoplastic intrinsic (intraneural cysts)). Compression of the ulnar nerve in Guyon’s canal by a benign giant cell tumour is rare.

O’Hara and Stone (1988) described an unique case of ulnar neuropathy of the wrist due to an aberrant flexor carpi ulnaris insertion with approximately one-fifth of the tendon inserted 5 mm radially to the major insertion. Later, Al-Qattan and Duerkson (1992) described a similar recurrent branch and Papierski (1996) described a similar case which the reunion with the main trunk of the ulnar nerve occurred distal to the pisiform. Although it is a rare variant, the possibility of this recurrent branch should be considered when exploring Guyon’s canal.

According to Streib et al., axonal degeneration may be an early abnormality in distal ulnar neuropathy; as nerve damaged from compression increases, segmental demyelisation occurs.

The diagnosis of distal ulnar neuropathy is based on clinical criteria but electromyography and determination of the nerve conduction should be done to localize the lesion and to determine the extent of nerve damage. An accurate history must be taken including details about occupation, hobby and life style. Generalized disorders have to be considered such as rheumatoid arthritis, scleroderma, and diabetes mellitus. The possibility of an abnormality of the cervical spine, shoulder, and elbow must be excluded.

Symptoms are similar to those of ulnar nerve involvement at the elbow, except for there will never be sensory loss in the dorsum of the hand because the dorsal cutaneous branch leaves the nerve forearm 5-8 cm proximal to the wrist.

Pain, when present, may be exacerbated by tapping over pisiform (Tinel’s sign). It may also radiate
up the forearm. The palmaris brevis sign may occasionally be useful in diagnosis which helps to differentiate between ulnar nerve compression at the cubital tunnel or at the wrist. When the patient abducts the little finger on volition, there is simultaneous contraction of the palmaris brevis. This contraction will be absent if the entrapment of the ulnar nerve is at the cubital tunnel but it is usually preserved when the ulnar nerve is compressed at the pisohamate hiatus.

Acute pain and swelling occur in the wrist in patients with calcification in the flexor carpi ulnaris tendon but usually without ulnar nerve compression.

Electrodiagnostics is usually helpful in localizing the site of the lesion. In type I, electrodiagnostic studies may reveal normal motor conduction velocity of the ulnar nerve in the across-the-elbow and elbow-to-wrist segments, prolonged distal latency to the abductor digiti minimi and first dorsal interosseous muscles, prolonged sensory latency and diminished evoked sensory responses. In type II, normal motor conduction velocity in the ulnar nerve in the across-the-elbow and elbow-to-wrist segments, normal sensory latency and sensory evoked responses, normal distal motor latency to the abductor digiti quinti minimi and prolonged latency to the first dorsal interosseous; denervation potentials in the first dorsal interosseous but not in the abductor digiti quinti.

X-rays of the hand and of the wrist including the carpal canal view are necessary to demonstrate possible fractures and bone displacement. Magnetic resonance imaging is indicated only in patients with equivocal clinical findings, a suspected mass lesion or persistent symptoms after surgery.

The treatment requires evaluation of the etiological factor. If the syndrome results from mechanical repetitive trauma (occupation, hobby, life style), the approach is trying to avoid the pressure on the hypothenar eminence. An initial trial of conservative therapy by immobilization, discontinuance of traumatic habits and local injection of cortisone may be tried. Surgical decompression may be indicated in refractory cases.

If mass lesions cause compression, the therapy is surgical. Mass lesions such as small ganglia may not always be palpable through the skin. Persistent signs of impairment of the deep branch of the ulnar nerve with distal latency criteria to suggest involvement of the ulnar nerve in Guyon’s canal warrant surgical exploration.

When the surgical exploration of the Guyon’s canal region is performed, the ulnar nerve and artery can be freed in Guyon’s canal and the nerve dissected. The skin incision should be extensive to wrist and palmar line as showed in Figure 1. If this should reveal a ganglion, it can be dissected out and removed completely with its deeper pedicle. If an obvious mass lesion is found, it is excised; otherwise, all constricting bands are divided and the pisohamate hiatus is unroofed.

Two cases of ulnar nerve compression at the wrist due to arthrosynovial cysts arising from the hamatroctiquetal joint with complete recovery was reported by Maynou et al. and confirmed the favourable prognosis of this form of compression provided surgical treatment is performed early and rigorously.

We conclude that Guyon’s canal syndrome is a well defined syndrome, which complains three types 1) with motor and sensory abnormalities; 2) only motor weakness and 3) pure sensory deficit. Nevertheless the syndrome is not so frequent as the carpal canal syndrome and it is crucial to know both the surgical technique and anatomy in order to obtain a satisfactory surgical result.

Acknowledgements - The authors are thankful to Flávia C. F. Tavares for the English review.

REFERENCES