Accessory Muscles: A Cause of Nerve Compression in the Distal Forearm. Case Report and Literature Review

Músculos Accesorios: una Causa de Compresión Nerviosa en el Antebrazo Distal. Reporte de Casos y Revisión de la Literatura

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RESUMEN: Compresión nerviosa por músculos anormales localizados en el muñequito y antebrazo distal es una condición infrecuente. Músculos accesorios pueden comprimir estructuras bajo la vía del túnel carpiano o canal ulnar, produciendo dolor y parestesias. Se describen dos casos de compresión nerviosa ulnar y mediana en el antebrazo distal causados por prominentes músculos accesorios. Se presenta una revisión de la literatura.

PALABRAS CLAVE: Músculos; Síndromes de Compresión Nerviosa; Variación Anatómica.

PRESENTACIÓN

La compresión nerviosa por músculos anormales localizados en el muñequito y antebrazo distal es una condición infrecuente, con pocos informes en la literatura (Zeiss & Guilliam-Haidet, 1996; Ruocco et al., 1998; Harvie et al., 2004). Los músculos accesorios pueden comprimir estructuras bajo el túnel carpiano o canal ulnar, causando dolor y parestesias (Morrison, 1916; Ryu & Watson, 1987; Sañudo et al., 1993; Server et al., 1995; Sanchez Lorenzo et al., 1996; Depuydt et al., 1998; Santoro et al., 2000; Schuurman & van Gils, 2000; Soldado-Carrera et al., 2000; Bozkurt et al., 2005; Jones, 2006; Acikel et al., 2007; Ogun et al., 2007). Se describen dos casos de compresión nerviosa ulnar y mediana en el antebrazo distal causados por prominentes músculos accesorios.

Caso 1. Una paciente de 21 años de edad, diestra, se quejaba de parestesias y parestesias en el territorio nervioso ulnar de su mano derecha durante seis meses, antes de acudir a un centro de atención ambulatoria. No había antecedentes de traumatismos o problemas de salud antes del inicio de sus síntomas. La exploración física revelaba tendencia en el lado ulnar de su muñequito, pero no se observó tumor ni masa cuando se examinó. No había signo de Tinel en su antebrazo y muñequito. No se observaba debilidad o atrofia en los músculos intrínsecos de su mano derecha. El estudio de conducción nerviosa mostró resultados no específicos. Después de un período de observación de tres meses y tratamiento del dolor, se aconsejó exploración quirúrgica del lado ulnar del muñequito y antebrazo.

Durante la exploración quirúrgica, se observó un músculo, con apariencia normal, cruzando el tronco nervioso y vascular en el antebrazo distal, proximal al muñequito (Fig. 1-2). La exploración quirúrgica se expandió tanto proximalmente como distalmente para obtener una visión completa de sus sitios de inserción. Se liberaron estructuras bajo presión. Se realizó también exploración del canal ulnar.

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The anomalous muscle originated from the anteromedial aspect of the palmaris longus tendon about 3.5 cm proximal to the wrist crease and inserted over the fascia of the abductor digiti minimi muscle (Fig. 3). The muscle was located over flexor carpi ulnaris muscle, ulnar side of flexor digitorum superficialis tendons and crossed over the proximal third of ulnar canal, in close contact with the ulnar nerve and vessels.

Origin site, meshed with the abductor digiti minimi muscle. Muscle dimensions in situ were, 6.0 cm long, 2.0 cm wide and 1.0 cm thick. No other abnormalities were observed. The muscle was excised in order to decompress ulnar canal.

After surgery, symptomatic relief was fully accomplished. Histopathologic report described normal muscle tissue.

Case 2. A 27-year-old male patient, right handed, engineer, complained of numbness over his right hand and referred sore pain at his right distal forearm. Symptoms worsened after weight lifting and computer typing. Patient received anti-inflammatory drugs, physical therapy, wrist splinting, and medical rest over a one-month period. No symptomatic improvement was obtained. Low resolution ultrasound testing reported flexor tenosynovitis. No other abnormalities were informed.

Physical assessment showed a bulky mass over the ulnar side of the distal forearm (Fig. 4), which increased in volume during wrist flexion and ulnar deviation against resistance. The anomalous enlargement was also evident when the fifth finger was tested in abduction against resistance. Hypoesthesia was found to be present at the volar ulnar side of the right hand, with normal sensibility over the dorsal-ulnar aspect of the hand. Froment’s sign was present.

A second ultrasound study, with a high-resolution technique, and a well-trained muscle skeletal radiologist,
was performed. Reverse palmaris longus and accessory abductor digiti minimi muscles were reported. Persistent median artery was also found. No additional testing was applied.

Surgical exploration was indicated in order to release nerve compression. A flat, wide muscle over the median and ulnar nerve appeared present immediately beneath skin incision (Fig. 5).

Three insertion sites were present. The most radial and superficial insertion, fused with the palmar aponeurosis, as a normal palmaris longus tendon. Underneath the recently described, a second and wider insertion, meshed with the flexor retinaculum, which was found to be the main distal insertion site of this accessory muscle. A third, muscular and most ulnar insertion crossed over the ulnar neurovascular bundle and joined the normal abductor digiti minimi muscle (Fig. 6).

Origin site was located at the proximal antebrachial fascia (Fig. 7). Clinical appearance was a normal muscle and pathologist informed normal muscle tissue (Fig. 8).

After excision, full symptomatic recovery was achieved.

**DISCUSSION**

The palmaris longus muscle is probably one of the most variable muscles located in the upper limb. Alike the palmaris, the abductor digiti minimi muscle is considered to be the most variable of all the hypothenar muscles, being its accessory muscle belly presentation the most frequent of them all (Soldado-Carrera *et al*).

The origins of the accessory muscle bellies are mostly found in the lower third of the superficial compartment of the anterior forearm. In general, there is a single origin site, which is most frequently found in the antebrachial fascia. It may also originate from the palmaris longus tendon. Double origin, has also been described, coming from the palmaris longus tendon and superficial antebrachial fascia or, from the flexor carpi ulnaris tendon and deep antebrachial fascia. The origin of the accessory muscles in this report was found at the palmaris longus tendon in case 1 and at the antebrachial fascia in case 2.
Different kinds of insertions of these accessory formations have been reported. In the cases presented above, insertion was single, and blended with the normal digiti minimi muscle belly in case 1. In the second case, a triple insertion was observed, fusing with palmar aponeurosis, flexor retinaculum and abductor digiti minimi muscle, from radial to ulnar. Three headed reverse palmaris longus muscles, with similar distal insertions have been reported previously in literature (Yildiz et al., 2000; Acikel et al.; Natsis et al., 2007).

Anatomical reports describe that, muscle variations at the distal forearm are frequent, and are mostly reported by radiologists during MRI or ultrasound imaging studies (Zeiss & Jakab, 1995; Zeiss & Guilliam-Haidet; Ruocco et al.; Schuurman & van Gils 2000; Yildiz et al.; Bencetxe et al., 2001; Harvie et al.). Accessory muscles located at the palmar aspect of the distal forearm are highly variable in their morphology. A prevalence study, in non-symptomatic volunteers, using ultrasound of distal forearm and wrist, revealed up to 47% of patients with evidence of anomalous muscles, all of which, were variants of abductor digiti minimi muscle. A male over female prevalence was observed, and in 50% of the cases, the condition was found to be bilateral. Muscle thickness did not vary with hand dominance or manual employment (Harvie et al.).

Cihák (1972) described the embryological development of forearm and hand muscles. The superficial muscle layer differentiates into three blastemas: radial, middle and ulnar blastemas. These blastemas give rise to the abductor pollicis brevis, flexor digitorum superficialis and abductor digiti minimi muscles, respectively. The flexor digitorum superficialis muscle as the other blastemas, find their origin at the carpal region. Unlike the other, the flexor digitorum superficialis blastema migrates proximally, while the abductor digiti minimi and abductor pollicis brevis muscles remain in the same carpal region. Soldado-Carrera describes muscle variations in the forearm by a persistent group of undifferentiated mesenchymal cells. These cells, probably fail in their usual apoptosis process, resulting in supernumery muscles and variation of the anatomic presentation of distal forearm muscles (Soldado-Carrera et al.).

Despite these anatomical considerations, clinical reports of nerve compression at the wrist by accessory muscles are scarce. Evidence presented by clinical and anatomical studies is discordant.

In conclusion, the presence of accessory abductor digiti minimi, among other variant anatomical presentations, though appears to be a frequent finding in imaging studies, is scarcely reported as a cause of nerve compression at the distal forearm. Given in consideration the large proportion of muscle variations present in general, non-symptomatic population, caregivers should accomplish to assess muscle variations as a possible cause of nerve compression, in order to improve patient management.

Both patients presented in this paper, had discomfort related to effort and postural changes. During wrist extension, accessory or aberrant muscle bellies might stretch out neurovascular structures in the surroundings of carpal tunnel or ulnar canal, causing compression symptoms.

**REFERENCES**

Acikel, C.; Ulkur, E.; Karagoz, H. & Celikoz, B. Effort-related compression of median and ulnar nerves as a result of reversed three-headed and hypertrophied palmaris longus muscle with extension of Guyon’s canal. *Scand. J. Plast. Reconstr. Surg. Hand Surg.*, 41(1):45-7, 2007.

Bencetxe, P.; Simonet, J.; el Ayoubi, L.; Renard, M.; Attignon, I.; Dacher, J. N. & Thiebot, J. Symptomatic palmaris longus muscle variation with MRI and surgical correlation: report of a single case. *Surg. Radiol. Anat.*, 23(4):273-5, 2001.

Bozkurt, M. C.; Tagil, S. M.; Ozcakar, L.; Ersoy, M. & Tekdemir, I. Anatomical variations as potential risk factors for ulnar tunnel syndrome: a cadaveric study. *Clin. Anat.*, 18(4):274-80, 2005.

Cihák, R. Ontogenesis of the skeleton and intrinsic muscles of the human hand and foot. *Ergeb. Anat. Entwicklungsgesch.*, 46(1):5-194, 1972.

Depuydt, K. H.; Schuurman, A. H. & Kon, M. Reversed palmaris longus muscle causing effort-related median nerve compression. *J. Hand Surg. Br.*, 23(1):117-9, 1998.
Harvie, P.; Patel, N. & Ostlere, S. J. Prevalence and epidemiological variation of anomalous muscles at guyon's canal. *J. Hand Surg. Br.*, 29(1):26-9, 2004.

Jones, D. P. Bilateral palmaris profundus in association with bifid median nerve as a cause of failed carpal tunnel release. *J. Hand Surg. Am.*, 31(5):741-3, 2006.

Morrison, J. T. A palmaris longus muscle with a reversed belly, forming an accessory flexor muscle of the little finger. *J. Anat. Physiol.*, 50(Pt. 4):324-6, 1916.

Natsis, K.; Levva, S.; Totlis, T.; Anastasopoulos, N. & Paraskevas, G. Three-headed reversed palmaris longus muscle and its clinical significance. *Ann. Anat.*, 189(1):97-101, 2007.

Ogun, T. C.; Karalezli, N. & Ogun, C. O. The concomitant presence of two anomalous muscles in the forearm. *Hand (N. Y.)*, 2(3):120-2, 2007.

Ruocco, M. J.; Walsh, J. J. & Jackson, J. P. MR imaging of ulnar nerve entrapment secondary to an anomalous wrist muscle. *Skeletal Radiol.*, 27(4):218-21, 1998.

Ryu, J. Y. & Watson, H. K. SSMB syndrome. Symptomatic supernumerary muscle belly syndrome. *Clin. Orthop. Relat. Res.*, (216):195-202, 1987.

Sánchez Lorenzo, J.; Cañada, M.; Díaz, L. & Sarasúa, G. Compression of the median nerve by an anomalous palmaris longus tendon: a case report. *J. Hand Surg. Am.*, 21(5):858-60, 1996.

Santoro, T. D.; Matloub, H. S. & Gosain, A. K. Ulnar nerve compression by an anomalous muscle following carpal tunnel release: a case report. *J. Hand Surg. Am.*, 25(4):740-4, 2000.

Sañudo, J. R.; Mirapeix, R. M. & Ferreira, B. A rare anomaly of abductor digiti minimi. *J. Anat.*, 182(Pt. 3):439-42, 1993.

Schuurman, A. H. & van Gils, A. P. Reversed palmaris longus muscle on MRI: report of four cases. *Eur. Radiol.*, 10(8):1242-4, 2000.

Server, F.; Miralles, R. C. & Galcerá, D. C. Carpal tunnel syndrome caused by an anomalous palmaris profundus tendon. *J. Anat.*, 187(Pt. 1):247-8, 1995.

Soldado-Carrera, F.; Vilar-Coromina, N. & Rodríguez-Baeza, A. An accessory belly of the abductor digiti minimi muscle: a case report and embryologic aspects. *Surg. Radiol. Anat.*, 22(1):51-4, 2000.

Yildiz, M.; Sener, M. & Aynaci, O. Three-headed reversed palmaris longus muscle: a case report and review of the literature. *Surg. Radiol. Anat.*, 22(3-4):217-9, 2000.

Zeiss, J. & Guilliam-Haidet, L. MR demonstration of anomalous muscles about the volar aspect of the wrist and forearm. *Clin. Imaging*, 20(3):219-21, 1996.

Zeiss, J. & Jakab, E. MR demonstration of an anomalous muscle in a patient with coexistent carpal and ulnar tunnel syndrome. Case report and literature summary. *Clin. Imaging*, 19(2):102-5, 1995.

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