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Radiological Case Report / Caso Clínico

Accessory Abductor Digiti Minimi: A Rare Cause or just an Incidental Finding in Carpal Tunnel Syndrome?

Abdutor Acessório do Dedo Mínimo: Uma Causa Rara de Síndrome do Túnel Cárpico, ou apenas um Achado Incidental?

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Abstract

The accessory abductor digiti minimi (aADM) is the most common accessory hypothenar muscle. Although most frequently asymptomatic, it can be a rare cause of compressive neuropathy due to mass effect over the ulnar nerve, but usually not over the median nerve. However, it may constitute a risk factor for median nerve compression if a close relationship between them is present. We describe two female patients, aged 54 and 60 years, that presented with unilateral carpal tunnel syndrome (CTS). Ultrasound studies (and an MRI in the youngest) showed proximal thickening of the median nerve with distal flattening, and an aADM muscle belly in close relationship with it. Compression of the median nerve by the aADM was surgically confirmed in the youngest patient. To our knowledge, there are no previously described cases of CTS caused by an aADM, only as an incidental finding and possible obstacle during carpal tunnel release.

Keywords

Carpal tunnel syndrome; Accessory abductor digit minimi; Accessory muscles of the hand and wrist.

Resumo

O abdutor acessório do dedo mínimo (aADM) é o músculo hipotenar acessório mais comum. É frequentemente assintomático, mas pode ser uma causa rara de neuropatia compressiva devido a efeito de massa sobre o nervo ulnar, embora habitualmente não sobre o nervo mediano. No entanto, pode constituir um fator de risco para compressão deste, caso uma relação de proximidade entre estas estruturas exista. Descrevemos os casos de duas mulheres com síndrome do túnel cárpico (STC), que efetuaram estudo ecográfico (e a mais jovem também RM), que demonstrou espessamento proximal do nervo mediano, com afilamento distal, e a presença de um ventre muscular do aADM na proximidade do nervo. Foi confirmada cirurgicamente compressão do nervo mediano pelo aADM na doente mais jovem. Tanto quanto sabemos, não existem casos descritos de STC causado por um aADM, apenas como um achado incidental e possível obstáculo durante a cirurgia do túnel cárpico.

Palavras-chave

Síndrome do túnel do carpo; Acessório abdutor mínimo de dígitos; Músculos acessórios da mão e punho.

Introduction

The accessory abductor digiti minimi (aADM) is the most common accessory hypothenar muscle, with a reported prevalence of 22–35%.[1] It extends volarly to the ulnar neurovascular bundle at the Guyon's canal, and can blend with the abductor digiti minimi, or maintain a separate muscle belly adjacent to it, in which case it inserts separately onto the ulnar aspect of the base of the proximal phalanx.[1,2] Several origins of this accessory muscle have been described, the most common from the antebrachial fascia, flexor retinaculum, or the palmaris longus tendon. Although previously believed to be constituted predominantly of a muscular structure, more recently it has been described that in most cases (69.4%) this accessory muscle is constituted by a small muscle belly at the level of Guyon's canal, with a fascial morphology proximal to it.[1]

Such as in the vast majority of cases of accessory musculature, which is not uncommon in the hand and wrist, this variant is most frequently asymptomatic.[1,2,3] However, in rare cases it can be a cause of compressive neuropathy, most commonly due to mass effect on the ulnar nerve. This is more frequent in patients with a predominantly muscular type of the aADM, as the size of the muscle belly is larger when compared to the fascial predominant type. Usually, this accessory muscle is not associated with compression of the median nerve. However, if a close relationship between the accessory muscle belly and this nerve is present, then it may constitute a risk factor for its compression. For example, hypertrophy of the aADM may develop in manual workers, predisposing them to the development of neuropathy.[1,4]

Accessory muscles of the hand and wrist are a possible cause for carpal tunnel syndrome (CTS), but their concomitant presentation has rarely been reported. The ones most often found during carpal tunnel release surgery are palmaris longus, lumbrical muscles, and palmaris profundus. The aADM has only been found in a minority of such cases (0.8%), but causation was not established.[1,5] To our knowledge, there are no cases where a definite causation between an aADM and CTS has been made. Radiologists lack familiarity with this accessory muscle on imaging, which can lead to clinical under-diagnosis. Its identification in imaging studies may avoid incorrect clinical misdiagnosis of a tumor (as they may present as a swelling). It also allows the surgeon to perform a

safe and successful approach to the carpal tunnel, as in most cases accessory muscles are unknown prior to surgery, and may be accompanied by ectopic motor branches and a high risk of iatrogenic injury.[1,3,5]

Case Report

Case 1

A 54-year-old woman presented with CTS symptoms and swelling of the volar aspect of the right wrist. Initial ultrasound study of the wrist demonstrated hypoechoic thickening of the median nerve at the level of the carpal tunnel, with intra-neural hypervascularization. In the ulnar aspect of the median nerve, a close relationship with an accessory muscle that crossed over Guyon's canal volarly and extended into the hypothenar region was seen (Fig. 1). This accessory muscle was seen at the location of the swelling. Further characterization was performed with magnetic resonance (MR) of the wrist and forearm (Fig. 2). The MR showed the known accessory muscle belly, originating at the palmaris longus tendon, just proximal to the carpal tunnel. This accessory muscle belly extended in an ulnar direction, crossing over Guyon's canal volarly, and having a continuous course with the muscle belly of the abductor digiti minimi. This was in keeping with an aADM, predominantly of muscular type. There was a close relationship with the ulnar aspect of the thickened median nerve, which is associated with edema/loss of fat of the carpal tunnel, as well as with palmar bowing of the flexor retinaculum. There was also a close relationship of the aADM with the structures of Guyon's canal, but no abnormal thickening of the ulnar nerve. The palmaris longus showed a normal origin and proximal muscle belly, with normal transition into the tendon fibers at the midportion of the forearm, and normal insertion at the palmar aponeurosis. The patient underwent a carpal tunnel release surgery, which confirmed the presence of an aADM, with muscle fibers originating from the flexor retinaculum, as well as thickening and bluish discoloration of the median nerve in the location where the muscle fibers crossed the nerve (Fig. 3).

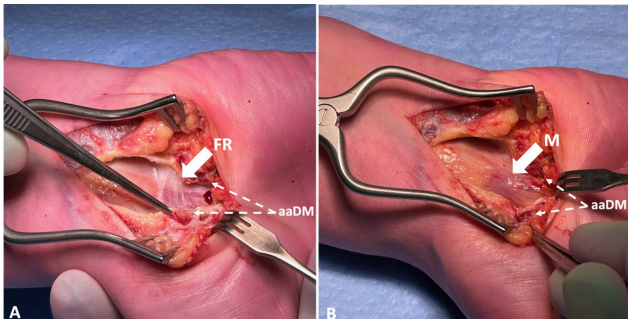

Figure 3 A & B – Photographs taken in the operating room during carpal tunnel release, demonstrating the flexor retinaculum (FR), which had fibers from the aADM originating from it, with the median nerve (M) deeply to it, which was thickened with a bluish discoloration.

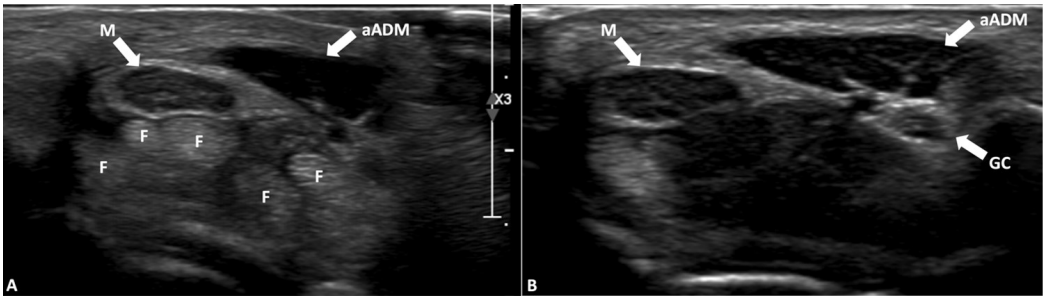

Figure 1 A & B – At the level of the carpal tunnel, hypoechoic thickening of the median nerve (M) is seen. In its ulnar aspect, close relationship with an accessory muscle (later confirmed to be an accessory abductor digiti minimi - aADM) that crossed Guyon's canal (GC) volarly and extended into the hypothenar region. No abnormal thickening of the ulnar nerve. F - flexor tendons.

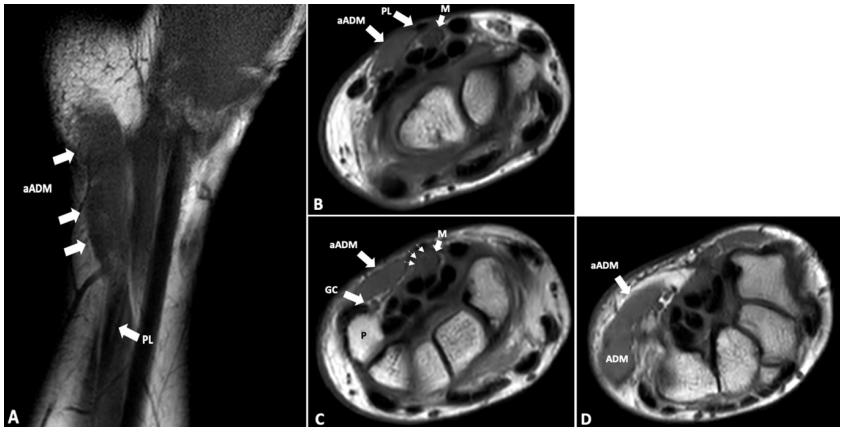

Figure 2 A, B, C & D – T1W coronal (A) and axial sequences (B, C and D, from proximal to distal) of the right wrist, demonstrating the origin of the aADM at the palmaris longus tendon (PL), and close relationship with the median nerve (M), which is thickened and associates with edema/loss of fat of the carpal tunnel, as well as with palmar bowing of the flexor retinaculum (dashed arrows). The aADM crosses volarly to Guyon's canal (GC) and has a continuous course with the muscle belly of the abductor digiti minimi (ADM). P - pisiform.

Case 2

A 60-year-old woman presented with CTS symptoms and pain over the ulnar aspect of the right wrist. An ultrasound study was performed, which showed thickened and hypoechoic appearance of the median nerve (Fig. 4), just before the carpal tunnel, with no associated hyperemic changes. Thin appearance of the palmaris longus tendon could be seen. An aADM was identified, in a close relationship with the median nerve, crossing Guyon's canal volarly, and having a continuous course with the muscle belly of the abductor digiti minimi. There was no continuity of the fibers with the

palmaris longus tendon, and the origin of the aADM seemed to be from the antebrachial fascia. The ulnar nerve at Guyon's canal showed a normal appearance.

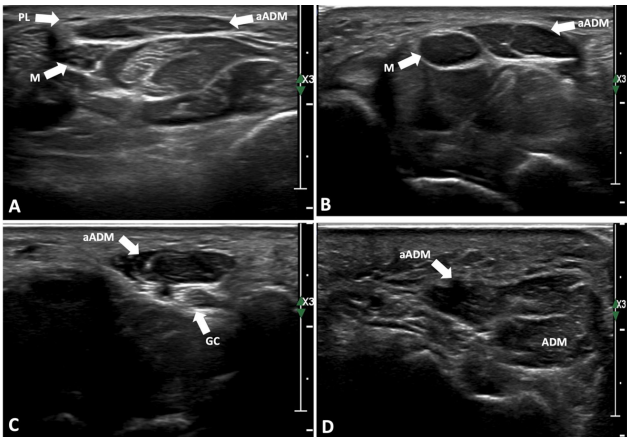

Figure 4 A, B, C & D – Ultrasound of the right wrist, with several images in axial plane progressively from proximal to distal and ulnar. Proximal to the carpal tunnel (A), a thin palmaris longus tendon (PL), normal appearance of the median nerve (M), and an accessory muscle belly in close relationship to these structures. At the carpal tunnel inlet (B), hypoechoic thickening of the median nerve, in close relationship with the accessory muscle belly. This muscle belly extends to the ulnar aspect of the wrist, crossing Guyon's canal (GC) volarly (C), and has a continuous course with the muscle belly of the abductor digiti minimi (ADM) (D). aADM - accessory abductor digiti minimi.

Discussion

Most cases of CTS occur between 36 and 60 years of age, with a female predilection (5:1).[6] In both cases, imaging findings corroborated the clinical suspicion of CTS. Imaging studies, namely ultrasound and MR, are useful in the diagnosis of entrapment neuropathy, particularly in detecting space-occupying lesions (such as ganglion cysts or accessory muscles), inflammatory arthritis, or congenital anomalies as possible causes.[1,5,7] However, in many cases CTS is idiopathic.[7] In the currently reported cases, besides the findings associated with CTS, an aADM in close relationship with the affected median nerve was shown. This accessory muscle has been implicated in Guyon's canal syndrome, namely in cases of predominant muscular type (or type II, according to Rixey, 2021), where the aADM is constituted by a muscle belly that extends all the way from its origin until blending with the abductor digiti minimi.[1,2] In both these patients, a type II aADM was present, but no imaging signs of ulnar neuropathy were evident. However, to our knowledge, there are no cases where a definite causation between an aADM and CTS has been made, and it wasn't clear through imaging alone whether the presence of this muscle was just an incidental finding, or a cause of CTS, despite the proximity of these structures. During carpal tunnel release in Case 1, thickening and bluish discoloration of the median nerve was found at the exact location where fibers from the aADM originated from the flexor retinaculum, corroborating the aADM as the cause of CTS, and, as such, the first confirmed case of CTS due to an aADM, to our knowledge. However, as the patient in case 2 was not yet surgically treated, which constitutes the gold standard for the diagnosis, it is not possible to be certain of the role the aADM has in this case, which constitutes a limitation of this case report. Although it is possible that the aADM's presence is just an incidental finding, we find that the similarity in clinical and ultrasound findings to case 1 raises the possibility of a causal relationship and it reinforces the need for the radiologist to be aware of this anatomical variant, in order to be able to inform the surgeon of a possible etiology for the CTS, and as something to be aware of if surgery is to be performed.

Conclusion

While described as an incidental finding during carpal tunnel release surgery, no studies, to our knowledge, had demonstrated the aADM as a cause for CTS. In this article, we reported two cases: one where a definite association between this accessory muscle and the CTS was demonstrated, and another one with similar clinical and imaging findings. While one of the cases lacks surgical confirmation as of this moment, both can help raise awareness among radiologists and surgeons for this variant, to avoid possible misdiagnosis as a tumor, helping recognize its potential causal role for CTS, and aiding in surgical planning.

Ethical Disclosures / Divulgações Éticas

Conflicts of interest: The authors have no conflicts of interest to declare.

Conflitos de interesse: Os autores declaram não possuir conflitos de interesse.

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Confidentiality of data: The authors declare that they have followed the protocols of their work center on the publication of data from patients.

Confidencialidade dos dados: Os autores declaram ter seguido os protocolos do seu centro de trabalho acerca da publicação dos dados de doentes.

Protection of human and animal subjects: The authors declare that the procedures followed were in accordance with the regulations of the relevant clinical research ethics committee and with those of the Code of Ethics of the World Medical Association (Declaration of Helsinki).

Protecção de pessoas e animais: Os autores declaram que os procedimentos seguidos estavam de acordo com os regulamentos estabelecidos pelos responsáveis da Comissão de Investigação Clínica e Ética e de acordo com a Declaração de Helsínquia da Associação Médica Mundial.

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