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CASE REPORT

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MR imaging of ulnar nerve entrapment secondary to an anomalous wrist muscle

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Abstract MR imaging of an anomalous hypothenar adductor muscle causing isolated deep ulnar nerve branch compression and producing a purely motor neuropathy is presented. The muscle appears to represent a type 1 variant of the intrinsic anomalous hypothenar adductor muscle.

Key words MRI · Anomalous muscle · Ulnar tunnel · Wrist · Compression neuropathy

Introduction

Ulnar nerve compression generally occurs at the level of Guyon's canal (the ulnar tunnel) secondary to a number of causes including repetitive trauma, ganglia [1], lipomas [2], calcinosis [3], false aneurysms [4], fibrous arch anatomic variations [5] and anomalous muscles [6].

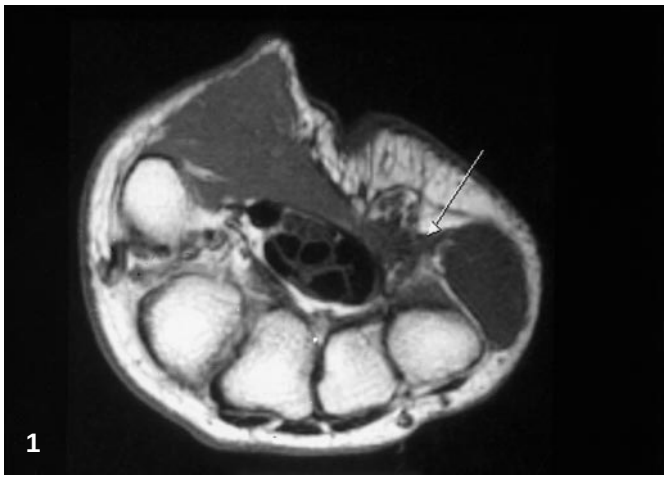
There has been extensive surgical documentation of anomalous muscle-induced ulnar tunnel syndrome or its variations such as the piso-hamate hiatus syndrome in the orthopedic literature with relatively little imaging documentation, particularly MR imaging. A recent report of anomalous muscles causing ulnar tunnel syndrome described the MR imaging characteristics of a superficial "accessory" palmaris longus muscle [7]. Anomalous intrinsic or extrinsic muscles may also be present in the region of Guyon's tunnel without causing clinically significant ulnar nerve compression [8].

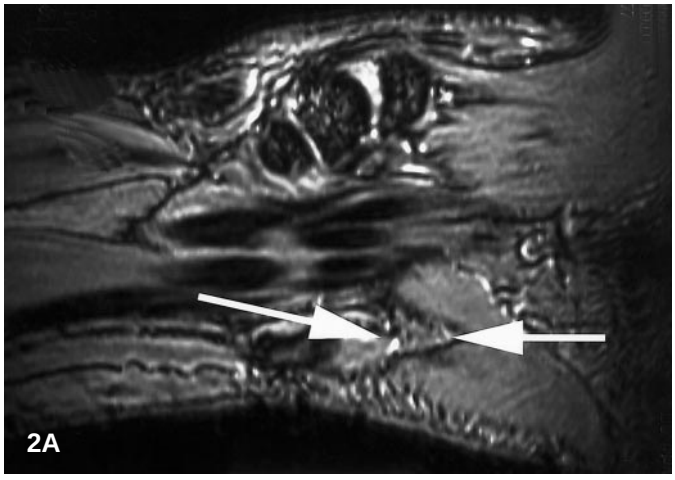
The current case is of interest because it appears to be the first MR imaging report of a deep, intrinsic anomalous hypothenar adductor muscle causing isolated deep ulnar nerve compression and producing a neuropathy that was purely motor in nature.

Case report

A 59-year-old woman presented to the orthopedic service with an unusual isolated neuropathy of the motor branch of the ulnar nerve in her left hand. She reported a spontaneous onset of atrophy in her hand without any antecedent trauma. Physical examination and electrodiagnostic studies confirmed motor weakness, with wasting of the interosseous and intrinsic muscles and isolated motor nerve involvement of the ulnar nerve in the hand.

Plain radiographs of the left wrist were unremarkable. T1-weighted spin echo MR images show the position of the anomalous muscle with respect to the ulnar tunnel and the adjacent opponens, abductor, and flexor digiti minimi muscles (Fig. 1). Note the mass with a signal intensity of muscle, which crosses the distal aspect of Guyon's canal distal to the hook of the hamate. Three-dimensional gradient-recalled echo images were reconstructed using a General Electric (GE) SPARCstation in order





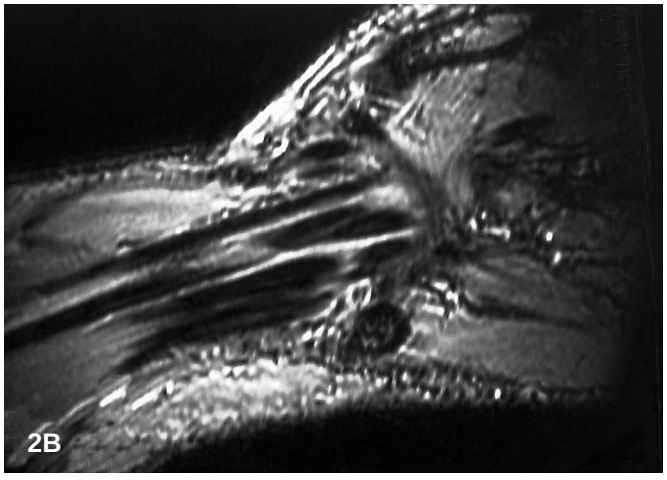


Fig. 1 Axial T1-weighted spin echo (467/17 ms:TR/TE) image of the left wrist at the level of the anomalous muscle (*white arrow*) just distal to the hook of the hamate (General Electric 1.5-T magnet; FOV=10×10 cm; 256×256 matrix; 1.5 NEX)

Fig. 2 **A** Three-dimensional reconstructed coronal oblique gradient echo (17.6/38/15:TE/TR/flip angle) image of the left wrist obtained from a General Electric SPARCstation, demonstrating the intrinsic anomalous muscle extending from the hypothenar muscle group toward the transverse carpal ligament (*between arrows*). General Electric 1.5-T magnet; FOV=10×10 cm; 256×128 matrix; 1.5 NEX. **B** Comparison three-dimensional reconstructed coronal oblique gradient echo (17.6/38/15:TE/TR/flip angle) image of the normal right wrist

Fig. 3 Intraoperative photograph showing surgical exposure of the intrinsic muscle (hemostat is under the anomalous muscle)

better to define the anatomic relationship of the anomalous muscle with respect to the intrinsic hypothenar muscles (Fig. 2A). Oblique coronal images show the relatively deep, transverse course of the anomalous muscle between the abductor/flexor hypothenar muscle complex and the transverse carpal ligament. The muscle lay distal to the hook of the hamate and coursed over the deep motor branch of the ulnar nerve branch in a transverse orientation between the opponens digiti minimi and the transverse carpal ligament.

Left wrist exploration and ulnar nerve decompression were performed. An intraoperative photograph depicts the transversely oriented anomalous muscle (Fig. 3). The muscle coursed from the hypothenar muscle mass, compressing the deep branch of the ulnar nerve before attaching to the transverse carpal ligament. The muscle was divided in two to effect an adequate decompression. The patient experienced a palpable increase in her strength 6 days following surgery, and at 3 months postoperation she regained full muscle bulk of her interossei and intrinsic muscles.

Discussion

We report on what appears to be the first MR imaging diagnosis of an intrinsic anomalous hypothenar muscle causing a compressive neuropathy in the ulnar tunnel. The anomalous muscle caused isolated deep ulnar nerve branch neuropathy, which was purely motor in nature. The imaging findings were confirmed at operation.

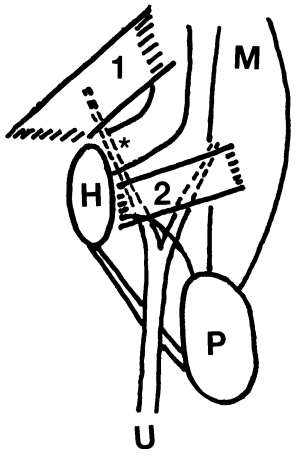


Fig. 4 Diagrammatic depiction of the two intrinsic muscles described by Failla [6] (*H* hook of the hamate, *P* pisiform, *U* ulnar nerve proximal to the anomalous muscles which contains sensory and motor components, *M* hypothenar muscle group, * deep ulnar nerve with pure motor fibers – the more medial branch is the sensory branch, *1* type 1 anomalous muscle which corresponds to our case, *2* type 2 anomalous muscle)

Previous reports of anomalous muscles in the wrist have been published in the radiologic literature. However, to our knowledge, only one well-documented MR imaging report of a neuropathy induced by an anomalous muscle has been reported [8]. That case differed from ours in that the aberrant muscle was extrinsic, originating from the palmaris longus tendon and ulnar antebrachial fascia before bifurcating and entering both the carpal and ulnar tunnels to compress both the median nerve and sensory branches of the ulnar nerve. The authors state that the carpal tunnel accessory component is a true variant or accessory of the palmaris longus muscle, while the ulnar component may represent an accessory to the abductor or flexor digiti minimi.

The aberrant muscle in our patient is radiographically and surgically documented to be a purely intrinsic variant of the hypothenar region according to Failla's recent classification [6]. He describes two types of intrinsic anomalous muscles, which are diagramatically depicted in Fig. 4. We believe that our case is most closely analogous to the type 1 aberrant intrinsic muscle. This muscle is ulnarly attached to the hypothenar muscle mass and radially to the transverse carpal ligament near the distal aspect of Guyon's canal such that a pure motor paresis is created by compression. In contrast, the type 2 variant is more proximally situated and would cause both a sensory and motor neuropathy.

Anomalous muscles of the wrist have been reported in the anatomic and orthopedic literature since 1944, when Reimann demonstrated a 3% prevalence of an accessory palmaris longus muscle in cadaveric dissections [9]. This finding was corroborated by Sanudo et al. in a more recent cadaveric study in 1993 [10]. In contrast, more recent reports in the orthopedic and radiologic literature have suggested a much higher prevalence. Zeiss et al. reported a series of 36 wrists of asymptomatic volunteers in which 25% demonstrated anomalous muscles, all of which inserted with the abductor digiti minimi muscle [8]. Of these, 67% were bilateral findings, 60% of the anomalous muscles originated proximal to the ulnar tunnel, while 40% originated within the wrist. Dodds et al. published a similar cadaveric study, which demonstrated a 22% prevalence of anomalous wrist muscles with 46% bilaterality [11]. The anomalous muscle slips also were found to insert with the abductor digiti minimi muscle.

Although anomalous wrist muscles appear relatively common, only a few cases of ulnar neuropathy secondary to an anomalous variant have been reported. This suggests that despite the relatively common finding of an anomalous muscle, ulnar nerve compression is rare.

Several different anomalous muscles resulting in ulnar nerve compression in the wrist have been described. The distinction between extrinsic and intrinsic variants is difficult because some have muscle bellies that travel from the forearm to the hand while others do not, origins and insertions vary and nomenclature in the literature has not been uniform. Examples include extrinsic muscles such as the anomalous flexor digitorum superficialis muscle [12], accessory abductor digiti minimi muscle [10, 13], anomalous flexor digiti minimi muscle [14, 15] anomalous flexor carpi ulnaris muscle [16], accessory palmaris longus muscle [17], and intrinsic muscles such as the accessory palmaris brevis muscle [18], anomalous flexor digiti minimi muscle [19], and most recently, anomalous hypothenar adductor muscles [6], of which this case is an example of a type 1 variant.

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