A Conservatively Managed Anatomical Variant of the Flexor Digitorum Superficialis Muscle in the Hand

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Abstract

Anomalous flexor digitorum superficialis muscles in the hand are an uncommon phenomenon, and therefore present challenges in diagnosis and management. We report a case of a 16-year-old girl presenting with a painful, slowly enlarging palmar swelling. The swelling was investigated with ultrasound and magnetic resonance imaging, and was found to be an anomalous muscle belly of the flexor digitorum superficialis muscle. After careful consideration, multidisciplinary discussion, and thorough imaging, the patient was treated successfully without surgical exploration or excision, in comparison to previously reported cases. The patient was pain free and had no concerns at 8-month follow-up, demonstrating the value of conservative management in these cases.

Keywords
- flexor digitorum superficialis
- anatomic variants
- magnetic resonance imaging
- ultrasound

Case Report

A 16-year-old right-handed girl presented to the hand clinic with a 6-month history of swelling to the right palm. The mass had been slowly increasing in size, and although occasionally painful, there was no functional impairment. On examination, a soft swelling was noted over the tendon sheath to the right index and middle fingers distal to the thenar eminence. The swelling moved with flexion of the proximal interphalangeal (PIP) joint to the index finger. There was no neurovascular dysfunction. The swelling had been investigated before referral to us via ultrasonography (►**Fig. 1**), revealing a solid lesion that was thought to possibly be a giant cell tumor, although on review by our musculoskeletal radiologists it was actually felt to be muscular in nature. An urgent magnetic resonance imaging (MRI) scan was arranged to further assess the mass.

MRI revealed a swelling that was isointense to neighboring muscle in all sequences, again suggestive of a muscular origin (►**Fig. 2**). The patient was therefore diagnosed with an anomalous flexor digitorum superficialis (FDS) muscle in the palm. At follow-up, there was still residual swelling and aching, causing the patient to take time off school. The patient was keen to have the swelling either debulked or excised, but was advised that the muscle was providing sole flexor action to her index finger PIP joint, and it was therefore unwise to interfere with the muscle surgically. With careful reassurance, the patient was managed conservatively, accepting that the aching in her palm was likely due to an increased awareness of the muscle. At further 8-month follow-up, her pain had resolved, with no change in the mass. She was therefore discharged, on the proviso that we would like to see her again should there be any change in the size, shape, or consistency of the mass.

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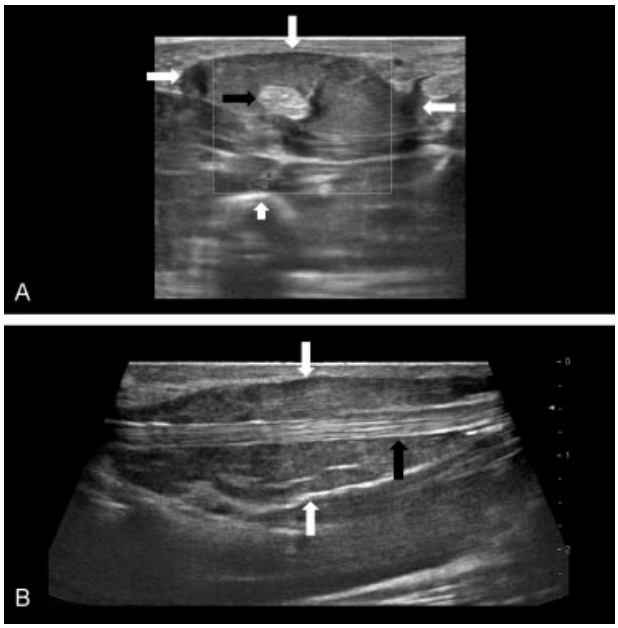

Fig. 1 Axial (**A**) and sagittal (**B**) sonographic images of the right index finger showing a hypoechoic solid mass lesion (long white arrows) surrounding the FDP tendon (black arrows). The FDS tendon is notably absent. The short white arrow indicates the second metacarpal.

Discussion

Anomalous palmar FDS muscle bellies are uncommon, and therefore present a diagnostic challenge. The majority of patients present in their teenage years or 20s with a slowly enlarging mass in the palm,[1] which may also cause pain[2] and functional compromise.[3] The index finger of the right hand is most commonly affected, with a female predisposition.[1] Carpal tunnel syndrome is also reported as a presenting feature, which may or may not be accompanied by a palmar mass.[4] There have also been reports of patients presenting with triggering of the wrist and finger[5] and rupture of the associated flexor digitorum profundus (FDP) tendon.[6] On examination, a soft palmar mass that becomes more firm and moves proximally with finger flexion is usually found, although these findings are not ubiquitous.

The genetic development of these anomalies has been discussed recently by Bhat et al,[1] and it is thought they may be atavistic in nature. The authors also propose an updated classification system for these anomalies, allowing categorization of the full range of anatomical variants and acknowledging their phylogenetic origin (►**Table 1**). Normally, the FDS is described as having two heads: a humeroulnar head, arising from the medial epicondyle of the humerus, the ulnar collateral ligament of the elbow, and

Table 1 Updated classification of palmar FDS anomalies (adapted from Bhat et al[1])

Type I: "Amphibian" type, with an intrinsic FDS brevis—bears a similarity to the primitive condition seen in the manus of amphibians:
• Type Ia: Complete replacement of the normal FDS (longus) tendon with FDS brevis
• Type Ib: FDS brevis exists alongside the tendon of FDS (longus)
Type II: Digastric type with an additional muscle belly in the hand:
• Type IIa: FDS tendon interrupted with a muscle belly
• Type IIb: An anomalous muscle belly lying alongside the FDS tendon in the hand
Type III: Distal extension of the FDS muscle belly into the palm

Abbreviation: FDS, flexor digitorum superficialis.

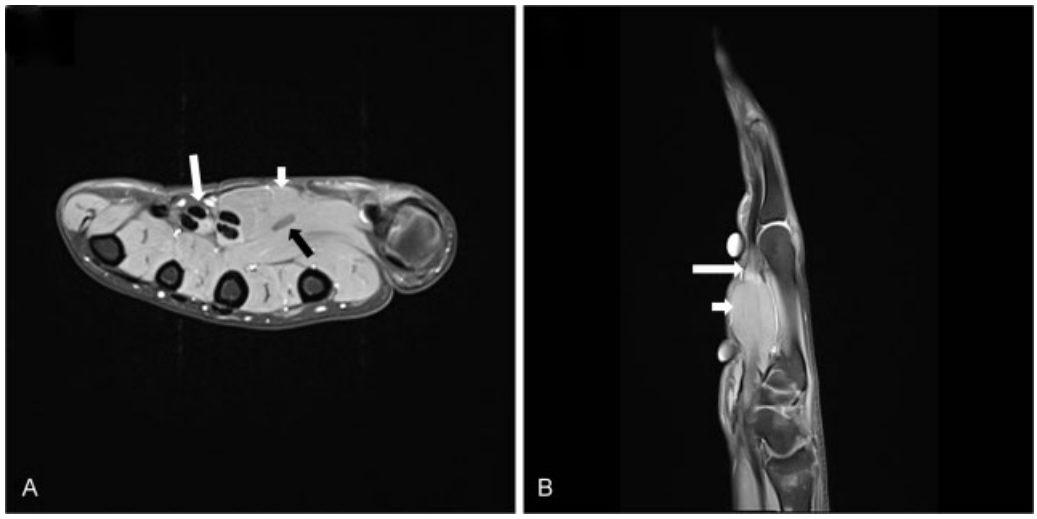

Fig. 2 Axial (**A**) and sagittal (**B**) T1 fat saturated post-gadolinium images of the right hand. The clinically palpable lump is seen as a soft tissue mass (short white arrows) which is isointense to neighboring muscles, surrounding the FDP tendon to the index finger (black arrow). The FDS tendon to the index finger is absent, with the normal arrangement of FDS and FDP tendons to the ring finger indicated by the long white arrow in image a. The long white arrow in image b indicates the residual FDS tendon arising from the muscle and attaching with FDP at the level of the metacarpophalangeal joint (A1 pulley).

the coronoid process of the ulna, and a radial head, arising from the anterior body of the radius. In the distal forearm, these muscles form four tendons to the four fingers, which split to insert onto the radial and ulnar aspects of the proximal half of the middle phalanx of each finger.[7]

In this case, the anomalous muscle belly originated just proximal to the distal crease of the flexor retinaculum, replacing the normal FDS longus tendon, and became tendinous again at the level of the A1 pulley (►**Fig. 2B**), where the anomalous FDS brevis tendon joined the FDP tendon, before inserting normally at the proximal half of the middle phalanx of the index finger. Using Bhat et al's classification system, our case demonstrates the Type IIa variant.

The correct choice of investigation in these palmar masses is essential to guide management and highlight sinister differentials, and varies between reports, with plain film radiography, ultrasound, computed tomography, and MRI all used to varying extents. The imaging of these pseudotumors should follow the principles for all upper extremity tumors, as previously outlined by Peterson et al.[8] Initial investigation with plain film radiographs may be performed, and although these will not provide a diagnosis of a muscular anomaly, they can help rule out other differentials for a soft tissue swelling.

Sonography may also be considered as a first-line investigation when assessing these masses, and is rapidly accessible, cost-effective, and noninvasive.[9] Ultrasound can be used to define the size, location, and extent of a mass, and can differentiate between solid and cystic lesions. On ultrasound, anomalous muscles are hypoechoic, with fibroadipose septa and a striated appearance.[10] Ultrasound also allows dynamic investigation of a mass, and a change in shape with joint movement is particularly suggestive of an anomalous muscle.

MRI is often considered the gold standard when assessing tumors of the hand. In comparison to ultrasound, MRI offers a more accurate diagnosis of the tumor type, through analysis of both the position and tissue character of the tumor.[11] Anomalous muscles are isointense to normal muscles within the hand. For this reason, they are often overlooked as they do not stand out as abnormal. It is therefore important to analyze the origins and insertions of suspected anomalous muscles, while observing their relation to the surrounding anatomy.

The majority of previously reported anomalous FDS muscles in the palm have been managed surgically. Indeed, in a recent review, of the 31 out of 37 cases that had their treatment detailed, all underwent at least some degree of surgical intervention.[1] Surgical treatments have included simple exploration, partial excision, and decompression. However, as demonstrated in our case, surgical intervention may not be required to achieve satisfactory results. Our management included thorough imaging with close correspondence between hand surgeons and musculoskeletal radiologists, and regular follow-up with careful reassurance, sparing the patient an operation. The patient had a positive outcome and her symptoms had resolved themselves over time with no further concerns.

Conclusion

We present a case that illustrates the challenges in diagnosing and managing anatomical variants of the FDS muscle. The patient was treated successfully without the need for surgical intervention, in comparison to the majority of previously reported cases that have undergone surgical exploration or excision. We believe that conservative management is a valid option when treating these masses, requiring meticulous use of imaging and multidisciplinary discussion between musculoskeletal radiologists and hand surgeons.

Conflict of Interest
None.

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References

1 Bhat W, Davis CR, Akali A, Kay SP, Roberts AM. Painful, palpable and pathological: anomalous flexor digitorum superficialis brevis in the palm, comparative anatomical context, and an updated classification of anomalies of the flexor digitorum superficialis. J Hand Surg Eur Vol 2014;39(1):101–106
2 Grant SD, Due TM. Anomalous flexor digitorum superficialis presenting as a painful palmar mass: a case report. Clin Anat 1995;8(6):432–433
3 Stephens N, Marques E, Livingston C. Anomalous flexor digitorum superficialis muscle belly presenting as a mass within the palm. Can J Plast Surg 2007;15(1):44–46
4 Unglaub F, Wolf MB, Dragu A, Horch RE. Bilateral atypical muscles causing acute bilateral carpal tunnel syndrome in recreational climber. Arch Orthop Trauma Surg 2010;130(1):37–40
5 Bou-Merhi JS, Harris PG, Brutus JP. "Trigger finger at the wrist" due to anomalous flexor digitorum superficialis muscle belly within the carpal tunnel. Chir Main 2007;26(4–5):238–242
6 Lillmars SA, Bush DC. Flexor tendon rupture associated with an anomalous muscle. J Hand Surg Am 1988;13(1):115–119
7 Schmidt HM, Lanz U. Surgical Anatomy of the Hand. Stuttgart: Thieme; 2004
8 Peterson JJ, Bancroft LW, Kransdorf MJ. Principles of tumor imaging. Eur J Radiol 2005;56(3):319–330
9 Bianchi S, Della Santa D, Glauser T, Beaulieu JY, van Aaken J. Sonography of masses of the wrist and hand. AJR Am J Roentgenol 2008;191(6):1767–1775
10 Nguyen V, Choi J, Davis KW. Imaging of wrist masses. Curr Probl Diagn Radiol 2004;33(4):147–160
11 Teh J, Whiteley G. MRI of soft tissue masses of the hand and wrist. Br J Radiol 2007;80(949):47–63