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### **Accessory muscles of the extremities**

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## **Abstract**

Accessory muscles and variations are not uncommon at the upper and lower extremity.

They are often overlooked as they are asymptomatic and present as incidental findings on imaging.

However, they may present as a soft tissue swelling, thereby mimicking soft tissue tumors.

Other symptoms are attributed to impingement on neurovascular structures and to exercise-related pain.

Thorough knowledge of the anatomy, systematic imaging analysis and the awareness of it are the clues to the correct identification.

On ultrasound, accessory muscles have a similar echotexture as other muscles, whereas the signal intensity on **Magnetic Resonance imaging** is similar to muscle. Because of the intrinsic contrast with the adjacent intermuscular fat, accessory muscles are best depicted on MR images without fat suppression.

This article provides a short overview of the anatomy of most prevalent accessory muscles of the upper and lower limb and its potential pathogenic nature.

## **Key-words**

► Accessory Muscle ► Variants ► Ultrasonography ► Magnetic Resonance Imaging

## **Introduction**

### **General Clinical Presentation**

Accessory muscles are distinct structures different from the usual musculature described in anatomy textbooks of the human body.<sup>1</sup> Most accessory muscles are incidental findings on imaging done for other clinical indications. However, they may become symptomatic because they present as a soft tissue mass. In addition, they may cause compression or displacement of adjacent structures, including nerves, vessels and tendons or induce exercise-related pain due to a focal compartment syndrome or inadequate blood supply.<sup>1,2</sup>

The clinical presentation is summarized in ► **Table 1**.

### **Imaging Features**

On *plain radiography*, accessory muscles may cause obliteration of fat planes, but they are rarely diagnostic because of its low soft tissue contrast. A typical example is obliteration of Kager's fat pad by an Accessory Soleus muscle (**Fig. 1 A**).

On *ultrasound (US)*, the echotexture of accessory muscles is identical to other muscles and they behave like muscles with dynamic manoeuvres and contraction. US is also the preferred technique for assessment of exercise-induced pain.

*Computed Tomography (CT)* may show a soft tissue lesion with similar attenuation of the muscle. Due to radiation constraints, CT is rarely used for evaluation of accessory muscles.

Moreover, the intrinsic contrast resolution is less than on *Magnetic Resonance ~~Imaging~~ imaging (MRI)*.

The signal intensity of accessory muscles is similar to muscle on all MR pulse sequences.

Whereas, most true soft tissue neoplasm are of increased signal intensity on fat-suppressed T2-weighted images (FS T2-WI), accessory muscles are barely distinguishable from the surrounding structures when FS is applied ( ▶ **Fig. 1 B**).

Therefore, because of their intrinsic contrast with the adjacent intermuscular fat, accessory muscles are best identified on T1-weighted images without FS ( ▶ **Fig. 1 C**).

Both US and MRI may be used to evaluate the mass effect on the adjacent structures.

### **Accessory muscles of the upper limb**

The most clinical significant accessory muscle of the upper limb are summarized in ▶ **Table 2**.

#### **Elbow and forearm**

##### ***Anconeus Epitrochlearis***

- Prevalence: 1-34%<sup>2</sup>, may be bilateral.<sup>3</sup>
- Synonyms: Accessory Anconeus.
- Origin: medial epicondyle.<sup>1</sup>
- Insertion: olecranon.<sup>1</sup>
- Potential symptoms: ulnar nerve entrapment.<sup>4</sup> On MRI, the compressed ulnar nerve may be swollen and of high signal on T2-WI ( ▶ **Fig. 2**). US shows a swollen and hypoechoic nerve.<sup>1</sup> Elbow flexion may be useful to demonstrate dynamic impingement of the muscle on the ulnar nerve<sup>1</sup>.
- Differential diagnosis: axial T1-WI without FS at the level of the cubital tunnel is useful to distinguish the Anconeus Epitrochlearis from the medial head of the Triceps and the ulnar head of the Flexor Carpi Ulnaris, which is located more distally.<sup>2</sup>

##### ***Gantzer muscle***

- Prevalence: common, may be bilateral.<sup>1</sup>
- Synonyms: Accessory Head of the Flexor Pollicis Longus.
- Origin: medial epicondyle and/or coronoid process or rarely the Flexor Digitorum Superficialis.
- Insertion: ulnar border of the Flexor Pollicis Longus ( ▶ **Fig. 3**).<sup>5</sup>
- Potential symptoms: potential entrapment of the median or anterior interosseous nerve, particularly in case of hypertrophy of the muscle.<sup>5</sup> MRI may show denervation edema, atrophy and fatty infiltration of the Flexor Pollicis Longus, Flexor Digitorum Profundus and Pronator Teres due to anterior interosseous nerve entrapment.<sup>1</sup>

#### ***Accessory brachialis***

- Prevalence: unknown.
- Origin: medial midshaft of the humerus and the medial intermuscular septum.
- Insertion: common tendon of the antebrachial flexor compartment muscles.<sup>2,6</sup>
- Potential symptoms: potential entrapment of the median nerve.<sup>6</sup>

#### ***Anomalous Palmaris Longus***

- Prevalence: variants in the muscular anatomy of the Palmaris Longus are seen in 9%.<sup>7</sup>
- Origin: medial epicondyle.<sup>1</sup>
- Insertion: proximal edge of the flexor retinaculum and the palmar fascia.<sup>1</sup> Most often the muscle belly is located proximally and the tendinous portion is located distally. In a digastric variant, the muscle belly is located centrally with discrete proximal and distal tendons. In a reversed Palmaris, the muscle belly is located distally at the forearm with a long proximal tendon.<sup>7</sup> A duplicated Palmaris Longus consists of a central tendon lying between two muscle bellies ( ▶ **Fig. 4**).<sup>2</sup>
- Potential symptoms: Forearm soft-tissue mass or compressive neuropathy of the median or ulnar nerve.<sup>2</sup>

### Wrist and hand

#### ***Accessory Abductor Digiti Minimi***

- Prevalence: 24-47%.<sup>2,8</sup>
- Origin: antebrachial fascia or Palmaris Longus.<sup>1</sup>
- Insertion: Abductor Digiti Minimi and partially on the ulnar aspect of the base of the proximal phalanx of the fifth finger.<sup>1</sup> The Accessory Abductor Digiti Minimi forms the roof of the Guyon's canal and usually lies anterior to the ulnar neurovascular bundle ( ▶ **Fig. 5**).<sup>9</sup> Sometimes the muscle may pass superficial to the artery and deep to the nerve.<sup>1</sup>
- Potential symptoms: may cause ulnar neuropathy by squeezing the ulnar nerve against the pisohamate ligament during contraction. Axial US and MRI are best suited to evaluate the muscle thickness and its effect on the underlying ulnar nerve at the Guyon's canal.  
Whereas the normal nerve has a rounded shape, flattening may occur due to compression by the Accessory Abductor Digiti Minimi. During abduction of the fifth finger, US may demonstrate increased muscle thickness and more pronounced impingement.<sup>1,8,9,10,11,12</sup>

#### ***Anomalous Flexor Digitorum Superficialis of the Index***

- Prevalence: unknown.
- Origin: along with the Flexor Digitorum Superficialis muscle with the accessory muscle belly for the index finger. The location of the muscle belly may be variable, either be located proximally at the forearm, distally at the palm of the hands ( ▶ **Fig. 6**) or may be digastric (including a proximal and distal belly).<sup>2,13,14</sup>
- Insertion: a muscle belly located at the palm usually inserts at the A1-pulley of the index finger.

- Potential symptoms: A distal located muscle belly may cause pain and discomfort during movements of the index finger, whereas a more proximal located muscle belly may cause median neuropathy<sup>15</sup> or chronic flexor tenosynovitis at the carpal tunnel.<sup>16</sup>

#### ***Palmaris profundus***

- Prevalence: unknown.
- Origin: variable, either proximal or mid-third of the radius (type 1), the fascia of the Flexor Digitorum Superficialis (type 2) or the distal ulna (type 3).
- Insertion: runs as a tendon beneath the flexor retinaculum in the carpal tunnel, fans out and attaches either into the deep surface of the distal flexor retinaculum or the palmar aponeurosis.<sup>2,17</sup>
- Potential symptoms: may cause compression of the median nerve. Rarely the Palmaris Longus tendon may adhere to the median nerve, share a common sheath or may penetrate the median nerve and cause a split in the nerve at the distal forearm and wrist.<sup>1</sup>

#### ***Extensor Digitorum Brevis Manus***

- Prevalence: 1-3%<sup>18,19</sup>, may be bilateral.<sup>2</sup>
- Origin: distal radius or distal wrist capsule deep to the extensor retinaculum.<sup>1,2</sup>
- Insertion: extensor hood of the second or third finger by a tendon or a slip ( ▶ **Fig. 7** ).<sup>1,2</sup>
- Potential symptoms: may mimic a soft tissue mass or may cause exercise-related pain or tenosynovitis.<sup>1</sup>
- Differential diagnosis: The Extensor Digitorum Brevis Manus should be differentiated from a far distal position of the Extensor Digitorum ( ▶ **Fig. 8** ).

#### ***Accessory Extensor Carpi Radialis Muscle***

- Prevalence: Variable among subtypes. The reported prevalence of an accessory ECR intermedius ranges between 12-24%.<sup>20,21,22</sup>



- Synonyms and subtypes: A variety of accessory musculature related to ECR muscles has been reported in the literature, including accessory ECR Brevis, ECR Intermedius, and ECR Accessorius muscles.<sup>2,22</sup>
- Origin: the accessory ECR Brevis arises from the medial aspect of the normal ECR Brevis.<sup>23</sup> An ECR intermedius muscle originates between the origins of the ECR Longus and ECR Brevis.<sup>2</sup> The ECR Accessorius muscle is a rare accessory muscle that originates from the ECR Longus.
- Insertion: variable insertions of the accessory ECR brevis have been described, including the base of the second metacarpal, the base of the third metacarpal, and the dorsal digital expansion of the index finger. ECR intermedius muscle inserts onto the base of the second or third metacarpal or the Abductor Pollicis Longus muscle.<sup>2</sup> The ECR Accessorius inserts into the Abductor Pollicis Longus or Abductor Pollicis Brevis muscle.<sup>2</sup>
- Potential symptoms: may manifest clinically as a soft-tissue mass in the forearm or may mimic a split tear of the ECR tendons in the second extensor tunnel ( ▶ **Fig. 9**).<sup>2</sup>

### **Accessory muscles of the lower limb**

The most clinical significant accessory muscle of the lower limb are summarized in ▶ **Table 3**.

#### **Knee**

Accessory muscles are relatively rare about the knee joint.

#### ***Tensor Fasciae Suralis***

- Prevalence: rare, exact prevalence unknown.<sup>24</sup>
- Synonyms : Ischioaponeuroticus.
- Origin: Semitendinosus muscle and/or medial head of the Gastrocnemius.<sup>25</sup>

- Insertion: variable, either posterior fasciae of the leg, medial head of Gastrocnemius or superficial part of the Achilles tendon.<sup>25</sup>
- Potential symptoms: palpable popliteal mass, mimicking soft tissue tumor or Baker cyst<sup>24</sup>, potential vascular compression of the popliteal vein or artery and nerve compression of the sciatic, tibial, and sural nerves has been suggested as well.<sup>26</sup>

#### ***Accessory Semimembranosus***

- Prevalence: unknown.
- Origin: distal part of the Semimembranosus.<sup>27</sup>
- Insertion: medial head of the Gastrocnemius.<sup>27,1,2</sup>
- Potential symptoms: palpable popliteal mass, mimicking a soft tissue tumor.

#### ***Accessory Gastrocnemius***

- Prevalence: 2.0- 5.5%.<sup>28</sup>
- Synonyms and subtypes: third head of the gastrocnemius, medial and lateral accessory head.
- Origin: posterior femur ( ▶ **Fig. 10**).
- Insertion: may fuse distally with the other Gastrocnemius muscles.
- Potential symptoms: palpable popliteal mass, mimicking soft tissue tumor or neurovascular entrapment.<sup>29</sup>

#### ***Accessory Popliteus***

- Prevalence: rare, exact prevalence unknown.<sup>30</sup>
- Synonyms: Popliteus Biceps, double-headed Popliteus.<sup>1</sup>
- Origin: common origin with lateral gastrocnemius at the lateral femoral condyle or fabella.<sup>1</sup>
- Insertion: posteromedial capsule of the knee.<sup>1</sup>

- Potential symptoms: while crossing obliquely within the popliteal fossa, it may cause entrapment of the neurovascular structures from either anteriorly or posteriorly.<sup>30,2,1</sup>

### Ankle

Compared to knee joint, accessory muscles are much more frequent about the ankle joint.<sup>31,1</sup>

### ***Accessory Soleus***

- Prevalence: variable range from 0.7-10%, may be bilateral.<sup>2,31</sup>
- Origin: variable including either the posterior aspect of the tibia, deep aponeurosis of the soleus muscle or direct insertion of the soleus muscle.<sup>31</sup>
- Insertion: Variable. Based on its distal insertion 5 type have been reported.<sup>1,32,33,34</sup>
  - Type 1: Achilles tendon, 1-2 cm superior to the calcaneus.
  - Type 2: Superior aspect of the calcaneus, anteromedially to the Achilles tendon as a direct muscular insertion.
  - Type 3: Superior aspect of the calcaneus, anteromedially to the Achilles tendon as a short tendon.
  - Type 4: Medial aspect of the calcaneus as a direct muscular insertion ( ▶ **Fig. 1**).
  - Type 5: Medial aspect of the calcaneus as a tendinous insertion.
- Potential symptoms: Posteromedial mass of the ankle which may become stiff and tense in standing or tiptoe position<sup>35</sup> and exercise-related pain during sports (posterior impingement syndrome).<sup>31</sup>
- Differential diagnosis: Low myotendinous junction of the Flexor Hallucis Longus Muscle distal to the level of the posterior talocrural joint.<sup>31</sup>

### ***Peroneus tertius***

- Prevalence: very frequent ; range 40-93%.<sup>1,31</sup>
- Origin: mid-distal fibular diaphysis and the lateral aspect of the Extensor Digitorum Longus muscle.<sup>31</sup>

- Insertion: Base of the fifth or less frequent the fourth metatarsal. <sup>1,31</sup>
- Potential symptoms: may simulate an anterolateral mass at the ankle ( ▶ **Fig. 11**).<sup>31</sup>

#### ***Peroneus Quartus***

- Prevalence: variable ; range 6.6-26%. <sup>2,31,36</sup>
- Synonyms: differ along with the distal insertion: Peroneocalcaneus Externum (insertion at the retrotrochlear eminence), Peroneocuboideus (insertion at the cuboid), Peroneoperoneolongus (insertion at the Peroneus Longus).<sup>37</sup>
- Origin: Peroneus Brevis or more rarely the Peroneus Longus or the posterior aspect of the fibula. <sup>1,31</sup>
- Insertion: most often at the retrotrochlear eminence, more rarely at the cuboid, Peroneus Longus or inferior retinaculum. <sup>36,31,37</sup>
- Potential symptoms: may simulate a retrotrochlear mass lesion clinically ( ▶ **Fig. 12**) or may cause local friction with the Peroneus Brevis and Longus and predispose to instability, snapping, tenosynovitis and longitudinal splitting of the Peroneus Brevis. <sup>31,1,38,39,40,41,42</sup>
- Differential diagnosis: The Peroneus Quartus should be distinguished from a low-lying Peroneus Brevis based on the detection of a distinct distal tendon diverging from the Peroneus Brevis. <sup>31,2</sup>

#### ***Flexor Digitorum Accessorius Longus***

- Prevalence: 2- 8%. <sup>2,31</sup>
- Origin: variable, may originate from the Flexor Hallucis Longus muscle, tibia or fibula. <sup>31,37</sup>
- Insertion: Quadratus Plantae or Flexor Digitorum Longus tendon ( ▶ **Fig. 13**).<sup>31,37</sup>
- Potential symptoms: mass lesion at the posteromedial ankle or tarsal tunnel syndrome. <sup>37,43</sup>

#### ***Peroneocalcaneus internus***

- Prevalence: 1-8%.<sup>2,31</sup>
- Origin: lower third of the medial aspect of the fibula.<sup>1,31</sup>
- Insertion: small tubercle on the medial aspect of the calcaneus.<sup>1,31</sup>
- Potential symptoms: mass lesion at the posteromedial ankle, limitation of movement, posterior impingement syndrome and Flexor Hallucis Longus tenosynovitis.<sup>37,44</sup>
- Differential diagnosis: compared to the Flexor Digitorum Accessorius Longus, there is a distinct distal insertion at a small calcaneal tubercle.<sup>1,31</sup>

#### ***Tibiocalcaneus internus***

- Prevalence: unknown.
- Origin: medial crest of the tibia.<sup>31,37</sup>
- Insertion: medial aspect of the calcaneus 1 to 4 cm anterior to the Achilles tendon.<sup>31,37</sup>
- Potential symptoms: tarsal tunnel syndrome.<sup>31,37</sup>

#### **Conclusion**

Although most accessory muscles are asymptomatic, they may mimic a soft tissue tumor or cause pain or compression of adjacent structures and become symptomatic.

Thorough knowledge of the anatomy, systematic imaging analysis and awareness of accessory muscles are the clues to correct identification.

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### Captions to figures

**Fig. 1.** Accessory soleus. (A) Lateral radiograph shows partial obliteration of Kager's fat pad (asterisk). (B) Sagittal FS T2-WI and (C) sagittal T1-WI showing an accessory muscle belly posterior to the flexor hallucis longus muscle (white arrow). The muscular structure is more conspicuous on T1-WI than on images with fat suppression (black arrow). (D-E) Axial T1-WI demonstrate the accessory muscle belly (black arrow in D) which inserts directly at the medial aspect of the os calcaneum (black arrow in E), in keeping with type 4 accessory soleus.



Figure 1a



Figure 1b



Figure 1c



Figure 1d



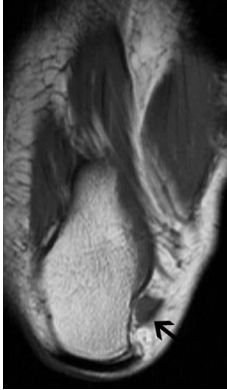


Figure 1c

**Fig. 2.** Anconeus epitrochlearis. (A) Axial T1-WI shows an accessory muscle belly running between the medial epicondyle (white asterisk) and the olecranon (white arrow). (B) Axial FS T2-WI shows thickening and hyperintense signal of the ulnar nerve due to entrapment (white arrow). (C) Axial ultrasound shows an accessory muscle (asterisk) in the trochlear groove and associated thickening of the ulnar nerve (white arrow).

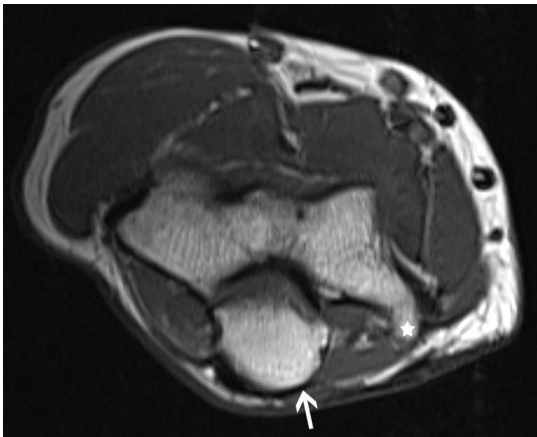


Figure 2a

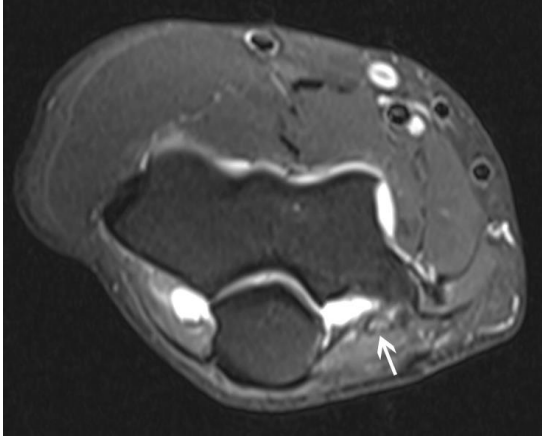


Figure 2b

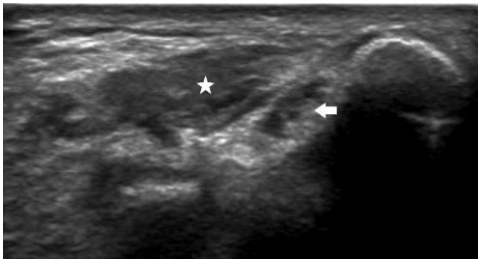


Figure 2c

**Fig. 3.** Gantzer muscle. (A) Schematic drawing illustrates the Gantzer (Gz) inserting into the ulnar border of the flexor pollicis longus (fpl). (B) Cadaveric specimen reveals the accessory muscle (Gz) as a small belly intervening between the flexor pollicis longus (fpl) and the flexor digitorum profundus (fdp). Observe the long tendon (white arrowheads) of the Gantzer that inserts into the aponeurosis (open arrowheads) of the flexor pollicis longus and the intimate relationship of this accessory muscle with the median (large arrows) and the anterior interosseous nerve (small arrows). (C) Axial cadaveric slice with (D) T1-WI and (E) 12-5 MHz ultrasound correlation demonstrate the relationship of the Gantzer muscle (arrowheads) with the median nerve (arrow) and the adjacent flexor muscles, including the flexor pollicis longus (fpl), flexor carpi radialis (fcr), flexor digitorum superficialis (fds), and flexor digitorum profundus (fdp) (Reprinted with permission from Martinoli C. et al. [Muscle variants of the upper and lower limb \(with anatomical correlation\)](#). Semin Musculoskelet Radiol. 2010 Jun;14(2):106-21. doi: 10.1055/s-0030-1253155.).

Gewijzigde veldcode



Figure 3a

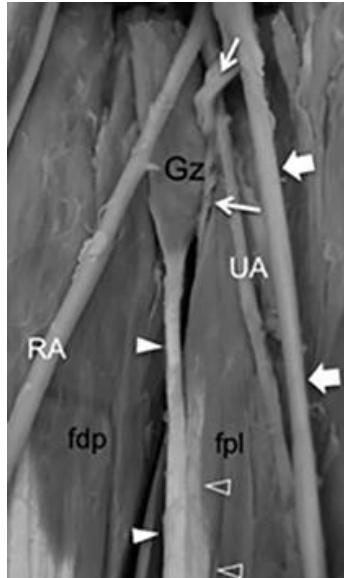


Figure 3b



Figure 3c

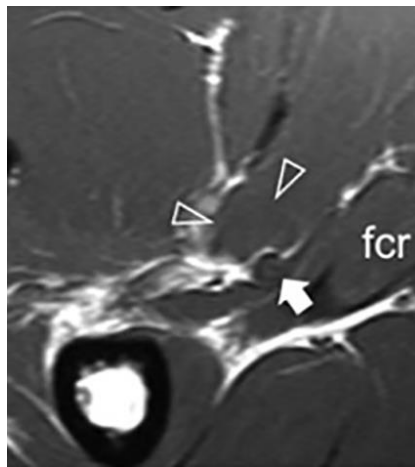


Figure 3d

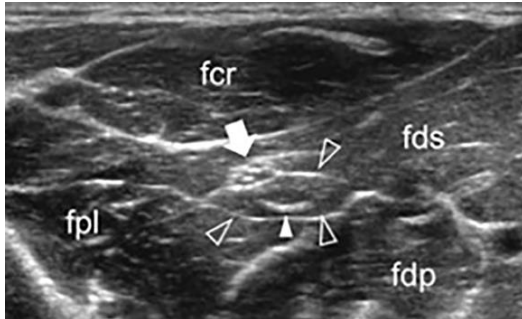


Figure 3e

**Fig. 4.** Anomalous Palmaris Muscle. (A) Cadaveric view of the ventral forearm demonstrates a completely fleshy palmaris (arrows) with a short proximal tendon (arrowhead) located between the flexor carpi radialis (fcr), the flexor digitorum superficialis (fds), and the flexor carpi ulnaris (fcu). (B–F) Reversed palmaris. Schematic drawing of a reversed palmaris shows the distal location of the muscle belly (arrow) in the forearm and a long proximal tendon (arrowhead). (C) Photograph of the left wrist of a woman presenting with a fusiform soft tissue lump (arrow) proximal to the wrist crease and carpal tunnel disease. The lump became stiff and more prominent during contraction of the flexor muscles. (D) Transverse 12-5 MHz ultrasound image obtained over the ventral lump with (E) T1-WI correlation demonstrates additional muscle tissue (arrows) superficial to the flexor tendons and the median nerve (white arrowhead). (F) Longitudinal T1-WI of the wrist demonstrates the reversed palmaris (arrows) associated with underlying flexor tenosynovitis (asterisks) (Reprinted with permission from Martinoli C. et al. [Muscle variants of the upper and lower limb \(with anatomical correlation\)](#). Semin Musculoskelet Radiol. 2010 Jun;14(2):106-21. doi: 10.1055/s-0030-1253155.).

Gewijzigde veldcode

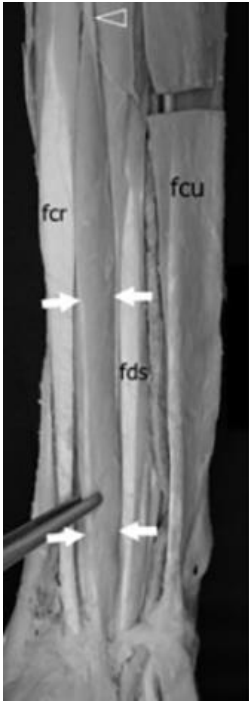


Figure 4a



Figure 4b

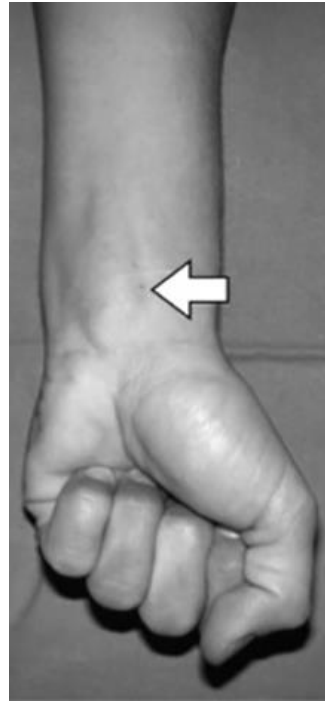


Figure 4c

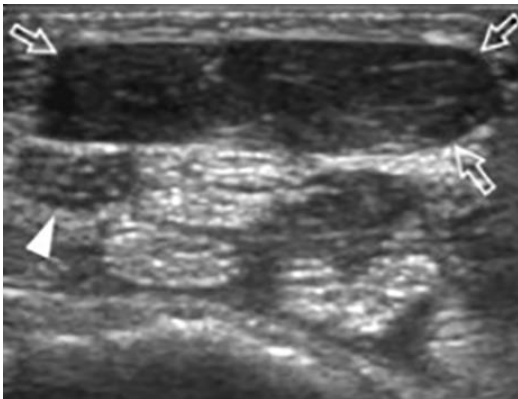


Figure 4d

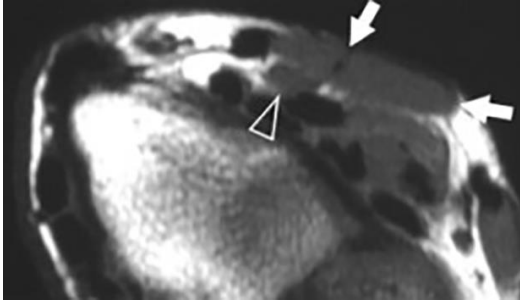


Figure 4e

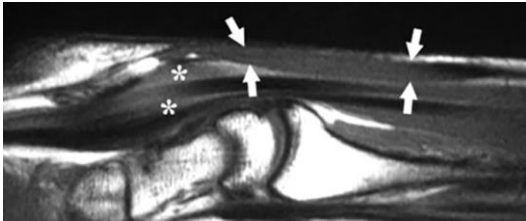


Figure 4f

**Fig. 5.** Accessory Abductor Digiti Minimi. (A) Axial T1-WI shows an small accessory muscle belly (black arrow) palmar to the ulnar neurovascular bundle (black arrowhead). (B) Axial T1-WI in a normal patient for comparison.

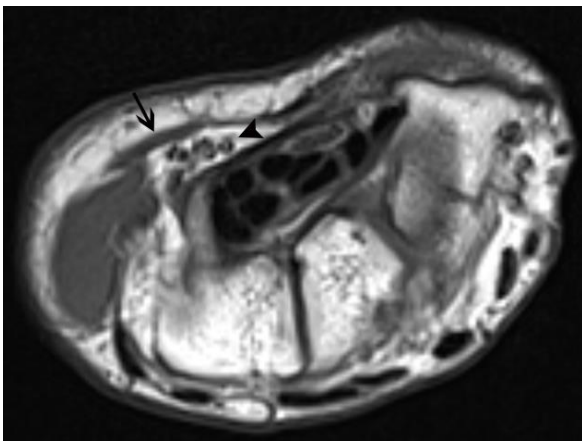


Figure 5a

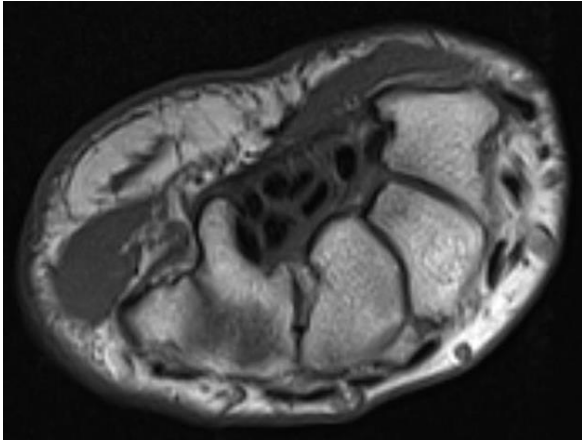
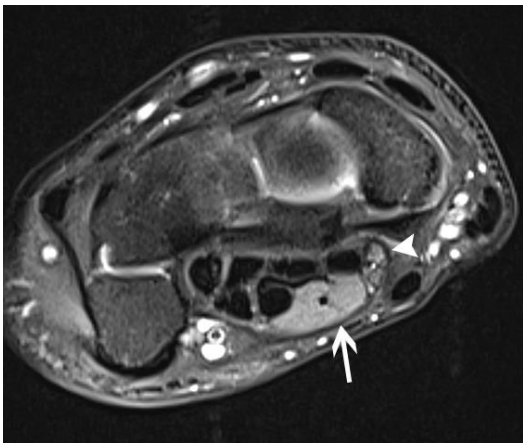


Figure 5b

**Fig. 6.** Anomalous Flexor Digitorum Superficialis of the Index. Axial FS Proton Density (PD)-WI shows an accessory muscle belly at the carpal tunnel adjacent to the tendon of the flexor digitorum superficialis (white arrow). The muscle belly lies at the ulnar side of the median nerve, which is slightly displaced radially (white arrowhead).



**Fig. 7.** Extensor Digitorum Brevis Manus muscle. (A) Photograph of the hand during active finger extension demonstrates a firm lump (arrow) over its dorsal aspect reflecting the contracted accessory muscle. (B) Transverse and (C) longitudinal 12-5 MHz ultrasound images reveal additional muscle tissue (arrows) along the course of the extensor tendons of the IV compartment. Note the tendon (arrowheads) of the accessory muscle. Scaph, scaphoid; Lun, lunate; Cap, capitate. Compared with the

resting state, active contraction leads to an increased thickness and shortening of the muscle belly. This change can be easily palpated at physical examination (Reprinted with permission from Martinoli C. et al. [Muscle variants of the upper and lower limb \(with anatomical correlation\)](#). Semin Musculoskelet Radiol. 2010 Jun;14(2):106-21. doi: 10.1055/s-0030-1253155.).

Gewijzigde veldcode

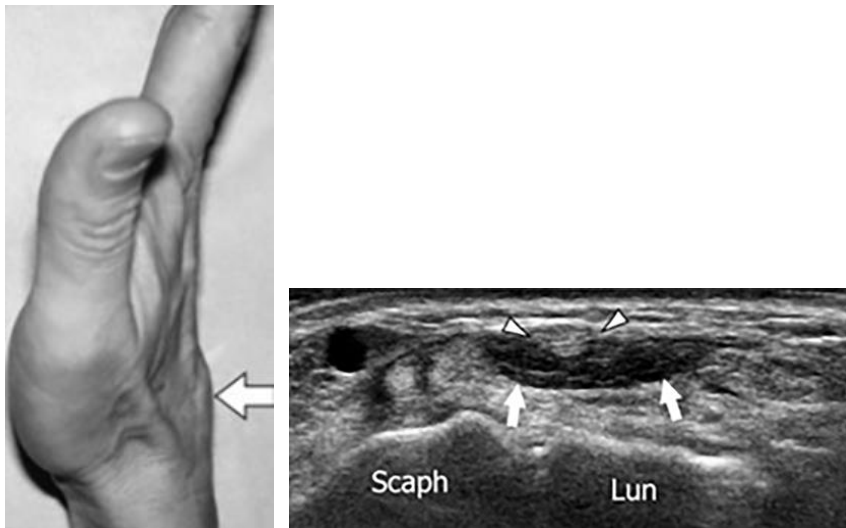


Figure 7a

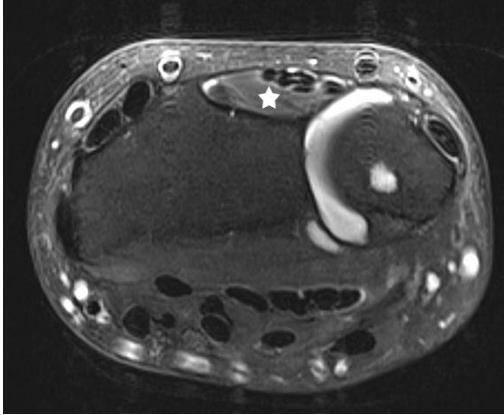
Figure 7b



Figure 7c

**Fig. 8.** Far distal located muscle belly of the Extensor Digitorum. Axial FS PD-WI shows a muscle belly of the Extensor Digitorum underneath the extensor retinaculum at the level of the distal radioulnar joint (white asterisk). At this location, one should expect only tendons at extensor compartment 4 of the wrist.





**Fig. 9.** Extensor Carpi Radialis Accessorius. (A) Axial FS T2-WI shows the presence of 3 tendons in the extensor compartment 2, mimicking longitudinal splitting of the extensor carpi radialis tendons (white arrow). (B) Sagittal and (C) coronal T2\*images demonstrate insertion of the tendon at the base of metacarpal 3 (white arrows).

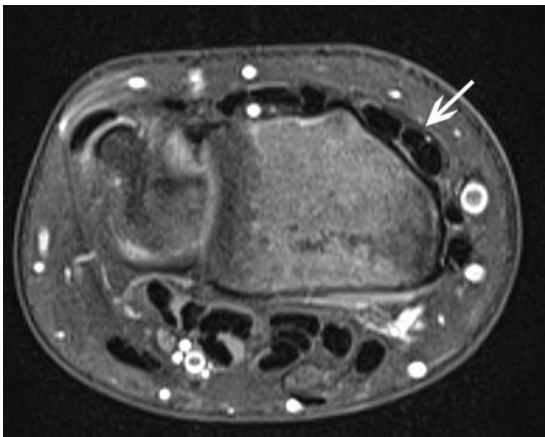


Figure 9a



Figure 9b



Figure 9c

**Fig. 10.** Accessory slip of the lateral gastrocnemius. (A) Axial FS PD-WI shows a muscle belly inserting on the posterior femur (white arrow). Note intimate relationship with the neurovascular bundle of the knee. Adjacent sagittal T1-WI demonstrates the proximal insertion at the posterior femur (B) and the intimate relationship with the neurovascular bundle of the knee on an adjacent slice (C) (black arrows).

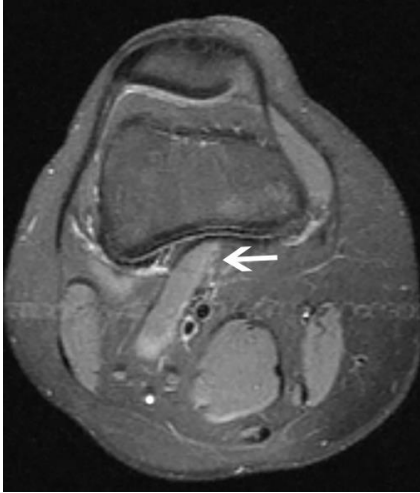


Figure 10a



Figure 10b



Figure 10c

**Fig. 11.** Peroneus Tertius (A) Axial PD-WI shows a small muscle belly running posterolaterally to the tendons of the Extensor Digitorum Longus (arrowhead). The tendon originates from the medial distal fibula. Note also an Accessory Soleus (black arrowhead). (B) Axial ultrasound in another patient showing the accessory muscle belly anterior to the peroneus brevis (white arrow).

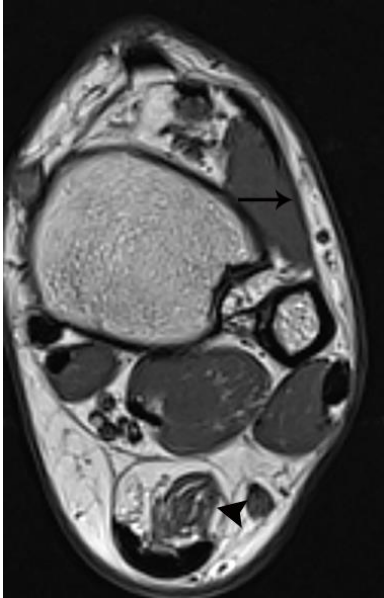


Figure 11a



Figure 11b

**Fig. 12.** Peroneus Quartus (A) Axial PD-WI shows a small accessory muscle (black arrowhead) posterior to the Peroneus Longus tendon. B) Axial and (C) longitudinal ultrasound showing the accessory muscle belly (black arrows).

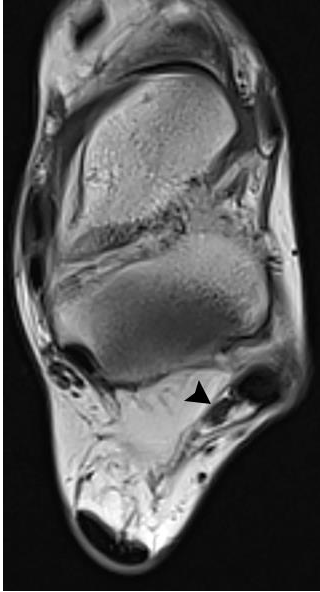


Figure 12a

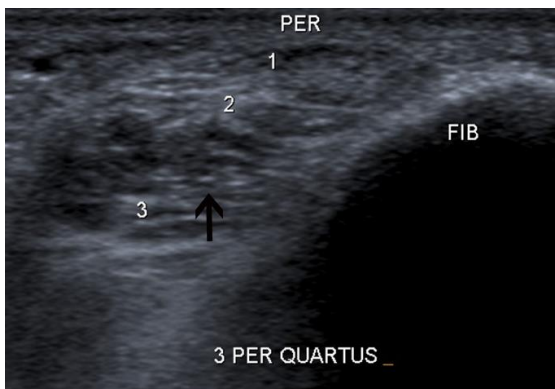


Figure 12b

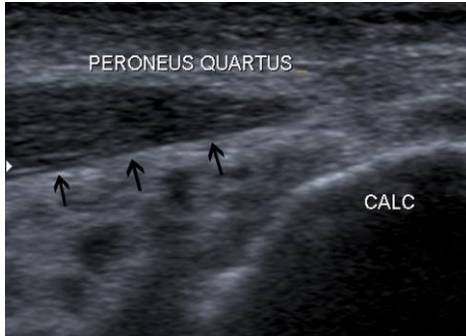


Figure 12c

**Fig. 13.** Flexor Digitorum Accessorius Longus (A) Axial PD-WI shows a small muscle belly running posteriorly to the Flexor Hallucis Longus (black arrow). Note intimate contact with the neurovascular bundle (black arrowhead).

(B) Sagittal T1-WI showing the accessory muscle belly (black arrow) posterior the Flexor Hallucis Longus (black arrowhead). Distally, the muscle merges with the Quadratus Plantae muscle.



Figure 13a



Figure 13b

## Tables

**Table 1.** Clinical presentation of accessory muscles

- Asymptomatic
- Impingement on adjacent structures (nerves, vessels, tendons)
- Swelling or palpable mass
- Exercise-related pain

**Table 2** Accessory muscles of the upper limb

<b>ELBOW and FOREARM</b>	<b>WRIST and HAND</b>
Anconeus epitrochlearis	Accessory Abductor Digiti Minimi
Gantzer Muscle	Anomalous Flexor Digitorum Superficialis of the Index
Anomalous Palmaris Longus	Palmaris Profundus
	Extensor Digitorum Brevis Manus
	Accessory Extensor Carpi Radialis Muscle
	Extensor Pollicis Longus Accessorius

**Table 3** Accessory muscles of the lower limb

<b>KNEE</b>	<b>ANKLE and FOOT</b>
Tensor Fasciae Suralis	Accessory Soleus
Accessory	Peroneus tertius
Semimembranosus	Peroneus quartus
Accessory popliteus	Flexor digitorum accessorius longus
Accessory Gastrocnemius	Peroneocalcaneus internus



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