

“A Study on Accessory Muscle of Flexor Compartment of Forearm”

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ABSTRACT: During routine anatomical dissections, the presence of the accessory muscle in the flexor aspect of the forearm was noted. This accessory muscle presents an intimate relationship with the median nerve. This variation may be clinically important because symptoms of median nerve compression arising from similar variations are often confused with more common causes, such as radiculopathy and carpal tunnel syndrome. The muscular variations of upper limb are common.

Methods: During routine dissection classes to undergraduate medical students, we came across additional muscle bellies in the flexor compartment of forearm arising from the under surface of flexor digitorum superficialis(FDS) and inserted to flexor pollicis longus (FPL) separately. Origin, insertion, nerve supply and its relation was noted.

Results: presence of accessory muscles(Gantzlers muscle) was noted.

KEYWORDS: flexor digitorum superficialis(FDS), Flexor pollicis longus(FPL), Median nerve, accessory muscle, Gantzlers muscles, Anterior interosseous nerve(AIN).

Date of Submission: 01-05-2018

Date of acceptance: 17-05-2018

I. Introduction

Flexor digitorum superficialis is the largest of the superficial flexors and arises by two heads. flexor pollicis longus is deep muscle and is sometimes connected to flexor digitorum superficialis or profundus or pronator teres [1]. In 1813, Gantzer described an accessory muscle in the forearm; this muscle could join the flexor pollicis longus muscle and the deep finger flexor muscle [2-4]. However, Kaplan [5] describes that this muscle was described by Albinus almost a century before. Muscle anomalies of the upper extremity are recognized causes of peripheral nerve disorder, Koloh-Nevin Syndrome (Anterior Interosseous Nerve Syndrome) caused by the compression neuropathy of the anterior interosseous nerve in the forearm is believed to occur because of its compression by the accessory heads of flexor pollicis longus and flexor digitorum profundus.

Gantzer described two accessory muscles in the human forearm which are named Gantzer's muscle. This muscle arises as small belly from forearm flexors and is inserted either into FPL or FDP [6]. The Gantzer's muscle mostly originated from the medial epicondyle of the humerus or from the under surface of flexor digitorum superficialis (FDS) muscle.

These variants may consist of absence of a muscle, supernumerary muscles, deviation from the normal course, or an unusual origin or insertion. Major Variations in the flexor digitorum superficialis is rare. occasionally muscle slips derived from it may replace the Palmaris longus. There may be muscle slips passing from it to the adjacent muscles.

The objective of this study was to analyze the incidence, origin, insertion, and innervation of the Gantzer muscle. And to find the relationship of the anterior interosseous nerve and the median nerve, verifying the possibility of Gantzer muscle being the cause of the anterior interosseous nerve syndrome.

II. Material And Methods

30 upper limbs of 15 Adult cadavers were utilised during study period of 2 years in S.V Medical College, Tirupati and the dissections were carried out in all the limbs in which the skin was reflected to expose the superficial fascia, and then the deep fascia. It was incised and reflected to expose the muscles of the superficial compartment of the fore arm. All the muscles were examined for their presence, position, attachments, shape and their nerve supply. Superficial compartment was cut to expose the deep compartment

muscles. The anatomical variations of the muscles was noted and photographed. Measurements of the muscle was taken by Vernier callipers.

III. Observations

Additional muscular slips were noted in flexor compartment of forearm. Out of 30 upper limbs, 12 (40%) of them showed extra muscular slips. Presence of extra muscular slips (i.e., Gantzers muscle)[Fig:1] was observed bilaterally in all the upper limbs.

The shape of the muscle was observed as fusiform in 8(66%) upper limbs, slender in 4 (33%) upper limbs. The average length of muscle was 9.30cm and the average width of the muscle was 6.12cm.

In all the 12 upper limbs the origin of gantzers muscle is from deep surface of flexor digitorum superficialis passing obliquely and laterally inserting in to flexor pollicis longus. In one upper limb the muscular slip (Gantzers muscle) tendon was divided in to three parts (divisions)[Fig:3]. Out of the three divisions the lateral two are inserted to flexor pollicis longus and the medial division of the tendon courses itself on the lateral aspect of flexor digitorum profundus tendon, which is going to the index finger after passing below the flexor retinaculum. There was tendinous connections between the Gantzers muscle tendon and flexor pollicis longus muscle.

The Median nerve is present anterior to the Gantzers muscle and anterior interosseous nerve is present posterior to the muscle. In all the upper limbs accessory muscle (Gantzers) is supplied by anterior interosseous nerve. [Fig:2]

IV. Discussion

Flexor pollicis longus is uniquely human. In other primates there is only one common deep flexor that provides a tendon to the thumb (Bergman *et al.*, 2006) [7]. The presence of additional muscles (as observed in present case) may be due to the incomplete cleavage of the forearm flexor muscles during development as the deep layer of the flexor muscle mass gives rise to the FDS, FDP and FPL .

Muscular variations in the flexor compartment of the forearm are important because they form etiological factors of many neurological conditions; such as anterior interosseous nerve syndrome which is a pure motor palsy and it presents with weakness or paralysis of flexor pollicis longus, flexor digitorum profundus of index finger as “spinner’s sign”, making ‘O’, is disturbed due to inability to flex interphalangeal joint of the thumb and distal inter-phalangeal joint of the index finger. It is also known as square pinch deformity as there is a classical attitude of weak pinch due to weakness of thumb and index finger muscles (Vasavi *et al.*, 2009) [8].

The incidence of the Gantzer muscle was recorded in 12(40%) out of the 30 dissected forearms in the present study. This is close to the percentage observed by Tamang *et al.*(43%). Dellon and Mackinnon (45 %), Gunnal *et al.*(51.1%) , Al Qattan (52%), Dykes and Ainson (53.3%), Malhotra *et al* 54.2%. , Jones *et al* (55%), and Shirali *et al.* (55%) [9,10,11,12,13,14,15,16]

Bilateral occurrence of AHFPL muscle is more common than unilateral occurrence (Hemmady *et al.*, 1993; Al-Qattan, 1996; Shirali *et al.*, 1998; Oh *et al.*, 2001)[17,12,16,18] and the present study reported the same. The majority of the muscles were fusiform in shape in the present study and this corresponds to the finding of Gunal;tamang; Shalom Elsy Philip and Mahakkaunahah [11,9,19,20]

The incidence of origin of gantzers muscle in the present study is same that of the most authors who stated that the most frequent site of Gantzer muscle origin is the medial epicondyle of the humerus (Mangini [21] and Hemmady *et al.* [17]).

The Gantzers muscle was sandwiched between the median and the anterior interosseous nerves in 100% specimens in the present study. (Domiaty *et al.*, 2008)[22] also observed the same in their study,(Shirali *et al.*, 1998)[16] noted that the accessory head passed anterior to the anterior interosseous nerve in 100% specimens and posterior to the median nerve in 95% of specimens. The reports of Mangini; [20], Hemaddy *et al*; [17]; Jones & Abrahams [15]; Shirali *et al.* [16]; Oh *et al.* [18] studies also reported the nerve ran posterior to the belly.

The average length of muscle in the present study is 82.12mm. Other authors stated that the mean length of the muscle belly was found as 50 – 80 mm by Hemmady *et al* [17].68 mm by jones *et al*[15] and the average width of the muscle in the present study was 6.12cm , 7mm in the study of Oh *et al* [18], 6.7 mm in the study of Mahakkanukrauh *et al* [20], 10 – 25 mm in the study of Hemmady *et al* [17]

V. Conclusion

The presence of accessory muscles or supernumerary heads are considerable causative factors of neuropathies and other compressive effects. Compression of the AIN (Anterior interosseous nerve) by this muscle could occur and give rise to anterior interosseous syndrome which has to be elicited by various diagnostic procedures by clinician and surgeons. The variant muscle bellies and tendons should be kept in mind to avoid clinical complications during radiodiagnostic procedures or surgical approach of this region. The

surgical anatomy of this variation is important for the surgeons since these muscular variations can cause chronic inflammation, nerve compressions, tenosynovitis and may require surgical excision.

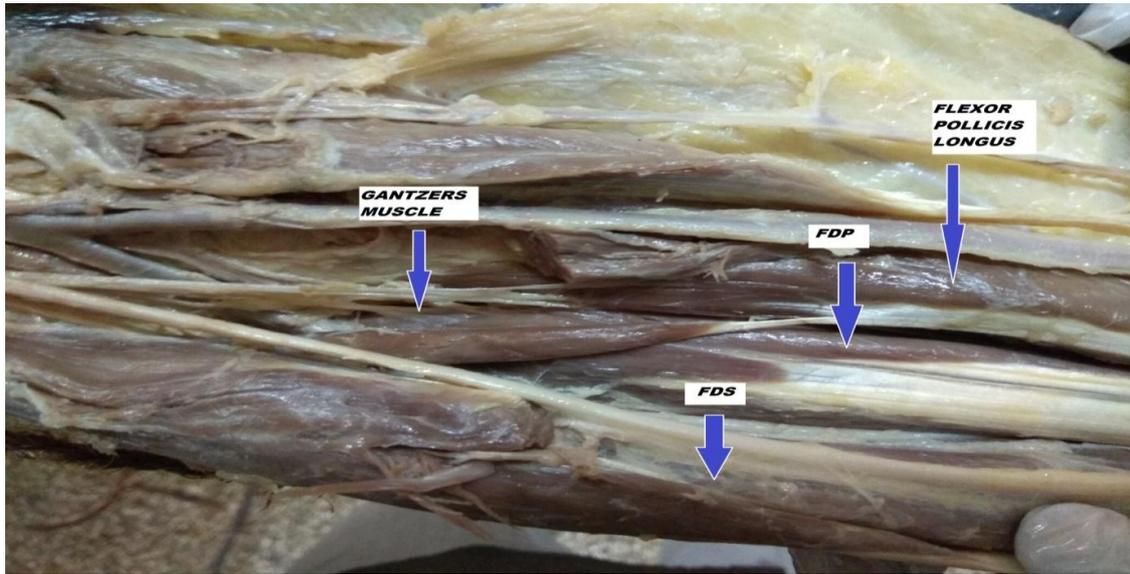


Fig :1 Showing the presence of Gantzers muscle

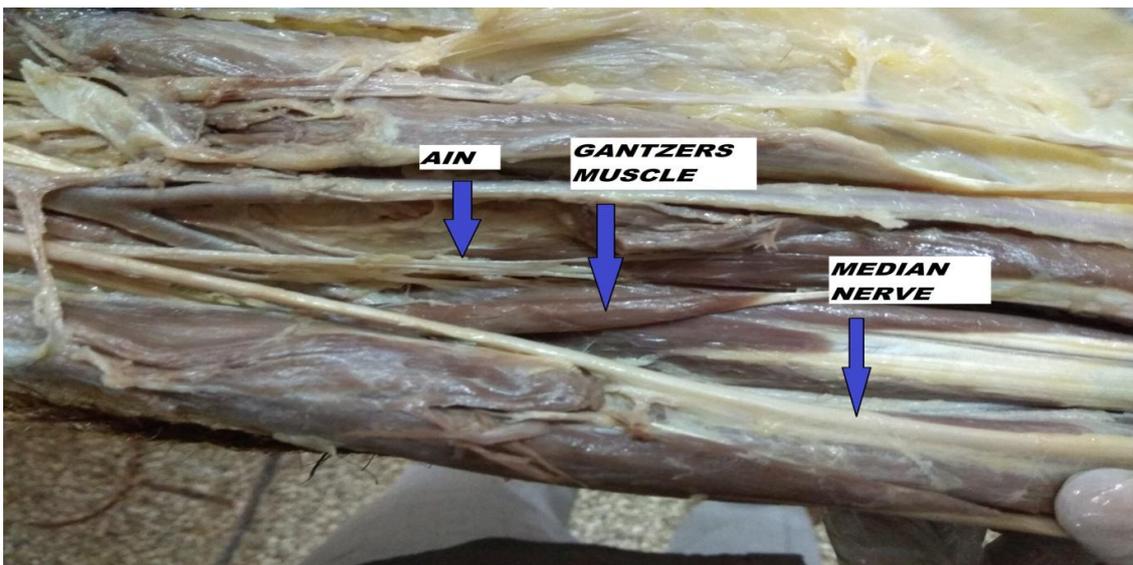


Fig :2 Showing the relation of median nerve and anterior interosseous nerve



Fig:3 showing the Gantzers muscle tendon divisions

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Dr.V.Bangarayya "“A Study on Accessory Muscle of Flexor Compartment of Forearm””.
"IOSR Journal of Dental and Medical Sciences (IOSR-JDMS), vol. 17, no. 5, 2018, pp 18-21