INCIDENCE AND MORPHOLOGY OF ACCESSORY HEAD OF FLEXOR POLLICIS LONGUS MUSCLE – AN ANATOMICAL STUDY

Binod Kumar Tamang¹, Pranoti Sinha², Rohit Kumar Sarda³, Poonam Shilal⁴, B.V. Murlimanju⁵

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ABSTRACT: BACKGROUND: Accessory head of Flexor pollicis longus in the forearm is one of the factors for causing anterior interosseous nerve syndrome. The objectives were to study the incidence, morphology of accessory head of flexor pollicis longus and its relation with median nerve and anterior interosseous nerve. **METHODS:** The present study was observational and descriptive type. A total of 60 upper limbs from 30 cadavers were dissected in the Department of Anatomy. The accessory head of flexor pollicis longus muscle was identified and its relation with median and anterior interosseous nerve was observed. The shape, origin and insertion of accessory head of flexor pollicis longus were noted. The length and width of the muscle belly and tendon were measured with digital vernier caliper. The findings were compared with that of previous studies. **RESULTS:** The accessory head of flexor pollicis longus was present in 13(43.3%) cadavers. The shape of muscle was fusiform in 84.61% and slender in 19.38%. Commonest site of origin was coronoid process of ulna (53.33%), from the medial epicondyle 33.33% and 6.66% each from tendon of brachialis and deep head of pronator teres respectively. The average length and width of muscle belly were 93.48 ± 1.76 mm and 7.03 ± 1.43 respectively. The tendon length and width were 20 ± 8.09 mm and 0.55 ± 0.23 mm. The median nerve was running anteriorly and the anterior interosseous nerve laterally to the muscle belly in all the cases. **CONCLUSION:** The presence of accessory head of flexor pollicis longus can be an important factor in anterior interosseous nerve syndrome, pronator teres syndrome. The results obtained in the present study would be useful for both physicians and surgeons to know the cause and therefore an appropriate management of the clinical syndromes.

KEY WORD: accessory head of flexor pollicis longus, morphology, anterior interosseous nerve, Flexor digitorum superficialis.

INTRODUCTION: The Flexor pollicis longus (FPL) is the long flexor muscle of the thumb. It arises from the anterior surface of the radius extending from below its tuberosity to the upper attachment of pronator quadratus and also from the adjacent interosseous membrane.¹ According to the previous studies FPL may have accessory slips or heads which has also been called as Gantzer's muscle or an occasional head or accessory head of flexor pollicis longus (AHFPL).²⁻⁴ The occasional head runs distally and obliquely parallel to the oblique cord (Phylogenetically degenerated fibres of upper part of the flexor pollicis longus muscle) to join the FPL and its tendon.² Various articles have discussed about the relationship between AHFPL muscle and anterior interosseous nerve and median nerve. This variant muscle belly may be one of the structure that compress the AIN causing anterior interosseous nerve syndrome.^{3, 5, 6}

MATERIALS AND METHODS: The present study was carried out in the department of anatomy, Sikkim Manipal Institute of medical sciences, Gangtok, India. Thirty (30) cadavers (20 male and 10 female) which were used for dissection by First year MBBS students were included in the study. Cadavers with congenital anomalies, scars of any origin, or other pathologies were excluded. The dissection was carried out by giving vertical incision from the middle of the ventral surface of the lower parts of the arm upto the tip of the middle finger. Skin was separated from the superficial fascia and the important subcutaneous structures were identified. Antebrachial fascia was incised along the same line. The superficial flexor group of muscles were examined and slowly separated from the deep flexors and looked for the presence of AHFPL and any other accessory muscle belly along with it. AHFPL once identified its relation with MN and AIN were observed. The accessory head was carefully traced above to see its origin and below upto its insertion. The shape of the muscle belly was recorded and with the help of a digital vernier caliper the length of muscular part, tendon length up to its insertion, the maximum width of muscle belly, and the maximum width of tendon were recorded in millimeter.

RESULTS: In the present study the AHFPL was seen in 43.33% of the total 30 cadavers dissected. Out of 60 upper limbs the AHFPL was seen in total 15 limbs (25%). Bilateral AHFPL was seen in 2 cadavers (10%). The remaining AHFPL was seen unilaterally 7(46.6%) on the right side and 4(26.66%) on the left side. The shape of the muscles were mainly fusiform in 84.61% and it was slender in 19.38%. It was observed that the origin of the AHFPL were variable. In most of the cases the AHFPL was arising with one or other muscles of the flexors or pronator of the forearm. In 53.33% the AHFPL was taking origin from coronoid process of ulna and in 33.33% cases the origin of the muscles was from the medial epicondyle of humerus. In all the above mentioned cases the fibres of AHFPL was arising with Flexor digitorum superficialis (FDS) (Fig.1). In 2 different cases the muscle was arising from tendon of brachialis (Fig.2) and deep head of pronator teres (Fig.3) partially blending with fibres of FDS. In addition to AHFPL, in one case an additional muscle belly was observed and identified as accessory head of flexor digitorum profundus and both were arising as common belly from the undersurface of FDS (Fig.4). In all the cases we observed that the AHFPL was inserted by its thin tendon in the region of upper middle part of the forearm by joining the medial side of the tendon of FPL. The length of the muscle belly of AHFPL was 93.48 ± 1.76 mm, its tendon length upto the insertion was 20 ± 8.09 mm. The width of the muscle belly was 7.03 ± 1.43 mm and the width of its tendon close to the insertion was 0.55 ± 0.23 mm. The measurements are compared with the previous findings (Table-1). In the present study all the AHFPL was supplied by the branches from anterior interosseous nerve. The median nerve was related anterior and the AIN was running lateral to the AHFPL muscle belly in all the cases (Fig.1), however the branches for Flexor digitorum profundus were passing underneath the muscle belly.

DISCUSSION: The flexor muscles of the forearm develops from the flexor mass dividing into 2 layers superficial and deep and the occurrence of accessory muscles connecting the flexor muscles could be the reason of incomplete separation of the flexor mass during development.⁷ Various authors have reported the incidence of AHFPL, and the incidence ranged from 66.6%, 45%, 55%, 52%, 66.7%, and 46.03%.^{3, 5, 7, 9, 10} In the present study the AHFPL was seen in 43.33% cases. The presence of bilateral AHFPL found to be more than unilateral,^{5, 7-9} but in our study it was observed in only 2(10%) cases.

The majority of the muscles (86.66%) were fusiform in shape and only 13.3% was slender and this corresponds to the finding of Gunal and Mahakkaunahah.^{2,13} Many literatures have described the various source of origin of the muscles.^{2,5,7,13,14} In the present study the muscles was mainly originating from the coronoid process with the fibres of FDS (53.33%), from the medial epicondyle with fibres of FDS (33.3%), and except in 2 different cases the muscle was arising from tendon of brachialis and deep head of pronator teres. It was somewhat in agreement with the finding of Jones and Abraham who found that the muscle arose from the coronoid process it was always involved either from the undersurface of FDS or medial epicondyle.⁷ As quoted by Jones and Abraham⁷ that Dykes and Anson¹⁹⁴⁴ and Mangini¹⁹⁶⁰ have describe the other minor attachments: brachialis muscle, oblique cord or pronator teres muscle (PT), intramuscular flexor fascia. Similar to this in our study we found in one case where the muscle was taking origin from deep head of PT and in another case it was arising from tendon of brachialis.

A very few authors have taken the measurement of AHFPL,^{2,3,7,18} but in our knowledge none of these authors have taken the tendon width at its insertion (Table 1). This may be of importance as its tendon contributes to the volume of carpal tunnel while causing carpal tunnel syndrome.

AIN branches posterior from median nerve between 2 heads of PT and with anterior interosseous artery it descend anterior to interosseous membrane between and deep to FPL and Flexor digitorum profundus (FDP) and supply both and terminate posterior to pronator quadratus.¹ Paralysis of AIN due to compression in the forearm is called as the Kilohnevin syndrome.^{2,3,6,19} The causes for compression could be abnormal muscles and tendon, trauma, vascular arcade etc.¹⁵ Anterior interosseous nerve syndrome (AINS) would be of complete type when the entire of AIN passes posterior underneath the AHFPL belly causing weakness of all the three muscles supplied by it and incomplete type of AINS is likely to occur when only the medial branches of AIN to the FDP which passes beneath the muscle belly is compressed.² In the study done by previous authors, the AIN was running posterior to the belly of AHFPL,^{2,3,7} while in others the nerve passed anteriorly in front of muscle belly.^{5,8} However, the present study showed the AIN was passing lateral to the belly of AHFPL in all the cases and only their tendon crossed the AIN towards its insertion. But the branches to the FDP were passing underneath the belly of the muscle.

CONCLUSION: Although the incidence of AHFPL is variable among the different races,¹⁰ it can be one of the cause for AIN syndrome, pronator teres syndrome, carpal tunnel syndrome, or abnormal sensation in the lower part of the forearm. In the present study variable results were obtained as compared to the studies conducted by previous authors and this could be due to low sample size. Nevertheless the study would be useful for both physicians and surgeons to know the incidence and morphology of AHFPL as the cause in relation to anterior interosseous nerve syndrome and Pronator teres syndrome.

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Fig 1: Anterior compartment of right forearm. FPL- Flexor pollicis longus, AHFPL- Accessory head of flexor pollicis longus, AIN- Anterior interosseous nerve, MN- Median nerve, FDS- Flexor digitorum superficialis.

Fig 2:Anterior compartment of right forearm. . FPL- Flexor pollicis longus , AHFPL- Accessory head of flexor pollicis longus, TOB- Tendon of brachialis, AIN- Anterior interosseous nerve, MN- Median nerve, FDS- Flexor digitorum superficialis.

Fig 3:Anterior compartment of right forearm. AHFPL- Accessory head of flexor pollicis longus, MN- Median nerve, DPT- deep head of pronator teres.

Fig 4: Anterior compartment of left forearm. FPL- Flexor pollicis longus, AHFPL- Accessory head of flexor pollicis longus, FDP- Flexor digitorum profundus, AHFDP- Accessory head of flexor digitorum profundus, AIN- Anterior interosseous nerve, MN- Median nerve, FDS- Flexor digitorum superficialis.

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AUTHORS:

1. Binod Kumar Tamang
2. Pranoti Sinha
3. Rohit Kumar Sarda
4. Poonam Shilal
5. B.V. Murlimanju

PARTICULARS OF CONTRIBUTORS:

1. Associate Professor, Department of Anatomy, Sikkim Manipal Institute of Medical Sciences.
2. Assistant Professor, Department of Anatomy, Sikkim Manipal Institute of Medical Sciences.
3. Tutor, Department of Anatomy, Sikkim Manipal Institute of Medical Sciences.
4. Assistant Professor, Department of Anatomy, Sikkim Manipal Institute of Medical Sciences.

5. Assistant Professor, Department of Anatomy, KMC, Mangalore.

NAME ADDRESS EMAIL ID OF THE CORRESPONDING AUTHOR:

Dr. Binod Kumar Tamang,
Associate Professor,
Department of Anatomy,
Sikkim Manipal Institute of Medical Sciences,
Sikkim Manipal University, 5th mile,
Tadong, East Sikkim.
Email – binotboom@gmail.com

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