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Original Article

Anatomy Section

# Incidence and Morphology of Accessory Head of Flexor Pollicis Longus in Telangana, India

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## ABSTRACT

**Introduction:** Flexor Pollicis Longus (FPL) may have accessory slips which arise from lateral or medial border of coronoid process of ulna and medial epicondyle of humerus. The accessory slip of FPL is known as Accessory Head of Flexor Pollicis Longus (AHFPL) or Gantzer's Muscle.

**Aim:** To study the incidence and morphology of AHFPL and the relationship of AHFPL with Median Nerve (MN) and Anterior Interosseous Nerve (AIN) in Telangana population.

**Materials and Methods:** The present study was an observational study, conducted on 25 cadavers (21 male, 4 female) for a period of 18 months (July 2019-December 2020) in Department of Anatomy, Osmania Medical College, Hyderabad, Telangana, India. The cadavers which were used for dissection by first year MBBS students were included in the present study and the cadavers with scars, deformities and with congenital anomalies were excluded from the present study.

**Results:** In the present study, AHFPL was found in 58% upper limbs. It was bilateral in 40%, unilateral in 18% upper limbs. The shape of AHFPL was fusiform in majority of (86.2%) upper limbs. It originated from the coronoid process of ulna in 62% and from medial epicondyle of humerus in 38% upper limbs, inserted by joining with tendon of FPL. The AHFPL was innervated by AIN in all the cases and this nerve was located posterior to AHFPL in majority of (83%) upper limbs, posterolateral in few (17%) upper limbs. The MN was related anterior to the AHFPL in most of the upper limbs.

**Conclusion:** In the present study, AHFPL was found in 58% upper limbs. Bilateral occurrence (40%) was common than unilateral (18%). The presence of AHFPL can cause AIN syndrome, pronator teres syndrome. The knowledge of AHFPL would be useful for both physicians and surgeons to know the aetiology and management of compression neuropathy/nerve entrapment syndrome.


**Keywords:** Anterior interosseous nerve, Forearm, Median nerve, Muscle

## INTRODUCTION

The FPL is a recent acquisition in the evolution. It takes origin from the grooved anterior surface of radius and from the adjacent interosseous membrane and gets inserted on to the base of distal phalanx of thumb [1,2]. The FPL is one of the deep flexors of forearm. It is a prime mover of thumb, concerned with precise grasping and stabilise the flexed terminal phalanx of thumb [1].

FPL may have accessory slips which arise from lateral or medial border of coronoid process of ulna and medial epicondyle of humerus. The accessory slip of FPL is known as AHFPL or Gantzer's Muscle [3]. The AHFPL was first described by Carl Friedrich Gantzer in 1813, inserting into FPL/FDP (Flexor Digitorum Profundus) [3].

The AHFPL may cause an entrapment neuropathy of AIN, known as Kiloh-Nevin syndrome/AIN syndrome [4]. This syndrome presents as a weakness in flexion of interphalangeal joint of thumb and distal interphalangeal joint of index and middle finger [4]. The flexor muscles of forearm develop from the flexor mass, which divides into superficial and deep layers. The FPL, FDP muscles originates from the deep layer. Incomplete differentiation of the deep layer of flexor mass during development gives rise to AHFPL [4].

The knowledge of AHFHL is useful for the diagnosis and surgical intervention of nerve entrapment syndrome like AIN syndrome and rarely for carpal tunnel syndrome [5,6]. The incidence of AHFPL is variable among different population. It ranges from 24% to 76.3% [3,7,8].

In the present study, the authors were concerned with the incidence and morphology of AHFPL and the relationship of AHFPL with MN and AIN in the Telangana population.

## MATERIALS AND METHODS

The present study was an observational study, conducted on 25 cadavers (21 male, 4 female) for a period of 18 months (July 2019-December 2020) in Department of Anatomy, Osmania Medical College, Hyderabad, Telangana, India. The study has taken prior approval from Institutional Ethical Committee.

**Inclusion criteria:** The cadavers which were used for dissection by first year MBBS students were included in the present study.

**Exclusion criteria:** The cadavers with scars, deformities and with congenital anomalies were excluded from the present study.

### Study Procedure

The dissection was carried out by giving volar incision extending from the distal arm to the palm. Skin was reflected. Superficial fascia, deep fascia was removed. The superficial flexor group of muscles were observed and they were separated from deep flexors. Each forearm was examined carefully to see the presence of AHFPL. Once AHFPL was identified it was studied with respect to incidence, morphology and its relation with MN, anterior osseous nerve.

## STATISTICAL ANALYSIS

The collected data was statistically analysed by using Statistical Package for the Social Sciences (SPSS) 20.0 and expressed as percentages.

## RESULTS

The present study was conducted on 25 cadavers (50 upper limbs) and the results are presented in [Table/Fig-1]. In the present study, AHFPL was found in 58% (29) upper limbs. It was bilateral in 40% (20), unilateral in 18% (9) upper limbs. Among unilateral cases 10% (5) in the right, 8% (4) in the left upper limbs were observed.

| Variables | Bilateral | Unilateral | | Total |
|---|---|---|---|---|
| | | Right | Left | |
| Number of UL | 20 | 5 | 4 | 29 |
| Percentage | 40 | 10 | 8 | 58 |

**[Table/Fig-1]:** Incidence of AHFPL.

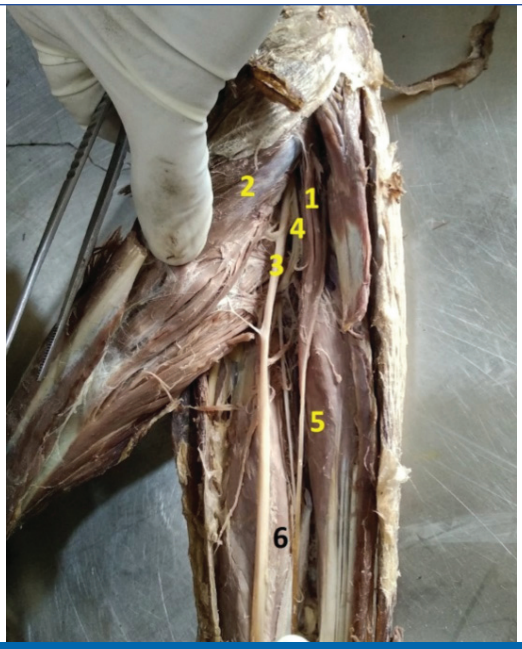
The shape of AHFPL was fusiform in most of (86.2%) upper limbs [Table/Fig-2,3] and it was slender in few (13.8%) of upper limbs [Table/Fig-4]. In most of upper limbs (62%) AHFPL originates from the coronoid process of ulna [Table/Fig-3] and it also takes origin from medial epicondyle of humerus in 38% upper limbs [Table/Fig-5].

| Variables | Shape | | Origin | | Insertion into FPL | |
|---|---|---|---|---|---|---|
| | Fusiform | Slender | Coronoid process of ulna | Medial epicondyle of humerus | Upper 1/3rd | Middle 1/3rd |
| Number | 25 | 4 | 18 | 11 | 19 | 10 |
| Percentage | 86.2 | 13.8 | 62 | 38 | 66 | 34 |

**[Table/Fig-2]:** Shape, origin and insertion of AHFPL (n=29).


**[Table/Fig-3]:** Showing the shape, origin and insertion of Accessory Head of Flexor Pollicis Longus (AHFPL).
1. Accessory head of FPL, 2. Flexor Digitorum Superficialis, 3. Flexor Pollicis Longus, 4. Flexor Digitorum Profundus, 5. Median Nerve, 6. Anterior Interosseous Nerve


**[Table/Fig-4]:** Showing slender Accessory Head of Flexor Pollicis Longus (AHFPL).
1. Accessory head of FPL, 2.Flexor Digitorum Superficialis, 3.Median Nerve, 4.Anterior interosseous Nerve, 5.Flexor Pollicis Longus




**[Table/Fig-5]:** Showing Accessory Head of Flexor Pollicis Longus (AHFPL) and its relation with Median Nerve (MN) and Anterior Interosseous Nerve (AIN).
1. Accessory head of FPL, 2. Flexor Digitorum Superficialis, 3.Median Nerve, 4.Anterior interosseous Nerve, 5. Flexor Digitorum Profundus, 6. Flexor Pollicis Longus

Insertion of AHFPL was by joining with the FPL in upper 1/3rd in 66% [Table/Fig-2] and middle 1/3rd in 34% upper limbs [Table/Fig-5]. The AHFPL was innervated by AIN in all the cases. The AIN was located posterolateral to AHFPL in 17% of upper limbs [Table/Fig-4], posterior to AHFPL in 83% [Table/Fig-5]. The MN was related anterior to the AHFPL in most of the upper limbs (98%) [Table/Fig-4].

## DISCUSSION

The AHFPL consists of fusiform muscle fibres in opposition to unipennate muscle fibres of FPL and function of fusiform muscle fibres in opposition to unipennate muscle fibres leads to extra strain on the normal functional movement of the FPL and loss of precise, skillful movement [1]. The AHFPL may compress AIN, lead to paresis/paralysis of the FPL, FDP of the index finger and cause difficulty in the flexion of interphalangeal joint of thumb, distal interphalangeal joint of index finger and in making 'O' using thumb and index finger which is known as spinner's sign [2].

The incidence of AHFPL was variable among different population [Table/Fig-6] [2-15]. Highest incidence was reported by Jadhav SD and Zambare BR and Hemmady MV et al., [8,15], and lowest reported by Afroz MKH et al., and Sembian U et al., [3,11]. In our study, the incidence of AHFPL was 58%, these results were close to the results of previous studies done by Khade B et al., Desai RR et al., and Mahakkanukrauh P et al., [2,6,14].

| S. No. | Author and Year | Population | Sample size | Incidence | |
|---|---|---|---|---|---|
| | | | | Number | Percentage |
| 1. | Khade B et al., 2020 [2] | Maharashtra | 60 | 32 | 53 |
| 2. | Afroz MKH et al., 2020 [3] | Karnataka | 50 | 12 | 24 |
| 3. | Ballesteros DR et al., 2018 [4] | Colombia | 106 | 34 | 32 |
| 4. | Rani SB et al., 2017 [5] | Tamilnadu | 50 | 24 | 48 |
| 5. | Desai RR et al., 2017 [6] | Maharashtra | 60 | 35 | 58.3 |
| 6. | Caetano EB et al., 2015 [7] | Brazil | 80 | 54 | 68 |
| 7. | Jadhav SD, Zambare BR 2015 [8] | Maharashtra | 114 | 87 | 76.3 |

| | | | | | |
|---|---|---|---|---|---|
| 8. | Gunnal SA et al., 2013 [9] | Maharashtra | 180 | 92 | 51 |
| 9. | Tamang BK et al., 2013 [10] | Sikkim | 60 | 26 | 43.3 |
| 10. | Sembian U et al., 2012 [11] | Chennai | 200 | 02 | 02 |
| 11. | Sharma M et al., 2008 [12] | Punjab | 60 | 24 | 40 |
| 12. | Uyaroglu FG et al., 2006 [13] | Turkey | 52 | 27 | 51.9 |
| 13. | Mahakkanukrauh P et al., 2004 [14] | Thai | 240 | 149 | 62.1 |
| 14. | Hemmedy MV et al., 1993 [15] | Maharashtra | 54 | 35 | 66.6 |
| 15. | Present study 2021 | Telangana | 50 | 29 | 58 |

**[Table/Fig-6]:** Incidence of AHFPL reported by various authors [2-15].

In this study, the shape of AHFPL was fusiform in most of the limbs (86.2%), and it was slender only in few limbs (13.8%). These observations were in accordance with the observations of studies done by Gunnal SA et al., Tamang BK et al., [9,10].

The origin of AHFPL in the present study was mostly from coronoid process of ulna (62% of upper limbs) than from medial epicondyle of humerus. Our findings were in accordance with the findings of Jadhav SD and Zambare BR and Sharma M et al., [8,12]. In the present study, it was found that the insertion of AHFPL was mainly with the upper 1/3rd of FPL (66%) than middle 1/3rd FPL. Most of the authors reported the same [4,6,8].

The AHFPL was supplied by AIN in all cases and the nerve was posterior to the AHFPL in most of the cases (83%). These findings were in accordance with the findings of several studies done by Afroz MKH et al., Gunnal SA et al., Hemmady MV et al., [3,9,15], Repetitive trauma to the forearm and structural anomalies and cicatricle contraction of AHFPL as in Volkmann Ischemic Contracture can lead to entrapment of AIN and MN. Paralysis of AIN due to compression in the forearm is also known as the Kiloh-Nevin syndrome [9]. The presence of AHFPL has to be kept in mind during anterior approaches to the proximal radius and elbow joint as decompressive fasciotomy for compartment syndrome of forearm [15]. Precise knowledge of AHFPL muscle is necessary while doing the diagnosis and surgeries of various compartment syndromes of forearm.

The advancement of new imaging techniques such as Computed Tomography (CT) and Magnetic Resonance Imaging (MRI) are helpful to detect the anatomical variation and abnormalities of the muscles of forearm. These techniques should be used before surgery for better outcome and to prevent iatrogenic trauma during surgeries.

## Limitation(s)

The sample size was limited (50) and concentrated on incidence, morphology, relation of AHFPL with median and AIN. It will be beneficial to conduct similar studies with larger sample size.

# CONCLUSION(S)

In the present study AHFPL was found in 58% upper limbs. Bilateral occurrence (40%) was common than unilateral (18%). The present study throws light on the importance of AHFPL as it is relevant for the compression neuropathy/nerve entrapment syndrome. The precise anatomical knowledge of AHFPL would be useful for the surgeons, Orthopedicians during decompressive fasciotomies for compartment syndrome.

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