

# Cadaveric Study of the Human Thumb: Observation on Different Forms of Variations in Pollicis Tendons and Their Clinical Significance.

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## ABSTRACT

**Background:** Few structures of the human body are as unique as the hand. The hand needs to be mobile in order to position the fingers and the thumb. Coordination of the hand is required for performing tasks. The structures that form and move the hand require proper alignment and control along with adequate strength for normal hand function to occur. The thumb is a highly evolved structure of the hand and is an exemplary example of human evolution. It has gained attraction among researchers due to its uniqueness, clinical significance and associated variations in morphology. **Aim –** The aim of this study was to observe variations among Abductor Pollicis Longus (APL), Extensor Pollicis Longus (EPL) and Extensor Pollicis Brevis (EPB). **Methods:** Upper limbs from twenty embalmed cadavers were studied in the Department of Anatomy and variations among the APL, EPL and EPB were documented. **Results:** Unilateral variations were noted among form and structure of APL, EPL and EPB. Bilateral variations were absent. All three muscles in all twenty specimens had same nerve supply. **Conclusion:** Variations among APL, EPL and EPB are clinically significant and may lead to obfuscations during hand and upper limb surgeries.

**Keywords:** Coordination, Evolution, Tendons, Thumb, Variations.

## INTRODUCTION

The thumb of the human hand is an evolutionary milestone in human evolution. The thumb is the first digit of the hand and is responsible for all gripping movements. The thumb joint is anatomically referred to as the first carpometacarpal joint and is a synovial joint of saddle variety. Muscles and tendons associated with the thumb or acting upon it are referred to as pollicis tendons. The long tendons of Abductor Pollicis Longus (APL), Extensor Pollicis Longus (EPL) and Extensor Pollicis Brevis (EPB) contribute to the smooth functioning of the thumb.<sup>[1]</sup> All these muscles belong to the extensor compartment of forearm and are uniformly innervated by the posterior interosseous nerve.

thumb and EPB extends the first carpometacarpal joint.<sup>[3]</sup> Anatomic variations in relation to form, number, origin and insertion are not rare. Such variations continue to create interest in hand surgeons and researchers. Presence of any supernumerary tendon could be useful for tendon transfer without hampering stability and mobility of the thumb.

## MATERIALS AND METHODS

This study was performed on twenty formalin fixed upper limbs of unknown age and sex in the Department of Anatomy during routine dissection classes of 1st MBBS students during 2015. The extensor muscles of the front of forearm were dissected following Cunningham's dissection manual and structures of APL, EPL and EPB were observed in detail.

## RESULTS

Unilateral variants were observed in three cases only. There were no bilateral identical or non-identical variations. All muscles were innervated by posterior interosseous nerve.

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APL extends the thumb at the first carpometacarpal joint.<sup>[2]</sup> EPL extends the terminal phalanx of the

1. Variation in APL: In one case, on the right side, the APL showed duplication immediately prior to its insertion however, both slips inserted onto the base of the first metacarpal. Normal form and structure was observed among tendons of EPL and EPB.
2. Variation in EPL: In one case, on the right side, the EPL showed duplication immediately prior to its insertion however, both slips inserted onto the base of the proximal phalanx. Normal form and structure was observed among tendons of APL and EPB.
3. Variation in EPB: In one case, on the right side, the EPB showed higher origin from the ulna, however its insertion was normal, on the proximal phalanx of the thumb. Normal form and structure was observed among tendons of APL and EPL.

## DISCUSSION

Anatomical knowledge of variations among the long tendons of the thumb is important during treatment and rehabilitation of the diseased and traumatized hand especially when considering tendons for repair or graft. Among all muscles in the extensor compartment of the forearm, the APL is known to exhibit numerous variations. Variations in the number of tendons of APL muscle may be asymptomatic and an incidental finding.<sup>[4]</sup> In our study we observed a duplication of APL tendon on one side. The presence of accessory muscles may be important in de Quervain's syndrome.<sup>[5]</sup> As multiple tendon variation is more commonly reported in APL the same should not be neglected.<sup>[6]</sup> A maximum of seven tendons of APL have been reported.<sup>[7]</sup> Multiple tendons of APL may hinder with the normal biomechanics of the thumb. Lack of knowledge of compartmentalization of APL tendons may lead to poor surgical outcome post decompression. Variations in EPL are rarely seen. In our study we observed a duplication of EPL tendon on one side. Presence of multiple tendons may alter the kinematics around the site of attachment.<sup>[8]</sup> EPB commonly had additional attachments. In our study we observed a higher level of origin of EPB tendon on one side. The anomalies related to the extensor muscles of forearm are commonly due to a developmental malformation.<sup>[9]</sup> Presence of such variations underlines their anthropological importance.<sup>[10]</sup> Clinical knowledge about the existence of these tendons and their variations is important for surgeons during hand surgery.

## CONCLUSION

Supernumerary tendinous slips may be useful for tendon grafts during reconstructive hand surgery. Such variations may also alter the force distribution around a joint. Existence of such variations may be a result of atavism.

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