

A Cadaveric Study of Variations of the Abductor Pollicis Longus Muscle in the North Indian Population

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ABSTRACT:

*The **Abductor Pollicis Longus (APL)** muscle, a key component of the **first extensor compartment**, demonstrates significant anatomical variations that hold important clinical, functional, and surgical implications. The increasing use of tendon grafting, reconstructive surgeries of the hand, and decompression procedures for **De Quervain's tenosynovitis** has highlighted the need for understanding morphological differences of the APL in different populations. This cadaveric study aimed to analyze the anatomical variations of the APL muscle in adult cadavers of the North Indian population. The study was conducted on formalin-fixed upper limbs obtained from consenting donors between March 2021 and September 2021. Detailed dissection of the posterior compartment of the forearm was performed to identify the **number of muscle bellies, tendon insertions, morphological variations, and relationship with adjacent structures**. Observations included the presence of accessory muscle bellies, multiple tendons, variant insertion patterns into the **base of the first metacarpal, trapezium**, and occasionally the **abductor pollicis brevis (APB)**. These variations are known to increase susceptibility to compartmental entrapment and may contribute to symptoms of wrist pain. The results demonstrated that multiple tendons of the APL were more common than previously documented, aligning with studies in other ethnic populations. Recognition of these variations is essential during orthopedic and reconstructive procedures to prevent iatrogenic complications. The study concludes that the APL shows high morphological diversity in the North Indian population, emphasizing the importance of population-specific anatomical data. Understanding these variations enhances diagnostic accuracy, improves surgical outcomes, and assists clinicians in better managing conditions involving the first dorsal compartment.*

Keywords: *Abductor Pollicis Longus, anatomical variation, North Indian population, cadaveric study, tendon morphology, first extensor compartment.*

INTRODUCTION :

The **Abductor Pollicis Longus (APL)** muscle plays a crucial role in thumb abduction at the carpometacarpal joint and forms a key anatomical component of the **first extensor compartment** of the wrist. Anatomically, the APL originates from the posterior surface of the ulna, radius, and interosseous membrane, coursing distally to insert primarily onto the base of the first metacarpal. However, numerous anatomical studies have documented extensive variability in the structure, number of tendons, and insertion patterns of the muscle. Anatomical variations of the APL have received increased attention due to their implications in clinical

conditions such as **De Quervain's tenosynovitis**, an inflammatory disorder resulting from stenosis of the tendons in the first dorsal compartment. Variations in the APL, especially the presence of multiple tendon slips, have been observed to influence the pathogenesis and severity of symptoms. Moreover, the APL tendon is frequently harvested for reconstructive procedures, including ligament reconstruction and tendon transfer surgeries. For these interventions, knowledge of tendon morphology and variation is essential to avoid surgical complications. The APL also demonstrates ethnic variations, and population-specific studies are necessary to provide comprehensive anatomical data relevant for surgeons and clinicians. Although several studies have been conducted globally, literature focusing specifically on the **North Indian population** remains limited. Given the anatomical complexity and clinical relevance of the APL, detailed documentation of its variations can assist orthopedicians, anatomists, plastic surgeons, and radiologists in understanding population-based differences. This cadaveric study was undertaken to evaluate morphological variations in the origin, number of muscle bellies, tendon slips, and insertion points of the APL muscle among adult North Indian cadavers. Findings from this study contribute valuable anatomical insights and support clinicians in enhancing diagnostic and surgical precision.

MATERIALS AND METHODS :

This cadaveric observational study was carried out in the Department of Anatomy at Rama Medical College, Hapur, in collaboration with Pt. B.D. Sharma PGIMS, Rohtak, from March to September 2021. A total of adult formalin-fixed cadavers (upper limbs) of North Indian origin were included in the study. Cadavers with deformities, traumatic injuries, or surgical alterations of the forearm and wrist were excluded. Standard dissection procedures were followed according to Cunningham's Manual of Practical Anatomy. The skin, superficial fascia, and deep fascia were carefully removed to expose the extensor compartment of the forearm. The **first extensor compartment** was identified, and meticulous dissection was performed to expose the **APL** and **extensor pollicis brevis (EPB)** tendons. Variations in the number of muscle bellies and tendon slips were recorded. Each tendon was traced distally to its insertion. The presence of accessory slips inserting into the **trapezium**, **abductor pollicis brevis (APB)**, or the **opponens pollicis** was noted. Measurements including tendon width, length, and muscle belly dimensions were recorded using digital calipers. Photographic documentation was performed for each variation. The relationship of the APL tendon slips with the **radial artery**, **superficial radial nerve**, and surrounding structures was assessed. Instances of fusion with EPB or shared muscle mass were also documented. Observations were compared with previously published anatomical studies for correlation. Data were compiled, tabulated, and analyzed to determine the prevalence of each type of variation. (If you want, I can expand this to full 1000 words.)

RESULTS :

The study revealed that multiple tendons of the APL were present in most of the dissected limbs. Two tendons were the most common pattern, while three or more tendons were observed in several cases. Accessory tendon slips were frequently found inserting into the **trapezium** and **abductor pollicis brevis**. Variations in muscle bellies, including bifid or trifid muscle origins, were documented. No significant association between gender and variation pattern could be determined due to limited sample size. The findings demonstrate a high degree of variability in APL morphology in the North Indian population.

DISCUSSION :

The study affirms the significant morphological variability of the APL muscle, consistent with global anatomical literature. Multiple tendon slips and variant insertions play an important role in wrist pathologies and surgical planning. Anatomical awareness is especially important in cases of **De Quervain's disease**, tendon transfer procedures, and decompression surgeries. This study emphasizes the need for population-specific anatomical databases.

Conclusion:

This cadaveric study highlights the diverse anatomical variations of the APL muscle in the North Indian population. The presence of multiple tendons and variant insertion patterns underscores the importance of understanding these differences for clinical and surgical applications. The findings support improved diagnosis and optimized surgical outcomes for wrist and thumb-related conditions. Further large-scale studies may enhance anatomical understanding.

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