



UNIQUE VARIATION OF FLEXOR DIGITORUM SUPERFICIALIS TO THE LITTLE FINGER - A CASE REPORT

Mohamed Thuslima¹, Dhivyalakshmi Gnanasekaran^{2*} and Raveendranath Veeramani³

^{1,2,3}Jawaharlal Institute of Postgraduate Medical Education and Research [JIPMER], Puducherry, India.

*Corresponding Author: Dhivyalakshmi Gnanasekaran

Jawaharlal Institute of Postgraduate Medical Education and Research [JIPMER], Puducherry, India.

Article Received on 26/04/2017

Article Revised on 16/05/2017

Article Accepted on 05/06/2017

ABSTRACT

Flexor digitorum superficialis (FDS) is the largest of the superficial flexors of the forearm. It arises by humero ulnar and radial heads. The muscle usually separates into two strata. The superficial stratum joined laterally by the radial head, divides into two tendons for the middle and ring finger and the deep stratum for the index and little finger. Distal to the carpal tunnel the four tendons diverge and insert into the middle phalanx. During routine dissection, a unique variation of FDS was identified. The deep stratum divided very proximally into two muscle bellies and then ends in two tendons for the little finger and index finger. The tendon to the little finger (FDS V) presented an intermediate muscle belly at the distal forearm that was connected to the superficial stratum of FDS on its radial side. A thin tendinous slip of communication was noted between the proximal tendon of FDS V and the tendon of flexor digitorum profundus muscle, which merged with the later at the level of the middle of the forearm. Phylogenetically, these variations are considered to be due to either retrogressive remnants of connection between two strata or progressive occasional separation of the individual muscle belly. This additional tendon slips can be used as a separate motor unit in tendon transplant surgeries. The anomalous tendinous communication between flexor digitorum superficialis and flexor digitorum profundus tendon may limit finger independence and can produce restrictive flexor tenosynovitis. Surgeons should be aware of such variations to differentiate, diagnose and treat various disease conditions of distal forearm and hand.

KEYWORDS: Flexor digitorum superficialis, flexor of forearm, flexor digitorum profundus, tendon graft, hand grip.

INTRODUCTION

Flexor digitorum superficialis (FDS) is the largest of the superficial flexors of the forearm. It arises by two heads namely humero-ulnar and radial heads. This muscle usually separates into two strata. The superficial stratum joined laterally by the radial head, divides into two tendons for the middle and ring finger. The deep stratum provides a muscular slip to join the superficial fibers directed to the ring finger and then ends in two tendons for the index and little finger. Distal to the carpal tunnel the four tendons diverge and insert into the middle phalanx.^[1]

Several muscle tendon variations have been described in the flexor compartment of the forearm and most of them were related to FDS of the little finger (FDS V) with varying degrees of agenesis.^[2, 3] Knowledge of such variations and its developmental and phylogenetic basis is important for the physicians and surgeons to diagnose, differentiate and treat various disease conditions of distal forearm and hand.

CASE REPORT

During routine dissection of the right upper limb of an adult Indian male cadaver in the department of anatomy, JIPMER, a unique variation of FDS V was noted. FDS had a normal humero-ulnar and radial heads of origin. It separated into two strata. The superficial stratum gave two tendons for the middle and ring fingers. The deep stratum divided very proximally into two muscle bellies and then ends in two tendons for the little finger and index finger. The tendon to the little finger presented an intermediate muscle belly at the distal forearm that was connected to the superficial stratum of FDS on its radial side. [Figure 1] A thin tendinous slip of communication was noted between the proximal tendon of FDS V and the tendon of flexor digitorum profundus muscle, which merged with the later at the level of the middle of the forearm. [Figure 2] Behind the flexor retinaculum, the tendons were arranged in pairs as normally: the superficial pair to ring and middle finger, the deep pair to the index and little finger and were inserted into the anterior aspect of middle phalanx after splitting into two bundles which pass around the profundus.

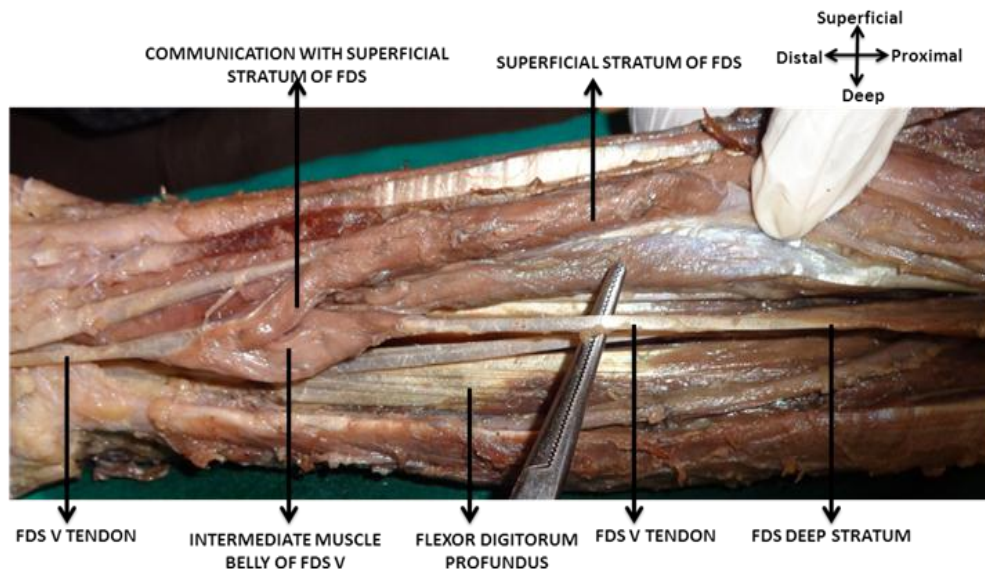


Figure 1: Shows separate muscle belly for FDS V from deep stratum. FDS V tendon having intermediate muscle belly which communicates with superficial stratum.

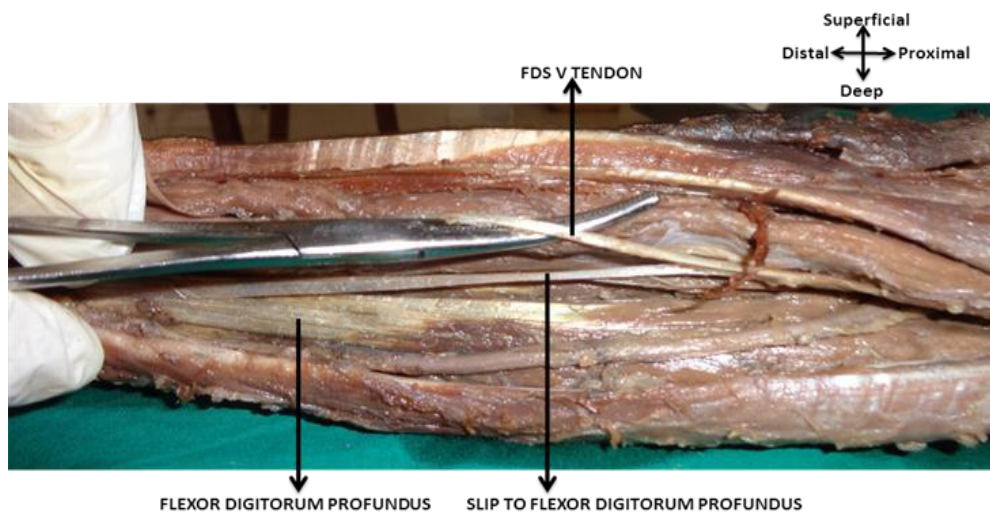


Figure 2: Shows a small tendinous slip of communication between the FDS V and the flexor digitorum profundus.

DISCUSSION

Flexor muscles of forearm develop from the common flexor pre muscle mass (mesoderm) which is continuous with the tissue of the digits. Subsequently, it divides into superficial and deep layers to form the superficial and deep flexors. The palmar mass later regresses for functional reasons in humans to form the long tendons. Any communication between the flexor muscles could be due to incomplete cleavage of flexor mass during development. Failure of the muscle fibers to retreat from the palm and distal forearm may result in the presence of abnormal muscle bellies in flexor tendons in the palm and distal forearm. Phylogenetically, these variations are considered due to either retrogressive remnants of connection between two strata or progressive occasional separation of the individual muscle belly.^[5, 6]

Many studies have shown the variability of the FDS V in humans. In a study on 70 cadaveric hands, it was found that 13% of the hands had anatomical variations for the FDS V.^[7] Ohtani O studied the structure of FDS in 52 cadaveric limbs and proposed four major and six minor types of variations of FDS. Our findings were atypical and not in the favour of any of these classifications.^[4] However, Shoja MM has reported that the deep part of the FDS was split and showed two distinct fusiform muscle bellies and continued as tendon to the index and little finger similar to our case.^[8]

FDS has been used as a motor for various tendon transfer procedures in the hand.^[9] Richer et al evaluated the results of transfer of the FDS to the abductor pollicis brevis for the restoration of thumb abduction in thenar paralysis caused by advanced chronic Carpal Tunnel Syndrome (CTS) and found satisfactory results.^[10] The

use of the FDS V tendon as the donor motor had minor morbidity compared with other methods and had predictable improvement and patient satisfaction.^[9] Hence recognition of FDS variation is important during tendon transfer procedures and repair of tendon lacerations.

There is conflicting information as to the grip strength of the hand in individuals with absent FDS V. Some authors propose that absent FDS V significantly lowers the grip strength^[11, 12] and some say it doesn't.^[13] The knowledge of the possible presence of accessory tendons could be exploited in tendon transfer procedures without affecting the grip strength. Another condition that should be considered in the present case report is the tendinous communication between FDS V and flexor digitorum profundus. This type of anomaly affecting the digital flexor tendon that is the connection between flexor digitorum superficialis and flexor digitorum profundus tendon may limit finger independence and can produce a restrictive flexor tenosynovitis.^[14]

CONCLUSION

This case report provides valuable insights into the embryological and phylogenetic basis of the variations in FDS V and the clinical implications of such variations.

REFERENCES

1. Biant LC. Elbow and forearm. In: Standring S (ed). Gray's anatomy: The Anatomical Basis of Clinical Practice. 41st ed., New York; Elsevier Limited, 2016; 849.
2. Tan JS, Oh L, Louis DS. Variations of the Flexor Digitorum Superficialis As Determined by an Expanded Clinical Examination. *J Hand Surg Am*, 2009; 34(5): 900-6.
3. Capdarest-Arest N, Gonzalez JP, Türker T. Hypotheses for Ongoing Evolution of Muscles of the Upper Extremity. *Medical Hypotheses*, 2014; 82(4): 452-6.
4. Ohtani O. Structure of the Flexor Digitorum Superficialis. *Okajimas Folia Anat Jpn*, 1979; 56(5): 277-88.
5. Lewis WH. The development of the arm in man. *Am J Anat*, 1902; 1: 145- 83.
6. Jones EG. Some unusual muscular anomalies explained embryologically. *Acta anat*, 1966; 64(4): 516-30.
7. Gonzalez MH, Whittum J, Kogan M, Weinzeig N. Variations of the flexor digitorum superficialis tendon of the little finger. *Journal of hand surgery*, 1997; 22(2): 277-80.
8. Shoja MM, Tubbs RS, Loukas M, Shokouhi G. The split flexor digitorum superficialis. *Ital J Anat Embryol*, 2008; 113(2): 103-7.
9. Gupta A, Kumar V. Bilateral Absence of Flexor Digitorum Superficialis (FDS) Tendon of the Little Finger: Clinical Significance. *J Clin Diagn Res*, 2014; 8(2): 135-6.
10. Richer RJ, Peimer CA. Flexor superficialis abductor transfer with carpal tunnel release for thenar palsy. *J Hand Surg Am*, 2005; 30(3): 506-12.
11. Bowman P, Johnson L, Chiapetta A, Mitchell A, Belusko E. The clinical impact of the presence or absence of the fifth finger flexor digitorum superficialis on grip strength. *J Hand Ther*, 2003; 16(3): 245-8.
12. Methot J, Chinchalker SJ, Richards RS. Contribution of the ulnar digits to grip strength. *Can J Plast Surg*, 2010; 18(1): e 10-4.
13. Puhaindran ME, Sebastin SJ, Lim AY, Xu WX, Chen YM. Absence of flexor digitorum superficialis tendon in the little finger is not associated with decreased grip strength. *J Hand Surg Eur*, 2008; 33(2): 205-7.
14. Gavin M, Fiona P, Anne B, Stewart W. Musculotendinous Anomalies in Musician and Nonmusician Hands. *Plastic And Reconstructive Surgery*, 2003; 112(11): 1815-22.