ORIGINAL COMMUNICATION

Anatomy Journal of Africa. 2022. Vol 11 (2): 2197-2201

A CADAVERIC STUDY OF FIRST DORSAL EXTENSOR COMPARTMENT IN AFRICANS: CLINICAL IMPLICATIONS

Bolaji Oyawale Mofikoya[1], Andrew Omotayo Ugburo[1], Orimisan Belie[2]

[1]Burns, Plastic Surgery and Hand rehabilitation, Department of Surgery, Faculty of Clinical Sciences, College of Medicine, University of Lagos, Lagos, Nigeria.

[2]Burns, Plastic Surgery and Hand rehabilitation, Department of Surgery, Lagos University Teaching Hospital, Lagos, Nigeria.

Correspondence to: Dr. Bolaji Mofikoya. Department of Surgery, University of Lagos. Email: bmofikoya@yahoo.com

ABSTRACT

While several reports have been made regarding the anatomic variations in the first dorsal extensor compartment, very few have emanated from Africa. This study looked at this compartment with respect to variations in the superficial branch of the radial nerve and the enclosed tendons. The first dorsal extensor compartment of the hand was studied in 32 formalin preserved adult African cadavers. The superficial branch of the radial nerve emerged from underneath the brachioradialis 8.4cm(sd±2.2cm) proximal to the radial styloid and branched 6.2cm (sd ±1.5cm) proximal to it as well. This nerve along with the cephalic vein or its tributary transversed part of the compartment in all the hands. A double Extensor pollicis longus was found in one hand. Septations were observed in 31.3 %(n=10) of the hands. Abductor pollicis longus tendon was fused in three hands, and had more than one slip in 94% of the hands. A single extensor pollicis brevis tendon was found all dissected hands. Clinical implications of these findings are highlighted in this work.

Key words: anatomy, first dorsal metacarpal compartment, Africans, cadaver

DOI: https://dx.doi.org/10.4314/aja.v11i2.7

INTRODUCTION

The dorsoradial surface is one of the most exposed areas of the hand. The first dorsal compartment FDC (anatomic snuff box, also called fovea radialis) lies in this area. Lying between the tendons of abductor pollicis longus APL, extensor pollicis brevis EPB laterally and the extensor pollicis longus EPL medially [Anson BJ,1963]. This clinically important area not only bears the terminal branches of the superficial branch of radial nerve SBRN, it often contains the the cephalic vein and houses the radial artery. The floor is formed by the distal radius, scaphoid, trapezium as well as the base of the first metacarpal [Grechenig W et al., 1999].

This compartment is also the site of a condition described by De Quervains in 1892, characterised by intense pain at the FDC on ulnar deviation at the wrist. The condition has been postulated to be related to repetitive overuse of the wrist in women, also several anatomic risk factors, such as aberrant tendons, presence of septum or aberrant compartments, and abnormal insertions of tendon slips may be responsible for the development of De Quervains disease DQ [Ilyas AM et al., 2007; Pires PR et al., 2013; Wolfe SW et al., 2010]. To our knowledge no report has been made regarding these variations in the African till date.

We therefore decided to look at the anatomy of the first dorsal compartment in African cadavers with respect to the branches of the superficial branch of Radial nerve, presence of septations in the fibrosseous canal, as well as tendon multiplicity.

MATERIALS AND METHODS

Cadaveric dissections were carried on 32 adults hands (10 males and 6 females) at the surgical skills Center of the College of Medicine University of Lagos, Nigeria . All were done with the aid of x 4.5 magnification loupes and measurement was done with the aid of an caliper.

Anatomic dissections were carried out from the radial border of the elbow joint as far distally as the dorsal surface of the first web space. (figure1). The following measurements were taken: distance between the olecranon process and the radial styloid process; distance between point of emergence of the SBRN and radial styloid; distance between the lateral and the medial branches of SBRN at the level of the Radial styloid; p resence of the cephalic vein at the FDC; multiplicty of tendon slips in the FDC; septations in the FDC. (In this study a septation is defined as a fibrous sheath of any length completely or partially separating EPB from APL tendons in the FDC).

RESULTS

All forearms and hand dissected had Superficial branch of radial nerve emerge from the medial border of the brachioradialis. Each SBRN divided into a smaller medial and a greater lateral branch. The branches travelled across various parts of the first dorsal compartment in all limbs. There were septations in the floor of the FDC in 10 compartments.

The was single EPB tendon in all hands. There was a double EPL found in one hand, there were multiplicity of APL slips in 30 hands as shown in table 1.**Table 1. Distances of SBRN to anatomic landmarks and anatomic variations**

Distances	**Mean (cm)**	**SD**
Olecranon to Radial Styloid distance	25.2cm	±3.2cm
SBRN to Radial Styloid distance	8.4 cm	±2.2cm
SBRN origin to Branching	6.2cm	±1.5cm
Inter branch distance at the Radial Styloid level	1.8cm	±0.2cm
Variations noted	**Frequency (%)**	
FDC septations	10(31.3%)	
Single EPB slip	32 (100)	
APL Single Slip	2(6)	
APL 2 slips	6(19)	
APL 3 slips	11(34)	
APL 4 slips	8(25)	
APL fused	3(9)	

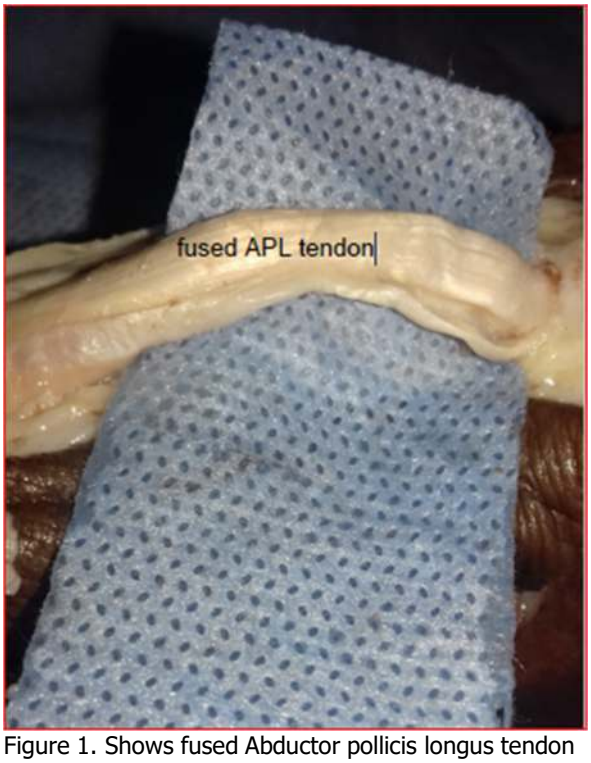

Figure 1. Shows fused Abductor pollicis longus tendon

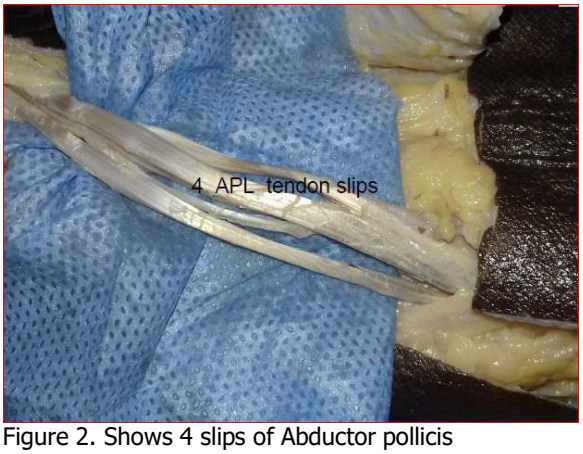

Figure 2. Shows 4 slips of Abductor pollicis

DISCUSSION

The The first dorsal extensor compartment is often described in classic anatomy textbooks as consisting of a single extensor pollicis brevis EPB, abductor pollicis longus APL, over a fibrosseous canal with insertions into first metacarpal and proximal phalanx respectively. There is a high degree of variations in the tendon insertions as well as the distal SBRN branches in this area in many studies [Baba et al.,1954; Bahm et al.,1995; Bouchlis G et al., 1997; Brown et al., 2003; Brunelli GA and Brunelli GR, 1991] Our study similarly identified a number of these variations as shown in table 1.

We found the SBRN to be closely related to the FDC in all our dissected hands. It arose 8.4cm from the radial styloid and branched at a mean distance of 6.2cm in all dissected hands which is similar to the emergence points of 8cm by Gonzalez et al.,1995 and 8.31cm by Robson AJ et al., 2008 . While our branching point was 6.2cm proximal to the radial styloid process in our work, apparently more proximal than the reports of Gonzalez who reported 5cm and Robson who reported 4.92cm. This is also comparable to the findings of Samarakoon et al., 2011 who reported an emergence point of 8.54 cm and branching point of 5.54cm from the radial styloid process. This work further confirms the vulnerability of this nerve in several procedures of the distal hand such as open reduction and internal fixation of the distal radial fractures, wrist arthroscopy, surgical decompression of the FDC in DQ, Radial artery cannulation in the Critically ill, Radial forearm flap dissections for plastic surgery reconstructions, as well as AV fistula creation in patients undergoing long term haemodialysis.

We also observed the cephalic vein or its tributary to be present in the FDC in all 32 hands as earlier reported[Vialle et al 2001] .

31.3% of our studied compartments had partial or complete septations, this was low compared to other studies . There is a high variability in the prevalence of septations in reports by several workers from 34% by Leslie et al., 1990 to 79.4% reported by Hazani R, et al., 2008. But there are several degrees of septations. Gao ZY et al., 2008 further classified the subcompartments into types I to III. We did not classify the septations in this study. There have been suggestions that septations may play a possible role in the development of DQ with some reports suggesting a more developed subcompartment for EPB increases the chances of a failure of injection therapy as there is less likelihood the injected agent will be delivered into the EPB subcompartment[Nayak SY et al., 2017].

The most frequent and widely described variation found in literature regarding the FDC is the multiplicity of APL slips[Baba et al., 1954; Lee ZH et al., 2017; Jackson WT et al, 1986; Martinez R et al., 1985; Sarickcioglu and Yildirim et al., 2004 ; Stein et al., 1951; Thwin et al ., 2014]. These varies widely, and up to seven slips have been documented which is similar to our finding of 94% having more than one slip and nearly a tenth of the hands had a large APL tendon that was fused . Interestingly single APL slip has been more significantly documented in DQ patients compared to the general population[Lee ZH et al 2017]. However in patients with DQ with mutilple slips , the decompression may be associated with the risk of tendon dislocation[Matzon et al., 2019].

Apart from the above other relevance of the FDC is the need to consider other pathologies in the evaluation of FDC pain. Conditions such as Basal joint arthritis, scaphoid fractures as well as Scapho-trapezium arthritis can cause pain in this compartment.

We realize our work is limited by the small sample size, as well as formalin preservation of the cadaver.

CONCLUSION

This study shows FDC variations similar to previous reports, however the role of these variants in the aetiology of DQ is still unclear. There are clearly applied anatomic considerations in the evaluation of FDC pain as well as with regards to clinical procedures carried out in this region.

CONFLICTS OF INTEREST

The authors have no conflict of interest with respect to this study.

REFERENCES

1. Anson BJ.(1963). An atlas of human anatomy. 2nd ed. Philadelphia: WB Saunders;. 180e1.
2. Baba MA (1954) The accessory tendon of the abductor pollicis longus muscle. Anat Rec 119:541–547
3. Bahm J, Szabo Z, Foucher G (1995) The anatomy of de Quervain's disease. A study of operative findings. Int Orthop 19(4):209–211
4. Bouchlis G, Bhatia A, Asfazadourian H, Touam C, Vacher C, Oberlin C (1997) Distal insertions of abductor pollicis longus muscle and arthritis of the first carpometacarpal joint in 104 dissections. Ann Chir Main Memb Super 16(4):326–338
5. Brown GD , Roh MS, Strauch RJ, Rosenwasser MP, Ateshian GA, Mow VC (2003) Radiography and visual pathology of the osteoarthritic scaphotrapezio-trapezoidal joint, and its relationship to trapeziometacarpal osteoarthritis. J Hand Surg 28(5):739–743
6. Brunelli GA, Brunelli GR (1991) Anatomical study of distal insertion of the abductor pollicis longus. Concept of a new musculotendinous unit: the abductor carpi muscle. Ann Chir Main Memb Super 10(6):569–576
7. Gao ZY, Tao H, Xu H, Xue JQ, Ou-Yang Y, Wu JX (2017) A novel classification of the anatomical variations of the first extensor compartment. Medicine (Baltimore);96(35):e7875.
8. Gonzalez MH Sohlberg R, Brown A, Weinzweig N J(1995) Hand Surg Am Jul;20(4):657-60
9. Grechenig, W.; Peicha, G.; Fellinger, M.; Seibert, F. J. & Weiglein, A. H (1999). Anatomical and safety considerations in establishing portals used for wrist arthroscopy. Clin. Anat., 12(3):179-85,
10. Hazani R, Engineer NJ, Cooney D, Wilhelmi BJ(2008) Anatomic landmarks for the first dorsal compartment. Eplasty;8:e53. Epub 2008 Nov 18.

11. Ilyas AM, Ast M, Schaffer AA, Thoder J (2007)De Quervain tenosynovitis of the wrist. J Am Acad Orthop Surg;15:757-64.
12. Jackson, W.T., Viegas, S.F., Coon, T.M., Stimpson, K.D., Frogameni, A.D., Simpson, J.M(1986) Anatomical variations in the first extensor compartment of the wrist. A clinical and anatomical study. J Bone Joint Surg Am 68, 923-926
13. Lee, Z.H., Stranix, J.T., Anzai, L., Sharma, S. (2017) Surgical anatomy of the first extensor compartment: A systematic review and comparison of normal cadavers vs. De Quervain syndrome patients. J Plast Reconstr Aesthet Surg 70, 127-131
14. Leslie Bruce, Ericson William, Morehead James (1990) Incidence of a septum within the first dorsal compartment of the wrist. The Journal of hand surgery. 15. 88-91.
15. Martinez, R., Omer, G.E., Jr., (1985) Bilateral subluxation of the base of the thumb secondary to an unusual abductor pollicis longus insertion: a case report. J Hand Surg Am 10, 396-399
16. Matzon JL, Graham JG, Lutsky KF, Takei TR, Gallant GG, Beredjiklian PK. (2019) A Prospective Evaluation of the Anatomy of the First Dorsal Compartment in Patients Requiring Surgery for De Quervain's Tenosynovitis. J Wrist Surg Oct;8(5):380-383.
17. Nayak SR, Hussein M, Krishnamurthy A, et al (2009) Variation and clinical significance of extensor pollicis brevis: a study in South Indian cadavers. Chang Gung Med J Nov-Dec;32(6): 600e4
18. Pires PR, Pires PRJ, Schneiter HG. Tenossinovite De Quervain, in: Barreto JM, Cristante AF(2013) (eds) SBOT Série Ortopédica Cirúrgica, Elsevier, Rio de Janeiro; 209-19.
19. Robson, A. J.; See, M. S. & Ellis H (2008) Applied anatomy of the superficial branch of the radial nerve. Clin. An 21(1):38-45
20. Samarakoon, L. B.; Lakmal, K. C.; Thillainathan, S.; Bataduwaarachchi, V. R.; Anthony, D. J. & Jayasekara, R. W(2011) Anatomical relations of the superficial sensory branches of the radial nerve: a cadaveric study with clinical implications. Patient Saf. Surg., 5(1):28
21. Sarikcioglu, L., Yildirim, F.B., (2004) Bilateral abductor pollicis longus muscle variation. Case report and review of the literature. Morphologie 88, 160-163.
22. Stein, A.H., Jr., Ramsey, R.H., Key, J.A., (1951) Stenosing tendovaginitis at the radial styloid process (DeQuervain's disease). AMA Arch Surg 63, 216-228.
23. Thwin SS, Fazlin F, Than M (2014) Multiple variations of the tendons of the anatomical snuffbox. Singapore Med J. Jan;55(1):37-40
24. Vialle, R.; Pietin-Vialle, C.; Cronier, P.; Brillu, C.; Villapadierna, F. & Mercier P(2001) Anatomic relations between the cephalic vein and the sensory branches of the radial nerve: How can nerve lesions during vein puncture be prevented? Anesth. Analg., 93(4):1058- 61,
25. Wolfe SW. Tendinopathy. In: Wolfe SW, Green DP, Hotchkiss RN, Pederson WC, Kozin SH (eds.) (2010) Green's Operative Hand Surgery: Expert Consult. Elsevier, Philadelphia;2079-83.