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

Bolaji Oyawale Mofikoya1, Andrew Omotayo Ugburo1, Orimisan Belie2

1Burns, Plastic Surgery and Hand rehabilitation, Department of Surgery, Faculty of Clinical Sciences, College of Medicine, University of Lagos, Lagos, Nigeria.
2Burns, 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 fibroosseous 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 a 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; presence of the cephalic vein at the FDC; multiplicity 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

<table>
<thead>
<tr>
<th>Distances</th>
<th>Mean (cm)</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Olecranon to Radial Styloid distance</td>
<td>25.2cm</td>
<td>±3.2cm</td>
</tr>
<tr>
<td>SBRN to Radial Styloid distance</td>
<td>8.4 cm</td>
<td>±2.2cm</td>
</tr>
<tr>
<td>SBRN origin to Branching</td>
<td>6.2cm</td>
<td>±1.5cm</td>
</tr>
<tr>
<td>Inter branch distance at the Radial Styloid level</td>
<td>1.8cm</td>
<td>±0.2cm</td>
</tr>
</tbody>
</table>

Variations noted

<table>
<thead>
<tr>
<th>Variations noted</th>
<th>Frequency (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>FDC septations</td>
<td>10(31.3%)</td>
</tr>
<tr>
<td>Single EPB slip</td>
<td>32 (100)</td>
</tr>
<tr>
<td>APL Single Slip</td>
<td>2(6)</td>
</tr>
<tr>
<td>APL 2 slips</td>
<td>6(19)</td>
</tr>
</tbody>
</table>

Figure 1. Shows fused Abductor pollicis longus tendon
DISCUSSION

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 fibroosseous 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 8.4 cm from the radial styloid and branched at a mean distance of 6.2 cm in all dissected hands which is similar to the emergence points of 8 cm by Gonzalez et al., 1995 and 8.31 cm by Robson AJ et al., 2008. While our branching point was 6.2 cm proximal to the radial styloid process in our work, apparently more proximal than the reports of Gonzalez who reported 5 cm and Robson who reported 4.92 cm. 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 5.54 cm 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 multiple 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**