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Original Research Article

Variations in the Extensor Groove on Radial Styloid Process

AzraJabeen[1], Lakshmi TA[2], Sujatha N[1]

[1]Post Graduate, [2]Assistant Professor,
Department of Anatomy, St. John's Medical College, Bangalore, India.

Corresponding Author: Lakshmi TA

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ABSTRACT

Introduction: In this era of electronics, use of hand held electronic devices has increased tremendously. The result is overuse of thumb coupled with awkward position of wrist that has led to an increase in tenosynovitis of tendons in the first extensor compartment. A study of the normal morphology of this region will help to understand these pathological conditions and also improve the results of their treatment. The aim of this study was to study the classification, morphology and morphometric parameters of the first extensor groove on the radial styloid process.
Materials and methods: 50 Right and 50 Left dry adult radii of unknown sex were taken from the Dept of Anatomy, St John's Medical College, and Bangalore. The bones were divided into 3 types based on the grooves on the extensor surface of radial styloid.
Type 1: groove that was divided into two sub-grooves by a tiny bony ridge,
Type 2: groove without the tiny ridge,
Type 3: without any groove.
The distance between the processes of the palmar bony ridge to dorsal bony tubercle (AC) and to the sharp point of styloid process of radius (AB) was measured using digital vernier caliper in all the bones.
Results: The following observations were made:
Type 1 - 40%
Type 2 - 35%
Type 3 - 25%
AC: Right 11.27 mm ± 1.61, Left 11.69 mm ± 1.48.
AB: Right 16.31mm ±2.20, Left 16.55mm ±2.18.
Conclusion: The above anatomical data could provide a safe range for plating of radius in fractures, in treating de Quervain and for steroid injections depending on the bony landmarks which are easy to identify on the body surface.

Keywords: Extensor groove, styloid process of radius, De Quervain's disease, first extensor compartment of wrist.

INTRODUCTION

Radius is the lateral bone of the forearm. It has an expanded proximal and distal end with an intervening shaft between it; the distal end being broader.

The distal end of radius is wider and has four surfaces. The posterior surface presents a palpable dorsal tubercle (Lister's tubercle), which is limited medially by an oblique groove; lateral to the tubercle there is a wide, shallow groove, divided by a faint vertical ridge. The tendons of abductor pollicis longus (APL) and extensor pollicis brevis (EPB) lie side by side in this shallow osseous groove in the first extensor compartment over this surface. [1]

Overuse of thumb and malposition of wrist or in De Quervain's disease, chronic inflammation due to constant friction between these tendons, their synovial sheaths and the bone leads to tenosynovitis which causes pain and functional immobility. [2] Anatomical and surgical studies have reported the presence of multiple slips of APL tendon and septum splitting this compartment and this may have a role in the pathogenesis of tenosynovitis associated with this compartment. [3,4] The effective treatment for the condition is steroidal injection; which in turn depends on the accuracy of the site and technique of injection. [2]

The aim of this study was to evaluate the anatomical variation in the morphology and the morphometric parameters of the first extensor compartment of the wrist. The results of the study could help in the accurate positioning of the needle for injections, which might have a better clinical outcome and patient satisfaction.

MATERIALS AND METHODS

In the present study 50 Right and 50 Left dry adult radii of unknown sex were taken from the Dept. of Anatomy, St John's Medical College, Bangalore.

Each radius was observed carefully and simultaneously by two observers.

***Inclusion Criteria*:** 100 adult dry radii were randomly selected from the department of Anatomy, St John's medical college, Bangalore.

***Exclusion Criteria*:** All dry radii were inspected carefully and those damaged at the distal end and those showing pathology like healed fractures were excluded from study.

Bones were divided into 3 types based on the extensor groove & existence of a tiny bony ridge in the extensor groove on radial styloid process.

- **Type 1:** groove that is divided by a tiny bony ridge into two- refer figure 1
- **Type 2:** groove without the tiny bony ridge- refer figure 2
- **Type 3:** without any groove- refer figure 3

Three points A, B and C were marked on the grooves by a marker pen - refer figure 4

- A - highest point on the palmar bony ridge
- B - tip of the styloid process
- C - highest point on the dorsal bony ridge

Specific geometrical parameters AB (Distance between the processes on the palmar bony ridge and on the dorsal bony tubercle) and AC (Distance between the processes on the palmar bony ridge and the sharp point on the styloid process) on the extensor groove were also observed using digital vernier caliper (Mitutoyo, Japan; accurate up to 0.01mm).

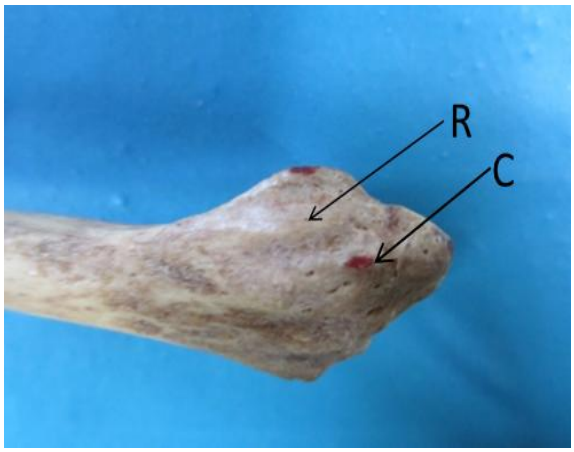

Figure 1: Type I (Groove that is divided by a bony ridge into two compartments).
R- ridge, C- dorsal tubercle

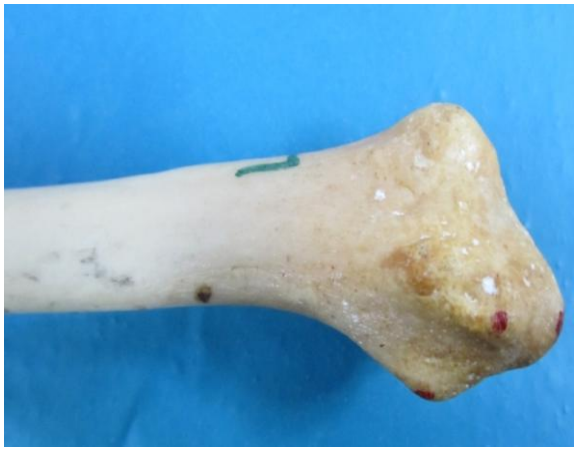

Figure 2: Type II (Groove without the tiny bony ridge).

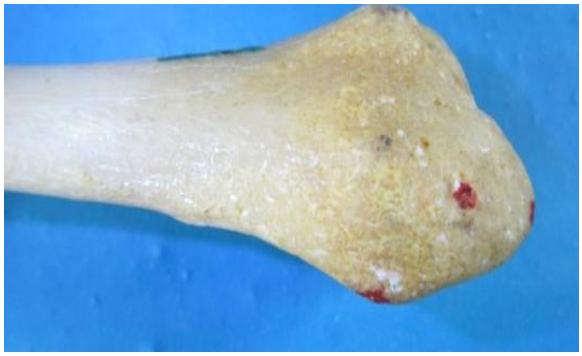

Figure 3: Type III (Without any groove).

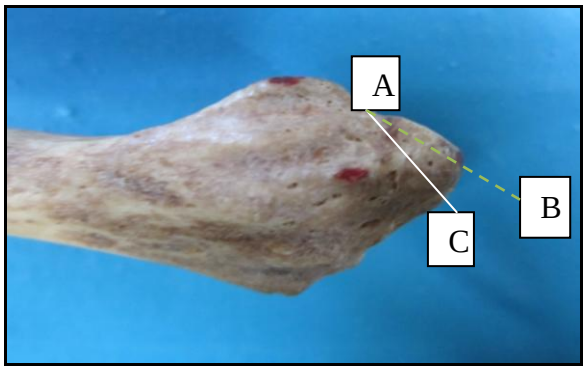

Figure 4: Distances measured.

A: Highest point on palmar bony ridge, B: Tip of the styloid process, C: Highest point on the dorsal bony tubercle, AB: Distance between palmar bony ridge to tip of styloid process, AC: Distance between palmar bony ridge to dorsal bony tubercle

Statistics

Statistical analysis was done using SPSS version 16. Mean and standard deviation were calculated. Side differences were compared using student 'T' test. 'P' value < 0.005 was considered significant.

RESULTS

The results are compiled in the Tables 1 and 2.

Table 1: Percentage of different types.

Type	Right (%) (n=50)	Left (%) (n=50)
1	23(46%)	17(34%)
2	18(36%)	17(34%)
3	9 (18%)	16(32%)

Table 2: Measured distances (AB and AC) on both sides (mm).

Distance (n=50)	Right (mean ± sd)	Left (mean ± sd)	P value
AB	16.31 ± 2.20	16.55 ± 2.18	0.582
AC	11.27 ± 1.61	11.69 ± 1.48	0.188

No significant difference was noted between the measurements of left and right sides

Table 3: Comparison of Percentage of different types with other studies.

Author population year n	Kulkarni [5] North Indian 2014 n = 178	Liang Xiao [2] Chinese 2012 n = 284	Present Study South Indian 2015 n = 100
Type I	61.79%	63.73 %	40%
Type II	32.02%	27.82%	35%
Type III	6.17%	8.45 %	25%

DISCUSSION

Over use of hand held devices like mobile phones, electronic playing gadgets with thumb and mal position of wrist has led to increased number of patients with pain in the wrist joint. Pain may be due to trauma, metabolic disorders, De Quervain's disease or could be due to the presence of tiny bony ridge. In 1895, Fritz De Quervain, described tenosynovitis within the first dorsal extensor compartment, which is most common cause of pain and disability.

The presence of tiny bony ridge in the first dorsal compartment dividing this compartment into two compartments may be a cause of overcrowding of tendons predisposing to friction, inflammation and tenosynovitis. This septum may be the cause for unsuccessful treatment with injection of steroid as it may form a barrier for diffusion of locally injected steroids. In the present study, tiny bony ridge was present in 46% on right side and 34% on the left side. On comparison with studies done by Kulkarni [5] on Indian population and Xiao [2] in Chinese population, the percentage of Type 1 appears less, whereas type 3 without the groove appears higher at 25% when compared with the other 2 studies. Refer Table 3. Yet another study by Shanti KC in a South Indian population states that 8% of 100 radii studied did not have the bony ridge at all. [6] The present study concurs with another study on French population which states that 40% of the radii examined had bony septum in the first extensor groove. [4] Studies done on American population by Gonzalez et al, [3] Jackson et al, [7] and Aktan et al in Turkish [8] population found bony septum in 40% -

45% of the populations under study. These coincide with the present study. A study done by Leslie et al [9] in a population in England states that the septum was present in 34% which is slightly less than that in the present study but similar to that done in Louiseville, Kentucky USA by Hazani et al. [10] These differences with regard to the types could be due to different populations under consideration.

The irregular extensor groove situated on the lateral aspect of distal radius has 3 palpable bony points, highest point on the palmar bony ridge, the tip of styloid process and the upper point on the dorsal bony tubercle. The styloid process is approximately 1.6 cm and the dorsal tubercle is approximately 1 cm from the palpable palmar bony ridge. The bony septum if present lies within the triangle formed by these 3 points. Ultrasound guided injection into this region especially if given into both subdivisions of the groove formed due to the presence of the bony ridge or septum might give a better clinical result especially since 50% of the individuals seem to possess this bony septum. The recognition of this ridge could possibly prevent prospective surgical interventions. Studies have shown that patients treated surgically after failure of local injected steroids had septum in the first dorsal extensor compartment.

CONCLUSION

The above anatomical data and its variations could provide a safe range for clinicians and surgeons in performing surgery in the extensor compartment and in giving two point injection within the separate tendon sheaths considering the possibility of septum in the patients of tenosynovitis or De Quervain's disease.

Further studies could be done in living patients using higher imaging techniques, comparing the above parameters with respect to the handedness and gender of the individual, which could also reveal differences.

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