Anatomical Localization of Lister's Tubercle and its Clinical and Surgical Importance

İsmail Ağır[*,1], Mahmut Nedim Aytekin[2], Fatih Küçükdurmaz[3], Servan Gökhan[4] and Umut Yücel Çavuş[4]

[1]*Department of Orthopedics and Traumatology, Adıyaman University Training and Research Hospital, Adıyaman, Turkey*

[2]*Department of Orthopedics and Traumatology, Atatürk Training and Research Hospital, Ankara, Turkey*

[3]*Clinic of Orthopaedics and Traumatology, Bezmi Alem Foundation University School of Medicine, 34093, Istanbul, Turkey*

[4]*Department of Emergency Medicine, Dışkapı Yıldırım Beyazıt Training and Research Hospital, Ankara, Turkey*

Abstract: The dorsal tubercle of the radius, once called Lister's tubercle, is used as a landmark in wrist arthroscopy, wrist joint injections, and similar surgical and clinical procedures. However, there is no useful information in the reference anatomy books and literature. The aim of this study was to identify the anatomical localization of Lister's tubercle on the dorsum of radius in relation to the radial styloid process and the ulnar notch of radius and to demonstrate the clinical and surgical importance of these relationships. We studied 20 dried cadaver radius specimens. The distances from Lister's tubercle to the radial styloid process and to the ulnar notch were measured by using a digital micrometer caliber and the ratio of the two measures was calculated. The dorsal tubercle of the radius is variable in position and can be either closer to the radial styloid process or to the ulnar notch. The present study showed that in 11 of the radii the dorsal tubercle of the radius was nearer to the radial styloid process than the ulnar notch, while in 9 subjects it was nearer to the ulnar notch. This anatomical variation may be relevant for wrist injections, wrist artroscopy or wrist surgery.

Keywords: Distal radius fracture, extensor pollicis longus, Lister's tubercle, screw penetration.

INTRODUCTION

Dorsal tubercle of the radius (Lister's tubercle) is used as a landmark in wrist arthroscopy, wrist joint injections, and similar surgical and clinical procedures. However, there is no useful information in the reference anatomy books and literature [1-4].

Besides being an anatomic landmark during surgery, there is also some clinical importance to the anatomical localization of Lister's tubercle. For instance during volar plate fixation for distal radius fractures, when the screws are applied in unsuitable orientation and length, they may irritate the extensor pollicis longus (EPL) tendon which lies in the groove medial to the dorsal tubercle. Over a long period this may cause EPL tendon ruptures [1,5].

The aim of this study was to identify the anatomical localization of tubercle on the dorsum of radius in relation to the radial styloid or ulnar notch (sigmoid notch) of the radius and to demonstrate the clinical and surgical importance of its position.

*Address correspondence to this author at the Department of Orthopedics and Traumatology, Adıyaman University Training and Research Hospital, Adıyaman, Turkey; Tel: +90(416)2161015; Fax: +90(416)2162659;
E-mail: iagir@hotmail.com

MATERIALS AND METHODS

We studied 27 dried adult cadaver radii. All radii were obtained from adults whose bone development had been completed and they were from separate individuals. Gender of donors were a mixture (male and female). Seven dried cadaver radii which had structural deformities, previous distal radial trauma, or any pathologic irregularity such as arthritis were excluded because these kind of deformities could cause mismeasurement. Measurments were done on 20 radii; 8 were right and 12 were left.

The following anatomical landmarks were defined on each radius; the mid point of the Lister's tubercle (point 1), the midpoint of the distance between volar and dorsal borders of the ulnar notch (the height of the ulnar notch) (point 2) and the mid point of radial styloid process (point 3) (Fig. **1**). A line was drawn connecting the midpoint of the height of the ulnar notch (point 2) and the midpoint of the radial styloid process (point 3). Further, a perpendicular line was drawn from the Lister's tubercle (point 1) to this line (Fig. **2**). The distances from the point of intersection of the two lines to the ulnar notch and the radial styloid process (point 3) were measured by using a digital micrometer caliber and the ratio of the two measurements were calculated. All measurements and calculations were made by one observer and all measurements were made not on photos but on cadaver bones.

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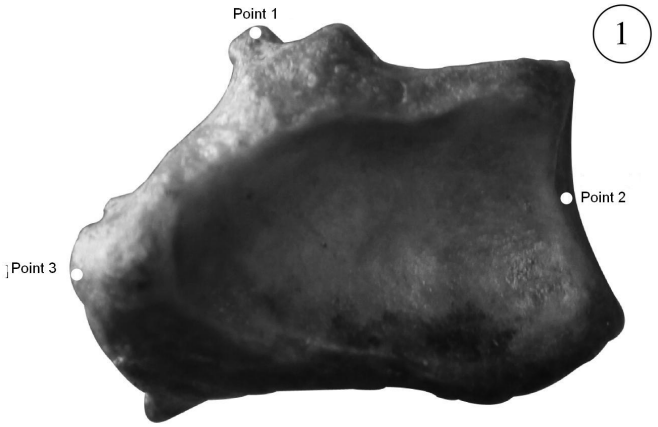

Fig. (1). Lister's tubercle (point 1), radial styloid process (point 3) and the midpoint of distance between ventral and the dorsal borders of the ulnar notch (point 2) were marked.

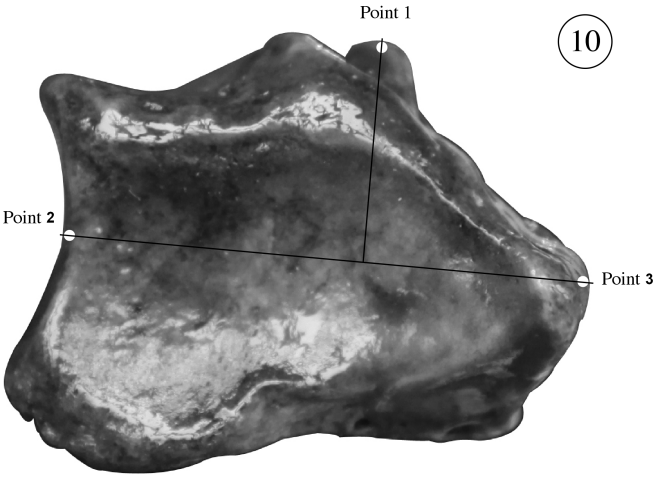

Fig. (2). Lines and points are shown on the number 10 radius.

RESULTS

Measurements made on the 20 dried cadaver radii showed that in 11 of the radii. Lister's tubercle was nearer to the styloid process, while in nine subjects it was nearer to the ulnar notch. The distance from Lister's tubercle to the radial styloid process extended between 12.2 – 18.6 mm (see Table **1**) (Figs. **3**, **4**). Further, the distance from Lister's tubercle and ulnar notch extended between 11.3 – 16.9 mm (see Table **1**) (Figs. **3**, **4**). The highest ratio of the two distance was 1.40 (the nearest distance to the ulnar notch) while the lowest was 0.78 (the nearest distance to the radial styloid) All the measurements are shown on Table **1**.

DISCUSSION

Lister's tubercle is an anatomic process on the dorsum of the radius that functions as a pulley to the EPL. The anatomic localization of Lister's tubercle is important in some clinical and surgical procedures. Although the function of the tubercule is defined in reference anatomy books and in related literature, however, the position of it is not defined [1-4].

Lister's tubercle is used as a landmark in wrist arthroscopy and wrist injections [6]. In addition to that, it is also used as a landmark in dorsal wrist capsulotomy [7]. The present study has shown that the localization of the Lister's tubercle on the radius is variable, it either lies close to radial styloid process or to the ulnar notch, knowlege of the location of the tubercle may help during the procedures of the region.

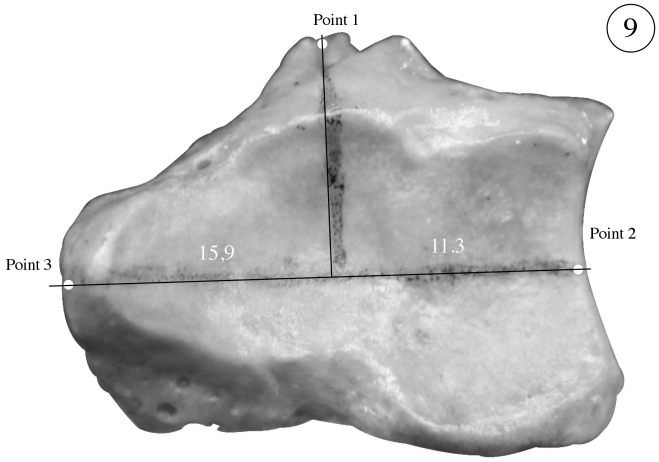

Fig. (3). The highest ratio was 1,40 on the number 9 radius.

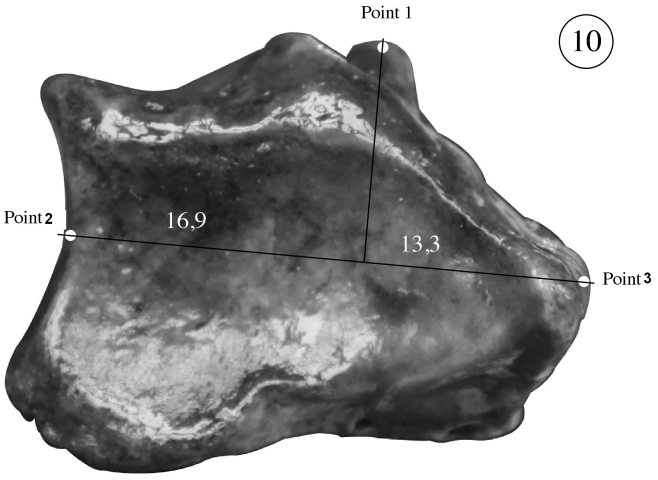

Fig. (4). The lowest ratio was 0,78 on the number 10 radius.

Hazani *et al*. [8], defined Lister's tubercle as an anatomical landmark for the first dorsal compartment. In this study, they determined a point for the injections into the first dorsal compartment to manage de Quervain's disease. A diagonal line from Lister's tubercle to the scaphoid tubercule was determined and the intersection point of abductor pollicis longus (APL) and the diagonal line was marked as the APL-Lister's tubercle-scaphoid junction. In our study it has been shown that the localization of Lister's tubercle may be either close to the ulnar notch or the radial styloid process on the dorsum of the radius. When the tubercle lies close to the ulnar side the ALS point lies more distally and when it lies close to radial side the ALS point lies more proximally so ALS point varies according to the localization of the Lister's tubercle on dorsum of radius.

There are two main causes for the rupture of the EPL; mechanical and vascular, It has been shown that, the EPL, which is located just ulnar to Lister's tubercle, may be irritated or ruptured by the screws or drill bit used during plate fixation of the distal radius dorsally or ventrally [9, 10].

Table 1. Distances from Lister's tubercle to radial styloid and ulnar notch and ratio between two measurements.

	Distances from Lister's tubercle to radial styloid (mm)	Distances from Lister's tubercle to ulnar notch (mm)	Ratio of distances from Lister's tubercle to radial styloid/distances from Lister's tubercle to ulnar notch
1	14,9	15,3	0,97
2	15,5	12,4	1,25
3	12,6	14,9	0,84
4	13,7	16,9	0,81
5	14,1	16,9	0,83
6	15,8	12,0	1,31
7	15,4	11,4	1,35
8	16,2	14,8	1,09
9	15,9	11,3	1,40
10	13,3	16,9	0,78
11	15,4	12,1	1,27
12	13,2	14,8	0,89
13	18,6	15,6	1,19
14	12,2	14,4	0,84
15	15,6	11,4	1,36
16	14,9	13,1	1,13
17	15,7	16	0,98
18	17,1	12,9	1,32
19	14,8	12,4	1,19
20	13,2	13,9	0,94

Another relevant mechanical feature relates to the pieces of bone that occur as a result of distal radial fractures [11]. Vascular reasons are either systemic diseases or mechanical reasons which decrease the synovial circulation of the third compartment and the blood supply of the EPL [12].

There are a few studies that show the screw penetration into the EPL groove during or after volar plating. One of them is the study of Benson *et al*. [5]. Benson *et al*. (2006), in which they applied a three locked volar plate; a four- hole standard plate, a five-hole wide plate of Hand innovation (Miami, FL) or a Acumed standard plate (Hillsboro, OR) on six fresh frozen cadavers the screws were seen to penetrate into the third extensor compartment. In the Acumed plate, the targeting guide-set screw hole and the hole just distal to this correspond to the fibro-osseous canal of the third extensor compartment. In both Hand Innovation plates, the third hole in the proximal row, counting from the radial side of the plate, directs the drill bit and/or screw into the third extensor compartment. Finally, they suggested that the surgeon may consider using shorter screws in these specific plate holes, or possibly leaving these screw holes unfilled if adequate fixation can be obtained with the remaining screws or pegs. Alternatively, it may be possible to put shorter screws or no screw if the stability is complete. However our study has shown that tubercle is not constant in position and may lie either close to ulnar notch or the radial styloid process. The difference may be thicker than the diameter of one screw. In that way, we cannot say that the screws defined in the study of Benson *et al*. (2006), always correspond to the fibro-osseous canal of the third extensor compartment. Computed tomograpy may help us to define the position of Lister's tubercle before volar fixation surgery for distal radius fractures.

CONCLUSION

As a result, the Lister's tubercle on radius is variable and can lie close to the radial styloid process or to the ulnar notch. This anatomical variation may be relevant for either wrist injections, wrist artroscopy or wrist surgery.

CONFLICT OF INTEREST

No conflicts of interest regarding this submission arise for any of the authors of this submission.

ACKNOWLEDGEMENTS

Declared none.

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