

Studying the Lower End of the Ulna Cross-Sectionally using Morphometric Measurements

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Abstract

Objective: The anatomy of the distal end of the ulna is important for reconstructive surgeries. The distal end houses the fovea, head, and styloid process. The pole and the seat are the two parts that make up the ulnar head. A severe kind of ulna fracture is coupled with a fracture of the distal end of the radius because the distal ulnar metaphysis does not heal. This is comparable to Baldwin's procedure, which involves extra periosteal excision of a piece of the ulna's metaphysis in order to produce pseudo arthrosis in the lower end of the ulna.

Method: For one year, 102 completely ossified, dry adult ulnae (51 right and 51 left), regardless of age, gender, etc., were subjected to this study at the Department of General Medicine, Maharshi Devraha Baba Autonomous State Medical College, Deoria. All measurements were made with Vernier digital calipers.

Results: The maximum pole width was 4.10 mm on average on both sides. The maximum seat height was 3.83 mm on average on both sides. The largest fovea width measured 3.83 mm on average on both sides. The greatest styloid process length averaged 6.172 mm on both sides.

Conclusion: Anatomists, forensic experts, orthopedic surgeons, prosthetics, and researchers undertaking medico-legal investigations, those designing appropriate prostheses, and those caring for patients with lower ulna fractures must all use the information from this study clinically.

Keywords: Ulna, Seat, Fovea, Pole, and Styloid Process.

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Introduction

In reconstructive procedures, the distal end of the ulna's anatomy is crucial. The head, styloid process, and fovea are located at the distal end. The pole and the seat are two components of the ulnar head [Figure 1].

The triangular-shaped fibro cartilaginous complex sits between the pole and the triquetral bone. On the tip of the triangular fibro cartilaginous complex, the fovea is located. The inferior radioulnar joint is

formed by the seat articulating with the radius' ulnar notch. The head of the ulna had to be replaced with prosthetic material due to rheumatoid arthritis, traumatic arthritis, arthrosis, tenosynovitis of the extensor carpi ulnaris, injury to the triangular fibrocartilage complex, and Colles' fracture. Two-thirds of the head of the ulna's perimeter, which is protected by

articular cartilage, are covered by the seat [1].

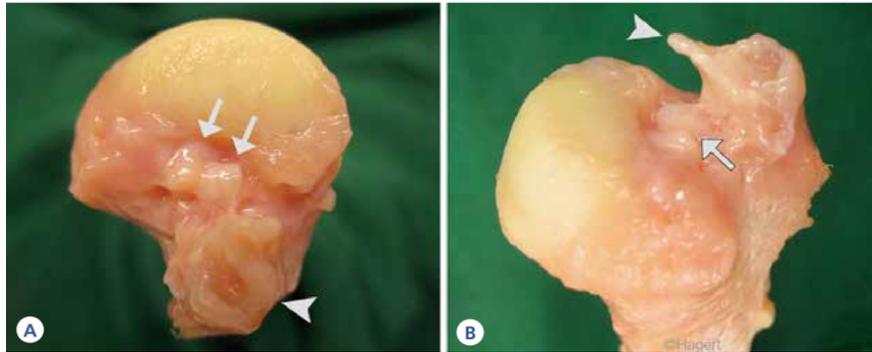


Figure 1: Parts of ulna

Its lateral surface is convex and articulates with the ulna's radial notch. Its smooth distal surface is separated from the carpus by an articular disc. The styloid process and its articular surface are joined at the apex. One centimetre above the styloid process of the radius, the distal end of the ulna is palpable. There is a vertical groove on the back of the ulna between the head and styloid process. The styloid process of the ulna's apex is where the ulnar collateral ligament attaches [3]. Unlike the impaction of the head of the ulna against the ulnocarpal impaction, ulnar styloid triquetral impaction is a pathological condition that generates pain on the ulnar side and has distinct radiographic and clinical features.

The styloid process of the ulna opposite the proximal end of the lunate is painful and there is discomfort on the ulnar side of the wrist. Introduced is the idea of the styloid process of the ulna, and anatomical differences in the length of the styloid process of the ulna were shown. The supination-pronation axis is fixed in reference to the ulna on which the distal section of the radius spins by 150 degrees in an arc and lateral movements of the radius by 30 degrees that allow this movement to rotate by 180 degrees for hand rotation. Strong impacts on the thenar side of the hand during athletic activities can cause the wrist to extend excessively, the

intercarpal joints to pronate, and the ulna to deviate [4].

The Herbert ulnar head prosthesis was implanted to treat the ulnar head fracture and dislocation. Joints like the ulnocarpal joints and distal radioulnar joints are affected by trauma to the area around the head of the ulna. Untreated severe ulna injuries can result in arthrosis of the distal radioulnar joint [5].

This research may aid orthopedic surgeons and prosthetists in the treatment of the lower end of the ulna with triquetrum fracture.

Methods

Study Design: This was a cross-sectional study carried out at the Department of General Medicine, Maharshi Devraha Baba Autonomous State Medical College, Deoria for one year.

Methodology: The distal end of the ulna, which connects to the wrist's triangular fibrocartilaginous complex, serves as the pole. The distance between the sites where the transverse axis meets the pole's borders was measured along the transverse axis. Using a Digital Vernier caliper, the maximum width of the pole seen at the distal end of the ulna was recorded.

The seat refers to more than two-thirds of the ulna's head's distal convex lateral articular surface. It was calculated as the distance from the seat's lateral most points

in the upper and lower margins, respectively. Utilizing a Digital Vernier caliper, the highest seat height at the ulna's distal end was recorded.

The indentation known as the fovea is located at the distal end of the ulna. The distance between the sites where the transverse axis meets the lateralmost point on the lateral border of the fovea and the lateral end of the base of the styloid process of the ulna was measured in transverse axis. Using a Digital Vernier calliper, the greatest width of the fovea at the distal end of the ulna was seen and recorded.

The bony protrusion from the medial and posterior surface of the lower end of the ulna is called the styloid process. The distance between the styloid process's tips to its base is used to measure it. Using a

digital vernier calliper, the styloid process' maximum length was seen and noted.

Sample Size: This study included 102 fully ossified, dry adult ulnae (51 right and 51 left).

Results

Because they did not come from the same individuals, there was a little discrepancy in the values of the lower ends of the ulna on the right and left sides of the body. The values of all 4 parameters at the lower end of the ulna are statistically insignificant on both sides. The maximum pole width on both sides was 4.10 on average. The maximum seat height was 3.83 on average on both sides. The highest fovea width was 3.83 mm on average on both sides. The maximal styloid process length averaged 6.172 mm on both sides [Table 1].

Table 1: Results displaying all of the right and left ulna's parameters

Parameter	Right ulna (Mean±S.D.)	Left ulna (Mean±S.D.)	t	D.F.	P-value	95% C.I. for the mean difference
Mean maximum width of the pole	4.16±0.63	4.04±0.50	1.066	51	0.293	-0.13-0.33
Mean maximum height of the seat	3.93±0.52	3.83±0.44	1.163	51	0.253	-0.04-0.25
Mean maximum width of the fovea	3.83±0.47	3.86±0.45	0.603	51	0.553	-0.21-0.11
The mean maximum length of the styloid process	6.23±1.13	6.06±1.03	0.786	51	0.431	-0.23-0.3

Discussion

In normal life, hand and radius movements revolve around the fixed point represented by the ulna's distal end. The significance of the distal end of the ulna is beneficial for the management of complex injuries as well as for therapy [6]. The mean maximum width of the pole in the current investigation was 4.16±0.63 mm on the right side and 4.04±0.50 mm on the left. The results of the current study are comparable to those of Bangalore, India-based research by Vijaykishan B et al. (2016). The results

from Sharma A. (2011) in North India were marginally higher than the results from the present study in South India [2,5].

As a result, it suggests that values vary throughout regions of India, demonstrating regional heterogeneity. Because the ulnae belonged to different people, it is also inferred from the aforementioned study that the mean maximum width of the pole was greater on the right side than the left [7].

On the right side of the seat, the mean maximum height was 3.90±0.54 mm, and on the left, it was 3.80±0.46 mm. [8] The

values found by the current investigation are lower than those by Vijaykishan B et al, Zarana AA et al, Sharma A et al, Oommen SS and Joshi SD et al [2,3,5,6].

On the right side, the mean maximal fovea width was 3.83 ± 0.47 mm, while on the left, it was 3.86 ± 0.45 mm. The values found by the current study are lower than those by Vijaykishan B et al, Zarana AA et al, Sharma A et al, Oommen SS, and Joshi SD et al [2,3,5,6].

The mean maximal length of the styloid process in the current study was 6.23 ± 1.13 mm on the right side and 6.06 ± 1.03 mm on the left. The values found by the current study are higher than those by Vijaykishan B et al, Zarana AA et al, Sharma A et al, and Oommen SS [2,3,5,6].

Conclusion

Clinically, this study is crucial for anatomists, forensic experts, orthopaedic surgeons, prosthetists, research, medicolegal investigations, the creation of suitable prostheses, and the treatment of patients with fractures at the lower end of the ulna.

Conflict of Interest: The authors state that they have no conflicts of interest.

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