

# A Morphological and Morphometric Study of Proximal End of Dry Radii in Rajasthan Region and its Clinical Significance

Riya Narwani<sup>1\*</sup>, Aarushi Narwani<sup>2</sup>

<sup>1\*</sup>Professor, Department of Anatomy, SMS Medical College, Jaipur, Rajasthan, India.

<sup>2</sup>MBBS Student (IInd Professional), VMCC and Safdarjung Hospital, Delhi, India.

## ABSTRACT

**Background:** Radius is the bone which is present on the lateral aspect of forearm. Hence; we planned the present study, morphology and morphometry of proximal end of dry radii in Rajasthan Region.

**Materials & Methods:** Assessment of 40 intact adult Dry Radii was done for evaluating the morphology and morphometry of proximal end. Assessment of various parameters was done on the proximal and distal end of the radius was done. Measurement was done both in the supinated and semi-pronated positions of the radius. Various antero-posterior and medio-lateral parameters of the radius were recorded in Microsoft excel sheet.

**Results:** Circular and irregular morphology of the head of total radius was found in 45 percent each. Mean length of the left and right radius was found to be 24.02 and 24.22 respectively. Single ridge was the most common morphologic variants of bicipital tuberosity encountered in the present study.

**Conclusion:** Both irregular and circular shape of the head of the radius is most common shapes of radius head.

**Key words:** Morphology, Morphometry, Radii.

## \*Correspondence to:

**Dr. Riya Narwani,**  
Professor,  
Department of Anatomy,  
SMS Medical College, Jaipur, Rajasthan, India.

## Article History:

**Received:** 15-10-2018, **Revised:** 11-11-2018, **Accepted:** 27-11-2018

## Access this article online

Website: <a href="http://www.ijmrp.com">www.ijmrp.com</a>	Quick Response code 
DOI: 10.21276/ijmrp.2018.4.6.064	

## INTRODUCTION

Radial head and neck fractures constitute 1.7–5.4% of all fractures. Radial head fractures alone constitute one-third of all elbow fractures and about 20% of all elbow trauma cases. An appreciation of the part played by radial head in the overall stability of elbow and forearm has encouraged several investigators to recommend conservation of radial head, either by operative fixation or by prosthetic replacement.<sup>1-3</sup>

Radius is the bone which is present on the lateral aspect of forearm. The word radius in Latin means ray. In the context of the radius bone, a ray rotates around its axis line extending diagonally from the centre of the capitulum to the centre of the distal ulna. Radius is usually ossified from three centres one primary centre for the body, and two secondary centres, one for the upper end and one for the lower end.<sup>4-8</sup> Hence; we planned the present study, morphology and morphometry of proximal end of dry radii in Rajasthan Region.

## MATERIALS & METHODS

The present study was conducted in the department of human anatomy, SMS Medical College, Jaipur, Rajasthan (India) and it

included assessment of 40 intact adult Dry Radii for evaluating the morphology and morphometry of proximal end of dry radii. Ethical approval was obtained from institutional ethical committee.

## Exclusion Criteria:

- Bones with incomplete ossification,
- Bones with fracture,
- Deform bones

Assessment of various parameters was done on the proximal and distal end of the radius. Measurement was done both in the supinated and semi-pronated positions of the radius. Various antero-posterior and medio-lateral parameters of the radius were recorded in Microsoft excel sheet. All the results were analysed by SPSS software.

## RESULTS

Table 1 shows the percentage of shapes of head in total radius. In the present study, a total of 40 radii were analysed. Circular and irregular morphology of the head of total radius was found in 45 percent each. Mean length of the left and right radius was found to be 24.02 and 24.22 respectively. Mean height of the left and right

radial head at the medial end of was found to be 0.96 and 0.97 respectively. Mean depth of articular feet was found to be 0.20 and 0.22 respectively. Single ridge was the most common morphologic variants of bicipital tuberosity encountered in the present study.

**Table 1: Percentage of shapes of head in total radius**

Shape of head	n	%
Oval	4	10
Circular	18	45
Irregular	18	45
Total	40	100

**Table 2: Mean of all parameters of radius on the right and left sides**

Parameter		Mean
Length of radius	Right	24.02
	Left	24.22
Height of the radial head at medial end	Right	0.96
	Left	0.97
Height of the radial head at lateral end	Right	0.79
	Left	0.82
Head transverse diameter	Right	1.81
	Left	1.89
Depth of articular facet	Right	0.20
	Left	0.22

**Table 3: Variants of bicipital tuberosity**

Variant	Single ridge	Smooth	Double ridge
Right	12	5	1
Left	13	9	0
Total	25	14	1

**DISCUSSION**

In the present study, a total of 40 radii were analysed. Circular and irregular morphology of the head of total radius was found in 45 percent each. Swieszkowski et al did a morphologic study of the radial head which was performed using a co-ordinate measuring machine integrated with a computer aided design system. They measured maximum diameter, height of radial head and depth of articular surface. They concluded that there were no significant differences on the right and left sides.<sup>9</sup> Koslowsky et al took optosil imprints of 18 pairs of proximal radii and measured maximum and minimum radial head diameter and concluded that radial head has complex shape and no significant differences occurred between right and left radii. They also measured radial neck length and neck shaft angle using x-rays as well as optosil imprints. They concluded that wide variety of lengths and diameters complicates standard prosthetic design, but ipsilateral and contralateral X-rays can be useful for preoperative stem size calculation.<sup>9,10</sup>

Mean length of the left and right radius was found to be 24.02 and 24.22 respectively. Mean height of the left and right radial head at the medial end of was found to be 0.96 and 0.97 respectively. Mean depth of articular feet was found to be 0.20 and 0.22 respectively. Single ridge was the most common morphologic variants of bicipital tuberosity encountered in the present study. Measurements of bicipital tuberosity and its angular relationship with radial head is important in the reconstruction of biceps tendon. Word 'Radius' is a Latin word meaning 'Spoke' or 'Ray'. The radius is the weight bearing bone of the forearm. The radius is the lateral bone of the forearm and its shaft has expanded ends. The proximal end includes head, neck and tuberosity. The shaft is triangular in section. Lower end projects distally as styloid process. The role of the radial head in the functional anatomy and kinematics of the elbow and forearm continues to be defined. The importance of the radial head has stimulated a greater degree of interest in the fixation and reconstruction of traumatic injuries to the radial head and/or neck, whether simple or complex.<sup>10-12</sup>

King et al did dimensions of the native radial head were measured in 28 cadaveric upper extremities and radiographs of the contralateral elbows of 40 patients who had received a radial head replacement. They measured mean difference between the maximum and minimum radial head diameters. They concluded that although the native radial head is not circular, it does not have a consistently elliptic shape.<sup>11</sup> Smith et al did cadaveric study of the radial head and neck to determine the anterior and posterior limits for safe placement of internal fixation on the surface of the radial head or neck. They concluded that the "safe zone" is nearly one third of radial head circumference and can be reliably determined with the method of intraoperative marking as outlined.<sup>12</sup>

**CONCLUSION**

Under the light of above mentioned results, the authors conclude that both irregular and circular shape of the head of the radius is most common shapes of radius head. Adequate knowledge of the morphologic and morphometric aspect of the radius helps the surgeons while performing various surgical procedures involving radius.

**REFERENCES**

1. van Eerten PV, Lindeboom R, Oosterkamp AE, Goslings JC. An X-ray template assessment for distal radial fractures. Arch Orthop Trauma Surg. 2008;128:217-21.
2. Slutsky DJ. Predicting the outcome of distal radius fractures. Hand Clin. 2005;21:289-94.
3. Giannicola G, Manauzzi E, Sacchetti FM, Greco A, Bullitta G, Vestri A, et al. Anatomical variations of the proximal radius and their effects on osteosynthesis. J Hand Surg Am 2012;37:1015-23.
4. Slutsky DJ. Predicting the outcome of distal radius fractures. Hand Clin. 2005;21(3):289-94.
5. Werner FW, Palmer AK, Fortino MD, Short WH. Force transmission through the distal ulna: Effect of ulnar variance, lunate fossa angulation, and radial and palmar tilt of the distal radius. J Hand Surg 1992;17:423-8.
6. Chien HY, Chen AC, Huang JW, Cheng CY, Hsu KY. Short to medium term outcomes of radial head replacement arthroplasty in posttraumatic unstable elbows: 20 to 70 months follow up. Chang Gung Med J 2010;33:668-78.

7. Ando Y, Yasuda M, Goto K. Is ulnar variance suitable for a parameter of Colles' fracture preoperatively? *Osaka City Med J.* 2006;52:63–6.
8. Leung F, Ozkan M, Chow SP. Conservative treatment of intraarticular fractures of the distal radius – Factors affecting functional outcome. *Hand Surg.* 2000;5:145–53.
9. Swieszkowski W, Skalski K, Pomianowski S, Kedzior K. The anatomic features of the radial head and their implication for prosthesis design. *Clin Biomech (Bristol, Avon).* 2001 Dec; 16(10):880-7.
10. Koslowsky TC, Beyer F, Germund I, Mader K, Jergas M, Koebeke J. Morphometric parameters of the radial neck: an anatomical study. *Surg Radiol Anat.* 2007 Jun; 29(4):279-84.
11. King GJ, Zarzour ZD, Patterson SD, Johnson JA. An anthropometric study of the radial head: implications in the design of a prosthesis. *J Arthroplasty.* 2001 Jan; 16(1):112-6.
12. Smith GR, Hotchkiss RN. Radial head and neck fractures: anatomic guidelines for proper placement of internal fixation. *J Shoulder Elbow Surg.* 1996 Mar-Apr; 5(2 Pt 1):113-7.

**Source of Support:** Nil.

**Conflict of Interest:** None Declared.

**Copyright:** © the author(s) and publisher. IJMRP is an official publication of Ibn Sina Academy of Medieval Medicine & Sciences, registered in 2001 under Indian Trusts Act, 1882.

This is an open access article distributed under the terms of the Creative Commons Attribution Non-commercial License, which permits unrestricted non-commercial use, distribution, and reproduction in any medium, provided the original work is properly cited.

**Cite this article as:** Riya Narwani, Aarushi Narwani. A Morphological and Morphometric Study of Proximal End of Dry Radii in Rajasthan Region and its Clinical Significance. *Int J Med Res Prof.* 2018 Nov; 4(6):283-85.

DOI:10.21276/ijmrp.2018.4.6.064