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MORPHOLOGICAL AND MORPHOMETRIC STUDY OF DRIED HUMAN LUNATE BONE AND ITS CLINICAL SIGNIFICANCE IN TELANGANA REGION

Anatomy

Dr. Aparna Veda Priya.K — Incharge Professor and HOD, Dept of Anatomy, Osmania Medical College, Hyderabad, Telangana.

Dr. Zainab Fatima* — Post Graduate, Dept of Anatomy, Osmania Medical College, Hyderabad.*Corresponding Author

Dr. Murtaza Husain — Post Graduate, Dept of Anatomy, Osmania Medical College, Hyderabad.

ABSTRACT

INTRODUCTION: The lunate is a crescent-shaped carpal bone found within the hand. The lunate is found within the proximal row of carpal bones. Proximally, it articulates with the radius. Laterally, it articulates with the scaphoid, medially with the triquetral, and distally with the capitate. The lunate also articulates on its distal and medial surface with the hamate bone [1]. The proximal surface of the lunate bone is smooth and convex, articulating with the radius. The lateral surface is flat and narrow, with a crescentic facet for articulation with the scaphoid. The medial surface possesses a smooth and quadrilateral facet for articulation with the triquetral. The palmar surface is rough, as is the dorsal surface. The dorsal surface is broad and rounded. The distal surface of the bone is deep and concave. [2] As a proximal carpal bone, the lunate is also involved in movement of the wrist [3]

AIM AND OBJECTIVE: To study the morphological & morphometric details of different types of dried adult human Lunate bones.

METHODOLOGY: The study was done on 50 dried adult human Lunate bones (25 right and 25 left) of unknown sex available in the Department of Anatomy, Osmania Medical College, koti, Hyderabad and other medical colleges in Telangana .Damaged bones were omitted from the study. Lunate bones were studied for the number of the joint facets and metrically, after Martin - Sailer [4] (10 indicators) . All measurements were made using the digital vernier caliper with accuracy of 0.01 mm.

RESULTS: This study of lunate bones revealed that 31% of them had one facet on the distal joint surface for the capitate bone (type I, according to Viegas et al. [5] and 69% of them had two facets for the capitate and the hamate bones (type II, according Viegas et al. [5] The mean value of the greatest width of the proximal and the distal joint surface is lower in the lunate bone Type II hence it undergo greatest pressure and more prone for kienbock's disease.

CONCLUSION: The lunate bone plays an important role in the statics and biomechanics of the wrist joint complex. Some anatomical variations affect the translation of pressure from the metacarpal bones and, therefore, affect its biomechanics and pathology [6] hence its knowledge is important for orthopedicians , surgeons and anatomist.

KEYWORDS

Lunate, Os Lunatum, Types Of Lunate Bones, Facets, Kienbock's Disease.

INTRODUCTION:

The lunate is a crescent-shaped carpal bone found within the hand. The lunate is found within the proximal row of carpal bones. Proximally, it articulates with the radius. Laterally, it articulates with the scaphoid, medially with the triquetral, and distally with the capitate. The lunate also articulates on its distal and medial surface with the hamate bone [1]. The proximal surface of the lunate bone is smooth and convex, articulating with the radius. The lateral surface is flat and narrow, with a crescentic facet for articulation with the scaphoid. The medial surface possesses a smooth and quadrilateral facet for articulation with the triquetral. The palmar surface is rough, as is the dorsal surface. The dorsal surface is broad and rounded. The distal surface of the bone is deep and concave. [2] The lunate receives its blood supply from dorsal and palmar branches. The carpal bones function as a unit to provide a bony superstructure for the hand [1] . As a proximal carpal bone, the lunate is also involved in movement of the wrist [3]

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MATERIAL AND METHODS:

The study was done on 50 dried adult human Lunate bones (25 right and 25 left) of unknown sex available in the Department of Anatomy, Osmania Medical College, koti, Hyderabad and other medical colleges in Telangana. Damaged bones were omitted from the study. Lunate bones were studied for the number of the joint facets and metrically, after Martin - Sailer [4] (10 indicators). All measurements were made using the digital vernier calliper with accuracy of 0.01 mm.

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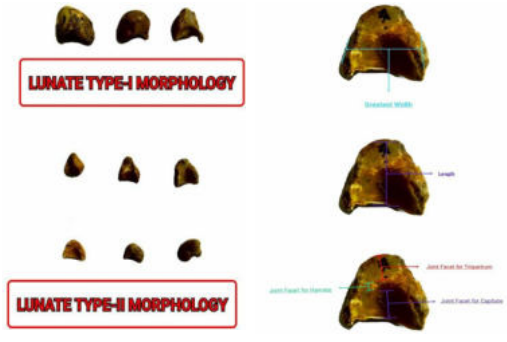

FIG -1 showing TYPE I & II Lunate:

The analysis of the morphometric parameters of type I and type II Lunate bone (Table 1) shows:

1. All measurements after Martin and Sailer [4] except indicator No 6 are greater at the os lunatum type II.
2. The width of the joint facet for os capitatum in type I is greater than the same of type II (indicator No 7a).
3. The width of the joint facet for os capitatum in type II is always greater than the width of the joint facet for os hamatum.

The morphometric characteristic are similar to that of Dyankova S [7]

Table 1: Measurements of lunate bone type I & II (Mean ,standard error):

Indicator after R. Martin and K. Sailer [4]	Indicator No	type I (n=31)	type II (n=69)
Length	1	15.73 ± 0.74	16.16± 0.43
Greatest width	2	11.39±0.57	17.56±0.64
Greatest height	3	16.04±0.23	16.31±0.26

Greatest height of the proximal surface	4	13.24±0.40	13.46±0.74
Greatest width of the proximal surface	5	10.24±0.37	11.93±0.96
Greatest height of the distal surface	6	15.17±0.54	14.86±0.66
Width of the distal surface in the middle	7	7.82±0.53	10.22±0.52
Width of the joint facet for os capitulum	7a	7.82±0.53	6.74±0.25
Width of the joint facet for os hematum	7b	0	3.16±0.37
Greatest depth of the distal surface	12	2.31±0.12	2.56±0.14

DISCUSSION

Different classifications of the Lunate (os lunatum) types can be found according to the method of research [8,9,10,11,12].

This direct study of dried lunate bones excludes the probability of mis determination of type II as type I unlike roentgenological, MRI and arthroscopy. Here is the data obtained from previous studies (Table 2).

Table :2 – lunate bones types:

Method	Authors, years	type I (%)	type II (%)
Dissection of wrists	Viegas S. F. et al. (1990 a) [13]	39.3 %	60.7%
	Viegas S. F. et al. (1990 b)[5]	34.5 %	65.5%
	Viegas S. F. et al. (1993) [10]	27%	73 %
Roentgenography of wrists	Viegas S. F. et al. (1990 b) [5]	46.1%	53.9%
	Tsuge S. R. Nakamura (1993) [14]		
	Contralateral unaffected wrists of patients with trauma		42%
	Contralateral unaffected wrists of patients with Kienbock's disease		37%
	- Bilateral wrists of volunteers		35%
MRI and arthroscopy	Malik A. M. et al. (1999)[15]	42.5 %	57.5 %
MR arthrography	Pfirrmann C. W. A. et al. (2002) [16]	50%	50%
Macerated bones (2004)	Dyankova S. [7]	34%	66%
Dried lunate bones	**Present study**	**31%**	**69%**

The analysis of the morphometric parameters of type I and type II shown in table 1 similar to that of Dyankova S.[7]

The lunate bone is subject to pressure both from the proximal and the distal direction. In specilised literature this pressure from both sides is known as “the phenomenon of the nut-cracker” [17]. The “nutcracker's phenomenon” is also considered to play an important role in the development of Kienbock's disease. The pressure varies with the anatomical type of the lunate bone. This pressure from the distal direction on the lunate bone type II comes not only from the capitate and respectively from the IInd and IIIrd metacarpal bones, but also from the hamate and respectively from the IVth and Vth metacarpal bones. Thus, there is probably a significant pressure increase on a unit area of the lunate bone type II. As the mean value of the greatest width of the proximal and the distal joint surface is lower in the lunate bone Type II, the pressure this type suffers is probably the greatest.

CONCLUSION:

The lunate bone plays an important role in the statics and biomechanics of the wrist joint complex. Some anatomical variations affect the translation of pressure from the metacarpal bones and, therefore, affect its biomechanics and pathology [6] hence its knowledge is important for orthopedicians , surgeons and anatomist.

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