

Original article:

Study of morphometry of the distal radius

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Abstract:

Introduction: Morphometric parameters of distal radius such as palmar tilt and angle of radial inclination play a significant role in the reduction of distal radius fractures, kinematics of wrist, and design of distal radius prosthesis. With this background present study was done to determine the morphometric parameters of distal radius in dry adult Indian bones.

Materials and methods: 140 intact adult Indian radius were chosen, and the following parameters measured: length of radius, palmar tilt, angle of radial inclination, length of radial styloid process, and widths of distal radius. Student t – test and Spearman’s rank correlation was done.

Results: The mean radial inclination was $22.8^\circ \pm 1.5$ on the left side; and $23.1^\circ \pm 2.6$ on the right ($p = 0.57$). The mean palmar tilt was $9.2^\circ \pm 3.99$ on the left; and $9.1^\circ \pm 1.0$ on the right ($p = 0.05$).

Discussion: The length of radius correlates negatively with palmar tilt, and positively with width of distal radius; length of radial styloid correlates positively with angle of radial inclination.

Conclusion: More studies comparing radiographic and morphometric measurements may need to be done to better define normal parameters of distal radius in a population group.

Keywords: distal radius , radial inclination

Introduction:

Distal radius morphometry (radial inclination, palmar tilt, radial height, and ulnar variance) is an important parameter in the evaluation and treatment of distal radius fractures in which anatomical alignment must be corrected. Currently, treatment of distal radius fractures in Indonesia is still based on morphometry of western population or from the contralateral side. The aim of this study is to determine distal radius morphometry of Indonesian population and to compare between right and left side, male and female gender. The aim of this study was to determine the morphometric parameters of the distal radius from dry adult Indian bones. (1,2) To the best of our

knowledge, there are no direct osteometric studies reported on the morphometry of distal radius done in the Indian population with relevance to clinical orthopedics.

Materials and methods:

The present study was carried out in our department . The sample size estimation was discussed and confirmed with expert statistician. 140 intact adult Indian radius were chosen, and the following parameters measured: length of radius, palmar tilt, angle of radial inclination, length of radial styloid process, and widths of distal radius. Student t – test and Spearman’s rank correlation was done.

Results:

The mean radial inclination was $22.8^{\circ} \pm 1.5$ on the left side; and $23.1^{\circ} \pm 2.6$ on the right ($p = 0.57$). The mean palmar tilt was $9.2^{\circ} \pm 3.99$ on the left; and $9.1^{\circ} \pm 1.0$ on the right ($p = 0.05$).

Discussion:

Distal radius fractures account for up to fifteen percent of all upper limb fractures; the goal of treatment being restoration of the normal anatomical alignment. (3) The quality of reduction is assessed mainly by degree of restoration of radial angle of inclination and palmar tilt.(3) However, the criteria currently used to evaluate the quality of reduction are based on western figures. (4)

This method of assessment using plain radiographs has been criticized by some authors. ^{5,6} Johnson and Szabo (1993) did a cadaver based study to investigate the effects of forearm rotation on these radiologic parameters. (7) They found that a 5° rotation produced a 1.6° change in palmar tilt on a conventional lateral view.

The distal portion of the radius has a quadrilateral crosssection and includes the metaphyseal and epiphyseal regions. Anatomic features of the distal radius include the styloid process, the dorsal tubercle, and four surfaces: anterior, lateral, posterior, and medial. The scaphoid fossa, lunate fossa, and sigmoid notch are three concave articular surfaces. The scaphoid fossa and the lunate fossa are separated by a dorsal-volar ridge which defines the scaphoid and lunate facets. The anterior surface is concave, angled anteriorly, and covered by the pronator quadratus . Its

rough surface provides an attachment point for the palmar radiocarpal ligaments. The anterior surface extends radially from the radial styloid ulnarly to the triangular fibrocartilage complex (TFCC). It extends distally and ulnarly to the capitate (radiocapitate), lunate (radiolunate), and triquetrum (radiotriquetral). The lateral surface extends along the lateral margin to form the styloid process. The styloid process is conical and projects 10–12 mm beyond the articular surface for the proximal scaphoid and lunate. The distal part of the styloid provides an attachment for the articular capsule and for the capsular thickening of the collateral ligament. Knowledge of normal values of morphometry is important for any racial or population group. Angles of radial inclination and palmar tilt are much less in the present Indian study as compared to earlier studies.(8) Palmar tilt is less on the left as compared to the right. More studies comparing radiographic and morphometric measurements may need to be done to better define normal parameters of distal radius in a race or population.

Conclusion:

Knowledge of normal values of morphometry is important for any racial or population group. Angles of radial inclination and palmar tilt are much less in the present Indian study as compared to earlier studies. Palmar tilt is less on the left as compared to the right. More studies comparing radiographic and morphometric measurements may need to be done to better define normal parameters of distal radius in a race or population.

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