Morphometry of the scaphoid waist: A better understanding for hand surgery

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ABSTRACT

The scaphoid bone is one of the eight small bones of the carpus. Along with the lunate and the distal carpal articular surface of the radius, it forms the wrist joint, an ellipsoid variety of synovial joint. The eight small bones arranged in two rows act together to allow simple translational movement and thereby play a special role in wrist stability and in coordinating various movements at the wrist joint. The scaphoid bone is vulnerable to fracture because of its position within the wrist. It is the most frequently fractured carpal bone accounting for seventy-one percent of all carpal bone fractures. This study was performed to observe the circumference of the scaphoid waist. Our study was focused on dry adult scaphoid specimens of humans in population of Bihar and our findings can be useful for clinicians.

Keywords – Scaphoid, Waist, Fracture, Foramina

INTRODUCTION

The scaphoid bone is the largest bone in the proximal row of carpal bones. The word scaphoid is derived from the Greek word “skaphe” for boat. The scaphoid is an obliquely oriented bone on the radial side of the wrist, which articulates with the radius, lunate, capitate, trapezium and trapezoid. The scaphoid has an unusual “twisted” shape and orientation [1]. Interposition of the scaphoid within the carpus facilitates wrist mobility and stability but is compensated by increasing the susceptibility of scaphoid to trauma. As the scaphoid is similar to the navicular it is also referred to as carpal navicular but the term is rather misleading. The body of the scaphoid is bean shaped with a dorsal sulcus and a ridge [2]. The bone has six surfaces out which two are non-articular. These non-articular surfaces have multiple arterial foramina. Upto seventy-five percent of the blood supply is from the branches of the radial artery. In twenty percent of scaphoids, most of the arterial foramina are in the waist area of the bone with no more than a single foramen in the proximal third [3]. Eighty percent of scaphoid bone consists of cartilage, leaving behind limited space for entrance for the supplying arteries [4]. Scaphoid injury is the most common pathology of the carpal bones [5]. Scaphoid
fractures account for 2% to 7% of all orthopaedic fractures [6], are the most common of all carpal bone fractures and are the most commonly undiagnosed fracture [7]. Scaphoid fractures have produced great confusion in the medical community regarding clinical diagnosis, radiographic evaluation and therapeutic management [8]. Misdiagnosis and improper treatment can result in potentially devastating complications such as delayed fracture union, pseudoarthrosis, avascular necrosis and wrist instability all of which can lead deformity and osteoarthritis [9]. The scaphoid is suspended within the wrist and covered almost completely by cartilage [10]. This configuration is optimal for intricate movements of the wrist joint but rather suboptimal for healing of a scaphoid fracture. A fractured scaphoid unites by primary bone healing with direct formation of bone across the fracture line without external callous formation. Scaphoid nonunions may also develop a problem called avascular necrosis. This can also result in fragmentation and collapse of the bone and may complicate surgical repair of the scaphoid. This study was undertaken to observe the morphometry of the scaphoid waist in Bihar population as very limited documented literature was previously available in the State.

MATERIAL & METHOD
The study included 80 dry human scaphoid bones which were obtained from the department of Anatomy of each of the following medical colleges in Bihar; Katihar Medical College, Indira Gandhi Institute of Medical Sciences and Patna Medical College. Age, sex, side and race were not taken into consideration and only intact bones were observed. Bones with signs of previous fractures and with malformations were excluded from the study. Width of the scaphoid was calculated at the narrowest angle of the waist using thread and then measuring the thread with a ruler.

OBSERVATIONS
Out of 80 scaphoid bones, we observed that only 3 were devoid of waists. Waist circumference was statistically significant. The narrowest waist in the sample was 5.9mm and the widest waist was 7.8mm. Mean waist circumference was recorded to be 6.85mm and SD was 0.98.

DISCUSSION
In this study we observed that the scaphoid waist was absent in three specimens. The scaphoid waist serves as an important anchoring point for several ligamentous attachments [11]. As the waist provides several ligamentous attachments in its absence the attachments could be weak [12]. This may explain higher incidence of ligamentous injuries in scaphoid bones without a waist. Internal fixation has become a well established alternative to casting for acute scaphoid fractures [13]. Screw design has evolved and several different types of screws with varying sizes are now available. Knowing the mean morphometric parameters of the scaphoid in a given population can facilitate the pre-operative selection of a screw of appropriate length for internal fixation. Waist circumference was statistically significant and it may be possible that the scaphoids with waist circumference towards the higher limit could have been of the right hand as Indian population is right dominant. Thus explaining greater force transmission on dominant side according to Wolfe’s Law [14]. Future implications of the present study include clinical correlation with the living subjects. Radiological morphometry can be done using CT Scan and the findings of our study can be compared with radiological findings. Our study was limited to the knowledge of age, race, side and sex. This study has thrown some light on the morphometry of the scaphoid bones in Bihar population. A comparative study of morphometry of the scaphoid can be taken up in which data obtained from Bihar can be compared with that of other states. The data obtained from this study and similar studies that shall be taken up in the future will provide useful information to orthopedicians, hand surgeons, chiropractors, radiologists and clinical anatomists.
REFERENCES

Figure:

Image 1 - Scaphoid bone taken for study (77/80 specimens)
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Image 2 - Scaphoid bones without waists (03/80 specimens)

Image 3 - Measurement of Scaphoid waist using thread

Image 4 - Measuring the linear thread against ruler