

## ANATOMICAL DISPOSITION OF CARPAL BONES OF GOLDEN RETRIEVER DOG BY X-RAY EXPOSURE

R. Mandal<sup>1</sup>, S. Ray<sup>1</sup>, A.P. Minj<sup>1</sup>, S. Podder<sup>2</sup>, S.K. Mukhopadhyay<sup>3\*</sup> and S. Ganguly<sup>4</sup>

**ABSTRACT:** The present study was conducted to know the general disposition of bones in carpal region of experimental dogs by X-ray study with an objective that the findings will facilitate to have an in-depth knowledge about the proper positioning of the carpal bones for surgical management of fractures and different types of bone deformities in dogs. In the present study, the anatomical disposition and arrangement pattern of carpal bones playing a pivotal role in providing the structural conformity in the limbs of Golden Retriever dog has been thoroughly confirmed by X-ray exposure.

**Key Words:** Bones, Dogs, Carpal, X-ray.

### INTRODUCTION

Usefulness of keeping pets like dogs for maintaining mental health and environmental harmony of the society cannot be denied. Especially dogs are very important because they are multi utility animals for us. Dogs have high running speed and use their toes (phalanges) for walking and running. Many a times, it is observed that when they jump from height and get fracture or sprain in the fore limb, because the body weight is conferred on

the fore limbs at the time of landing (Evans 1993) Fracture or sprain on the fore limb causes lameness. It is found that the carpus and tarsus are the two most susceptible areas of the limbs to sustain injury, dislocation and even fracture because this region bears the true weight during the time of jumping from height (Adams 2004). For correction of deformity by external manipulations or by making open surgery one should have a sound knowledge of normal disposition of bones, muscles and tendons of limb region. Only exact knowledge of

---

<sup>1</sup>Department of Veterinary Anatomy & Histology,

<sup>2</sup>Department of Veterinary Gynaecology & Obstetrics,

<sup>3</sup>Department of Veterinary Pathology, Faculty of Veterinary & Animal Sciences, West Bengal University of Animal and Fishery Sciences, Kolkata- 700 037, India.

<sup>4</sup>AICRP-PHT (Kolkata Centre), Department of Fish Processing Technology, Faculty of Fishery Sciences, West Bengal University of Animal and Fishery Sciences, Kolkata- 700 094, India.

\*Corresponding Author.

## Anatomical Disposition of Carpal Bones of Dog

**Table 1: Width and height of carpal bones of dog.**

Carpal bones	Measurements (mm)	
	Width	Height
First	5.81±0.06	5.21±0.01
Second	7.7±0.07	4.92±0.03
Third	7.22±0.03	6.19±0.11
Fourth	11.11±0.07	9.18±0.10
Ulnar	17.33±0.45	10.22±0.11
Intermedio-radial	22.88±0.18	11.09±0.17

All the values have been expressed as Mean ± S.E.

anatomical disposition of various structures and particularly the bones of this region will help to undertake proper treatment.

### MATERIALS AND METHODS

After post-mortem the specific body parts (fore limbs from the elbow joint) of six dead dogs (aged 7-8 years, Golden Retriever breed) were collected. They were washed thoroughly and kept in the deep freeze for preservation. The X-ray exposure of the carpus of live and morbid experimental dogs (Table 1) was done which were collected for maceration. X-rays were taken at KV-51 to 52 and MAS- 0.80. The carpals were positioned for medio-lateral, latero-medial, dorso-palmer and palmo-dorsal view.

### RESULTS AND DISCUSSION

In dog all these carpal bones could be distinguished both in X-ray plate and macerated specimen. The shape, size and the disposition of all the bones in the carpus were observed and recorded by gross observation in macerated specimen. The Radial and Intermediate fused carpal were the largest of all the carpal bones and situated at the medial aspect of the proximal row and articulated proximally with the distal end of radius, distally with almost all the bones of the second row carpal bones and laterally with the ulnar carpal bone (Fig.1).

This is in agreement with the statement of Sisson (1975), Evans (1993), Adams (2004) and Ghosh (2006) who have recorded that the carpal bone was the largest due to fusion of



**Fig.1: Radiography of dorso- palmar view of the carpus region of right forelimb of dog (R-radius, U-ulna, IRC-intermediate-radial fused carpal, C.1-first carpal, C.2-second carpal, C.3-third carpal, C.4-fourth carpal, Mc.I-first metacarpal, Mc.II-second metacarpal, Mc.III-third carpal, Mc.IV-fourth metacarpal, Mc.V-fifth metacarpal ).**



**Fig.2: Radiography of dorso- palmar view of the carpus of right forelimb of dog (R- radius, U-ulna, IRC-intermediate-radial fused carpal, C.1-first carpal, C.2-second carpal, C.3-third carpal, C.4-fourth carpal, UC-ulnar carpal, Mc.I-first metacarpal, Mc.II-second metacarpal, Mc.III-third carpal, Mc.IV- fourth metacarpal, Mc.V- fifth metacarpal).**

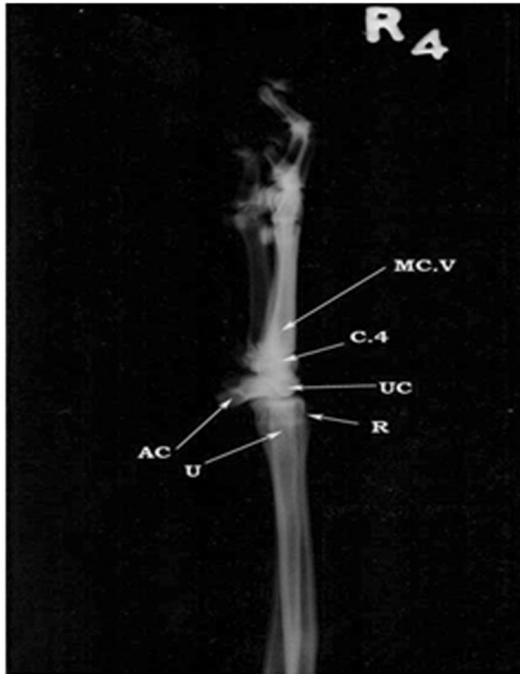
the radial and intermediate carpal bones and articulated proximally with the distal end of the radius, distally with almost all the carpal bones of the distal row and laterally with the ulnar carpal. The carpus appeared as a pentagonal structure with the base directed upward and the blunt apex directed downward in view of X-ray plate. The ulnar carpal bone was an irregularly wedge-shaped bone situated below the radius and ulna and above the fourth and fifth metacarpal bones (Fig.2).

The proximal articular surface (of carpal bone) was convex and the distal articular surface was irregular. It bore an irregular facet at its medial aspect for articulation with the

radial and intermediate fused carpal. This finding is at par with those of Sisson (1975), Nickel *et al.* (1986), Evans (1993) and Adams (2004) who have stated that this bone articulated with radius and ulna proximally, accessory carpal palmarly, fourth carpal and fifth metacarpal distally and radial-intermediate fused carpal medially. The accessory carpal bone was in the form of a short rod with its free posterior end blunt and directed medially (Fig.3).

It was located on the palmar side of ulnar carpal. Both the ends were found to be enlarged. The base was broad and had an extended facet for articulation of the ulnar carpal bone and a

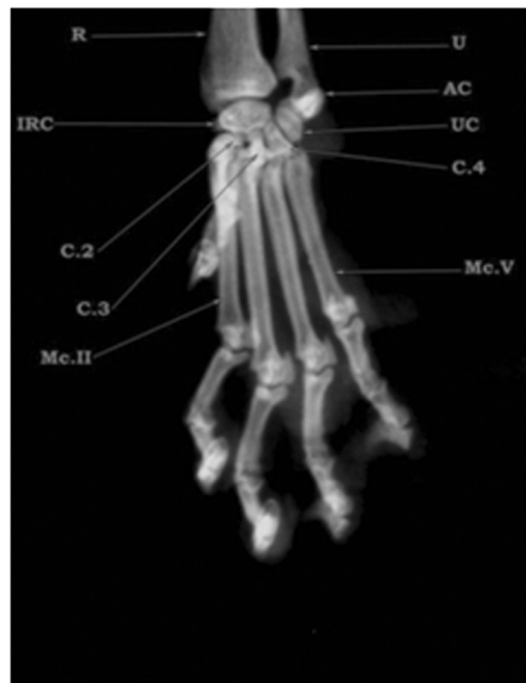
Anatomical Disposition of Carpal Bones of Dog



**Fig.3: Radiography of latero-medial view of right forelimb (carpal region) of dog (R- radius, U- ulna, IRC- intermediate-radial fused carpal, AC- accessory carpal, C.1- first carpal, C.2- second carpal, C.4-fourth carpal, UC-ulnar carpal, Mc.I- first metacarpal, Mc.V-fifth metacarpal).**

small facet for articulation for the styloid process of ulna. Sisson (1975), Nickel *et al.* (1986) and Evans (1993) described the bone in similar way to that of the present findings. They have stated that the accessory carpal was a truncated rod of bone located on the caudal or palmar side of the ulnar carpal. Both ends of this bone were enlarged.

The basal enlargement bore a slightly saddle shaped articular surface for ulnar carpal, which was separated by an acute angle from a smaller transversely concave, proximally directed articular area for the styloid process of ulna. The free end was thickened and overhangs



**Fig.4: Radiography of dorso-palmar view of the carpus of right forelimb of dog (R- radius, U-ulna, IRC-intermediate-radial fused carpal, C.2-second carpal, C.3- third carpal, C.4-fourth carpal, UC-ulnar carpal, Mc.I-first metacarpal, Mc.II-second metacarpal, Mc.V-fifth metacarpal).**

slightly. The First carpal bone was the smallest of all the carpal bones and placed at the medial aspect of the carpus between the radial carpal above and the first metacarpal below. This small flat bone articulated laterally with the second carpal, proximally with radial and intermediate fused carpal and distally with the first and second metacarpal. This finding is in agreement with the statement of Sisson (1975), Nickel *et al.* (1986). However Evans (1993) noted that this bone articulated proximally with the radial carpal and distally with the first metacarpal only, where as in this investigation the distal end was articulate distally with the

first and second metacarpal. The Second Carpal bone was a small, wedge shaped bone that articulated proximally with the radial-intermediate fused carpal, distally with second metacarpal, laterally with the third carpal and medially with the first carpal. Similar observation has been made by Sisson (1975), Nickel *et al.* (1986) and Evans (1993) who has recorded that the second carpal was a small, wedge-shaped, proximo-distally compressed bone that articulated proximally with the radial carpal, distally with second metacarpal, laterally with the third carpal, and medially with the first carpal.

The third carpal bone was somewhat like the second carpal and was larger than the second carpal. It had a large palmar projection, which articulated with the third metacarpal bones. It articulated medially with the second carpal, laterally with the fourth carpal, proximally with the radial carpal, and distally with third metacarpal. Disposition of this bone had been described by other workers which are at par with the findings of this investigation. However, statements of Nickel *et al.* (1986) and Evans (1993) regarding the articulation of its palmar projection with the second and fourth metacarpal along with that of the third metacarpal, was not clearly detected in this study. The Fourth Carpal bone was largest bone of the distal row articulated distally with the fourth and fifth metacarpal, medially with the third carpal and proximally with radial intermediate fused carpal at its medial aspect and ulnar carpal at its lateral aspect.

Contact of this bone with the ulnar carpal was found to be wide in comparison to that of

radial and intermediate fused carpal. This finding is in virtual agreement with that of Sisson (1975), Nickel *et al.* (1986), Evans (1993) and Adams (2004). However, Evans (1993) and Sisson (1975) did not mention anything about its broad contact with the ulnar carpal bone at its proximal surface.

### ACKNOWLEDGEMENTS

The authors are thankful to Hon'ble Vice Chancellor, West Bengal University of Animal and Fishery Sciences and the Dean, Faculty of Veterinary and Animal Sciences, WBUAFS, Kolkata, India for providing necessary facilities to carry out this research work.

### REFERENCES

- Adams RD.(2004).** Canine Anatomy. 4<sup>th</sup> edn. Blackwell Publishing Co. Iowa State Press. Iowa. p. 46.
- Evans HE.(1993).** Millers Anatomy of the Dog. 3<sup>rd</sup> edn. W.B. Saunders Co. Philadelphia. Pennsylvania. p. 193.
- Ghosh RK.(2006).** Primary Veterinary Anatomy, 4<sup>th</sup> edn. Current Book International. Kolkata. p. 27.
- Nickel R, Schummer A, Seiferle E and Wilkens (1986).** The Anatomy of the Domestic Animals. Vol.1. 5<sup>th</sup> edn. Verlag Paul Parey. Berlin. Hamburg. p. 63.
- Sisson S.(1975).** Sisson and Grossmans' The Anatomy of the Domestic Animals. Vol. 2. 5<sup>th</sup> edn. WB Sanders Co. Philadelphia. p. 1446.