Gross Anatomy of the Wing Bones of the Great Indian Horned Owl (Bubo bengalenses)

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ABSTRACT

The present study was conducted on the wing bones of an adult great Indian horned owl. The humerus was the largest of the wing bones. It had a slightly twisted cylindrical shaft and two expanded extremities. The proximal extremity had a distinct elongated head, a medial tuberosity and a lateral tubercle which continued as the prominent deltoid crest caudolaterally. Distal extremity on its caudal aspect had a wide shallow olecranon fossa. Ulna was thicker and radius was slender rod like. The head of the radius had a facet for radial condyle of humerus and laterally an articular area for ulna. Distal end had a facet for radial carpal. Both radius and ulna enclosed a wide interosseous space. The carpals were two, radial and ulnar carpals. Distal row of carpals were fused with proximal and of metacarpus and formed the carpometacarpus which had three components. The chief component was the 2nd carpometacarpus, 3rd was a thin bony spindle and 1st was a nodule on the proximal end of the chief component. Digits were three, the first digit was the thumb or pollex which had one phalanx. Second digit was the longest with two phalanges. Third digit had one phalanx.

Keywords
Humerus, Carpals, Carpometacarpus, Digits

Introduction

The great Indian horned owl, also called the Indian eagle-owl or Rock eagle-owl or Bengal eagle-owl is inhabited in the Indian subcontinent. It is a fairy large owl with prominent brown ear-tufts. They are generally nocturnal and flies with slow deliberate wing beats interspersed with long bouts of gliding on outstretched wings. It has a wing span of 50 to 60 inches, when in the air, it combines active flying with passive gliding. It often flies close to the ground. They usually hunt from a perch, but will also make low foraging flights to dive on prey. They primarily hunt rats and mice but also take birds up to the size of a pea fowl. Since the information available on the wing bones of this bird was scanty, the
present study was conducted to investigate the morphological features of these bones in detail.

Materials and Methods

The materials for the study were collected from great Indian horned owl brought for post-mortem examination to the Department of Veterinary Pathology Rajiv Gandhi Institute of Veterinary Education and Research, Puducherry. The bones were removed and collected by the regular process of maceration, cleaned, dried and the various gross anatomical features were recorded.

Results and Discussion

The skeleton of the wings consisted of the humerus, the radius and ulna, the wrist or carpus, the metacarpus and the digits.

Humerus

The humerus (Fig.1) was the strongest and largest of the wing bones. It was cylindrical long bone placed obliquely downward and backward, between the scapula above and radius and ulna below. It had a shaft and two extremities. The shaft was cylindrical and extremities were expanded. The shaft had a slightly twisted and formed a shallow musculo spiral groove.

Proximal extremity

The proximal extremity showed a distinct elongated head, a medial tuberosity and a lateral tubercle. The medial border was concave in its length while the lateral border was nearly straight. Head was more elongated and turned medially with its long axis vertical. large ovoid head in crow (Nora and Nawal 2017) and in domestic fowl (Nickel et al., 1977) in cattle egret (Rezk 2015). Dorsolateral to the head was the lateral tubercle which continued as a prominent lateral tubercular crest as deltoid crest similar to (Ali et al., 2016, Tahon et al., 2013, Dyce et al., 2010, Baumel et al., 1993 and Nickel et al., 1977). The deltoid crest which extended for about 3cm and terminated in the proximal third of the shaft. The free edge of this crest was thin and sharp. The medial tuberosity was larger. There was a deep capital groove between the medial tuberosity and head. Caudal to the deep capital groove was another groove, the coracobrachial groove. The medial tuberosity continued caudally as a bicipital crest. On the cranial surface, ventral to the medial tuberosity was located a deep pneumotricipital fossa as reported by Rezk (2015) in cattle egret. The fossa had a large pneumatic foramen on other hand Baumel et al., (1993) mentioned that the pneumatic foramen is not found in the humeri of all birds. A lateral tubercle was noticed on dorsolateral aspect of the head which concurred with a similar finding reported by Rezk (2015) cattle egret.

The distal articular extremity presented on the cranial surface a trochlea as reported by Nickel et al., 1977 in domestic fowl. Just proximal to the trochlea, a muscular line was seen which curved from medial to lateral. On the caudal surface it showed a large lateral ulnar condyle and a small medial radial condyle for articulation with the ulna and radius respectively forming the elbow joint. The condyles were separated by an intercondyloid notch. The large ulnar and small radial epicondyles were situated external to the corresponding condyles. On the cranial surface was present, an olecranon fossa which appeared wide and shallow which concurred with a similar observation made by Rezk (2015) in cattle egret. Kumar et al., 2016 had reported a well-marked olecranon fossa in barn owl. Above the condyles was a condyloid fossa which was bordered.
**Fig. 1** Photograph Showing the humerus of great Indian horned owl;
1. Head 2. Medial tuberosity 3. Deltoid Crest 4. Trochlea 5. Coronoid fossa 6. Condyles

**Fig. 2** Photograph Showing the radius and ulna of great Indian horned owl.
1. Radius 2. Ulna 3. Olceranon Process 4. Sigmoid Notch

**Fig. 3** Photograph showing the wing of great Indian horned owl
Radius and Ulna

The radius and ulna (Fig. 2) formed the bones of the forearm. The ulna was thicker than the radius in agreement with (Ali et al., 2016 and Tahon et al., 2013). The ulna was noticed to be the longest bone in the forelimb which agreed with a similar finding by Kumar et al., 2016 in barn owl. It presented a shaft and two extremities.

The shaft was almost cylindrical and was curved proximally. The shaft presented on its cranial and lateral surfaces small elevated projections which gave origin to secondary follicles of wing feathers.

The proximal extremity had an olecranon process and two concave articular facets, one larger and one smaller for the condyles of the humerus. Just below these articular facets there was another articular area for the radius. A ridge was noticed to descend down from the summit of the olecranon process and reached the proximal one third of the lateral surface of the shaft. The olecranon process was weakly developed as reported by Nickel et al., 1977 in domestic birds.

The distal end of the ulna had a small cranial condyle which articulated with the radial carpal and a large caudal condyle which articulated with the ulnar carpal. Moreover, the distal end on its medial aspect presented a small radial sulcus to form the distal radio ulnar joint.

Radius

Radius was rod like, slender but expanded at both the extremities. The proximal extremity represented the head which presented a facet which articulated with the radial condyle of humerus and lateral to this was an articular area for articulation with ulna. The shaft was slightly curved. The distal extremity had a facet which articulated with the radial carpal. A wide interosseous space was enclosed between the radius and ulna.

Carpals

The wrist consisted of two carpals the ulnar and radial carpal. In accordance with (Ali et al., 2016 and Tahon et al., 2013 and Hinchliffe, 1985). The ‘W’ shaped ulnar carpal was located on the caudal aspect of the wrist region. Rezk (2015) observed a ‘U’ shaped ulnar carpal in cattle egret. The ulnar carpal articulated proximally with the ulna and distally with the Carpo meta carpus. Radial carpal was rectangular in shape, situated on the cranial aspect of the wrist and articulated proximally with radius and ulna and distally with the carpometacarpus which concurred with the findings of Rezk (2015) in cattle egret.

Carpo meta carpus

The distal row of carpals were fused with the proximal end of meta carpus and formed the carpometacarpus in accordance with (Ali et al., 2016 and Tahon et al., 2013 and Hinchliffe, 1985). The proximal articular area presented facets for articulation with radial carpal cranially and caudally with ulnar carpal. It consisted of three components which were fused into one bone. The chief or greater component represented the second carpometacarpus which was the largest and strongest. The third carpometacarpus was observed as a thin bony spindle and was fused both proximally and distally with the chief component and enclosed a large interosseous space. From the proximal end of the second carpometacarpus projected a thick strong process which was in the form of a nodule and this represented the first carpo met carpus. Similar observations were reported by Nickel et al., 1977 in domestic birds.
Digits of the wing

There were three digits (Fig. 3) in the wing which articulated proximally with the corresponding carpo meta carpal bones. The first digit, the thumb or pollex consisted of one long proximal phalanx which was thorn like as reported in pigeon by Nickel et al., 1977. In fowl, duck and goose Nickel et al., 1977 also recorded a second very small and sharp pointed phalanx. The second digit was the longest and strongest digit. It articulated with the distal end of the second carpo meta carpus and consisted of two phalanges. The proximal or first phalanx was the larger with thick cranial border and a sharp curved edge. The distal or second phalanx was in the form of a pointed thorn. The third digit had only one phalanx which articulated with the distal end of third carpo meta carpus, just beside the first phalanx of the second digit which agreed with a similar finding by Nickel et al., 1977 in fowl.

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