

# GROSS ANATOMICAL STUDIES ON THE OS COXAE OF THE OSTRICH (*STRUTHIO CAMELUS*)

O.R. Sathyamoorthy<sup>1</sup> and Geetha Ramesh<sup>2</sup>

Department of Veterinary Anatomy and Histology  
Madras Veterinary College  
Chennai – 600 007, Tamilnadu

The ostrich is the largest living bird measuring up to 2.75 m in height and weigh over 160 kg (Fowler, 1986). The ostrich is called as 'camel bird' because of its similar habits with dromedaries. The large flightless birds viz. ostrich, emu, rheas, cassowaries, kiwis, moas and elephant birds were grouped together and given the name 'ratites'. The outstanding feature of these flightless birds is the possession of a sternum without a keel, hence the name ratite or raft-like (King and McLelland, 1979). The ostrich has been credited with a speed of 70-80 km/hr (Alexander *et al.*, 1979). The present study was carried out because the literature available on the ostrich anatomy is very scanty.

## Materials and Methods

The os coxae of the ostriches were collected from three, two year-old birds brought to the Department of Veterinary Pathology, Madras Veterinary College for post-mortem examination. The bones were biologically macerated, cleaned, dried and then gross anatomical features were recorded.

## Results and Discussion

The pelvic girdle was large, elongated and consisted of the paired ilium, ischium and pubis and firmly attached to the synsacrum (Fig. 1) as reported by Deeming (1999) in ostriches, Hildebrand (1979) in birds and Wake (1979) in reptiles.

But in contrary, the pelvic girdle of the earliest known bird archaeopteryx is small

and the ilia are connected only with six vertebrae. In fishes, the pelvic girdle is very simple without making connection with the axial skeleton (Walter and Sayles, 1965).

The ilium was broad, flat and oriented perpendicular. It fused cranio-ventrally with the pubis and caudo-ventrally with the ischium as reported by Deeming (1999) in ostriches. Ilium was the largest and the most dorsal part of the os coxae as reported by Wake (1979) in birds.

The left and right ilia fuse to each other along the dorso-cranial midline to form a boat-like structure which accommodated and fused to the synsacrum, as observed by Deeming (1999) in ostriches and Nickel *et al.* (1997) in fowl. In the postacetabular part, the ilia of both the sides were deviated (Fig. 2) from each other and also from the neural spines of the synsacrum. Only near the caudal end it was in contact with a neural spine.

In the present study, it was observed that the preacetabular part was shorter and broader and the postacetabular part was longer and narrower (Fig. 1). It is in agreement with the findings of Nickel *et al.* (1997) in duck and goose, where the preacetabular part was one third shorter than postacetabular part. But it was in contrary to his findings in fowl, where both the parts were of equal length and in pigeon where the preacetabular part was longer than the postacetabular part.

The length of the ilia was 48 cm. The breadth of the cranial border was 9.5 cm

<sup>1</sup> Assistant Professor.

<sup>2</sup> Professor and Head.

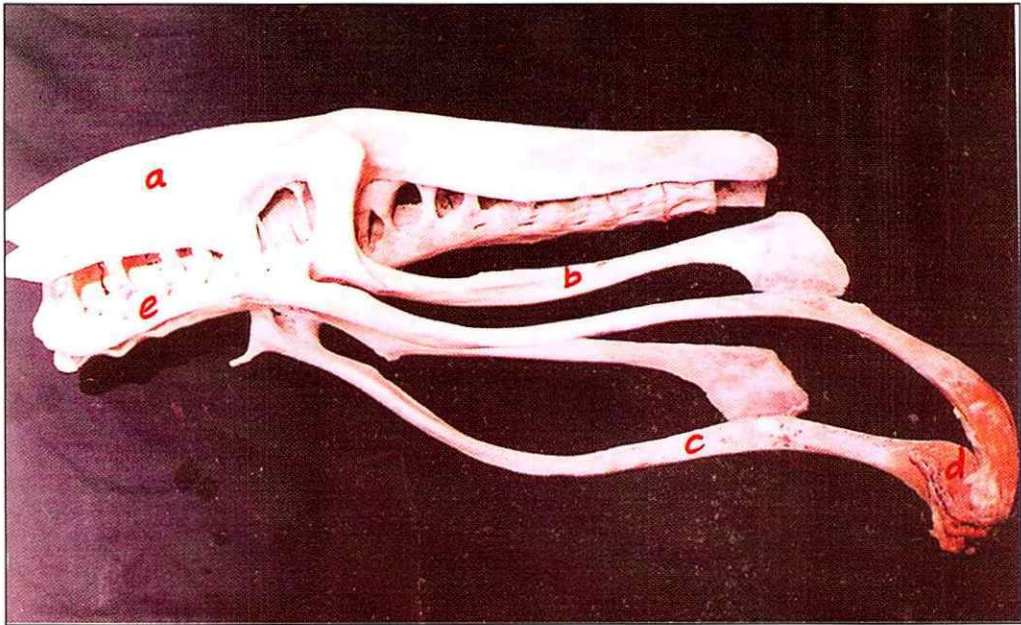


Fig. 1. Photograph of the os coxae of a two years old ostrich

a. Ilium    b. Ischium    c. Pubis    d. pubic symphysis    e. Synsacrum

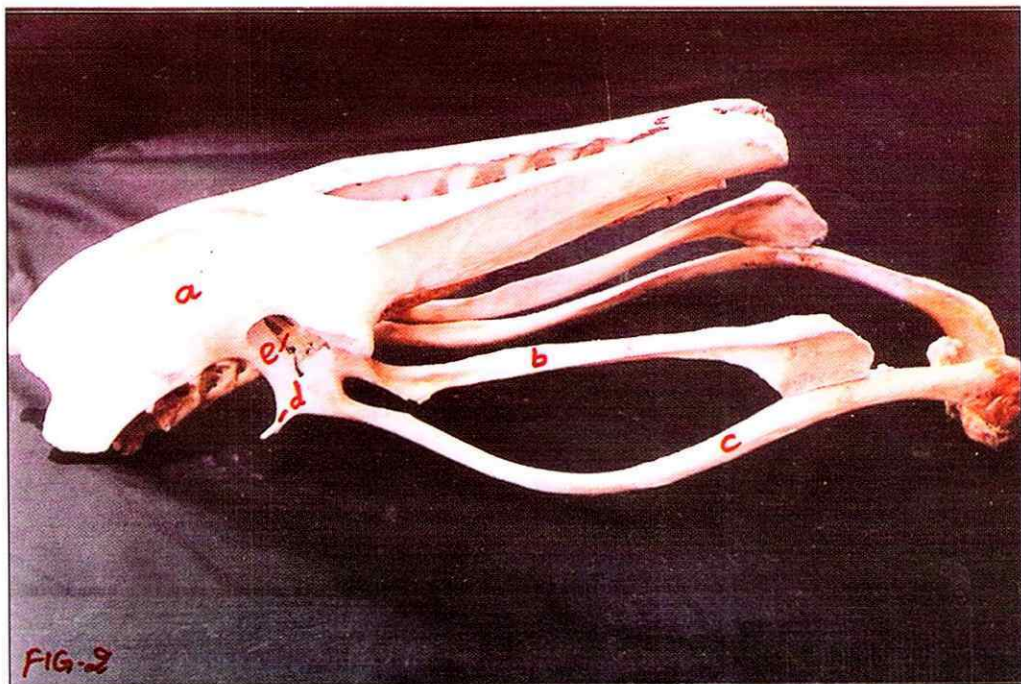


Fig. 2. Photograph of the os coxae of a two years old ostrich

a. Ilium    b. Ischium    c. Pubis    d. preacetabular tubercle    e. Acetabulum

behind the acetabulum, the breadth was 6 cm and at the caudal end the breadth was 5 cm.

The lateral surface was concave and broader in the preacetabular part and consisted of rough lines, ridges and rough tuberosity at the middle of the preacetabular part near the ventral border. It is in agreement with the observations made by Wake (1979) in fowl. The lateral surface at the level of acetabulum was convex. In the postacetabular part, the lateral surface of the ilium was concave and showed a low, thick ridge running parallel to the ventral border. It is in contrary to the observations of Wake (1979) in fowl that the postacetabular part is also convex.

In the present study, it was observed that the cranial border of the ilia was broader, thin and concave proximally and extended into a thin, broad plate distally. In the postacetabular part the dorsal border was broader (Fig. 2). A rough ridge was present at the dorsolateral border which starts at the level of acetabulum and continues backwards till the caudal end. The dorsal border was thickest at the level of acetabulum, thinner cranially and thicker caudally. The posterior border was narrow, thick and convex. The ventral border was thin but at the caudal end it became thick. The medial surface was rough and firmly attached to the transverse process of the synsacrum, as reported by Hildebrand (1979) in birds.

Nickel *et al.* (1997) observed that in fowl, the internal face of the ilium is excavated to accommodate the kidney in the fossa renalis. In the present study no fossa renalis was observed in the os coxae of ostriches.

The acetabulum was present at the junction of the cranial and middle thirds of the ilium and was perforated medially (Fig. 1) as observed by Deeming (1999) in ostriches, Hildebrand (1979) in birds and Wake (1979) in crocodiles. But it is in contrary to the observations of Wake (1979) in mammals, where the acetabulum is closed and showed a separate acetabular bone in many mammals, which enters into the formation of acetabulum except monotremes, rodents and bats (Walter and Sayles, 1965).

The diameter of the acetabulum was 5.5 cm cranio-caudally and 6 cm dorso-ventrally. A notch was noticed at the ventral margin near the cranial border.

Caudo-dorsal to the acetabulum was a large bony prominence, the antitrochanter (Fig. 1) covered by cartilage, as observed by Nickel *et al.* (1997) in fowl and Bezuidenhout (1986) in ostriches.

In the present study, it was observed that the acetabulum was formed by all three bony elements, *viz.*, ilium, ischium and pubis, as observed by Bezuidenhout (1986) in ostriches. But in contrary the pubis is not involved in the formation of acetabulum in the fowl and duck (Nickel *et al.*, 1997) and in crocodiles (Walter and Sayles, 1965).

The pubis was a long, bent, caudally directed, S-shaped rod of bone. It was 520 cm long (Fig. 1). Cranially it was fused with ilium to contribute to the formation of acetabulum, as observed by Bezuidenhout (1986) in ostriches. The pubic-foramen observed by Walter and Sayles (1965) in stegocephalians was not observed in the present study.

The cranioventral end of the pubis showed a preacetabular tubercle (Fig. 2) (pectineal process), which was 3 cm long. It is in accordance with the observations of Nickel *et al.* (1997) in fowl and Bezuidenhout (1986) in ostriches. An epipubic cartilage which extended from the anterior end of the pubic symphysis in turtle (Wake, 1979) was not noticed in the present study in ostriches.

Between the dorsal border of the pubis and the ventral border of the ischium was a wide gap, the incisura pubioischadica, as observed by Nickel *et al.* (1997) in duck.

The pubis projected caudally and bent ventromedially and cranially to fuse with the pubis of the opposite side and form a pubic symphysis (Fig. 2) as observed by Bezuidenhout (1986) and Walter and Sayles (1965) in African ostriches. But in contrary, the pubic symphysis is absent in the South American ostriches (rheas) (Walter and Sayles, 1965), in fowl (Nickel *et al.*, 1997) and in crocodiles (Wake, 1979).

In the present study, it was observed that the pubis formed one-fifth of the articular surface of acetabulum. Cranially, the pubis of both the sides were nearer to each other (6 cm apart). In the middle, they were separated widely (20 cm) and at the caudal end they were 9.5 cm apart.

The ischium was a long (33 cm) slender bone situated dorsomedial to the pubis (Fig. 1) and did not form symphysis and

observed by Eaton (1975) in birds and Deeming (1999) in ostriches and Fowler (1993) in ratites.

But in contrary, in crocodiles (Walter and Sayles, 1965) and south American ostriches (rheas), only an ischial symphysis occurs. In mammals, the os coxae of the two sides meet ventrally. The monotremes, marsupials, many rodents, insectivores, ungulates and carnivores have a symphysis ischiaticum and symphysis pubis, but in primates, the pubic bones unite in a symphysis.

The ilium and ischium were separated by a large ilioischial incisure. The ischium and pubis were separated by a large ischio-pubic incisure. The ischium fused with the pubis in two areas, one near the cranial end, where the ventral surface of the ischium was connected to the dorsal surface of the pubis and the other one at the caudal end, where the ischium was expanded into a broad plate (Fig. 1) and was in contact with the pubis, creating two opening between the two bones. The cranial opening was the obturator foramen and the caudal opening was ischiopubic foramen, as reported by Deeming (1999) in ostriches.

## Summary

The os coxae consisted of ilium, ischium and pubis. The ilium was the largest and most dorsal part of the os coxae. It fused cranio-ventrally with the pubis and caudo-ventrally with the ischium. The left and right ilia fused to each other along the dorso – cranial midline. The preacetabular part of the ilium was shorter and broader, whereas the post acetabular part was longer and narrower. The lateral surfaces were concave. The medial surface was firmly attached with the transverse process of the synsacrum. The acetabulum was present at the junction of cranial and middle thirds of the ilium and was perforated medially. Caudo-dorsal to the acetabulum the antitrochanter was present. The pubis was a long, bent, caudally directed,

S-shaped rod of bone. At the cranio-ventral end, the preacetabular tubercle was present. A pubic symphysis was noticed. The ischium was long, slender bone situated dorso-medial to the pubis and did not form symphysis. The ischium and pubis were divided by a large ischiopubic incisure.

## References

- Alexander, R.M., Maloiy, G.M.O., Njau, R. and Jayes, A.S. 1979. Mechanics of running of the ostrich (*Struthio camelus*). *J. Zoology*, **187**: 169-178.
- Bezuidenhout, A.J. 1986. The topography of the thoraco – abdominal viscera in the ostrich (*Struthio camelus*). *Onderstepoort J. Vet. Res.*, **53**:111-117.
- Deeming, D.C. 1999. *The Ostrich – Biology, production and health*. 1<sup>st</sup> ed. CABI Publishing House, New York, pp. 13-50.
- Eaton, A. 1975. *Comparative anatomy of the vertebrates*. 3<sup>rd</sup> ed. Oxford and IBH Publishing Co., New Delhi.
- Fowler, M.E. 1986. *Zoo and wild animal medicine*. 2<sup>nd</sup> ed. W.B. Saunders Company, London, p. 190-198.
- Fowler, M.E. 1993. *Zoo and wild animal medicine. Current therapy 3*. W.B. Saunders Company. London, pp. 194-197.
- Hildebrand, M. 1979. *Analysis of vertebrate structure*. John Wiley and Sons, New York, pp. 157-190.
- King, A.S. and McLelland, J. 1979. *Form and function in birds*. Academic Press, New York, London. pp. 54-61.
- Nickel, R., Schummer, A. and Seiferle, E. 1997. *Anatomy of the domestic birds*. Verlag Paul Parey, Berlin, pp. 1-25.
- Wake, M.H. 1979. *Hyman's comparative vertebrate anatomy*. 3<sup>rd</sup> ed. The University of Chicago Press, Chicago, London, pp. 238-264.
- Walter, H.E. and Sayles, L. P. 1965. *Biology of the vertebrates. A comparative study of man and his animal allies*. 3<sup>rd</sup> ed. The Mac Millan Company, New York.

