Gross Anatomy of the Bones of the Pelvic Limb of Spotted Deer (Axis axis)

C.V. Rajani1, I.S. Sajitha, M. Pradeep and J.J. Chungath
Department of Veterinary Anatomy and Histology, College of Veterinary and Animal Sciences, Pookode, Wayanad 673 576. Kerala, India.

(Received : 25-08-2012; Accepted : 06-02-2013)

Spotted deer, a native animal of the Indian subcontinent, has a beautiful golden brown coat with big white spots. It is the most widespread of the entire deer species. The males attain a shoulder height of 85-90 cm and weight of 80 kg. Information on the anatomical peculiarities of the pelvic limb in spotted deer is scanty. Hence, the study was undertaken to elucidate the anatomical features of the pelvic limb in spotted deer.

Materials and Methods
Pelvic limb bones were collected from three spotted deer that died of natural causes and were brought to the Department and Pathology, College of Veterinary and Animal Sciences, Pookode for postmortem examination. Bones were processed (Young, 1980) for studying the gross anatomical features.

Results and Discussion
The pelvic girdle comprised of two os coxae each with three bones: craniodorsal ilium, cranioven- tral pubis and caudoventral ishium. The bone was 24 cm long and the long axis of ilium and ishium were almost in line. The pelvic inlet was elliptical and very oblique. The middle transverse diameter of the pelvic inlet and transverse diameter of pelvic outlet were 6.8 cm and 5.3 cm respectively. The pelvic inlet was wider than the outlet. The pubis and ishium formed the floor of the pelvis and pelvic floor sloped a little caudally as in small ruminants (Dyce et al., 1996).

The ilia were almost parallel to each other and positioned obliquely. It showed a broad wing and elongated side to side compressed shaft.

The gluteal surface of the wing of ilium showed gluteal line as a rounded crest parallel to the lateral border. The sacropelvic surface showed an extensive rough articular area separated from a narrow elongated smooth iliac surface by a rounded ridge. These features concurred with the reports of Nickel et al. (1986) in small ruminants. However, in cattle the shaft of ilium was shorter and the gluteal line was indistinct. The arcuate line and the psos tubercle on the shaft were less prominent. The iliac crest was thin, concave and sharp while the greater ischiatic notch was deep. The cocygeal tuber was thickened while the thin sacral tuber was separated from the opposite side by a wide interval.

The pubis consisted of a body, a transverse cranial ramus and a paramedian caudal ramus. The cranial border, pectin ossis pubis, showed iliopubic eminence laterally like a roughened ridge as in sheep (Getty, 1975). But in cattle it was a large roughened tubercle. Ventrally the cranial border presented a transverse groove which faded before reaching the acetabular notch.

The ishium comprised of a body, a ramus and a tabula. The middle of the ventral surface had a rough ridge for the muscles. The tall and sharp ischiatic spine located caudal to the greater ischiatic notch showed laterally vertical rough lines. The tuber ishii was lare and trituberculate with the lateral tubercle more prominent as recorded in goat. However it was different from sheep where the lateral tubercle of the tuber ishii was much longer (Nickel et al., loc. cit) and the ischiatic spine was low and everted (Getty, loc. cit). The lesser ischiatic notch was very shallow. The acetabular notch was 3

1Corresponding author: Email : cv_rajani@yahoo.com
cm deep and its rim had an articular circumference of 8.2 cm. It showed a narrow deep notch caudomedially. The ischiatic arch was narrow and deep with an angle of about 60°. The large and elliptical obturator foramen located on the pelvic floor bordered by pubis and ishium had a length of 6 cm and a breadth of 3 cm.

The slender cylindrical shaft of femur was curved cranially especially in the distal third as in Sambar deer (Rajani et al., 2012). But the shaft was almost straight in cattle. The smooth cranial surface presented in nutrient foramen in the proximal third. The narrow longitudinally concave caudal surface presented in its middle third the *facies aspera* bounded by the prominent lateral and faint medial femoral lips. The distal extremity showed a well-developed supracondylid fossa.

The proximal extremity consisted of a head, neck and two trochanters. The strongly convex head projected more medially and showed a shallow *fovea capitis* in the middle. The neck was distinct medially as in smaller species. Lateral to the head, the proximal extremity presented the massive undivided *trochanter major* (Hyma, 2004) and its summit projected 1.5 cm above the level of the head. Nickel et al. (*loc. cit.*) stated that in large ruminants the greater trochanter was located at a higher level than the head Rajani et al. (*loc. cit.*) observed in sambar deer that the *trochanter major* was in level with the head. The *trochanteric fossa* was 2-3 cm deep and extensive. The *trochanter minor* was in the form of a small protuberance at the caudomedial aspect of proximal third of shaft. The intertrochanteric crest was well developed.

The distal extremity consisted of sagittally oblique distocephally projected two large condyles and a cranial trochlea. The intercondyloid fossa was rough, oblique and wide. The smooth wide trochlear groove had a length of 5.5 cm and breadth of 2.8 cm. It was bounded by medial and the lateral trochlear ridges of which the medial one was more prominent. The lateral epicondyle was massive and showed deep *extensor fossa* and shallow *popliteal fossa*.

The patella was almost triangular as in cattle with an average length and breadth of 3.8 cm and 3.5 cm respectively. However, in sambar deer it was ovoid, long and narrow. The base was broader in spotted deer whereas in the cattle it was in the form of a thick transverse ridge. The rough cranial surface was convex while the caudal articular surface was smooth. It showed a blunt sagittal ridge which divided it into a medial smaller and a lateral larger area as in large ruminants and sambar deer. But in
small ruminants the caudal surface of patella was concave transversely.

The long bone tibia was moderately curved as in cattle. The proximal third of the shaft was triangular in cross section while distal end was ova. Medial and lateral surfaces were longitudinally convex and concave respectively. The popliteal line and the muscular ridges on the flat caudal surface were less prominent. But in cattle, the ridges are more prominent. The cranial border was almost straight and pointed than in ox where it was blunt and laterally curved. The proximal extremity consisted of two condyles with undulating articular surfaces separated caudally by the popliteal notch. The medial and lateral intercondylar eminences were separated by a central intercondylar area. The medial intercondylar tubercle was taller as in cattle and differed in small ruminants where both are equal. The lateral condyle showed cranially an extensor sulcus for the passage of tendons.

The distal extremity had two sagittal oblique grooves and an intermediate ridge. The medial malleolus had a pointed end that extended beyond the distal extremity. Laterally it articulated with the lateral malleolus.

The fibula comprised of only two extremities. The head was fused with the tibia and was a small prominence on the lateral condyle of the tibia. A small quadrilateral side to side compressed bone of about 1.5 cm long formed the distal extremity as in cattle.

The tarsus comprised of five bones arranged in three rows: tibial and fibular tarsal in the proximal row, central and fourth fused tarsal in the middle row and the first tarsal and the second and third fused tarsal in the distal row. The fibular tarsal had a well-developed tuber calcis at the proximal extremity which was marked by a wide shallow groove. Central and fourth fused tarsal extended along the entire width of the tarsus. It showed a medioplantar hook like projection directed proximally. The plantar surface showed two tuberosities of which, the lateral one was rounded and the medial was less prominent. The first tarsal was a small quadrilateral bone while second and third fused tarsal was broad and flat.

The metatarsals were two in number: A large metatarsal formed by fusion of third and fourth metatarsals. The shaft of large metatarsal was compressed transversely and was distinctly four sided in the proximal 2/3rd while distally it was almost oval. It was longer than the large metacarpal. The dorsal longitudinal sulcus was wide, deep and distinct. The plantar longitudinal sulcus was distinct in the proximal 2/3rd. The proximal perforating foramen of the plantar surface opened on the plantar aspect of the proximal extremity. The medioplantar angle of the proximal end articulated with the small metatarsal bone which was a small quadrilateral sesamoid bone.

Two chief digits (III) and (IV) each with three phalanges and three sesamoids (two proximal sesamoid bones and one distal sesamoid bone) each were observed. Second and fifth digits were dewclaws.
The proximal and middle phalanges were more slender than that of pectoral limb. The proximal extremity of proximal phalanx showed two glenoid cavities and a median groove. The flexor tubercles of proximal phalanx were positioned more proximally as in small ruminants. The distal end showed two condyles of which, the lateral condyle was larger.

The three sided middle phalanx was one third shorter than the proximal phalanx as reported by Getty (loc. cit) in cattle. The proximal end presented two concave facets while the distal end had two condyles.

The distal phalanx resembled the shape of a roof. The articular surface possessed concavities and two facets palmarly for distal sesamoid. The dorsal border was narrow and sharp. This was similar to small ruminants where the dorsal border was narrow as in sheep whereas in cattle the border was broader. The extensor process was rough and prominent.

**Summary**

Gross anatomical studies on the bones of the pectoral limb of spotted deer were carried out. All the parameters were compared with that other species like small ruminants and cattle.

**References**


