ANATOMICAL STUDIES ON THE SKELETON OF PELVIC LIMB IN MOUSE DEER (*Moschiola indica*)

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ABSTRACT

The anatomical peculiarities of the skeleton of hind limb in mouse deer (*Moschiola indica*) was studied using three specimens brought for post mortem in the Veterinary College, Pookode. The os coxae in mouse deer resembled those of carnivores and rabbit. In the ilium, gluteal line was faint and the sacral surface was extensive. The ilium and ischium was positioned parallel to the back bone and and was fused with the sacrum. The lesser ischiatic notch was absent and the acetabulum was large and deep. Obturator foramen was typically oval. Femur was long; the head was prominent and placed at a higher level than the greater trochanter. Head of the femur was smaller than the acetabulum and the articular surface extended on to the neck. Medial and lateral supracondyloid fossae and the lateral supracondyloid crest were absent. Trochlear ridges were sagittal and equal. Patella was arched, narrow and elongated. Tibia was the longest bone of the pelvic limb and the distal end was notable for the great distal extent of its medial malleolus. Fibula was much reduced. There were five tarsal bones arranged in three rows. There were three metatarsals, of which the middle one formed the well-developed large metatarsal bone and the small medial and lateral metatarsals were very thin and long. Distally the large metatarsal presented two trochleae separated by a deep intertrochlear incisor. The two well-developed digits presented three phalanges and three sesamoids.

Key words: Mouse deer, pelvic limb skeleton, anatomy

INTRODUCTION

Mouse deer belongs to the family *Tragulidae* (Patton, 2004) and is the smallest ruminant in the world. This animal is found only in the tropical forests in Southern Asia, including the islands of Java, Sumatra and Kalimantan. The population of mouse deer is declining due to habitat destruction, hunting activity and the threat of predators (Najamudin *et al.,* 2012). They are solitary or live in pairs and feed more or less exclusively on plant resources. Each and every animal of the forest plays its particular role in keeping the ecological stability and hence the threat to this species has to be abruptly stopped so as to prevent further deterioration in population. The present study on the gross anatomical features of the pelvic limb of the mouse deer will form a basis for

further physiological and pathological studies and also aid in the diagnosis and treatment in this species.

MATERIALS AND METHODS

Three specimens brought for post mortem to the Department of Veterinary Pathology, Veterinary College, Pookode constituted the material for this study. The bones were prepared as described by Young (1980).

RESULTS AND DISCUSSION

The os coxae in mouse deer was formed of ilium, ischium and pubis and resembled those of carnivores and rabbit. The long axis of the ilium was almost in line with that of the ischium (Fig. 1) as seen in pig (Nickel *et al*., 1981). The gluteal line was faint. Greater ischiatic spine was low and everted. Sacral surface was extensive as in pig (Hilary and Flood, 1996) and smooth. The parallel position of ilium and ischium to the back bone and their fusion with the sacrum helps to transmit the thrust of hind limbs to body axis without any loss of force. Iliac surface was narrow and became thicker towards the sacral tuber. Iliac crest was convex, thick and rough in the middle which formed the highest point of the bone. Sacral and coxal tubers were lower than the crest. The lateral border of the ilium terminated abruptly. The sacro- pelvic surface presented a ridge at the distal extremity towards the body of the ilium.

Acetabulum was large and deep as reported in small ruminants and dog (Evans and Christensen, 1979, Siddiqui *et al.,* 2008 and Konig and Liebich, 2009). Acetabular notch was seen on the caudal part of the rim just in front of the obturator foramen. Ischiatic symphysis was not ossified. Obturator foramen was oval with an average length of 1.5 cm and width of 1 cm. The pelvic inlet was typically "U" shaped. Ischium was quadrilateral in shape and the dorso-pelvic surface was slightly concave. The lesser ischiatic notch was absent and the ischiatic spine was less prominent. Caudo-lateral angle or tuber ischii was thick, smooth and rudimentary. Strength and rigidity of pelvic girdle enable the animal to successfully withstand the thrust of the hind limbs during jumping.

Femur was long with a length of 8 cm. The prominent head of the femur was smaller than the acetabulum with the articular surface extending on to the neck. Head was at a higher level than the greater trochanter as in the cat (Arnbjerg and Heje, 1993 and Dyce *et al*., 2002). The neck was relatively long and the femoral head bowed medially as in *Apterodontinae* (Grohe *et al.*, 2012). The fovea

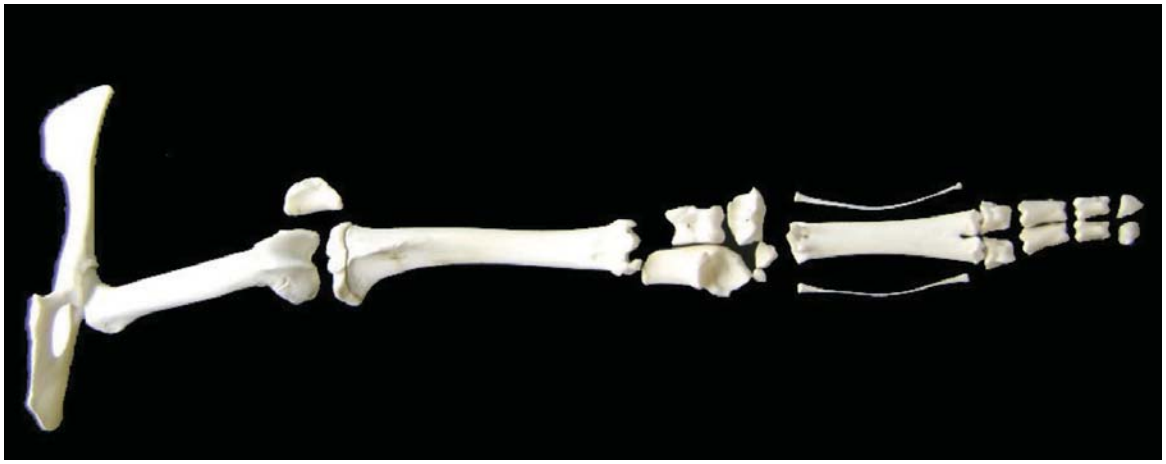

Fig.1. The skeleton of pelvic limb of the mouse deer

capitis was faint. Greater trochanter was small and continued distally on the caudal surface of the shaft as a thin faint ridge. The trochanteric fossa was wide and broad and guarded by the oblique intertrochanteric crest that extended from the inconspicuous lesser trochanter to the greater trochanter. Proximal aspect of the cranial surface presented the nutrient foramen. Medial and lateral supracondyloid fossae and the lateral supracondyloid crest were absent. Trochlear ridges were sagittal and equal and the intercondyloid fossa was wide.

Patella was arched, narrow and elongated (Fig. 1) as in rabbit (Popesko *et al*., 1992). It was compressed transversely with a wide base and presented two surfaces. Cranial surface was convex and smooth. Articular surface was divided by a vertical ridge into two strongly concave areas of which the lateral one was larger. Lateral border was convex and presented numerous foramina. Medial border was almost straight.

Tibia was the longest bone of the hind limb (9 cm) as reported in llama (Hilary and Flood, 1996). The triangular proximal end was much more massive than the anterio-posteriorly compressed distal end as in the new goat-like camelid (David and Webb, 2005). The popliteal surface was rough proximally and smooth distally and the lateral border presented a groove leading to the nutrient foramen. The popliteal surface presented a single popliteal line. The intercondyloid eminence was divided into two but the lateral and medial divisions were of the same height. The intercondylar area was well separated and showed numerous tiny foramina. Tibial tuberosity was well developed with a short and very prominent tibial crest. Fibula was much reduced. The distal end of the tibia was notable for the great distal extent of its medial malleolus as seen in new goat-like camelid (David and Webb, 2005). Fibula was much reduced. The lateral malleolus was fused with the tibia and reached up to the same level as that of the medial malleolus and on its lateral side there was a rough, highly pitted notch which extended upwards along the lateral border of the tibia.

Proximal row of tarsal bones consisted of the tibial tarsal and fibular tarsal; the middle row was constituted by the quadrilateral, well developed, fused central and fourth tarsal and the distal row presented the first and fused second and third bones which were very small. The centroquartal bone was pierced by a canal which was continuous with the large metatarsal for the lodgement of blood vessels. It also presented a hook-like plantaro-medial projection which articulated with the large metatarsal.

There were three metatarsals of which the middle one formed the well-developed large metatarsal bone (5.5 cm long) and the small metatarsals were very thin and long. Distally the large metatarsal presented two trochleae separated by the intertrochlear incisor which was very deep. The dorsal metatarsal groove was very wide and deep. Medial half of the dorsal surface presented a ridge which extended from the proximal to distal third of the large metatarsal. The two well-developed digits presented three phalanges and three sesamoids each as in other ruminants. The proximal phalanx was the biggest of all.

Bones of the pelvic limb in mouse deer are strong to keep the body clear off the ground when required and to take leaps by their straightening. Long segments of the hind limbs bent like a spring and increase the thrust produced by straightening of the hind limbs. The skeletal peculiarities represent adaptation of the species in sensing danger and making a rapid escape from its predators by running fast.

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