



MORPHOLOGICAL STUDIES ON THE FEMUR AND PATELLA OF LEOPARD (*Panthera Pardus*)

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Abstract

The study was conducted on the femur and patella of two leopards brought for postmortem. The femur comprised of a shaft and two extremities. The proximal extremity was made of a medially placed head and two trochanters. The summit of laterally placed trochanter major was placed in level with the head. The trochanter minor was placed at the caudomedial aspect of the shaft close to the neck. The shaft was straight and cylindrical. Its cranial, medial and lateral surfaces were smooth and continuous, while the caudal surface was flat and formed the *facies aspera*. The distal extremity consisted of medial and lateral condyles caudally and a trochlea cranially. Between the two condyles, an inter-condyloid fossa was present and the abaxial aspects of condyles presented protuberances called lateral and medial epicondyles. The trochlear groove was smooth and was bounded by medial and lateral ridges. The patella was ovoid in shape and was twice longer than its width.

Key words: Morphology, Morphometry, Femur, Patella, Leopard

Leopards fall under the fifth largest species of all cats. Their body is heavy and sturdy with short muscular legs. Kirberger *et al.* (2005) and Ray *et al.* (1996) reported some morphological features of femur in lion and leopard respectively. But very little information is known on anatomical features of femur and

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patella in leopard. So the present study was conducted to elucidate the peculiarities of femur and patella in leopards.

Materials and Methods

Femur and patella were collected from two leopards that died of natural causes and were brought to the Department of Pathology, for postmortem examination. Bones were processed (Young, 1980) for studying the morphological and morphometrical features.

Results and Discussion

The femur was a long bone and comprised of a shaft and two extremities (Figs.1 & 2). The proximal extremity consisted of a head, neck and two trochanters. The head was hemispherical and projected medially. Because of the peculiar shape of femoral head, the hip joint has more versatility of movement as in dogs and cats. (Dyce *et al.*, 1996). On the medial aspect of the head, a shallow, circular, rough depression, the *fovea capitis femoris* was present. The head and shaft were connected by a neck and was distinct medially. These findings are in accordance with those seen in dogs (Nickel *et al.*, 1986).

Lateral to the head, the proximal extremity presented the trochanter major which was undivided and its apex was placed in level with that of the head as in dogs. However in cats, the apex is situated at a lower level than the head (Nickel *et al.*, 1986). Contrary to this,

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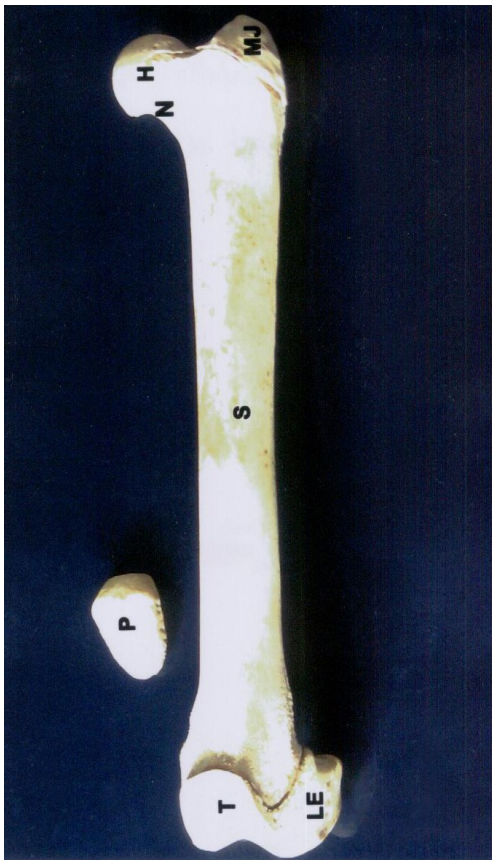


Figure.1: Femur of leopard-cranial view. H-Head, N-neck, MJ- Trochanter major, S-Shaft, T- Trochlear groove, LE-Lateral epicondyle., P-Patella

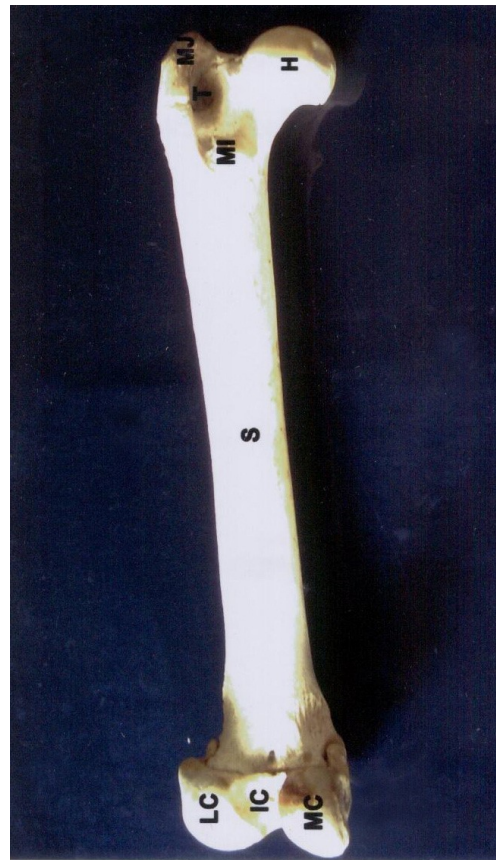


Figure.2: Femur of leopard-caudal view. H- Head, MJ- Trochanter major, N- Neck, S-Shaft, MC- Medial condyle, LC-Lateral condyle, IC - Inter condyloid fossa.

Ray *et al.* (1996) reported that in leopards the trochanter major was located at a higher level than the head. The medial surface of the trochanter major was excavated to form a well developed trochanteric fossa as seen in other carnivores (Nickel *et al.*, 1986). The shaft presented a distinct pyramid shaped eminence, the trochanter minor at the proximal third of its caudomedial aspect close to the neck. This is in partial agreement with that of the dog wherein the trochanter minor is placed at a lower level (Miller, 1965). The intertrochanteric crest was well developed. However, it was not as prominent as in dogs. Nickel *et al.* (1986) reported that the intertrochanteric crest was better developed in dogs than in cats. Hence the present finding suggests that the intertrochanteric crest in leopard has more resemblance to felines than that of canines. Caudolateral border of the bone distal to the greater trochanter was rough and this area

represented the trochanter tertius as in dogs (Budras *et al.*, 1994)

In the present study, the shaft was almost straight and cylindrical, whereas in dogs it was slightly curved in its length (Getty, 1975). The cranial, medial and lateral surfaces were continuous and smooth whereas the caudal surface was nearly flat and slightly roughened in the middle third forming the facies aspera and presented two nutrient foramina. The facies aspera was bounded by the lateral and medial femoral lips that diverged proximally to join the trochanter major and trochanter minor respectively. The lateral femoral lip was more prominent and the two lips enclosed the flat trochanteric surface at the proximal third as in dogs (Miller, 1965). In the distal third the femoral lips were ill developed and only a faint lateral femoral lip joined the lateral epicondyle. This lip formed the lateral boundary of the nearly flat popliteal surface. These findings partially concur

with that of the dogs where in the distal third, both the femoral lips were present and joined the lateral and medial epicondyles respectively and these lips diverged and enclosed the sagittally concave popliteal surface (Nickel *et al.*, 1986).

The distal extremity consisted of two condyles and an articular groove, the trochlea (Figs. 1 & 2). The condyles, medial and lateral projected caudodistally and were convex both sagittally and transversely and the lateral one was slightly larger as in dogs (Miller, 1965). Between the two condyles, a broad, oblique and rough inter-condyloid fossa was present and was separated from the popliteal surface by the inter-condylar line as in other carnivores (Nickel *et al.*, 1986). Both sides of the condyles were rough. Abaxial aspects of the condyles presented protuberances called the lateral and medial epicondyles and depressions. The articular surfaces of the condyles extended caudally onto the small facets on adjacent epicondyles for the fabella (Nickel *et al.*, 1986). The medial and lateral supracondylar tuberosities seen proximal to the facets for fabella as reported in dogs by Miller (1965) were rudimentary in leopard. The trochlea was smooth, wide and was located on the cranial aspect at the distal extremity. It was bounded by two sagittal ridges, the medial and lateral of which the lateral one was slightly longer. However, Ray *et al.* (1996) reported that both ridges were of equal length in leopards. As in dogs, the articular surface of the trochlea was continuous with that of the condyles and articulated with the patella. The extensor fossa noticed between the lateral ridge of the trochlea and the lateral epicondyle was shallower than that of the dogs (Miller, 1965). Caudal to the extensor fossa a large depression, popliteal fossa was noticed on the lateral surface of the lateral condyle.

The patella was ovoid in shape and was twice longer than its width. It presented two surfaces, two borders, a base and an apex (Fig. 1). The base directed upwards and was broad and rounded. However, in lion, the patella had a long, narrow apex and a flat, broad base (Kirberger *et al.*, 2005). The apex was blunt and more pointed than the base. The cranial surface was convex and rough while the caudal articular surface was smooth and articulated with the trochlea of femur. This surface was divided into two almost equal proximo-distally

Table: Morphometrical parameters of the femur and patella of Leopard

Parameters	Measurements (in cm)
Femur	
Length	24
Head	
Circumference	8.3
Trochanteric fossa	
Width	0.8
Depth	1.3
Circumference of the shaft	
At proximal level	7.5
At middle level	7.1
At distal level	8.8
Inter condyloid fossa	
Maximum length	2.4
Maximum width	1.4
Trochlea	
Length of groove	3.4
Width of groove	2.2
Patella	
Maximum length	3.5
Maximum width	2.5

concave areas by an indistinct vertical ridge. The medial border was grooved and both the borders were perforated by several foramina of varying sizes. These partially agree with the findings in dogs where, the patella was narrower and the foramina were present only at the medial border (Miller, 1965)

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