

Comparative anatomical studies on the scapulae of Bengal tiger and Indian leopard

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The Bengal tiger (*Panthera tigris*) and Indian leopard (*Panthera pardus*) are 2 great felines found in the Indian subcontinent. The status of the leopard is not so precarious when compared to the Bengal tigers numbering around 1,411, yet poaching is still a great threat to both the species. On many occasions, various biological samples of Bengal tigers and Indian leopards are required to be identified for solving forensic problems and settling legal disputes for litigation of the offenders. Therefore keeping this point in mind, the present study was undertaken to highlight the anatomical differences between the scapula of tiger and leopard based on its morphology and biometry.

For this study, bones of one adult from each species were taken into consideration which were received from the wildlife department, Government of Asom. As these bones were not cleaned properly, they were brought to the department and processed with hot water maceration technique (Tasbas and Tecirlioglu 1996). Biometrical values were statistically analyzed as per Snedecor and Cochran (1994).

In the present study, the scapulae of both adult Bengal tiger and Indian leopard were triangular flat bones (Fig. 1) with 3 borders and three angles as also reported in feline species (Nickel *et al.* 1986). The supra and infraspinatus fossae (Fig. 1) of the scapula of tiger was better developed than that of leopard, which was indicative of strong and massive infraspinatus and supraspinatus muscles in tigers. The posterior border of the scapula was more convex in tiger as compared to that of leopard (Fig. 1).

In both the species, the acromion process (Fig. 1) was directed ventro-cranially and tuber of the scapular spine was

directed ventro-caudally. The ventro caudally directed tuber of the scapular spine (Fig. 1) attributed to better insertion of trapezius muscle in these big cat species. Similar observations were also reported in cats (Nickel *et al* 1986) and dogs (Miller 1964). The Scapular spine was convexo-concave in tiger and vertical in leopard. Linear elevations were present on the supra- and infraspinous fossae in Bengal tiger but not seen in Indian leopard. Medial surface of the scapulae in both the



Figs 1–6. **1.** Lateral surface of the scapulae of Leopard and Tiger showing infra (I) and subscapular (S) fossae with tuber scapulae (arrows). **2.** Medial surface of the scapulae of Leopard and Tiger showing rough lines in the subscapular fosse (arrows). **3.** Well defined neck of scapula in Leopard (arrow) **4.** Well defined neck of scapula in Tiger (arrow) **5.** Glenoid cavity (Gc) of the scapula and acromion process (arrow) in Tiger **6.** Glenoid cavity (Gc) of the scapula and acromion process (arrow) in Leopard.

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Table 1. Biometrical values (mean $\pm$ SE) of different parameters in morphological identification of scapulae of tiger and leopard

Parameters	Tiger (mean $\pm$ SE in cm)	Leopard (mean $\pm$ SE in cm)
Length of scapula	24.820 $\pm$ 0.124	19.710 $\pm$ 0.060
Width of scapula (from cranial to caudal angle)	21.110 $\pm$ 0.223	13.550 $\pm$ 0.177
Length of the scapular spine (up to acromion process)	25.600 $\pm$ 0.450	19.750 $\pm$ 0.297
Width of the neck of scapula	5.640 $\pm$ 0.028	3.500 $\pm$ 0.070
Thickness of cranial border	0.205 $\pm$ 0.003	0.100 $\pm$ 0.007
Thickness of caudal border	1.150 $\pm$ 0.035	0.690 $\pm$ 0.003
Thickness of vertebral border	4.335 $\pm$ 0.024	2.300 $\pm$ 0.014
Length of the neck	0.980 $\pm$ 0.014	0.799 $\pm$ 0.008
Distance of cranial nutrient foramen from the scapular spine	1.950 $\pm$ 0.035	3.250 $\pm$ 0.070
Distance of caudal nutrient foramen from the scapular spine	0.500 $\pm$ 0.017	0.830 $\pm$ 0.028
Distance of cranial foramen from ventral end of the spine (on the lateral surface)	3.505 $\pm$ 0.039	4.760 $\pm$ 0.092
Distance of the caudal foramen from the ventral end of the spine (on the lateral surface)	2.915 $\pm$ 0.166	3.460 $\pm$ 0.152
Distance of the nutrient foramen on the costal surface from base of coracoid process	5.070 $\pm$ 0.067	2.480 $\pm$ 0.014
Length of glenoid cavity (from cranial end of the rim to the caudal end)	5.550 $\pm$ 0.088	3.360 $\pm$ 0.184
Width of the glenoid cavity (at the widest level)	4.335 $\pm$ 0.024	2.300 $\pm$ 0.014

species was shallow (Fig. 2). On this surface, four numbers of rough lines were found in tiger whereas 5 rough lines were present in leopard (Fig. 2). The rough area (cranially) for serratus ventralis muscle was triangular and narrow in tiger and oval in leopard and the same was narrow in tiger and marginal and oval in leopard. The neck of the scapula were well defined in both the species (Figs 3 and 4). Two number of nutrient foramina were present just dorsal to the neck on either side of the scapular spine. They were at the same level in tiger (Fig. 5) and at different levels in leopard (Fig. 6) – cranial foramen was dorsal to the caudal. The glenoid cavity of the scapula of both the species was oval in tiger and bean-shaped in leopard. Different biometrical values of the scapulae pertaining to leopard and tiger have been depicted in Table 1.

SUMMARY

The present study was conducted on the scapulae of adult Royal Bengal tiger and Leopard. Marked differences were noticed in the morphology of these two great felines. On the lateral surface, scapular spine was convexo-concave in tiger and vertical in leopard, linear elevations were present in the supra and infraspinous fossae but it was not so in leopard.

Five numbers of rough ridges on the costal surface was present in leopard which were four in tiger. The cranial rough area for attachment of serratus ventralis muscle was triangular in tiger and oval in leopard. The caudal rough area for the same muscle was narrow in tiger and marginal in leopard.

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REFERENCES

- Tasbas M and Tecirlioglu S. 2005. Maceration Technology in Arasirmalar. (*Meserasyon teknigi uzerinde arasirmalar*). Ankara Üniversitesi Veteriner Fakültesi Dergisi 12(4): 324-30.
- Snedecor G W and Cochran W G. 1994. *Statistical Methods*. 9th edn. Pp. 124-130. Iowa State University Press, Ames, USA.
- Nickel R, Schummer A and Seiferele E. 1981. *Lehrbuch der anatomical der hausteier*. Vol 2. 2nd Edn. Eingeweide, Berlin, Paul Parey.
- Miller M E, Christensen G C and Evans H E. 1964. *Anatomy of the Dog*. W B Saunders Company, Philadelphia.