Available online at www.ijpab.com

DOI: http://dx.doi.org/10.18782/2320-7051.5370

ISSN: 2320 – 7051

Int. J. Pure App. Biosci. **5 (6):** 80-85 (2017)

Research Article

International Journal of Pure & Applied Bioscience

OPEN ACCESS

Gross and Morphometrical Studies on Scapula of Civet Cat (*Viverricula indica*)

Kamal Sarma, Jasvinder Singh Sasan* and Shalini Suri

Division of Veterinary Anatomy, F.V.Sc & A.H, SKUAST-Jammu, R.S Pura-181102

*Corresponding Author E-mail: jssasan216@gmail.com

Received: 2.08.2017 | Revised: 5.09.2017 | Accepted: 10.09.2017

ABSTRACT

The present study has been conducted on the scapula of a small Indian civet cat. The scapula was flat roughly quadrilateral bone with two surfaces, three angles and three borders. Medial surface presented subscapular fossa. Lateral surface was divided into supra-spinous and infra-spinous fossa by scapular spine. The total length of the scapular spine was 5.77 cm. The maximum height of spine was observed at proacromion level. Spine terminated as acromion process. Roughly triangular caudally directed metacromion process was seen just dorsal to acromion process. Tuber spine was indistinguishable. Glenoid cavity was elliptically elongated in outline. Tuber scapulae was indistinct. The ratio of maximum width of supra-spinous to infra-spinous fossa was 1 : 1.55 whereas scapular index was 50.74.

Key words: *Civet cat, Glenoid cavity, Metacromion process, Morphometrical, Scapula*

INTRODUCTION

The small Indian civet (*Viverricula indica*) is a civet native to South and Southeast Asia. It is listed as Least Concern on the IUCN (International Union for Conservation of Nature and Natural Resources) Red List because of its widespread distribution, widespread habitat use and healthy populations living in agricultural and secondary landscapes of many range states[5]. Dorsal crest and absence of long black hairs distinguish it from the large civet. It is smaller a smaller animal with a body length of 3 ft, a tail length of 1 ft and weighs 6-8 lbs. the general colour varies from brownish or olive grey to light grey. There are longitudinal dark stripes and rows of spots along the body. The small Indian civet is a shy animal and almost entirely nocturnal in habit. In literature, abundant information is available on gross anatomy of scapula of domestic animals (Raghavan[15]). Literature is also available on scapula of Blue bull[1], chital[3], blackbuck[4], cheetah[16]. Due to paucity of literature on the scapula of small Indian civet, the present study has been planned. The outcome of this study will be useful to the field veterinarians, zoo veterinarians and wildlife experts.

Cite this article: Sarma, K., Sasan, J.S. and Suri, S., Gross and Morphometrical Studies on Scapula of Civet Cat (*Viverricula indica*), *Int. J. Pure App. Biosci.* **5(6):** 80-85 (2017). doi: http://dx.doi.org/10.18782/2320-7051.5370

MATERIALS AND METHODS

The present study was conducted on the scapula of an adult male civet cat. The bone was processed as per standard technique[15] and subsequently studied to record gross morphological features. Different biometrical parameters were measured with help of thread, meter scale and Vernier calipers as follows:

a. Maximum length (cm): Along the scapular spine
b. Diagonal length (cm): From coracoid process to caudal angle of scapula
c. Width of scapula (cm) at three levels i.e. dorsal, middle and distal
d. Length of scapular spine (cm)
e. Height of scapular spine (cm) at three levels i.e. dorsal, middle and proacromion level
f. Length (cm) of the acromion and metacromion processes
g. Antero-posterior and transverse diameters (cm) of glenoid cavity
h. Circumference of glenoid cavity (cm)
i. Maximum width (cm) of supra-spinous and infra-spinous fossae
j. Scapular index (SI). It was calculated as the ratio between maximum length and maximum width of scapula[1]

SI = (Maximum length/Maximum width) * 100

RESULTS AND DISCUSSION

The scapula was a flat roughly quadrilateral shaped bone unlike other species. It was relatively wider at the dorsal end and narrower at ventral end (Fig. 1) which was similar to the findings of Raghavan[15] in ox, Lahunta[10] in dog, Getty[8] in horse, Choudhary *et al.*[3] in chital, Choudhary[4] in blackbuck and Bharti and Singh[1] in blue bull. However, Bordoloi *et al.*[2] found it to be less triangular but flat in Great Indian Rhino. The scapula of civet cat in the present study presented three borders, three angles and two surfaces as seen earlier in horse[8], cattle[12], sheep[8] and dog[10]. Medial surface presented subscapular fossa with few ridges indicating muscular attachment (Fig. 2). Lateral surface was divided by a prominent scapular spine (Fig. 1) into two unequal parts namely supra-spinous and infra-spinous fossa. Lahunta[10] in dog, Bordoloi *et al.*[2] in Great Indian Rhino and Ozkan[13] in hedgehogs revealed that these two fossae were almost equal. In civet cat, the supra-spinous fossa increased in width distally unlike in case of cattle[15]. The scapular spine extended up to the neck of the bone and terminated as free pointed highly developed acromion process (Fig. 1) which did not overhang the glenoid cavity as seen in dog[10]. The scapular spine was wavy in outline as also reported by Bharti and Singh[1] in blue bull. In contrast, the acromion process was absent in horse[8]. According to Bordoloi *et al.*[2], in Great Indian Rhino, the scapular spine diminished from the tuber spine to the distal part without forming the acromion process. Sarma *et al.*[17] revealed that the spine showed the uncinate process which was directed caudally in adult elephants of Assam. Kalita and Bhattacharya[9] found that the scapula had an additional spine which divided the supra-spinous fossa into cranial and caudal parts in sloth bear. Just dorsal to the acromion process there was a metacromion process (Fig. 1) which was roughly triangular in outline and caudally directed. Similar observation was made by Luliis and Pulera[11] in domestic cat. Such process was not seen in dog[10]. Tuber spine was indistinguishable. This was in accordance with the findings of Smuts and Bezuidenhout[20] in dromedary and Pandya *et al.*[14] in Asiatic lion, however, the same was prominent in horse[8] and Great Indian Rhino[2].

Three borders were dorsal, cranial and caudal border. Dorsal and caudal borders were almost straight whereas cranial border was thin and highly convex. The caudal border was the thickest of all the three borders as also reported in dog[10]. It presented a concavity distally known as scapular notch (Fig. 1) which was also observed in dog[10] and cheetah[16]. Out of the three angles, caudal angle was the thickest. The ventral angle presented glenoid cavity which was elliptically elongated in outline (Fig. 3) as compared to oval in horse[8], circular in cattle[12], circular and deep in Black Bengal goat[19], shallow in dog (Evans and Christensen[7]), almost rectangular in Indian

elephants[17], shallow rounded in chital (2), shallow and shaped like heart of playing cards in blackbuck[3]. Glenoid notch was indistinct. A beak-like coracoid process (Fig. 3) projected medially from the anterior margin of the glenoid cavity as also observed by Sebestiani and Fishbeck[18] in domestic cat. Lateral to it was the tuber scapulae which was indistinct. It was absent in Great Indian Rhino[2]. The biometry of scapula of adult small Indian civet cat is presented in Table 1. The maximum length of scapula (without scapular cartilage) was 6.8 cm whereas the diagonal length was 7.1 cm (an increase by 4.41 %). The width of scapula was measured at three levels. It was 3.41 cm at dorsal, 3.45 cm at middle and 2.18 cm at distal level of the scapula. Maximum width was seen at the middle part. The decrease in width was more pronounced distally (decreased by 36.81 %) as compared to dorsally (decreased by 1.16 %). The total length of the scapular spine was 5.77 cm. The height of scapular spine was also measured at three levels. It was 0.3 cm at dorsal, 0.9 cm at middle and 1.0 cm at the level of acromion process. The scapular spine thus showed a continuous increase in the height towards acromion process. The maximum height of spine was observed at proacromion level. The increase was significant up to the middle of the spine. The ratio of length of scapular spine to maximum height at proacromion level was 5.77 which was 6.77 for cheetah[16]. The length of the acromion process was 0.4 cm whereas the length of metacromion process was 0.7 cm. The scapular index was 50.74 for civet cat and the same was 56.60 for blue bull[1], 82.05 for tiger, 72.82 for leopard, 67.34 for sambar, 65.83 for sheep, 62.43 for buffalo, 57.51 for deer, 55.74 for pig, 52.59 for ox, 45.86 for horse, 45.45 for Nilgai and 43.62 for goat as recorded by Dalvi *et al.*[6]; 59.40 and 58.35 for Asiatic lion and chital as reported by Pandya *et al.*[14] and 61.05 for blackbuck[3]. The maximum width of supra-spinous fossa was 1.9 cm whereas infra-spinous fossa was 2.95 cm. The ratio of maximum width of supra-spinous fossa to infra-spinous fossa was 1 : 1.55. It was 1 : 2.97 in blue bull (Bharti and Singh[1]), 1 : 4.15 in chital[3] and 1 : 3.21 in black buck[4]. The glenoid cavity had a circumference of 3.3 cm. The antero-posterior diameter was 1.05 cm and the transverse diameter was 0.69 cm.

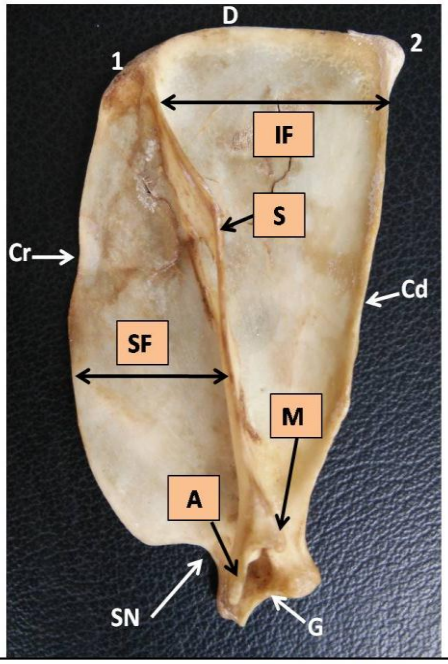

Fig. 1 Lateral surface of scapula of civet cat showing cranial angle (1), caudal angle (2), cranial border (Cr), caudal border (Cd), dorsal border (D), scapular spine (S), acromion process (A), metacromion process (M), scapular notch (SN), glenoid cavity (G), supra-spinous fossa (SF) and infra-spinous fossa (IF)

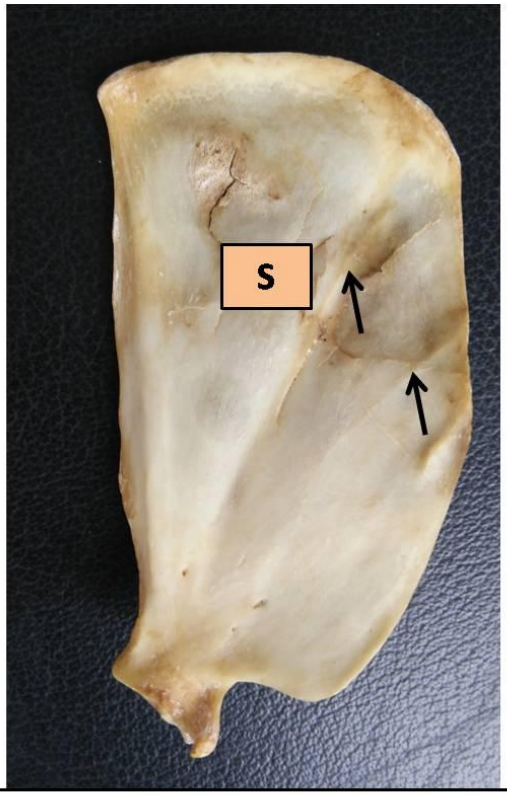

Fig. 2 Medial surface of scapula of civet cat showing subscapular fossa (S) and few rough lines (arrow) for muscle attachment

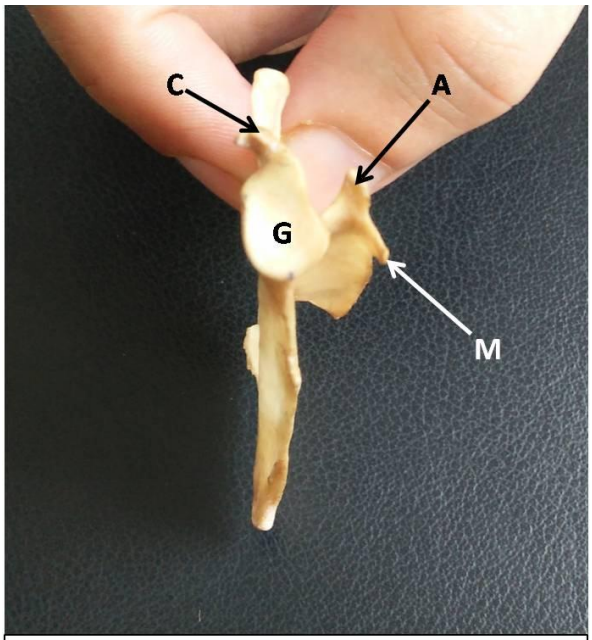

Fig. 3 Distal angle of scapula of civet cat showing glenoid cavity (G), coracoid process (C), acromion process (A) and metacromion process (M)

Table 1: Biometry of scapula of adult small Indian civet cat

S.No.	Parameters	Value
1.	Maximum length	6.8 cm
2.	Diagonal length	7.1 cm
3.	Width of scapula a. Dorsal b. Middle c. Distal	 3.41 cm 3.45 cm 2.18 cm
4.	Length of scapular spine	5.77 cm
5.	Height of scapular spine a. Dorsal b. Middle c. Proacromion level	 0.3 cm 0.9 cm 1.0 cm
6.	Length of acromion process	0.4 cm
7.	Length of metacromion process	0.7 cm
8.	Circumference of glenoid cavity	3.3 cm
9.	Antero-posterior diameter of glenoid cavity	1.05 cm
10.	Transverse diameter of glenoid cavity	0.69 cm
11.	Scapular index	50.74
12.	Maximum width of supra-spinous fossa	1.9 cm
13.	Maximum width of infra-spinous fossa	2.95 cm
14.	Ratio of maximum width of supra-spinous to infra-spinous fossa	1 : 1.55

CONCLUSION

The scapula was a flat roughly quadrilateral bone unlike most species. It had two surfaces, three angles and three borders. Scapular spine terminated as acromion process. Roughly triangular caudally directed metacromion process was a striking feature was seen just dorsal to acromion process. Glenoid cavity was elliptically elongated in outline. The ratio of maximum width of supra-spinous to infra-spinous fossa was 1 : 1.55 whereas scapular index was 50.74.

REFERENCES

1. Bharti, S.K. and Singh, I., Gross and Morphometrical Studies on Scapula of Blue bull (*Boselephus tragocamelus*), *Int. J. Pure App. Biosci.* **5(3)**: 623-627 (2017).
2. Bordoloi, C.C., Kalita, H.C., Kalita, S.N. and Baishya, G., Scapula of the Great Indian rhino (*Rhinoceros unicornis*). *Indian Vet. J.,* **70:** 540-542 (1993).
3. Choudhary, O.P., Mathur, R., Joshi, S., Beniwal, G. and Dangi, A., Gross and Biometrical studies on scapula of chital (*Axis axis*). *Veterinary Practitioner,* **14(2):** 224-227 (2013).
4. Choudhary, O.P., "Osteo-morphological studies of skull and appendicular skeleton of Indian Blackbuck (*Antilope cervicapra*)" G.B.P.A.T. Pantnagar, India (2015).
5. Choudhury, A., Duckworth, J.W., Timmins, R., Chutipong, W., Willcox, D.H.A., Rahman, H., Ghimirey, Y., and Mudappa, D., "Viverricula indica". *IUCN Red List of Threatened Species. Version 2016.2*. International Union for Conservation of Nature. (2015).
6. Dalvi, R.S., Bhamburkar, V.R., Ladukar, O.N. and Banubakode, S.B., Morphometric Study on Scapulae of Some Domestic and Wild Animals. *Tech. Bul. XII Convention and National Symposium of IAVA*, pp: 43 (1997).
7. Evans, H.E. and Christensen, G.C., *Miller's Anatomy of the dog.* 2nd edn., WB Saunders Company, Philadelphia, USA, pp: 177-196 (1979).
8. Getty, R., *Sisson and Grossman's The Anatomy of the Domestic Animals.* 5th edn. Volume I. WB Saunders Company, Philadelphia, USA, pp: 273-296 (1975).
9. Kalita, P.C., and Bhattacharya, R., Macro-anatomy of the scapula of sloth bear (*Melursus ursinus*). *Indian J. Vet. Anat.*, **14:** 77-79 (2002).
10. Lahunta, E.D., *Miller's Anatomy of the dog.* 4th edn. Elsevier Saunders, pp: 127-132 (2013).

11. Luliis, G.D., and Pulera, D., *The dissection of vertebrates: A laboratory manual.* Elsevier, pp: 144-146 (2007).
12. McLeod, W.M., Trotter, D.M. and Lumb, J.W., *Bovine Anatomy*. Minneapolis, Burgess, pp: 643-657 (1958).
13. Ozkan, Z.E., Macro-Anatomical Investigations on the Hedhehog Skeleton (*Erinaceus europaeus*) I-Ossa Membri Thoracici. *Turk. J. Vet. Anim. Sci.*, **28:** 271-274 (2004).
14. Pandya, S.P., Bhayani, D.M. and Vyas, Y.L., Gross anatomical study on the scapula of Asiatic lion (*Panthera leo persiac*). *Indian J. Vet. Anat.*, **16(1&2):** 53-56 (2004).
15. Raghavan, D., *Anatomy of ox.* Indian Council of Agricultural Research, New Delhi, pp: 97-117 (1964).
16. Roşu, P.M., Predoi, G., Belu, C., Georgescu, B., Dumitrescu, I. and Raita, S.M., Morphometric biodiversity in cheetah thoracic limb bones: a case study. *Scientific works. Series c. Veterinary medicine*, vol. Lxii, issue 1, issn 2065-1295, pp: 41-45 (2016).
17. Sarma, M., Kalita, S.N. and Choudhary, K.B.D., Passive locomotor system of adult elephants of Assam. *Indian Vet. J.* **84(11):** 1187-1189 (2007).
18. Sebestiani, A.M. and Fishbeck, D.W., *Mammalian Anatomy: The Cat.* 2nd edn. Morton Publishing Company, Colorado, pp: 30 (2005).
19. Siddiqui, M.S.I., Khan, M.Z.I., Sarma, M., Islam, M.N. and Jahan, M.R., Macro-anatomy of the bones of the limb of Black Bengal Goat (*Capra hircus*). *Bangladesh J. Vet. Med.*, **6(1):** 59-66 (2008).
20. Smuts, M. and Bezuidenhout, A.J., *Anatomy of the Dromedary*. Clarendon Press, Oxford, UK. pp: 24-34 (1987).