Original Research Article

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

Shalini Suri, Jasvinder Singh Sasan* and Kamal Sarma

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

*Corresponding author

A B S T R A C T

Mandible was the largest bone of the skull. It was a single bone and consisted of two halves that articulated cranially at intermandibular symphysis. The mandible lodged all the lower teeth. The body was concave dorsoventrally and presented three alveoli for incisors and a large alveolus for canine in each half of the mandible. The labial surface was more extensive than lingual surface. The symphaseal surface faced each other and formed intermandibular symphysis. It was rough and irregular. The rami were right and left and were symmetrical. Each ramus was flattened from side to side. The two rami diverge to form a large “V” shaped mandibular space. The horizontal part of rami was of same height from the level of 1st to last cheek tooth. The lateral surface of horizontal part presented two distinct mental foramina out of which the cranial mental foramen was located just in front of cheek tooth and was larger as compared to caudal mental foramen. The alveolar border was nearly straight. A wide space, diastema, separated the canine from 1st premolar. This border presented alveoli for two premolars and a single molar tooth each with two roots. The posterior border was thick, convex and rounded. It continued posteriorly to form angular process. The vertical ramus was much thinner as compared to horizontal part due to presence of a masseteric fossa on its lateral surface. It was roughly triangular in outline. Medially, the vertical ramus presented mandibular foramen. Both the mandibular and mental foramen was located at about the same level. The articular extremity of vertical ramus presented a non-articular coronoid process and an articular condyle separated by mandibular notch. Coronoid process was flattened from side to side. The condyle was transversely elongated convex articular process that formed temporo-mandibular articulation with squamous temporal bone.

Keywords
Angular process, Coronoid process, Diastema, Mandible, Masseteric fossa

Article Info
Accepted: 04 September 2018
Available Online: 10 October 2018

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 (Choudhury et al., 2015). Dorsal crest and absence of long black hairs distinguish it from the large civet. It is 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 mandible of domestic animals (Raghavan, 1964). Literature is also available on mandible of domestic cat (Sebestiani and Fishbeck, 2005), camel (Chaurasia et al., 2010), tiger (Tiwari et al., 2011), blackbuck (Choudhary et al., 2015).

Due to paucity of literature on the mandible 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.

**Materials and Methods**

The present study was conducted on the mandible of an adult civet cat. The bone was processed as per standard technique (Raghavan, 1964) to record gross morphological features. The various parameters of mandible of civet cat were recorded with help of Vernier Caliper, thread and scale in centimeter. Different parameters studied included (Fig. 1):

- Greatest linear length of mandible (A)
- Maximum mandibular height (B)
- Mandibular foramen to the base of mandible (C)
- Cranial mental foramen to the base of mandible (D)
- Mandibular foramen to the caudal mandibular margin (E)
- Height of coronoid process from condyle (F)
- Condyle to base of the mandible (G)
- Mandibular foramen from last cheek tooth (H)

**Results and Discussion**

Mandible was the largest bone of the skull as mentioned earlier by Raghavan, (1964) in ox, Chaurasia et al., (2010) in camel and Tiwari et al., (2011) in tiger. It was a single bone and consisted of two halves that articulated cranially at intermandibular symphysis. The mandible lodged all the lower teeth.

It presented a body and two rami as described earlier by Raghavan, (1964) in ox. The body was concave dorsoventrally and presented three alveoli for incisors and a large alveolus for canine in each half of the mandible (Fig. 2). Sebestiani and Fishbeck, (2005) observed three incisors followed by a single sharp canine in domestic cat. Similar observation was made by Kalita et al., (2001) in leopard, Joshi, (2004) in Indian tiger and Lahunta, (2013) in dog. The lingual surface was smooth and concave whereas labial surface was smooth and convex. It was more extensive than lingual surface as observed by Raghavan, (1964) in ox. The symphaseal surface faced each other and formed intermandibular symphysis. It was rough and irregular (Fig. 3).
The rami were right and left and were symmetrical. Each ramus was flattened from side to side. The two rami diverge to form a large “V” shaped mandibular space as also observed by Shahid and Kausar (2005) in one-humped camel. Each ramus consisted of two parts namely horizontal part which presented alveoli for cheek teeth (Fig. 2) and vertical part. The horizontal part was of same height from the level of 1st to last cheek tooth. The lateral surface of horizontal part presented two distinct mental foramina (Fig. 2). Cranial mental foramen was located just in front of cheek tooth and was larger as compared to caudal mental foramen (Fig. 2). Kalita et al., (2001) also observed two mental foramina in leopard. Sebestiani and Fishbeck, (2005) observed two or three mental foramina in domestic cat. Tiwari et al., (2011) also observed 2-3 mental foramina in mandible of tiger, middle one being the largest. This mental foramen is the external opening of mandibular canal. The alveolar border was nearly straight. A wide space, diastema, separated the canine from 1st premolar (Fig. 2). This border presented alveoli for two premolars and a single molar tooth each with two roots. The posterior border was thick, convex and rounded. It continued posteriorly to form the angular process (Fig. 2) as also observed in domestic cat (Sebestiani and Fishbeck, 2005) and dog (Raghavan, 1964).

The vertical ramus was much thinner as compared to horizontal part due to presence of a depression on its lateral surface called masseteric fossa (Fig. 2). It was roughly triangular in outline. Similar observations were made by Raghavan, (1964) in dog, Sebestiani and Fishbeck, (2005) in domestic cat and Tiwari et al., (2011) in tiger. In some species such as bear, it is divided into upper and lower parts by a low crest (Hoshi, 1971).

Medially, the vertical ramus presented mandibular foramen (Fig. 3) which marked the entrance into the mandibular canal. Both the mandibular and mental foramen were located at about the same level.

**Table 1 Biometrical parameters of mandible of civet cat**

| S. No. | Parameters                                                                 | Value (in cm) |
|-------|---------------------------------------------------------------------------|---------------|
| 1     | Greatest linear length of mandible (A)                                    | 4.8           |
| 2     | Maximum mandibular height (B)                                             | 2.3           |
| 3     | Mandibular foramen to the base of mandible (C)                            | 0.4           |
| 4     | Cranial mental foramen to the base of mandible (D)                        | 0.4           |
| 5     | Mandibular foramen to the caudal mandibular margin (E)                    | 0.9           |
| 6     | Height of coronoid process from condyle (F)                               | 1.2           |
| 7     | Condyle to base of the mandible (G)                                       | 0.9           |
| 8     | Mandibular foramen from last cheek tooth (H)                              | 0.9           |
| 9     | Greatest length of the mandibular space                                   | 4             |
| 10    | Greatest width of the mandibular space                                    | 3.5           |
| 11    | Length of diastema                                                        | 0.6           |
| 12    | Length of condyle                                                         | 1.2           |
| 13    | Distance between caudal mental foramen and caudal mandibular border       | 3.68          |
| 14    | Distance between caudal mental foramen and rostral mental foramen         | 0.25          |
| 15    | Distance between rostral mental foramen and incisor root                  | 0.95          |
| 16    | Condyle height index                                                      | 10.69         |
The articular extremity of vertical ramus presented a non-articular coronoid process and an articular condyle separated by mandibular notch (Fig. 2). Coronoid process was wide below and tapering above. It was triangular in lateral view (Fig. 2). It was flattened from side to side. The condyle was present behind the coronoid process. It was transversely elongated convex articular process that forms temporo-mandibular articulation with squamous temporal bone.

The greatest linear length and maximum height of mandible was 4.8 cm and 2.3 cm, respectively. Monfared, (2013) reported 8.3 ± 1.03 and 3.7 ± 0.59 cm as length and height for the Persian cat’s mandible. However, Saber et al., (2016) measured mean mandibular length and height in flat-headed (6 ± 0.58 and 2.97 ± 0.27 cm) and round-headed (4.43 ± 0.58 and 2.17 ± 0.25 cm) Australian domestic cat. The mandibular foramen was 0.9 cm from caudal mandibular
border and 0.4 cm from ventral border of the mandible. The mean distance between the mandibular foramen and the caudal border of mandible was 1.3 ± 0.4, 0.9 ± 0.2 cm, while distance from the ventral border of mandible was 0.7 ± 0.2, 0.4 ± 0.1 cm in flat- and round-headed skulls of domestic cat, respectively (Saber et al., 2016). The condyle height index was 10.69 which was within the range of carnivores (0.95-18.2) (Hoshi, 1971). Other biometric parameters have been depicted in Table 1.

References

Chaurasia, S., Tiwari, Y., Pandey, A., Kumar, V. and Malik, M.R. 2010. Biometry of mandible of camel (Camelus dromedarius). Int. J. Mol. Bio. 1(1): 25-28.

Choudhary, O.M., Singh, I., Bharti, S.K., Khan, I.M., Sathapathy, S. and Mrigesh, M. 2015. Gross and morphometrical studies on mandible of blackbuck (Antelope cervicapra). Int. J. Morph. 33(2): 428-432.

Choudhury, A., Duckworth, J.W., Timmins, R., Chutipong, W., Willcox, D.H.A., Rahman, H., Ghimirey, Y., and Mudappa, D., 2015. "Viverricula indica". IUCN Red List of Threatened Species. Version 2016. 2. International Union for Conservation of Nature.

Hoshi, H. 1971. Comparative morphology of the mammalian mandible in relation to food habit. Okajimas Fol. Anat. Jap. 48: 333-345.

Joshi, H. 2004. Gross anatomical studies of the skull of Indian tiger (Panthera tigris). Doctoral thesis, Bikaner, College of Veterinary and Animal Science, Rajasthan Agricultural University.

Kalita, A., Sarma, M. and Sarma, K.K. 2001. Anatomy of the mandible of Indian leopard. Ind. Vet. J. 78(12): 1138-40.

Lahunta, E.D. 2013. Miller’s Anatomy of the dog. 4th edn. Elsevier Saunders, pp: 104-105.

Monfared, A.L. 2013. Anatomy of the Persian cat’s skull and its clinical value during regional anesthesia. Global Veterinaria 10 (5): 551- 555.

Raghavan, D. 1964. Anatomy of ox. Indian Council of Agricultural Research, New Delhi, pp: 97-117.

Saber, A.S., Caceci, T., Gummow, B and Johns, K. 2016. Morphometric studies on the skull of the australian domestic cat (F. catus) and its clinical implications for regional anesthesia. J. Vet. Anat. 9(1): 1-24.

Sebestiani, A.M. and Fishbeck, D.W. 2005. Mammalian Anatomy: The Cat. 2nd edn. Morton Publishing Company, Colorado, pp: 21-22.

Shahid, R.U. and Kausar, R. 2005. Comparative gross anatomical studies of the skull of one-humped camel (Camelus dromedarius). Pak. Vet. J. 25(4): 205-206.

Tiwari, Y., Taluja, J.S. and Vaish, R. 2011. Biometry of mandible in tiger (Panthera tigris). Annual Review & Research in Biology 1(1): 14-21.

How to cite this article:

Shalini Suri, Jasvinder Singh Sasan and Kamal Sarma. 2018. Gross and Morphometrical Studies on Mandible of Civet Cat (Viverricula indica). Int.J.Curr.Microbiol.App.Sci. 7(10): 229-233. doi: https://doi.org/10.20546/ijcmas.2018.710.023