International Journal of Molecular Biology, ISSN: 0976–0482 & E-ISSN: 0976–0490
Volume 1, Issue 1, 2010, pp-25-28

Biometry of mandible of camel (*Camelus dromedarius*)

Chaurasia S.*, Tiwari Y., Pandey A., Kumar V. and Malik M.R.
*Department of Anatomy & Histology, Apollo College of Veterinary Medicine, Agra road, Jaipur, 302031
akpandey1109@rediffmail.com
Department of Animal Breeding and Genetics, College of Veterinary Science &A.H., Kuthulia, Rewa-486001, Madhya Pradesh

Abstract- The mandible was the largest (43.00 ± 1.833 cm), heaviest (2.52 ± 0.331 kg) and thickest (5.00 ± 0.316 cm) bone of the skull. The body of the bone was long (14.30 ± 0.687 cm), narrows (4.90 ± 0.359 cm), dorsally grooved and completely ossified. It carried 10 cheek, 4 canine and 6 incisor teeth. The mandibular and mental foramina were large. There was an additional foramen below the 2nd cheek tooth on the lateral side of horizontal ramus of the mandible. An additional triangular process was also present below and behind the mandibular condyle. The height (22.80 ± 0.761 cm) of the mandible was more than the vertical ramus (21.40 ± 1.080 cm). The vertical ramus was wider (9.20 ± 0.303 cm) than the horizontal part which measured 19.50 ± 0.632 cm in length and 7.90 ± 0.328 cm in width. The angle of jaw was not much pronounced. The rostral border of vertical ramus was 8-10 times thicker (5.20 ± 0.363 cm) than the caudal border (0.50 ± 0.0210 cm) medially on vertical ramus there were two rough thickenings for heavy muscular attachments. The mandibular foramen was approximately in the middle of the medial surface of vertical ramus. The mandibular condyle was large prismatic in shape and had extensive, convex articular surface which was divided into rostral and caudal parts by an articular ridge.
Keywords- Mandible, Condyle. Cheek teeth and Ramus

Introduction

The anatomy of the domestic animals has been described in the text (Raghavan, 1964). However, the camel being an important and useful animal in the desert and having much morphological variation has not been given adequate attention. Hence, the present study has been undertaken.

Material and Methods

Eleven mandibles have been procured from the department of anatomy and histology, post mortem room/site of Apollo college of Veterinary medicine, Jaipur and other private agencies/ abattoirs etc. The bones were cleaned, macerated and dried. The following measurements were taken. The linear measurements were measured with the help of vernier caliper, scale and thread etc.

Table 1-

Sr. No.	Parameters
1	Weight of the mandible by monopan balance.
2	Greatest linear length, width, thickness and height of the mandible.
3	Length, width and thickness of the body of mandible.
4	Height, width and thickness of vertical ramus.
5	Length and width of horizontal ramus
6	Greatest length and width of mandibular space.
7	Height and width of coronoid process.
8	Rostrocaudal (longitudinal) and Transverse diameter of the mandibular condyle.
9	Distance of mandibular foramen from caudal and rostral borders of ramus
10	Distance of mental foramen from rostral most mid point of the body of the incisive bone.

The salient comparative anatomical features of the bone were also studied.

Results and Discussion

The mandible was the largest and heaviest (2.52 ± 0.331 kg) bone of the skull and was movably articulated with the same (Table. 2). Raghavan (1964) and Getty (1975) described the mandible as largest bone of the skull and face respectively in ox. The greatest length, width and height of the mandible measured 43.00 ± 1.833cm, 14.00 ± 0.632 and 22.50 ± 0.769 cm respectively. It was thickest (5.00 ± 0.316 cm) at its rostral border caudal to the last cheek tooth. The mandible was a single bone. However, it is reported to have two halves at birth. In ox and dog these do not fuse completely even in the adult/old age (Raghavan 1964) but in camel the body was completely ossified and even line of fusion was not distinctly visible. The mandible of camel carried 10 lower cheek, four canines and six incisor teeth i.e. (I 3, C 2, PM 3, M 2 or 3)2. The incisors were small. The rostral canine was large and located just caudal to the corner incisor. The caudal incisor was smaller and placed about 3.5 cm caudal to the rostral one. The first cheek tooth was smallest and these increased in size caudad upto fourth cheek tooth (Figs. 1, 2 and 3). However, variable numbers of teeth have been reported by different authors. Rashid and Kausar (2005) reported 4 alveoli for incisor teeth and a canine about 1.25 inches caudal to the fourth incisor in camel. Banerjee (2000) and Kohler- Rollefson (1991) reported 18 teeth in lower jaw of camel. The ventral ends of two halves of the mandible united rostrally and formed the body as reported in horse (Getty 1975) (Fig .3). It was completely ossified and was long and narrow. It measured 14.30 ± 0.687 cm, 4.90 ± 0.359 cm and 2.50 ± 0.207 cm in its length, width and thickness respectively. The dorsal surface was dorsoventrally concave and grooved. In fresh state it was covered by buccal mucous membrane. The ventral surface was convex and more extensive than the lingual surface and formed the base of the relatively small chin. The symphyseal surface as described in ox and other domestic animals by Raghavan (1664) was absent in camel. The ventral surface was continuous above with the lateral surface of the ramus and was related to the lower lip. The alveolar border was convex and separated the labial and lingual surfaces. It carried six alveoli for the lower incisor teeth (fig.3) in contrast to four reported by Rashid and Kausar (2005). However, variable numbers of teeth/alveoli have been reported in camel and other domestic animals. The variation in number may be due to age and breed of the animal and perhaps due to variation in the number of canine teeth. The rami were right and left. The two branches were symmetrical, flattened from side to side wider above than below and extended backwards and upwards. Each ramus presented horizontal and vertical parts (Figs.1, 2 and 3). The caudal border of the horizontal part and rostral border of the vertical part of ramus of camel were thickest among the domestic animals. The rami diversed caudad and included a large V shaped mandibular space which was 25.20 ± 0.769 cm in length and was widest (6.60 ± 0.654 cm) between the last cheek teeth (fig. 3). The vertical part measured 21.40 ± 1.080 cm and 9.20 ± 0.303 cm in its height and width respectively in comparison to horizontal part which was shorter (19.50 ± 0.632 cm) and narrower (7.90 ± 0.328 cm). The most prominent part of the curve of the ramus formed the angle of jaw which in camel was not as pronounced as in ox. The vertical part was expanded and served for the purpose of muscular attachment. Each ramus presented two surfaces, two borders and two extremities as has been described in the text (Getty 1975). The lateral surface of horizontal ramus was smooth and convex from above downwards. At the junction with the body there was a fossa containing the comparatively large mental foramen which is the external opening of the mandibular canal (Fig. 1). It was located below the rostral canine about 9.00 ± 0.765 cm caudad from the rostral most mid point of the body of the incisive bones. In camel an additional mental foramen was also present and was located below the second cheek tooth on the lateral surface (Fig. 1). This foramen has not been reported in any of the domestic animals in the text (Raghvan 1964). The vertical part of the ramus of the mandible presented on the lateral surface rough lines for the attachment of masseteric muscles. The medial surface of the horizontal part was smooth and convex. Close to the alveolar border was a faint rough myelohyoid line for the attachment of mylohyoid muscle (Fig.2). The medial surface of the vertical part of ramus was convexo concave from before backwards. It was marked by prominent prominence at the junction of the alveolar border and rostral border of the vertical part of ramus (Fig. 2). Caudal and little above it there was another almound shaped prominence probably these are for heavy muscular attachment. The caudal half of the surface has muscular lines. The presence of number of prominences and muscular lines on the surface, strong and heavy mandible and presence of strong canine teeth in camel are probably for providing firm

muscular attachment as the animal is suppose to exert extra force for cutting, drawing and breaking the twigs and branches of the bushes and trees as its normal food habits. Unusually strong teeth are probably for grinding tough vegetation and for use of mouth in fighting with other male during breeding season as also reported by Banerjee (2000). The mandibular foramen was approximately in middle of the medial surface of vertical ramus of mandible i.e. at the distance of 4.40 ± 0.328 cm from caudal border and 3.70 ± 0.228 cm from rostral border of the part as reported by Rashid and Kausar (2005) in ox and dog and it was further forwards in the horse. From lower end of the foramen a distinct vascular groove extended downward and forward (Fig. 2). The large mandibular foramen which marked the entrance into the mandibular canal which traversed through the bone and passed below the roots of lower cheek teeth and opened at mental foramen. The interdental space between the caudal canine and 1st cheek tooth was thin, concave and sharp. It measured 6.60 ± 0.875 cm in length. Behind this the border was thick and excavated by five alveoli of cheek teeth. Posterior border of horizontal part was thick, convex and rounded. The caudal border of the vertical ramus was convex and thin from below upward while the rostral border of the part was 8 to 10 times thicker (5.20 ± 0.363 cm) than its caudal border (0.50 ± 0.021 cm). A triangular process in the upper part of the caudal border (Fig. 1 and 2) projected upwards and forwards and appeared unique in camel as this has not been reported in any of the domestic animals, However, angular process at the angle of jaw have been reported in dog (Raghavan 1964). The ventral extremity of the ramus was fused with the body. The articular extremity consisted of coronoid process, mandibular notch and mandibular condyle. The coronoid process was almost straight with blunt and thick caudal end. It projected upwards and backwards and was about 6.40 ± 0.477 cm in height. It was flattened from side to side and was 3.86 ± 0.166 cm in width. In the articulated condition it projected into the temporal fossa and served for the attachment of the temporalis muscle. In horse the coronoid process is reported as thin transversely and curved slightly medially and backward. In ox it curves backward. In dog it is very extensive and bent slightly outward and backward (Rashid and Kausar, 2005). The condoyle was placed below and behind the coronoid process and it was large, transversely elongated and measured 4.80 ± 0.334 cm and 5.00 ± 0.316 cm in its rostrocaudal and transverse diameter respectively (Table 2). It was nearly prismatic in shape and had three distinct lateral, medial and caudal angles. The medial angle was prominent and rough. The dorsal surface was convex and contained extensive articular surface. It was divided into rostral transversely elongated and caudal quadrilateral parts by a articular ridge. The condyle projected more inwards and was roughned medially for the attachment of the lateral pterygoid muscle. Below the condyle the bone was constricted and formed the neck of the mandible. However, in camel the neck was not that much of constricted and distinct as in other domestic animals as reported in the text (Raghavan 1964). The mandibular notch was comparatively shallow.

References

Banerjee G.C. (2000) *A Text book of Animal Husbandry. 8th edn., oxford and I.B.H Publishing Co. Pvt. Ltd. New Delhi Page no*. 1031, 1019, 1028.

Raghavan D. (1964) *Anatomy of Ox. Indian Council of Agricultural Research, New Delhi*

Rashid R.D. and Kausar R. (2005) *Pakistan Veterinary Journal* 25 (4): 205-206.

Getty R. (1975) *The anatomy of the Domestic Animals*. *Vol-1, 5th Ed. W. B. Saunder's Company, Philadelphia.*

Kohler-Rollefson (1991) *Camelus dromedarius. In mammalian species*, 375.

Table 2- Range, Mean and SE of weight (Kg) and linear parameters (cm) of mandible in Camel

Parameter	Range	Mean ± SE
Mandible		
Weight	1.43 – 3.00	2.52 ± 0.331
Length	38.00 – 47.00	43.00 ± 1.883
Width	12.00 – 16.00	14.00 ± 0.632

ISSN: 0976–0482 & E-ISSN: 0976–0490, Volume 1, Issue 1, 2010

Thickness	4.00 – 6.00	5.00 ± 0.316
Height	20.00 – 25.00	22.80 ± 0.761
Body of mandible		
Length	12.00 – 16.00	14.30 ± 0.687
Width	4.00 – 6.00	4.90 ± 0.359
Thickness	1.50 – 3.50	2.50 ± 0.207
Vertical ramus		
Height	19.00 – 24.00	21.40 ± 1.080
Width	8.50 – 10.00	9.20 ± 0.303
Thickness	4.00 – 6.00	5.20 ± 0.363
Horizontal ramus		
Length	18.00 – 22.00	19.50 ± 0.632
Width	7.00 – 9.00	7.90 ± 0.328
Inter mandibular space		
Length	23.00 – 28.00	25.20 ± 0.769
Width	5.00 – 9.00	6.60 ± 0.654
Coronoid process		
Height	5.00 – 8.00	6.40 ± 0.477
Width	3.50 – 4.50	3.80 ± 0.166
Mandibular condyle		
Rostro caudal diameter.	4.00 – 6.00	4.80 ± 0.334
Transverse diameter.	4.00 – 6.00	5.00 ± 0.316
Distance of mandibular foramen		
From caudal border	3.50 – 5.50	4.40 ± 0.328
From rostral border	3.00 – 4.50	3.70 ± 0.228
Distance of mental foramen From rostral most point of the incisivus bone	7.00 – 11.00	9.00 ± 0.765

Legends to the Figures

Figs 1-3.

1. Photograph of lateral surface of the mandible of camel showing additional foramen (1), mental foramen (2) and rostral canine tooth (3).
2. Photograph of medial surface of the mandible of camel showing coronoid process (Cp), mandibular condyle (C), angular process (P), thickening (1), groove (2) and myelohyoid line (3).
3. Photograph of the dorsal view of mandible showing mandibular condyle (C), coronoid process(Cp), body of the mandible (B) and alveoli of incisor teeth (I).