

Topographic and Morphometric Anatomy of Mental Foramen of Black Bengal goat (*Capra hircus*) in Bangladesh with its Clinical Implication for Regional Anesthesia

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Research Article

Volume 1 Issue 1

Received Date: March 09, 2018

Published Date: March 19, 2018

DOI: 10.23880/izab-16000102

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Abstract

The study was conducted to investigate the topographic and morphometric anatomy of mental foramen of Black Bengal goat. Total 20 mandibles from both sex of adult Black Bengal goat were studied. Mental foramen was always present at lateral aspect of the rostral part of body of each mandible with various shape, size and direction. Oval shaped and dorso-laterally directed mental foramen were predominant (85% and 80%) than the round shaped and laterally directed mental foramen (15% and 20%); respectively. The mean distance between lip commissure to mental foramen, base of body of mandible to mental foramen, 1st premolar tooth to mental foramen, lateral incisor tooth to mental foramen and caudal border of ramus of mandible to mental foramen were 2.37±0.09, 0.77±0.04, 1.46±0.09, 2.01±0.05 and 11.81±0.89 cm; respectively. Those topographic and morphometric anatomy of mental foramen of Black Bengal goat may helpful for veterinary surgeon to localize mental foramen easily for regional anesthesia during different surgical intervention of lower jaw.

Keywords: Topography; Morphometry; Mental foramen; Clinical implication, Black Bengal goat

Introduction

Black Bengal goat (*Capra hircus*) is common small sized ruminant livestock species reared all over Bangladesh. They have very high and income generating potential [1].

Mental foramen of Black Bengal goat is an opening through which the mental nerve and vessel are existed [2,3]. It is located at the lateral aspect of the rostral part of body of each mandible. Variation in the shape, size, direction and position are noticed in mental foramen [4,5]

of Black Bengal goat. Blockage of mental nerve under regional anesthesia during surgical interventions like impaction, fracture reduction, teeth extraction from lower jaw, epulis becomes more common practice in Black Bengal goat. The topographic and morphometric anatomy of mental foramen of Black Bengal goat is essential for veterinary surgeon to localize mental foramen easily [6,7]. Several studies were carried out on morphometry of foramen of Iranian Native goats [4], Markhoz Goat [5]. West African Dwarf goat [8] and Gwembe Valley Dwarf goat [9]. Fewer studied were done on morphometry of mental foramen of in Black Bengal goat in Bangladesh [10]. Here, the study was planned for details investigation of topographic and morphometric anatomy of mental foramen of Black Bengal goat in Bangladesh with its clinical implication for regional anesthesia.

Materials and Methods

The study was conducted on 20 mandibles of both sex of adult Black Bengal goat from the period of 5th September to 10th November, 2017. These mandibles (along with skull) were collected from local market, Khulshi, Chittagong. Dissection was performed to expose mental foramen with mental nerve. Then the muscle and ligament from mandibles were removed and they were processed to form dried bone as per standard technique [11-13]. All mental foramen of mandibles were studied to record their topographic and morphometric features at laboratory of Department of Anatomy and Histology,

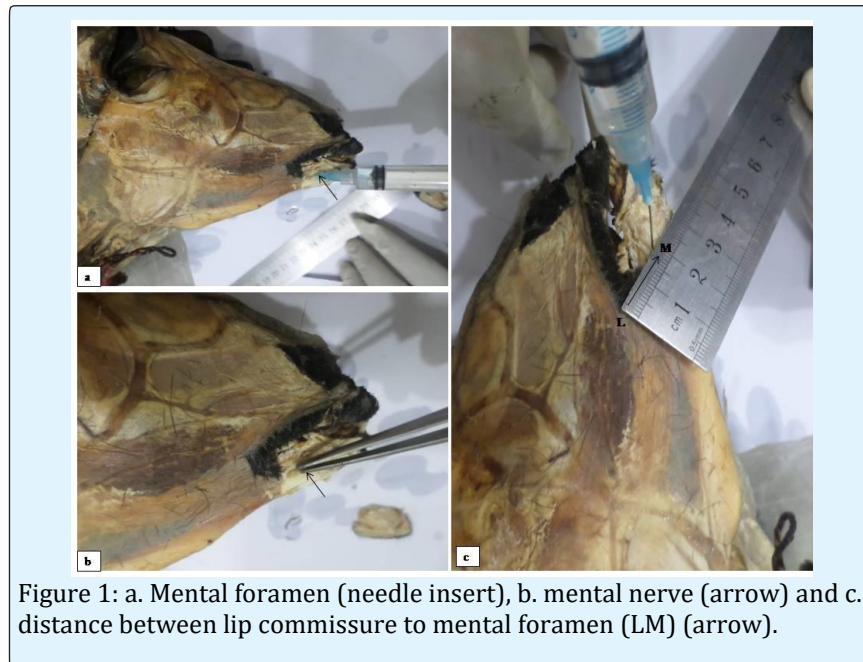
Chittagong Veterinary and Animal Sciences University (CVASU), Khulshi, Chittagong, Bangladesh. The following studies were conducted on the collected and dried mandibles bones of both sex of adult Black Bengal goat.

1. Mental foramen was indentified at lateral aspect of the rostral part of body of each mandible with various shape, size and direction.
2. The distance between lip commissure to mental foramen were measured and recorded.
3. The distance between base of body of mandible (ventral border of the mandible) to mental foramen were measured and recorded.
4. The distance between lateral alveolar border of the first premolar tooth to the mental foramen were measured and recorded.
5. The distance from the lateral extent of the alveolar root of lower incisor to mental foramen were measured and recorded.
6. The distances from the caudal border of mandibular to the mental foramen were measured and recorded.

All measurements were expressed as mean measurements with standard deviation (Mean \pm SD)

Result and Discussion

In dissected mandible of Black Bengal goat, mental foramen with mental nerve was always present at lateral aspect of the rostral part of body (Figure 1).



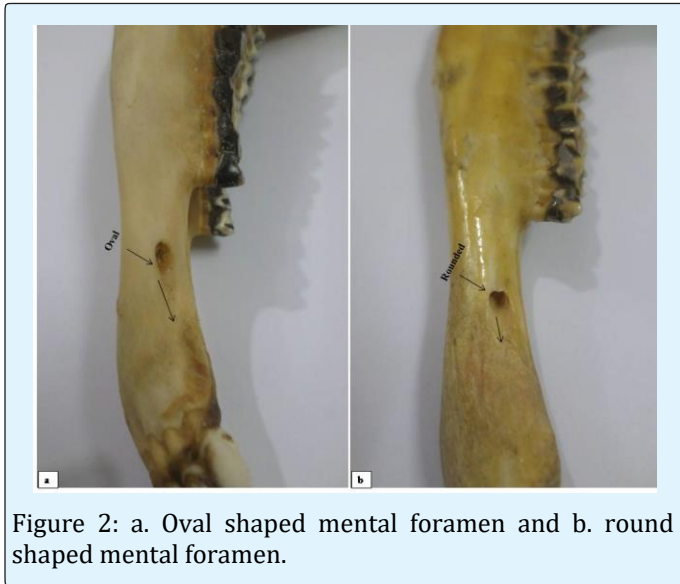


Figure 2: a. Oval shaped mental foramen and b. round shaped mental foramen.

In dried mandible, various shape, size, direction and position of mental foramen were noticed (Figure 2). This study was supported by the studies of Monfared, et al. (2013), Goodarzi N and Hoseini (2013), Kataba, et al. (2014) [4,5,9] where their data showed variation in shape, sized of mental foramen of goat. Oval shaped

mental foramen was predominant (85%) than the round shaped mental foramen (15%). Dorso-laterally directed mental foramen was predominant (80%) than the laterally directed (20%) mental foramen (Table 1). This finding suggested, palpating the rostar portion of mandible of Black Bengal goat along the dorso-lateral direction or lateral direction; is easy to find out the mental foramen in live goat.

Parameter		Percentage
Shape of mental foramen	Oval	17 (85%)
	Rounded	3 (15%)
Direction of mental foramen	Dorso-lateral direction	16 (80%)
	Lateral direction	4 (20%)

Table 1: Variation of shape and direction of mental foramen of mandible of Black Bengal Goat.

The distance between lip commissure to mental foramen (LM), base of body of mandible to mental foramen (BM), 1st premolar tooth to mental foramen (PM), lateral incisor tooth to mental foramen (IM) and caudal border of ramus of mandible to mental foramen (RM) in Black Bengal Goat were indentified in (Figure 3) and data were presented in (Table 2).

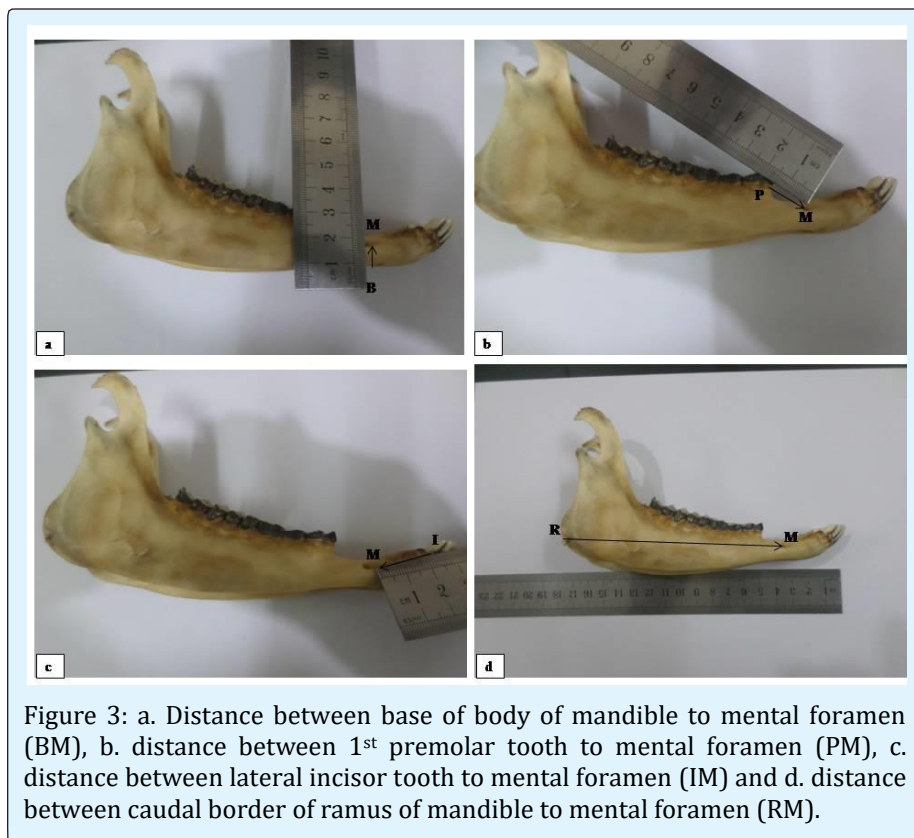


Figure 3: a. Distance between base of body of mandible to mental foramen (BM), b. distance between 1st premolar tooth to mental foramen (PM), c. distance between lateral incisor tooth to mental foramen (IM) and d. distance between caudal border of ramus of mandible to mental foramen (RM).

Parameter	Mean \pm SD (cm)	Maximum (cm)	Minimum (cm)
Distance between lip commissure to mental foramen	2.37 \pm 0.09	2.5	2.2
Distance between base of body of mandible to mental foramen	0.77 \pm 0.04	0.8	0.7
Distance between 1 st premolar tooth to mental foramen	1.46 \pm 0.09	1.7	1.3
Distance between lateral incisor tooth to mental foramen	2.01 \pm 0.05	2.1	1.9
Distance between caudal border of ramus of mandible to mental foramen	11.81 \pm 0.89	13.2	10.1

Table 2: Morphometric anatomy of mental foramen of mandible of Black Bengal goat.

The mean distance between lip commissure to mental foramen in Black Bengal goat was 2.37 \pm 0.09 cm, maximum was 2.5 cm and minimum was 2.2 cm. This finding suggested, palpating the rostral portion of mandible along the cranio-ventral direction from lip commissure; is easy to find out the mental foramen in live goat.

The mean distance between base of body of mandible to mental foramen in Black Bengal goat was 0.77 \pm 0.04 cm which was almost similar with previous study of Mohamed, et al. (2016) [14] where he found 0.70 \pm 0.18 cm in Barbados Black Belly Sheep. More mean distance (2.35 \pm 0.26 cm) was found in the study of Kataba, et al. (2014) [9] in Gwembe Valley Dwarf goat. This difference might be due to more wideness of mandible along dorso-ventral direction.

The mean distance between 1st premolar tooth to mental foramen in Black Bengal goat 1.46 \pm 0.09 cm where 2.25 \pm 0.38 cm was found in Barbados Black Belly Sheep [14]. These findings suggested, mental foramen may be palpable along the ventro-lateral line (about 1.46 \pm 0.09 cm away) from 1st premolar tooth. The mean distance between lateral incisor tooth to mental foramen in Black Bengal goat was 2.01 \pm 0.05 cm; where 2.11 \pm 0.17 cm was found by Uddin, et al. (2009) [10] in Black Bengal goat; 2.25 \pm 0.31 cm by Mohamed, et al. (2016) [14] in Barbados Black Belly Sheep; 1.56 \pm 0.22 cm by Olopade and Onwuka (2005) [8] in West African Dwarf goat and 1.58 \pm 0.19 cm by Kataba, et al. (2014) [9] in Gwembe Valley Dwarf goat.

The mean distance between caudal border of ramus of mandible to mental foramen in Black Bengal goat was 11.81 \pm 0.89 cm which was almost similar with the previous study of Uddin, et al. (2009) [10], where he found 11.69 \pm 0.4 cm and by Karimi, et al. (2012) [15], where he found 13.74 \pm 0.18 cm in Mehraban Sheep. More mean distance (15.23 \pm 1.46 cm) was found in the study of Mohamed, et al. (2016) [14] in Barbados Black Belly Sheep. Less mean distance (9.26 \pm 0.49 cm) was found in

the study of Kataba, et al. (2014) [9] in Gwembe Valley Dwarf goat.

Conclusion

Information regarding topographic and morphometric anatomy of mental foramen of Black Bengal goat will be helpful for veterinary surgeon to localize mental foramen precisely (at 2.37 \pm 0.09 cm cranio-ventral direction from lip commissure; 0.77 \pm 0.04 cm from rostral base of mandible; 1.46 \pm 0.09 cm ventro-lateral direction from 1st premolar tooth; 2.01 \pm 0.05 cm caudal from lateral incisor tooth and 11.81 \pm 0.89 cm cranial from caudal border of ramus) for regional anesthesia during different surgical intervention of lower jaw. This will also be helpful for veterinary surgeon to avoid toxicity of local anesthetic agent as they can identify exact location of mental foramen during surgical procedure with short time and low cost.

Acknowledgement

Author wishes to express his deep sense of gratitude and thanks to staffs and faculty members of Department of Anatomy and Histology, Faculty of Veterinary Medicine, Chittagong Veterinary and Animal Sciences University, Khulshi, Chittagong, Bangladesh for their kindful facilitation during this work.

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