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Topographic and morphometric study of the mental foramina of Abaza goats with its clinical implication for regional anesthesia

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Abstract

In this study, the topographic and morphometric structure of the mental foramen of both female and male Abaza goats, a domestic goat breed found in Turkey, was examined. The mandibles and body weights of 30 adult Abaza goats, both female and male, were used. The goats were obtained during the sale of the Abaza goat herd sacrificial and forbearance. The mandibles were separated from the head and the skin, muscles and ligaments were cleaned and the mandibles were left to dry by standard technique. Various measurements were carried out on the mandible in accordance with relevant studies in the literature. The mental foramina of the goats were round and oval and the mental foramina on one mandible were not necessarily of the same shape. In addition, the number of mental foramina, which differed between goats, was observed to be two in most goats. The distance between the mental foramen and the ventral edge of the mandible was 0.88 ± 0.15 cm. The distance between the first premolar teeth and the mental foramen was found to be 1.59 ± 0.13 cm. The distance between the mental foramen and the lateral incisiv interdental was 1.85 ± 0.39 cm. The distance between the caudal edge of the ramus mandibulae and the mental foramen was calculated as 12.38 ± 1.52 cm.

Key words: Abaza goat, anatomy, mental foramen

Introduction

Abaza goats, which are bred in the province of Artvin in Turkey, are generally bronze, white, black and brown. Their mouths, horns, legs and the areas around their eyes are black.
In terms of their body structure, they are thin and slender and likened to the gazelle (Batu, 1951).

Morphometry is a research method that allows the statistical analysis of the width, length or angle measurements between two specific points numerically or graphically (17). In the literature (18,19,20,21), various morphometric studies have been conducted on the mandibles of different animal species using different methods.

It has been previously reported that the mental artery and mental nerve pass from the mental foramen (2,3). In an emergency situation that requires surgical intervention, it is very easy to locate this region as a topographical for quick and easy anesthesia to block the mental nerve. Knowing the topographic and morphometric anatomy of the mental foramen provides simplicity in veterinary surgery during an emergency (6,7).

In the literature, morphometric analyses have been performed in different countries on different goat breeds (4,5,8,9). However, very few studies observed that mental foramen is on topographic and morphometric structure (10,16).

Materials and methods

In this study, mandibles of 30 Abaza goats, both female and male, were used. The mandibles were collected along with their skulls during the sacrificial slaughtering of the Abaza goats of the animal farm of the Kafkas University’s Veterinary Faculty. First, the mental foramen were removed from the skulls along with the mental nerve. The muscles and ligaments were then separated from the mandibles. The mandibles were dried using standard bone maceration technique (11,13). Then, in accordance with the literature, measurements were carried out with an electronic caliper from the points mentioned below.

1. The mental foramina were identified in various shapes, size and directions at the lateral aspect of the rostral part of each mandible.

2. The distance from the lip commissure to the mental foramen was measured and recorded.

3. The distance from the base of the mandible (ventral border of the mandible) to the mental foramen was measured and recorded.

4. The distance from the lateral alveolar border of the first premolar tooth to the mental foramen was measured and recorded.
5. The distance from the lateral extent of the alveolar root of the lower incisor to the mental foramen was measured and recorded.

6. The distance from the caudal border of the mandibular to the mental foramen was measured and recorded.

Statistical analysis

The mean values of all measurements with standard deviations were evaluated in SPSS Statistics 20.0.

Results

The mental foramen and mental nerve on the lateral face of the mandible are shown in Figure 1. It was observed that the mental foramina in Abaza goats were quite different. Mental foramina of different structures were observed between the bilateral faces of the same mandible. It was determined that two of the goats had two mental foramina on each side of their mandible. Three of the goats had two mental foramina on one side of the mandible and only one mental foramen on the other side. There were four mandible with an oval shaped mental foramen between the mandible, while three of the mental foramen were round. In addition, there was a protrusion extending from the middle of the mental foramen of three mandibles between the mandible (Figure 2).

The measurement points taken to determine the topographic and morphometric location of the mental foramina are shown in Figure 3. The average and standard deviation values of the values taken from these measurement points are given in Table 1 below.
Figure 1: a: Mental foramen, b: Mental nerve, c: Distance between the mental foramen and commisura labiorum

Figure 2: a) Two mental foramina b) Round shaped mental foramen c) Oval shaped mental foramen

Figure 3: a) Distance from the base of the mandible to mental foramen (BM), b) Distance from the first premolar tooth to the mental foramen (PM), c) Distance from the lateral incisor tooth to the mental foramen (IM) and d) Distance from the caudal border of the ramus of the mandible to the mental foramen (RM)
<table>
<thead>
<tr>
<th>Parameter</th>
<th>Mean (cm)</th>
<th>Std. Deviation (cm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Distance from the lip commissure to the mental foramen</td>
<td>3.12</td>
<td>0.9</td>
</tr>
<tr>
<td>Distance from the base of the mandible to the mental foramen</td>
<td>0.88</td>
<td>0.15</td>
</tr>
<tr>
<td>Distance from the first premolar tooth to the mental foramen</td>
<td>1.59</td>
<td>0.13</td>
</tr>
<tr>
<td>Distance from the lateral incisor tooth to the mental foramen</td>
<td>1.85</td>
<td>0.39</td>
</tr>
<tr>
<td>Distance from the caudal border of the ramus of the mandible to the mental foramen</td>
<td>12.38</td>
<td>1.52</td>
</tr>
</tbody>
</table>

Table 1. Morphometric anatomy of the mental foramen of the mandible of the Abaza goats

Discussion

Figure 2 shows the mental foramen in different shapes and sizes. The results of this study are similar to those of Monfared et al. (2013), Goodarzi N and Hosseini (2013), Kataba et al. (2014) and Poddar et al. (2018) in the literature.

In the present study, the distance from the mental foramen to the ventral edge of the mandible in the Abaza goats was measured as 0.88 ± 0.15 cm. This distance was determined to be 0.77 ± 0.04 by Podder et al. (2018), 0.70 ± 0.18 cm by Mohamed et al. (2016) and 2.35 ± 0.26 cm by Kataba et al. (2014).

The distance from the first premolar teeth to the mental foramen was found to be 1.59 ± 0.13 cm in the present study. This distance was found to be 1.46 ± 0.09 cm by Mohamed et al. (2016) and 2.25 ± 0.38 cm by Podder et al. (2018). As a result, it is suggested that the mental foramen can be palpated at the distance of the first premolar tooth (1.59 ± 0.13 cm) in the Abaza goats.

The present study determined the distance between the mental foramen and the lateral incisiv interdental to be 1.85 ± 0.39 in the Abaza goats. This distance was reported to be 2.01 ± 0.05 cm by Poddar et al. (2018), 2.11 ± 0.17 by Uddin et al. (2009), 2.25 ± 0.31 cm by
Mohamed et al. (2016), 1.56 ± 0.22 cm by Olopade and Onwuka (2005) and 1.58 ± 0.19 cm by Kataba et al. (2014).

The distance from the caudal edge of the ramus mandible to the mental foramen in the Abaza goats was found as 12.38 ± 1.52 cm in the present study. This distance was reported by Poddar et al. (2018) as 11.8 ± 0.89, Uddin et al. (2009) as 11.69 ± 0.4cm and Kataba et al. (2014) as 9.26 ± 0.49 cm. It was observed that this distance was higher in the present study compared to those reported in the literature. This statement excludes the results of Karimi et al. (2012) who found this value to be 13.74 ± 0.18 cm for Mehreban sheep and Mohamed et al. (2016) who found it to be 15.23 ± 1.46cm.

**Table 2.** Comparison of the results of similar parameters for Abaza goats and other small ruminants

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Distance from the lip commissure to the mental foramen [cm]</th>
<th>Distance from the base of the mandible to the mental foramen [cm]</th>
<th>Distance from the first premolar tooth to the mental foramen [cm]</th>
<th>Distance from the lateral incisor tooth to the mental foramen [cm]</th>
<th>Distance from the caudal border of the ramus of the mandible to the mental foramen [cm]</th>
</tr>
</thead>
<tbody>
<tr>
<td>Black Bengal goat (Uddin et al.)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>2.11±0.17</td>
</tr>
<tr>
<td>Mehreban sheep</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Barbados Black Belly sheep</td>
<td>0.70±0.18</td>
<td>2.25±0.38</td>
<td>2.25±0.31</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gwembe Valley Dwarf goat</td>
<td>2.35±0.26</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Black Bengal goat (Podder et al.)</td>
<td>2.37±0.09</td>
<td>0.77±0.04</td>
<td>1.46±0.09</td>
<td>2.01±0.05</td>
<td></td>
</tr>
<tr>
<td>West African Dwarf goat</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Abaza goat</td>
<td>3.12±0.9</td>
<td>0.88±0.15</td>
<td>1.59±0.13</td>
<td>1.85±0.39</td>
<td></td>
</tr>
</tbody>
</table>
Conclusions

Meaningful the topographic and morphometric anatomy of the mental foramen is considered to be beneficial for any situation where urgent surgical intervention is required.

References

13. Merai MK (2012) Anatomical museum preparations of the skeleton and respiratory organs of some domestic animals. MVSc, Faculty of Veterinary Medicine, Beni-Suef University, Egypt.
