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Clinical Anatomy of the skull of the Barbados Black Belly Sheep in Trinidad

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Abstract

The aim of this study is to determine the clinically important anatomical landmarks useful for regional anesthesia in the head region of six adult Barbados Black Belly sheep in Trinidad. The applied anatomical measurements for 21 parts of the skull were made for this study. The results were of clinical importance and are useful in regional nerve blocks of the supra-orbital, infra-orbital, mandibular and mental nerves during surgical operations in head region and in dental extraction. The application of local anesthetic agent was easier for the maxillary and mandibular nerve blocks through the injection of local anesthetic agent at the infra-orbital foramen and mental foramen respectively. These data were discussed with regard their application to clinical maneuvers around the head of sheep and goat.

Keywords: Clinical anatomy, Skull, sheep, Trinidad.

Introduction

The Barbados Black Belly is a breed of domestic sheep in the Caribbean island of Trinidad. Both male and female have no horns .This breed is raised primarily for meat. It combines the rare attributes of adaption to the environment and high reproductive efficiency, which account for their average of two lambs per litter and an average lambing interval of eight to nine months. The cranial nerves and their passages from different foramina in the skull have clinical importance in regional anesthesia around the head (Hall *et al*., 2001). Studies of the clinical anatomy of the skull has been done in the Mehraban sheep (Karimi *et al*., 2012), in the Iranian Native sheep (Monfared, 2013), in the West African Dwarf goat (Olopade and Onwuka, 2005), in the Black Bengal goat (Uddin *et al*., 2009), in the Iranian Native goat (Monfared *et al*., 2013), in the Makhoz goat (Goodarzi and Hoseini, 2013), in the Rasquera goat (Pares-Casanova, 2014) and in the Gwembe Valley Dwarf goat (Kataba, 2014). This study was done to provide information regarding the clinically important landmarks around the skull of the Barbados Black Belly sheep in Trinidad which can be used by the veterinary surgeons for regional anaesthesia as there is no documented information.

Materials and Methods

I- Preparation of the skull

Six adult sheep of both sexes were collected for dissection purposes in gross anatomy lab, School of Veterinary Medicine, West Indies University, Trinidad. The heads were without any skeletal abnormalities and were cut at the occipitoatlantal joint. Skinning and defleshing of the heads were done by using dissecting equipments such as scalpel, knives, forceps and scissors The cheek muscles, eyes, tongue and nasal cartilages were removed. Also, the brain was removed by filling the cranial cavity with water and cleaning using a long forceps with vigorous shaking and pouring off through the foramen magnum. The process was repeated several times until the brain was completely removed. The skulls were boiled in a suitable sized metal container for two hours then the soft tissue was removed with tooth brush then washed with tap water. The skull was macerated by bacterial maceration by keeping it in a cloth mesh immersed in a hot water and kept in a plastic container and stored in a warm place for six weeks. The skull was taken out and scraped using a tooth brush and knife for cleaning. The skull was left to dry for two weeks then bleached by soaking in 3% hydrogen peroxide for four days in a sealed container until the bones appeared clean and whitish in color. Finally, the skull was thoroughly rinsed with water and left to dry for two weeks (Hildebrand, 1968 and Merai, 2012).

II- Anatomical landmarks

The following measurements and appropriate indices were calculated using measuring tape according to Monfared (2013) in Iranian Native sheep, Kataba (2014) in goat and Allouch (2014) in bovine.

1. Skull length: from the rostral end of the alveolar process of the incisive bone to the occipital crest and divided into cranial and nasal skull lengths.
2. Nasal skull length: from the cranial edge of the maxillary bone cranially at the level incisor tooth to cranial border of the frontal bone caudally.
3. Cranial skull length: from the cranial border of the frontal bone cranially to occipital crest.
4. Infraorbital foramina distance: Width between the infraorbital foramina.
5. Supra-orbital foramina distance: Greatest width between the two supra-orbital foramina.
6. Distance from the medial canthus to the supraorbital foramen.
7. Distance from the medial canthus to the infraorbital foramen.
8. Facial tuberosity to infra orbital foramen.
9. Midpoint of the first upper premolar at its alveolar border to infraorbital foramen
10. Nasal process of the incisive bone to infraorbital foramen
11. Nasoincisive notch to infraorbital foramen.
12. Mandibular length: from the level of alveolar border of the incisive bone to the caudal border of the mandible.
13. Lateral alveolar border of the first premolar tooth to the mental foramen.
14. Caudal mandibular border to the mental foramen.
15. Lateral alveolar border to mental foramen: Distance from the mental foramen to the lateral extent of the alveolar root of lower incisor.
16. Ventral border of the mandible to mental foramen.
17. Maximum mandibular height: from the highest point of the coronoid process to the basal level of the mandible.
18. Condyloid fossa to the base of the mandible.
19. Caudal border of mandible to mandibular foramen: the vertical line from the mandibular foramen to the caudal border of the mandible.
20. Base of mandible to mandibular foramen.
21. Mandibular angle to mandibular foramen.

III- Statistical Analysis

All the measurements were expressed as mean measurements with the standard deviation (Mean ± SD).

IV- Radiography of the sheep skull

Results

The anatomical landmarks were of clinical importance and aid in regional nerve blocks of mandibular, mental and infraorbital nerves. No differences between male and female skulls.

Table. I -Morphometry of the cranium of the Barbados Black Belly sheep (Figs. 2, 3 & 4)

Item	Parameters (cm)	Mean ± SD	Figs
1	Skull length	24.65±2.16	2/1
2	Nasal skull length	7.77±0.93	2/2
3	Cranial skull length	16.09±1.23	2/3
4	Infraorbital foramina distance	9.56±0.79	3/1
5	Supra orbital foramina distance	5.64±0.84	3/2
6	Medial canthus to supraorbital foramen	3.87±1.30	4/1
7	Medial canthus to infraorbital foramen	7.68±0.59	4/2
8	Facial tubercle to infra orbital foramen	3.16±0.70	4/3
9	Midpoint of the first upper premolar to infraorbital foramen	1.70±0.24	4/4
10	Nasal process of incisive bone to infra orbital foramen	6.51±0.63	4/5
11	Nasoincisive notch to infra orbital foramen	3.58±0.75	4/6

Table. II -Morphometric of the mandible of sheep (Figs 6, 7 & 8)

Item	Parameters (cm)	Mean ± SD	Figs
12	Mandibular length	18.16±1.53	6/1
13	lateral alveolar border of the first upper premolar tooth to mental foramen	2.25±0.38	6/2
14	caudal mandibular border to mental foramen	15.23±1.46	6/3
15	Lateral alveolar border to mental foramen	2.25±0.31	6/4
16	ventral border of the mandible to mental foramen	0.70±0.18	6/5
17	Maximum mandibular height	10.79±0.64	6/6
18	Condyloid fossa to base of the mandible	7.08±0.73	6/7
19	Caudal border of the mandible to mandibular foramen	2.3±0.25	7/1
20	Base of mandible to mandibular foramen	3.75±0.22	7/3
21	Mandibular angle to the mandibular foramen	3.41±0.25	7/2

The supraorbital foramen:

The supraorbital foramen was located dorsal to the orbital cavity and it was detected easily by measuring the distance between the supraorbital foramina (Fig.3/A) or measuring the distance dorsal to the medial canthus of the eye (Fig. 4/A). The supraorbital foramen was the pathway of the trochlear nerve (Fig. 11/1) of the ophthalmic branch of the trigeminal nerve which supplied the forehead and the middle two-thirds of the upper eyelid. To block the nerve, a needle was inserted into the supraorbital foramen (Figs. 5/A, 11/A) which causes lacrimation from the eye, desensitization of the area supplying and upper eye lid dropping.

The infraorbital foramen:

The infraorbital foramen (Figs. 1/A, 3/B & 4/C) was easily palpated under the levator labii maxillaries and levator nasolabilais muscles, so these muscles should be moved dorsally, the foramen was detected by using the distance between it and either medial canthus of the eye (Fig. 4/2) , facial tubercle (Fig. 4/3) which was a vital and prominent, midpoint of the first upper premolar (Fig. 4/4), nasal process of the incisive bone (Fig. 4/5) or nasoincisive notch (Fig. 4/6).

The infraorbital foramen was the pathway of the maxillary nerve of the trigeminal nerve. The maxillary nerve entered the maxilla through the maxillary foramen. After entrance into the infraorbital canal, the nerve gave off alveolar branches to the cheek teeth and branches to maxillary sinuses then exited from the infraorbital foramen as infraorbital nerve (Fig. 12/5) which gave external nasal, internal nasal and maxillary labial branches respectively to the skin of the lateral nasal region, mucosa and skin of the nasal vestibule and skin of the maxillary lip.

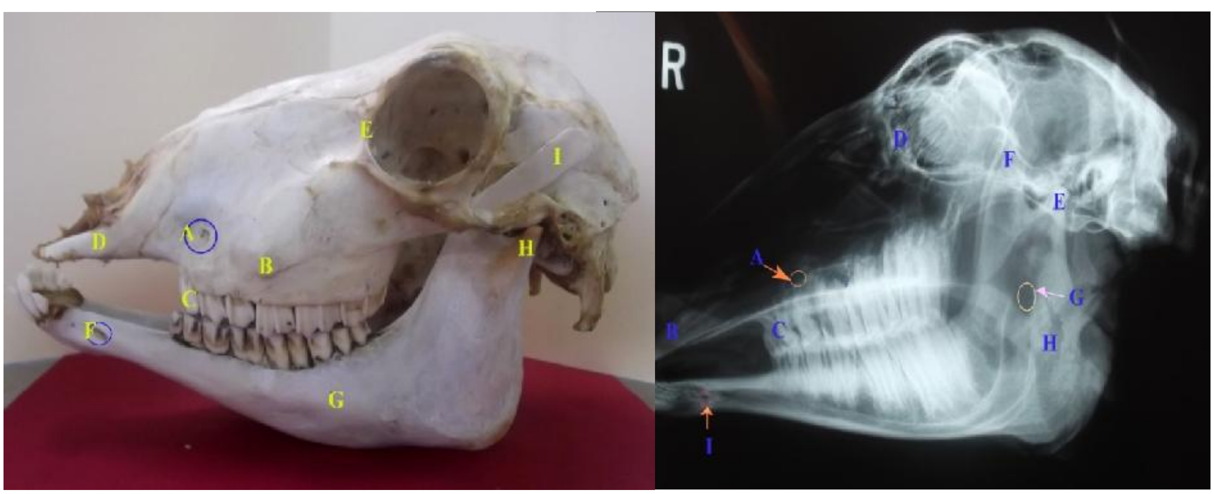
To block this nerve, a needle was inserted into either the maxillary foramen (Figs. 5. 11/B) or the infraorbital foramen (Fig. 5, 11/C). it was easier to desensitize the nerve within the infraorbital canal and its exit. It was not necessary to insert the needle to the entire distance of the canal for a complete block because the local anesthetic drug progressed caudally in the canal by pressure.

The mandibular foramen

The mandibular foramen was located on the medial surface of the mandible (Figs. 1/G, 7/A & 8/D). It was detected by using the distance between the mandibular foramen and the caudal border of the mandible (Fig. 7/1), mandibular angle (Fig. 7/2) or base of the mandible (Fig. 7/3). The inferior alveolar nerve was a branch of the mandibular branch of the trigeminal nerve. It passed through the mandibular foramen supplying the mandibular teeth, alveoli, gingiva as well as the skin and mucosa of the lips and chin. The inferior alveolar nerve was blocked difficulty by entering a needle medially and vertically into the mandibular foramen, so the lower teeth and lower lip on that side were desensitized. A potential complication of haemorhage can occur in doing the mandibular nerve block as the needle is inserted into the mandibular foramen (Figs. 9/A, 10, 11/D) where the arteries and veins lie and they may be injured during injection.

The mental foramen

The site of the mental foramen (Figs. 1/F, 6/A) was detected by using the distance between it and lateral alveolar border of the first premolar tooth (Fig. 6/2), caudal mandibular border (Fig. 6/3), lateral alveolar border of the mandible (Fig. 6/4) or ventral border of the mandible (Fig. 6/5). To feel the foramen, the depressor labii mandibulais muscle was displaced dorsally. The mental nerve (Fig. 12/4) was the rostral continuation of the inferior alveolar branch after its emerging from the mental foramen supplying the chin and lips. The mental nerve can be injected close to its exit from the mental foramen on the lateral side of the mandible rostral to the first check tooth. The needle was directed in a rostro-caudal direction towards the foramen (Figs. 9/B, 11/E). Ipsilateral dropping and desensitization of the lower lip and incisor teeth was occurred.



A B

Fig.1 Gross (A) and Radiograph (B) of the Skull of the Black Belly sheep; Lateral view

A: Infraorbital foramen; B: Facial tubercle; C: First upper premolar tooth; D: Nasal process of incisive bone; E: Medial canthus of the eye; F: Mental foramen; G: Mandible; H: Condylar process of the mandible; I: Coronoid process of the mandible.

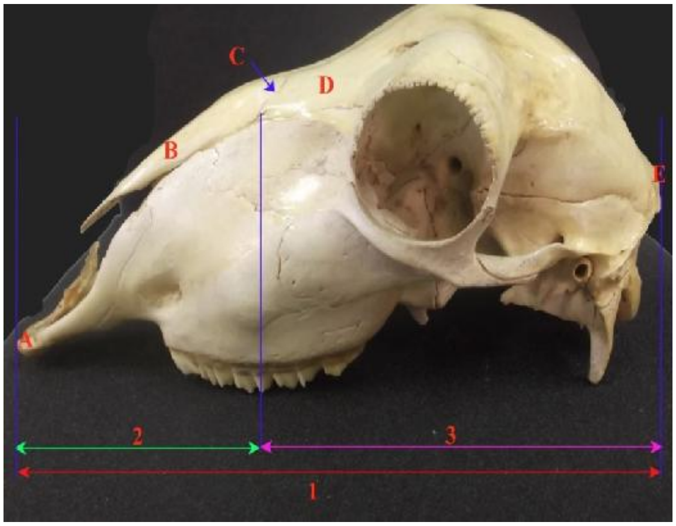


Fig. 2 Skull of the Black Belly shape

(Anatomical landmarks); Lateral view
(Anatomical landmarks)
A: Nasal process of the incisive bone
B: Nasal bone C: Nasofrontal suture
D: Frontal bone E: Nuchal crest
1: Skull length 2: Nasal length
3: Cranial length

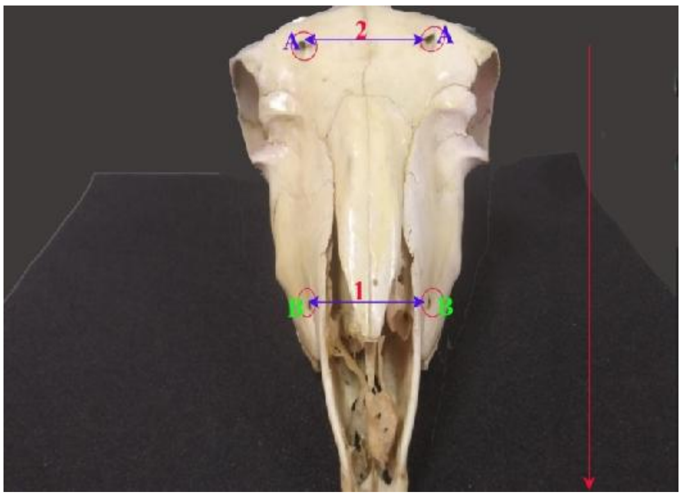
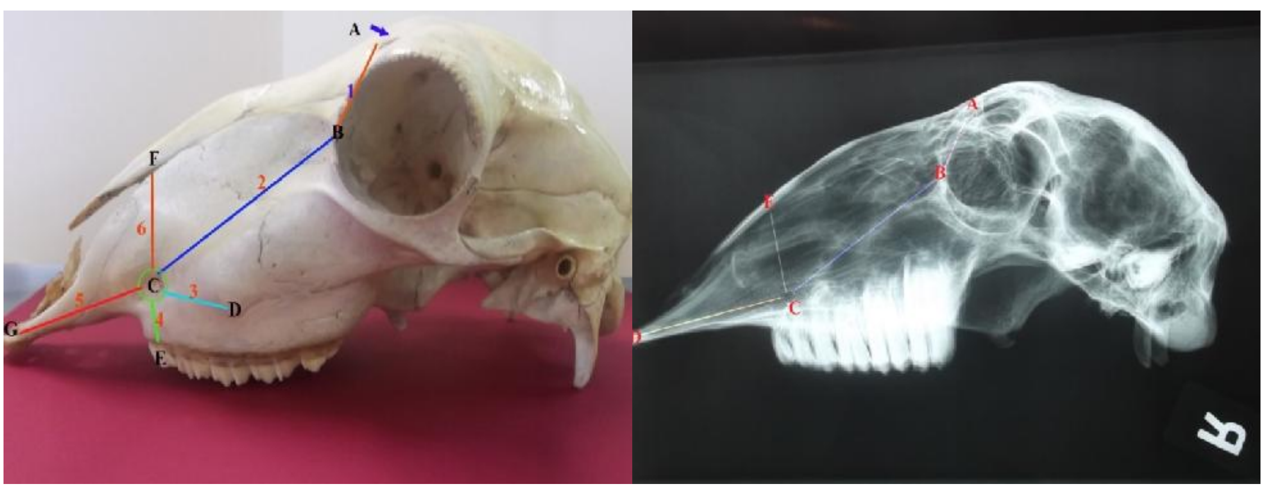


Fig. 3 Skull of the Black Belly shape

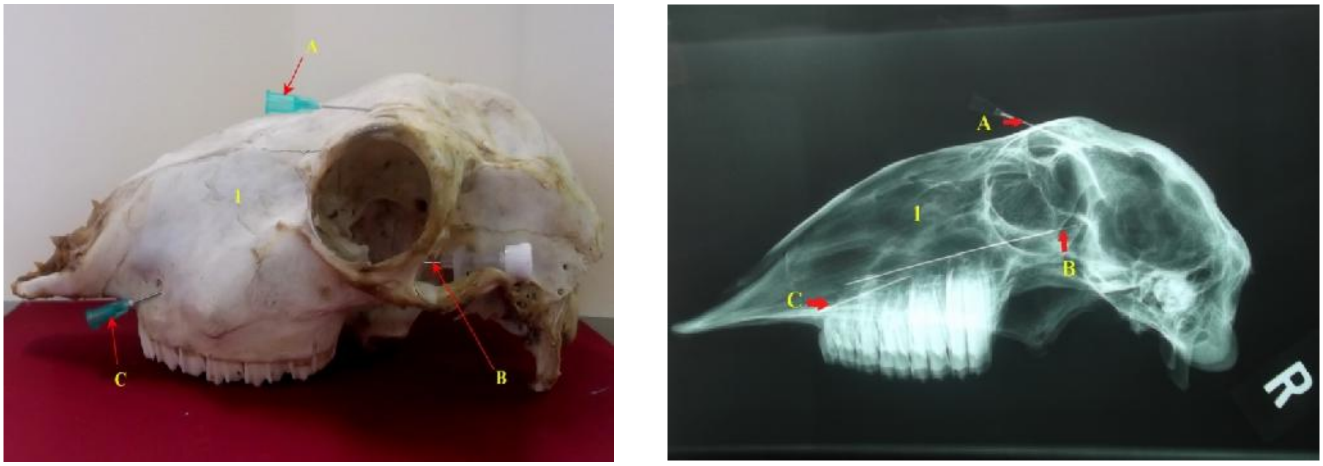
(Anatomical landmarks); Dorsal view
A: Supraorbital foramina
B: Infraorbital foramina
1: Infraorbital foramina distance
2- Supraorbital foramina distance



A B

Fig.4 Gross (A) and Radiograph (B) of the Skull of the Black Belly sheep (Anatomical landmarks); Lateral view A: Supraorbital foramen; B: Medial canthus of the eye; C: Infraorbital foramen; D: Facial tubercle; E: First upper premolar teeth; F: Nasoincisive notch; G: Nasal process of incisive bone

1: Medial canthus to supra-orbital foramen; 2: Medial canthus to infra-orbital foramen; 3: Facial tuberosity to infra orbital foramen; 4: Infra-orbital foramen to the midpoint of the first upper premolar; 5: Nasal process of incisive bone to infra- orbital foramen; 6: Infra-orbital foramen to the nasoincisive notch;



A B

Fig.5 Gross (A) and Radiograph (B) of the Skull of the Black Belly sheep; the site of needle in the supraorbital foramina (A), maxillary foramen (B), Mental foramen (C), Lateral view. Note: 1: Skull 2: Mandible

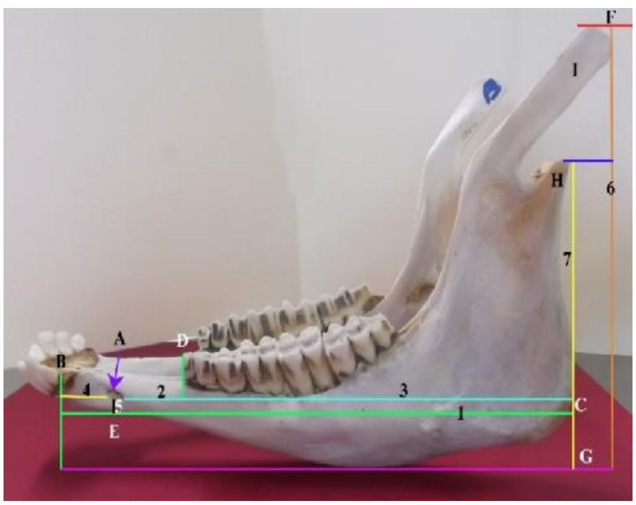


Fig.6 Mandible of the Black Belly shape (Anatomical landmarks); Lateral view
A: Mental foramen; B: Lateral alveolar border; C: Caudal mandibular border; D: Lateral alveolar border of the first premolar tooth; E: Ventral border of the mandible; F: Highest point of the coronoid process, G: Base of the mandible; H: Condylar process.

1: Mandibular length; 2: Mental foramen to the lateral alveolar border of the first premolar tooth; 3: Mental foramen to the caudal mandibular border; 4: lateral alveolar border to mental foramen; 5: Mental foramen the ventral border of the mandible; 6: Maximum mandibular height; 7: Condyloid fossa to base of the mandible

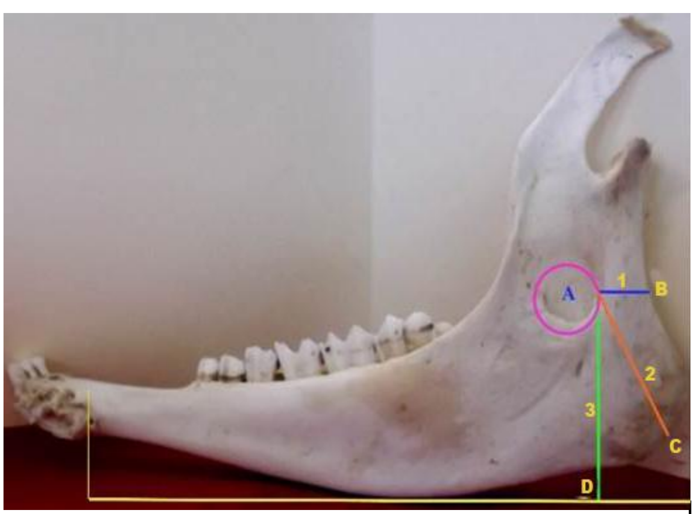


Fig.7 Mandible of the Black Belly shape (Anatomical landmarks); Medial view
A: Mandibular foramen; B: Caudal border of the mandible; C: Mandibular angle; D: Base of the mandible; 1: Mandibular foramen to the caudal border of the mandible; 2: Mandibular foramen to the mandibular angle; 3: Mandibular foramen to the base of the mandible

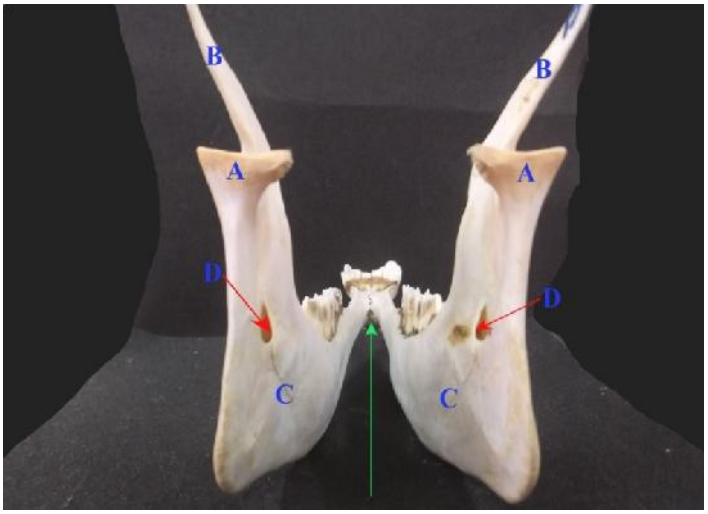
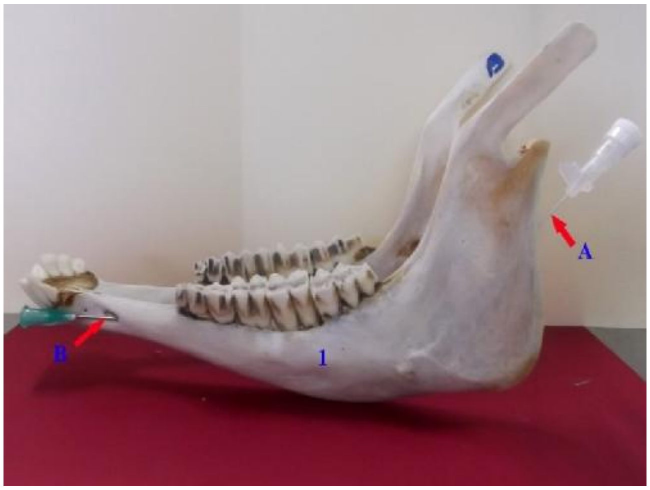
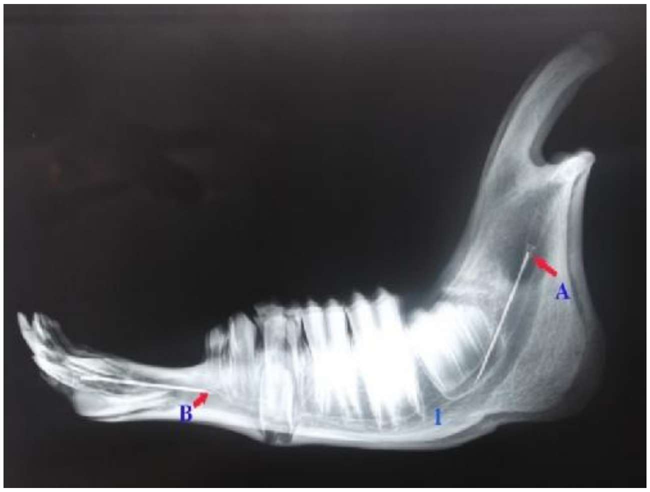


Fig. 8 Mandible of the Black Belly sheep Caudal view

A: Condylar process; B: Coronoid process
C: Ramus of the mandible; D: Mandibular foramen



A



B

Fig.9 Gross (A) and Radiograph (B) of the Mandible of the Black Belly sheep; the site of needle in the Mandibular foramen (A) and Mental foramen (B), Lateral view. Note: 1: Mandible

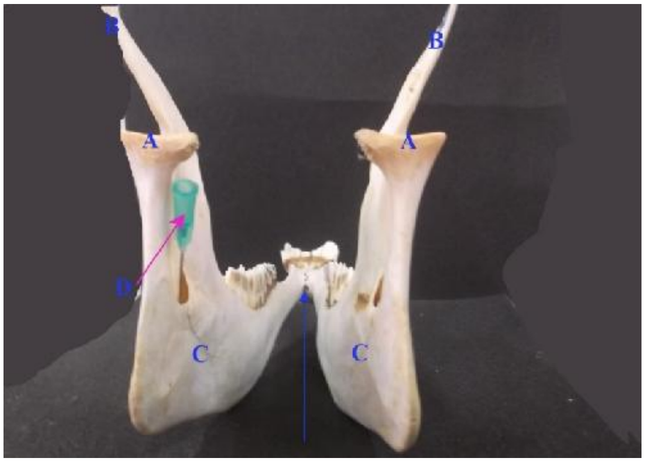


Fig. 10 Mandible of the Black Belly sheep Caudal view; the site of the needle in the Mandibular foramen (D)
A: Condylar process; B: Coronoid process
C: Ramus of the mandible.

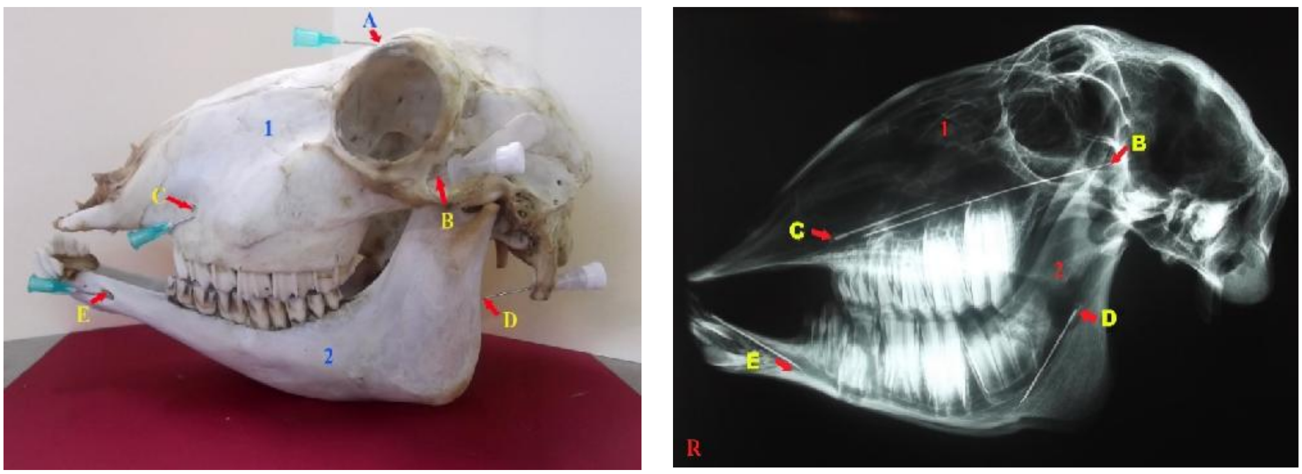


Fig.11 Gross (A) and Radiograph (B) of the Skull of the Black Belly sheep; the site of needle in the supraorbital foramina (A), maxillary foramen (B), Infraorbital foramen (c), Mandibular foramen (D), Mental foramen (E), Lateral view. Note: 1: Skull 2: Mandible

Fig. 12 A photomicrograph (B) of the head region of the Black Belly sheep showing the Mental nerve (4) and Infraorbital nerve (5)

Discussion

Table. III- Comparison of the clinical anatomy landmarks of the Barbados Black Belly sheep with other sheep and goat breeds.

Parameter TI &II	Barbados Black Belly sheep	Mehraban sheep (Karimi et al. 2011)	Iranian Native sheep (Monfared, 2013)	West African Dwarf Goat (Olopade and Onwuka, 2005)	Black Bengal goat (Uddin et al, 2009)	Kagani goat (Sarma, 2006)	Red sokoto (Maradi) goat (Olopade and Onwuka, 2008)	Rasquera goat (Pares-Casanova, 2014)	Makhoz goat (Goodarzi and Hoseini, 2013)	Iranian Native goat (Monfared et al. 2013)	Gwembe Valley Dwarf goat (Kataba, 2014)
1	24.65±2.16	20.06 ± 0.6	20.9 ± 4.77	16.99 ± 1.59		24.72 ± 0.93	20.3 ± 0.9	23.1 ± 1.01			15.02 ± 1.09
2	7.77±0.93		9.2 ± 0.46				5.8 ± 0.9				
3	16.09±1.23	11.98 ± 0.24	11.7 ± 2.03			7.32 ± 0.93					
4	9.56±0.79		6.1 ± 0.57								
5	5.64±0.84		9.5 ± 1.44								
6	3.87±1.30										
7	7.68±0.59										
8	3.16±0.70		1.87 ± 0.09	1.77 ± 0.26					1.81± 0.06	1.92 ± 0.17	2.06 ± 0-14
9	1.70±0.24		1.63 ± 0.44						1.7 ± 0.08	1.64 ± 0.11	1.13 ± 0.11
10	6.51±0.63										
11	3.58±0.75										
12	18.16±1.53	15.76 ± 1.59	14.08 ± 0.01	11.81 ± 1.10	14.21 ± 0.98				13.37 ± 0.67	14.1 ± 1.03	11.24 ± 0.52
13	2.25±0.38										
14	15.23±1.46	13.74 ± 1.8	11.29 ± 0.47	9.75± 1.07	11.69 ± 0.4				11.42 ± 0.42	11.34± 0.96	9.26 ± 0.49
15	2.25±0.31	2.07 ± 0.45	2.76 ± 0.05	1.84± 0.76	2.11 ± 0.17				1.58 ± 0.11	2.40± 0.26	1.58 ± 0.19
16	0.70±0.18										
17	10.79±0.64	9.75 ± 2.71	8.28 ± 0.48	7.11± 0.57	8.83 ± 0.57				8.94 ± 0.43	8.69± 0.18	6.64 ± 0.44
18	7.08±0.73	7.75 ± 0.96	6.26 ± 0.17	5.28± 0.57	6.38 ± 0.51				5.87 ± 0.44	4.37± 0.59	4.07 ± 0.37
19	2.3±0.25	1.35 ± 0.29	0.86 ± 0.03		0.9 ± 0.15				1.19 ± 017		1.10 ± 0.07
20	3.75±0.22	4.14 ± 0.47	2.99 ± 0.03	1.55 ± 0.25	3.64 ± 0.23				3.43 ± 0.25	2.88 ± 0.93	2.35 ± 0.26
21	3.41±0.25		2.82 ± 0.04						2.74 ± 0.17		2.18 ± 0.19

The current investigation showed that the skull length was higher that the value reported in the Mehraban sheep (Karimi *et al*., 2011), in Iranian Native sheep (Monfared, 2013), in West African Dwarf Goat (Olopade and Onwuka, 2005), in the Red sokoto goat (Olopade and Onwuka, 2008) and in the Gwembe Valley Dwarf goat (Kataba, 2014). While, it was lower that the value reported in the Kagani goat (Sarma, 2006).

In the present study, the nasal skull length was longer than the value reported in the Mehraban sheep (Karimi *et al.*, 2011) and in Kagani goat (Sarma, 2006).

The current work showed that the cranial skull length was higher than the value mentioned by Monfared (2013) in the Iranian Native sheep.

The mean distance between the supra- orbital foramina was lower than the value mentioned by Monfared (2013) in the Iranian Native sheep.

This study revealed that the distance between the medial canthus of the orbit and the supraorbital foramen was 3.87 cm for Barbados Black Belly sheep. No values were given for other sheep in literature.

The distance from the facial tuberosity to the infra-orbital foramen was higher in Barbados Black Belly sheep than the value reported in the Iranian Native sheep (Monfared, 2013), in the West African Dwarf Goat (Olopade and Onwuka, 2005), in the Makhoz goat (Goodarzi and Hoseini, 2013), in the Iranian Native goat (Monfared *et al*., 2013) and in the Gwembe Valley Dwarf goat (Kataba, 2014)

The distances between the infraorbital foramen and the medial canthus and, the nasoincisive notch and the nasal process of the incisive bone were 7.68 cm, 3.58 cm and 6.51 cm respectively. Values are not given for other sheep.

The distance from the infra orbital foramen to the midpoint of the first upper premolar in the Barbados Black Belly sheep was similar to that observed in the Makhoz goat (Goodarzi and Hoseini, 2013). However, it was lower for the Iranian Native sheep (Monfared, 2013), the Iranian Native goat (Monfared *et al*., 2013) and the Gwembe Valley Dwarf goat (Kataba, 2014).

Our findings as well as those obtained by Hall *et al*. (2001) ascertained that the facial tuberosity is a prominent feature and can be used as a guide for infra-orbital nerve block to desensitize the skin of the upper lip, nostril and face on that side of the level of the infra-orbital foramen. The injection of local anesthetic drug within the infra-orbital canal leads to the analgesia and easily extraction of the incisor, canine and first two premolar teeth.

In the present study, the mandibular length and the maximum mandibular height were higher than the values obtained in the Mehraban sheep (Karimi *et al*., 2011), the Iranian Native sheep (Monfared, 2013), the West African Dwarf goat (Olopade and Onwuka, 2005), the Black Bengal goat (Uddin *et al.*, 2009), the Makhoz goat (Goodarzi and Hoseini, 2013), the Iranian Native goat (Monfared *et al*., 2013) and the Gwembe Valley Dwarf goat (Kataba, 2014).

The obtained results showed that the distance from the condyloid fossa to the base of the mandible was comparable to that reported in the Mehraban sheep (Karimi *et al*., 2011) and was higher than in the Iranian Native sheep (Monfared, 2013), the West African Dwarf Goat (Olopade and Onwuka, 2005), the Black Bengal goat (Uddin *et al.*, 2009), the Makhoz goat (Goodarzi and Hoseini, 2013), the Iranian Native goat (Monfared *et al.*, 2013) and the Gwembe Valley Dwarf goat (Kataba, 2014).

The obtained results showed that the distance from the caudal border of the mandible to the level of the mandibular foramen was higher than the values reported for the Mehraban sheep (Karimi *et al*., 2011), the Iranian Native sheep (Monfared, 2013), the Black Bengal goat (Uddin *et al*., 2009), the Makhoz goat (Goodarzi and Hoseini, 2013) and the Gwembe Valley Dwarf goat (Kataba, 2014).

The distance of the mandibular foramen to the base of the mandible in the Barbados Black Belly sheep was nearly equal to what was observed in the Black Bengal goat (Uddin *et al.*, 2009) and in the Makhoz goat (Goodarzi and Hoseini, 2013) but higher than was recorded in the Iranian Native sheep (Monfared, 2013), the West African Dwarf goat (Olopade and Onwuka, 2005), the Iranian Native goat (Monfared *et al*., 2013) and the Gwembe Valley Dwarf goat (Kataba, 2014). However Karimi *et al.* (2011) recorded a higher value than the value reported in the present study.

The results showed that the distance from the mandibular angle to the mandibular foramen was higher than the value reported in Iranian Native sheep (Monfared, 2013), in the Makhoz goat (Goodarzi and Hoseini, 2013) and in the Gwembe Valley Dwarf goat (Kataba, 2014).

Observations of the present study confirmed those of Hall *et al*. (2001) that the parameters of the mandibular foramen were of clinical importance for attaining the regional anesthesia of the mandibular foramen for desensitization of the lower jaw with its teeth and the lower lip on the side of the block.

The results showed that the distance between the lateral alveolar root and the mental foramen was comparable to the reported value in the Mehraban sheep (Karimi *et al*., 2011), the Iranian Native sheep (Monfared, 2013), the Black Bengal goat (Uddin *et al.,* 2009) and the Iranian Native goat (Monfared *et al*., 2013). It was higher than in the West African Dwarf Goat (Olopade and Onwuka, 2005), the Makhoz goat (Goodarzi and Hoseini, 2013), the West African Dwarf Goat (Olopade and Onwuka, 2005), the Makhoz goat (Goodarzi and Hoseini, 2013) and the Gwembe Valley Dwarf goat (Kataba, 2014).

In the present study, the distance between the mental foramen to the caudal mandibular border was higher than the values obtained in the Mehraban sheep (Karimi *et al.*, 2011), the Iranian Native sheep (Monfared, 2013), the West African Dwarf goat (Olopade and Onwuka, 2005), the Black Bengal goat (Uddin *et al*., 2009), the Makhoz goat (Goodarzi and Hoseini, 2013), the Iranian Native goat (Monfared *et al*., 2013) and the Gwembe Valley Dwarf goat (Kataba, 2014).

In the present study, the distances between the mental foramen to the lateral alveolar order of the first upper premolar tooth and to the ventral border of the mandible were 2.25 cm and 0.70cm respectively. No values were given for other sheep in literature.

Observations of the present study confirmed those of Hall *et al*. (2001), where the parameters of the mental foramen are vital because injection of local anesthetic drugs can be made in the rostral aspect of the mandibular canal via the mental foramen for blocking the infra-alveolar nerve, so that desensitization of lower jaw with its teeth and the lower lip will occur and this method is easier and avoids all risks of blood vessel injuries as in the case of the infra-alveolar nerve block

The results were of clinical importance and will aid in the administration of regional nerve blocks by allowing easier methods like blocking the maxillary nerve via the injection of the local anesthetic agent through the infraorbital foramen. The mandibular nerve similarly can be blocked by injecting the local anesthetic agent through the mental foramen, in addition to the supra-orbital and mental nerves which are useful during surgical operations in head region and dental extraction or rasping. The results will also help the veterinarian to avoid the risks associated with the use of general anaesthesia and the toxicity of local anaesthetic agents in sheep. Use Surgical procedures could be performed in the standing position which would allow for shorter surgical time, less anesthetic equipment and low cost of the procedure.

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