

# **Investigation of Anatomical Landmarks for Regional Anesthesia in Hind Limb of Black Bengal Goat (*Capra hircus*)**



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Investigation of Anatomical Landmarks for Regional Anesthesia in Hind  
Limb of Black Bengal Goat (*Capra hircus*)



Approved:

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**List of Abbreviation**

<b>Abbreviation and Symbol</b>	<b>Elaboration</b>
BB	Black Bengal
CVASU	Chittagong Veterinary and Animal Sciences University
SAQTVH	Shahedul Alam Quadary Teaching Veterinary Hospital
SD	Standard Deviation
Cm	Centimeter

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## Abstract

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The study was aimed to investigate the anatomical landmarks for regional anesthesia in hind limb of 7 adult Black Bengal goat of either sex at Anatomy lab, CVASU. 4 male and 3 female Black Bengal goats aged between 2-3 years and weighting  $8.2\pm 0.51$ kg were used for this study. With the permission of ethical committee of CVASU, the animals were euthanized and then used for dissection to expose the nerves of hind limbs. Ischiatic nerve was always present under the biceps-femoris muscles and  $1.24\pm 0.11$  cm caudo-medial from the greater trochanter of femur. Fibular nerve was found superficial along the lateral aspect of the gastrocnemius muscle which was also  $1.1\pm 0.04$  cm away from the starting point of tibial crest in its lateral aspect. Tibial nerve was passed between the two head of gastrocnemius muscle and later became superficial in front of Achilles tendon. To block the tibial nerve, more appropriate site was found at  $3.05\pm 0.12$  cm above from calcaneus bone. This study established reference anatomical landmarks for regional anesthesia (blocking of ischiatic, fibular and tibial nerve) in hind limb of Black Bengal goat.

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**Keywords:** Anatomical landmarks, Regional anesthesia, Hind limb, Black Bengal goat

## Chapter 1: Introduction

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Black Bengal (BB) goats have been recognized as the most effective livestock species for promoting health and economy of marginal and landless farmers in Bangladesh. More than 90% of goat population in Bangladesh comprised the Black Bengal goats, the remainder being Jamnapari and their crosses (Husain, 1993). Because of the importance of this goat breed, regional anatomical study is of interest to clinicians as well as veterinary surgeons to visualize details of structures relevant to the case at hand (Dyce et al., 2002).

Blockage of hind limb nerve under regional anesthesia during surgical interventions like digit amputation, limb amputation becomes more common practice in Black Bengal goat. For development of professional skills and easy handling by clinician, a satisfactory anaesthesia is very important (Maria, 2012). This helps to restraint the animal with minimize injury. The regional anaesthesia means loss of sensation in a larger, though limited body area. This is used where specific nerves to particular areas of interest are blocked; like specific nerve blocks to the limbs, paravertebral blocks (Edmondson, 2008).

The nerves that supply the hind limb of goat include the ischiatic nerve and its branches (major tibial and fibular nerve). They are formed by the ventral branches of the sixth and seventh lumbar and first and second sacral spinal nerves. Sometimes ventral branches of fifth lumbar and third sacral spinal nerves, respectively, may contribute to its formation (Getty, 1975). Branches of those plexus innervate muscles and skin of caudal lumbar region, hip, thigh and hind limb.

The topographic and morphometric anatomy of those hind limb nerves (ischiatic, fibular and tibial nerve) of Black Bengal goat is essential for veterinary surgeon to localize those nerves easily. Studies have been done on regional anesthesia (head region, flank region) of domestic animals including the horse, ox, dog and the goat (Dyce et al., 2002; Getty, 1975; Onar et al., 2001 and Olopade and Onwuka., 2005). Some studies have been performed on regional anesthesia (head region, flank region) of Black Bengal goat by different authors (Uddin et al., 2009; Sikder et all. 2010). No study was documented on the regional anesthesia on hind limb of Black Bengal goat

in Bangladesh. Here. The study was conducted to establish the reference anatomical landmarks for regional anesthesia (for blocking of ischiatic, fibular and tibial nerve) in hind limb of Black Bengal goat.

**Objectives:**

To investigate the anatomical landmarks for regional anesthesia in hind limb (blocking of ischiatic, fibular and tibial nerve) of adult Black Bengal goat



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## Chapter 2: Materials and Methods

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The investigation of anatomical landmarks for regional anesthesia in hind limb of seven (7) adult Black Bengal goat of either sex was carried out at Anatomy lab, CVASU, Chittagong. The materials and methods which were applied to perform this work are given below.

### **2.1 Ethical issue:**

The ethical approval was done by the Animal ethical committee of CVASU. All animal procedures followed the recommendations of the World standard procedure with minimal pain.

### **2.2 Study area and duration:**

The study was conducted at Anatomy lab, CVASU, Chittagong during my internship from the period of 25th July to 30th August, 2018. Dissection of animal and measurements of anatomical location of different nerves were performed at laboratory of Department of Anatomy and Histology, CVASU. And I also performed my practical work at SAQTVH, CVASU.

### **2.3 Study population:**

In this study, seven adult Black Bengal goat of either sex were used for determination of anatomical landmarks for regional anesthesia in hind limb (blocking of ischiatic, fibular and tibial nerve). 4 male and 3 female Black Bengal goats aged between 2-3 years and weighing  $8.2 \pm 0.51$  kg were used for this study.

### **2.4 Sacrifice of goat:**

Seven (7) adult Black Bengal goats were collected from local animal market, Chittagong. Animal were killed after proper sedation with infiltration of local anesthesia. Dissection was performed to expose the nerves of hind limb. All the dissection procedure was followed by the standard technique (Thomason J. 2001).

### **2.5 Measurements of landmark for regional anesthesia:**

The entire landmarks for regional anesthesia for hind limb nerve especially for the ischiatic, tibial and fibular nerve were determined. The distances between greater trochanter to ischiatic nerve, tibial crest to fibular nerve and calcaneus bone to tibial nerve were measured with the help of scale and tape. All the data were kept recorded

for the future analysis. All measurements were expressed as mean measurements with standard deviation (Mean  $\pm$  SD).

### **2.6 Photography:**

All the images related to this study were taken directly from the studied sample by using the camera. The images were slightly modified for better illustration of the study.

## Chapter 3: Results

### 3.1 Ischiatic nerve and its landmark:

Ischiatic nerve passed caudoventrally between trochanter major and tuber ischi and run along the gamellus and quadratus femoris muscles. The Greater trochanter was considered as the anatomical landmark to determine the location of ischiatic nerve. It was found caudo-medial (distance  $1.24 \pm 0.11$  cm) aspect from the greater trochanter of femur (Figure 1, 2, 3)

### 3.2 Fibular nerve and its landmark:

At the middle of the thigh, the fibular nerve decends along the lateral aspect of gastrocnemius muscle and further it was run between the fibularis longus and extensor digitorum lateralis muscles. The tibial crest was considered as the anatomical landmark to determine the location of fibular nerve. It was specifically  $1.1 \pm 0.04$  cm away from the starting point of tibial crest in its lateral aspect (Figure 1, 2, 3)

### 3.3 Tibial nerve and its landmarks:

Tibial nerve was passed between two head of gastrocnemius muscle and later became superficial in front of Achilles tendon. Calcaneus bone was considered as anatomical landmark to determine the location of tibial nerve. Here, in this study, more appropriate site was found at  $3.05 \pm 0.12$  cm above from calcaneus bone (Figure 1, 2, 3)

### 3.4 Measurements of distance of nerves from respective landmark:

The measurements of distances of hind limb nerves from the respective landmarks were determined and recorded (Table 1).

Anatomical landmark	Hind limb nerves	Distance between hind limb nerves and respective landmark (cm) (n = 7)
Greater trochanter of femur	Ischiatic nerve	$1.24 \pm 0.11$
Tibial crest	Fibular nerve	$1.1 \pm 0.04$
Calcaneous bone/ Achilles tendon	Tibial nerve	$3.05 \pm 0.12$

Table 1: Measurements of distance of nerves from respective landmark

## Picture gallery



Figure 1: Dissection of hind limb and exposed ischiatic, fibular and tibial nerve of Black Bengal goat (a = Ischiatic nerve, b = greater trochanter; c = fibular nerve; d = tibial crest; e = tibial nerve and f = cancanus bone)

## Picture gallery

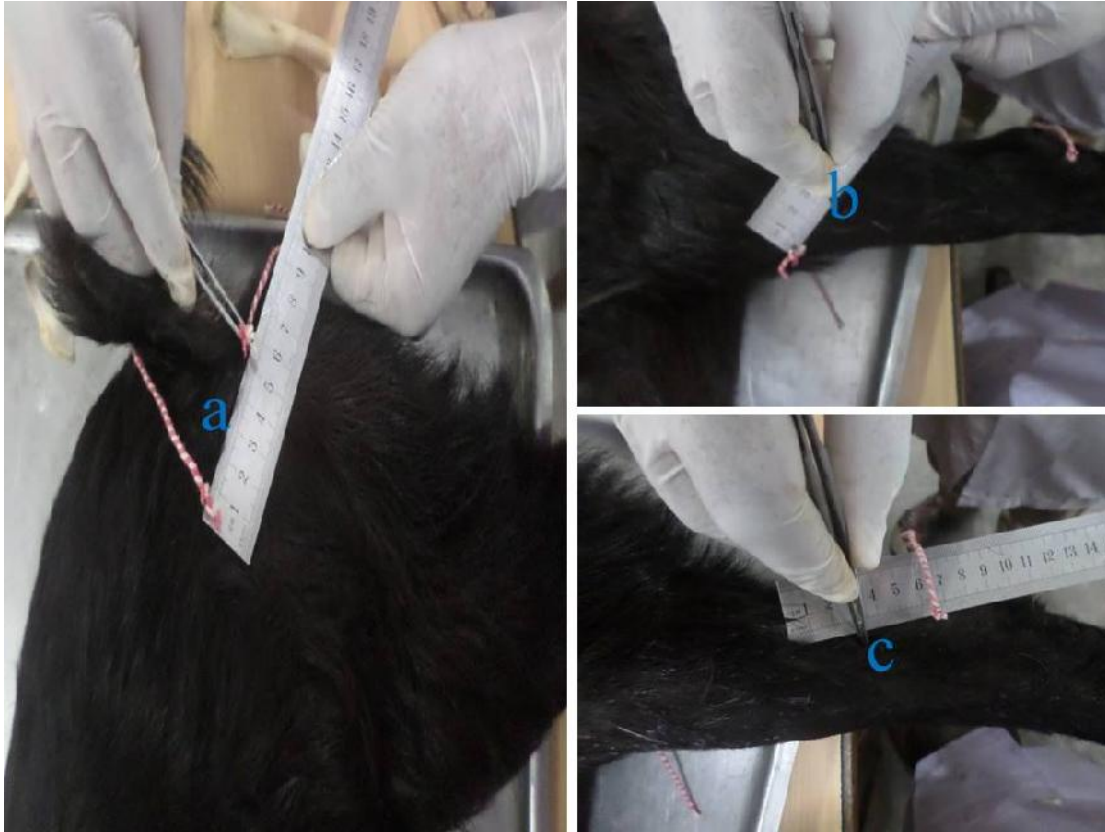


Figure 2: Topographic anatomy of Hind limb nerves of adult Black Bengal goat (a =location of ischiatic nerve; caudo-medial (distance  $1.24 \pm 0.11$  cm) aspect from the greater trochanter of femur; b = location of fibular nerve;  $1.1 \pm 0.04$  cm away from the starting point of tibial crest in its lateral aspect and c = location of tibial nerve;  $3.05 \pm 0.12$  cm above from calcaneus bone)

## Picture gallery



Figure 3: Landmarks for for regional anesthesia in hind limb (blocking of ischiatic, fibular and tibial nerve) of adult Black Bengal goat (a = greater trochanter of femur; b = starting point of tibial crest and c = calcaneus bone)

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## Chapter 4: Discussion

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The findings of the study showed that ischiatic nerve passed caudoventrally between trochanter major and tuber ischi and run along the gamellus and quadratus femoris muscles. The Greater trochanter was found as the anatomical landmark to determine the location of ischiatic nerve. Those findings were similar with the findings of Getty, (1975) and Ghosh, (2012). To block the ischiatic nerve, more appropriate site was found at caudo-medial (distance  $1.24 \pm 0.11$  cm) aspect from the greater trochanter of femur.

The fibular nerve descends along the lateral aspect of gastrocnemius muscle at the middle of the thigh and further it was run between the fibularis longus and extensor digitorum lateralis muscles. The tibial crest was found as the anatomical landmark to determine the location of fibular nerve. Those findings were similar with the findings of Getty, (1975); Ommer et al., (1995) and Ghosh, (2012). To block the fibular nerve, more appropriate site was found at  $1.1 \pm 0.04$  cm away from the starting point of tibial crest in its lateral aspect.

Finally, tibial nerve was passed between two head of gastrocnemius muscle and later became superficial in front of Achilles tendon. Calcaneus bone was found as anatomical landmark to determine the location of tibial nerve. Those findings were similar with the findings of Getty, (1975); Ommer et al., (1995) and Ghosh, (2012). But, no specific distances from calcaneus bone or achilles tendon was not documented by any authors. To block the tibial nerve, more appropriate site was found at  $3.05 \pm 0.12$  cm above from calcaneus bone.

**Limitation:**

The study period was very short because most of the time of our internship we were at different regions of our country and other countries except at the time of lab rotation. There are few number of goats were used in this study.



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## Chapter 5: Conclusion

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This study established reference anatomical landmarks for regional anesthesia (blocking of ischiatic, fibular and tibial nerve) in hind limb of Black Bengal goat. These will be helpful for a veterinary surgeon to localize hind limb nerves precisely. Blockages of hind limb nerve by those reference anatomical landmarks under regional anesthesia during surgical interventions were more easy, time saving and lower labor in Black Bengal goat. So these reference anatomical landmarks for regional anesthesia in hind limb of Black Bengal goat could be followed at the field practice.

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The author,

September, 2018

## Annex

### Information collection form

Sample No: ..... Date: .....

(A) Basic information:

Age: ..... Sex: .....

Breed: ..... Body weight: .....

(B) Anatomical landmark and distance between hind limb nerves and respective landmark:

Anatomical landmark	Hind limb nerves	Distance between hind limb nerves and respective landmark (cm)
Greater trochanter of femur	Ischiatic nerve	.....
Tibial crest	Fibular nerve	.....
Calcaneous bone/ Achilles tendon	Tibial nerve	.....

(C) Others:

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 .....  
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 .....  
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## **Biography**

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I am Payel Dutta, son of Mr. Arun Kumar Dutta and Mrs. Joyasree Dutta. I passed Secondary School Certificate examination in 2008 from Bandarban Govt. High School followed by Higher Secondary Certificate examination in 2010 from Mohsin College, Chittagong. Now I am an intern veterinarian under the Faculty of Veterinary Medicine in Chittagong Veterinary and Animal Sciences University. I took clinical training From Khon Kaen University, Thailand and Madras Veterinary College and VCRI under TANUVAS, India. In the future I would like to work as a veterinary practitioner and do research on clinical animal diseases in Bangladesh.