

Gross morphometrical postnatal developmental studies on spleen of Chotanagpuri sheep (*Capra ovis*)

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Abstract : This study involved morphologic and morphometric postnatal development on thirty spleens of the Chotanagpuri sheep. The spleen was collected and biometrical parameters were recorded. The spleen was found high in the abdominal cavity adjacent to the vertebral column in the region of 10–13th ribs in all age group. The colour of spleen varied with advancement of age which was creamish in early age and gradually became reddish brown. The shape of the spleen was roughly triangular in all age groups. The mean weight, maximum length, maximum width, length of dorsal, anterior and posterior borders and thickness of dorsal border at anterior, middle and posterior ends, thickness of anterior border at dorsal and middle ends, thickness of posterior border at dorsal end of spleen and distance of hilus from dorso-anterior and ventro-anterior angle significantly increased among different groups of sheep with advancement of age. However, there was no significant difference in thickness of anterior border at ventral end, thickness of posterior border at middle and ventral ends.

Key words : Gross morphology, Biometry, Postnatal development, Spleen, Chotanagpuri sheep

How to cite this paper : Mehta, S., Deshmukh, S.K., Minj, A.P., Kumar, K., Kumari, L. and Shahi, J.K. (2016). Gross morphometrical postnatal developmental studies on spleen of Chotanagpuri sheep (*Capra ovis*). *Vet. Sci. Res. J.*, 7(2) : 83-86, DOI : 10.15740/HAS/VSRJ/7.2/83-86.

Paper History : Received : 28.05.2016; Revised : 19.08.2016; Accepted : 06.09.2016

INTRODUCTION

Morphologic and morphometric studies of spleen not only reflect the genetic and environmental components of individual development but also are the foundation of clinical and surgical practices. It is the main site of opsonic antibody production, especially efficient in removal of encapsulated bacteria and removal of abnormal erythrocytes and intraerythrocytic inclusions and parasitised RBC (Maina *et al.*, 2014). In sheep, pronounced muscularization together with increased spleen dimension allows this organ to store blood and released as per need (Udroiu, 2008). Spleen can be found labeled “Lamb Melts” in markets. Spleens are very high in dietary iron. There are some reports on the anatomy of spleen of sheep but information on gross morphologic postnatal development of spleen of the sheep is very meager. Hence, present study was carried out to explore morphological and morphometrical postnatal

development of spleen of the Chotanagpuri sheep.

RESEARCH METHODOLOGY

The present study was conducted on spleen of thirty Chotanagpuri sheep, which died due to attack of hyena after post mortem from College of Veterinary Science and Animal Husbandry, Ranchi (J.H.). Based on their age, sheep were classified into five groups *viz.*, Group I (1-3 months), Group II (3-5 months), Group III (5-7 months), Group IV (7-9 months) and Group V (9 months and above), each group containing six numbers of animals. The weight of spleen of different groups was done with the help of digital weighing balance. The gross measurements were done with the help of Vernier's calipers and measuring tape. The biometrical data were statistically analyzed as per the methods of Snedecor and Cochran (1994) by using computer software.

RESULTS AND DISCUSSION

The spleen of different age groups of Chotanagpuri sheep was creamish in colour then it gradually became reddish brown with advancement of age during time of collection. The shape of spleen was roughly triangular in all age groups (Fig. 1 and 2). They were inserted between the dorsal sac of the rumen and the diaphragm which were firmly attached to both structures by connective tissue and located high in the abdominal cavity adjacent to the vertebral column in the region of the tenth to the thirteenth ribs. It shifted caudally and laterally with the advancement of age. Present finding was in agreement with Malik *et al.* (2001) in goat. The caudad and laterad shift of the spleen with the advancement of age in this study was probably dependent on relative increase in the size of the abdominal cavity and its viscera, especially stomach to which it was attached. The long axis was oblique in the form of a line which extended from the vertebral end of the last rib to middle of the tenth intercostal space.

There was a progressive increase in mean weight (Wt) with advancement of age, the value being varied from group I (16.64 ± 0.18 g) to group V (37.10 ± 0.54 g) (Table 1). However, spleen weight was measured about 69 ± 6.663 gm by Khalel (2010) and Khaleel *et al.* (2013) in Awasi sheep. The variation in our observation was due to heavy body weight of Awasi sheep than the Chotanagpuri sheep.

The mean maximum length (mxL) increased significantly from group I (5.29 ± 0.024 cm) to group V (8.43 ± 0.061 cm) (Table 1). However, its length was measured about 9.93 ± 0.342 cm by Khalel (2010) and Khaleel *et al.* (2013) in Awasi sheep. Table 1 indicated significantly higher mean maximum width (mxW) in group V (5.28 ± 0.061 cm) as compared to other groups. Khalel (2013) reported that the width of spleen in Awasi sheep was 6.48 ± 0.233 cm.

The ends were dorsal and ventral. The dorsal end or base was attached to the left crus of the diaphragm under the last two ribs and it extended about 3 cm behind the last rib. The ventral end was narrower and thinner than the dorsal end, which was situated opposite to the tenth intercostal space.

The surfaces were parietal and visceral. The parietal surface was convex and related to the diaphragm. It showed impressions of the upper parts of the last three ribs with progress of age. The visceral surface was concave and its anterior half was attached to the dorsal curvature of the rumen. The hilus was on the visceral surface, close to the anterior basal angle in the form of rounded depression (Fig. 2). Table indicated significantly higher mean distance of hilus from dorso-anterior angle (D_{hda}) in group IV (0.59 ± 0.022 cm) as compared to other groups. The mean distance of hilus from ventro-anterior angle (D_{hva}) was significantly higher in group V (6.20 ± 0.016 cm) as compared to other groups.

The borders were dorsal, anterior and posterior. The length of posterior border was comparatively higher than the dorsal and anterior borders. The posterior border was relatively thinner than the dorsal and anterior borders. There was a progressive increase in mean length of dorsal border (L_{db}) with advancement of age, the value being varied from group I (3.11 ± 0.059 cm) to group V (5.04 ± 0.054 cm). Table indicated significantly higher mean thickness of dorsal border at its anterior end (T_{dba}) in group IV (1.02 ± 0.043 cm) as compared to other groups. The

Table 1 : Average gross morphometrical observations of spleen in Chotanagpuri sheep at different age groups

Parameters	Age groups				
	Group I	Group II	Group III	Group IV	Group V
Wt (g)	16.64 ^c ± 0.18	19.93 ^d ± 0.34	26.11 ^c ± 0.34	28.40 ^b ± 0.23	37.10 ^a ± 0.54
mxL (cm)	5.29 ^e ± 0.024	5.64 ^d ± 0.070	6.45 ^c ± 0.039	7.05 ^b ± 0.044	8.43 ^a ± 0.061
mxW(cm)	3.72 ^d ± 0.019	4.57 ^c ± 0.078	4.94 ^b ± 0.155	4.36 ^c ± 0.030	5.28 ^a ± 0.061
L _{db} (cm)	3.11 ^e ± 0.059	3.62 ^d ± 0.052	4.07 ^c ± 0.041	4.44 ^b ± 0.041	5.04 ^a ± 0.054
T _{dba} (cm)	0.32 ^d ± 0.024	0.52 ^c ± 0.015	0.21 ^e ± 0.004	1.02 ^a ± 0.043	0.71 ^b ± 0.011
T _{dbm} (cm)	0.11 ^d ± 0.006	0.22 ^c ± 0.015	0.52 ^a ± 0.020	0.42 ^b ± 0.025	0.42 ^b ± 0.025
T _{dbp} (cm)	0.11 ^b ± 0.008	0.10 ^b ± 0.008	0.11 ^b ± 0.010	0.21 ^a ± 0.007	0.21 ^a ± 0.006
L _{ab} (cm)	4.51 ^d ± 0.019	5.08 ^c ± 0.037	5.14 ^c ± 0.043	5.30 ^b ± 0.009	6.90 ^a ± 0.025
T _{abd} (cm)	0.50 ^c ± 0.014	0.40 ^d ± 0.013	0.51 ^c ± 0.010	1.10 ^a ± 0.020	0.90 ^b ± 0.012
T _{abm} (cm)	0.19 ^c ± 0.009	0.19 ^c ± 0.006	0.20 ^c ± 0.007	0.50 ^a ± 0.012	0.40 ^b ± 0.013
T _{abv} (cm)	0.09 ± 0.009	0.10 ± 0.013	0.10 ± 0.020	0.10 ± 0.011	0.10 ± 0.012
L _{pb} (cm)	5.60 ^c ± 0.241	6.00 ^c ± 0.027	6.80 ^b ± 0.014	6.60 ^b ± 0.240	9.02 ^a ± 0.145
T _{pbd} (cm)	0.11 ^b ± 0.006	0.10 ^b ± 0.012	0.21 ^a ± 0.017	0.20 ^a ± 0.006	0.10 ^b ± 0.013
T _{pbm} (cm)	0.10 ± 0.014	0.09 ± 0.008	0.10 ± 0.007	0.10 ± 0.006	0.10 ± 0.008
T _{pbv} (cm)	0.10 ± 0.007	0.10 ± 0.007	0.09 ± 0.010	0.10 ± 0.013	0.11 ± 0.012
D _{hda} (cm)	0.19 ^c ± 0.016	0.20 ^c ± 0.017	0.19 ^c ± 0.008	0.59 ^a ± 0.022	0.40 ^b ± 0.020
D _{hva} (cm)	4.19 ^d ± 0.014	4.89 ^b ± 0.016	4.49 ^c ± 0.009	4.51 ^c ± 0.015	6.20 ^a ± 0.016

Mean values bearing common superscripts in a row do not differ significantly, where P<0.05



Fig. 1 : Photograph of spleen of Chotanagpuri sheep at different age groups showing a. apex, b. base (dorsal border), c. anterior border and d. posterior border

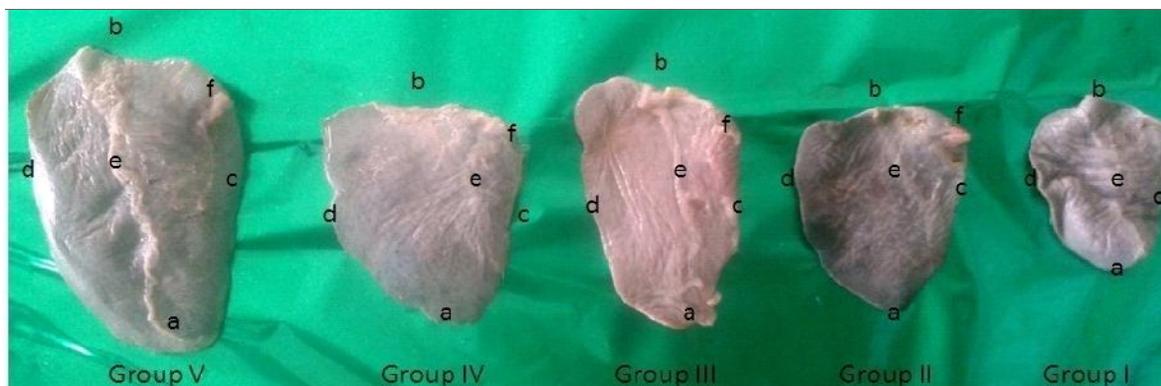


Fig. 2 : Photograph of spleen of Chotanagpuri sheep at different age groups showing a. apex, b. base (dorsal border), c. anterior border, d. posterior border, e. line of peritoneal reflection and f. hilus

mean thickness of dorsal border at its middle part (T_{dbm}) was significantly higher in group III (0.52 ± 0.020 cm) as compared to other groups. There was significant difference in mean thickness of dorsal border at its posterior end (T_{dbp}).

The mean length of anterior border (L_{ab}) increased significantly from group I (4.51 ± 0.019 cm) to group V (6.90 ± 0.025 cm). Table indicated significantly higher mean thickness of anterior border at its dorsal end (T_{abd}) in group IV (1.10 ± 0.020 cm) as compared to other groups. The mean thickness of anterior border at its middle part (T_{abm}) was significantly higher in group IV (0.50 ± 0.012 cm) as compared to other groups. Effect of age group had no significant influence on mean thickness of anterior border at its ventral end (T_{abv}).

Table 1 indicated significantly higher mean length of posterior border (L_{pb}) in group V (9.02 ± 0.145 cm) as compared to other groups. The mean thickness of posterior border at its dorsal end (T_{pbd}) was significantly higher in group III (0.21 ± 0.017 cm) as compared to other groups. Effect of age group had no significant influence on mean thickness of posterior border at its middle part (T_{pbm}) and mean thickness of posterior border at its ventral end (T_{pbv}). Khalel (2010) stated that in Awasi sheep the greatest thickness near the hilus was about 2.48 ± 0.142 cm.

The present study revealed that gross morphological postnatal developmental studies can be used as a tool for diagnosis of spleen disorders.

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