

## Gross Morphometry of Spleen in Postnatal Development Period of Indian Domestic Pig (*Sus scrofa domestica*)

Harshini Muppidi\*, Rajendranath N., Ranjith Kumar S., Radhakrishna Rao J.

Department of Veterinary Anatomy,

College of Veterinary Science, Rajendranagar,

P.V.N.R Telangana Veterinary University, Hyderabad-50030

\*Corresponding Author E-mail: [harshinirddy17@gmail.com](mailto:harshinirddy17@gmail.com)

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### ABSTRACT

The present postnatal developmental study was conducted on 18 healthy pigs (*Sus Scrofa domestica*) irrespective of sex. The size, shape, colour, weight, volume, length, width, and thickness were studied. Gross features revealed that the spleen in the pig was an elongated flat lymphoid organ located on the left side of the abdominal cavity along the greater curvature of the stomach in close relation to it and the colon. The colour of the spleen changed from reddish brown in the early stages to dark brown with the advancement of age. The pig's spleen presented two surfaces, two borders and two extremities, of which the parietal surface was convex and related to the left lateral wall of the abdomen. The visceral surface was divided by a longitudinal ridge into the anterior area related to the stomach and the posterior area to the colon. Hilus was located on the ridge. All gross parameters increased with the advancement of age in this study.

**Keywords:** Spleen, postnatal development, Indian domestic pig.

### INTRODUCTION

The mammalian spleen is an important site for haemopoiesis in early life, and it breaks down old red blood cells in adult life in all vertebrates. Besides this, it is responsible for immune protection and recycles iron with the help of splenic macrophages in the red pulp (Mebius & Kraal, 2005). Radostits et al.

(2000) cited that the spleen is like a flaccid bag, a blood storage site. Animals must depend on the spleen for blood transfusion during the natural heals of mechanical injury. The contractility of spleen connective tissue and smooth muscles in the capsule and trabeculae are prominent in ruminants (Press et al., 2006).

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## MATERIALS AND METHODS

The present study was carried out in the Department of Veterinary Anatomy, College of Veterinary Science, Rajendranagar, Hyderabad.

Spleen specimens were collected from a minimum of eighteen (18) apparently healthy pigs (six from each age group), irrespective of their sex, from the local slaughterhouses in and around Hyderabad. The following post-natal groups are made for the collection of specimens. Group-I (piglets-birth to 4 weeks), Group-II (Weaners-4 weeks to 10 weeks) and Group-III (Adults-above 10 weeks).

The weight of the spleen was measured in grams (g) using digital weighing balance. The volume of the spleen in a cubic centimetre (cc) was recorded by measuring the cylinder as per Archimedes' principle. To measure the spleen's length (L), a thread was placed at the two opposite ends at highest vertical points and the 'L' (in cm) was recorded using a meter scale. The width of the spleen was measured at the midpoint, and its mean values were recorded. Similarly, the thickness of the spleen in millimeters (mm) was measured at the middle, dorsal and ventral extremities by using digital Vernier callipers (Mitutoyo).

The data collected was analyzed statistically using one-way ANOVA (Snedecor and Cochran, 1994), and the means were tested for significance by Tukey's HSD test (Tukey, 1949) using SPSS (2009) Version 16.0.

## RESULTS AND DISCUSSION

In the present investigation, the spleen of the domestic pig was an elongated and flattened lymphoid organ located on the left side of the abdominal cavity in close relation to the stomach and colon. It was vertically placed along the greater curvature of the stomach in pigs (Figure 1). Similar reports were also made by several authors *viz.*, Spleen was strap like

and elongated by Dyce et al. (2010), Getty (2012) and slipper shaped by Usende et al. (2014) in pigs. Moreover, it was comma shaped in horse (Alam et al., 2005) and C-shaped in one-humped camel (Maina et al., 2014) respectively.

Color of spleen changed from reddish brown in Group-I and II to dark brown in Group-III. In adults, it varied and was brilliant red in pigs (Dyce et al., 2010 & Usende et al., 2014), whereas Rahmoun et al. (2019) reported that in one-month-old rabbit, the spleen was red-brown and with advancing age, it became much darker (Figure 2).

In this study, a pig's spleen consisted of two surfaces, two borders and two extremities. Parietal surface was convex and related to left lateral and ventral wall of the abdomen while the visceral surface was divided into two equal areas by a ridge. The anterior area of the spleen was related to the stomach, and the posterior area was to the colon. The hilus of the spleen was located on the ridge in the pig (Figures 3 and 4). The splenic vessels were embedded in a groove marked on the ridge. The cranial border was thick and straight, whereas the caudal border was thin and convex. The ventral end was smaller than the dorsal end and located in umbilical region. The dorsal end was under the last three ribs and related to the stomach cranially, the left kidney caudally and the pancreas medially. Our findings are in concurrence with the observations of Getty (2012) and Dyce et al. (2010) in pigs.

The average weight, volume, length, width and thickness of the spleen of pigs increased significantly ( $P < 0.05$ ) with advancing age (Table 1 and 2) (Graphs 1, 2 and 3). This is similar to the reports of Mehta et al. (2016) in sheep, Sivagnanam et al. (2017) in goats, Gupta et al. (2017) in goat fetuses, Rahmoun et al. (2019) in rabbits and Chaurasia et al. (2022) in goat.

**Table 1 showing the mean values of the parameters studied.**

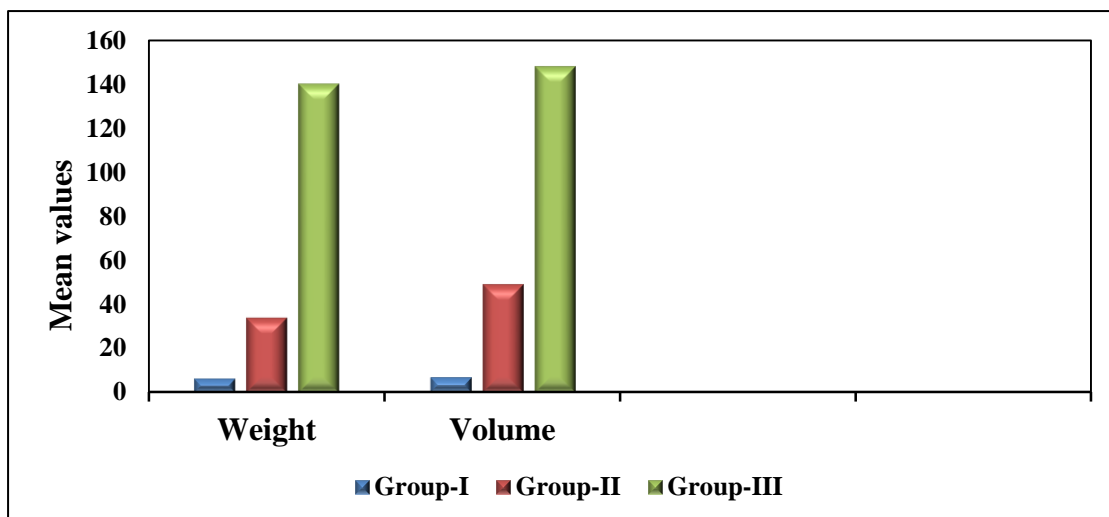
Parameter	Weight (g)	Volume (ml)	Length (cm)	Width(cm)	Thickness		
					Dorsal	Middle	Ventral
Group-I	5.93±1.31	6.53± 1.37	10.17±1.19	1.37±0.19	0.50±0.05	0.49±0.11	0.23±0.06
Group-II	33.91±3.40	49.17±5.83	21.71±1.41	3.68±0.12	0.60±0.15	0.73±0.11	0.46±0.07
Group-III	140.37±5.96	148.33 ±11.95	32.65±1.70	5.27±0.39	0.84±0.90	1.01±0.76	0.67±0.60

**Table 2 showing the comparison between the parameters**

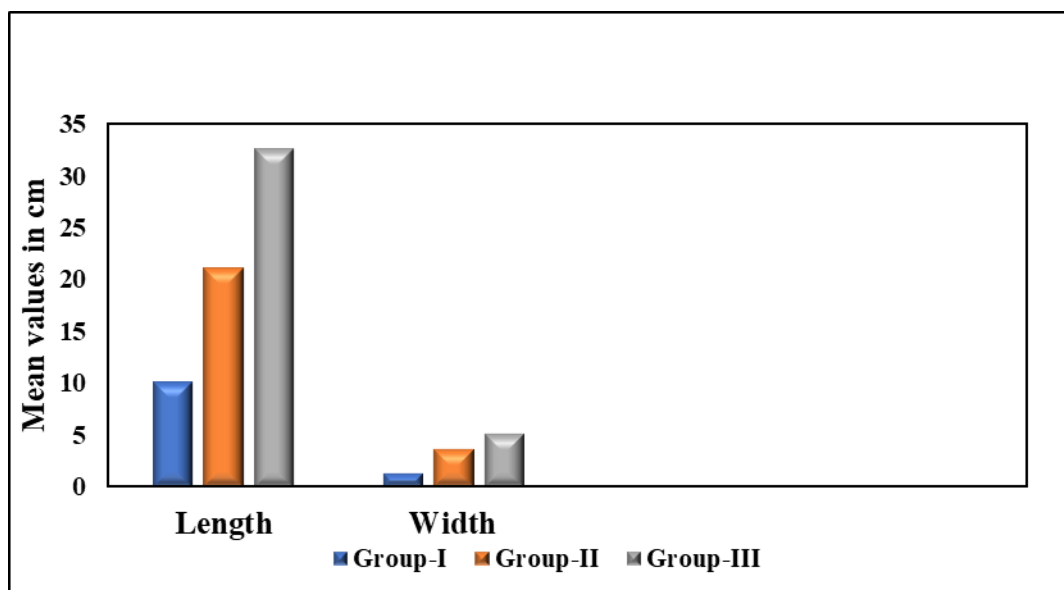
Parameter	Weight (g)	Volume (ml)	Length (cm)	Width(cm)	Thickness		
					Dorsal	Middle	Ventral
Group-I	5.93±1.31 <sup>a</sup>	6.53± 1.37 <sup>a</sup>	10.17±1.19 <sup>a</sup>	1.37±0.19 <sup>a</sup>	0.50±0.05 <sup>a</sup>	0.49±0.11 <sup>a</sup>	0.23±0.06 <sup>a</sup>
Group-II	33.91±3.40 <sup>b</sup>	49.17±5.83 <sup>b</sup>	21.71±1.41 <sup>b</sup>	3.68±0.12 <sup>b</sup>	0.60±0.15 <sup>a</sup>	0.73±0.11 <sup>a</sup>	0.46±0.07 <sup>a</sup>
Group-III	140.37±5.96 <sup>c</sup>	148.33 ±11.95 <sup>c</sup>	32.65±1.70 <sup>c</sup>	5.27±0.39 <sup>c</sup>	0.84±0.90 <sup>b</sup>	1.01±0.76 <sup>b</sup>	0.67±0.60 <sup>b</sup>

<sup>a,b,c</sup> values with different superscripts in a column differ significantly (P<0.005)

**Graph 1: Bar graph showing mean weight (g) and volume (ml) of spleen in Group I, Group II, Group III**



**Graph 2: Bar graph showing mean length and width in cm of spleen in Group I, Group II, Group III.**



Graph 3: Bar graph showing mean thickness at dorsal, middle and ventral aspect in cm of the spleen in Group-I, Group-II, Group-III

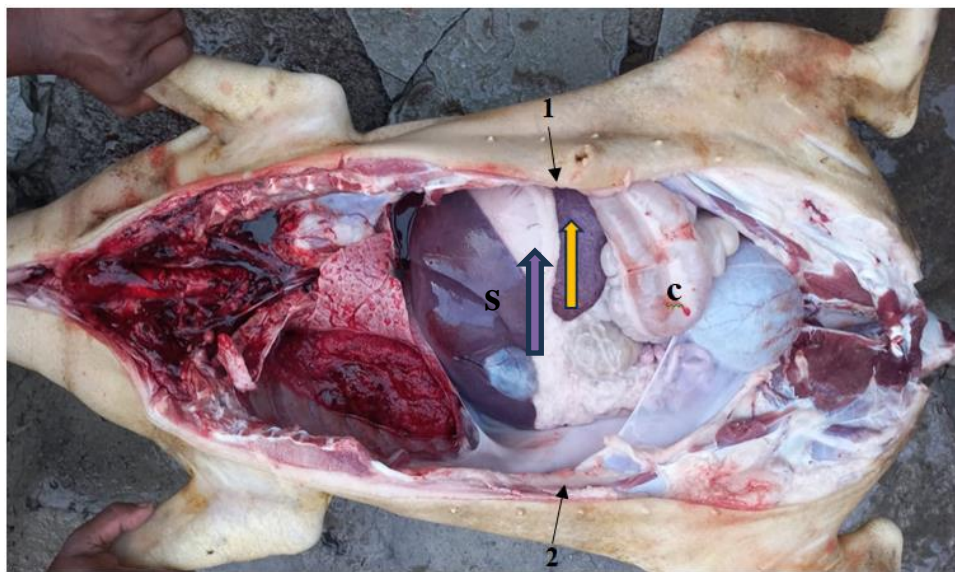
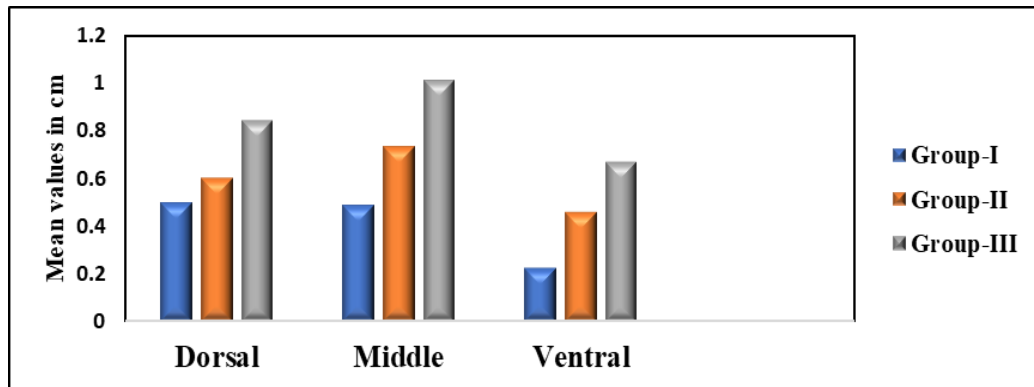


Fig.1. Ventral view photograph of abdomen of a pig (300days – Group-III) opened to show the position of spleen ( ————— ) in relation to the stomach (s) and colon (c). Cut left lateral (1) and right lateral (2) abdominal wall.

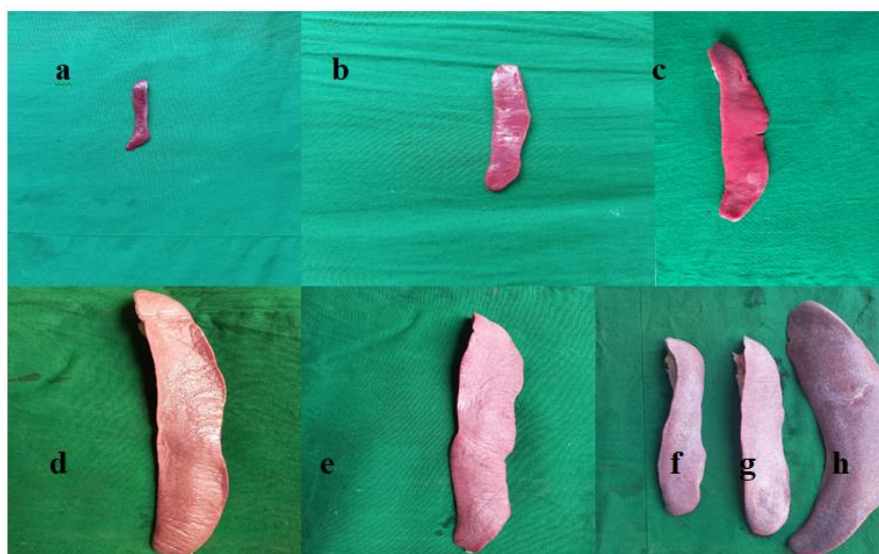
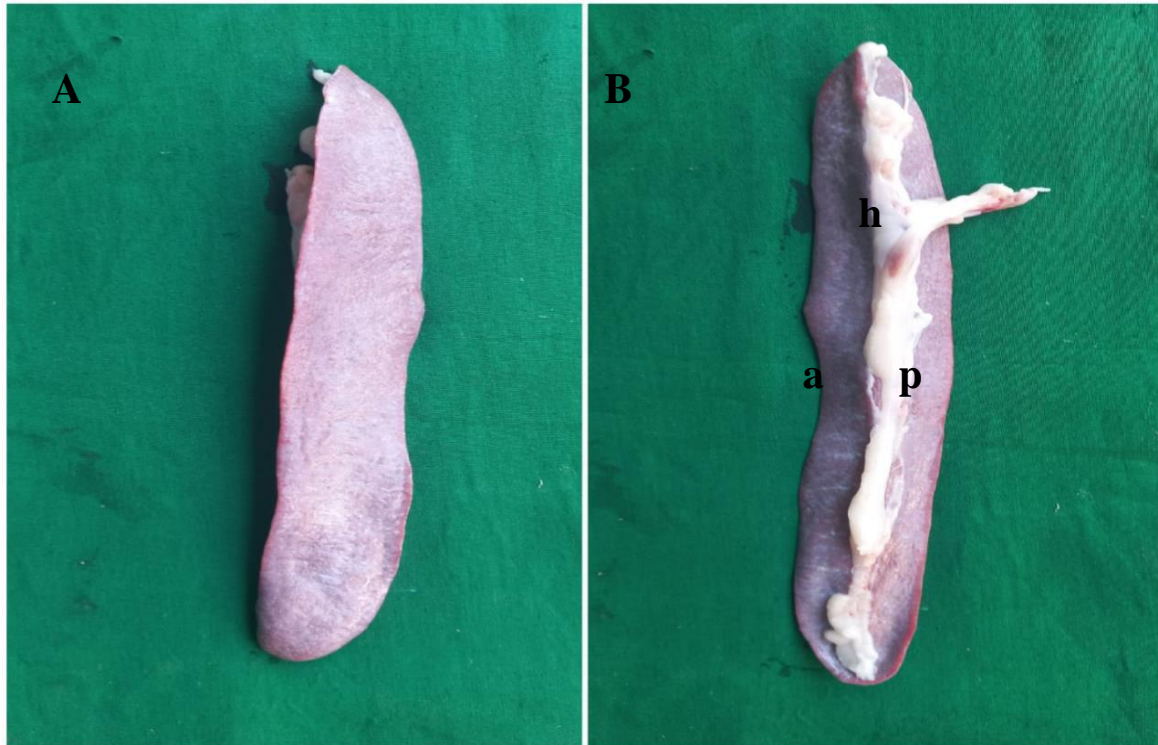
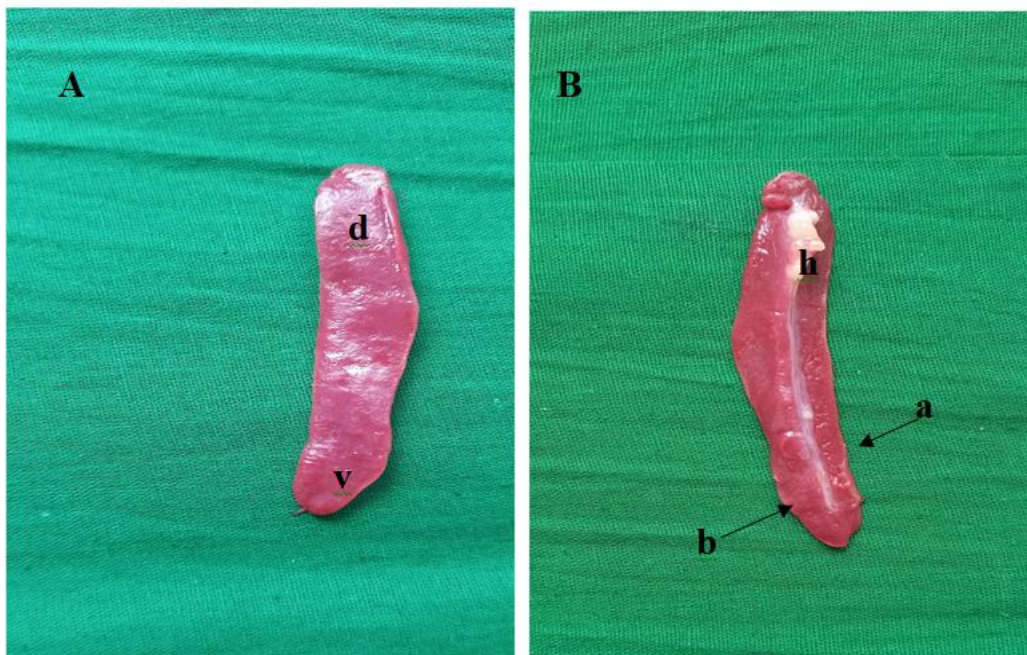


Fig.2. Photograph showing gross specimen of spleen in different age groups viz., Group-I (a - 0 day / b-6 day / c-21day piglets), Group-II (d-40 day / e-60 day) and Group-III (f-120 day / g-240day / and h-300 day) pigs.





**Fig 3. Photograph of spleen of 240 day pig (Group -III) showing the parietal (A) and visceral (B) surfaces. The hilus (h), longitudinal anterior (a), posterior (p) areas are seen on visceral surface.**



**Fig 4. Photograph showing gross specimens of 6 day old piglet spleen. Parietal surface (A), visceral surface (B), hilus (h), dorsal(d), ventral(v) extremity and cranial(a),caudal border(b).**

## CONCLUSION

The spleen in domestic pigs was an elongated and flattened structure situated on the left side of the abdominal cavity, closely associated with the stomach and colon. The variations in the colour of the spleen, transitioning from reddish-brown to dark brown with age, were consistent with findings reported in the literature. Detailed examination unveiled distinct surfaces, borders, and extremities of the spleen, with notable relationships to adjacent anatomical structures. Moreover, the study highlighted significant increases in the spleen's weight, volume, and dimensions with advancing age, mirroring trends observed in other animal species. These findings contribute to a comprehensive understanding of splenic anatomy and its developmental changes.

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### Conflict of Interest

The authors declare no conflict of interest.

### Author Contribution

All authors have participated in critically revising the entire manuscript and approving the final manuscript.

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