HISTOLOGICAL STUDIES ON THE SPLEEN OF MARWARI GOAT (*CAPRA HIRCUS*)

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ABSTRACT

The microscopic studies of 30 spleens showed that the capsule was composed of smooth muscle, collagenous and elastic fibres. Trabeculae emerged from the capsule and entered into parenchyma and subdivided it into smaller compartments by forming a net like framework. Splenic parenchyma was composed of white and red pulps. White pulp was lymphoreticular tissue consisted of lymphatic nodule and peri-arterial lymphatic sheath. Peri-arterial lymphatic sheath was less abundant. Red pulp was consisted of pulp arterioles, sheathed capillaries, terminal capillaries, splenic sinusoids and splenic cords. The splenic sinusoids were less abundant and poorly developed.

Key words: Spleen, Marwari goat, histology

Introduction

In the developing countries, a number of large and small farmers rear goat for their livelihood. It is sometimes referred to as 'Poor man's cow'. Research on this species has been largely neglected, specially its histology. So the detailed study on the different aspects of goat anatomy is required. Selection of the species is based on the local inhabitance and meagre availability of literature on this quadruped. Goat is well known for its production qualities and resistance to adverse climatic conditions prevailing in the arid and semiarid zone.

Materials and Methods

For the histological examination the small pieces of tissues (2 mm size) were collected from 30 spleens. From each spleen, the tissues were collected from fifteen fixed anatomical regions to explore the regional differences if any. The tissues were preserved in 10% formal saline, Bouin's fluid and Zenker's fluid for 48 hrs, 15 hrs and 18 hrs, respectively and processed for light microscopy by using paraffin of melting point of 58-60°C. The paraffin blocks were sectioned to obtain 5-6 µm thick sections which were stained with the following routine histological stains to demonstrate different components of spleen.

1. Eharlich's haematoxylin and eosine stain for routine observation (Luna,1968).
2. Gomori's method for reticulum (Luna, 1968).
3. Verhoeff's elastin stain for connective tissue fibres (Drury and Wallington, 1967).
4. Van Giesonstain for collagen fibres (Luna, 1968).
5. Silver impregnation for reticular, elastic and collagen fibre (Humason and Lushbaugh, 1960).

Results and Discussion

The spleen was covered by thick fibro-elastico-muscular capsule invested by the serous peritoneal covering. The capsule was composed of collagenous, elastic and reticular fibres along with smooth muscle fibres. Branching trabeculae emerged from the capsule. These entered into the splenic parenchyma and subdivided it into smaller compartments by forming a net like framework. The splenic parenchyma or stroma was composed of white pulp and red pulp. White pulp of spleen was lymphoreticular tissue consisting of lymphocytes, plasma cells and macrophages enmeshed in reticular network. The white pulp was composed of two components called as splenic nodules or Malphigian corpuscles or lymphatic nodule and peri-arterial lymphatic sheath. Splenic nodules were composed of aggregation of the lymphatic tissue along the course of small pulp artery. Eccentrically situated arteries were observed in the splenic nodules, the nodular artery or central artery. The germinal centre of the nodule was light stained, where the lymphocytes were loosely arranged. The red pulp filled the spaces between the white pulp and trabeculae. It consisted of pulp arterioles, sheathed capillaries, terminal capillaries, splenic sinusoids and splenic cords. The splenic sinusoids were less abundant and poorly developed. Numerous splenic cords were observed between the sinusoids. The framework of splenic cords was formed by loosely arranged reticular fibres and it contained numerous erythrocytes, reticular cells, lymphocytes, macrophages and plasma cells.

The spleen was covered by thick fibro-elastic and muscular capsule (Fig. 1 and 2) as also reported by McLeod *et al.* (1964) in bovine, Bajpai (1992) in goat. The capsule was invested by serous peritoneal covering, which was in accordance with the observation of Trautmann and Fiebiger (1957) in domestic animals. Simple squamous mesothelial cells of peritoneal covering were irregular in shape with centrally placed spherical nucleus and attenuated strands of cytoplasm (Fig.1) in present study. Similar finding was observed by Miller *et al.* (1965) in dog, Awal *et al.* (1992) in indigenous cattle, Bajpai (1992) in goat. The smooth muscle fibres were arranged in three layers; outer, middle and inner (Fig. 2). The fibres were parallel to the surface in outer and inner layer and oblique in middle layer. These findings are consonance with the finding of Bajpai (1992) in goat. Branching trabeculae emerged from capsule and entered in to the interior of the splenic parenchyma, which concurred, with the findings of McLeod *et*

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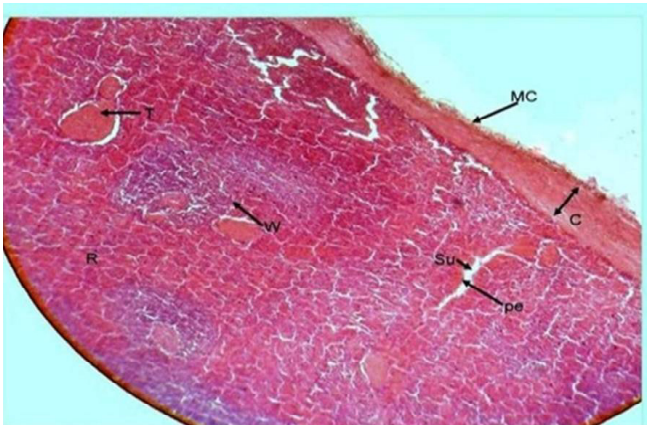

Fig. 1: Section of spleen showing capsule and peritoneal covering. C-Capsule, MC-Mesothelial cells, CA-Central artery, Su-Sinusoid, Pe-Phagocytic endothelium,T-Trabeculae, W-White pulp, R-Red pulp (H & E 100X).

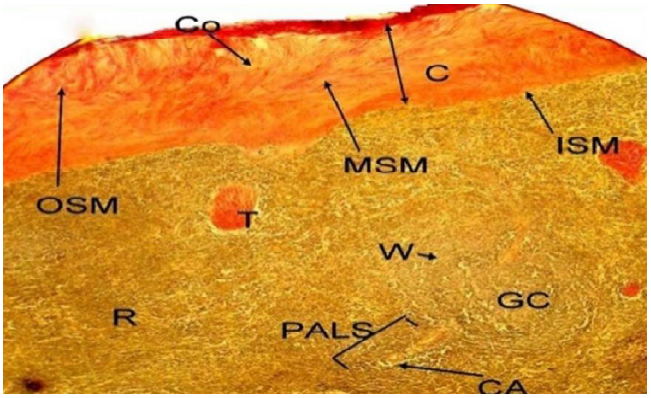

Fig. 2: Section of the spleen showing collagenous fibres and smooth fibres in capsule and trabeculae.T-Trabeculae, CO-Collagen fibres, ISM_Inner smooth muscle fibres, MSM-Middle smooth muscle fibres, OSM-Outer smooth muscle fibres,W-White pulp, R-Red pulp, C-Capsule, PALS-Periarterial lymphatic sheath, CA-Central artery,GC-Germinal center (Van Geison's stain 100x).

al. (1964) in bovine.

The reticular fibers of inner most part of capsule extended into trabeculae; similar observations were made by Ahmad *et al*. (1987) in Black Bangal goat and Panchal *et al*. (1998) in Marwari sheep. In present study, the fibres were vertically arranged in trabeculae and became progressively finer in the terminal branches. The collagenous, elastic and muscle fibres were oriented parallel to the trabecular direction.

The characteristic arrangement of elastic fibres and smooth muscles fibres in the capsule and trabeculae help in changing the volume of spleen and pumping out the excess blood in circulation. This simulated the finding of Banks (1981) in domestic animals that elastic fibres allowed large volume changes, whereas the contractions of smooth muscles fibres discharged the blood from the organ. The white pulp of lympho-reticular tissue consisting of lymphocytes, plasma cells and macrophages as also observed by Raghavan (1964) in ox, Banks (1981) in domestic animals. The white pulp was composed of two components, which were splenic nodules or Malphigian corpuscles or lymphatic nodules and peri-arterial lymphatic sheath (Fig. 2), findings are similar to Banks (1981) and Nicander *et al*. (1993). The peri-arterial lymphatic sheaths were less abundant in the spleen of goat, which was in agreement with the findings of Bajpai (1992) in goat.

In the present study, splenic nodules of various sizes were observed as an ovoid mass. The nodule was composed of aggregations of the lymphatic tissue along the course of small pulp artery as was previously described by Nickel *et al.* (1979) in domestic animals. It was also confirmed by the findings of Awal *et al*. (1992) in indigenous cattle that the splenic corpuscles were ovoid mass of compact lymphatic tissue and had a fine meshwork of reticular connective tissue containing mainly lymphocytes of various sizes. While describing the spleen of goat, Bajpai (1992) reported that lymphatic nodules generally occurred singly and occasionally aggregations of two to three nodules were observed.

Eccentrically situated arteries, the nodular artery or central artery were observed in the nodule (Fig. 2). This concurred with the findings of Trautmann and Fiebiger (1957) in domestic animals that each splenic corpuscle contained a small artery of variable position, falsely called as central artery. Trautmann and Fiebiger (1957) in domestic animals that the space between the white pulp and trabeculae were occupied by the red pulp. Similar findings were observed in the present study. Red pulp consisted of pulp arterioles, sheathed capillaries, terminal capillaries, splenic nodules and splenic cords which was concurred with the findings of Greep (1965). The splenic sinusoids were less abundant and poorly developed, similar observations were evidenced by Snook (1950) in horse.

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