

**ROLE OF SPLEEN IN IMMUNITY IN INFANCY
AND CHILDHOOD**

An Essay

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Master Degree in Pediatrics**

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INTRODUCTION AND AIM OF THE WORK

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The immune system is that part of a host defense mechanism. Its primary function is to protect against invasion by infectious agents (Nelson, 1983).

There are two mechanisms of immunity:

1. Natural immunity such as natural barriers (Skin & mucous membranes), phagocytosis and bacterial flora.
 - and 2. Acquired immunity which develops during life.
- The immune response comprises two main mechanisms, namely cellular and humoral immunity (James, 1981).

The lymphatic cells differentiate from the stem cells into T and B cells. The first for cellular immunity and the later for humoral immunity (Nelson, 1983).

The spleen has an important immunological role as it contains the largest accumulation of lymphoid tissues in the body. It's clearly involved in antibody production. It appears to be somewhat selective in its role as a defense mechanism. It can elaborate an immune response by stimulating the manufacture of IgM antibodies against circulating bacterial antigens (Lewis, 1983).

Aim of the Work:

The aim of this study is to discuss the role of spleen in Immunity in infancy and childhood both in health and disease.

EMBRYOLOGY AND ANATOMY OF THE SPLEEN

EMBRYOLOGY OF THE SPLEEN

The primordium of the spleen appears in the 5th week of development when mesenchymal cells can be seen aggregating between the two leaves of the upper part of the dorsal mesogastrium. These aggregations form simultaneously in several adjoining areas which subsequently fuse, so that the spleen is lobulated in early fetal life (Williams et al., 1980).

The mesenchymal cells elaborate the connective tissue framework of the spleen. This will form a system of irregular lacunae, containing blood corpuscles and blood-forming cells, while macrophages (reticulo-endothelial cells) line the spaces which will become the sinusoids. Lymphocytes migrate to the spleen late in fetal life, from the central lymph organs.

With the formation of the omental bursa, a part of the dorsal mesogastrium between its dorsal midline attachment and the spleen fuses with the peritoneum of the posterior abdominal wall and disappears (Langman, J. 1975).

The spleen remains intraperitoneal, connected dorsally (in the region of the left kidney) to the

body wall by the lienorenal ligament, and ventrally to the stomach by the gastrosplenic ligament.

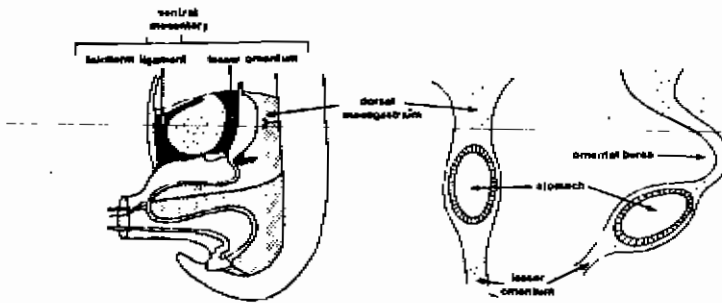


Fig. 1: Development of the spleen
(From T. Coetzee, 1982).

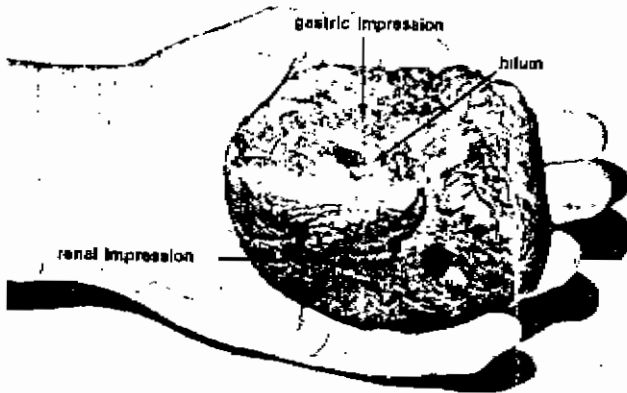


Fig. 3: The visceral surface of the spleen
(From T. Coetzee, 1982).

The spleen may retain its fetal lobulated form or there may be deep notches on the diaphragmatic surface and inferior border in addition to those on the superior border (Williams and Warwick, 1980).

The visceral surface is irregularly concave and presents impressions related to the stomach, left kidney, left colic flexure and tail of the pancreas.

The size of the spleen shows considerable variation between different individuals, under different nutritional conditions (usually smaller in starvation), and at different ages. The average adult mass is about 150 gram; with advancing age the size and mass of the spleen generally decrease. (Ref ?)

Blood supply

The arterial supply of the spleen comes from the large tortuous splenic artery, which runs in a generally transverse course from the coeliac axis to the left along the upper border of the pancreas in the posterior wall of the omental bursa. At the splenic hilum, while still in the lienorenal ligament, the artery divides into five or more branches which enter the hilum separately and ramify throughout its substance in the trabeculae (Anson, 1971). In about 80% of cases the artery divides, initially, into superior and inferior terminal branches. In 65% of cases a superior polar artery is present, arising most frequently from the main splenic trunk but sometimes from the superior terminal branch or even from the coeliac axis. The spleen receives a generous blood supply: approximately 350 litres of blood per day pass through the spleen .

The spleen is the source of 40% of the blood in the portal circulation. The splenic vein is formed by the union of five or more veins that emerge from the hilum. It runs in the lienorenal ligament, to the right, across the front of the left kidney, the left diaphragmatic crus and the aorta, lying in a

groove in the back of the pancreas. It usually receives the inferior mesenteric vein and ends, behind the neck of the pancreas, by joining the superior mesenteric vein to form the portal vein (T. Coetzee, 1982).

Internal structure of the spleen

The internal structure of the spleen could be regarded as consisting of a connective-tissue framework supporting vascular and lymphatic components.

The connective-tissue framework comprises the capsule, the trabeculae, and the reticular fibres of the splenic pulp-all in continuity. With the inter-connecting lacework of trabeculae, blood vessels are carried into the pulp. There are very few muscle cells in the connective tissue of the human spleen; the trabeculae consist of collagenous white fibrous tissue and yellow elastic tissue.

The branches of the splenic artery ramify throughout the substance of the spleen in the trabeculae. Some branches leave the trabeculae and acquire a periarteriolar sheath of lymphatic tissue which is enlarged in places to form lymphatic follicles (Malpighian bodies). These vessels are known as the central (or white pulp) arteries. The lymphatic sheaths and

The arterioles break up into several branches that reach the red pulp and subdivide further into penicilli. Near their termination some of these present a typical thickening consisting of phagocytic cells surrounding the endothelium (Ledingham, 1978). Beyond the sheath the vessels transport the blood to the sinusoids of the red pulp. This part of the circulation may be 'closed' (the capillaries open directly into the sinusoids), or 'open' (the blood passes through the spaces between the cells of the splenic cords in the red pulp and is only then collected in the sinusoids). It is likely that the circulation is 'open' when the spleen is distended (full of blood), whereas a 'closed' circulation is established when there is little blood flowing through the spleen (Junqueira, Carneiro, 1980) (Fig. 4).

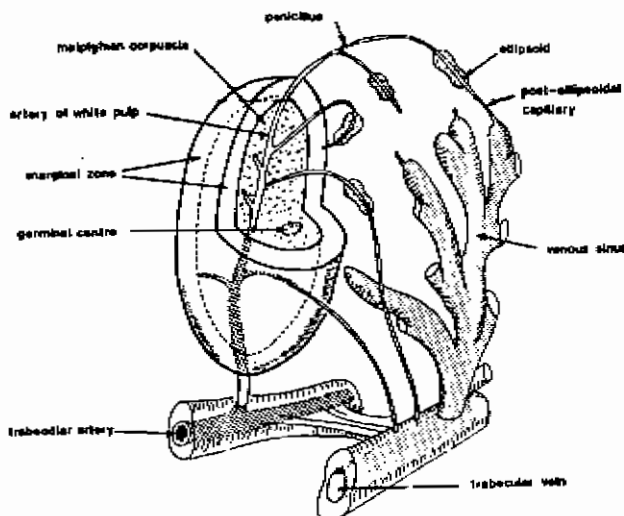


Fig. 4: The interior structure of the spleen
(modified from Ledingham and Mackay ; 1978).

PHYSIOLOGY OF THE SPLEEN