International Journal of Research and Review
www.ijrrjournal.com E-ISSN: 2349-9788; P-ISSN: 2454-2237

Case Study

Anatomical Variations in Spleen- A Cadaveric Case Study

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ABSTRACT

The spleen is lymphatic organ in the human body. Spleen is connected to the blood vascular system. It serves as a filter for blood and plays vital role in the immune responses of the body. It is wedge shaped organ located mainly in the left hypochondrium and partly in the epigastrium. It is wedged in between fundus of the stomach and the diaphragm. There are variations in the size, shape, notches etc of the spleen. Sometimes spleen may be wedge shaped or tetrahedral in shape. In this cadaveric case study during the routine dissection of Ist year undergraduate students at Dr. J. J. Magdum Ayurved Medical college, Jaysingpur, Maharashtra, India, spleen was found in normal position. But the anterior end of the spleen was pointed which is generally broad like a border. Also, the notch at the superior border of the spleen was also absent. And finally the shape of the spleen was nearly curved. These three variations were found in approximately 60 years old male cadaver during the dissection. So, it is necessary to study these variations. Different variations in the morphology of the spleen are mentioned in various studies previously. But in this cadaveric case study three variations were denoted in terms of shape, notch and anterior end of the spleen.

Key Words: Spleen, variations in shape, notch and anterior end, wedge or tetrahedral

INTRODUCTION

The spleen consists of a large encapsulated mass of vascular and lymphoid tissue situated in the upper left posterior region of the abdominal cavity between the fundus of the stomach and the diaphragm. After fixation in situation, its shape varies from a slightly curved wedge to a tetrahedron, depending on how much it was invented by the neighbouring colon at the time of death, the shape of the spleen being largely molded by the surrounding structures. Its long axis lies approximately in the plane of the tenth rib, its posterior border being about 4 cm from the mid-dorsal line at the level of the tenth thoracic vertebral spine; its anterior border reaches the mid-axillary line. The size and weight of the spleen vary with age, with the individual and in the same individual under different conditions. In the adult it is usually about 12 cm long, 7 cm broad and 3-4 cm wide. It tends to diminish in size and weight in older people. Its average adult weight is about 150

g (normal range: 80-300 g, largely reflecting its blood content).

The spleen has two major functions: the removal of particulate material including ageing erythrocytes from the circulation, and the provision of lymphocytes and antibodies as part of the body's system of secondary lymphoid tissues. Both of these activities are shared with other organs in the body, so the spleen is not essential to survival, although its removal diminishes the body's defense against disease.

TOPOGRAPHY AND RELATIONS OF THE SPLEEN -

The spleen has diaphragmatic and visceral surfaces, superior and anterior borders and inferior and posterior extremities. The diaphragmatic surface, which is convex and smooth, faces posterosuperiorly and to the left, except at its posterior edge which faces slightly medial. It is related to the abdominal surface of the diaphragm which separates it from the lowest part of the left lung and pleura and the ninth to eleventh left ribs. The pleural costodiaphragmatic recess extends down as far as its inferior border. The visceral surface facing the abdominal cavity, presents gastric, renal, pancreatic and colic impressions. The gastric impression, directed anteromedially and upwards, is broad and concave where the spleen abuts on to the posterior aspect of the stomach, from which it is separated by a recess of the greater sac. Near the inferior limit of the spleen is the hilum, a long fissure pierced by several irregular apertures through which vessels and nerves of the spleen enter and leave. The renal impression, which is slightly concave, is located on the lowest part of the visceral surface and is separated from the gastric impression above by a raised margin. It faces inferomedially and slightly backwards, being related to the upper and lateral area of the anterior surface of the left kidney and sometimes to the superior pole of the left suprarenal gland. The colic impression, at the extreme lateral end of the spleen, is usually flat and is related to the left colic flexure and phrenicocolic ligament. The pancreatic impression, small when present, is situated between the colic impression and the lateral part of the hilum; it is related to the tail of the pancreas which lies in the lienorenal ligament. The superior border, separating the diaphragmatic surface from the gastric impression, is usually convex and, near its lateral end, has one or two notches indicating the lobulated form of the spleen in early fetal life. The inferior border separates the renal impression from the diaphragmatic surface and lies between the diaphragm and the upper part of the left kidney's lateral border. More blunt and rounded than the superior border, it corresponds in position to the eleventh rib's lower margin. The posterior extremity usually faces the rounded vertebral column. The anterior extremity is more expanded and commonly forms a margin connecting the lateral ends of the upper and lower borders. It is related to the left colic flexure and to the phrenicocolic ligament. The spleen is almost entirely covered by peritoneum, which adheres firmly to its capsule. Recesses of the greater sac separate it from the stomach and left kidney. It develops in the upper dorsal mesogastrium, remaining connected to the posterior abdominal wall and stomach by two folds of peritoneum, respectively the lienorenal ligament and the gastrosplenic ligament. The lienorenal ligament is derived from peritoneum where the wall of the general peritoneal cavity meets the omental bursa between the left kidney and spleen; the splenic vessels lie between its layers. The gastrosplenic ligament also has two layers, formed by the meeting of the walls of the greater sac and the omental bursa between spleen and stomach; the short gastric and left gastro-epiploic branches of the splenic artery pass between its layers. Most laterally the spleen is in contact with the phrenicocolic ligament.

The spleen is also covered externally by a series of connective tissue bars (trabeculae); they ramify throughout the whole structure to create a fibrous skeleton

supporting its delicate tissues, which include both lymphoid tissues (white pulp) and extensive areas of blood-filled tissue (red pulp). In the living the spleen is soft and friable, and is dark purple because of the considerable amount of blood within its substance.

Near the spleen, especially within the gastrosplenic ligament and greater omentum, small encapsulated nodules of splenic tissue may occur, isolated or connected to the spleen by thin bands of similar tissue. Such accessory spleens or spleniculi may be numerous and widely scattered in the abdomen. The spleen may retain its fetal lobulated form or show deep notches on its diaphragmatic surface and inferior border in addition to those usually present on its superior border.

SURFACE ANATOMY -

The position of the spleen in the living can be assessed by percussion; the dull area extends over the ninth to eleventh ribs in vertical extent and should not go forward beyond the midaxillary line. The normal spleen is not palpable.

VESSELS AND NERVES OF THE SPLEEN -

Arteries

The spleen receives its blood from the splenic artery, a large tortuous branch of the coeliac artery. After giving off various minor branches to the pancreas and stomach, this vessel divides in the lienorenal ligament shortly before reaching the spleen into two or three main branches from which four, five or more segmental branches enter the spleen's hilum to supply a territory within it termed a splenic segment. Within each segment, the artery ramifies in the trabeculae to supply the parenchyma and capsule of the spleen. The pathway of blood beyond this point is considered later.

Veins

The minor veins pass from the red pulp of the spleen into the trabeculae, and thence into segmental veins running alongside the segmental arteries. On leaving the hilum, they continue in company with the arterial branches, draining into the main splenic vein in the lienorenal ligament. After receiving venous tributaries from various sources, the splenic vein usually drains directly into the hepatic portal vein.

Lymphatics

These drain along the splenic trabeculae to pass out of the hilum into the lymphatic vessels accompanying the splenic artery and vein. They take splenic lymph to the pancreaticosplenic and coeliac nodes.

Nerves

The coeliac sympathetic plexus gives off nerve fibres which pass along the splenic artery and its branches as a surface plexus, to enter the hilum and run with the segmental arteries and their branches. These fibres appear to be mainly noradrenergic vasomotor, concerned with the regulation of blood flow through the spleen; adrenergic agonists inhibit the concentration of red cells in the splenic blood indicating that sympathetic activity causes an increase in the 'fast' circulation of the spleen as opposed to slow filtration. The presence of other neural connections has not been demonstrated. [1]

VARIATIONS IN SPLEEN-

Accessory spleen or spleniculi may be found in the derivatives of the dorsal mesogastrium i.e. gastrosplenic, lienorenal and Gastrophrenic ligament and also in greater omentum, broad ligament of the uterus and in the spermatic cord. The variations can be seen in size, shape and notches of the spleen. [1,2]

CADAVERIC CASE STUDY-

During the routine dissection of the first year undergraduate students at the dissection hall of Dr. J. J. Magdum Ayurved Medical College, Jaysingpur, Maharashtra, India, spleen was found in normal position. But the anterior end of the spleen was pointed which is generally broad like a border. It was directed downwards and forwards. Also, the notch at the superior border of the spleen was also absent. The notches at the intermediate and inferior border were also not significantly marked. And finally the shape of the spleen was

nearly curved. The posterior end of the spleen was moderately broad which is generally rounded and was directed upwards, backwards and medially. These variations were found in approximately 60 years old male cadaver during the dissection

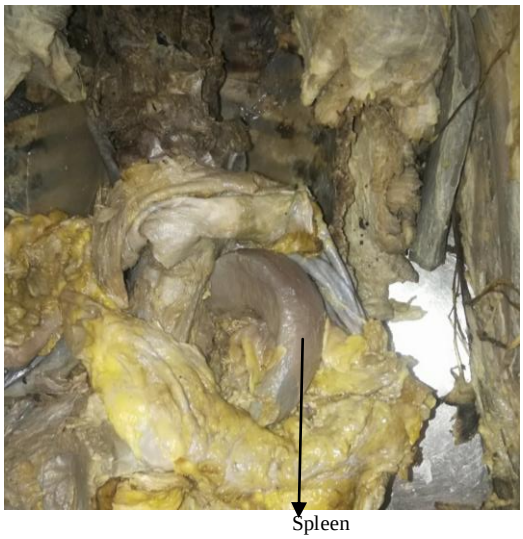

Photo 1 – Location of Spleen in the Cadaver

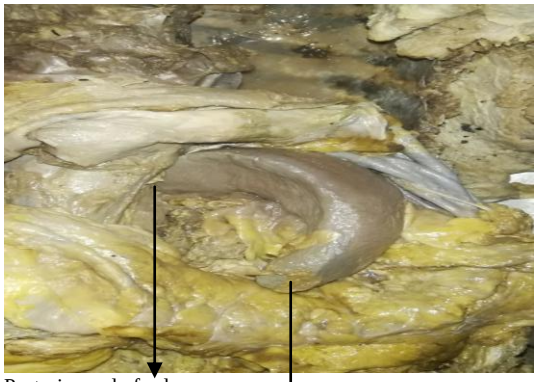

Photo 2- Two ends of Spleen

Photo 3- Absence of notch at superior border and curved shape of Spleen

DISCUSSION

Spleen is also called as Lien in Latin and Splen in Greek terminologies. It is wedge shaped organ and sometimes tetrahedral in shape. Its shape is largely molded by surrounding structures and also it is invented by the neighbouring colon. It is soft, highly vascular and dark purple in colour. The size, shape and weight of the spleen are markedly variable. Normally spleen is not palpable. In this single cadaveric case study, spleen was nearly curved in shape with pointed anterior end and devoid of notch at the superior border. No accessory spleen or splenic tissue was found in the cadaveric study. Lobulated appearance of the spleen is also in existence as it develops from mesoderm. During the development different lobules are formed which gets fuse with each other in the further development. This information of the morphological variations in the spleen is crucial for the clinicians in the practice. [1,3]

CONCLUSION

The spleen is important lymphoid organ in the human body. It performs the functions like Phagocytosis; Hemopoiesis also deals with the immune response of the human body and storage of RBCs. Anatomically its size, shape etc. may be variable. As noted in this study that, anterior end of the spleen was pointed which is generally broad. The notch was absent at the superior border of the spleen and general shape of the spleen was moderately curved. The knowledge about the different variations of the spleen is vital for the clinicians, surgeons while doing any surgical course of action related to the spleen. Also this information can be useful in doing any radiological process. Finally, anatomists can also get the note regarding the variations of the spleen for the dissection purpose. As this is single cadaveric case study, further research can be

more beneficial on a larger scale to study the different anatomical variations in the spleen.

ACKNOWLEDGEMENT

The coauthors and nonteaching staff in the department of Rachana Sharir (Anatomy) at Dr. J. J. Magdum Ayurved Medical College, Jaysingpur, Maharashtra, India has helped in this study.

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How to cite this article: Kulkarni SP, Kulkarni AA, Kalavade VA et.al. Anatomical variations in spleen- a cadaveric case study. International Journal of Research and Review. 2019; 6(3):94-98.

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