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ANATOMICAL VARIATIONS OF SPLEEN IN NORTH INDIAN POPULATION AND ITS CLINICAL SIGNIFICANCE

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ABSTRACT

There is a wide range of congenital anomalies of the spleen. Some are common, such as splenic lobulation and accessory spleen. Other less common conditions, such as wandering spleen and polysplenia, have particular clinical significance. The spleen, in healthy adult humans, is approximately 11 centimetres (4.3 in) in length. It usually weighs between 150 grams. It is covered from all the sides by peritoneum and is closely related to the fundus of the stomach, left kidney, left colic flexure and the diaphragm. Anatomical variations spleen in 32 cadavers (23 males and 9 females) obtained during routine dissection classes of undergraduate medical students in Govt. Medical College, Ambedkar Nagar U.P. and S.R.M.S. Institute of Medical Sciences, Bareilly U.P. Variations were observed in 13 spleens (40.6%)in which 3 spleens (9.3%) found multiple lobes and notches were present on the superior border of spleen, 4 spleens (12.5%) present deep notches on inferior border, 2 spleen (6.2%) showed deep notches on medial border, 2 spleen had shape similar to liver (6.2%). The findings of the study may be gainfully utilised by imaging specialists and surgeons, respectively to avoid possible errors in interpretations and subsequent misdiagnosis, and to assist in planning appropriate surgical approaches.

INTRODUCTION

Spleen is the largest lymphoid organ in the body. It is situated in the left hypochondrial region. It is wedge shaped and has two ends i.e. anterior and posterior, two surfaces i.e. diaphragmatic and visceral, and three margins i.e. superior, inferior and intermediate. The superior margin of the spleen possesses characteristic notches. The normal adult human spleen is about 1 inch thick, 3 inches broad, 5 inches long and 7 ounces in weight. Normally spleen is not palpable. Congenital anomalies of the spleen are believed to be rare and include absence of the spleen, splenic lobulation, duplication, displacement (splenoptosis or wandering spleen), polysplenia and presence of one or more accessory spleens. The most common of the splenic anomalies is the occurrence of accessory spleens, with incidence rate ranging between 10% and 30% in autopsy series [1, 2], whereas a wandering spleen and polysplenia are less common. Aim of the present study is to find out the anatomical variations of spleen occurring in North Indian Population. One of the most common congenital anomalies of the spleen is the presence of accessory spleens in various parts of the abdomen in addition to the main organ reported by Gayer et al., 2006[3] .

MATERIALS AND METHODS

This study was structured to investigate the gross anatomical variations in 32 formalin fixed cadaveric spleen (23 males and 9 females) obtained during routine dissection classes of undergraduate medical students in Govt. Medical College, Ambedkar Nagar U.P. and S.R.M.S. Institute of Medical Sciences, Bareilly U.P. The cadavers were dissected in the abdominal region. The dissection was done starting with skin incision followed by opening of the peritoneal cavity. In this study we observed anomalies, length, breadth and thickness of spleen. The organ was also observed for its abnormal shape and presence of notches on its superior, inferior and medial borders. This was an observational study with no usage of any experimental instruments. Appropriate measurements were taken by calipers and measuring tape and the specimens were photographed the findings were appropriately documented.

RESULTS

In the present study, out of 32 spleens 19 spleens (59.3%) were found to be normal and variations were observed in 13 spleens (40.6%). In our study 3 spleens (9.3%) found multiple lobes and notches were present on the superior border of spleen (figure: 1), 4 spleens (12.5%)

present deep notches on inferior border (figure: 2b, 3a), 2 spleen (6.2%) showed deep notches on medial border (figure: 2a), 2 spleen had shape similar to liver (6.2%) (Figure: 3b) and 1 spleen (3.1%) was pyramidal shaped with presence of notch on inferior border (figure: 3a) and one of the spleen (3.1%) was small sized 2.7 inches in length (figure: 4). Table: 1 shows percentage incidence of anatomical variations of spleen in North Indian Population.

Table: 1 Percentage incidence of anatomical variations of spleen out of 32 cadavers.

S.No.	Types of variations	No. of Spleen	Percentage%
1.	Notches in Inferior border	4	12.5%
2.	Multilobed/Many notches in superior surface	3	9.3%
3.	Notches in Medial border	2	6.2%
4.	Liver shape and Pyramidal shape spleen	3	9.3%
5.	Abnormal small size	1	3.1 %

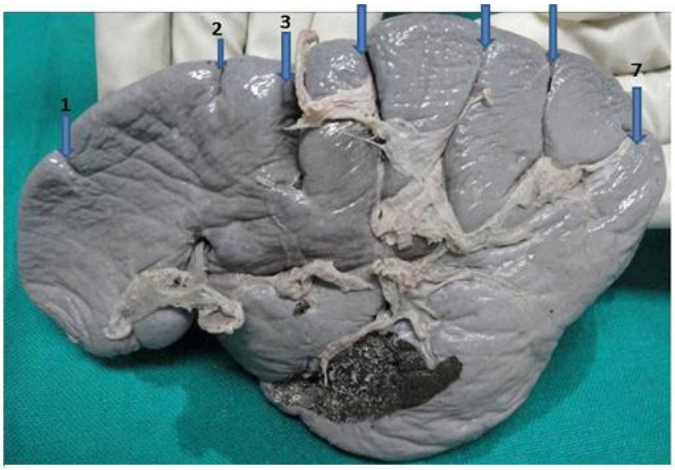

Figure:1. Visceral surface of spleen showing multilobed spleen and notches (1,2,3,4,5,6and7) on the superior border with arrow.

Figure: 2a.Visceral surface of spleen showing deep notch on medial border with arrow.

Figure:2b.Visceral surface of spleen showing deep notch on inferior border with arrow.

Figure:3a. Visceral surface of spleen showing pyramidal shaped spleen and deep notch on inferior border with arrow.

Figure:3b. Diaphragmatic surface showing "liver shaped" spleen.

DISCUSSION

In this era of imaging and minimally-invasive approaches, it is imperative on the part of both the radiologists and operating surgeons to have a thorough knowledge of the anatomy and the commonly-occurring variations in this organ. Spleen develops from the coelomic epithelium of the cranial part of the left leaf of the dorsal mesogastrium in the sixth week of intra-uterine life studied by Sadler, 2000[4]; Standring, 2005[5]. During the early phase of development, the spleen is represented by a few splenic nodules which eventually fuse to form the spleen. Some of these nodules may develop independently. This will lead to formation of accessory spleens. The embryological reason for having notches on the superior margin is the improper fusion of the splenic nodules along this margin during development. Until recently, the spleen was considered to be a less significant organ but now it is known to be important in circulatory and immune systems [6]. Ivan

Varga et al 2009[7] studied the congenital anomalies of spleen like lobular spleen, accessory spleen, ectopic spleen, wandering spleen, polysplenia, asplenia and splenogonadal fusion. Weiand & Mangold 2003[8] reported accessory spleens are present in about 10-15% of individuals, out of which 1-2% may be located in the tail of the pancreas. Souparis et al., 2002[9] studied presence of retroperitoneal accessory spleens may mimic retroperitoneal tumors with the history of epigastric pain, intermittent nausea and vomiting. Radiologists should be aware of this condition in order to avoid diagnosing, incorrectly this ectopic tissue as metastasis, adenopathy or another solid tumor studied by Gigot J 1998 [10]. Hakk Maummer Karakas et al 2005[11] studied splenic abnormalities on CT scan and MRI. They found the congenital variations of spleen like asplenia and polysplenia syndrome. Both anomalies were associated with multiple system and organ anomalies including the liver and heart. In the current studied by Satheesha Nayak B 2011[12] only 50% of the spleens presented with a notched superior margin. In the previous studies splenic notches on the superior margin were seen in 78.6% by Skandalakis et al.1993[13], 70% by Soyluolu et al.1996[14] and 95% by Ungör et al. 2007[15] of cases respectively. In our study we saw splenic notches only in 59.3% of cases and this were the lowest percentage reported in comparison to above authors. In our observations, we as anatomists feel that standard anatomy textbooks should incorporate the fact that presence of notches is confined not only to superior border but they can also be found in the inferior border. Presence of notches in the inferior border may be important for surgeons attempting splenic surgeries and radiologists interpreting CT scans.

Figure:4 Visceral surface showing an abnormally small spleen.

CONCLUSION

This study highlights the anatomical variations, developmental anomalies of spleen existing in North Indian population which forms a cornerstone for safe and effective surgery. Knowledge of the aforementioned anatomical variations is useful in laparoscopic surgeries. These sorts of anomalies should be kept in mind during clinical evaluations like splenomegaly, splenic traumas and Lymahadenopathy in clinical or imaging evaluations.

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