



Case Study

A RARE CONGENITAL SPLENIC FISSURE: INSIGHTS FROM A CADAVERIC STUDY

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ABSTRACT

The spleen, an important organ of the immune and circulatory systems, lies in the left hypochondriac region between the 9th and 11th ribs. It develops from the mesoderm as distinct lobules, which later fuse. In adults, residual notches along the superior border indicate this early lobulated stage. Congenital anomalies such as persistent lobulation, accessory spleens, and polysplenia are generally asymptomatic. **Case Findings:** During routine cadaveric dissection, a rare anatomical variation was observed- a sharp fissure measuring approximately 2cm in depth along the superior border. This fissure separated a distinct lobule on the diaphragmatic surface extending to the visceral surface. Such deep clefts occur in about 10% of individuals, but this presentation was unusually well- defined. **Diagnosis and Management:** The fissure was identified as a possible congenital anomaly, with no clinical symptoms and no intervention required. **Clinical Significance:** Knowledge of splenic morphology, including variations in notches and fissures, is essential for accurate diagnosis and surgical planning. Persistent fissures may be mistaken for traumatic lacerations or pathological lesions on imaging. This case highlights the importance of recognising rare congenital variations to avoid diagnostic errors and ensure safe clinical management.

INTRODUCTION

The spleen is the largest organ of the lymphatic system and plays a crucial role in both the immune and circulatory systems. It is positioned in the left hypochondriac region of the abdominal cavity, nestled between the fundus of the stomach and the diaphragm, and lying relatively below the left costal margin, between the 9th and 11th ribs. Anatomically, it rests on the upper pole of the left kidney and the tail of the pancreas. The spleen is divided into anterior and posterior segments and, in an average adult, is wedge-shaped, measuring approximately 12.5cm in length, 7.5cm in width, and 2.5cm in thickness.

The organ possesses three distinct borders- superior, inferior, and intermediate. The superior border is notable for its anterior notch, a reliable

anatomical feature often used in clinical practice to identify splenomegaly and to distinguish the spleen from adjacent structures. Typically, such notches are shallow; rarely do they extend deeply enough to form fissures or separate the organ into multiple lobes. Notches along the intermediate or inferior borders are uncommon, and when present, they can create diagnostic challenges in differentiating the spleen from neighbouring structures such as the stomach and left kidney. Deep fissures, when they occur, may also retain fluid, which on radiological imaging can be mistaken for traumatic lacerations. The inferior border is rounded, while the intermediate border is also rounded and directed towards the right side.

Developmental Anatomy of the Spleen: The spleen originates from mesenchymal cells within the dorsal mesogastrium during the fifth week of embryonic development. It begins as a mesenchymal condensation located above the tail of the developing pancreas. The early primordia of the spleen form as isolated clusters of mesenchymal cells within the left dorsal mesogastrium, arising as an elevation due to local thickening of the surrounding mesothelium.

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Mesothelial cells migrate into the underlying mesenchyme, which becomes densely cellular and vascularised.

Initially, the foetal spleen is lobulated, with these lobulations typically regressing before birth as the organ's surface becomes smooth. The fusion of splenic lobules (or primordia) continues after birth, and incomplete fusion can result in persistent lobulation or deep fissures in the adult organ. Such anomalies represent a developmental "stagnation," where the spleen retains features of its foetal morphology.

Anatomical Variations of the Spleen: Anatomical variations of the spleen are relatively uncommon compared to other abdominal organs, but they do occur. The most frequent variations involve differences in shape, size, or position, most of which are clinically insignificant. Documented congenital anomalies include:

- Shape anomalies– Persistent lobulations, deep notches, and clefts.
- Accessory spleens (splenunculi)– Small nodules of splenic tissue separate from the main organ.
- Wandering spleen– Due to laxity or absence of ligamentous attachments.
- Polysplenia– The presence of multiple small spleens, often associated with other congenital anomalies.

Among these, accessory spleens are the most common, occurring in up to 10– 30% of individuals, usually near the hilum or tail of the pancreas.

Persistent lobulation or deep fissures along the splenic border is a less common anomaly. In the majority of cases, splenic notches are shallow, particularly along the superior border, and serve as an important palpatory landmark in splenomegaly assessment. Occasionally, however, these notches may be unusually deep-extending 2–3cm into the parenchyma- and may approach or even reach the hilum. When present, such fissures can create the impression of a bilobed or multilobed spleen.

Deep fissures have limited clinical implications but are important to recognise in radiology and surgery. On imaging, especially in the context of abdominal trauma, a deep congenital fissure can mimic a laceration, potentially leading to unnecessary intervention. In rare cases, deep fissures may also be misinterpreted intraoperatively as traumatic or pathological changes.

Although the occurrence of deep fissures on the diaphragmatic surface has been documented, they are rare, seen in only about 10% of individuals. Persistence of developmental lobules is the most likely explanation, reflecting incomplete fusion of splenic primordia.

Clinical and Developmental Significance: An understanding of splenic anatomy and its possible variations is critical in multiple clinical contexts- ranging from physical examination to radiological interpretation and surgical intervention. In physical examination, the presence and location of notches aid in differentiating an enlarged spleen from adjacent organs. In imaging, awareness of congenital variations prevents misdiagnosis of deep fissures or accessory spleens as traumatic injuries or neoplasms.

From a developmental perspective, such variations are a reminder of the complex embryogenesis of the spleen and the persistence of foetal morphological features in some individuals. While most variations are asymptomatic and discovered incidentally- often during dissection, imaging, or surgery- they can sometimes influence clinical decision-making, particularly in trauma care, oncological surgery, or haematological disease management.

Rationale for Current Study: Although accessory spleens and other anomalies such as multiple fissures have been well-documented, fewer studies have focused specifically on lobulated spleens or persistent deep fissures. Existing literature suggests that deep fissures along the diaphragmatic surface are rare and present in a small proportion of the population. Given their potential for diagnostic confusion and surgical relevance, it is important to document such findings and evaluate their frequency in both clinical and cadaveric settings.

Given this, the current study investigates the prevalence of splenic congenital abnormalities, paying special attention to profound fissures and chronic lobulation. By highlighting such variations, we aim to improve anatomical understanding, enhance diagnostic accuracy, and contribute to safer surgical and radiological practice.

Case History

During routine dissection carried out in the Department of Sharir Rachana, National Institute of Ayurveda, Deemed University, Jaipur, a longitudinal fissure (as shown in fig. 1.1) of about 2cm in depth along superior border, which is not usual that makes a differentiated lobule (as shown in fig. 1.2) at diaphragmatic surface extended to visceral surface was noted in 70-year-old formalin fixed female cadaver of North Indian origin. The spleen apparently looked healthy and measured 14cm in length, 10cm in breadth and 4cm in thickness (as shown in fig. 1.3). Additional to morphological variation of spleen, the deep costal impression is present on the anterolateral surface of liver along with irregular inferior border and the

comparative size ratio of anatomical left and right lobe of liver is unusual.

MATERIALS AND METHODS

A routine dissection was performed on the cadaver and observed that the morphology of spleen

Figures of Spleen

was variant from the other dissected and formalin fixed spleen specimen. A lobulated structure is formed by the notch at superior border, which is the remnants of foetal spleen.



Fig. 1.1 Postero-lateral view: Longitudinal fissure at superior border



Fig 1.2 Visceral Surface: Differentiated Lobule



Fig. 1.3 Anatomical Position: Observed measurements of spleen

DISCUSSION

The spleen exhibits considerable variation in size, shape, position, fissures, and weight depending on age, individual differences, and physiological conditions. In adults, it typically measures 12–14cm in length, 7–9cm in breadth, and 3–4cm in thickness, with an average weight of about 150gm (range: 80–300gm, depending largely on blood content). While the organ's shape usually ranges from wedge-like to tetrahedral, the superior border characteristically bears notches-remnants of foetal lobulation- resulting from incomplete fusion of splenic primordia during development. Normally, lobulation disappears before birth, but persistence can manifest as accessory lobules or deep fissures. Fissures are rare, particularly on the diaphragmatic surface, with a reported incidence of around 10%.

In the present case, a distinct longitudinal fissure was noted between the superior and inferior borders on the diaphragmatic surface, dividing it into two lobes. Such anatomical variations are clinically relevant, as deep fissures may be mistaken for traumatic lacerations or pathological masses on imaging. Fluid accumulation within these fissures can further complicate radiological interpretation. Accessory lobules may also mimic renal or adrenal lesions. Awareness of these variants is crucial for

radiologists to avoid misdiagnosis and for surgeons to preserve splenic tissue during operative procedures.

CONCLUSION

The presence of abnormal fissures and lobes may lead to misdiagnosis. Understanding the notches on the spleen's margins aids radiologists in identifying blunt splenic injuries, surgeons in spleen transplantation, and doctors in palpating the enlarged spleen and distinguishing it from surrounding organs.

In the blunt trauma of the upper abdomen, fissures and lobes of spleen might confuse the radiologists in interpretation of radiological findings especially. It's merely a structural modification with no physiological effects. To correctly understand the genesis of anomalies and birth defects, there is need to first have knowledge of normal prenatal development. To improve diagnostic and therapeutic accuracy this knowledge of anatomical variations is of vital importance.

Nevertheless, this knowledge is very important for anatomists during their routine classroom dissections. To correctly understand the genesis of anomalies and birth defects, there is need to first have knowledge of normal prenatal development.

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