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Original Research

Evaluation of congenital abnormalities of spleen: A cadaveric study

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***ABSTRACT*:**
Background: The spleen is vital lymphatic organ in the human body which located in the left hypochondrial region. Currently, its anatomical variation with immunological and hematological functions for its clinical significance gets attention. The aim of this study was to assess the congenital abnormalities of spleen in adult human cadaver. **Materials and methods:** For the study, we studied 90 cadavers with respect to the location, blood supply and any congenital variations in the spleen. All the observations during the study were noted for further analysis. **Results:** In the present study, we studied 90 spleens. Out of the 90 spleens, we observed that 76 spleens were normal in their location and had arterial supply from a single splenic artery (Table 1). However, we observed 9 cases of Accessory spleen and 5 cases of multilobulated spleen. The results were statistically non-significant. **Conclusion**: From the results of present study this can be concluded that multilobulated spleen even though is a rare anomaly can occur in patients generally. 45More accurate knowledge of splenic variations is of fundamental importance to improve diagnostic and therapeutic approaches.
Keywords: Accessory spleen, spleen, congenital abnormality, multilobulated spleen.

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INTRODUCTION

The spleen is vital lymphatic organ in the human body which located in the left hypochondrial region.[1] It has three surfaces: diaphragmatic, gastric and renal surface and the two borders: superior and inferior. [1] The gastric surface meets the diaphragmatic surface on the superior border. The renal surface is marked by renal impression. This surface meets gastric and diaphragmatic surfaces respectively on the inferior border and a margin close to the splenic hilum. [2] The spleen removes old erythrocytes, white cells and platelets. It plays vital roles in regard to blood storage, formation of lymphocyte and defense against foreign particles. [3] The spleen is the major accumulation of lymphoid tissue in the human body, an organ which prenatally produces and postnatally controls blood cells. Normally, a developed spleen lies in the upper left quadrant in parallel with the long axis of the 10th rib. It is a mesodermal derivate which first appears as a condensation of mesenchymal cells inside the dorsal mesogastrium at the end of the fourth embryonic week. Some congenital anomalies of the spleen are common, such as splenic lobulation and accessory spleen, while other conditions are rare, such as wandering spleen and polysplenia. Splenogonadal fusion is also a rare developmental anomaly, resulting from abnormal fusion of the splenic and gonadal primordia during prenatal development. [6] Hence, the present study was conducted to assess the congenital abnormalities of spleen in adult human cadaver.

MATERIALS AND METHODS

The study was conducted in the Department of Human Anatomy. For the study, we studied 90 cadavers with respect to the location, blood supply and any congenital variations in the spleen. The study was done during the routine abdominal dissection of the cadavers during first year lectures.

PROCEDURE FOR INSPECTION OF SPLEEN

First the peritoneum was opened and stomach was delineated. To locate the position of the spleen, we observed the fundic portion of the stomach and after the spleen was located, we further traced the branches of splenic artery from celiac trunk to the spleen to check for any possible anomalies or variations.

Furthermore, spleen was also observed for any abnormality with respect of shape, presence of lobulation, presence of any notches over its superior, inferior and medial bodies, and presence of any accessory splenic tissue. All the observations during the study were noted for further analysis.

The statistical analysis of the data was done using SPSS version 11.0 for windows. Chi-square and Student's t-test were used for checking the significance of the data. A p-value of 0.05 and lesser was defined to be statistically significant.

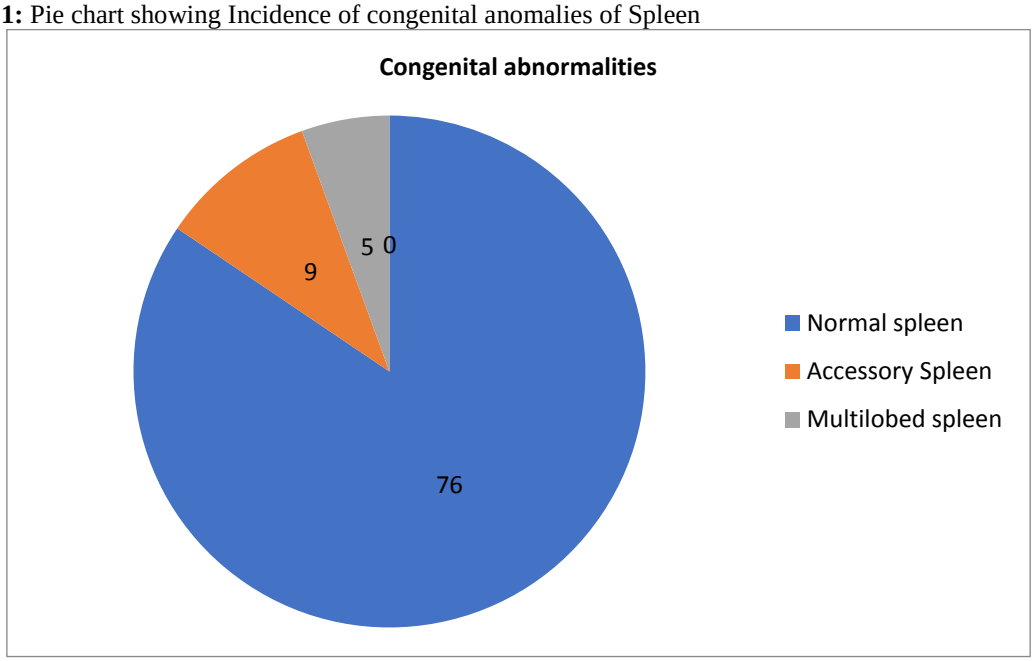
RESULTS

In the present study, we studied 90 spleens. Out of the 90 spleens, we observed that 76 spleens were normal in their location and had arterial supply from a single splenic artery (Table 1). However, we observed 9 cases of Accessory spleen and 5 cases of multilobulated spleen. (Fig 1) Congenital anomalies of the spleen were detected in 14 cases, accounting for 15.5% .

Table 1: Observation after inspecting the spleen in different cadavers

Characteristics of spleen	Number of observations	p-value
Normal spleen	76	0.45
Accessory Spleen	9	
Multilobed spleen	5	
Total	90	

Graph 1: Pie chart showing Incidence of congenital anomalies of Spleen



DISCUSSION

The congenital absences of spleen (splenic agenesis), congenital hypoplasia, lobulation, polysplenia, accessory spleen (spleniculi) are congenital malformation of the spleen. These malformations usually occur as a result of some changes which occur in the process of development of spleen. The spleen begins to develop during the sixth week of fetal life from a mass of mesenchymal cells originating in the dorsal mesogastrium. Rotation of the stomach and growth of the dorsal mesogastrium translocate the spleen from the midline to the left side of the abdominal cavity. Rotation of the dorsal mesogastrium establishes a mesenteric connection, the splenorenal ligament, between the spleen and the left kidney. Splenic lobulation is a rare anomaly, this low rate could be due to the fact that fetal splenic lobulation normally disappears before birth but sometimes may persist, causing a prominent lobule and may be erroneously interpreted for a mass in the abdomen. The gastrosplenic and splenorenal ligaments maintain the spleen in its anatomical position.

In the present study, we studied 90 spleens. Out of the 90 spleens, we observed that 76 spleens were normal in their location and had arterial supply from a single splenic artery (Table 1). However, we observed 9 cases of Accessory spleen and 5 cases of multilobulated spleen. The results were statistically non-significant. In present study 15.5% incidence of congenital abnormalities of spleen were observed. However Orlando et al observed 2.07% incidence. They observed Accessory spleens were observed in 44 patients (1.6%) and spleen lobulation in 11 (0.47%). An accessory spleen was the most common of the splenic anomalies. Among the 44 patients in

whom an accessory spleen was discovered laparoscopically, the recognition of this anomaly prevented a relapse of a hematological disease in one case and avoided a useless exploratory laparotomy in the second, where the radiologist had interpreted this malformation as a space-occupying lesion. In the third case, the accessory spleen was initially misdiagnosed as a solid tumor of the pancreas, but was eventually recognized as a congenital anomaly by a second laparoscopy.[10]

Mohammadi S et al evaluated the incidence of accessory spleen in Iranian cadavers. Sixty hundred and ninety three spleens (541 males, 152 females) were excised from cadavers. Fresh Iranian cadavers with no history of alcohol, poisoning or drug abuse, and no evidence of pathologic abnormality or injury to the spleen were included in study. The presence of accessory spleens, its dimension and weight investigated in cadavers. During routine postmortem examination, five cases with an accessory spleen were found in the autopsy. Of the cases, 3 were male and 2 were female. The accessory spleens were observed at the splenic hilum. The length of the accessory spleens ranged from 2-3.5 cm, while the range of width was between 0.5 and 2.5 cm. The accessory spleens were confirmed by histological examination. They concluded that an accessory spleen has clinical importance in some locations. When an accessory spleen is situated in another site, it may mimic some tumors such as pancreatic tumor and adrenal tumor.

Anderson C et al reviewed a series of 1042 reports of necropsies on children dying at Children's Hospital of Pittsburgh. In each case, note was taken of the status of the spleen, the lobation of the lungs, the arrangement of the bronchi, the morphology of the atrial appendages, and the presence of any congenital malformations of the heart and great vessels and of any malformations of the abdominal organs. There was isomerism of the left atrial appendages in eight (0.77%), 13 (1.25%) showed isomerism of the right appendages, and seven (0.67%) had multiple spleens without having isomerism of the atrial appendages. Unexpectedly, a normal spleen was found in one patient with isomerism of the right appendages and also in a patient with isomerism of the left appendages. In one patient with isomeric left atrial appendages there was no spleen. The review showed that the morphology of the atrial appendages, and hence the arrangement of the atria, is not accurately predicted by the type of spleen. The arrangement of the atrial appendages is the most reliable guide to the recognised combinations of congenital cardiac malformations previously described as "splenic syndromes". Because there is no certain way of predicting all the malformations in patients with complex congenital heart disease, it is advisable to record separately for each patient the details of lobation of the lungs, the bronchial and atrial arrangement, anomalies of the heart and great vessels, the type of spleen, and any abnormal arrangement of the abdominal organs. [7, 8]

Unver Dogan N et al investigated the incidence and distribution of AS during routine forensic autopsies. AS were investigated in 720 consecutive autopsy cases. Fifty-four AS were found in 48 (6.7%) cases. AS were found in hilum of the main spleen in 28 cases, the great omentum in 13 cases, the pancreas in 5 cases, and the pelvis in 2 cases. There were two AS in two cases and three AS in another two cases. Awareness of the possible presence of AS is important because when splenectomy is performed for some conditions such as immune thrombocytopenic purpura, failure to remove the AS may result in the failure of the condition to resolve. Additionally, during medical imaging, AS may be confused for enlarged lymph nodes or neoplastic growths.

Mallikarjun Adibatti et al in their study observed that all the spleens presented with a notched superior border. The presence of the notches on the superior margin is useful for the physician to palpate the spleen during enlargement of spleen.[11]

The notches or clefts on the superior border of the adult spleen are remnants of the grooves that originally separated the fetal lobules. These clefts can be sharp and are occasionally as deep as 2–3 cm. They may be erroneously interpreted as splenic laceration in patients with abdominal trauma. Multilobulated spleen should be kept in mind during clinical evaluations like splenomegaly, splenic traumas, lymphadenopathy and also in cases where splenectomy is required due care is needed to remove all the splenic lobules, otherwise the
residual lobules even though quite smaller may take the function there by nullifying the effect of splenectomy.

CONCLUSION

From the results of present study this can be concluded that multilobulated spleen even though is a rare anomaly can occur in patients generally. The radiographers should be aware of such congenital anomalies during evaluating routine radiographs. In the present era of laparoscopic splenectomy, more accurate knowledge of splenic variations is of fundamental importance to improve diagnostic and therapeutic approaches.

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