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Original Research Article

A histopathological study of spectrum of splenic lesions- An eleven year analysis of clinical and pathological aspects of splenectomy specimens in a tertiary care hospital

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ABSTRACT

Background: The spleen is the largest organ in the mononuclear phagocytic system which plays a prominent role in systemic inflammation, hematopoietic disorders, and metabolic disturbances. Our limited understanding of the pathological processes in the spleen is due to the recent changing trends in the indications for splenectomy and the limited number of splenectomy specimens available for examination. Splenectomies are rarely performed for diagnostic purposes and are usually done as a therapeutic procedure.

The aim of the study is to analyse the etiological factors responsible for splenectomy and correlate factors such as age, sex and indications with macroscopic and histopathogical features in splenectomy specimens.

Materials and Methods: The present study is retrospective in nature and studies the histomorphological patterns in 68 splenectomy specimens received at the department of pathology at a single tertiary care center in Southern India.

Results: It was found that the male: female ratio was 1.4:1. The age of patients ranged from 6 to 75 years and the mean age was 37 years. Traumatic injury was found to be the most common indication for splenectomy (32.35%) followed by hypersplenism and portal hypertension. Congestive splenomegaly was the most common pathology in the specimens studied while a few rare incidental lesions were encountered.

Conclusion: This study reflects the current trends in the indications and surgical pathology of splenectomy specimens in a tertiary care teaching center.The indications for splenectomy correlated well with the histological findings.

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1. Introduction

The spleen is a secondary lymphoid organ which serves in the removal of aged RBCs and immune surveillance against blood borne microorganisms. It is also a primary site of extramedullary hematopoiesis. Lesions of the spleen may involve the red pulp, the white pulp or both.[1,2]

Since, splenectomies are performed with decreasing frequency and very few pathologically abnormal spleens are available for examination for the pathologist, the surgical pathology of the spleen remains poorly understood. Primary diseases of the spleen are uncommon and most splenectomies are indicated for traumatic rupture, haemolytic anaemias, immune thrombocytopenic purpura (ITP) and chronic venous congestion. Primary and metastatic tumours involving the spleen are rare compared to the incidence in other major organs.[3]

Splenectomy is rarely performed as a diagnostic maneuver and is usually done with therapeutic intentions following an established diagnosis. In a few cases,

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splenectomy is performed without diagnostic intent, but histologic examination unearths an unexpected condition.[4]

2. Materials and Methods

All splenectomy specimens received in the histopathology department at a tertiary care centre in Southern India between March 2010 and March 2021 formed the basis of this study.

All the specimens were complete splenectomy specimens removed by open laparotomy. The indications for splenectomies along with the weight, size and the macroscopic descriptions of the specimens were noted from the workstation and request forms.

Spleens had been sectioned serially by bread loafing and re-fixed in 10% neutral buffered formalin. They had been processed and paraffin embedded after meticulous gross examination and stained. The Haematoxylin and Eosin stained slides were reviewed by the study pathologists. Fresh sections of tissue blocks were obtained and slides were restained when required. Data acquired from the examination of each the slides was analysed systematically and results obtained were compared to existing studies in literature.

Special stains such as Perl's Prussian blue and Periodic Acid Schiff stains were performed when necessary to make a conclusive opinion. As this was a retrospective study, ethical approval or informed consent was not required for this systematic review.

3. Results

Sixty-eight splenectomy specimens were received during the study period with a male: female ratio of 1.4:1. Age of the patients ranged from 6 to 75 years with the highest number of splenectomy cases in the third decade (25%) followed closely by the second decade (18%). Only four patients were in the pediatric age group (<12 years) while 12 cases were in the adolescent age group. Only 6 patients were in the elderly age group. (8.8%).

The most common indication in the pediatric age group was hypersplenism and in the adolescent age group was trauma followed by hypersplenism. The most common indications in adults and elderly patients were traumatic injury to the spleen and infection respectively

Weight of the spleen was recorded in 48 cases. The weight of most of the splenectomy specimens resected for trauma was within normal limits (Mean weight – 181g) while most spleens resected for hypersplenism and hematological disorders showed increase in the weight of the organ. The mean weight of spleens resected for hypersplenism and hematological diseases was 853g and476g respectively.

There was also a difference between weight of the splenectomy specimens of males and females. The mean weight of specimens obtained from males and females was 493g (based on 30 spleens with recorded weights), and 407 g (based on 18 specimens with recorded weights) respectively.

Macroscopic findings in spleens resected for trauma included capsular laceration with haemorrhage in 16 cases and subcapsular haemorrhage with an intact capsule in 6 cases.

On microscopy, all specimens of traumatic spleen showed evidence of congestion of the red pulp and subcapsular hemorrhage with neutrophilic infiltrate at the ruptured site. Additionally, 3 cases showed well defined infarcts which on histopathological examination showed vast areas of coagulative necrosis.

11 cases of splenectomy were indicated for hypersplenism without portal hypertension. Of these, 8 cases showed features of congestive splenomegaly. (Mean weight- 1000g) 1 specimen showed reactive hyperplasia, 1 specimen showed extramedullary hematopoiesis and 1specimen revealed an epithelial cyst. Among the 8 cases of spleens with portal hypertension, all the specimens on microscopy showed enlargement of the spleen (Mean weight -440g). Microscopy showed thickened capsule with expanded red pulp due to sinusoidal dilatation, atrophic white pulp and areas of hemorrhage and hemosiderin laden macrophages suggestive of chronic venous congestion.

When histopathological diagnoses were summarized (Table 3), it was seen that congestive splenomegaly was the most common pathology throughout with all spleens resected for portal hypertension, thalassemia and Immune thrombocytopenic purpura showing features of congested and enlarged red pulp with pronounced sinusoidal dilation and hyperplasia of reticuloendothelial cells with fibrous thickening of capsule and trabeculae (Figure 1).

Fourteen splenectomy specimens were cases of hematological disorders, of which ITP was the most common (7 cases) followed closely by Evans Syndrome (4 cases). Only 1 specimen was from the pediatric age group and was from a case of thalassemia. The specimens received for hematological disorders showed increase in size and weight (Mean weight- 476g) with a thickened capsule, marked fibrosis with partial effacement of white pulp, reticuloendothelial cell hyperplasia and increased hemosiderin-laden macrophages (Figure 1).

Features typical of congestive splenomegaly (Figure 1) were also noted in most cases of hypersplenism (73%) and Evans syndrome (75%) and even in 1 case of traumatic injury to the spleen.

Spleens resected in 2 cases of Non Hodgkin lymphoma (NHL) were performed for therapeutic purposes as one patient had associated Evans syndrome with massive splenomegaly (Weight- 3000g) and the other presented with features of hypersplenism.

Table 1: Age wise distribution of patients

Decade	Age range	No of cases	Percentage	Males	Females
1	0-10	4	5.8%	2	2
2	11-20	12	17.6%	8	4
3	21-30	17	25%	13	4
4	31-40	7	10.2%	5	2
5	41-50	10	14.7%	4	6
6	51-60	11	16.1%	6	5
7	61-70	5	7.3%	3	2
8	71-80	1	1.4%	0	1
Total		68			

Table 2: Indications of splenectomy

Indication of Splenectomy	No of cases	Percentage
Trauma	22	32.35%
Hypersplenism without portal hypertension	11	16.17%
Splenic abscess	10	14.7%
Hypersplenism with portal Hypertension	8	11.7%
Immune thrombocytopenic purpura (ITP)	7	10.3%
Evans syndrome	4	5.8%
Hereditary Spherocytosis	2	2.9%
Hydatid cyst	2	2.9%
Thalassemia	1	1.47%
Space occupying lesion	1	1.47%
Total	68	

Table 3: Histopathological diagnoses made on the splenectomy specimens

Histopathological Diagnosis	No of cases	Percentage
Congestive splenomegaly	29	42.6%
Normal histology with congestion and hemorrhage	18	26.4%
Splenic abscess	8	11.7%
Infarction	3	4.4%
Reactive Hyperplasia	2	2.9%
Non-Hodgkin Lymphoma	2	2.9%
Tuberculosis	1	1.47%
Hydatid cyst	1	1.47%
Lymphangioma	1	1.47%
Hamartoma	1	1.47%
Epithelial cyst	1	1.47%
Extramedullary hematopoiesis	1	1.47%
Total	68	

Of the 10 cases indicated for splenic abscess, 8 specimens on sectioning revealed a cavity with a thick wall filled with purulent material. Histopathological examination showed acute inflammatory infiltrate composed of numerous polymorphs in a necrotic background with perisplenitis.

One case clinically perceived to be a splenic abscess was diagnosed as an infarct and another case of spleen from a 75-year-old female showed a moderately enlarged spleen with multiple yellow nodules scattered in the splenic parenchyma. Microscopy showed extensive caseous necrosis surrounded by granulomas composed of epithelioid histiocytes, multinucleated giant cells and chronic inflammatory infiltrates. Acid fast bacilli were however not seen.

Of the two cases clinically diagnosed as hydatid cyst, one case showed the presence of echinococcus granulosus in the spleen in a 60-year-old female patient. On macroscopic examination, the spleen showed a pearly white hydatid cyst membrane. Microscopically, an acellular thick eosinophilic outer membrane and an inner germinal layer were noted (Figure 2).

The other specimen showed a single large cyst with a thick fibrous wall filled with clear fluid. Microscopy revealed a single cyst filled with eosinophilic amorphous proteinaceous material and lined by a flat layer of attenuated

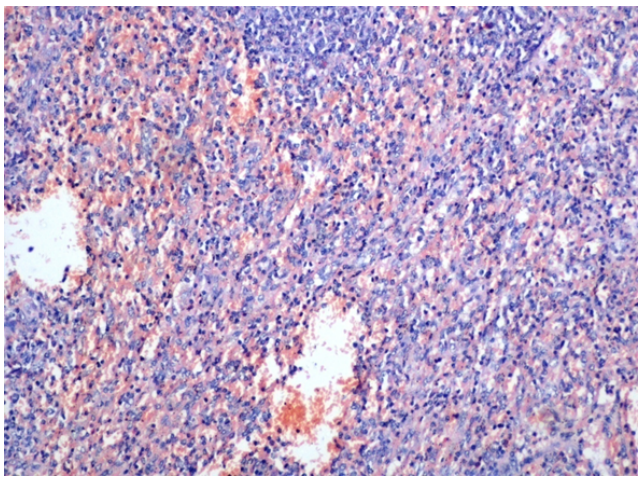

Fig. 1: Microscopy of congestive splenomegaly, 40x, H and E stain

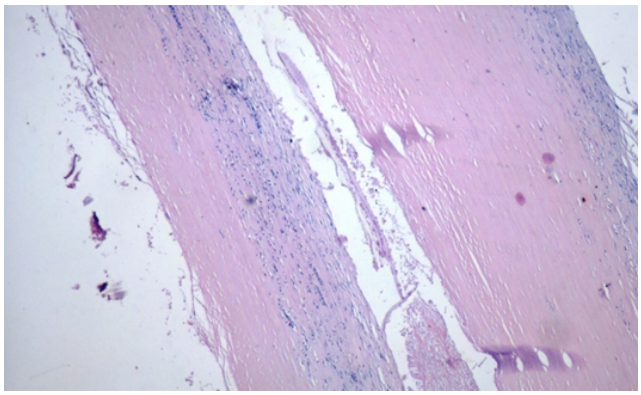

Fig. 2: Microscopy of Hydatid cyst of spleen, 40x, H and E stain

endothelial cells suggestive of a splenic lymphangioma (Figure 3).

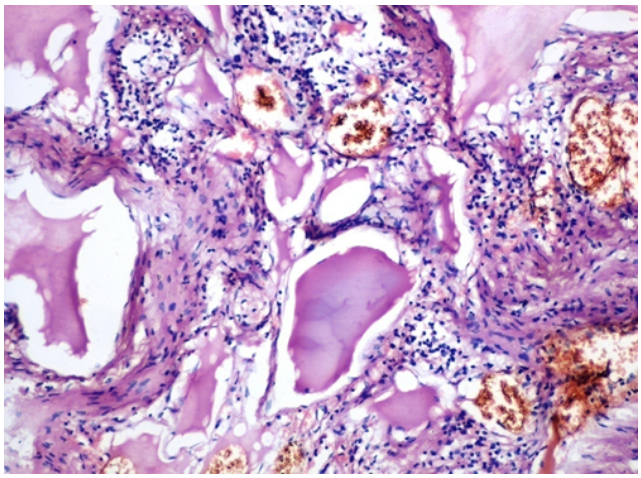

Fig. 3: Microscopy of lymphangioma, 40x, H and E stain

Two spleens with morphology strongly suggestive of NHL were diagnosed, one of which underwent splenectomy as a therapeutic measure for co-existing Evans syndrome with a massively enlarged spleen. (Weight – 3000g)

Both these patients were however referred elsewhere for further management and categorization on IHC was not feasible.

The spleen which was resected in view of a space occupying lesion showed disorganized vascular channels of varying width, with intervening red pulp-like disorganized stroma with or without lymphoid follicles suggestive of a hamartoma (Figure 4).

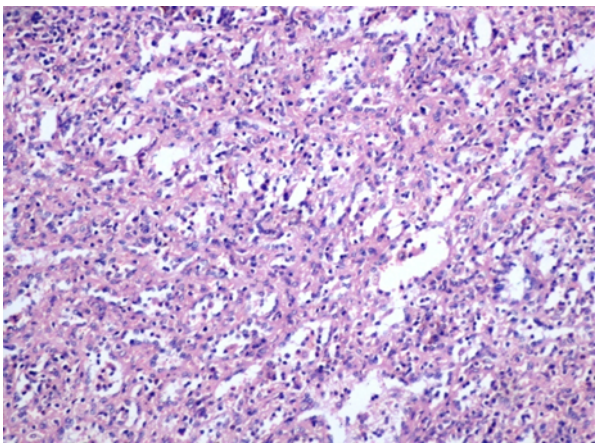

Fig. 4: Microscopy of splenic hamartoma, 40x, H and E stain

4. Discussion

Due to the recent change in indications for splenectomy, splenic specimens are rarely available for histopathological examination. Owing to its anatomical position and structure, the spleen is not amenable to incisional biopsy or partial resection and a detailed histopathological examination of splenectomy specimens is of paramount importance as it can detect the architectural changes of spleen in several disease conditions.[4]

This study describes the pathological features in 68 splenectomy specimens received at the department of pathology in a tertiary care centre over a period of 12 years. All the spleens in this study were removed by the technique of open laparotomy.

The most common indication for splenectomy in our study was trauma, followed by hypersplenism with and without portal hypertension and splenic abscess. The slight male predominance (male: female ratio - 1.4:1) and the peak in the third decademay be due to the most common indication being traumatic injury with young males more likely to be involved and injured in traumatic accidents. Among the four cases in the pediatric age group, the youngest patient was 6 years old. Spleen was resected in 3 patients in the pediatric

age group as a measure to alleviate hypersplenism and in the other patient as a therapeutic maneuverin thalassemia major. It has been similarly reported by other authors that most elective splenectomies in the pediatric age group are most commonly indicated for hematological and immunological disorders like hereditary spherocytosis, chronic ITP, haemoglobinopathies and hypersplenism.[5]

Splenectomy in patients over 65 years of age is rarely performed as it is associated with a high risk of complications and studies have shown differences in the leading causes of splenectomy in elderly patients. One study found the most common indications to be perioperative splenic injury, infection and spontaneous rupture of the spleen[6] while another study found the leading indications to be ITP and lymphoma.[7]

In our study, however, we found that the leading cause of splenectomy in elderly patients was infectious in etiology with 3 cases of splenic abscess and 1 case of splenic tuberculosis. There were no cases of splenectomy indicated for trauma in elderly patients and this may be due to decreased splenic size in elderly people (20% of volume of a normal spleen in young patients) and the associated risk of complications related to asplenism in the elderly.[8]

Studies worldwide have reported different proportions of splenectomies indicated for traumatic rupture in different countries. Similar to our study, traumatic injury to the spleen has consistently seen to be the most common indication for splenectomy in many studies worldwide with the incidence averaging around 65%.[9,10]

Only one Indian study showed the common cause to be thalassemia which could be attributed to the fact that the study was conducted in a region which was included in the thalassemia belt of India.[11]

Most cases were seen in adult males in the second and third decades (Average age –31 years). There were 17 males and 5 females and the male to female ratio was 3.4: 1. This age and gender distribution in traumatic spleens may be explained by young males being more likely to be involved in outdoor and physically demanding activities and their exposure to trauma is likely to be more in comparison to females in our study of the same age group as well as other age groups. This pattern was also observed in other studies.[12,13]

The average weight in spleens resected for trauma was 181g. Increased splenic weight has been found to be an independent factor associated with traumatic rupture of spleenas an enlarged spleen is exposed and unprotected by the ribs making it more susceptible to damage but this was not reflected in our study.[14] Only one spleen resected for trauma in our study showed additional features of congestive splenomegaly (Weight – 403g).

The spleen is notorious as being the most commonly injured abdominal organ in non-penetrating injuries. This susceptibility of the spleen to injury from external forcesis attributed to the location and anatomic features of the spleen. Prominent macroscopic findings noted in traumatically ruptured spleens were capsular laceration and hemorrhage similar to other studies.[13]

On microscopy, most spleens(96%) resected for trauma in our study revealed normal histology except for congestion of the red pulp and hemorrhage with neutrophilic infiltrate at the ruptured site which were consistent with pathological findings secondary to the rupture in other studies.[12,13]

Farhi et al found that traumatically ruptured spleens were more likely to show prominent germinal centers with marginal zone hyperplasia in comparison to control cases.[15] Similar results were reported by Barnard et al found that traumatically ruptured spleens show an increase in the white pulp due to increased numbers of CD4-positive lymphocytes when compared to control spleens. They concluded that this immunological stimulation may predispose spleens to rupture. In this study, no such significant lymphoid alterations were observed.[16]

Lipogranulomas, subintimal hyaline deposits and extramedullary hematopoiesis have all been described in post-trauma spleens but we did not encounter any such lesions in our study.[15]

The other common indications for splenectomy in our study were hypersplenism without portal hypertension in which the cause was not identified (16%) and cases with portal hypertension (12%). Causes of hypersplenism without portal hypertension may be primary where the cause cannot be ascertained or secondary which may be due to conditions like portal hypertension, infections, granulomatous inflammation, malignancies, chronic hemolytic diseases and storage disorders.[17]

The proportion of splenectomies indicated for cases with portal hypertension is similar to other studies (10,12) but the number of patients undergoing splenectomy for hypersplenism is found to be unusually high in our study. Most of these spleens (73%) showed features of congestive splenomegaly similar to other studies[12] whileoccasional spleens showed reactive hyperplasia, extramedullary hematopoieticand even an infected epithelial cyst.

Authors have similarly reported features of congestive splenomegaly and reactive hyperplasia in spleens resected for hypersplenism.[18] Even rare cases of epithelial cysts presenting with hypersplenism have been described.[19] One case of hypersplenism showed massive splenic enlargement (Weight –2800g) with evidence of extramedullary hematopoiesis(EMH) without any evidence of myeloproliferative neoplasm(MPN). This has been also seen in a study where 2 cases of idiopathic EMH, were incidentally discovered in the spleen while evaluating unrelated symptoms with none harboring malignancies or showing subsequent development of MPN or other myeloid malignancies.[20]

Concordant with other studies, congestive splenomegaly was the most common pathology reported[10,12] in all cases of portal hypertension, ITP and thalassemia and in most cases of hypersplenism, hereditary spherocytosis and Evans syndrome.

The indications for splenectomy in hematologic disorders have changed considerably over the past two decades and presently, ITP and hereditary spherocytosis are the most common hematological diseasesin which splenectomy has been found to be therapeutic[21] and this pattern was observed in our study as well.

The rarity of spleens resected for thalassemia was probably due to the fact that, currently, splenectomy is not recommended as a standard procedure in thalassemic individuals due to the large amount of evidence that links splenectomy to a variety of complications.[22] Features seen in the spleen in the thalassemic patient were massive splenic enlargement with reticuloendothelial hyperplasia, fibrosis, congested red pulp, atrophic white pulp and hemosiderin laden macrophages were concordant with other studies.[11]

Only 2 cases of NHL were seen in our study and in both cases, splenectomies were performed for therapeutic purposes. (Evans syndrome and hypersplenism). This pattern was also seen in a study which demonstrated that hypersplenism and immune hemolyticanemia/thrombocytopenia resolved in patients after splenectomy which was mainly performed to modify the disease course in patients with NHL complicated byhemolyticanemia or hypersplenism.[23]

Studies have shown that spleens resected for ITP show formation of germinal centers in the lymphoid tissue of the white pulp, prominence of the histiocytes in the red pulp and infiltration with neutrophils with myeloid metaplasia throughout the splenic tissue.[24]

Two cases of Evans syndrome in our study showed reactive follicular hyperplasia but none of the other aforementioned features were noted. Most of these cases were likely treated with corticosteroids before resorting to splenectomy as a last measure and this may account for the low incidence of morphologic evidence of follicular hyperplasia. This absence of lymphoid activation characteristic in spleens from patients with ITP has seen to be ablated by prior corticosteroid therapy.[25]

Among the spleens resected for hematological diseases, only 2 patients in our study were from young patients with hereditary spherocytosis (12 years and 16 years). This age group was slightly different from the most common age group in which splenectomies are performed for hereditary spherocytosisi.e. 6 to 10 years.[26] On microscopic examination, these spleens showed features of congestive splenomegaly characteristic for hereditary spherocytosis in other studies as well.[27]

Splenic abscess has been described as an extremely uncommon condition with an incidence of 0.14–0.7% in autopsy studies. However, with improved imaging techniques and rise of immunosuppression, an apparent rise in the burden of splenic abscess has been noted with splenectomy being the accepted mode of treatment.[28] In keeping with this rising trend, 8 cases were diagnosed on microscopy as splenic abscess comprising 12% of the total specimens.

Unusual cases encountered in our study included splenic tuberculosis, hydatid cyst of the spleen, lymphangioma and hamartoma of the spleen. Splenic TB is usually seen in the setting of miliary or disseminated TB and very rarely occurs in isolation. In our study, however a case of isolated splenic tuberculosis was seen in an immunocompetent patient which is exceedingly rare.

Owing to the risk of spontaneous or traumatic rupture, hydatid cysts of the spleen are usually treated by total splenectomy as it offers complete cure from the disease with low mortality and morbidity rates.[29]

One case of lymphangioma was encountered which is an uncommon benign tumor commonly seen in childhood and very rarely presenting in adulthood.[30] This was clinically diagnosed as a hydatid cyst which is a common radiological differential diagnosis for a cystic lesion in the spleen.[31]

One spleen which was resected in view of a parenchymal space occupying lesion was revealed to have a hamartoma. The rarity of this lesion in this series is concordant with other studies which have shown hamartomas to be extremely uncommon lesions with an incidence of 0.024% to 0.13% in an autopsy review.[32]

5. Conclusion

Splenectomy specimens are rarely encountered and uncommonly received for histopathological examination, but they form the best opportunity for diagnosis of splenic pathology. In keeping with other studies, traumatic injury to the spleen was the most common cause of splenectomy in our region closely followed by hypersplenism and splenectomy as a surgery, is both therapeutic and diagnostic and this study reflects the recent changing trends in splenectomy where most cases were indicated for therapeutic purposes. In this eleven year retrospective study of splenectomy specimens, the most common indication was traumatic injury, followed by hypersplenism, portal hypertension and infectious etiology.

Congestive splenomegaly was commonly seen in most specimens resected for nine traumatic purposes. The indications for splenectomy correlated well with the histological findings in most cases while a few unusual lesions were also encountered. This emphasises the importance of a systematic approach to morphological diagnosis by a detailed macroscopic and microscopic examination of the spleen.

6. Source of Funding

None.

7. Conflict of Interest

The authors declare that there is no conflict of interest.

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