

Management Approaches of Splenic Surgery

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ABSTRACT:

BACKGROUND:

Splenic surgery is common surgical procedure with different indications and approaches that carries some potential complications which can be avoided.

OBJECTIVE:

To analyze the indications, management and complications of splenic surgery.

PATIENTS AND METHOD:

Prospective study conducted in the 3rd unit of general surgery department of Baghdad teaching hospital & private hospital over a period of 3 years, from the first of January 2008 till the end of December 2011. Ninety six patients with traumatic and non traumatic splenic pathologies were evaluated and followed up.

RESULTS:

This study includes ninety six patients with different splenic pathologies were included in this study with mean age of 23.69 ± 14.853 years. Sixty five patients with non traumatic pathology were treated by elective surgery with mean age of 20.25 ± 12.857 years, fifty eight of them by open splenectomy, four by laparoscopic splenectomy, two cystectomy of hydatid disease of the spleen and one by drainage of splenic abscess. Idiopathic thrombocytopenic purpura (I.T.P.) was the most common indication of non-traumatic splenectomy followed by thalassemia. Thirty one patients with trauma with mean age of 30.90 ± 16.325 years (16 of them had penetrating injury and 15 had blunt trauma) were treated by emergency splenectomy in 24 patients, splenorrhaphy in 5 and conservative treatment in 2 of them. Post-operative complications occurred in 25(26%) patients, pulmonary complication was the most common one, and the overall mortality was 5.2%.

CONCLUSION:

Splenectomy still the most common option in traumatic cases but the availability of new diagnostic imaging might improve the future results to conserve some injured spleen and there is a place for laparoscopic approach in selected cases of elective splenectomy and splenic preservation in some splenic hydatid cyst.

KEYWORDS: splenectomy, splenorrhaphy, splenic endocystectomy.

INTRODUCTION:

The spleen is the most frequently injured organ in blunt abdominal trauma, and a missed splenic injury is the most common cause of preventable death in trauma patients ⁽¹⁾. Globally, splenic injuries accounts for 25% of all solid abdominal organ injuries and the mortality rate associated with splenic trauma is reported to be between (7-18) percent ⁽²⁾. In the past century, the management of splenic injury has continued to evolve from a focus almost entirely on splenectomy to one of selective non-operative

management ⁽³⁾. The risk for post-splenectomy infectious complications and the appreciation of the spleen's immunologic importance have provided an impetus to attempt spleen preservation after trauma ⁽⁴⁾. Non-operative management of blunt splenic injuries has become the norm in Europe and North America for both children and adults because of advances in pre-hospital care, resuscitation, diagnostic imaging, critical care, splenorrhaphy techniques using suture materials, fibrin glue or dextran mesh and splenic artery embolism ^(5,6).

Non-traumatic indications for splenectomy include hematological causes such as hereditary spherocytosis, thalassemia major and certain form of immune thrombocytopenic purpura (ITP) ^(7,8) which is unresponsive to medical

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management such as steroid or recently available immunosuppressant romiplostin and eltrombopag or thrombopoietin receptor agonists⁽⁹⁾. In the presence of splenomegaly, the procedure is best performed by using an open or hand-assisted laparoscopic technique, the operative morbidity and mortality rates are higher in these patients due to the hematologic co-morbidity⁽⁷⁾. Another indication for non-traumatic splenectomy is Hodgkin's disease, selected patients with clinical stage I-A or II-A Hodgkin's disease may be candidates for a staging laparotomy or laparoscopy, in the absence of obvious liver or intra-abdominal nodal disease⁽⁷⁾. Other less common indications for non-traumatic splenectomy include splenic abscesses⁽¹⁰⁾, parasitic and non-parasitic cysts⁽⁷⁾, wandering spleen⁽¹¹⁾, splenic artery aneurysm, sinistral portal hypertension secondary to isolated splenic vein thrombosis or obstruction, or splenic mass presumed to be a primary or undiagnosed neoplasm. Splenectomy is occasionally included in en bloc resection for malignancy in an adjacent organ, such as the stomach, colon, adrenal gland, or pancreas⁽⁷⁾.

The objective:

Is to analyze the indications, management approaches and complications of splenectomy, splenic preserving procedures and conservative treatment.

PATIENTS AND METHODS:

A prospective study conducted over the period from the first of January 2008 until the end of December 2010 (three years period) on the surgical management of splenic problems in the third surgical unit in Baghdad teaching hospital & a private hospital. During this period ninety six patients enrolled in the study. The data regarding the age, gender, type of pathology (traumatic or non-traumatic), management approaches and types of operations, duration of hospitalization, morbidity and mortality were collected.

Patients with non-traumatic pathology were prepared for elective splenectomy, majority through left sub-costal or left para median abdominal incision. Some patients scheduled for surgery underwent hematological preparation & all of them received immunization. In Idiopathic thrombocytopenic purpura (ITP) patients, platelet aggregate was prepared in addition to the cortisone therapy who already receiving it. During surgery & after ligation of the splenic artery, squeezing of the spleen in order to get benefit of the already present constituents in the spleen, platelet aggregate or fresh blood was

given if needed. The lowest platelet count preoperatively in the present study was 11×10^9 /L. When huge spleen is encountered as in myeloproliferative disease, anterior dissection and dealing with the pedicle is started first, double ligation of the splenic artery, followed by squeezing the spleen and then double ligation of the splenic vein and the specimen was sent for histopathology. In hematological diseases, removal of splenuculi was mandatory. Other indications for non-traumatic splenic surgery include splenic abscesses, splenic hydatid cyst and splenectomy in en bloc resection for malignancy in an adjacent organ, such as pancreas.

Most patients with penetrating and blunt abdominal injuries were underwent laparotomy after resuscitation through a midline abdominal incision depending on the clinical features and investigations (plain abdominal X-ray, ultrasound of the abdomen and CT scan in few patients). In most patients the diagnosis was confirmed at laparotomy. Number of patients with splenic injury was scheduled for management by non-operative treatment.

Post splenectomy drainage had been established in all traumatic cases and in the selected cases of non-traumatic pathology; the overall number was seventy seven. Patients who underwent splenectomy for trauma received vaccination postoperatively. Some patients were discharged on prophylactic oral penicillin therapy. Mortality and the cause of death were recorded. Laparoscopic splenectomy is done in four patients of non-traumatic splenectomy.

RESULTS:

Ninety six patients were included in this study, the age of patients range from 2 years to 73 years with a mean age of 23.69 ± 14.853 years, 6 patients (6.2%) with age more than 50 years and 34 patients (35.4%) between 11-20 years (Table 1). Fifty four patients (56.2%) were males and 42 patients (43.8%) were females, so male to female ratio was 1.3:1 (Table 2).

Sixty five patients (67.7%) have non traumatic indications of splenectomy with mean age of 20.25 ± 12.857 years, fifty six of them (58.3%) with hematological diseases and nine (9.3%) with non-hematological diseases. All patients with hematological diseases were treated by elective splenectomy (only four of them treated by laparoscopic splenectomy). Idiopathic thrombocytopenic purpura (I.T.P.) was the most common indication followed by thalassemia as shown in (Table 3). Three patients with splenic

abscess, 2 of them were treated by splenectomy; the third patient was treated by drainage of the abscess through left sub costal incision. Two patients with hydatid cyst were treated by endocystectomy through a midline incision; with tube drain was left in the cavity (Table 3).

Thirty one patients with trauma (32.3%) with mean age of 30.90 ± 16.325 years, 15 patients (48.4%) had blunt trauma, 8 (25.8%) were due to road traffic accidents (R.T.A.) and 7 (22.5%) were due to fall from height (F.F.H.). While 16 patients (51.6%) sustained penetrating splenic injury, 9 (29%) were due to shell injury and 7(22.5%) were due to bullet injury. Splenectomy was the most commonly performed procedure for the management of splenic injury, 24 patients (out of 31) was treated by splenectomy, 11 patients (73.3%) with blunt trauma and 13 patients (81.2%) with penetrating injury. Splenorrhaphy was performed in 5 patients with splenic injury, 3 patients (18.7%) with penetrating injury, 2 patients (13.3%) of blunt injury, omental pedicle graft was used to buttress the suture splenorrhaphy in all cases, the mean hospital stay was 12 ± 2 days, and no patients required re-laparotomy for bleeding. Two patients were treated conservatively; both of them sustained blunt injury. One of them diagnosed by ultrasound and the other one diagnosed by Ct-scan, both of them followed by serial CT-scan, they are admitted to the surgical ward and followed closely. The mean hospital stay was 14 ± 3 days.

Accessory spleen (splenuculi) was found in 11 patients (11.4%), 8 in splenic hilum, 2 in gastrosplenic ligament and 1 in the splenicocolic ligament. These splenuculi were found in 5 patients with I.T.P. and 2 patients with thalassemia which all were removed and send for histopathology, and 4 patients with trauma which all were preserved.

Twenty five patients (26%) developed one complication or more, pulmonary complication in 14 patients, wound infection in 6 patients, sub phrenic abscess in 3 patients, gastric fistula in 1 patient (Table 4). Five out of 96 patients died, an overall mortality of (5.2%), this occurred in 3 patients with penetrating trauma and 2 patients with blunt trauma. In general death occurred in those where the associated injuries were sever and multiple.

DISCUSSION:

In this study patient's age ranged from 2 years to 73 years with a mean age of (23.69 ± 14.853) years. The peak incidence of splenic pathology

being in age group 11- 20 years (35.5%) followed by the age group 21–30 years of age (25%) with significant P value (0.016). Male to female ratio is 1.3 : 1 with significant P value

(0.000162), these results of this study is comparable to a study done in Basrah at 2009⁽¹²⁾(which is done for non-traumatic splenectomy only)that shows peak incidence in age group (11–20) and male to female ratio is 1.2:1, but it is incomparable to a study done in AL- Yarmok teaching hospital at 2005⁽¹³⁾ (which is done for splenic injury only) that shows the peak incidence in age group (21–30) and male to female ratio is 13:1 , this is explained by the fact that injury of spleen is more in outdoor activity which is more in males in our community.

In this study splenic surgery for non traumatic causes is more than traumatic causes (67.7% versus 32.2%), which is incomparable to study done in Al–Rasheed Military hospital at 2002⁽¹⁴⁾ which shows that the indication for hematological diseases was 38.6% while in the present study is 58.3%, and this is explained by that many cases of hematological diseases are unfit for military services and not admitted to Al-Rasheed Military hospital.

In the present study, I.T.P. was the most common indication (37.5%) for elective splenectomy and thalassemia was second common indication (28.6%), this is coincide with others⁽¹⁵⁾, but it differs from a study done in Basrah at 2009⁽¹²⁾ which show that thalassemia is more common than I.T.P. (71.4% versus 8.4%), this reflects that the incidence of I.T.P. and thalassemia are different in different parts of our country. It is also differs from a study in Iran⁽⁸⁾ at 2012 which shows that splenectomy done for thalassemia major in 43.3%, hereditary spherocytosis in 15.1% and ITP in 11.3% of patients. Another study in Oman⁽¹⁶⁾ shows predominance of thalassemia in their series.

In this study, splenectomy was performed by early ligation of the splenic artery that allows more platelets to be auto transfused into the systemic circulation and minimizing platelets transfusion during surgery even with those patients with low platelets count preoperatively as low as $11 \times 10^9 /L$ in the present study. In a study published at 2012⁽¹⁷⁾ in Saudi Arabia, they observed a median rise of 18300 per mm³ of platelets after 5 minutes of splenic artery ligation which was statistically significant and almost equal to platelet transfusion of 4 unit of platelet concentrates in an adult, this results in significant

gain in platelets thereby avoiding the transfusion of platelets concentrates.

Three cases with splenic abscess, two of them were treated by splenectomy and one patient by drainage due to adhesion of spleen to the adjacent structures, while study in Basrah at 2006⁽¹⁸⁾ about splenic abscess showed that 6/10 patients were treated by splenectomy, 3/10 by drainage and 1/10 by conservative treatment. While others suggest in a ten year retrospective study done in India⁽¹⁰⁾ that percutaneous drainage is safe and effective alternative to surgery especially in unilocular or bilocular abscesses allowing preservation of spleen, although splenectomy remains the final definitive procedure if percutaneous drainage fails.

Splenectomy is the treatment of choice for splenic hydatid cyst although percutaneous aspiration with irrigation with hypertonic saline is optional⁽¹⁹⁾. In the present study there are two cases of splenic hydatid cyst with plenty of splenic tissue and on the basis of splenic tissue preservation; cystectomy was done with tube drain in the remaining cavity without complication on follow up.

In this study blunt injury as a cause of traumatic splenic surgery is about equal to that of penetrating injury (48.4% versus 51.6%) this is not coincide with study done in Spain⁽⁶⁾, Tanzania⁽²⁰⁾, Saudi Arabia⁽²¹⁾ & in Iraq before 2003^(14, 22, 23) as blunt injury was more common than penetrating injury. There is increased incidence of penetrating injuries more than blunt injuries at 2005 & 2008 studies in Iraq^(13, 24) which was due to deteriorated security state at that time, and slight decrease of penetrating injury in this study may be explained by slight improvement in security state.

In this study 24(77.4%) patients with trauma (out of 31 patients) were treated by splenectomy this procedure was of choice for both types of trauma, penetrating and blunt , this result is comparable to a study done at AL-Rasheed hospital⁽¹⁴⁾ and AL-Yarmouk hospital⁽²³⁾ which reported that splenectomy was the treatment in (90% and 85% respectively). And also these results simulate the results of studies performed in Saudi Arabia⁽²¹⁾ and Tanzania⁽²⁰⁾, but unlike other studies which are done in the west and other developed countries^(5, 25) which shows non operative management in 90% of blunt pediatric splenic injuries and about (60-70)% of adult patients.

In this study, 2 traumatic patients (13.3%) were

treated conservatively both of them with blunt trauma, abdominal CT-scan showed finding suggestive of splenic injury. It is clear that as long as non-operative management is dependent on the availability of CT scanning, it cannot be offered to most injured patients as only few injured patients have access to CT scanning.

Therefore; there is a need to develop management protocols specific to developing countries based on categorizing the patient using clinical evaluation rather than expensive imaging if non-operative treatment is to be adopted in developing countries⁽²⁰⁾.

In this study splenorrhaphy was performed in 5 patients (16.1%), 3 of them (18.7%) with penetrating injury and 2 patients (13.3%) with blunt injury. Study published by Pachter et al⁽²⁶⁾ showed that splenorrhaphy was successfully attempted in 88.9% of patients with splenic injury (65% with blunt splenic injury and 35% with penetrating trauma). Feliciano et al⁽²⁷⁾ concluded that splenorrhaphy was performed in 43.3% of all patients with splenic injuries and was used more commonly in patients with penetrating injuries 47.8% versus 38.5 % blunt.

These contradictory results between this study and other published series about the management of splenic injuries may be attributed to the lack of facilities in our hospitals such as intensive care unit, CT-scan, spleen angiography and hemostatic agents which may be difficult to be offered in the present circumstances. We also noted that the time of operative intervention for trauma cases in this series showed an increase in the night-time splenectomy rate and the fact that most of the emergency surgery at night is performed by junior surgeons (who may be unfamiliar with splenic salvage techniques), may have also contributed to increased rate of splenectomy. And finally the patients and their families should accept the possibility of re-operation because of re-bleeding although it is a low possibility.

One pitfall for non-operative management of splenic trauma lies in the significant possibility of failing to diagnose and treat the concomitant intra-abdominal injuries, hence other injuries may be missed as many as (30%) of patients and other drawbacks include prolonged hospitalization, increased hospital cost, and complications of repeated blood transfusion⁽²⁸⁾. In the present study, the presence of associated injuries was found to be significantly influence the mortality and morbidity. Early recognition

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and treatment of associated injuries is important in order to reduce mortality and morbidity associated with splenic injuries.

Drainage of the splenic bed has always been a controversial issue, drains are most frequently inserted "just in case" to detect early bleeding, although bleeding complications diagnosed on the basis of clinical picture and ultrasonography, not on the volume and dynamics of the draining fluid⁽²⁹⁾. Drainage of peritoneal cavity in the present series was performed in 77 out of 94 patients. It was observed that drainage does not prevent complications or allow for their earlier recognition, that is why some authors think that routine drainage after "clean", uncomplicated splenectomy is not necessary and all infectious complications occurred in patients with drainage in the surgical site⁽²⁹⁾. The routine use of drains following splenectomy for trauma is supported by the series reported by Naylor and Shires⁽³⁰⁾, these authors reported the incidence of subphrenic abscess of only (3.4%) in 408 patients undergoing splenectomy for trauma.

The complication rate in this study is 26%, which is lower than a study done by Phillip L Chalya

et al in Tanzania⁽²⁰⁾ and Naylor et al⁽³⁰⁾ which shows post-operative complications of 30.5% and 55% respectively. In this study there is significant P value for both pulmonary and wound complications but not for abdominal complications which is similar to Naylor et al⁽³⁰⁾ while Phillip L Chalya et al in Tanzania⁽²⁰⁾ shows more surgical site infections.

Five out of 96 patients died an overall mortality rate was 5.2%. This occurred in 3 patients with penetrating trauma and 2 patients with a blunt type of splenic injury, in general, death occurred in those patients because of severe and multiple associated injuries. This result is lower than series done in Tanzania⁽²⁰⁾ with 19.5% mortality rate. No mortality between non-traumatic splenectomy.

CONCLUSION:

Splenectomy still the most common option in traumatic cases but the availability of new diagnostic imaging might improve the future results to conserve some injured spleen, there is a place for laparoscopic approach in selected cases of elective splenectomy and splenic preservation in some splenic hydatid cyst.

Table 1: Age distribution of the patients.

Age group	Main classification				Total	
	Traumatic		Non traumatic			
	No.	%	No.	%	No.	%
0-10 years	1	1.0%	12	12.5%	13	13.5%
11-20 years	9	9.4%	25	26.0%	34	35.4%
21-30 years	7	7.3%	17	17.7%	24	25.0%
31-40 years	5	5.2%	7	7.3%	12	12.5%
41-50 years	4	4.2%	3	3.1%	7	7.3%
> 50 years	5	5.2%	1	1.0%	6	6.2%
Total	31	32.3%	65	67.7%	96	100.0%

P value = 0.016 (by using chi square)

Table 2: Gender distribution of the patients.

Gender	Main classification				Total	
	Traumatic		Non traumatic			
	No.	%	No.	%	No.	%
Male	26	27.1%	28	29.2%	54	56.2
Female	5	5.2%	37	38.5%	42	43.8
Total	31	32.3%	65	67.7%	96	100.0%

P value = 0.000162 (by using chi square)

Table 3: Non traumatic indications of splenic surgery.

Cause	Indications	No.	%
Hematological	• ITP	21	37.5
	• Hereditary spherocytosis	7	12.5
	• Hodgkin's lymphoma (staging)	4	7.1
	• Thalassemia	16	28.6
	• Myeloproliferative disease	6	10.7
	• Gaucher's disease	1	1.8
	• Sinistral portal hypertension	1	1.8
	Total	56	100
Non Hematological	• Splenic abscess	3	33.3
	• Splenic hydatid cyst	2	22.2
	• Simple splenic cyst	2	22.2
	• Splenectomy enbloc resection	2	22.2
	Total	9	100

Table 4: Post- operative complications.

Type of complication		Traumatic		Non traumatic		Total		P-value
		No	%	No	%	No.	%	
Pulmonary complication	No complication	20	20.8%	62	64.6%	82	85.4%	0.002
	Pneumonia	2	2.1%	1	1.0%	3	3.1%	
	Atelectasis	7	7.3%	2	2.1%	9	9.4%	
	Pulmonary embolism	1	1.0%	0	0.0%	1	1.0%	
	Respiratory failure	1	1.0%	0	0.0%	1	1.0%	
	Total	31	32.3%	65	67.7%	96	100.0%	
Wound Complication	No complication	25	26.0%	64	66.7%	89	92.7%	0.007
	Wound infection	5	5.2%	1	1.0%	6	6.2%	
	Burst abdomen	1	1.0%	0	0.0%	1	1.0%	
	Total	31	32.3%	65	67.7%	96	100.0%	
Abdominal complication	No complication	26	27.1%	63	65.6%	89	92.7%	0.166
	Sub-phrenic abscess	2	2.1%	1	1.0%	3	3.1%	
	Gastric fistula	1	1.0%	0	0.0%	1	1.0%	
	Pancreatic fistula	1	1.0%	0	0.0%	1	1.0%	
	U.T.I.	1	1.0%	1	1.0%	2	2.1%	
	Total	31	32.3%	65	67.7%	96	100.0%	

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