

Conservative Versus Operative Management of Blunt Splenic Injuries

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ABSTRACT

Background: The spleen is the most frequently injured organ in blunt abdominal trauma, mainly because of its highly vascularized parenchyma and its anatomic location. In the past the management of blunt splenic injuries was splenectomy, but high rate of operative complications caused paradigm shift from operative to non-operative management (NOM) in hemodynamically stable blunt abdominal trauma patients. Now, nonoperative management of hemodynamically stable patients with blunt splenic injuries is the standard of care and has been proven to be safe and successful in the acute setting. The advent of newer imaging techniques with high resolution CT scanners has enabled the clinicians to exactly diagnose the extent of intra-abdominal organ injury.

Objective: This work aim to compare between operative and conservative management of splenic trauma.

Methodology: Total numbers of patients in this study were 20 patients classified in two groups, the first group contained 12 patients and the other group contained 8 patients. The First group was managed conservative and the second was managed operative with splenectomy and splenorrhaphy. The first group of patients consisted of 9 males (75%) and 3 female (25%). The second group of patients consisted of 6 males (75%) and 2 females (25%).

Results: In this study, blunt splenic injury was found to be more common in males because of their risky and hard work. RTA and Falling from a height were found to be the most common causes of blunt abdominal injuries. According to CT, grade one and two of splenic injury are more common than other grades of splenic injury. As regard complication the operative management has more complication as postoperative wound infection and postoperative chest infection. So, NOM of splenic injury is the management of choice in haemodynamically stable patients.

Conclusion: The nonoperative management is considered the ideal management for blunt splenic injuries due to less complication, less blood transfusion, less hospital stay and less mortality than operative management.

Keywords: Splenic, CT, Operative Management, Conservative Management.

INTRODUCTION

The spleen is the most commonly injured organ in blunt abdominal trauma and is frequently injured in penetrating trauma to the left upper quadrant, the management of penetrating splenic injury is straightforward and primarily operative ⁽¹⁾.

Splenic injury should be suspected in patients with direct trauma to the left side, associated rib fractures, and left upper quadrant tenderness ⁽²⁾.

CT scan is the standard imaging study to diagnose and grade splenic injuries. CT also guides management of injuries, and a finding of high grade of splenic injury on CT scan seems to increase the rate of operation and correlate with hemodynamic instability. However, even most of the patients with blunt still can be managed successfully with non-operative management ⁽³⁾.

Splenic preservation should be achieved whenever possible to avoid post-splenectomy complication such as bleeding, abscess, adhesive obstruction and the most serious over whelming post splenectomy infection caused by encapsulated bacteria, Streptococcus pneumonia, Haemophilus influenza and Neisseria meningitidis, which are resistant to antimicrobial treatment and have a high mortality rate ⁽⁴⁾.

Non-operative management has become standard practice and achieves a high success rate ⁽⁵⁾.

The decision to operate on a patient with a splenic injury is best based on hemodynamic stability which is monitored by pulse, blood pressure, respiratory rate, urine output and ongoing blood loss as reflected on patient hemoglobin and hematocrit values, and responsiveness to non-operative methods rather than grade of injury ⁽⁶⁾.

AIM OF THE WORK

This study aims to differentiate between cases of blunt splenic injury that indicate operative management and others that need only conservative management.

PATIENT AND METHODS

This study carried out on 20 patients presented with blunt splenic trauma, admitted to Emergency Department in Etay El-Baroud Hospital in the duration from Mars 2018 to November 2018.

Inclusion criteria:

- Patients from 10 to 50 years old.
- Patients with blunt abdominal trauma.
- Patients with isolated splenic injury.

Exclusion criteria:

- Patients under 10 and over 50 years old.
- Penetrating splenic injuries.
- Bleeding disorders.

The 20 Patients were classified into two groups:

□ **Group A: includes 12 patient**

They were managed conservatively.

Selection criteria for this group include:

- 1- Hemodynamically stable with normal pulse, blood pressure, adequate urine output and normal hemoglobin and hematocrit values.
- 2- Have no signs of peritonitis.
- 3- Have no other associated injuries indicate laparotomy.

All patients were managed according ATLS protocol and assessed: -

1- Clinical assessment

- Assessment of the general condition, central venous line, urinary catheter, resuscitation, repeated measurement of blood pressure, pulse rate per minute, respiratory rate per minute and urine output per hour.
- Repeated abdominal examination

2- Laboratory investigation including:

- Complete blood picture.
- Prothrombin activity, PTT, bleeding and clotting time.

3- Radiological investigation

- Abdominal ultrasonography (FAST) for all patients.
- Computed tomography (CT) for all patients to document splenic injuries and exclude any associated injuries.
- X ray abdomen and chest to detect associated injuries.

All patients admitted to intensive care unit (ICU) or high dependency unit (HDU) for one or two days then transfer to floor. Patients managed non operative by bed rest, IV fluid, blood transfusion when indicated, repeated assessment of vital sign, urine output, serial abdominal examination, serial HB and HCT and serial abdominal ultrasound.

Discharge criteria

Clinical

- Patient is hemodynamic stable with normal pulse, blood pressure, respiratory rate and normal urine output.
- Abdominal examination free with normal bowel habits.
- Patient becomes ambulatory and tolerating regular diet.

Laboratory

Normal HB and HCT.

Radiological

U/S abdomen becomes free or minimal.

In addition to the previous patient has no associated conditions necessitating hospitalization.

Follow up

Patients were seen in the outpatient clinic 1 week after discharge and U/S of the abdomen was repeated. After the first follow-up visit, daily activity was permitted with the exception of any activity that would produce sudden blow to the spleen.

Follow-up visit continue for 3-6 month but with increase duration between visits.

Follow-up U/S was also repeated at varying time during outpatient follow-up.

Follow-up CT scan was not done routinely but only in few selected patients with the most severe splenic injuries to document the healing.

□ **Group B: includes 8 patient**

Were operated, 6 patients do splenectomy and 2 do splenorrhaphy.

Selection criteria for this group include:

- 1- Hemodynamically unstable with tachycardia, tachypnea, low blood pressure, oliguria and decreased hemoglobin and hematocrit values.
- 2- Have signs of peritonitis.
- 3- Have other associated injuries indicate laparotomy.
- 4- Failure of conservative measures.

Preoperative evaluation of the patients including:

All patients were managed according ATLS protocol and assessed:

1- Clinical assessment

- Assessment of the general condition, central venous line, urinary catheter, resuscitation, measurement of blood pressure, pulse rate per minute, respiratory rate per minute and urine output per hour.
- Abdominal examination

2- Laboratory investigation including:

- Take blood sample for cross matching and Complete blood picture.
- Prothrombin activity

3- Radiological investigation

- Abdominal ultrasonography (FAST) for all patients.

4- Operative management

Management of life threatening conditions then go to operative room, 6 patients do splenectomy;

Under general anaesthesia, patients put in supine position, mid line incision was done, the left hand is placed on the spleen which is drawn forwards, downward and medially to divide the posterior leaflet of the lienorenal ligament and the fine adhesions to the diaphragm, then the spleen is delivered through the incision, lower pole first then the upper pole, then the short gastric vessels are ligated and divided, the splenic artery and vein are clamped, divided and doubly ligated, good haemostasis was done, a drain is left in the bed of spleen and finally the incision is closed in layer.



Fig. (1): Clamping of splenic pedicle during total splenectomy.

2 patients do splenorrhaphy:

Under general anaesthesia, patient put in supine position, mid line incision was done, good field and good access to the spleen is obtained , deep simple sutures over a pedicled omentum were taken in the splenic tear, good haemostasis was done, a drain is left, and the incision is closed in layer.

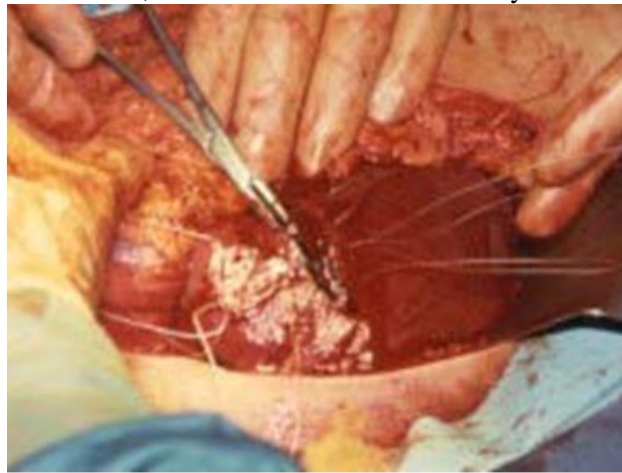


Fig. (2): Suturing of splenic tear (splenorrhaphy).

All patients have good postoperative care, all patients have blood transfusion, and they all receive vaccines postoperative to guard against overwhelming post splenectomy infection.

RESULTS

Total numbers of patients in this study are 20 patient classified in two groups, the first group contains 12 patients and the other group contains 8 patients. The First group was managed conservative and the second was managed operative with splenectomy and splenorrhaphy. The first group of patient consist of 9 male (75%) and 3 female (25%) and had mean (range) of age 23±9.23 years (10-40). The second group of patient consist of 6 male (75%) and 2 female (25%) and had mean (range) of age 35±11.12years (20-50) Table (1).

Table (1): Comparison between the two groups according to demographic data

	Conservative (n=12)		Operative (n=8)		Test of sig.	P
	No.	%	No.	%		
Sex					χ ² =0	F _E p=1
Male	9	75.0	6	75.0		
Female	3	25.0	2	25.0		
Age (years)					t=0.215	0.428
Min. – Max.	10 – 40		20 – 50			
Mean ± SD.	23±9.23		35±11.12			
Median	21.5		35			

Ultrasound: The ultrasound was done for the two groups: In the first group 3 patient had minimal collection (25%), 6 patient had mild collection (50%) and 3 patient had moderate collection (25%). While in the second group 4 patient had moderate collection (50%) and 4 patient had massive collection (50%), Table (2).

Table (2): Comparison between the two groups according to Ultrasound

	Conservative (n=12)		Operative (n=8)		χ^2	MC _p
	No.	%	No.	%		
Ultra sound						
Minimal	3	25.0	0	0.0	□□□□□□	0.005
Mild	6	50.0	0	0.0		
Moderate	3	25.0	4	50.0		
Massive	0	0.0	4	50.0		

Hemodynamics: The first group 12 patient was stable and then one patient became unstable (8.3%) and other 11 patient still stable (91.7%). While the second group all patients were unstable (100%) table (3).

Table (3): Comparison between the two groups according to hemodynamics

	Conservative (n=12)		Operative (n=8)		χ^2	P
	No.	%	No.	%		
Hemodynamics						
Stable	11	91.7	0	0.0	□□□□□□	5.42
Unstable	1	8.3	8	100.0		

The treatment: In the first group 11 patient were managed conservative (91.7%) while 1 patient became unstable and did splenectomy (8.3%). In the second group all patient were unstable and managed operative (100%) 2 of them did splenorhaphy and the other 6 did splenectomy table (4).

Table (4): Comparison between the two groups according to treatment

	Conservative (n=12)		Operative (n=8)		Test of sig.	P
	No.	%	No.	%		
Treatment						
Conservative	11	91.7	0	0	McN	0.132
Operative	1	8.3	8	100.0		

The complications: In the first group 11 patient were managed nonoperative and had no complication (91.7%) and 1 had complication (8.3%). While in the second group 2 patient develop complication (25%) one wound infection and the other chest infection table (5).

Table (5): Comparison between the two groups according to complication

	Conservative (n=12)		Operative (n=8)		χ^2	FE _p
	No.	%	No.	%		
Complication						
No complication	11	91.7	6	75.0	□□□□□□	0.306
Complication	1	8.3	2	25.0		

The associated injuries: 3 patients had associated injuries (25%) in the first group while 4 patients had associated injuries (50%) in the second group table (6).

Failure of policy: 11 patient had succeed (91.7%) in the first group and 1 had failed (8.3%) Table (6)

Table (6): Comparison between the two groups according to associated injury and failure of policy

	Conservative (n=12)		Operative (n=8)		χ^2	P
	No.	%	No.	%		
Associated injury						
No associated injuries	9	75.0	4	50.0	1.318	0.250
Associated injuries	3	25.0	4	50.0		
Failure of policy						
Success	11	91.7	8	100.0	0.702	FE _p = 0.402
Failure	1	8.3	0	0.0		

Blood transfusion: As regard blood transfusion there is great difference between the 2 groups. In the first group only 3 patients need for blood transfusion (25%) while in the second group all patient need blood transfusion (100%) table (7).

Table (7): Comparison between the two groups according to blood transfusion

	Conservative (n=12)		Operative (n=8)		χ ²	P
	No.	%	No.	%		
Blood transfusion						
No	9	75.0	0	0.0	□□□□□□	0.001
Yes	3	25.0	8	100.0		

The hospital stay: As regard hospital stay the result is nearly equal for both groups. In the first group the minimum of hospital stay is 5 days, the maximum is 9 days and the mean is 6.40 ± 1.35 while in the second group the minimum of hospital stay is 5 days, the maximum is 7 days and the mean is 6.0 ± 0.79 table (8).

Table (8): Comparison between the two groups according to hospital stay

	Conservative (n=12)	Operative (n=8)	T	P
hospital stay (day)				
Min.778 – Ma5x.	5.0 – 9.0	5.0 – 7.0		
Mean ± SD.	6.40 ± 1.35	6.0 ± 0.79	0.15	0.5
Median	6.0	6.0		

According to mortality: In the first group all patient survive (100%) while in the second group 7 patient survive (87.5%) and one patient die (12.5%) due to subarachnoid hemorrhage Table (9).

Table (9): Comparison between the two groups according to mortality

	Conservative (n=12)		Operative (n=8)		χ ²	FE _p
	No.	%	No.	%		
Mortality						
Survive	12	100.0	7	87.5	□□□□□	0.208
Died	0	0.0	1	12.5		

DISCUSSION

In this study total numbers of patients are 20 classified into 2 groups. The first group consists of 12 patient met selection criteria of nonoperative management and admitted to ICU or HDU and were managed conservative, while the second group consist of 8 patients and were unstable and managed operative with total splenectomy and splenoraphy.

The first group of patient consist of 9 male (75%) and 3 female (25%) The second group of patient consist of 6 male (75%) and 2 female (25%) table (3). However male predominance in both groups agreed with study of **Zabolotny et al.** (7) in which male was(84%) and female was(16%) and also agreed with study of **Davies et al.** (8) in which male was (71%)and females was (29%). The male predominance is due to males are more active and because of their risky work.

In the first group the mechanism of trauma was 3 patient due to falling from height (FFH) (25%)

and 9 patient due to road traffic accident (RTA) (75%). While in the second group 2 patient due to FFH (25%) and 6 patient due to RTA (75%).

So in this study the main mechanism of trauma was RTA then FFH. Which coincide with the study of **Osifo et al.** (9) where RTA was the mechanism of trauma in 50% of the patient and the second most common mechanism was FFH. But this disagreed with **Kristoffersen and Mooney** (10) study where the main mechanism of trauma was FFH.

According hemodynamic all patients of the first group were stable early, then one patient became unstable (8.3 %) and 11 patient still stable (91.7%). While the second group all patients were unstable (100%) and do splenectomy table (9).

The ultrasound used to detect collection in the abdomen ,to detect type of injury in the spleen and also used for follow up of the patients but cannot determine the grade of splenic injury so nonoperative cases need complementary CT abdomen.

The ultrasound was done for the two groups: In the first group 3 patient had minimal collection (25%), 6 patient had mild collection (50%) and 3 patient had moderate collection (25%). While in the second group 4 patient had moderate collection (50%) and 4 patient had massive collection (50%). With increase the amount of blood collection in the abdomen by ultrasound the risk of failure of nonoperative management increase.

The CT was done for first group only because the second group was hemodynamic unstable. According type of injury The CT finding was 9 patient had tear (75%) and 3 patient had splenic hematoma (25%).

In addition to the type of injury CT help in grading of splenic injuries which was 4 patient with grade I injuries (33.3%), 4 patient with grade II injuries(33.3%), 2 patient with grade III injuries(16.6%) and 2 patient with grade IV injuries(16.6%). This different from study of **Koca et al.** ⁽¹¹⁾ which was 25.8% were grade I, 32.2% grade II, 29% grade III, and 12.9% grade IV injuries. It also different from results of study of **Kristoffersen and Mooney** ⁽¹⁰⁾ and study of **Zabolotny et al.** ⁽⁷⁾ which showed that grade III splenic injury is the most common.

In the first group 3 patients had associated injuries (25%) in form of fracture rib, hemothorax fracture of the humerus, head trauma, while in the second group 4 patients had associated injuries (50%) in form of head injuries musculoskeletal injuries and other intra-abdominal injuries.

Associated injuries lead to more blood transfusion, more length of hospital stay and increase in failure of NOM. This coincides with study of **Koca et al.** ⁽¹¹⁾.

In the first group 11 patients were managed non-operative (91.7%) while 1 patient (8.3%) become unstable and did splenectomy, in the second group all patients were unstable and do splenectomy and splenoraphy.

This result coincides with the study of **Jamaladeen et al.** ⁽¹²⁾ in which success rate of NOM was (86%) and (91%) respectively, but less than result of **Crankson** ⁽¹³⁾ (98%) and result of **Davies et al.** ⁽⁸⁾ (100%). This result is higher than study of **Osifo et al.** ⁽⁹⁾ in which success rate of NOM was (75%).

As regard blood transfusion there is great difference between the 2 groups. In the first group only 3 patients need for blood transfusion (25%) while in the second group all patient need blood transfusion (100%).

This coincides with study of **Zabolotny et al.** ⁽⁷⁾ in which (10%) of nonoperative patient receive blood transfusion while all operative patient receive blood transfusion.

In this study increased require for blood transfusion associated with high grade splenic injuries, multiple extrasplenic associated injuries and operative treatment which coincide with study of **Koca et al.** ⁽¹¹⁾.

As regard hospital stay the result is nearly equal for both groups. In the first group the minimum of hospital stay is 5 days, the maximum is 9 days and the mean is 6.40 ± 1.35 while in the second group the minimum of hospital stay is 5days, the maximum is 7 days and the mean is 6.0 ± 0.79 table (14). This coincide with study of **Zabolotny et al.** ⁽⁷⁾ in which average of hospital stay was 7.1 day.

In the first group 11 patients (91.7%) were managed nonoperative and had no complication and 1 patient (8.3%) had complication, become unstable and do splenectomy. While in the second group 2 patients develop complication (25%) one wound infection and the other early postoperative chest infection .So complication is more common with operative management.

This coincides with study of **Oumar et al.** ⁽¹³⁾ in which complication increase with operative management and rate of complication with NOM was (4.8%).

In the first group all patient survive (100%) while in the second group 7 patients survive (88.5%) and one patient die (12.5%) due to subarachnoid hemorrhage .The mortality is usually due to associated injury not due to splenic injury.

CONCLUSION

The nonoperative management is considered the ideal management for blunt splenic injuries due to less complication, less blood transfusion, less hospital stay and less mortality than operative management.

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