Different Modalities in Management of Splenic Trauma

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Abstract

Aim: The aim of this study is to evaluate the predictors of outcome of both operative and non-operative splenic conservation in blunt abdominal trauma. Patients and methods: Patients with splenic trauma from December 2012 to November 2015. Patients were classified into two groups either Non-operative (conservative), or Operative (surgical). Informed consent was taken from all patients. Results: Twenty patients were included in this study and were classified according to the modalities of treatment into main groups: conservative (non-operative) group were 12 cases and surgical (operative) group were 8 cases. Conservative group include 6 male and 6 female, while surgical group include 6 male and 2 female. In the conservative group, post-operative perisplenic abscess was detected in two cases in which sonar guided drainage was successful. While in the surgical group, left sub-phrenic abscess was detected in one case in which sonar guided drainage was successful. And seroma of the exploratory wound was detected in one case in which antibiotics& repeated dressings was successful. 1 cases died in surgical group intra operative due to massive haemorrhage while no mortality in conservative group. Conclusion: Non-operative management for blunt splenic trauma in hemodynamically stable patients is safe, effective and associated with, low morbidity and no mortality especially in grade I-II and III with inferior results in grade V. However, non-operative management should be practiced in hospitals where an efficient ICU is available. Key Words: Management, Spleen, Trauma

Introduction

Blunt abdominal trauma is more frequently encountered in the emergency department than penetrating one; usually result from motor vehicle collision. Blunt trauma to the abdomen can cause severe injury especially to solid abdominal organs. The spleen and liver is the most commonly injured organs after blunt abdominal trauma and its management has been a topic for discussion over the past decade, small and large intestines are the next most injured. Motor vehicle accidents are the leading cause of injury to the spleen with pedestrian or bicycle accidents, falls and blunt trauma induced by physical assaults or sports [eg; boxing] as additional common causes. The anatomy of the spleen plays an important role in its pattern of injury, attached in place by its suspensory ligaments and partially protected by the lower costal margin, the spleen is susceptible to decelerating injury in motor vehicle accidents, puncture or laceration injury when lower ribs are fractured. In motor vehicle accidents, lateral impact seems to be an additional risk factor for splenic involvement, with the person seated closer to the side of collision placed at greater risk.

Complications of post-splenectomy, especially intra-abdominal hemorrhage can be fatal, with delayed or inadequate treatment having a high mortality rate and the recognition of the fundamental role of the spleen in the immune response has led to greater efforts to preserve the spleen after injury.

Until recently, the accepted treatment for splenic trauma, even for minor injuries, used to be splenectomy. This aggressive approach was based on the belief that, in adulthood, the spleen does not contribute any major function and conservative treatment was associated with potential life-threatening hemorrhage. With increasing recognition of the spleen's role in immunological function and awareness of overwhelming post-splenectomy sepsis (OPSI), non-operative management of hemodynamically stable patients with blunt...
splenic injury has become the standard of care in pediatric and adult populations. Successful outcome following NOM is reported as up to 95% of patients regardless of the grade of splenic injury.

However, this changed policy towards splenic conservation requires careful risk–benefit analysis in the face of potentially life-threatening hemorrhage from delayed splenic rupture and the possibility of transfusion-induced viral infections.

Furthermore, the increasing availability of reliable and good quality radiological imaging including ultrasound, computerized tomography (CT) scanning, and magnetic resonance imaging (MRI) have greatly improved the information available with regard to the nature of the splenic injury and this may well help to identify the suitable patients for conservative management but at the expense of patient radiation.

In order for Nonoperative treatment (NOT) of splenic injuries to be the standard goal of therapy in hemodynamically stable patients, it is necessary to have an accurate knowledge of patient selection criteria for Nonoperative management, as well as a precise assessment of the factors precluding conservative therapy. This becomes tangible due to diagnostic and therapeutic angiography addition.

Knowing all these factors set the trend in splenectomy-conservative therapy debate (non-operative management, conservative surgery, and spleen auto transplant); it is currently considered that traumatic splenic injury is no longer an absolute indication for splenectomy, thus a proper reviewing of indications for emergency surgery in traumatic hemoperitoneum is needed.

Controversy exists about how to appropriately select patients for non-operative treatment since bleeding from splenic injuries can incur significant morbidity and mortality.

Patients and Methods
This study was conducted at the casualty Unit of Minia University Hospital, and included patients with splenic trauma from December to November. All patients were subjected to the primary survey provides the initial opportunity for evaluating and stabilizing a trauma patient. During the survey, the ABCDEs of trauma care are addressed. Secondary survey the patient is assessed systematically. Investigations were done as Plain X-ray (chest and abdomen), Abdominal u/s which is the routine investigation for all cases, to detect hemoperitoneum, Computerized tomography (C.T) in certain selected hemodynamically stable cases to determine hemoperitoneum, site & grading of splenic trauma according to AAST criteria for splenic Injury Scale. Laboratory investigations were done as Hb and serial hematocrit value, Prothrombin time &concentration, TLC and other investigations according to the presence of any associated co morbidity or as medical consultation needed.

We classified our patients into two groups either Non – operative (conservative), or Operative (surgical).The criteria for conservative management were hemodynamically stable patient or with correct response to plasma volume expansion, absence of signs of diffuse peritonitis on physical examination, transfusion requirements related to splenic injuries of less than 3 units of red blood cell concentrates (packed RBCs) and No suspicion of associated abdominal injuries and grade I, II & III splenic injury on imaging tests.

Criteria for discontinuing non operative management were Increasing abdominal pain, tenderness, and onset of diffuse peritonitis, more than 6 units packed RBC transfusion in the first 8-12 hours of observation, especially in the absence of orthopedic injuries, expansion of subcapsular splenic hematoma on a follow up CT and development of a symptomatic perisplenic fluid collection or hematoma on a follow up sonar.

Criteria for immediate operation were haemodynamic instability on admission.

All patients with systolic arterial blood
pressure (SAP) lower than 92 mmHg on admission in the emergency department and were unresponsive to fast infusion of liters of crystalloid solution and those who, after initial stabilization, developed low SAP lower than 92 mmHg were considered to be in a haemodynamically unstable condition, recurrence of instability after stabilization, peritoneal signs on physical examination.

Patients who planned for Conservative measures were put on absolute bed rest for 28–70 hrs in ICU, monitoring (every 0/0 hr in first 2 hr, every 1 hr in 0nd 8 hr and 1 hr for the resting 02 hr) for Pulse, blood pressure, respiratory rate and temperature chart. Serial physical examinations are mandatory to detect changes in tenderness or the onset of new peritoneal signs in patients who are awake and alert, hemodynamic monitoring (serial hemoglobin, hematocrite value and prothrombin concentration) every 0/hr in first 0/hr and every day in the period of hospital stay. Serial follow up U/S every 0/hr in first 0/hr, every 1 hr in the 0nd 8 hr and every day in the period of hospital stay and abdominal C.T in the next day after being stable (excludes associated abdominal injuries & detects site, extent & grade of splenic injury according to AAST splenic Injury Scale).

Follow up in our clinic for 4–8 weeks to detect any complication.

Assessment of the injury was done for patients who were subjected to surgery; If the injury is superficial (II and III) suture splenorraphy was done as fig (1). If the injury is deep or there is an avulsed part of the spleen (IV and V) splenectomy was done as fig (2). Tubal drains were put in the splenic bed and in the pelvis.

Patients were admitted to ICU post-operatively until stabilization of their general condition then transferred to the surgical ward.

Post-operative follow up include close monitoring of Pulse, blood pressure, respiratory rate and temperature chart every 0/hr in the first of 4 hr, every 1 hr in 0nd 8 hr and every 1 hr in the resting 02 hr, drains: every 1 hr in first 4 hr then every 1 hr in the resting 02 hr if there is blood collected >0 per hr------the abdomen was re-explored. Laboratory investigation including: coagulation profile, renal function, CBC, blood glucose level and electrolytes. Imaging investigation including: postoperative U/S.

Follow up after discharge in outpatient clinic was by imaging (U/S) For 4 weeks to detect any complication as abscess formation, delayed rupture spleen after 4 weeks or wound problems.
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Figure 1: Exploration reveals small superficial tear in spleen. Suture splenorraphy was done.

Figure 7: Exploration reveals ruptured sub capsular splenic hematoma. Splenectomy was done.

Results
Twenty patients were included in this study and were classified according to the modalities of treatment into 2 main groups: conservative (non-operative) group were 7 cases and surgical (operative) group were 7 cases. Conservative group include 9 male and 2 female, while surgical group include 2 male and 5 female.

Age distribution of patients included in the study.

<table>
<thead>
<tr>
<th>Age Group</th>
<th>0-10 YS</th>
<th>11-20 YS</th>
<th>21-40 YS</th>
<th>41-60 YS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Conservative</td>
<td>7</td>
<td>3</td>
<td>1</td>
<td>7</td>
</tr>
<tr>
<td>Surgical</td>
<td>7</td>
<td>3</td>
<td>1</td>
<td></td>
</tr>
</tbody>
</table>

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According to the type of trauma we had in the Conservative group the mechanism of blunt trauma in \( \text{7} \) cases that include fall from height (FFH) in \( \text{7} \), striking hard objects (SHO) in \( \text{7} \), & motor vehicle accident (MVA) in \( \text{7} \) cases. While in the Surgical group the mechanism of blunt trauma in \( \text{7} \) cases that include fall from height in \( \text{7} \), striking hard objects in \( \text{7} \) & motor vehicle accident in \( \text{7} \) cases.

**Type of trauma of patients included in the study.**

<table>
<thead>
<tr>
<th></th>
<th>FFH</th>
<th>SHO</th>
<th>MVA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Conservative</td>
<td>( \text{7} )</td>
<td>( \text{7} )</td>
<td>( \text{7} )</td>
</tr>
<tr>
<td>Surgical</td>
<td>( \text{7} )</td>
<td>( \text{7} )</td>
<td>( \text{7} )</td>
</tr>
</tbody>
</table>

There was \( \text{7} \) cases in conservative group diabetic and hypertensive and in surgical group only one case which was hypertensive.

On admission \( \text{7} \) patients were haemodynamically stable (\( \text{7} \) were treated conservatively , and \( \text{7} \) treated surgically), The other \( \text{7} \) patients were haemodynamically un-stable (\( \text{7} \) cases respond to resuscitation and treated conservatively, while \( \text{7} \) cases did not respond to resuscitation and required urgent exploration).

**Hemodynamic stability of patients included in the study.**

In the conservative group \( \text{7} \) cases didn't require blood transfusion while the other \( \text{7} \) cases (\( \text{7} \) cases required \( \text{7} \) unit of blood and other \( \text{7} \) cases required \( \text{7} \) units of blood).While in the Surgical group \( \text{7} \) cases required \( \text{7} \) units of blood and other \( \text{7} \) cases required \( \text{7} \) units of blood.
Blood units distribution of patients included in the study.

Ultrasonography was done in all cases of the study (4 cases were treated conservatively and 6 cases needed abdominal exploration), while Computed tomography was done in 6 cases only (3 cases were treated conservatively and 3 cases required exploration).

Distribution of amount of collection in U/S of patients included in the study.

<table>
<thead>
<tr>
<th></th>
<th>No collection</th>
<th>minimal</th>
<th>Mild</th>
<th>moderate</th>
<th>Marked</th>
</tr>
</thead>
<tbody>
<tr>
<td>Conservative</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Surgical</td>
<td>0</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td>2</td>
</tr>
</tbody>
</table>

According to AAST after imaging by U/S & CT; in the conservative group 1 case were grade I, 7 cases were grade II, 2 cases were grade III & 6 cases were grade IV.

While in the surgical group 2 cases were grade I, 2 cases were grade II, 0 case were grade III, 0 case were grade IV & 2 cases were grade V.

Distribution of grade of splenic injury of patients included in the study

<table>
<thead>
<tr>
<th></th>
<th>Grade I</th>
<th>Grade II</th>
<th>Grade III</th>
<th>Grade IV</th>
<th>Grade V</th>
</tr>
</thead>
<tbody>
<tr>
<td>Conservative</td>
<td>0</td>
<td>2</td>
<td>5</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Surgical</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>4</td>
</tr>
</tbody>
</table>
## Associated extra-abdominal injuries distribution of patients included in the study.

<table>
<thead>
<tr>
<th></th>
<th>Conservative</th>
<th>Surgical</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Neurological</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Brain edema</td>
<td>Medical</td>
<td>Brain edema</td>
</tr>
<tr>
<td>Extra Dural hematoma</td>
<td>Surgical</td>
<td>Hemorrhagic contusion</td>
</tr>
<tr>
<td>Scalp injury</td>
<td>Suture</td>
<td></td>
</tr>
<tr>
<td><strong>Cardiothoracic</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Haemothorax</td>
<td>ICT</td>
<td>Haemothorax</td>
</tr>
<tr>
<td>pneumothorax</td>
<td>ICT</td>
<td>Pneumothorax</td>
</tr>
<tr>
<td>Fracture ribs</td>
<td>Binder</td>
<td>Fracture ribs</td>
</tr>
<tr>
<td>Lung contusion</td>
<td>Medical</td>
<td>Lung contusion</td>
</tr>
<tr>
<td><strong>Orthopedic</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fracture femur</td>
<td>Surgical</td>
<td></td>
</tr>
<tr>
<td>Fracture tibia</td>
<td>Surgical</td>
<td></td>
</tr>
</tbody>
</table>

Suture splenorrhaphy with vicryl was done in 1 case, and splenectomy was done in 5 cases.

In the conservative group, postoperative peri-splenic abscess was detected in two cases in which sonar guided drainage was successful. And seroma of the exploratory wound was detected in one case in which antibiotics & repeated dressings was successful.

### Complications in patients included in the study.

<table>
<thead>
<tr>
<th></th>
<th>Conservative</th>
<th>Surgical</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Free</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Wound seroma</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Subphrenic abscess</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

1 case died in surgical group intra operative due to massive hæmorrhage while no mortality in conservative group.

Admission in ICU was required for 5 patients of the conservative group and 7 patients of the surgical group.

In the conservative group; 5 cases stay in hospital for less than one week (6 cases stay 7 days and 4 cases stay 8 days), while 5 cases stay for 2-7 week (7 cases stay 3-7 days and 8 cases stay 4-10 days). While in the surgical group 6 cases stay for 5 days, while 3 case stay for 6 days & 4 case died intra operative.

All patients were followed up in the outpatient clinic for 6 month by clinical examination & imaging (U/S), 6 cases were followed up by C.T.

In the Conservative group; 6 cases showed satisfactory progress and the other 8 patients developed peri-splenic abscess that resolved by antibiotics. While in the surgical group 6 cases showed satisfactory progress, while 5 cases developed complication as wound seroma in one patient which treated medically and subphrenic abscess in one patient which treated medically by antibiotics.

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Distribution of complications after discharge in patients included in the study.

<table>
<thead>
<tr>
<th></th>
<th>Conservative</th>
<th>Tt</th>
<th>Surgical</th>
<th>ttk</th>
</tr>
</thead>
<tbody>
<tr>
<td>Free</td>
<td>14</td>
<td></td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Abscess</td>
<td>7</td>
<td>7</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Seroma</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Discussion

Until recently, the accepted treatment for splenic trauma, even for minor injuries, used to be splenectomy. This aggressive approach was based on the belief that, in adulthood, the spleen does not contribute any major function and conservative treatment was associated with potential life-threatening haemorrhage. With increasing recognition of the spleen’s role in immunological function and awareness of overwhelming post-splenectomy sepsis (OPSI), there has been an increasing trend towards conservative treatment and splenic salvage procedure (11).

However, this changed policy towards splenic conservation requires careful risk–benefit analysis in the face of potentially life-threatening haemorrhage from delayed splenic rupture and the possibility of transfusion-induced viral infections.

Furthermore, the increasing availability of reliable and good quality radiological imaging including ultrasound, computerized tomography (CT) scanning, and magnetic resonance imaging (MRI) have greatly improved the information available with regard to the nature of the splenic injury and this may well help to identify the suitable patients for conservative management (11).

We have reviewed the outcome of splenic injuries in our study with the main aim of examining the effect of this changed conservative policy on patients and its implications.

During our study period, 14 patients responded to conservative management, 7 patients required splenectomy due to failure of conservative management a percentage of 72% versus 28% respectively.

In the study done by (R. Aseervatham, M. Muller 22) eighty-five patients were identified. Non-operative management was used on 78 patients, while 5 patients were managed surgically a percentage of 76% versus 24%.

In the study done by (Köksal N, Uzun MA, and Müftüoğlu T 22) 86 patients were identified. Non-operative management was used on 39 patients, while 26 patients were managed surgically a percentage of 22% versus 78%.

These agree with our study (12).

This also agrees with the study done by (Lo A, Matheson AM, Adams 22) eighty patients were identified. Non-operative management was used on 22 patients, while 32 patients were managed surgically a percentage of 26% versus 74%.

In the study done by (A yaghoubi Notash, H Ahmadi Amoli, et al., 27) 302 patients were identified. Non-operative management was used on 298 patients, while 28 patients were managed surgically a percentage of 20% versus 80%.

This don’t agree with our study (12).

Regarding the age in our study, we noticed that there was a slight age difference between patients who failed conservative management, for children and for adults versus, for patients who completed the conservative

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management successfully, $\frac{1}{\text{t}}, \frac{7}{\text{r}}\%$ for children and $\frac{\text{A}^\text{r}, \text{A}^\text{r}}{\text{A}^\text{r}, \text{A}^\text{r}}\%$ for adults.

But in the study done by (S Sinha, SVV Raja, and MH Lewis $\gamma. \gamma. \lambda$) $\gamma$ patients were identified. The median patient age was $\gamma$ years (range, $\gamma^\text{r} - \gamma^\text{r}$ years). The median age of the operative and non-operative groups was not significantly different ($\gamma^\text{r}$).

But in the study of (Douglas and Simpson $\gamma^\text{r} \gamma^\text{r}$) described $\gamma^\text{r}$ cases of children with clinical signs of splenic injury treated conservatively out of whom, $\gamma^\text{r}$ children did not require surgical intervention. This study proved that the spleen has indeed the capability of healing itself with an excellent outcome in selected cases ($\gamma^\text{r}$).

But in the study done by (George A Giannopoulos, Iraklis E Katsoulis, et al., $\gamma. \gamma. \lambda$) non – operative management was initially applied in $\gamma^\text{r}, \gamma^\text{r}$ ($\gamma^\text{r}$ patients) of all blunt abdominal injuries. No significant differences were observed between operative group and conservative group in relation with age ($\gamma^\text{r}$).

- Regarding the grade of injury our study showed that:
  - a) $\gamma$ patients of $\gamma^\text{r} (\gamma^\text{r})\%$ were of grade I
    - This patient was successfully treated none operatively (a percentage of $\gamma^\text{r}, \gamma^\text{r}$ of grade I splenic injury).
  - b) $\gamma$ patients ($\gamma^\text{r}, \gamma^\text{r}\%$ were of grade II
    - All of them were successfully treated none operatively (a percentage of $\gamma^\text{r}, \gamma^\text{r}$ of grade II splenic injury).
  - c) $\gamma$ patients ($\gamma^\text{r}, \gamma^\text{r}\%$ were of grade III
    - $\gamma$ of them were successfully treated none operatively (a percentage of $\gamma^\text{r}, \gamma^\text{r}$ of grade III splenic injury).
    - The remaining one patient was needed operative Interference and splenorrhaphy was done (a percentage of $\gamma^\text{r}, \gamma^\text{r}$ of grade III splenic injury).
  - d) $\gamma$ patients ($\gamma^\text{r}, \gamma^\text{r}\%$ were of grade IV
    - $\gamma$ of them were successfully treated none operatively (a percentage of $\gamma^\text{r}, \gamma^\text{r}$ of grade IV splenic injury).
    - The remaining $\gamma$ patient needed operative Interference and splenectomy was done (a percentage of $\gamma^\text{r}, \gamma^\text{r}$ of grade IV splenic injury).

- All cases needed operative interference and and splenectomy was done (a percentage of $\gamma^\text{r}, \gamma^\text{r}$ of grade V splenic injury).

These our results concluded that lower grades (I-III) have the highest rate of success. Included that class I, II and III can be treated safely and class IV can be treated with high prediction of failure and recommended that class V should be treated surgically.

- In the study done by (Köksal N, Uzun MA, Müftüoğlu T $\gamma. \gamma. \gamma$) $\gamma^\text{r}$ patients concluded that The mean operative splenic injury grade was $\gamma$ in the patients who underwent surgery, and the mean injury grade based on CT scan was $\gamma$. in the patients who were managed conservatively ($\gamma^\text{r}$).

- In the study done by (S Sinha, SVV Raja, and MH Lewis $\gamma. \gamma. \lambda$) $\gamma$ patients concluded that Using Buntain's CT grading, the majority of grades I and II splenic injuries were managed non-operatively and grades III and IV were managed operatively. These agree with our study ($\gamma^\text{r}$).

- This also agree with the study done by (Lisa K, McIntyre; MD; Melissa et al., $\gamma. \gamma. \gamma$) on $\gamma^\text{r} \gamma^\text{r}$ patients concluded that Risk of failure increased with admission to a level III or IV trauma hospital compared with a level I trauma hospital ($\gamma^\text{r}$).

- In our study, the mean duration of hospital stay for patients who were treated conservatively was slightly higher than those who needed operative.

- This agree with the study done by (S Sinha, SVV Raja, and MH Lewis, $\gamma. \gamma. \lambda$) concluded that the non-operative group had a significantly longer hospital stay ($\gamma^\text{r}$).

- This also agree with the study done by (Köksal N, Uzun MA, Müftüoğlu, $\gamma. \gamma. \gamma$) concluded that the mean duration of hospitalization in the patients with operative and non-operative management groups were $\gamma. \gamma$ and $\gamma. \gamma$ days, respectively ($\gamma^\text{r}$).

- In the study done by (M Beuran, I Gheju, et al., $\gamma. \gamma. \gamma$) concluded that hospital stay varies between $\gamma$ to $\gamma$ days when no other injuries are present to elicit a prolonged stay ($\gamma^\text{r}$).

- But in the the study done by (Margherita Cadeddu, Anna Garnett, et al., $\gamma. \gamma. \gamma$) concluded that The median length of

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stay in hospital was significantly higher in the operative group than in the Nonoperative group that don’t agree with our study (11).

- Regarding the blood transfusion in our study is the need for transfusion greater in patients managed surgically.
  - In the study done by (Köksal N, Uzun MA, Müftüoğlu T, 11) concluded that The mean unit of blood transfusion in the patients with operative and non-operative management groups were 1, 1 and 1, this don’t agree with our study. These agree with our study (11).
  - In the study done by (R. Aseervatham, M. Muller, 11) concluded that transfusion requirement were lower in non-operative group. This also agree with our study (11).
  - In the study done by (S Sinha, SVV Raja, and MH Lewis 11) concluded that Blood transfusion requirement was significantly higher among the operative group (11).
  - In the study done by (Lo A, Matheson AM, Adams D 11) concluded that transfusion requirement were lower in non-operative group than surgical group (11).

- Regarding the mortality rate in our study one patient only died in surgical group intra operative and no mortality in non-operative group.
  - In the study done by (Köksal N, Uzun MA, Müftüoğlu T 11) concluded that no mortality in surgical and conservative group (12).
  - In the study done by (S Sinha, SVV Raja, and MH Lewis 11) concluded that There were no deaths in the non-operative group. In the operative group, one patient who sustained polytrauma remained unstable, developed a systole and died in ICU on the first postoperative day (10).
  - In the study done by (Margherita Cadeddu, Anna Garnett, et al., 11) concluded that the mortality rate was similar between operative and Nonoperative groups (4, 11, v. 11, p = 0, 11) (11).
  - In the study done by (Yikun Qu, Shiyan Ren, Chunmin Li, et al., 11) concluded that Fourteen of 11 patients (11, 11) undergoing splenectomy had intra-Abdominal Trauma peritoneal hemorrhage: reoperation was performed in 11 patients, and 11 patients died after reoperation, giving the hospital a mortality rate of 11, 11; whereas, 11 of 11 patients (11) had no hemorrhage following splenectomy, and the mortality rate (11) in this group was significantly lower (P < 0, 11) (11).
  - Regarding the hemodynamic in our study 11 patients were hemodynamically stable and 11 patients were hemodynamically un-stable. 11 patients treated conservatively, while 11 patients treated surgically. Our study concluded that patients who are hemodynamically stable patients are safe, effective.
  - In the study done by (J. Skattum, P. A. Naess, C. Gaarder 11) concluded that non-operative management continues to be reported as a successful approach in hemodynamically stable patients without other indications for laparotomy, achieving high success rates in both children and adults. These agree with our study (11).
  - In the study done by (Lo A, Matheson AM, Adams D 11) concluded that Patients with splenic injuries who are hemodynamically stable can be managed non-operatively with acceptable outcome. However, in the presence of concomitant trauma, there is an increasing trend towards operative management. This also agrees with our study (11).
  - In the study done by (Köksal N, Uzun MA, Müftüoğlu T 11) concluded that hemodynamic stability is the most important factor which could affect the selection of patients for non-operative management outcome regardless of the patient age and computed tomography scan grading of the injury. These also agree with our study (11).

So we can conclude that non operative management for blunt splenic trauma in hemodynamically stable patients is safe, effective and associated with, low morbidity and no mortality especially in grade I-II and III with inferior results in grade V.

However, non-operative management should be practiced in hospitals where an efficient ICU is available.

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