Splenic injuries in children: The challenges of non operative management in a developing country

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ABSTRACT

Aim: This is to report the challenges and experience gained with non operative management of splenic injuries in a developing country where sophisticated imaging facilities are either not available or exorbitantly expensive. Materials and Methods: All patients who presented with splenic injury at the University of Benin Teaching Hospital between January, 2000 and December, 2006 were assessed and those who met the criteria were recruited for non operative management. Diagnosis of splenic injury was made by combining clinical assessment and ultrasound findings. Results: A total of 24 children with a mean age 12 ± 0.04 years and male/female ratio 1.7:1 were treated during the period. Road traffic accident, accounting for 50% of the cases was the major cause of trauma followed by falls from heights. Delay in presentation was a major concern as 62.5% of them were not referred until shock supervened. None of the patients could afford CT scan but ultrasound scan was able to confirm diagnosis in all. Basing decision on clinical parameters, non operative management was successfully done in 75% while 25% were operated as they could not meet the criteria. No mortality was recorded in the non operated group while one was recorded in those operated. The average length of hospitalization was two weeks. Conclusion: Non operative management of splenic injuries can be successfully done in a developing country using clinical parameters as a guide. The 75% of patients with splenic injury treated can be improved upon by health awareness campaign/improvement in government policy that will result in early presentation.

KEY WORDS: Children, nonoperative management, splenic injuries

INTRODUCTION

The spleen is a highly vascular lymphoid organ, located in the left hypochondrium, which plays a major role in providing immunity. The absence of bony protection makes it one of the most frequently injured abdominal viscera. Diseased spleen especially due to malaria fever which is endemic in Africa ruptures even from trivial abdominal trauma.[1] Prior to 1970, particularly during the Nigeria civil war, the only treatment for splenic injury was splenectomy irrespective of the grade of injury and patients’ clinical state.[1,2] The problems of asplenia soon became a major drawback to total splenectomy. Overwhelming post splenectomy sepsis and resistant malaria fever became very fatal more than ever in children.[3,4]

The recognition, that patients without spleen have an increased risk of death from overwhelming infection, led surgeons to consider methods of splenic preservation.[2,5] Initially operative repair, splenorrhaphy, was attempted. Subsequently, in North America and Europe, where the majority of abdominal injuries are from blunt trauma, usually road traffic accidents (RTA) and with the introduction of the CT scan, non operative management became popular and now predominant.[2,5-8] Today, more than 90% of blunt pediatric splenic injuries and about 60-70% of adult ones are managed non operatively in the West and other developed countries.[2,9-20] In developing countries, such as Nigeria, however, lack of imaging facilities or inability to afford them even when available make it a great challenge to embark on non operative management.[1,20-25] In view of this, laparotomy with splenorrhaphy or splenectomy continued to remain the standard treatment in this centre.[20] Splenorrhaphy in children who reside in regions where malaria is endemic is very difficult as the splenic capsule is attenuated and holds sutures.
poorly.[1,12-25] Asplenic children in developing countries are also more exposed to virulent organisms because of the poor environmental hygiene and as such die more from overwhelming post splenectomy sepsis.[1]

The need to adopt a non operative protocol that is available and cost effective in our own setting became paramount. This paper reports the challenges and experience with non operative management of splenic injuries in children at the University of Benin Teaching Hospital. An experience we feel may be useful to health provider, especially those working in low socioeconomic setting where sophisticated facilities may not be available.

MATERIALS AND METHODS

This is a seven year experience with non operative management of splenic injury at the University of Benin Teaching Hospital, Benin City, Edo State, Nigeria, between January, 2000 and December, 2006. The hospital is a tertiary health institution located in the South-south Geopolitical Zone of Nigeria. Patients were referred to our unit from trauma unit of the hospital, other hospitals in the state and by the paramedical health providers. Each patient was evaluated for age, sex, etiology of splenic injury, place of referral, time lag between trauma and presentation to us and clinical state on arrival. Splenic injury was diagnosed by combining clinical assessments, imaging and radiological investigations. Based on clinical evaluations within the first 24 h on presentation, the patients were placed in either of the four categories:

• A - Those who were hemodynamically stable on arrival and thereafter.
• B - Those that were unstable but stabilized by administration of crystalloids only.
• C - Those that were unstable but stabilized by administration of colloids.
• D - Those who have penetrating abdominal injury and those who remained unstable after resuscitation with 50% of their estimated blood volume within the 24h.

The mode of treatment; operative or non operative was then decided. Category A-C had non operative treatment while category D had operation. Non operative treatment included crystalloids and or colloids, antibiotics and analgesia administration. All the patients had hourly assessment of pulse rate, blood pressure, urinary output, abdominal girth and tenderness, sensorium, temperature and respiratory rate. Daily hematocrit, blood chemistry, radiological monitor and restriction to bed for one to two weeks were the routine but these were, however, adjusted based on the financial status of the patients. In such instances, after the initial ultrasound confirmation of splenic injury, subsequent decisions were based on clinical evaluations. Splenorrhaphy or splenectomy and intraoperative autotransfussion were done for those who had an operation.

Some patients had severe multiple trauma and somere found to have neither clinical nor radiological evidence of splenic injury. These categories were excluded from the study. The data obtained was analyzed using SPSS and presented in tables and figures.

RESULTS

A total of 24 children comprising of 15 males and 9 females with a ratio of 1.7:1 were treated with isolated splenic injury in 19 (79.2%). Their ages ranged between 2-18 years with a mean of $12 \pm 0.04$ years. [Figure 1] shows the age distribution of the patients. The age group mainly affected were those between 11-15 years who accounted for 10 (41.7%) and 16-18 years 8 (33.3%). Those in age group 5-10 years 4 (16.7%) and less than 5 years 2 (8.3%) were less commonly affected. Out of the 24 patients, only 9, (37.5%) presented to us directly after the trauma. The remaining 15 (62.5%) were referred from 10 (41.7%) chemist’s shops, 4 (16.7%) private clinic and 2 (8.3%) traditional clinics when they had deteriorated [Figure 2].

Road traffic accidents was a leading cause of splenic injuries as half (50%) of the patients were involved in car, motorcycle or bicycle accidents. Fall from a height was implicated in six (25.0%), domestic accidents three (12.5%), sport injuries two (8.3%) and penetrating gunshot one (4.2%). Only few patients presented within few hours of injuries. The mean time lag for RTA was two days, fall from heights 1.5 days, domestic accident six hours, sport injuries 11 hours and gunshot one hour. All those referred late were hemodynamically unstable. Overall, a total of 16 (66.7%) were in poor clinical state on arrival.

![Figure 1: Age distribution of the children](image-url)
Eight from RTA, three fall from a height, two domestic accidents, two sport injuries and 1 penetrating gunshot [Table 1]. The clinical parameters of the patients, their mean and standard deviation on presentation are depicted in Table 2. Body weight 12-20 kg (26 ± 0.05), haematocrit 6-12.5 mg% (8.5 ± 0.40), core body temperature 35-37.4ºc (36 ± 0.12), systolic blood pressure 50-120 mmHg (70 ± 2.80) and pulse rate 80-130/min (98 ± 2.40).

Table 1: Etiology, time lag before presentation and clinical state on arrival

<table>
<thead>
<tr>
<th>Variables</th>
<th>Etiology No.</th>
<th>%</th>
<th>Range</th>
<th>Time lag mean</th>
<th>C. State</th>
</tr>
</thead>
<tbody>
<tr>
<td>Road traffic accident</td>
<td>12</td>
<td>50.0</td>
<td>1-6 days</td>
<td>2 days</td>
<td>8 unstable</td>
</tr>
<tr>
<td>Fall from heights</td>
<td>6</td>
<td>25.0</td>
<td>1-3 days</td>
<td>1.5 days</td>
<td>3 unstable</td>
</tr>
<tr>
<td>Domestic accident</td>
<td>3</td>
<td>12.5</td>
<td>2-8 h</td>
<td>6 h</td>
<td>2 unstable</td>
</tr>
<tr>
<td>Sport injuries</td>
<td>2</td>
<td>8.3</td>
<td>10-12 h</td>
<td>11 h</td>
<td>2 unstable</td>
</tr>
<tr>
<td>Gunshot</td>
<td>1</td>
<td>4.2</td>
<td>2 h</td>
<td>2 h</td>
<td>1 unstable</td>
</tr>
<tr>
<td>Total</td>
<td>24</td>
<td>100</td>
<td>00</td>
<td>00</td>
<td>16 unstable</td>
</tr>
</tbody>
</table>

Table 2: Clinical parameters

<table>
<thead>
<tr>
<th>Variables</th>
<th>Age</th>
<th>Body Wt.</th>
<th>Haematocrit</th>
<th>Sys. BP</th>
<th>Temp.</th>
<th>Pulse rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ranges</td>
<td>2-18 years</td>
<td>12-50 kg</td>
<td>6-12.5 mg%</td>
<td>50-120</td>
<td>35-37.4ºC</td>
<td>80-130</td>
</tr>
<tr>
<td>Mean/SD</td>
<td>12 ± 0.04</td>
<td>26 ± 2.05</td>
<td>8.5 ± 0.40</td>
<td>70 ± 2.80</td>
<td>36 ± 0.12</td>
<td>98 ± 2.40</td>
</tr>
</tbody>
</table>

Table 3: Modalities of treatment

<table>
<thead>
<tr>
<th>C. state</th>
<th>Modality</th>
<th>Frequency</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stable</td>
<td>Non operative</td>
<td>8</td>
<td>33.3</td>
</tr>
<tr>
<td>Unstable</td>
<td>Stabilized with crystalloid; Non operative</td>
<td>3</td>
<td>12.5</td>
</tr>
<tr>
<td>Unstable</td>
<td>Stabilized with colloid; Non operative</td>
<td>7</td>
<td>29.2</td>
</tr>
<tr>
<td>Unstable</td>
<td>Failed attempt at stabilization</td>
<td>5</td>
<td>20.8</td>
</tr>
<tr>
<td>Unstable (gunshot)</td>
<td>Resuscitation, then laparotomy</td>
<td>1</td>
<td>4.2</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>24</td>
<td>100</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Options</th>
<th>Outcome</th>
<th>Frequency</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Non operative</td>
<td>Hospitalization 1-2 weeks; All survived</td>
<td>18</td>
<td>75.0</td>
</tr>
<tr>
<td>Splenorrhaphy</td>
<td>Hospitalization 2-3 weeks; All survived</td>
<td>4</td>
<td>16.7</td>
</tr>
<tr>
<td>Splenectomy</td>
<td>Hospitalization 3 weeks; one died, one survived</td>
<td>2</td>
<td>8.3</td>
</tr>
<tr>
<td>Total</td>
<td>23 survived, one died</td>
<td>24</td>
<td>100</td>
</tr>
</tbody>
</table>

DISCUSSION

Non operative management is feasible in developing
countries in spite of the enormous challenges. This study shows that 18 (75.0%) of the 24 children treated over the seven years period were successfully managed without operation. Management protocol based on categorizing the patients using clinical evaluations rather than expensive imaging was found to be affordable and cost effective. Earlier reports from this sub region were not encouraging perhaps due to the understanding that non operative management is not feasible without sophisticated imaging facilities. The importance of imaging (CT scan) for the diagnosis and follow-up of patients with splenic injuries cannot be overemphasized. Depending on it as the sole determinant and predictor of management outcome have been queried by other workers.

CT scan was not available in this centre until recently and when it was, none of our patients could afford it. Ultrasound scan was good enough in detecting splenic injury and the presence of hemoperitoneum has also been reported. The diagnosis having been confirmed, the subsequent clinical state is a reflection of the rate of bleeding. This to a large extent reflects the severity and grade of splenic injury. Diligent and committed staffs were on ground to detect any variations from the baseline clinical parameters throughout the period of hospitalization as also noted in previous report. This was, however, exerting on the staffs as most monitoring were manual. Understaffed pediatric surgery units in developing countries where there are no CT scan may need to adopt non operative management cautiously.

More males were affected than females with a ratio of 1:7:1 and the age range 11-15 years was the highest group affected. This tallies with reports from other geopolitical zones in Nigeria. Trauma generally, affects more males worldwide particularly during periods of civil unrest and the incidence increases with age, reaching a peak between 20-30 years. Some patients above 16 years are managed by adult surgeons and this could explain why the prevalence was lower in the age range 16-20 years than 11-15 years in this series, even though the incidence of trauma is the reverse.

The mortality of 6.3% earlier reported by Ameh in Northern Nigeria is comparable with 4.2% recorded in this study. All his patients were, however, operated due to lack of imaging facilities, 59.4% splenorrhaphy and 40.6% splenectomy. He opined that laparotomy would have been avoided in 51.6%, were imaging facilities available. This is similar to a report from Eastern Nigeria where all 23 cases seen over the past one and half decades were operated, 65.2% splenectomy and 34.8% splenorrhaphy. Adopting this non operative protocol based on clinical evaluations in view of the scarce resources resulted in 75% of our patients being successfully managed non operatively. We could not, however, record up to 90% non operative management as recorded in developed countries due to factors peculiar to our setting.

Road traffic accident is a leading cause of splenic injury in developed cities but the delay in presentation with a mean of two days in this study is alarming. This could be due to the poor transportation system and non availability of rescue team. Financial constraint and lack of awareness made those rescued from injury scene (62.5%) initially sought help from cheaper sources such as chemist’s shops. They were sent to us when they continued to deteriorate. Unlike Western countries were patients present within few hours of injury and in relatively stable clinical state our patients (66.7%) presented in poor clinical state. This could partly explain while 25.0% of our cases were offered operation.

The patient who sustained splenic avulsion from penetrating gunshot, though presented early did not meet the criteria for non operative treatment. Control of bleeding and resuscitation was very difficult and his death within few hours after total splenectomy from irreversible shock was not unexpected as there were no facilities for angiography embolization.

Non operative management of splenic injury is not hundred percent successful even in the most sophisticated centres. Not all patients and all grades of trauma can be treated as seen in our series and reports from centres with modern facilities. Some patients who met the criteria for selection have been lost during management and delay rupture with life-threatening bleeding has been reported several days after splenic trauma. There, therefore, a need for follow-up long after the most stable patient has been discharged.

In conclusion, developing countries are far behind in acquiring modern facilities available currently for management of splenic injury in developed countries. Transporting such knowledge without taking into account the socioeconomic status of the people will result in poorer outcome as these facilities are not on hand and inexorably expensive. Adequate clinical assessment, vigorous resuscitation, committed monitoring and cooperation between nursing staffs and patients give good results when non operative treatment is adopted using clinical parameters as a guide.

REFERENCES


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