

Is successful non-operative management of isolated pediatric splenic trauma in children possible in an Indian urban hospital.

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Abstract

Background: Non-operative management in majority of paediatric blunt abdominal trauma injuries is routine. The need for pediatric intensive care unit (PICU) admission, length of hospital stay pre and post discharge imaging, duration of activity restriction varies from country to country and center to centre. The purpose of this study was to characterize the pattern of practice in a developing state health institution and formulate safe and effective care plan for managing children with isolated blunt splenic injuries. **Method:** A retrospective study between 2009-2015 with isolated blunt splenic trauma at our hospital in paediatric population. **Result:** A total of 40 children (30 male and 10 female) with isolated blunt trauma spleen were included in this study. Age group was between 2.5–16 years (mean 9.5 ± 0.17 years). Fifteen patients were hemodynamically unstable and were resuscitated at reception. Average grade of splenic injury was 2.9. All the patients were admitted in general ward and attached to monitor with heart rate (HR), respiratory rate (RR), electrocardiogram (ECG), blood pressure (B.P) and oxygen saturation (SPO₂) monitoring. Average length of hospital stay was 5.5 days (Range 3-11 days). Initial imaging was Ultrasonography (USG) and contrast enhanced computed tomography (CECT) in 18 patients and CECT abdomen only 22 patients. Follow-up imaging was done with USG only in 10 patients (25%) before discharge. Mean observed activity restriction in our study was 5 weeks range (4-8 weeks). All the 40 patients had successful non-operative management without any death or complication.

Conclusion; Non-operative management of isolated blunt splenic trauma in paediatric patients was 100% successful in our study. Routine pre-discharge imaging may not be necessary and admission to paediatric ICU might not be mandatory, provided strict hemodynamic monitoring is done. In most isolated splenic injuries 6 weeks activity restriction is safe.

Keywords: Non-operative management, Blunt splenic trauma, Imaging, American association for the surgery for trauma (AAST).

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Introduction

The majority of abdominal injuries were due to blunt trauma, usually Road Traffic Accidents (RTA). With the introduction of computed Tomography (CT), non-operative management became popular and now predominant [1]. Today about 90% of blunt paediatric splenic injuries and about 60-70% of adult splenic trauma patients are managed non-operatively in the west and other developed countries [1,2]. The American Pediatric Surgical Association (APSA) guide lines are based on severity of injury according to CT grade [3]. According to injury severity score (ISS), the length of hospital stay ranges from 2 to 5 days and the length of

activity restriction ranges from 3 to 6 weeks. Foremost, the guidelines assume hemodynamic stability and provide little information to guide the less experienced clinicians when to operate [4]. The guidelines also assume isolated splenic injury, although some have included children with minor remote injuries including undisplaced fractures and soft tissue injuries.

In developing countries like India lack of imaging (CT) facilities in some hospitals and non-availability of paediatric intensive care units (ICU's), non-operative management of splenic trauma becomes more challenging. Laparotomy with splenectomy or splenorrhaphy continued to remain the standard treatment in many developing countries [2].

Moreover, asplenic children in developing countries are more prone to infections by virulent organisms [5].

Our study reports the challenges and experience with the non-operative management of paediatric isolated blunt splenic trauma in a region with limited resources. Furthermore, we will discuss the frequency and need for follow-up imaging, the length of hospital stay and the duration of activity restriction for such children.

Materials and Methods

This was a retrospective study between 2009-2015, including isolated blunt splenic trauma. The data collected included patients age, sex, length of hospital stay, mood of injury, hemodynamic data, hematocrit, blood pressure, hemoglobin, heart rate, blood transfusion requirements. Clinical characteristics; all the patients were monitored hourly. The assessment of heart-rate, respiratory rate, blood pressure, urinary output, abdominal signs (girth, tenderness, and discoloration), 8 hourly hematocrit was done in first 48 h than 24 hourly and blood chemistry was also done. Diagnostic tests; Imaging data included, the initial imaging, pre-discharge and post discharge imaging. The American Association for the Surgery for Trauma (AAST) organ injury scale was used to grade the splenic injury based on CT and USG scans. Skeletal survey and CT brain was performed to rule out associated injury when necessary.

Outcome Characteristics

Injury severity scale for splenic injury was assigned to each patient by the radiologist. The criteria for injury scale were American Association for the Surgery for Trauma (AAST) organ injury scale. Restriction to bed was advised as per the APSA guidelines, i.e., activity restriction of 6 weeks for more severe grade IV injuries and a progressive one week decrease in duration of restriction for subsequent less severe injury grades. Patients were followed over an average period of 2.9 ± 0.9 years. The data was entered in SPSS software and analyzed.

Results

A total of 40 cases (comprising 30 male and 10 female) with isolated blunt trauma spleen were included in the study. Their age ranged between 2.5-16 years, with mean of (9.5 ± 0.14) years. Age group (9-14 years) constituted 16 (40.0%) of cases. Road Traffic Accident (RTA) and fall from height were the cause of splenic injury, as both constituted 50% each as a cause of injury. Twenty eight (70%) of the patients presented with in first 20 h of injury. Overall 15 (37.5%) patients were hemodynamically unstable and remaining 25 (62.5%) was stable.

Average grade of injury was 2.5 (Table 1). The mean paediatric trauma score was 10.3 range (5-11), the clinical parameters of these patients included, body weight 15-36 Kg, hematocrit between 12-21 mg% (10 ± 0.30), core body temperature was 36-37.5 (36 ± 0.11), systolic blood

Table 1. Incidence of grades of injury

Grade of Splenic Trauma	Number of Patients	Percentage
1	4	10.0%
2	8	20.0%
3	15	37.5%
4	11	27.5%

pressure 60-120 mm Hg (72 ± 3.6) and pulse rate 90-140 beats/min (mean 100 ± 3.4). Criteria for blood transfusion were either hematocrit less than 21 haemoglobin less than seven. Of the 40 children, 15 (37.5%) required blood transfusion @ 20 ml/kg. The initial imaging method used for diagnosis of splenic injury at presentation at our hospital was CECT in 22 patients CECT with USG in 18 patients.

All the 40 patients were admitted in general ward attached to the monitor with facility of pulse, B.P, ECG and SPO₂ monitoring. The mean length of stay in all patients was 5.6 days (range 3-11days). In 10 (25.00%) patients imaging studies USG were performed out before discharge for pain abdomen and it did not change the management in any case. In remaining 30 patients no imaging was carried out before discharge. In these 10 pre-imaging studies, there was no single change of management as a result of pre-discharge imaging. In 3 cases, the spleen was regarded as either completely healed or normal before discharge. Criteria for discharge was according to grade of injury patients with Grade I, Grade II, Grade III, Grade IV injury had hospital stay of 2, 3, 4, 5 days, respectively.

Patients were seen in follow-up an average of 2.7 times. Average follow-up period was 19.26 months. Post-discharge imaging (USG) was a performed in all patients on 3-8 weeks. The mean time to imaging on follow-up was 4.6 weeks. All scan showed varying degree of resolution and complete healing was documented in 24 (60%) of cases by 6 weeks. In the follow-up 2 patients with grade IV Injury at initial imaging were re-admitted for pain abdomen unrelated to splenic trauma and were discharged at one day seven and day 10, respectively. During the hospital stay patients were allowed to quiet activities just before discharge. The average time to return of full activity was 5 weeks. Activity restriction was documented in 30 cases (75%). The non-operative management in all our 40 children was successful with no death.

Discussion

Non-operative management of blunt isolated splenic trauma is well accepted. All though different aspects of this management, such as length of hospitalization, need for ICU admission, the initial imaging used to grade the injury, follow-up imaging, and length of activity restriction continue to be variable in different countries and centers [6-8]. In our series we characterized our experience of non-operative management of isolated blunt trauma spleen in pediatric age group. This study showed that 40 (100%)

of the 40 children treated over 6 years were successfully managed conservatively. There were no deaths and all the patients recovered without any complications.

Initial confirmation of the injury was made by USG and CECT in our series. Computed tomography is considered 'gold standard' in the current literature for evaluation of blunt abdominal trauma [9]. CT provides excellent assessment of the grade of injury and rules out other associated abdominal solid visceral and gut injury. We found that 26 (65%) of children had grade 3 and 4 injury and 2 (8%) patients had grade V injury. All of these patients were managed conservatively.

Males were affected more than females with a ratio of 2:1 which corresponds with the authors like [10,11]. We managed all the patients in general ward with strict monitoring of hemodynamic parameters. Our experience has shown that the place of management does not have an impact on success of non-operative management. Our experience was similar to findings confirmed by authors like Zabolotny et al. [12] who state that similar grades of splenic injury did equally well regardless of admission to ward or Pediatric Intensive Care Unit (PICU). Furthermore, admission to the PICU with several authors including Siplovich et al. [13] has also questioned the need for intensive care monitoring. Stylianos, in his study concluded that PICU admission is warranted only for most severe (grade-IV) splenic injuries [3].

Follow-up Image: In our series, 10 (25%) patients, routine pre-discharge imaging was carried out and in 30 (60%) children no pre-discharge imaging was ordered. There was no difference in the results of these studies. Furthermore, these imaging studies did not change the overall management of these patients. Other studies have largely come to the similar conclusion that routine pre-discharge imaging is unnecessary in patients with isolated blunt trauma spleen [14,15]. Pronikoff et al. [14] found that half of all the splenic injuries, regardless of the severity had CT evidence of complete healing within 6 weeks of injury. In our study post-discharge imaging was performed at an average of 4.6 weeks (range 3-8weeks). Complete healing was documented in 60% of our patients at 6weeks of injury and remaining patients showed varying degree of resolution of the injury. Some of the less severe injuries as well as severe injuries were still not completely healed at 6 weeks of injury [14]. So some authors suggest that 3 month activity restriction might be reasonable [16]. USG was used as the sole modality in follow-up imaging, as we believe CT unnecessarily exposes children to radiation without any change in clinical management. Pranikoff et al. [14] noted in their series that in none of the cases did CT results alter clinical management, thereby raising the question of the utility of routine scanning. Huebner et al. [15] found that the appearance of splenic injury on CT scan remained unchanged or improved in 95% of the imaging studies. Rovin et al. [17] found that almost all splenic injuries showed complete healing on CT by 3

months of injury and smaller grades of injury heal even before 3 months. APSA also recommended that there be no routine follow-up imaging. CT regardless of injury severity and that the imaging should be performed in a focused manner based on clinical parameters.

Activity Restriction

All though we suggest an activity restriction of 6weeks for grade IV and V injuries and a progressive 1 week decrease in duration of restriction for subsequent less severe grades but the average time to return of full activity in our series was 5 weeks, without any untoward complication. Restriction of activity is common after splenic injury. Majority of surgeons advise 3 months activity restriction [18]. In a recent study, it was observed that most of the patients returned to activity in less than 3 months [19]. The APSA trauma committee has shown that it is safe for surgeons to be even more aggressive in allowing patients to return to full activity levels. Applying to this data we found that activity restriction could be 6 weeks only. Our view is supported by Zabolotny et al. [12] who states that all injuries require no more than 6 weeks of restricted activity and they have linked the length of activity restriction to grade of splenic injury.

Mean length of hospital study in this study was 5.50 days range was (3-11 days). All though studies have shown that injury grade can't be used to predict the operative or non-operative management [20]. The current APSA guidelines suggest that once non-operative management has been determined, the injury grade can be used to facilitate the appropriate hospital stay, aid in discharge planning and guide recommended activity restriction. It was suggested that in absence of grading the severity of splenic injury is overestimated by the surgeon/clinician, which results in compensatory increase in the length of hospital stay and activity restriction [16]. Monitoring of our patients was supervised by consultant paediatric surgeons. Furthermore, the radiology was reported by the qualified radiologist in order to avoid the over-estimation of injury by surgeon as has been reported in many studies.

Conclusion

Our study suggests that non-operative management is almost 100% successful provided close and strict hemodynamic and laboratory monitoring is done. Initial CECT for grading the injury makes surgeon confident for non-operative management. Further management is guided by hemodynamic parameters. The routine admission to PICU and follow-up imaging is not necessary. Physical activity restriction in excess of 6 weeks may not be indicated.

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