SAS Journal of Surgery
Abbreviated Key Title: SAS J Surg
ISSN 2454-5104
Journal homepage: https://www.saspublishers.com

OPEN ACCESS

Surgery

Current Trends of Conservative Management of Blunt Abdominal Solid Organ Injury

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DOI: 10.36347/sasjs.2022.v08i08.004 | **Received:** 05.03.2022 | **Accepted:** 09.04.2022 | **Published:** 04.08.2022

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Abstract **Original Research Article**

Introduction: Bangladesh is one of the most densely inhabited countries in the world. Road traffic accidents are one of the leading causes of morbidity, and the incidence of blunt abdominal injuries is on the rise. Over the last several years, the treatment of blunt abdominal injury (BAI) has changed dramatically. Conservative or non-operative treatment (NOM) of liver, spleen, and kidney injuries has proven to be quite effective. ***Methods of study*:** A prospective observational study was done in Dhaka medical college with 50 consecutive patients included from January 2010 to June 2010. ***Results:*** Within the 50 consecutive patients 88% were male, and 64% were motor vehicular crashes. 26 patients (52%) had a liver injury; 5 (10%) had a renal injury; 7 (14%) had a splenic injury and 3 (6%) had a pancreatic injury; 9(18%), 2 patients (4%) had both liver and spleen injury, 3 patients (6%) had both spleen and kidney injury. 39 (78%) patients were managed successfully by a conservative approach. Compared with these patients who underwent non-operative management (NOM) initially, patients in the operative group had a higher injury severity score. ($p < 0.001$). Twenty-seven patients (high risk) were successfully treated without surgery. No serious complication was found on routine image follow-up. ***Conclusion*:** Conservative or non-operative management of blunt abdominal solid organ injury in hemodynamically stable patients is highly successful in many fields when compared with the operative group, including the outcomes of morbidity, mortality, and length of hospital stay.

Keywords: Blunt abdominal Injury, Solid organ Injury, Conservative, etc.

INTRODUCTION

Surgical patients all over the world suffer from blunt abdominal trauma, which is a leading cause of morbidity and death. According to WHO estimates, almost 16000 people die from injuries every day throughout the world, accounting for 9% of all deaths in 2000 and 12% of all diseases [1]. Isolated blunt abdominal trauma (BAT) accounts for roughly 5% of all blunt trauma deaths each year. BAT contributes an additional 15% of trauma mortality as part of multiple-site damage (polytrauma) [2]. Bangladesh is an extremely impoverished and heavily populated country. About a quarter of the population lives in cities. The most prevalent reason for admission to a surgical unit is blunt abdominal injuries. BAT is caused by three things: a car accident, a fall from a great height, and an attack, in that order. Sheering compression and tension forces are the mechanisms of damage. Solid organs such as the spleen, liver, kidneys, and occasionally the pancreas are prone to harm due to the crushing impact of the stresses between the abdomen wall, lower chest, and spinal column.

The use of the ATLS (Advanced Trauma Life Support) protocol in quickly diagnosing and treating life-threatening injuries is critical for improving outcomes in patients who have suffered blunt abdominal trauma. Resuscitation and main survey

(ABC) should be started at the same time and continued while doing secondary surveys from the patient's head to toe. It has been shown that repeated and serial physical examinations, sometimes known as tertiary surveys, can reveal injuries that were missed during the original assessment. Several years ago, these injuries were quite simple to treat operatively; but, in recent years, most sufferers of blunt-force trauma have been able to get safe non-operative, image-guided therapies. Increasingly advanced cross-sectional imaging and image-guided, minimally invasive treatments have had a significant influence on early detection and treatment decisions. All trauma patients should have laboratory tests done regularly. All patients with severe traumatic abdominal injuries should get enough blood products. USG [3], CT scan [4], and DPL [5] are the most routinely utilized diagnostic techniques in acute abdominal trauma. FAST (focused abdominal sonography for trauma)[5] is becoming more widely utilized to detect hemoperitoneum in both stable and unstable patients after acute abdominal trauma. Because it may detect liver, spleen, kidneys, and retroperitoneal lesions with great sensitivity and specificity, CT – Scan examination of the abdomen has become the gold standard way of examining stable patients with BAT. A CT scan, on the other hand, may overlook hollow viscus and diaphragmatic damage. To improve the result, the ATLS procedure and the revised injury severity score must be used [6]. The conservative approach to management can be the most effective and realistic for our country.

AIMS AND OBJECTIVES

General:

- To evaluate the spectrum of blunt abdominal solid organ injury and the outcome of non-operative management of traumatic abdominal solid organ injury.

Specific:

- To assess which type of solid organ is more prone to injury.
- To assess the proportion of cases managed conservatively
- To compare the outcome of nonoperative management with the operative management of blunt abdominal solid organ injury.

MATERIALS AND METHODS

A Prospective observational study of 50 cases of Blunt Abdominal Trauma was carried out in Dhaka medical college Hospital from 1st January 2010 to 30 June 2010. The sample was taken purposively without randomization. Inclusion Criteria were Blunt abdominal solid organ injury with or without minor injuries in other parts of the body and Blunt lower chest injuries. Exclusion Criteria were associated with hollow viscous injury, associated diaphragmatic injury, Transfusion of more than five (5) units of blood, Geriatric patients (age more than 75 years old), Patients having significant head injury (GCS <15), and Patients having more than one long bone fracture Evidence of massive bleeding, hemodynamically unstable in spite of active resuscitation, Transfusion of more than five (5)units of blood, Geriatric patients (age more than 75 years old). Data has been collected using a structured data collection format containing the variables of interest and compared with those of other national & international settings. On admission, initial evaluation and immediate resuscitation have been done before going through detailed history & clinical examination. Data reviewed for analysis were: demographics, mechanism of injury, initial management, diagnostic tests, associated injuries, Abbreviated injury scale, injury severity score (ISS), Revised trauma score, American association for the surgery of trauma (asst) liver injury scale (1994 revision), spleen injury grade, quantity of hemoperitoneum, treatment, blood products administered, length of stay (LOS) in the general surgery ward (SW), complications and mortality. Patients hemodynamically stable at arrival, or stabilized after initial fluid resuscitation, underwent abdominal trauma CT scan. Depending on clinical status, stable patients without alarming radiological findings were observed in the regular surgical ward. Repeated CT scans during the hospital stay or during follow-up were not routinely performed but were done when found to be clinically justified. In any evidence of ongoing bleeding, an operative intervention was done.

Data collection compilation and analysis were done on a computer with the help of a statistician. Data were analyzed using SPSS for Windows, version 11.5. Statistical comparisons of means and medians were made using the Mann–Whitney test. Comparisons of proportions were made using v2 analysis with Pearson's correlation coefficient or Fisher's exact test where appropriate. Data are expressed as mean ± SD if not otherwise stated. A p-value of < 0.05 was considered statistically significant.

RESULTS

Age:

Table I: Age incidence (n = 50)

Age (years)	No of patients	Percentage(%)
1 -10	3	6
11-20	8	16
21-30	29	58
31-40	5	10
41-50	2	4
51 -60	3	6

The ages of the patients in the study ranged from 8 to 58 years. The highest incidence of 58% was in the age group 21 -30 years. This is followed by 16% in the age group between 11-20 years and 10 % in the group between 31-40 years. The mean age ±SD is 30.4 ± 16.2.

Sex:

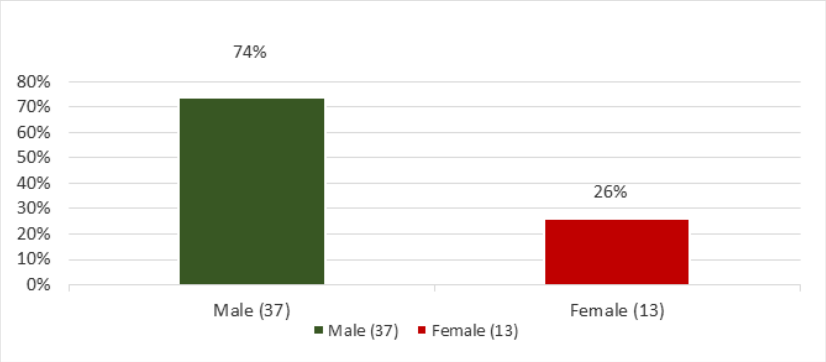

Fig 1: Sex distribution (n = 50)

The majority of the patient in the series were male (74%) and only 26 % were female.

Table II: Mechanism of injury (n=50)

Mechanism	No of patient	Percentage (%)
Road traffic accident	32	64
Fall from a height on a hard blunt surface	12	24
Physical assault	6	12

In this study road traffic accident, accounting for 64 % of cases is the most common.

Clinical Presentation

Table-III: Clinical presentation (n=50)

Clinical features	*No of patients*	*Percentage (%)*
Abdominal pain	21	42
Abdominal tenderness	16	32
Abdominal distention	7	14
Vomiting	12	24
Anaemia	23	46
Haematuria	9	18
Dehydration	15	30
Dyspnoea	4	8
abdominal rigidity	3	9
Absent bowel sound	11	22
Extra abdominal injuries	9	18

The commonest complaint at presentation was abdominal pain (42%). The majority of the patients had abdominal tenderness (32%), abdominal rigidity was present in 9% of cases and abdominal distension was present in 14% of patients. Bowel sound was absent in 22% of patients. Out of 50 cases, 18% presented with extra-abdominal injuries.

Organ Injury:

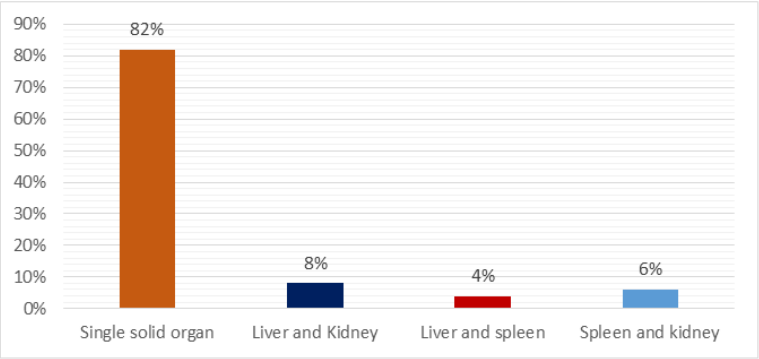

Fig-2: Single solid organ and combined solid organ injury, (n=50)

This shows that a total of 41 patients had abdominal single solid organ injury. among them, 29 patients (76.47%) had a single solid organ injury. that was liver; 27 in no and pancreas injury which is 2 in number 4 patients (8 %) had both liver and kidney and 2 patients (4%) had both liver and spleen injury 3 patients (6%) had both spleen ad kidney injury.

Solid-organ injury types and grading:

Table-IV: Solid organ injury types and grading (n=50)

Organ	*Injury Types and grading*		*No of patient*	*Percentage of patients (%)*
Liver	Type of injury	Laceration	17	34
		Sub capsular haematoma	14	28
		Non-specific injury	1	2
	Grade of injury	Grade -1	11	22
		Grade-11	17	34
		Grade -111	4	8
Spleen	Type of injury	Laceration	2	4
		Sub capsular haematoma	4	8
		Avulsion of pedicle	--------	--------
	Grade of injury	Grade-1	3	6
		Grade-11	2	4
		Grade -111	1	2
Kidney	Type of injury	Laceration	4	8
		Sub capsular haematoma	5	10
		Avulsion of renal pedicle	----	-----
	Grade of injury	Grade-1	3	6
		Grade-11	4	8
		Grade -111	2	4
Pancreas	Grade of injury	Grade 1	1	2
		Grade 11	2	4

In the above series, 32 patients among 50 had liver injuries. Most of them were laceration - 17 patients (34%), subcapsular haematoma -14 patients (28%) and non specific injury -1 patients (2%). According to the liver injury scale, the maximum number of patients were of grade 11 injury, 17 patients (34%) then 11 patients 22 %, and only 4 patients were of grade 111 injury.

In this series 9 patients had kidney injury .out of them 4 (8%). This series shows that 9 patients, out of 50, had kidney injury following blunt trauma .laceration through kidney were 4 in number (8%), and 5 patients had a subcapsular hematoma (10%). According to the kidney injury scale, 4 patients were of grade 1 renal injury (8%), 6% patients that are 3 patients had grade 11, and 4% patients had grade 111 kidney injury. All the injuries were unilateral. This series shows that only 6% had blunt trauma to the spleen, out of the 3 patients (6%) were grade 1 injury, 2 patients were grade -11 injury and 1 patient was of grade 111 spleen injury. All these patients were treated conservatively. The liver was the commonest organ to be injured (64%), 32% of which occurred due to laceration. Among the rest, kidney injury was 18%, splenic injury 12%, and pancreatic injury 6%.

Diagnostic Investigations

Table V: Diagnostic Investigations done by patients: (n=50)

Name of investigation	**No patient availed**	**percentage**
USG of whole abdomen	50	100
Plain X-ray abdomen	50	100
Chest x-ray	21	42
Other skeletal X-ray	22	44
CT Scan of the whole abdomen	31	62

Diagnostic aids were a little bit limited in this series. Within our limited resources, both from govt side and patient, plain X-ray abdomen, blood grouping and cross-matching could be availed in all the cases. USG of the whole abdomen was done in all patients, only 31 patients could afford a CT Scan of the abdomen. Chest X-ray was done in 10 patients, who complained of dyspnoea; other skeletal radiological investigations (X-RAY) eg of the pelvis and long bones were done in cases of suspicion 20 cases.

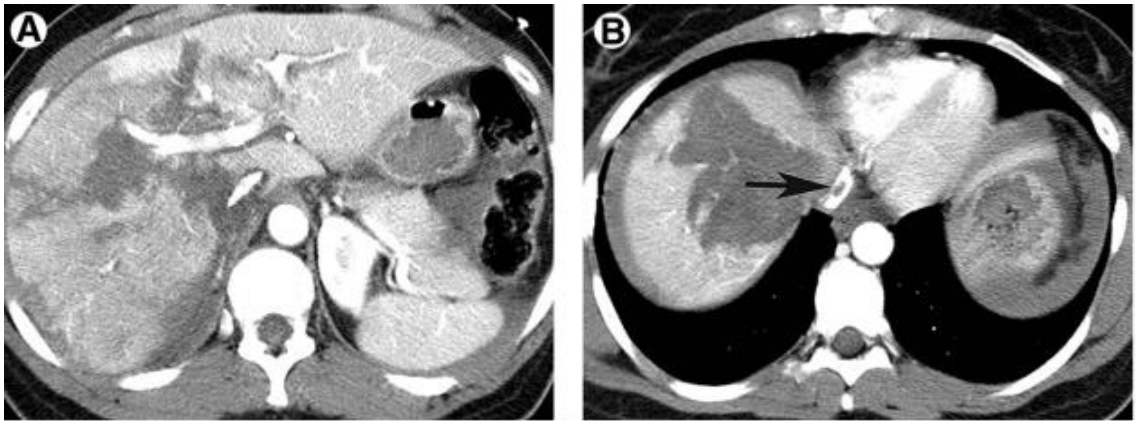

Figure-3: A 42-year-old female sustained a grade IV liver laceration in a fall from a building. (A) Contrast-enhanced axial CT scan through the liver at the level of the portal vein shows deep lacerations involving the dome of the liver and extending to the portal veins and IVC. (B) Contrast-enhanced axial CT scan shows a small thrombus in IVC (arrow) and perihepatic hematoma. No evidence of active vascular extravasation

Figure 4: Contrast-enhanced sagittal oblique US image of the right kidney obtained in the arterial phase shows a markedly hypoechoic area (arrow) surrounded by a hematoma (arrowhead). The profile of the organ is interrupted

Management:

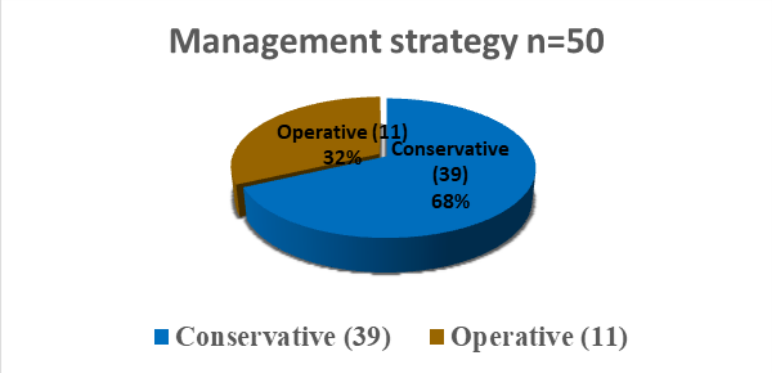

Figure 5: Management (n=50)

Out of 50 patients, 11 patients (32%) underwent laparotomy while 39 patients (68%) managed conservatively.

Comparison of non-operative vs operative treatment:

Table VI: NOM versus OM: treatment and outcome measures

Parameters	Non-operative management (NOM) n=39	Operative management (OM) n=11	p-value	Total
Investigations				
CT scan performed	39 (100%) 3.0 ± 1.6	6 (60%) 1.8 ± 1.8	0.001 0.017	45 (92%) 2.8 ± 1.7
Ultra-sonogram (USG)	39 (100%) 0.5 ± 1.0	11(100%) 0.3 ± 0.7	NS	50 (100%) 0.5 ± 0.9
Hospital stay				
Total LOS	10.0 ± 7.7	15.8 ± 14.2	NS	11.2 ± 9.5
Transfusion requirements				
Blood Tx	1.3 ± 4.0	20 ± 22	0.001	15 ± 21
Outcome				
Complications (SSI, UTI etc)	12 (31%)	8 (80%)	0.009	20 (41%)
Total cost (10^3 tk)				
Total cost (10^3 tk)	11 ± 18	23 ± 27	0.001	15 ± 21
Mortality	0	3 (30%)	NS	3 (6 %)

(NS: not significant; SW: surgery ward; LOS: length of stay; Tx: transfusion requirements).

DISCUSSION

Solid-organ injuries are encountered in civilian surgical practice with regular frequency. Diagnosis of solid organ injury is not always easy. Early diagnosis is very important in lowering mortality from solid organ injury. Over the past half-century mortality from the solid organ, injury has been reduced by aggressive surgical diagnosis and management. Mechanism of injuries varies from developing to developed countries and from rural to urban areas. This study of non-operative management of blunt abdominal solid organ injuries included 50 cases in Dhaka Medical College & Hospital during the period of January 2010 to May 2010 in two casualty blocks. All patients where the first intention was managed without surgery were considered to have undergone nonoperative management (NOM). Patients, where subsequent laparatomy was necessary, were considered failures of NOM (FNOM). When the initial decision was not clearly stated, FNOM was defined as laparotomy performed more than 24-48 hours after admission depending upon clinical condition. The ages of the patients in the study ranged from 8 to 58 years. The highest incidence of 58% was in the age group 21 -30 years. This is followed by 20% in the age group between 11-20 years and 10% in the group between 11- 20 years. . Mean age ±SD is 30.4 ± 16.2. The injuries occurred most commonly in among young people & the incidence was declining with advancing age. Salomone *et al*., [7] showed in a similar study that the peak incidence occurred in persons aged age 14 to 30 years. Rahman mm [8] in this study also found the highest incidence (48%) in the 21-30 year group. most probably this is due to young people are getting involved in earning sources in their families. In this series, the majority of the patients in the series were male (74%) and only 26% were female whereas Siddique AB [9] showed in his study that 94% were male & 6% were female. Absolutely it reflects the women's empowerment in their families and eventually in the economy of the country. Salomone *et al*., [7] in their study showed blunt abdominal trauma accounted for 79% 0f cases, and 59% of those were automobile-related injuries. While Rahman MM [8] in his study found that 50% of cases were due to road traffic accidents. The mechanism of injury varies in different studies. This variation may be due to the socio-economic condition, political instability, and law and order situation from country to country. A delay in presentation and diagnosis is associated with significant morbidity and mortality in this series, 40% of the patients reached DMCH. This is quite different from the result of the study by Biswas NP [10] performed in Barisal in 2004, where the percentage of people arriving before 6 hours was 19%. People are getting more conscious about health facilities. Detailed clinical features of the cases were studied. The commonest mode of presentation was pain (42 %). The majority of the patients had abdominal tenderness (32%), and abdominal rigidity was present in 9% of the cases. In a study by Hall and Angels [11], 100% of patients had abdominal pain and 89.3% had tenderness. Associated injuries obviously can complicate the eventual clinical status of the patients out of 50 cases, more than half of the patients (65 %) did not have any associated extra-abdominal injuries. Associated injuries were treated accordingly. The diagnosis was mainly based on the history of trauma, clinical presentation, and repeated physical examination, supplemented only by some baseline investigations within our limited resources. plain x-ray abdomen and blood grouping and cross-matching, ultra-sonogram of the whole abdomen were done in all the cases as these were necessary supplementary simple investigation, and also because these facilities are available during the emergency hours in DMCH. Chest x-ray was done in almost all the patients who complained of dyspnea, other skeletal radiological investigations (eg: x-ray) of the pelvis and long bones were done in cases of suspicion. Ultra-sonogram and CT scan, especially FAST, are emerging as standard procedures in evaluating patients with abdominal trauma USG of the whole abdomen were done in all patients, only 31 patients could afford CT Scan of the abdomen who were admitted to DMCH. FAST is not available in Dhaka medical college

hospital. The distribution of hemoperitoneum on acute CT scan was: large (27%), moderate (6%), small (27%), and absent (12%). Median grade of injury(on acute CT) was 2 .the distribution is grade-1 (22%),grade-2(34%) grade-3 (8%);kidney – grade -1 (6%), grade-2 (8%), grade3 (4%). splenic injury: grade I (6%), grade II (4%), grade III (2%), And pancreas ,grade 1 (2%),grade2(4%). Out of 50 cases 39 patients were initially treated with non-operative management and 11 patients have failed to respond with this non-operative management. Patients with operative management had increased transfusion requirements ($p < 0.001$), and higher costs and demonstrated significantly more frequent shock (< 100 mmHg) at admission ($p < 0.001$) compared to those with NOM. The mean cost of patients treated with surgery was more than twice as high as in the NOM group. Blood transfusion requirements were significantly less in the NOM group ($p < 0001$). Complications requiring intervention, overall morbidity and mortality, and LOS were lower among those managed non-operatively A total of 20 (41%) patients had complications (infections or complications related to the splenic injury). Over the last several years, non-operative management has increasingly been recommended for the care of selected blunt abdominal solid organ injuries. A study by Reutledge R *et al*., [12] found that the frequency of non-operative management of hepatic injuries increased from 55% in 1988 to 79% in 1992 and 34% to 46% in patients with splenic injury. This variation is due to a lack of investigation facilities and proper monitoring systems in our country. The recognition that between 50 and 80 percent of liver injuries stop bleeding spontaneously, coupled with better imaging of the injured liver by computed tomography (CT), has led progressively to the acceptance of non-operative (NOP) management with a resultant decrease in mortality rates (Pachter HL and Hofstetter SR 1995) [13]. Stimulated by the success of NOP management of spleen and hepatic injuries in children who have stable hemodynamics, there has been a trend towards NOP management in hemodynamic stable adults with similar injuries. A "paradigm shift" is said to occur when the rules governing a process are fundamentally changed, and such is the case with the treatment of liver injuries. Modern treatment of liver trauma is increasingly NOP (Konig T *et al*., 2007) [14]. The treatment of abdominal injuries has evolved and a NOP approach has been adopted in an increasing number of selected patients (Pachter HL and Hofstetter SR 1995). Advantages of NOP management include avoidance of non-therapeutic celiotomies and the associated cost and morbidity, fewer intra-abdominal complications compared to operative repair, and reduced transfusion risks (EAST 2003) [15]. In the present study, most of the patients required 1-3 units of blood (68 %). only 2% of cases needed more than 5 units. The postoperative period was closely monitored. 43.75% of patients had uneventful, left the hospital without any complications but the rest of the patients developed various post-operative complications. 3 patients (18.75%) of wound infection and 1 case (6.25%) of wound dehiscence. No case of reactionary hemorrhage. In this series, the majority of the patients (44%) were discharged within 7 -10 days. Minor injuries from liver and spleen were discharged very early that is 6^{th} or 7^{th} day of admission Quamruzzaman M [16]. In his study, showed that most of the patients (45%) had left the hospital within the same period. Out of 5 patients, 1 patient died preoperatively and 4 patients died postoperatively. Among these patients 1 patient had liver injury, 2 patients had both liver and spleen injury and 1 patient had spleen injury. The strength of this study lies in the prospective documentation of the decision to treat a patient non operatively or to interrupt NOM and treat surgically.

LIMITATION

Traumatic solid organ injury is one of the commonest traumatic conditions that are encountered in hospitals, namely in the department of casualty surgery. It is evident from the study, that certain factors like prolonged transportation time, delay in receiving definite surgical treatment, absence of definite blood transfusion protocol, failure to receive early resuscitation with consequent poor hemodynamic status, etc. have been associated with a poor outcome in the management of such cases. Criteria for taking the patient to the operating room after a period of NOM were not established. Patients with liver trauma should have a follow-up imaging study and liver function test. In this study, post-discharge follow-up assessment could not possible.

RECOMMENDATION

Trauma management is teamwork and starts from the first person attending to the victim at the site of the incident. The integration of pre-hospital care in a well-equipped and well-staffed comprising general surgeon, orthopedic surgeon, cardiothoracic surgeon, neurosurgeon, urologist, and anesthesiologist under the guidance of a trauma center is essential to achieve the desired outcome in the management of traumatic injury. It is important to realize that NOM is not the ''conservative'' approach but rather the radical one. It requires intensive monitoring, increased awareness, detailed knowledge of physiology, and – above all –an experienced physician by the bedside.

The hospitals, at all levels, need to have a standard protocol to manage the trauma victims; adequate primary resuscitation and appropriate referral of the victim are to be ensured, even at the root level of health centers. Fast, x-ray facilities and other imaging methods, blood bank, and laboratory facilities should be made available instantaneously, whenever required near the trauma unit.

CONCLUSION

Non-penetrating trauma is the most prevalent kind of solid organ injury, with the liver being the most common clinical examination. In most situations, basic techniques are enough to diagnose solid organ injury. Conservative treatment is preferable for minor liver, spleen, and kidney damage. At the end of the day, we may not be able to avoid all patient deaths, but we can do our best with limited resources to alleviate suffering. We can minimize morbidity from delayed handling of such situations by having well-equipped trauma centers all around the country.

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