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Management of abdominal trauma patients in a peripheral hospital of Eastern India – A prospective study

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ABSTRACT

Background: Abdominal trauma is a common surgical problem in patients attending emergency departments of all peripheral medical colleges like ours. As it consumes a lot of health resources, this becomes quite a significant public health burden. We conducted an epidemiological study regarding age, sex, etiology, clinical presentation, and management on these patients of our medical college. We also re-evaluate the routine use of contrast-enhanced computed tomography (CECT) scan in management of abdominal trauma. **Aims and Objectives:** This study aims to identify the various causes of abdominal trauma in peripheral regions and to classify the different clinical presentations of abdominal trauma and evaluate the effectiveness of conservative management. **Materials and Methods:** We had conducted this prospective study in a tertiary care center from February 2022 to August 2024. We had conducted thorough clinical examination and whole abdomen radiology (Straight X-ray abdomen and sonology) of all the patients after proper resuscitation in the emergency ward. As emergency CECT scan of abdomen is not available round the clock in our peripheral medical college, we have to use four quadrant puncture and diagnostic peritoneal lavage in few patients with abnormal clinical and or radiological (Ultrasonography and X-ray) findings. Few patients underwent emergency laparotomy. The rest were put in conservative management with continuous monitoring, among them few patients underwent delayed laparotomy. **Results:** During the study, 168 patients were admitted. Of these, 24 underwent emergency laparotomy after resuscitation, while 144 were managed conservatively. Among the conservatively managed patients, 21 later required delayed laparotomy based on clinical and radiological findings. A total of 29 patients underwent CECT scans. The primary cause of injury was road traffic accidents (RTA), with physical assault- and cattle-related injuries also notable, especially among the elderly (Chi-square = 166.5551, $P < 0.00001$). **Conclusion:** Non-operative management was successful in most cases in 123 patients, with only 29 requiring a CECT scan. RTAs and physical assaults were the primary causes, with middle-aged individuals being the most affected. In peripheral areas, elderly patients frequently sustain injuries from cow attacks. Most abdominal injuries can be treated conservatively, and well-planned management can significantly reduce mortality.

Key words: Road traffic accident; Blunt abdominal trauma; Penetrating abdominal trauma

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INTRODUCTION

Trauma is one of the common causes of mortality and morbidity encountered in routine practice among which abdominal injury is common after extremity and head injury.[1] Motor vehicle accidents account for 75–80% of blunt abdominal trauma (BAT). Other important causes are outdoor sports activities, physical assault, fall from

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height, and industrial or occupational accidents. BAT may be missed frequently as many times there was no obvious injury mark over abdomen or no definitive abdominal clinical signs initially.[2] Hence, it required a high degree of suspicion to diagnose BAT and systematic clinical and radiological examinations repeatedly needed to pick up the right diagnosis.

Penetrating abdominal trauma injuries (PAT) may not require exploratory laparotomy all the time if the patient is hemodynamically stable after resuscitation with minor injury on Ultrasonography (USG) or contrast-enhanced computed tomography (CECT) scan report. Thus, CECT scan of the whole abdomen is very essential in those patients who undergo conservative management.[3-5] However, in peripheral hospitals, CECT scan has some limitations-not available round the clock, and usually, the report is delayed from 24 to 72 h. Computed tomography (CT) scan also has risk of contrast allergy, contrast-induced nephropathy and last but not the least risk of delayed cancer.[6,7] Sometimes, CT scan may miss some gastrointestinal injury tract injuries particularly in retroperitoneum, some small diaphragmatic injuries and pancreatic injuries.[8] For this reason, we have used CECT scan selectively in our study group of patients.

Management of blunt trauma abdomen patients by selective non-operative management has widely accepted in many trauma care centers nowadays. Inspired by this concept, now many trauma care centers are applying non-operative management to selective penetrating abdominal injuries also.[9-12]

Aims and objectives

This study aims to identify the various causes of abdominal trauma in peripheral regions, including road traffic accidents (RTAs), physical assaults, and cattle attacks. It also seeks to classify the different clinical presentations of abdominal trauma and evaluate the effectiveness of conservative management.

MATERIALS AND METHODS

After getting proper clearance from our Institutional Ethical Committee, this prospective study was done on the patients with abdominal trauma attending our peripheral hospital emergency department of Eastern India between February 2022 and August 2024. After admission through emergency, a total 168 patients of abdominal trauma were properly resuscitated in the emergency ward. All the patients were managed according to ATLS guidelines with securing airway, breathing, and circulation. After initial resuscitation thorough physical examination from head to toe was performed to decide proper management protocol.

Inclusion criteria

All abdominal trauma patients from 15 years and above in our study were included in the study.

Exclusion criteria

Pediatric age group patients (age below 15 years) were not included in our study as there was no pediatric surgeon in our hospital round the clock.

Work plan

Detailed history taking including age, sex, occupation, cause and nature of injury, time of injury, and pre-hospital treatment were taken for proper documentation and subsequent monitoring. Thorough physical examination reveals some patients with one or more penetrating injuries with or without signs of peritonitis, and some patients with symptoms of pain, vomiting, distension, rigidity, hematemesis, and hematuria. Detailed clinical examination with minute documentation of all the injuries was done meticulously. All the patients were undergone thorough evaluation by straight X-ray abdomen and whole abdomen USG along with routine blood investigations. Suspected urinary bladder injury patients were kept inserting indwelling Foley's catheter to monitor the status of hematuria.

After initial resuscitation, patients with suspicious USG and or X-ray or clinical findings underwent further invasive investigations like four quadrant puncture with a large bore needle and diagnostic peritoneal lavage (DPL) to decide emergency exploration of abdomen needed or not. DPL was done by open small infra-umbilical incision under local anesthesia followed by 18 no. Ryle's tube insertion through which normal saline given intraperitoneally and drain fluid collected in urobag was checked. Patients with gross intraperitoneal bleeding or with continuous bleeding who cannot be stable hemodynamically after sufficient resuscitation were taken for emergency laparotomy. DPL fluid containing enteric materials in collecting urobag also suggested emergency laparotomy.

Total 24 patients underwent an emergency exploratory laparotomy. Rest of the patients (144) selected for conservative management were put on absolute bed rest with hourly monitoring of vitals such as pulse, respiration, blood pressure, and temperature. Further sonological re-evaluation of these patients was done depending on their clinical and laboratory findings. Periodic abdominal examination was also a very important procedure in trauma patient evaluation. These patients were allowed liquid diet when their abdomen became soft, passed flatus with restoration of normal peristalsis. Gradually, semi-solid food was allowed followed by a normal diet. Patient was discharged after all laboratory reports normal, tolerating

normal diet satisfactorily and passing normal color stool and urine. All the patients were monitored till discharge from hospital and with advice of early follow-up in surgical outpatient department (OPD) after 2 weeks.

Total 29 patients required a CECT scan of the abdomen later on due to various reasons. Among them 21 patients underwent delayed laparotomy mostly between 48 and 96 h for not obtaining satisfactory improvement on conservative management with CECT scan suspecting intra-abdominal injuries (pancreatic injury, diaphragmatic injury, and retro-peritoneal colon injury). Those who operated the operative findings and management were properly documented.

Ethical issue

This study was conducted after getting permission from the Institutional Ethical Committee (IEC no: IEC/DMGMCH/2022/10). Proper written informed consent from each patient or patient's attendants/relatives was obtained after explaining the study procedure to them in their own vernacular language.

RESULTS AND ANALYSIS

As presented in Table 1, total 168 patients of abdominal trauma were admitted in our peripheral hospital from February 2022 to January 2024 (fulfilling inclusion criteria). All the patients were admitted through the emergency department of our hospital. Most trauma cases were referred from more remote hospitals after initial management. After resuscitation in the surgical ward, 24 patients underwent emergency laparotomy. Remaining 144 patients were selected for conservative management and were put on absolute bed rest with hourly monitoring of vitals such as pulse, respiration, blood pressure, and temperature. Further sonological re-evaluation of these patients was done depending on their clinical and laboratory findings. Periodic abdominal examination was also a very important procedure in trauma patient evaluation. These patients were allowed liquid diet when their abdomen became soft, passed flatus with restoration of normal peristalsis. Gradually, semi-solid food was allowed followed by a normal diet. Patient was discharged after all laboratory reports normal, tolerating normal diet satisfactorily and passing normal color stool and urine. All the patients were monitored till discharge from hospital and with advice of early follow-up in surgical OPD after 2 weeks.

Table 1: Distribution of patients according to management approach

Total number of patients admitted	168
Number of patients undergo immediate laparotomy	24
Number of patients selected for conservative treatment	144
Number of patients undergo delayed laparotomy	21
Number of patients required CECT scan	29
Number of patients treated (conservatively) successfully	123

CECT: Contrast-enhanced computed tomography

Total 29 patients required a CECT scan of the abdomen later on due to various reasons. Among them 21 patients underwent delayed laparotomy mostly between 48 and 96 h for not obtaining satisfactory improvement on conservative management with CECT scan suspecting intra-abdominal injuries (pancreatic injury, diaphragmatic injury, and retro-peritoneal colon injury). Those who operated the operative findings and management were properly documented. These data entered in Microsoft Excel and analyzed using SPSS™ software.

Chart 1 demonstrates that all the patients were in the age group of 15–73, but mostly in between 25 and 45 as we did not include below 15 years patients. One hundred and thirty-two patients (78.57%) among them were male and 36 (21.43%) were female.

As shown in Chart 2, RTAs were the leading cause of abdominal injuries in our study, accounting for 98 cases (60.71%). The second most common cause was physical assault, affecting 34 patients (17.86%), primarily due to property disputes, which were more prevalent in rural areas.

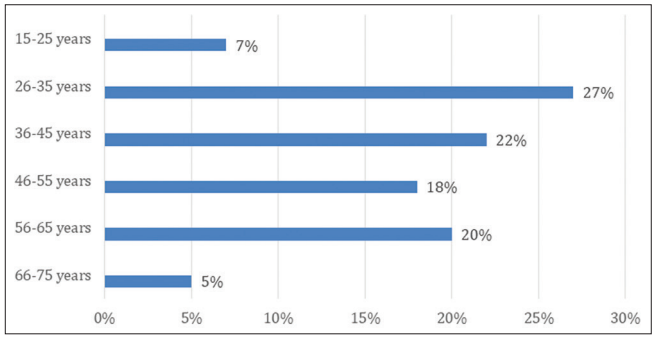

Chart 1: Distribution of the study population according to age of the patients

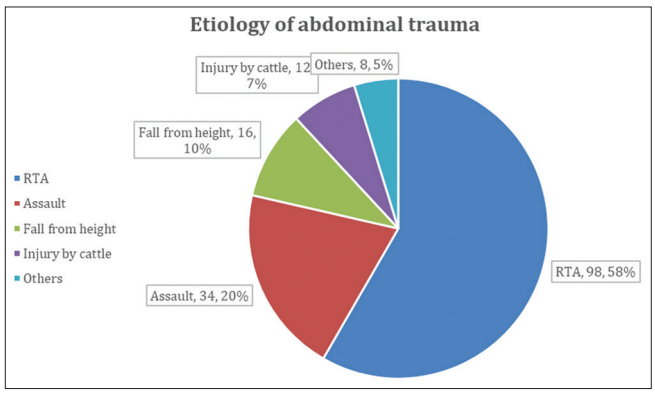

Chart 2: Distribution of the study population according to etiology of trauma

Physical assaults mostly involved middle-aged individuals and included cases of domestic violence. Falls from height were the third most common cause, occurring in 16 patients (9.52%), primarily due to occupational accidents, such as falling from trees. Abdominal injuries, mostly penetrating, were reported in 12 patients (7.14%) following attacks by cattle, a more frequent occurrence in rural areas than in urban regions. In addition, the collapse of mud walls due to heavy rain was identified as a cause of abdominal trauma in peripheral region hospitals.

As per Table 2, the most common clinical presentation in this study was abdominal tenderness, observed in 146 patients (78.49%). The second most common symptom was tachycardia, seen in 121 patients (65.05%), followed by abdominal pain in 109 patients (58.6%). Other presenting symptoms included vomiting, abdominal rigidity, abdominal wall injuries, distension, and hematuria.

DPL and four quadrant puncture was done in 23 patients where detailed USG of whole abdomen suspects retroperitoneal pancreatic injury or intraperitoneal urinary bladder rupture or inconclusive. However, DPL failed to suggest any definitive management protocol in pancreatic injury patients who were undergone CECT scan later on. DPL and puncture only reveal hemoperitoneum in a few cases but cannot suggest the source of bleeding. Those who had significant hemoperitoneum with hemodynamic instability underwent immediate laparotomy. However, those patients with significant hemoperitoneum acquired hemodynamic stability were put on conservative management and planned for CECT scan. Thus, DPL and puncture were not very helpful to suggest a management protocol.

Total 29 patients required CECT scans later on as there was no satisfactory improvement on conservative management, suspicion of associated chest injury, suspected pancreatic injury, and persistent hematuria. CECT scan detects small liver contusions in the upper part, multiple mesenteric contusions and hematomas, small retroperitoneal hematoma, and intraperitoneal bladder injury. Among these patients 21 were managed by delayed laparotomy and rest by conservative methods.

Table 2: Distribution of the study population according to different clinical presentations

S. No	Clinical presentation	Number of patients (186)	Percentage
1	Tenderness	146	78.49
2	Tachycardia	121	65.05
3	Pain abdomen	109	58.6
4	Abdominal wall injury	61	32.8
5	Vomiting	42	22.58
6	Rigidity	41	22.04

There was a total of six mortality in 168 patients of our study group. Total five patients expired postoperatively after emergency laparotomy. Three of them had severe liver injury and one had splenic vascular trauma and one had gonadal vessel tear from aorta due to cow attack. Among 21 patients who undergo delayed laparotomy, one expired postoperatively. This patient had retroperitoneal pancreatic injury who developed post-operative pancreatic fistula. Postoperatively, three patients developed anastomotic leakage after resection anastomosis, two patients had pancreatic fistula, two patients had significant oozing from repaired liver injury but all of them managed conservatively. Surgical site infection occurred in 11 patients, who were managed by regular dressing and specific antibiotic application (from wound swab culture and sensitivity). No mortality among 123 patients who were treated conservatively.

Table 3 suggests that USG was used more frequently and successfully than CT scans in managing the study population. USG served as the first-line radiological investigation and was complemented by CECT.

DISCUSSION

In our study, we managed 168 patients in our peripheral hospital from August 2019 to March 2021. Among them 41 were PAT patients and 127 were blunt trauma abdomen patients. Like other studies males are almost 3 times more commonly affected than females. Penetrating injuries of the abdomen were more common in males compared to females. Middle age group of 25–45 years are more vulnerable to abdominal trauma mostly due to RTA and assault.

The most common cause of abdominal trauma in our study was RTA, accounting for 58.33% of cases. While most incidents occurred during vehicle travel, some victims sustained injuries while walking along the roadside. Physical assault was the second most common cause, responsible for 20.24% of cases. Falls from trees, as well as accidents during industrial activities or building construction, were also notable causes, particularly in peripheral regions. Elderly individuals were more frequently affected by assaults and injuries caused by cattle, as their limited mobility made them more vulnerable to such incidents.

Table 3: Distribution of the patients according to investigation tool used

Investigation tool used	Yes	No	Total
USG of whole abdomen	139	09	148
CECT of whole abdomen	29	119	148

The Chi-square statistic is 166.5551, P<0.00001. USG: Ultrasonography, CECT: Contrast-enhanced computed tomography

Before the later part of last century, abdominal injuries were primarily managed by laparotomy. Over the past two decades, there has been a paradigm shift in this approach.[13] Many trauma care center now adopted more conservative approach to manage hepatic and splenic injuries inspired by related trials report.[11] It was seen in different trials that presence of hemoperitoneum or altered mental status (may be due to drug, alcohol or head injury related) did not mandate emergency laparotomy, irrespective of the grade of injury, or age of the patient. Many large trauma care centers also adopted conservative approach selectively to manage penetrating injury including stab[14,15] and gunshot injuries of abdomen.[16,17] Avoiding unnecessary surgery also decreases perioperative complications thus saving significant health resources.[18,19]

The mainstay of conservative management of abdominal trauma patients was continuous clinical monitoring. However, clinical evaluation alone of the abdominal injuries is difficult and may not be accurate all the time especially in patients with altered mental status (due to drugs, alcohols, or head trauma and altered sensations due to concomitant spinal injuries and pain due to associated lower chest or pelvic trauma). This underlies the role of investigations to supplement the clinical findings which are usually done by a CECT scan in a hemodynamically stable patient.[13] Initial USG abdomen may be inconclusive many times but repeat USG is always recommended rather than CECT scan which has some limitations. USG was easily available in our peripheral hospital and has no complication of radiation injury which is the best initial modality of investigation for trauma patients. However, sometimes repeat USG also was not suggestive where the role of CECT scan is very essential.

We had managed a total of 144 patients of abdominal trauma by this conservative protocol initially in our peripheral hospital which was successful in 123 patients (85.42%). CECT scan was required in only 29 (20.14%) among total 144 patients. Thus, it was seen in our study that the majority of abdominal trauma patients can be managed conservatively without routine use of CECT scan. More important finding was detailed USG of abdomen repeatedly during follow-up by different radiologists, sometimes able to find intra-abdominal injuries in patients.

Four quadrant puncture and DPL were two old and invasive diagnostic procedures where initial USG was inconclusive. Both procedures tell us only the presence of hemoperitoneum or enteric content. However, now-a-days hemoperitoneum is not an absolute indication of emergency laparotomy though presence of enteric content always mandates emergency laparotomy. Hence, DPL and puncture were not very helpful.

We had no mortality among the 123 patients who were managed conservatively successfully. Among 144 patients taken initially for conservative management, only one patient expired postoperatively after delayed laparotomy. This patient had retroperitoneal hematoma with pancreatic injury, who developed pancreatic fistula in post-operative period and ultimately expired. USG was successful in finding the diagnosis in about 139 patients (82.74%), and the rest were picked up by CECT scan (29 patients).

Limitations of the study

This study is limited by its single-center design, which may reduce generalizability. The lack of round-the-clock CECT scans led to reliance on alternative diagnostic methods (DPL), potentially affecting accuracy. The sample size was relatively small, and selection bias may have influenced treatment decisions. A short follow-up period and lack of long-term outcome data limit insights into delayed complications.

CONCLUSION

RTA, physical assault, falls from height, and cattle attacks remain the leading causes of abdominal trauma in peripheral regions. Most cases of abdominal trauma, whether blunt or penetrating, can be successfully managed with conservative treatment in peripheral hospitals. Routine CECT scan of the abdomen is not required in the majority of abdominal trauma cases. This conservative method helps to save health resources along with minimal perioperative morbidity and mortality.

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PKS- Concept, data collection and analysis, manuscript preparation, treating surgeon; **DB-** Manuscript editing and review; **SB-** Manuscript review, treating surgeon; **RS-** Data analysis, manuscript writing and editing and review.

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