e-ISSN: 0976-822X, p-ISSN:2961-6042

Available online on http://www.ijcpr.com/

International Journal of Current Pharmaceutical Review and Research 2024; 16(4); 291-295

Original Research Article

Determining the Role of IAP Monitoring in the Management of Patients with Blunt Injury Abdomen: A Hospital-Based Study

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Received: 08-02-2024 / Revised: 17-03-2024 / Accepted: 24-04-2024
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Conflict of interest: Nil

Abstract

Aim: The aim of the present study was to assess the role of intra-abdominal pressure (IAP) monitoring in the management of patients with blunt injury abdomen.

Methods: The Hospital based prospective observational study was conducted in the Department of General Surgery in Patna Medical College and Hospital Patna, Bihar, India with blunt injury abdomen, over a period of 12 months and 100 patients were included in the study.

Results: Out of 100 patients, 60 were treated conservatively, 40 required surgical intervention. 15 patients required ventilator support in our study. 5 patients expired. Out of 100 patients, 85 were male (85%), 15 were female (15%). Overall hospital stay (considering both conservatively managed and surgically intervened patients) increased significantly as IAP increases at 0, 3, 6, 24, 48, 72, 96 hours, except at 12 hours. Hospital stay decreased as IAP increases in surgically intervened group because IAP returned to normal after surgical decompression, but this finding was statistically significant only at 72 hours (p value was 0.0001) in our study.

Conclusion: There was no significant correlation regarding hospital stay and increased IAP in our study as hospital stay increased both in conservatively managed and surgically intervened patients except at 72 hours in surgically intervened group. Before development of IAH and ACS, the potential candidates should be offered surgical decompression at proper time.

Keywords: Intra-abdominal pressure, Intra-abdominal hypertension, Abdominal compartment syndrome.

Introduction

Intra-abdominal hypertension (IAH) and abdominal compartment syndrome (ACS) have been recognised since the nineteenth century. For more than 50 years, ACS has been identified as a complication in severe blunt abdominal trauma (BAT). It arises as a result of elevated intraabdominal pressure (IAP) caused by abdominal trauma as well as intestinal blockages with serous edoema of the bowels or continuously increasing ascites. [1,2] IAH and ACS are prominent variables causing significant morbidity and death in critically sick patients, and their importance has been recognised in the last 15 years. [3-5]

Despite its strong association with man, trauma has been dubbed the "forgotten disease" of modern society. Trauma is the biggest cause of mortality and disability in underdeveloped countries, as well as the main cause of death among those under the age of 45. [6] Trauma is the second leading cause of death, accounting for 16% of worldwide disease burden. In trauma management, pre-hospital transportation, initial examination, extensive resuscitation procedures, and accurate diagnosis are critical. Injury is the seventh leading cause of death worldwide, and the abdomen is the third most commonly injured organ. In roughly 25% of instances, abdominal injuries necessitate surgery. 85% of abdominal traumas are blunt in nature. Abdominal trauma continues to be a major cause of trauma-related injuries and deaths. Blunt abdominal injury can also occur as a result of a fall from a great height, an assault with blunt items, sports injuries, or bomb blasts. [7,8]

Abdominal trauma can result in the increase of IAP for a variety of reasons including the accumulation of blood or free fluid in the peritoneal cavity, oedema of the intestinal wall, retroperitoneal hematoma or abdominal packing for haemorrhage control. Therefore the continuing hepatic haemorrhage and increasing amounts of bloody ascites found in failed non operative management can lead to an elevation in IAP. Evaluation of a patient with abdominal trauma can be a most challenging task that a surgeon may be called upon to deal with. Investigative modality can only supplement the clinical evaluation and cannot replace it in the diagnosis of blunt abdominal trauma. [9]

The aim of the present study was to assess the role of intra-abdominal pressure (IAP) monitoring in the management of patients with blunt injury abdomen.

Materials and Methods

The Hospital based prospective observational study was conducted in the Department of General Surgery in Patna Medical College and Hospital Patna, Bihar, India with blunt injury abdomen, over a period of 12 months and 100 patients were included in the study.

Inclusion Criteria

Age ≥ 18 years, patients with acute blunt injury abdomen were included in the study.

Exclusion Criteria

Patients with penetrating injuries, polytrauma, bladder injury, pathology and urological problems, with intra- abdominal mass and pregnant females were excluded from the study.

Written consents were obtained from patient/their legal attendants. All information collected was kept strictly confidential.

The study included patients admitted with blunt injury abdomen in our hospital. Institutional ethics committee approval was obtained before starting the study. Patients/patient attendants who were willing to give informed consent were included in study. IAP was measured in emergency medicine department and ICU at presentation, that is, 0 hours, 3 hours, 6 hours, 12 hours, 24 hours, 48 hours, 72 hours and 96 hours.

Duration of ICU and hospital stay, occurrence of intraabdominal hypertension, new organ function damage, need for tachypnea support and mortality in patients of blunt trauma abdomen were noted as outcomes.

Parameters noted were blood pressure, pulse rate, respiratory rate, oxygen saturation (SpO2), urine output, blood urea, serum creatinine, IAP, time of presentation to hospital after injury, duration of ICU and hospital stay, need for 292achypnea292 support, morbidity (new organ- system dysfunction) and mortality.

IAP was measured indirectly by estimating intra vesical pressure through a Foley's catheter. The whole procedure was carried out under aseptic precautions. In already inserted per-urethral Foleys catheter (assuming and assuring empty urinary bladder, 25 ml of normal saline (NS) instilled into bladder, sterile transparent tubing attached to it and held vertically at 90° at pubic symphysis. The length of vertical normal saline column was measured when steady. It is calculated as intra vesicle pressure in terms of cm of water and was calculated in terms of mm of Hg with help of following formula, 1 cm of water=0.736 mm of Hg.

After completion of this procedure, Foleys catheter was reconnected to urobag. Blunt injury abdomen patients were managed as per advanced trauma life support (ATLS) guidelines in our study. Patients who were in need of assisted ventilation, were managed with mechanical ventilator. Post-operative clinical outcome was measured in terms of survival and mortality. Patients which showed impending signs and sequels of raised IAP, early surgical decompression of abdomen was performed in the form of DCS. Any of the clinical signs like tachycardia, drop in blood pressure or urine output, tachypnea, distention of abdomen and increase in IAP were considered as signs of impending IAH. [10]

Patients who required surgical decompression (on basis of 2 consecutive findings of raised IAP in case of solid organ injury and all cases with hollow organ perforation, IAP >20 mm of Hg were considered for surgical intervention and inspite of IAP <20 mm of Hg if vital parameters were deranged were also considered for surgical decompression of abdomen.), underwent emergency exploratory laparotomy. In patients with ACS, the decision to proceed with decompressive laparotomy was decided by primary surgeon in-charge of the patient, who deteriorated upon a trial of non-operative management, after taking in to above clinical and laboratory parameters. [11]

Statistical Analysis

Descriptive statistical analysis is carried out in this study to explore the distributions of several characteristics of the cases studied. Results on categorical data are shown as N (% of cases) and the results on quantitative variables are shown as mean standard±deviation across two surgical groups. The statistical significance of difference of various qualitative responses between two surgical groups is tested using Chi square test for independence of attributes. For comparing quantitative variables across two surgical groups, independent sample t test and Pearson correlation is used after confirming the underlying normality assumption. P values less than 0.05 would be considered to be statistically significant. The entire statistical analysis is performed using statistical package for social sciences (SPSS ver 17, Inc. Chicago, USA) for MS windows. The technical details on the sample size calculation and the statistical formulae used are given in 10.2 appendix- statistical analysis.

Results

Table 1: Conservative/surgical management

Management	Frequency	Percent
Conservative	60	60
Surgery	40	40
Total	100	100
Ventilatory support		
Yes	15	15
No	85	85
Outcome of study population (survival/expired)		
Yes	95	95
No	5	5
Gender		
Male	85	85
Female	15	15
Mean age	36.44±10.50	
Time of presentation	7.3±3.37	
Hospital stay	8.036±3.02	

Out of 100 patients, 60 were treated conservatively, 40 required surgical intervention. 15 patients required ventilator support in our study. 5 patients expired. Out of 100 patients, 85 were male (85%), 15 were female (15%).

Table 2: Observation between IAP and hospital stay in surgically intervened patients

Time		Correlation	P value
0	IAP	-0.316	0.075
	Hospital stay		
3	IAP	-0.268	0.136
	Hospital stay		
6	IAP	-0.190	0.270
	Hospital stay		
12	IAP	-0.120	0.530
	Hospital stay		
24	IAP	-0.284	0.129
	Hospital stay		
48	IAP	0.226	0.220
	Hospital stay		
72	IAP	0.610	0.0001
	Hospital stay		
96	IAP	0.482	0.009
	Hospital stay		

Table 3: Observation between IAP and hospital stay in conservatively treated patients

Time		Correlation	P value
0	IAP	0.634	0.0001
	Hospital stay		
3	IAP	0.743	0.0001
	Hospital stay		
6	IAP	0.773	0.0001
	Hospital stay		
12	IAP	0.810	0.0001
	Hospital stay		
24	IAP	0.783	0.0001
	Hospital stay		
48	IAP	0.778	0.0001
	Hospital stay		
72	IAP	0.732	0.0001
	Hospital stay		
96	IAP	0.644	0.0001
	Hospital stay		

Overall hospital stay (considering both conservatively managed and surgically intervened patients) increased significantly as IAP increases at 0, 3, 6, 24, 48, 72, 96 hours, except at 12 hours. Hospital stay decreased as IAP increases in surgically intervened group because IAP returned to normal after surgical decompression, but this finding was statistically significant only at 72 hours (p value was 0.0001) in our study.

Discussion

Trauma has been called the neglected disease of modern society, despite its close companionship with man. Trauma is the leading cause of death and disability in developing countries and the most common cause of death under 45 years of age. [12] Trauma is the second largest cause of disease accounting for 16% of global burden. The WHO estimates that by 2020, trauma will be the first or second leading cause of years of productive life lost for the entire world population.2 Pre-hospital transportation, initial assessment, thorough resuscitative measures and correct diagnosis are of utmost importance in trauma management. [13] World over injury is the 7th cause of mortality and abdomen is the third most common injured organ. Abdominal injuries require surgery in about 25% of cases. 85% of abdominal traumas are of blunt character. [14]

Out of 100 patients, 60 were treated conservatively, 40 required surgical intervention. 15 patients required ventilator support in our study. 5 patients expired. Out of 100 patients, 85 were male (85%), 15 were female (15%). Similar finding was observed in study conducted by Mehta et al [13], Bhoir et al. [10] Overall hospital stay (considering both conservatively managed and surgically intervened patients) increased significantly as IAP increases at 0, 3, 6, 24, 48, 72, 96 hours, except at 12 hours. Bhoir et al[10] R. R. increased significantly as IAP increases at 0, 3, 6, 12, 24, 48, 72 and 96 hours of hospital admission. Hospital stay decreased as IAP increases in surgically intervened group because IAP returned to normal after surgical decompression, but this finding was statistically significant only at 72 hours (p value was 0.0001) in our study.

In our present study considering both conservatively managed and surgically intervened patients overall hospital stay increased significantly as IAP increases at 0, 3, 6, 24, 48, 72, 96 hours except at 12 hours. This was in contrast to study conducted by Khan et al [14], in which there was no significant correlation between IAP and duration of hospital stay. Hospital stay decreased as IAP increases in surgically intervened patients because IAP returned to normal after surgical decompression, but this finding was statistically significant only at 72 hours (p value was 0.0001) in our study. As IAP increases hospital stay increased in conservatively managed patients as IAP took longer time to become normal in contrast to surgically managed patients, this finding was statistically significant at 0, 3, 6, 12, 24, 48, 72, 96 hours (p value was 0.0001). One patient succumbed to death at 9 hours of presentation to hospital in emergency department due to massive retroperitoneal hematoma (detected on CECT abdomen IV contrast) in spite of prompt resuscitative measures.

Conclusion

There was no significant correlation regarding hospital stay and increased IAP in our study as hospital stay increased both in conservatively managed and surgically intervened patients except at 72 hours in surgically intervened group. Before development of IAH and ACS, the potential candidates should be offered surgical decompression at proper time.

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