Section: General Surgery

Original Research Article

SIGNIFICANCE OF INTRA-ABDOMINAL PRESSURE MONITORING IN THE TREATMENT OF PATIENTS WITH BLUNT ABDOMINAL INJURIES

Received : *02/09/2023*
Received in revised form : *06/10/2023*
Accepted : *17/10/2023*

Keywords:
Abdominal Trauma, Intra-Abdominal Pressure, Intraabdominal Hypertension, Ventilatory Support.

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DOI:10.47009/jamp.2023.5.5.220

Source of Support: Nil,
Conflict of Interest: None declared

Int J Acad Med Pharm
2023; 5 (5); 1124-1128

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Abstract

Background: Abdominal trauma can cause a rise in intra-abdominal pressure (IAP) for a variety of reasons, including blood or free fluid collection in the peritoneal cavity, intestinal wall oedema, retroperitoneal hematoma, or abdominal packing for haemorrhage management. The purpose of this study was to investigate the role of intra-abdominal pressure (IAP) monitoring in the management of patients with blunt abdominal injuries. **Materials and Methods:** For one and a half years, a hospital-based prospective observational study was conducted on 100 patients who came to the emergency medicine department and were later transferred to the department of general surgery at an Indian tertiary care facility. At the presentation, IAP was measured in 0 hours, 3 hours, 6 hours, 12 hours, 24 hours, 48 hours, 72 hours, and 96 hours. The duration of ICU and hospital stay, the occurrence of intraabdominal hypertension, new organ function loss, and the necessity for ventilatory assistance were all observed as outcomes in patients with blunt trauma to the abdomen. **Result:** Out of 100 patients, 82 (82% were male) and 18 (18%) were female. The average time spent in the hospital was 7.876 hours, with a hospital stay of 8.12 days. The most common age group involved is between the ages of 20 and 30. Out of 100 patients, 58 were treated conservatively, whereas 42 needed surgery. In our study, 16 individuals required ventilator support. The correlation between IAP and vital parameters, as well as renal parameters, was shown to be statistically significant at 0, 3, 6, 24, and 72 hours. At 96 hours, all metrics are negligible except PR, which has a strong positive correlation with IAP and was found to be statistically significant, and RR, which has a weak positive connection with IAP and was found to be statistically significant. **Conclusion:** The most common mode of blunt abdominal injury is a car accident. Measures should be taken to evacuate patients from the accident scene to trauma hospitals as soon as possible. Recognising people at danger, regularly monitoring abdomen pressure, and initiating resuscitation treatments could significantly reduce death.

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 cause an increase in IAP for a variety of reasons, including blood or free fluid accumulation in the peritoneal cavity, intestinal wall oedema, retroperitoneal hematoma, or abdominal packing for haemorrhage management. As a result of the ongoing hepatic bleeding and growing volumes of bloody ascites discovered in failed non-operative therapy, IAP can rise. The world society of abdominal compartment syndrome (WSACS) was founded in 2004 by a group of international physicians and surgeons. It presented evidence-based IAP, IAH, and ACS guidelines, definitions, and recommendations. IAP refers to the steady-state pressure within the abdominal cavity. Normally, IAP ranges between 5-7 mm Hg.[9] IAH is defined as a continuous or recurring pathological increase of IAP of 12 mm Hg or above. Acute coronary syndrome (ACS) is defined as sustained IAP greater than 20 mm Hg (with or without abdominal perfusion pressure less than 60 mm Hg), which is associated with new organ dysfunction or failure. Even a small and prolonged increase in intraabdominal pressure over baseline of 10 mm Hg has a negative impact on end-organ performance, compromising neurologic, cardiac, respiratory, gastrointestinal, hepatic, and renal homeostasis. In all cases of blunt abdominal injury, IAP should be measured and monitored using any standard accessible method, with full aseptic precautions. Patients will be closely watched for simple measures such as heart rate, blood pressure, breathing rate, and urine output in addition to IAP because alterations in these parameters can predict the imminent IAH and ACS before the actual rise in IAP. Despite increased awareness and guidelines, there is still some resistance to routine screening and monitoring practices. Increased awareness of IAP, as well as changes in the clinical management of critically ill or injured patients, have resulted in an exponential increase in IAH and ACS research in recent years.[10,11] As a result, by monitoring intraabdominal pressure, we will be able to detect individuals with elevated intraabdominal pressure and intervene to reduce morbidity and mortality associated with IAH and ACS.

MATERIALS AND METHODS

For one and a half years, a hospital-based prospective observational study was conducted on 100 patients who came to the emergency medicine department and were later transferred to the department of general surgery at an Indian tertiary care facility.

Patients with acute blunt injury to the abdomen with an age of 18 years were included in the study.

The study excluded patients with head and spinal injuries, urinary bladder injuries, a history of neurogenic bladder, or previous bladder surgery.

At presentation, IAP was assessed at 0 hours, 3 hours, 6 hours, 12 hours, 24 hours, 48 hours, 72 hours, and 96 hours.

The duration of ICU and hospital stay, the occurrence of intraabdominal hypertension, new organ function loss, and the necessity for ventilatory assistance were all observed as outcomes in patients with blunt trauma to the abdomen. Blood pressure, pulse rate, respiratory rate, oxygen saturation (SpO2), urine output, blood urea, serum creatinine, IAP, time of presentation to hospital after injury, length of ICU and hospital stay, need for ventilatory support, morbidity (new organsystem dysfunction), and mortality were all recorded.

IAP was estimated indirectly using a Foley's catheter to estimate intravenous pressure. The entire surgery was performed under aseptic conditions. In a previously placed per-urethral Foleys catheter (assuming and insuring an empty urine bladder, 25 ml of normal saline (NS) infused into bladder, sterile clear tubing linked to it and held vertically at 90° at the pubic symphysis. When the vertical normal saline column was stable, the length was measured. It is estimated as intra vesicle pressure in cm of water and was converted to mm of Hg using the following formula: 1 cm of water=0.736 mm of Hg.

Following the conclusion of this procedure, the Foleys catheter was reconnected to the urobag. In our investigation, patients with blunt abdominal injuries were handled according to advanced trauma life support (ATLS) recommendations. Mechanical ventilators were used to handle patients who required assisted ventilation. The clinical result of the surgery was examined in terms of survival and mortality. Early surgical decompression of the abdomen in the form of DCS was performed on patients who indicated anticipated signs and sequels of increased IAP. Tachycardia, drops in blood pressure or urine output, tachypnoea, abdominal distention, and an increase in IAP were all considered indicators of impending IAH.

Patients who needed surgical decompression had an exploratory laparotomy as a last resort. After considering the foregoing clinical and laboratory characteristics, the decision to continue with decompressive laparotomy was made by the primary surgeon in charge of the patient, who deteriorated following a trial of non-operative therapy.7
Statistical evaluation

Statistical Analysis

The collected data was assembled and input into a spreadsheet programme (Microsoft Excel 2007) before being exported to the data editor page of SPSS version 15 (SPSS Inc., Chicago, Illinois, USA). The confidence level and level of significance for all tests were set at 95% and 5%, respectively.

RESULTS

This study was conducted at an Indian tertiary care institute's department of general surgery. The study included 100 patients who presented to the emergency room with a blunt injury to the abdomen and met the inclusion and exclusion criteria.

There were 82 men (82%), and 18 women (18%) among the 100 patients. The average time spent in the hospital was 7.876 hours, with a hospital stay of 8.12 days. The most common age group involved is between the ages of 20 and 30.

Out of 100 patients, 58 were treated conservatively, whereas 42 needed surgery. In our study, 16 individuals required ventilator support. The correlation between IAP and vital parameters, as well as renal parameters, was shown to be statistically significant at 0, 3, 6, 24, and 72 hours.

At 12 hours, all metrics are significant except IAP, which has a modest positive connection with DBP and was judged to be statistically insignificant. SpO2 shows a substantial negative connection with IAP, however the correlation was found to be statistically insignificant.

At 96 hours, all metrics are negligible except PR, which has a strong positive correlation with IAP and was found to be statistically significant, and RR, which has a weak positive connection with IAP and was found to be statistically significant. Low IAP is associated with a high respiratory rate. Except for 12 hours, overall hospital stay rose considerably when IAP increased at 0, 3, 6, 24, 48, 72, and 96 hours.

Because IAP reverted to normal following surgical decompression, hospital stay reduced as IAP increased in the surgically intervened group, although this finding was statistically significant only after 72 hours in our study. ($p \leq 0.05$) Correlation of hospital stays in patients receiving conservative care. This conclusion is statistically significant at 0, 3, 6, 12, 24, 48, 72, and 96 hours in our current investigation of 100 patients with traumatic injury abdomen.

Table 1: Conservative/Surgical Management among Study Participants

Variable	Number	Percentage (%)
Management		
Conservative	58	58
Surgery	42	42
Ventilator support		
Yes	16	16
No	84	84

Table 2: Observation between IAP and Hospital Stay in Surgically Intervened Patients

Time		Mean±SD	P value
0	IAP	10.9±3.12	0.09
	Hospital stay	10.80±1.75	
3	IAP	12.40±1.50	0.1
	Hospital stay	10.80±1.75	
6	IAP	13.10±4.10	0.16
	Hospital stay	10.80±1.75	
12	IAP	17.24±12.14	0.23
	Hospital stay	10.80±1.75	
24	IAP	17.02±6.25	0.2
	Hospital stay	10.80±1.75	
48	IAP	13.03±5.1	0.26
	Hospital stay	10.80±1.75	
72	IAP	11.45±5.9	0.003*
	Hospital stay	10.80±1.75	
96	IAP	8.24±1.10	0.02*
	Hospital stay	10.80±1.75	

** indicate statistically significance at $p \leq 0.05$*

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

Time		Mean±SD	P value
0	IAP	09.62±2.20	0.01*
	Hospital stay	06.32±1.65	
3	IAP	09.66±2.68	0.02*
	Hospital stay	06.32±1.65	
6	IAP	09.40±2.98	0.001*
	Hospital stay	06.32±1.65	
12	IAP	09.20±02.06	0.001*
	Hospital stay	06.32±1.65	
24	IAP	08.75±1.36	0.003*
	Hospital stay	06.32±1.65	
48	IAP	06.31±2.2	0.002*

ISSN (O): 2687-5365; ISSN (P): 2753-6556

	Hospital stay	06.32±1.65	
72	IAP	06.22±1.1	0.003*
	Hospital stay	06.32±1.65	
96	IAP	7.65±1.32	0.001*
	Hospital stay	06.32±1.65	

** indicate statistically significance at p≤0.05*

DISCUSSION

Abdominal trauma can cause an increase in IAP for a variety of reasons, including blood or free fluid collection in the peritoneal cavity, intestinal wall edema, retroperitoneal hematoma, or abdominal packing for hemorrhage control. As a result, the ongoing hepatic haemorrhage and rising volumes of bloody ascites reported in failed NOM can cause an increase in IAP.[13] The impact of IAH on numerous organ systems result in ACS with multiple organ dysfunctions. Because of the limited belly wall compliance, elevated IAP causes compromised physiology and organ functions.[14]

Our study's most common age group was 20-30 years; similar findings were reported in studies conducted by Mehta et al (21-30 years) and Amuthan et al (20-30 years).[15,16] In the current study, 66 men (85.70%) and 11 women (14.30%). Similarly, Mehta et al. and Bhoir et al. discovered similar results. In our study, SBP and DBP dropped considerably when IAP increased at 0, 3, 6, 24, 48, and 72 hours of hospitalization.[9,15] A similar conclusion was reported in a study conducted by Bhoir et al, who discovered an inverse relationship between B.P and IAP. In our data, P. R. increased considerably as IAP increased at 0, 3, 6, 12, 24, 48, 72, and 96 hours of hospital admission. Bhoir et al. discovered a similar result in their investigation.[9] R. R. increased dramatically as IAP increased at 0, 3, 6, 12, 24, 48, 72, and 96 hours. Bhoir et al. discovered a similar result in their investigation.[9] U/O reduced dramatically as IAP increased after 3, 6, 12, 24, 48, and 72 hours in the hospital. This observation was consistent with the findings of Bhoir et al.[9] Serum creatinine levels increased considerably as IAP increased at 0, 24, 48, 72, and 96 hours of hospitalization. This was consistent with the findings of Khan et al. and Bhoir et al.[9,17] Serum creatinine levels increased considerably as IAP increased during 0, 24, 48, and 72 hours of hospitalization. A similar observation was made in a study undertaken by Khan et al, who discovered a statistically significant increase in B.U. in IAH patients.[17]

Except for 12 hours, the overall hospital stay increased significantly as IAP increased in our current analysis, which included both conservatively managed and surgically intervention patients. In contrast, no significant link was found between IAP and length of hospital stay in a study conducted by Khan et al.[17] Because IAP reverted to normal after surgical decompression, hospital stay decreased as IAP increased in surgically intervened patients, although this finding was statistically significant only after 72 hours in our study. In conservatively managed patients, hospital stay increased as IAP took longer to return to normal in comparison to surgically managed patients; this finding was statistically significant at 0, 3, 6, 12, 24, 48, 72, and 96 hours. There was no mortality in conservatively treated patients because early surgical decompression of the abdomen was performed in patients who indicated impending signs and sequels of increased IAP.

CONCLUSION

The most common cause of blunt abdominal injuries is a car accident. Measures should be taken to evacuate patients from the accident scene to trauma hospitals as soon as possible. Recognising people at danger, regularly monitoring abdomen pressure, and initiating resuscitation treatments could significantly reduce death. In all cases of traumatic acute abdomen, IAP should be measured and monitored using any standard accessible method, with full aseptic precautions. In our study, there is no significant relationship between hospital stay and increasing IAP because hospital stay rose in both conservatively managed and surgically intervened patients, except at 72 hours in the surgically intervened group. Potential patients should be offered surgical decompression before the onset of IAH and ACS.

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ISSN (O): 2687-5365; ISSN (P): 2753-6556

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ISSN (O): 2687-5365; ISSN (P): 2753-6556