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Original Research Article

To Assess the Role of Nonoperative Management in Reduction and Prevention of Abdominal Compartment Syndrome in Blunt Trauma Abdomen Cases

Dr. Sanjay Kumar Mahajan[1], Dr. Abhay Brahamane[2], Dr. Deepak Mandloi[3]

Assistant Professor, MGM Medical College Indore[1]
Assistant Professor, MGM Medical College Indore[2]
Assistant Professor, LNCT Medical College Indore[3]

Corresponding Author: Dr. Deepak Mandloi

Abstract

Background & Methods: The aim of the study is to assess the role of nonoperative management in reduction and prevention of ACS in blunt trauma abdomen cases. The direct methods are quite accurate over all ranges of IAP, it is impractical and not feasible for routine practice. Indirect pressure measurement is done through Inferior Vena cava, gastric, rectal and Urinary Bladder. The simplest and the method of choice is transurethral measurement of UBP using a Foley's catheter. The bladder is drained and then it is filled with 25 ml of normal saline.

Results: Improvement in the vitals & other parameters after conservative management is shown in the chart. Pulse was reduced by 41% Respiratory rate improved by 65%, and urine output was improved from 315.29 ml/12 hr. to 1167.66 ml/12 hr. 100% patients developed respiratory distress in the ACS group while 17.8% of patients developed respiratory distress in the non ACS affected group.

Conclusion: Out of 264 studied cases, ACS was diagnosed in 18 patients (having intra-vesical pressure>20 mm of Hg). Reversal of all the adverse effects of raised IAP and ACS, were reflected in terms of improvement in vitals output of surviving patients after non-operative management. As there was significant improvement in vitals and other parameters, after applying non-operative management therapy in blunt trauma abdomen patients with IAH, in terms of reduced morbidity and mortality and improved survival.

Keywords: nonoperative, ACS, trauma & abdomen.
Study Design: Observational Study.

1. Introduction

Intra-abdominal hypertension (IAH) and abdominal compartment syndrome (ACS) have been increasingly recognized in the critically ill as causes of significant morbidity and mortality[1]. The variety of previous definitions has led to confusion and difficulty in comparing one study to another. An international group of critical care specialists convened to standardize definitions for both IAH and ACS as well as establish standards for the measurement of intra-abdominal pressure (IAP).

The primary pathophysiologic event leading to intra-abdominal hypertension and the abdominal compartment syndrome (IAH/ACS) is interstitial edema in the bowel and

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mesentery due to capillary endothelial damage[2]. This capillary endothelial damage occurs due to ischemia from the original physiologic insult (sepsis, hemorrhage, etc) and due to secondary damage from the pro-inflammatory cytokines released in response to this insult. Many litres of interstitial fluid can accumulate within the intra-abdominal compartment via this mechanism. As fluid accumulates the abdominal wall and fascia is slowly stretched until they become less compliant, causing the pressure within the abdominal cavity to rise. Elevation of IAP has serious impact on organ perfusion throughout the body[3].

An especially susceptible organ to tissue ischemia/reperfusion injury, capillary leak and edema is the bowel. Since the abdominal wall limits the total volume of intra-abdominal space, as bowel expands the pressure within the abdomen also increases. This causes occlusion of capillary blood flow and ultimately ends in compromise of venous return and arterial flow[4]. The resulting ischemia triggers a vicious cycle of further inflammation, capillary leak, bowel edema and increasing intra-abdominal pressure. Normal intra-abdominal pressure is 0-5 mm Hg. Physiologic compromise begins when the pressure rises above 8-10 mm Hg. Once the pressures increase beyond about 20 mm Hg irreversible tissue injury occurs, ultimately resulting in ACS and multiple organ failure. Early recognition of rising abdominal pressure is critically important because it allows prompt intervention which will prevent ACS from developing, leading to a much better prognosis for the patient[5].

2. Material and Methods

Present Study was conducted at MGM Medical College Indore for 01 Year. IAP can be measured by direct or indirect methods. Though the direct methods are quite accurate over all ranges of IAP, it is impractical and not feasible for routine practice. Indirect pressure measurement is done through Inferior Vena cava, gastric, rectal and Urinary Bladder. The simplest and the method of choice is transurethral measurement of UBP using a Foley's catheter. The bladder is drained and then it is filled with 25 ml of normal saline. This saline in the bladder acts as a passive diaphragm for pressure transmission. The drainage tube is clamped beyond the aspiration port and a 16-gauge needle is inserted into the port. The tubing is then attached to water manometer or a pressure transducer, at the end of expiration in supine position, using the midaxillary line as the zero reference point.

Inclusion Criteria:

1. Abdominal distension
2. Increased intra-abdominal pressure
3. Hypotension
4. Tachypnea
5. Tachycardia.

3. Result

Table 1: Age Distribution of ACS PTS.

Age in Years	No of cases
20-30	02
30-40	06
40-50	08
50-60	02
>60	00

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Table 2: Total Mortality Data

	No. of patients	No. of patients died	%
With ACS	18	04	22.22%
Without ACS	246	08	3.25%
Total	264	12	4.54%

Table 3: Showing Management Efficacy in ACS Diagnosed Patients (Mean Value)

Parameters	Before management (Mean)	After management (Mean)
Pulse (per min)	125.31	76
R. Rate (per min)	42.27	15.32
A. Girth (inch)	88.84	87.91
U. Output (ml)/12 hr	314.29	1167.66

Improvement in the vitals & other parameters after conservative management is shown in the chart. Pulse was reduced by 41% Respiratory rate improved by 65%, and urine output was improved from 315.29 ml/12 hr. to 1167.66 ml/12 hr.

Table 4: Showing Respiratory Distress in ACS

Resp. Distress	With ACS	Without ACS	Total
Present	18	44	62
Not present	00	202	202
TOTAL	18	246	264

100% patients developed respiratory distress in the ACS group while 17.8% of patients developed respiratory distress in the non ACS affected group.

4. Discussion

We measured the IVP twice daily using CVP manometer which was connected to the Foley's catheter. 25 ml of NS was instilled through Foley catheter and it was connected to the CVP manometer. Rise in CVP pressure determines the increase in intra-abdominal pressure in terms of cm of NS[6]. This value was converted into mm of Hg (1 mmHg=1.36 cm of water). IAP more than 20 mm of Hg was diagnosed as a case of ACS. Those with intra-abdominal hypertension (IAH), were managed conservatively (non-operative management) in terms of fluid restriction, sedation, bowel evacuation etc. Those who developed frank ACS underwent intervention either in the form of laparotomy or drain placement. I measured the outcome in terms of improvement in vitals i.e. pulse rate, respiratory rate, abdominal girth, intra-abdominal pressure, and urine output. The patients were also assessed in terms of morbidity (total hospital stay), mortality (deaths) and survival[7]. This is the first study of its type analyzing the incidence of ACS in blunt trauma abdomen patients and their management and prevention by non-operative methods.

Reed, S.F., et al.,(Aggressive surveilance and early catheter directed therapy in the prevention of abdominal compartment syndrome in Trauma patients) were able to reduce IAP by 6 mm of Hg within 30 min of catheter placement in patients whose IAP crossed the 20 mm of Hg[8].

In a clinical study by Ernest A, Azzopardia, Bill M Williamsb, Srinivasan Iyerc, said that Current best evidence supports recommendations to reduce fluid-volume administered

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through use of colloids or hypertonic saline especially if the projected resuscitation volume surpasses a 'volume ceiling'. Continuous intra-vesical monitoring is recommended: to guide fluid resuscitation for early diagnosis of ACS; and as a guide to reliability of urine output as indicator of organ perfusion[9&10].

5. Conclusion

Out of 264 studied cases, ACS was diagnosed in 18 patients (having intra-vesical pressure >20 mm of Hg). Reversal of all the adverse effects of raised IAP and ACS, were reflected in terms of improvement in vitals output of surviving patients after non-operative management. As there was significant improvement in vitals and other parameters, after applying non-operative management therapy in blunt trauma abdomen patients with IAH, in terms of reduced morbidity and mortality and improved survival.

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