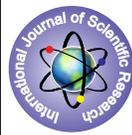


Emergency Re-Exploration and Decompression in Abdominal Compartment Syndrome by Measuring Intra-Abdominal Pressure.



Medical Science

KEYWORDS : Abdominal compartment syndrome, intra abdominal pressure, decompression.

DR .VIJAYAKUMAR .G	Assistant Professor, Dept of General Surgery, Basaveshwara Medical College And Research Centre,Chitradurga , Karnataka
Dr. SHARATH B.V	Associate professor,Dept of General Surgery, Basaveshwara Medical College And Research Centre, Chitradurga, Karnataka
Dr. KUMARASWAMY. R.C	Associate professor, Dept of Internal Medicine, Basaveshwara Medical College And Research Centre, Chitradurga, Karnataka.
Dr. PRADEEP KUMAR. J	Assistant professor, Dept of General Surgery, Basaveshwara Medical College And Research Centre, Chitradurga, Karnataka.
DR. VIJAYALAXMI. J. D	Senior resident, Dept of Anesthesia,Basaveshwara Medical College And Research Centre, Chitradurga, Karnataka

ABSTRACT

OBJECTIVE:

Objective of the study was to identify the patients who need emergency re exploration and decompression in abdominal compartment syndrome by measuring intra abdominal pressure.

PATIENTS AND METHODS:

Prospective study of intra-abdominal pressure measurement of forty five patients during first three post operative days, treated for various non-traumatic emergency conditions during December 2010 to August 2014 in a tertiary care centre by measuring intra-cystic pressure by using a Foley's catheter and a water manometer. Variables such as age, heart rate, respiratory rate, mean blood pressure, PaO₂, Urine output, duration of surgery, nature of closure and time taken to re-explore and to decompress the abdomen were also studied.

RESULTS :

Of 45 postoperative patients acute elevation of the intra-abdominal pressure above 20mmHg caused oliguria in all. Patients with Grade II and Grade III with IAP <30mmHg and oliguria improved with diuretics and conservative management except one who died of cardio-respiratory arrest. Operative re-exploration and decompression were done in 10 patients with IAP more than 30mmHg resulted in improved diuresis in 7 patients and three died because of continued renal failure.

CONCLUSION:

Patients with intra-abdominal pressure above 30mmHg and oliguric should undergo early re-exploration and decompression to have an improved outcome.

INTRODUCTION:

The abdomen is a closed space bound by the relatively non-expandable fascia of the abdominal musculature and as such is susceptible to compartment syndrome.

Abdominal compartment syndrome(ACS) is defined as abdominal hypertension and frequently manifest via such end organ sequelae as decreased urine output, increased peak pulmonary pressures, decreased cardiac preload and increased afterload [1,2,3].After abdominal surgery, pressures are typically in the range of 3 to 15 mm Hg. with an increase in pressure have deleterious effects on both intra and extra-abdominal organs such as renal, cardiovascular and respiratory system[1,2,3,4].

ACS is most commonly encountered in the multiple trauma and intensive care (ICU) setting. Factors that predispose to ACS are ileus as a result of gut edema and contamination, coagulopathy, packing used to control the bleeding, massive fluid resuscitation and transfusion, ascites, pancreatitis, after reduction of chronic hernia that have lost their domain and repair of ruptured aortic aneurysm. Closure of noncompliant wall under tension is associated with intra-abdominal hypertension in 100% of cases[1,2,3].

Traditionally, IAP has been measured indirectly through the urinary bladder using a Foley's catheter. This technique was adopted to avoid direct invasive techniques, and was subsequently popularized by Kronet *al*[4] in 1984.The bladder acts as a passive diaphragm to a volume of 50 to100 ml and thus accurately reflects IAPs over a wide range (0 to 70mm Hg).Generally no specific bladder pressure prompts therapeutic intervention except when the pressure is >35mmHg [5]. Rather emergent decompression is

carried out when intra-abdominal hypertension reaches a level at which end organ dysfunction occurs. Mortality is directly related to the time taken for emergency decompression [4]. Decompression is performed operatively either in the ICU if the patient is hemodynamically unstable or in the operating room. Following resuscitation and management of specific injuries open abdomen is closed as quickly as possible once the patient is stable. If the primary closure is not possible, closure may be achieved with a synthetic prosthesis, tissue graft or sequential closure technique with wound vacuum device [6].

As there are no set minimum pressure levels which warrants re-exploration, we undertook this study to evaluate the intra-cystic pressures at which decompression of abdomen can improve the patient outcome

MATERIALS AND METHODS:

After Institutional Review Board approval, during the period December 2010 through August 2014 , we prospectively studied intra-abdominal pressure of 45 postoperative patients in the age group between 35-65 years treated for various non-traumatic emergency conditions during the first three days after obtaining informed written consent to participate in the study as a part of their treatment by indirectly measuring with most widely used method involving transurethral measurement of urinary bladder pressure using a Foley's catheter. In the supine position, a Foley catheter is passed into the bladder and clamped distal to the culture aspiration port after the bladder has been emptied. Around 50 to 100 ml of sterile saline is instilled into the bladder. The clamp is released to allow the proximal drainage tubing to fill with saline from the bladder.

Pressure was recorded using water manometer with the reference point being the symphysis pubis and graded using a system proposed by Burch and associate which may help in guiding the need for therapy. In our study we considered IAP of 30 mmHg as cut off point and urine output < 20 ml as a criteria to re-explore and decompress the abdomen. Opened abdomen was closed primarily in all patients except in two patients in whom we used synthetic mesh to close the abdomen.

Following variables were also assessed during the study: age, heart rate, respiratory rate, mean blood pressure, PaO₂, Urine output, duration of surgery, nature of closure and time taken to re-explore and decompress the abdomen.

RESULTS :

Prospective study of IAP assessment of 45 enrolled postoperative patients treated for non-traumatic emergency showed mean IAP of 25.5mmHg and mean urine output of 20ml in the first 24 hours, with oliguria in all patients are listed in **Table 1 and 2**. Patients with Grade II and Grade III with IAP <30mmHg and oliguria improved with diuretics and conservative management except one who died of cardio-respiratory arrest. Operative re-exploration and decompression were done in 10 patients having IAP of > 30 mmHg resulted in improved diuresis in 7 patients and three died because of continued renal failure. Those who had early decompression had a better outcome than the late decompression.

TABLE 1. Abdominal Compartment Syndrome with Intra-abdominal Pressure During the First 24 Hours

Pathology / No. of Patients	Grade II (16 -25)	Grade III (26 - 35)	Grade IV (>35)
Hollow Viscus Perforation (30)	7	19	4
Intestinal Obstruction (11)	3	6	2
Ventral Hernia (4)	1	2	1

TABLE 2. Urine Output During the First 24 hours.

Pathology / No. of Patients	Grade II (16 -25)	Grade III (26 - 35)	Grade IV (>35)
Hollow Viscus Perforation (30)	7	19	4
Intestinal Obstruction (11)	3	6	2
Ventral Hernia (4)	1	2	1

Discussion

The level of IAP at which the ACS occurs is variable. Clearly, variability in the physiologic response to a graded increase in pressure depends in part on the intravascular volume status of the patient as well as underlying pulmonary or renal dysfunction. Therefore, the diagnosis and need for treatment depend on the clinical status of the individual patient. Burch and associates [1] have proposed a grading system for ACS, which may help in guiding the need for therapy. In patients with pressures less than 15mm Hg (i.e., grade I) treatment is rarely indicated. The need for treatment in patients with grade II ACS (15 to 25 mm Hg) depends largely on the clinical status of the patient. Patients without oliguria and elevated airway pressures probably warrant close observation. Grade III ACS (25 to 35 mm Hg) usually requires intervention. In these patients, hemodynamic and renal dysfunction often develops slowly, frequently leading to a delay in both diagnosis and therapy. Patients with IAPs greater than 35mm Hg (grade IV) are usually in grave clinical condition and require immediate treatment.

In one study, 38% of patients admitted to an intensive care unit after major abdominal surgery had IAPs greater than 20mm Hg. In our study, 80% had IAPs greater than 20mmHg after emergency surgery and we considered pressure greater than 30mmHg and urine output less than 20ml as criteria to re-explore and decompress the abdomen.

One recent clinical study reported four patients with acute post-operative renal insufficiency whose renal function improved after abdominal decompression [7]. In our study out of ten patients 7 had a improved diuresis immediately after decompression.

The death rate in patients with ACS is extremely high. Several small series have reported death rates ranging from 42% to 71% [4, 6, 8, 9, 10]. These high rates must be considered in the context of the patients' underlying disease. In our study mortality was 30% among the re-explored patients.

CONCLUSION:

In the face of elevated IAP and a clinical picture consistent with ACS, the chance of survival is extremely low without urgent abdominal decompression. An intra-abdominal pressure above 30 mmHg in a postoperative patient with low urinary output is a definitive indication for abdominal decompression. However decompression might be beneficial at much lower pressures in selected patients at higher risk.

REFERENCE

- Burch JM, Moore EE, Moore FA, Franciose R. The abdominal compartment syndrome. Surg Clin North Am. 1996;76:833-842 | 2. Nathens AB, Brenneman FD, Boulanger BR. The abdominal compartment syndrome. Can J Surg. 1997;40:254-262. | 3. Watson RA, Howdieshell TR. Abdominal compartment syndrome. Southern Med J. 1998;91:326-332. | 4. Kron IL, Harman PK, Nolan SP. The measurement of intra-abdominal pressure as a criterion for abdominal re-exploration. Ann Surg. 1984;199:28-30. | 5. C Clay Cothren, Walter L. Biffi, Ernest E. Moore. Trauma. Chapter 7 in Schwartz surgical principles, 9th Ed., Abdominal Compartment Syndrome Mc Gray Hill, Pg. 188. | 6. Schein M, Wittmann DH, Aprahamian CC, Condon RE. The abdominal compartment syndrome: the physiologic and clinical consequences of elevated intraabdominal pressure. J Am Coll Surg 1995;180:745-53. | 7. Richards WO, Scovill W, Shin B, et al. Acute renal failure associated with increased intraabdominal pressure. Ann Surg 1983; 197:183-187. | 8. Cullen DJ, Coyle JB, Teplick R, Long MC. Cardiovascular, pulmonary, and renal effects of massively increased intra-abdominal pressure in critically ill patients. Crit Care Med 1989; 17:118-21 | 9. Meldrum DR, Moore FA, Moore EE, Haenel JB, Cosgriff N, Burch JM. Cardiopulmonary hazards of peri-hepatic packing for major liver injuries Am J Surg 1995;170:537-42. | 10. Fietsam R, Villalba M, Glover JL, Clark K. Intra-abdominal compartment syndrome as a complication of ruptured abdominal aortic aneurysm repair. Am Surg 1989;55:396-402. |