Cal Of Applica Resolution **General Surgery**

A PROSPECTIVE STUDY ON INTRA-ABDOMINAL HYPERTENSION IN THE PERIOPERATIVE PERIOD

patients undergoing laparotomy mortality rates without treatment in patients developing Abdominal Compartment

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ABSTRACT BACK	GROUND :Intra-Abdominal Pressure (IAP) has been found to be an independent predictor of mortality in

Syndrome

AIM: find out the prevalence of intra-abdominal hypertension preoperatively in patients requiring abdominal surgery, find the incidence of IAH in the immediate postoperative period in patients undergoing abdominal surgery, determine the incidence of abdominal compartment syndrome in patients having intra-abdominal hypertension.

METHOS AND MATERIALS: All patients undergoing intra-abdominal surgery at the surgical unit during the study period were included. intra-abdominal pressure was measured thrice preoperatively, immediately after surgery and post operatively third day.

RESULTS: The prevalence of intra-abdominal hypertension preoperatively in patients with acute abdominal conditions requiring emergency surgery is 38%. The incidence of IAH in the first three postoperative days in patients undergoing abdominal surgery is 11.8%. No cases satisfying the criterion for abdominal compartment syndrome were identified in the post-operative period.

KEYWORDS: Intra-abdominal hypertension, Surgery, Complication, Abdominal surgery

1. INTRODUTION:

Increase in intra-abdominal pressure is a common yet frequently unrecognized phenomenon that has significant implications on the morbidity and mortality of the surgical patient. Intra-Abdominal Pressure (IAP) has been found to be an independent predictor of mortality in patients undergoing laparotomy mortality rates without treatment in patients developing Abdominal Compartment Syndrome (organ dysfunction associated with intra-abdominal hypertension) is estimated at 89-100%.[1] Fortunately this can be significantly reduced with treatment .Increased IAP, also referred to as intra-abdominal hypertension (IAH), has been found to impair organ function in critically ill patients and may lead to abdominal compartment syndrome (ACS).[2] The World Congress on Abdominal Compartment syndrome has defined IAH as "a sustained or repeated pathological elevation in IAP value higher than12 mm of Hg". While ACS is defined as a "sustained intraabdominal pressure >20mm of Hg (with or without abdominal perfusion pressure <60mm of Hg) associated with new organ. Dysfunction or failure". In healthy individuals IAP ranges from sub atmospheric to 5mm of Hg. Primary ACS develops as a result of pathological IAH caused by intraabdominal pathology and Secondary ACS occurs in the absence of primary intra-abdominal pathology. Primary ACS is commonly encountered in victims of multiple trauma, especially after damage control surgery and develops as a result of ileus caused by bowel edema and contamination, continued bleeding, coagulopathy, packing, capillary leak and massive fluid resuscitation and transfusion.[3] IAH is also found to occur in ascites, retroperitoneal hemorrhage, pancreatitis, pneumoperitoneum, reduction of chronic hernias, aortic aneurysm repair, complex abdominal procedures and liver transplantation.[4] Increased abdominal pressure has deleterious consequences on blood flow to intra-abdominal organs (intestine, liver, and kidney). Moreover upward displacement of the diaphragm results in increase in respiratory compromise. Also compression of the IVC reduces the venous return to the heart. Unfortunately in spite of the sinister nature of the condition it often goes unrecognized. Clinical examination is inefficient for evaluating intra-abdominal pressure (IAP). The gold standard for measurement of intra-abdominal pressure is by measuring the pressure in the urinary bladder. A routine Foley's catheter connected to a manometer is all that is required. This is easy to perform, cost effective, and does not cause additional harm to the patent. However when performed at four-hour intervals, IAP measurements may take up around 30 minutes of nursing time per day. Hence it is recommended that IAP be monitored at least in surgical patients with known risk factors for early detection. Identifying the risk factors for ACS will help to identify those patients who will most benefit from monitoring of intra vesical pressure. Unless ACS is

detected and treated early, the clinical deterioration of the patient is often attributed to the severity of the primary pathology or the occurrence of irreversible shock.[5] Most of the studies in literature on Abdominal compartment syndrome come from anesthesiology or critical care journals and deal with patients in the intensive care unit in general. Very limited articles are available from the surgeon's perspective. It is important to know the occurrence of raised intraabdominal pressure and its consequences in the surgical patients. Moreover an understanding of the predictive factors of intraabdominal hypertension will help to formulate protocols to incorporate routine intra-abdominal pressure monitoring in the perioperative care of the patients at risk.

2.AIM

- 1. To find the prevalence of intra-abdominal hypertension preoperatively in patients requiring abdominal surgery
- 2. To find the incidence of IAH in the immediate postoperative period in patients undergoing abdominal surgery.
- To determine the incidence of abdominal compartment syndrome in patients having intra-abdominal hypertension.

3.MATERIALS AND METHODS STUDY DESIGN

A prospective analytical study

STUDY SETTING

The surgical unit to which the author belongs at the Department of General Surgery, Govrnent Rajaji Hospital Madurai.

STUDY POPULATION

All patients undergoing intra-abdominal surgery at the surgical unit during the study period.

INCLUSION CRITERION

For inclusion in the study, subjects must fulfill all of the following criteria:

- All patients undergoing intraabdominal surgical procedures during the study period. The procedures include:
- Surgical procedures done through a midline/ paramedian/ subcostal incisions (eg. Appendicectomy through grid iron incisions routine hernia repairs etc. were not included as these conditions showed negligible incidence of IAH/ACS in the pilot study)
- Age more than 12 years.
- · Informed written consent should be obtained from the patient prior

to inclusion in the study.

EXCLUSION CRITERION

Any of the following is regarded as a criterion for exclusion from the study:

- Patients in whom Foley's catheterization is not possible
- Patients with history of chronic liver disease/ ascites
- Patients with history of previous laparotomy
- Pregnant patients
- · Patients who are do not give consent to participate in the study

SAMPLING METHOD

Consecutive sampling. All the patients who satisfy the inclusion criterion and without any exclusion criterion during the study period were included in the study. Since the study includes all the cases encountered during the period in one surgical unit it can be taken as a representative sample of the surgical patient load in general. Sample size calculation: Done using Epi info software .The pilot study showed that perforative peritonitis was the most common indication for laparotomy which was also associated with frequent incidence of IAH.

A cohort study was planned to compare the incidence of IAH in patients undergoing laparotomy for perforative peritonitis(Exposed) compared to elective laparotomy for other conditions(Unexposed).

DATA COLLECTION

The data collected include:

- Demographic data
- BMI
- Indication for surgery
- Pre-operative Intra-Abdominal Pressure measurement
- Open/Laparoscopic
- Type of incision used
- Intra-operative findings
- Procedure done
- Duration of surgery
- Type of anesthesia used
- Post operative elective ventilation
- Day of appearance of bowel sounds
- Day of passing flatus

Post operatively intra abdominal pressure was measured on receiving the patient in the post-op ward and on the third post-op day. Along with each IAP measurement, the blood pressure was also recorded to calculate the Abdominal perfusion pressure. (APP=MAP-IAP).

ASSESSMENT OF NEW ORGAN DYSFUNCTION IN PATIENTS WITH IAP>20mm of Hg (to identify Abdominal Compartment Syndrome)

Cardiovascular system

- 1. Blood pressure < 90 mm Hg systolic
- 2. heart rate > 100/minute or
- 3. Requirement for ionotropic support

Respiratory system

- 1. Respiratory rate > 20/minute or
- 2. SpO 2 < 90% or
- 3. the patient requires ventilatory support

Renal

- 1. Blood urea > 40 mg% or
- 2. serum creatinine > 1.2 mg% or
- 3. Rise in Blood urea/S Creatinine compared to the baseline values
- 4. urine output < 30 ml/hour

TECHNIQUE OF MEASUREMENT OF IAP DONE IN THE STUDY

Most patients would have had foley's catheter inserted for monitoring urine output or prior to surgery. The bladder is confirmed to be fully drained. Under aseptic precautions, the urobag is disconnected from the foley's catheter 25 ml of sterile distilled water is instilled directly into the drainage port of the catheter. This port the foley's catheter is now blocked with the plunger of a sterile 2ml syringe (or the cap of the urobag). After waiting for 30-60 seconds, an 18 G needle with an intravenous infusion catheter connected to it is inserted perpendicularly into the drainage port of the foley's catheter. The foley's catheter is kept at the mid axillary level. The water column can

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be seen to slowly flow into the infusion catheter. The infusion catheter is placed vertically. A tripod stand (which is used to hang iv fluid bottles) by the side of the bed can be useful to orient to the exact vertical from the ground level. The water column is allowed to equilibrate. The mid axillary line is marked by measuring the midpoint of the anterior and posterior axillary folds and extrapolating horizontally to the iliac crest. The vertical height of the water column from this level is taken as the intra-abdominal pressure in centimetres of H2O. A conversion factor of 1.36 is used to convert this into millimetres of Mercury.

4.RESULTS :

FOR EVERY PATIENT INCLUDED IN THE STUDY, INTRA-ABDOMINAL PRESSURE WAS MEASURED THRICE,

- PRE-OPERATIVELY,
- IMMEDIATELY AFTER SURGERY
- ON THE THIRD POST-OPERATIVE DAY.

TABLE NO:1 SUMMARY OF INTRA-OPERATIVE PRESSURE MEASUREMENTS IN THE STUDY

STATISTICAL MEASURES	Pre-operative IAP (mm of Hg)	IAP on receiving in the postop ward (mm of Hg)	IAP on 3 rd postop day (mm of Hg)
Total number	143	143	143
Mean	5.77	6.32	5.36
Median	2.94	5.88	5.15
Std. Deviation	6.10013	4.32475	3.58977
Maximum Value	22.05	19.11	16.17
Minimum Value	-3.68	-1.47	-2.20

GRADE I: IAP 12-15 mmHg, GRADE II: IAP 16-20 mmHg, GRADE III: IAP 21-25 mmHg,

GRADE IV: IAP>25 mmHg

TABLE NO:2 THE PRE-OPERATIVE IAP MEASUREMENTS ACCORDING TO GRADE IN THE STUDY POPULATION

intra-abdominal pressure	Frequency
Normal	116
Grade I	14
Grade II	12
Grade III	1
Grade IV	0

FIGURE NO 1: FREQUENCY OF IAP MEASUREMENTS PREOPERATIVELY IN THE STUDY POPULATION



FIGURE NO 2: FREQUENCY OF IAPMEASUREMEN TSIMMEDIATELYAFTER SURGERY



FIGURE NO 3: FREQUENCY OF IAP MEASUREMENTS POSTOPERATIVELY



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38%. The incidence of IAH in the first three postoperative days in patients undergoing abdominal surgery is 11.8%. No cases satisfying the criterion for abdominal compartment syndrome were identified in the post-operative period.

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5.DISCUSSION & CONCLUSION :

The mean pre-operative IAP value was 5.77 mm of Hg (95% CI 4.77-6.76 mm of Hg). However the IAP value was significantly higher in the paients undergoing emergency laparotomy(11.04mm of Hg; 95% CI 9.99-12.02 mm of Hg).Of the total of 143 patients included in the study, 10% of patients had GradeI IAH, 8% had Grade II IAH, and 1% had grade III IAH. All of these 27 subjects (who had IAH) were patients undergoing emergency laparotomy for acute abdominal conditions. Hence 27 of 70 patients undergoing emergency laparotomy (38%) had elevated intra-abdominal pressure at presentation. One individual (a case of perforative peritonitis) among this had an IAP value more than 20 mm of Hg (Grade III IAH). She had elevated renal parameters, and hypotension at presentation. Her abdominal perfusion pressure was 44.6 mm of Hg (APP= Mean Arterial Pressure- IAP, IAP 22mm of Hg, MAP 66.6 mm of Hg). The high incidence of IAH in patients with acute abdominal conditions has important implications on their management. In these patients, the elevated intra-abdominal pressure may be the cause of renal impairment, respiratory compromise, or hypotension. The best way to treat IAH in these patients is to do an emergency laparotomy where indicated. There was a statistically significant decrease in the mean IAP of individual patients before and after laparotomy in patients with acute abdominal conditions (11.01 vs 8.80mm of Hg, 95% CI of the means1.6 to 2.8 mm of Hg, p value < 0.001).

Sugrue et al studied 100 patients after laparotomy who were admitted to the Intensive Care Unit and reported an incidence of IAH of 33% in these patients. But this study was confined to sicker patients requiring ICU admission. In another study of 311 patients undergoing damage control laparotomy for severe abdominal trauma, the incidence of abdominal compartment syndrome was 5.5 %. In our study, none of the patients had IAP value to fit into the definition of a Abdominal compartment syndrome (IAP >20mm of Hg with a new onset organ failure). But a significant number of patients had Grade I and grade II IAH. As elaborated in the section on pathogenesis, organ derangement has been found to occur at IAP values above 12-15mm of Hg. These patients require medical management of IAH and have to be followed up with serial IAP measurements. In cases progressing to abdominal compartment syndrome, decompressive laparotomy is indicated. The prevalence of intra-abdominal hypertension preoperatively in patients with acute abdominal conditions requiring emergency surgery is

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