



"INTRA-ABDOMINAL HYPERTENSION IN SURGICAL ABDOMINAL EMERGENCIES - INCIDENCE AND RENAL OUTCOMES IN A LOW RESOURCE SETTING: A PROSPECTIVE OBSERVATIONAL STUDY"

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ABSTRACT

Introduction- Perforation peritonitis is a commonly encountered surgical emergency associated with intra-abdominal hypertension (IAH) and contributes to multi-organ dysfunction syndrome. This necessitates the timely management of these patients to reduce intraabdominal pressure (IAP) and hence morbidity. **Aim and objective-:** To determine the incidence and renal outcomes of IAH among patients undergoing emergency laparotomy. **Methodology:** This prospective observational study was done on 66 patients of age group >18 years and of both genders diagnosed with perforation peritonitis. Intra-abdominal pressure was measured by intra-vesical technique and renal functions were evaluated by using Sr Urea and Sr Creatinine levels. SPSS version 25 was used for statistical analysis. **Results:** The incidence of IAH preoperatively is 90.9% and shows significant decreases postoperatively. Patients with IAH have renal dysfunction as measured by Sr Urea (47.36 + 37.4) and Sr creatinine (1.46 + 0.57) levels which improved postoperatively to (27.67 + 13.8) and (0.98 + 0.69) respectively as IAP normalizes. **Conclusion:** It is important to timely recognize the IAH and its early management to avoid renal dysfunction in abdominal surgical emergencies.

KEYWORDS : Intraabdominal hypertension, Abdominal compartment syndrome, Renal dysfunction

INTRODUCTION

Peritonitis is a commonly encountered surgical emergency associated with morbidity and mortality as well, most of which is associated to multi-organ dysfunction syndrome (MODS). The presence of IAH in critically ill patients has been recognized as an independent predictor of mortality [1]. Although the number of published studies in patients with acute surgical illnesses is steadily increasing, there is still a scarcity of literature on IAP in patients with peritonitis, especially in the Indian subcontinent. We have conducted the study to evaluate the role of IAP and correlate it with the severity of peritonitis and renal dysfunction. The World Society of the Abdominal Compartment Syndrome (WSACS) has defined intra-abdominal hypertension (IAH) as a sustained or repeated pathological increase in IAP >12 mm Hg and abdominal compartment syndrome (ACS) as a severe form of IAH with a sustained IAP >20 mm Hg that is associated with the development of new organ dysfunction or failure. [2] There are no specific radiological features to identify abdominal compartment syndrome. CT scans do not directly diagnose intra-abdominal hypertension, but they can help identify the underlying cause, assess the severity of associated conditions, and detect complications. Whatever the cause is, rapid identification and diagnosis of intra-abdominal hypertension can be done using a simple bedside test, the intra-vesical pressure measurement.

MATERIALS AND METHODS

This prospective study was carried out in a tertiary care hospital, over 18 months. Consecutive adult patients (age ≥ 18 years) who came to the emergency department with a diagnosis of perforation peritonitis and suspected abdominal compartment syndrome were included. Patients in septic shock (SOFA score > 3), with open abdominal injuries, seropositive, pregnancy, BMI > 29.9 kg/m², failure of urethral catheterization, and refusal to participate were excluded. Clearance was obtained from the institutional ethical committee for undertaking the study.

Detailed information regarding the patient's demographics (age, gender, and body mass index), and clinical and biochemical evidence of organ failure was noted. The operative details, postoperative diagnosis, and postoperative IAP measurements were recorded.

Measurement of Intra-abdominal Pressure

Measurement of IAP was done using intra-vesicular pressure measurement. Each patient was catheterized with a two-way Foley catheter to empty the urinary bladder [2]. Then, bladder was filled with 50 ml of sterile saline and the catheter tubing was clamped. Intra-vesicular pressure was measured after one minute with a saline manometer at full expiration phase in a supine position. Mid-axillary level was taken as zero reference level. A conversion factor of 1.36 was used to convert the measured pressure in centimeters into mm Hg. Intra-abdominal pressure was measured soon after admission, after completion of the operation (0 hours), and subsequently at 6 hours, 12 hours, 24 hours, and 48 hours in the postoperative period.

Grades of IAH according to the level of IAP [2]

- Grade I: 12 – 15mmHg
- Grade II: 16 – 20mmHg
- Grade III: 21 - 25mmHg
- Grade IV: >25mmHg

Renal dysfunction criteria [3]

1. Blood urea > 40 mg% or
2. Serum creatinine > 1.2 mg%

RESULTS

Table 1: Demographic data of study population (N = 66)

		(N)
Age	Mean	42
Gender	Male	46
	Female	20
BMI	Underweight	0
	Normal	49
	Overweight	14
	Class I	3
	Class II	0

Among the 66 patients, 69.69% were male and 30% were female.

Table 2: Incidence of Normal IAP & IAH at Preop, 0-hour, 6 hours, 12 hours, 24 hours and 48 hours after surgery

Time		Frequency	Proportion	p-value
PREOP	No IAH	6	9.09%	

	IAH	60	90.91%	<0.001
IAP at 0 hours	No IAH	47	71.21%	
	IAH	19	28.79%	0.0005
IAP at 6 hours	No IAH	55	83.33%	
	IAH	11	16.67%	<0.0001
IAP at 12 hours	No IAH	58	87.80%	
	IAH	8	12.20%	<0.001
IAP at 24 hours	No IAH	62	93.94%	
	IAH	4	6.06%	<0.0001
IAP at 48 hours	No IAH	62	93.94%	
	IAH	4	6.06%	<0.0001

The incidence of IAH preoperatively is 90.9% and at 0 hours i.e., immediate postoperatively is 28.79%, at 6 hours and 12 hours it is 16.67% and 12.2% respectively also, at both 24 hours and 48 hours it is 6.06%. i.e., IAH decreased postoperatively

Table 3: Serum Urea levels in patients with normal and increased abdominal pressure

Sr. Urea	Group	N	Mean	SD	P value
PREOP	NORMAL IAP	6	26.33	13.53	0.01
	IAH	60	47.36	37.45	
POSTOP	NORMAL IAP	49	27.67	13.8	0.001
	IAH	11	45.36	14	
	PREOP IAH	60	47.36	37.45	
	POSTOP IAP	49	27.67	13.8	0.0003

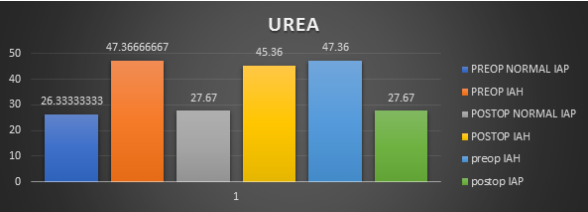


Figure 1: Graphical representation - Serum Urea levels in patients with normal and increased abdominal pressure

Table 4: Serum Creatinine levels in patients with normal and increased abdominal pressure

Sr Creatinine	Group	N	Mean	SD	P value
Preop	Normal IAP	6	1.06	0.28	0.015
	IAH	60	1.46	0.57	
Postop	Normal IAP	49	0.98	0.69	0.034
	IAH	11	1.39	0.48	
	Preop IAH	60	1.46	0.57	
	Postop IAP	49	0.98	0.69	0.0008

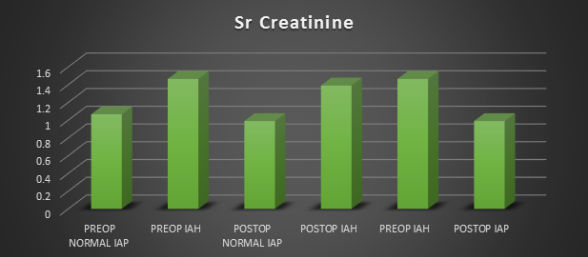


Figure 2: Graphical representation -Serum Creatinine levels in patients with normal and increased abdominal pressure

Based on the observations (Table 3 and 4), it can be concluded that patients with IAH exhibit significant renal dysfunction (Sr Urea and Sr Creatinine level) compared to those with normal IAP. In my study, serum urea and serum creatinine levels significantly improved in patients following surgery where IAP was normalized. Mortality rate of 21.21% was observed in my study group.

DISCUSSION

The present study is an attempt to explore the incidence and importance of IAH and ACS in the morbidity of surgical

patients. Most of the studies on IAH and ACS analyze either ICU or trauma patients. Very little has been documented on ACS in the general surgical population. Our study population includes patients who underwent laparotomy for various indications including traumatic and nontraumatic causes. The incidence of IAH in our study was 90.91% at admission and it is respectively 28.79%, 16.67% at 0 and 6 hours postoperatively. It is the same at 24 and 48 hours postoperatively i.e.,6%. Serum urea and serum creatinine was significantly raised in the IAH group when compared to the normal IAP group measured at admission i.e., preoperatively and at 6 hours postoperatively, thus indicating renal dysfunction in cases of IAH. In my study during the postoperative period (at 6 hours) incidence of renal dysfunction (deranged serum urea level) is 16% and 55% in patients with normal IAP and IAH respectively which shows incidence of renal dysfunction is significantly high in patients with IAH (p value=0.03), these results are similar to the study done by Shehtaj Khan. Shehtaj Khan series had a high incidence of renal dysfunction up to 49%, Sugrue et al. reported renal impairment in 69% of patients with IAH [3,4].

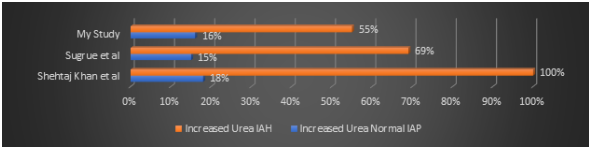


Figure 3: Graphical representation showing a comparison of the incidence of renal dysfunction (Increased Urea) in the Postop period (Normal IAP vs IAH)

In my study during the postoperative period (at 6 hours) incidence of renal dysfunction (deranged serum creatinine level) is 20% and 73% in patients with normal IAP and IAH respectively which shows the incidence of renal dysfunction is significantly higher in patients with IAH (p value=0.0011<0.05), these are similar to the study by Shehtaj Khan and Sugrue et al [3,4]. Unlike these studies, we have calculated the incidence of renal dysfunction measured by deranged urea and serum creatinine levels separately. Serum creatinine level (mean + SD) in preoperative IAH patients is 1.46 + 0.57 and 1.04 + 0.82 before and after surgery respectively, which is found statistically significant using paired t-test. (p value = 0.00011 < 0.05). This finding is similar to studies done by Shehtaj Khan et al and Sugrue et al [3,4].

Table 7: Comparison of Preop and Postop Creatinine values in Preop IAH patients

	Preop IAH patients		
	Preop (Mean± SD)	Postop (Mean± SD)	P- value
Shehtaj Khan et al	1.5 ± 0.8	1.3±0.6	<0.001
Sugrue et al	1.5±0.86	1.28±0.7	<0.05
My Study	1.46 ± 0.57	1.04 ± 0.82	0.001

Preoperatively total of 60 patients have IAH with mean serum creatinine level 1.46 + 0.57 from which 49 patients have normal IAP postoperatively with serum creatinine level 0.98 + 0.69 which is significantly improved (p-value = 0.0008 <0.05). An increase in intra-abdominal pressure is believed to affect renal function, especially renal filtration. The commonly performed glomerular function tests are blood urea and creatinine. A much more sensitive test is creatinine clearance but this test cannot be done properly in patients undergoing emergency surgery. My study and other studies show a significant increase in blood urea and creatinine levels.

Compression of the renal vein and parenchyma and reduced renal perfusion, lead to reduced microcirculation to the functioning glomeruli and cortex. This results in tubular and glomerular dysfunction and substantially reduced urine output since FG = MAP – 2 x IAP Thus the IAH induced renal

dysfunction and prerenal azotemia will neither be responsive to fluid resuscitation nor vasopressors. It improves dramatically by appropriately and promptly reducing the elevated IAP.[5] Conclusion: Increased intra-abdominal pressure has deleterious effects on various organs.

ACS is a treatable condition when it is timely diagnosed and appropriately managed. Awareness and recognition of this entity will go a long way in reducing the mortality of many critically ill patients. Hence our study emphasizes the use of this straightforward bedside test as it can be the determining factor between likely death and survival.

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