

Original Research Article

Correlation of intra-abdominal pressure with the outcome of perforation peritonitis

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ABSTRACT

Background: A progressive increase in intra-abdominal pressure (IAP) may cause abdominal compartment syndrome (ACS) with organ dysfunction. Studies have documented the impact of Intra-abdominal hypertension (IAH) on virtually every organ. However, it remains strangely underdiagnosed. Present study was aimed to correlate Intra-abdominal pressure with the outcome in perforation peritonitis patients.

Methods: This study was done on 50 patients with perforation peritonitis and patients undergoing intervention in the form of either emergency laparotomy or drain placement. The abdominal pressures were indirectly determined by measuring urinary bladder pressure with a Foley's catheter. Pearson correlation was used to see relation between intra-abdominal pressure and outcome of peritonitis.

Results: Mean intra-abdominal pressure during time of presentation to the hospital was 26.7 ± 3.2 cm H₂O. Among various morbidities following operation, surgical site infection was most common (38%) followed by wound dehiscence (24%). There was weak linear correlation between intra-abdominal pressure and factors determining morbidity such as surgical site infection, wound dehiscence, burst abdomen, prolonged ileus, ARDS and ARF. However, this was not statistically significant.

Conclusions: There is weak correlation of various co morbidities with increased intra-abdominal pressure in patients with perforation peritonitis which was not significant statistically.

Keywords: IAH, IAP, Intravesical pressure perforation peritonitis

INTRODUCTION

One of the commonest surgical emergencies attended by a general surgeon is peritonitis due to perforation of hollow viscous organ. It requires urgent surgical management and is associated with high rate of mortality and morbidity.

Intra-abdominal pressure (IAP) is the pressure concealed within the abdominal cavity.¹ Intra-abdominal pressure increases because of reasons such as peritonitis, ileus, a diffuse ascites, intra-abdominal hemorrhage, application of military anti-shock trousers, large intra-abdominal tumors, laparoscopic surgery, peritoneal dialysis,

abdominal or pelvic trauma.^{2,3} Intraabdominal pressure can be determined by measuring bladder pressure.³ Bladder pressure measurement is a method used in diagnosis and monitoring of abdominal compartment syndrome.² Abdominal compartment syndrome represents the pathophysiologic consequence of a raised intra-abdominal pressure, various systems are involved in this syndrome. The increased intra-abdominal pressure is transmitted to the pleural space and the lung compliance decreases. Further the combined increase in abdominal pressure and pleural pressure leads to a decrease in venous return, direct compression of the heart, and increased afterload (especially in the right ventricle). Perfusion to the intra-abdominal organs can be critically

reduced by the combined effects of the decreased cardiac output, increased interstitial pressure, and increased outflow pressure. This can lead to oliguria and renal failure. Finally, intracranial pressure may also be increased due to the decrease in cerebral venous return and increased venous pressure.⁴ Increased recognition of its prevalence among the critically ill, combined with advances in both the diagnosis and management of intra-abdominal hypertension (IAH) and abdominal compartment syndrome (ACS), have resulted in significant improvements in patient survival.^{5,6}

Table 1: Grading of intra-abdominal pressure (IAP) as determined by intravesical pressure.⁷

Grade	IAP (bladder pressure) in mmHg (in cm H ₂ O)
I	7.3-11 (10-15)
II	11.718.3 (16-25)
III	19.1-25.7 (26-35)
IV	>25.7 (>35)

Normal IAP is approximately 5-7 mmHg in the critically ill, but varies by disease severity with an IAP of 20-30 mmHg being common in patients with severe sepsis or an acute abdomen.¹

The accuracy and reproducibility of IAP measurements are of paramount importance in the management of IAH/ACS. While direct intraperitoneal catheter determinations are ideal, a variety of less invasive techniques for determining IAP have been devised including measurement of intravesicular (bladder), intragastric, intracolonic, and intrauterine pressure.^{8,9} Current methodology for intra-abdominal pressure assessment relies on the measurement of bladder pressure. Indeed, there is a good agreement between bladder pressure and intra-abdominal pressure.⁶

Present study was aimed to correlate Intra- abdominal pressure with the outcome in perforation peritonitis patients.

METHODS

The present study was conducted in a private tertiary hospital over a period of 7 months. It was an observational study done on 50 patients. Subjects aged 18 years and above with perforation peritonitis and patients undergoing intervention in the form of either emergency laparotomy or drain placement were included in the study

Pregnant patients, patients in whom catheterization was not possible, history of previous surgery and patients leaving against medical advice were excluded from the study. Structured Study instruments (subject proforma) was developed, and used to generate data.

The abdominal pressures were indirectly determined by measuring urinary bladder pressure with a Foley's

catheter. Patients were catheterized with a 16-gauge Foley's catheter. The bladder was drained completely and then filled with 100 ml of sterile saline through the Foley's catheter. The tubing of the collecting bag will be clamped. Then the catheter will be connected to a saline manometer. The symphysis pubis with the zero reference the pressure will be measured in centimeters of water at end-expiration. A conversion factor of 1.36 will be used to convert the pressure in centimeters of water into millimeter of Hg.

Data analysis

Data was analyzed using SPSS version 16. Descriptive statistics was used to summarize the variable. Pearson correlation was used to see relation between intra-abdominal pressure and outcome of peritonitis. P value less than 0.05 was considered statistically significant.

RESULTS

The mean age of the participants in present study was 45.7±1.6 years. Males were more affected (78%) than females (22%).mean duration of abdominal pain presentation was 4.7±4.6 days. Mean intra-abdominal pressure during time of presentation to the hospital was 26.7±3.2cm H₂O. Table 2 shows the blood parameters of the participants at the time of presentation to the emergency.

Table 2: Blood parameters.

Variables	Mean ± SD
Albumin	1.9± 0.5
Serum creatinine	1.8±0.9
Haemoglobin	10.2±4.1

Table 3: Associated signs and symptoms at the time of presentation (preoperatively).

Signs and symptoms	Yes (%)	No (%)
Fever	22	78
Vomiting	42	58
Constipation	20	80
Abdominal distension	44	56
Guarding and rigidity	78	22

Most of the patients presented with vomiting (42%). Abdominal distension (44%) and with abdominal guarding and rigidity which are consistent with the features of peritonitis. Post operatively mean duration of stay was 7.5±3.8 days among various morbidities following operation, surgical site infection was most common (38%) followed by wound dehiscence (24%) as seen in Table 4.

There was weak linear correlation between intra-abdominal pressure and various outcome measures. However, this was not statistically significant. Table 5

shows the r value of various parameters with intra-abdominal pressure.

Table 4: Post-operative morbidities among the patients.

Post-operative morbidities	Yes (percentage)	No (percentage)
Surgical site infection (SSI)	38	62
Wound dehiscence	24	76
Burst abdomen	16	84
Prolonged ileus	8	92
ARDS	16	84
ARF	4	96

Table 5: Correlation value of intra-abdominal pressure with post-op morbidities.

variables	R value	P value
SSI	0.1	0.2
Wound Dehiscence	0.04	0.7
Burst abdomen	-0.1	0.4
Prolonged ileus	0.04	0.7
ARDS	-0.06	0.6
ARF	-0.07	0.5

DISCUSSION

This study was done on 50 patients with peritonitis. The mean age of the participants was 45.7 years which was like study conducted by Huysen et al Males were most affected than females which were consistent with earlier studies.^{10,11} Most common site of perforation was prepyloric and duodenum while the least common was gall bladder. In our study IAP was measured using intravesical pressure using a standard transurethral bladder catheter which provided an accurate determination of IAP.⁷

In present study, clinically the incidence of burst abdomen was more with intra-abdominal pressure greater than 25 cm of H₂O however statistically it was not significant. IAP is the pressure concealed within the abdominal cavity. The presence of IAH is associated with an 11-fold increase in mortality compared with patients without IAH.¹² In this subgroup of patients, associated renal dysfunction was seen in patients and elevated IAP was found to have significant detrimental effect on blood urea, serum creatinine.¹³

Al-Bahrani et al, Intra-abdominal pressure correlates with the severity of organ failure and a high admission IAP is associated with prolonged intensive care stay. When we correlated the IAP with others morbidity related factors such as surgical site infection, ARDS, ARF it was not statistically significant. This is in contrast to Previous studies showing that IAH increases the risk of lung edema, decreases total respiratory system compliance,

and leads to pulmonary hypertension via increased intrathoracic pressure.¹³ It has been shown that IAH is transmitted to a large extent (25% to 80%) to the thoracic cavity, increasing peak inspiratory airway pressures, reducing functional residual capacity, and further exacerbating the increasing oxygen debt often observed in IAH.¹⁴ Cheatham et al had found that elevated IAP alone does not have sufficient sensitivity or specificity to be useful as a predictor of mortality In a retrospective study of patients with secondary ACS, overall mortality was 60% with 43% mortality for those decompressed.^{15,16}

CONCLUSION

There is increased risk of burst abdomen during increased intra-abdominal pressure as measured by change in intravesical pressure. Although there was incidence of surgical site infection ARDS and acute renal failure in patients with perforation peritonitis following increased intra-abdominal pressure, there is weak correlation of these co morbidities which was not significant statistically.

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Ethical approval: The study was approved by the institutional ethics committee

REFERENCES

1. Malbrain MLNG, Cheatham ML, Kirkpatrick A, Sugrue M, Parr M, De Waele J, et al. Results from the conference of experts on intra-abdominal hypertension and abdominal compartment syndrome. Part I: Definitions. Intensive Care Med. 2006;32:1722-32.
2. Tons C, Schachtrupp A, Rau M, Mumme T, Schumpelick V. Abdominal compartment syndrome: Prevention and treatment. Chirurg. 2000;71:918-26.
3. Iberti TJ, Kelly KM, Gentili DR, Hirsch S, Benjamin E. A simple technique to accurately determine intra-abdominal pressure. Crit Care Med. 1987;15:1140-2.
4. Pupelis G. Clinical significance of increased intraabdominal pressure in severe acute pancreatitis. Acta Chir Belg. 2002;102(2):71-4.
5. Cheatham ML, Safcsak K. Is the evolving management of IAH/ACS improving survival? Acta Clinica Belgica. 2007;62(Supplement 1);268.
6. Kimball EJ, Kim W, Cheatham ML, Malbrain MLNG. Clinical awareness of intra-abdominal hypertension and abdominal compartment syndrome in 2007. ActaClinicaBelgica. 2007;62(Supplement 1);66-73.
7. Burch JM, Moore EE, Moore FA, Francoise R. the abdominal compartment syndrome. SurgClin North Am. 1996;76:833-42.
8. Malbrain MLNG, Jones F. Intra-abdominal pressure measurement techniques. RR, Cheatham ML,

- Malbrain MLNG, Sugrue M, editors. *Abdominal Compartment Syndrome*. Landes Biomedical, Georgetown. 2006.
9. De Waele JJ, De laet I, Malbrain MLNG. Rational intraabdominal pressure monitoring: How I do it? *Acta Clinica Belgica*. 2007;62(Supplement 1):16-25.
 10. Pülat H, Karaköse O, Zihni İ, Özçelik KÇ, Eken H, Çalta AF, et al. Effect of intraabdominal pressure values and Mannheim Peritonitis Index to prognosis of patients with acute abdomen. *Int J Clin Exp Med*. 2016;9(6):12032-8.
 11. Jampani SR, Vattikonda S, Jampani S, Vasireddi V. Intra-abdominal pressure monitoring and outcome in patients with peritonitis. 2016;3(4).
 12. Khan S, Verma AK, Ahmad SM, Ahmad R. Analyzing intra-abdominal pressures and outcomes in patients undergoing emergency laparotomy. *J emergencies, trauma, and shock*. 2010;3(4):318.
 13. Quintel M, Pelosi P, Caironi P, Meinhardt JP, Luecke T, Herrmann P, et al. An increase of abdominal pressure increases pulmonary edema in oleic acid-induced lung injury. *Am J Respir Crit Care Med*. 2004;169(4):534-41.
 14. Malbrain ML, Chiumello D, Pelosi P, Bihari D, Innes R, Ranieri VM, et al. Incidence and prognosis of intraabdominal hypertension in a mixed population of critically ill patients: a multiple-center epidemiological study. *Crit Care Med*. 2005;33(2):315-22.
 15. Cheatham ML, White MW, Sagraves SG, Johnson JL, Block EF. Abdominal perfusion pressure: a superior parameter in the assessment of intra-abdominal hypertension. *J Trauma*. 2000;49:621-7.
 16. Britt RC, Gannon T, Collins JN, Cole FJ, Weireter LJ, Britt LD. Secondary abdominal compartment syndrome: risk factors and outcomes. *Am Surg*. 2005;71:982-5.

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