

The Severity Rate of Pre-Operative Acidosis Affecting Mortality in Patients with Abdominal Trauma Who Underwent Exploratory Laparotomy Ath. Adam Malik General Hospital Medan

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Abstract : Introduction Abdominal Trauma is in the third place among the traumatic incident and around 25% of the cases requires surgical procedure. The mortality in trauma patients known as lethal triad of death including hypothermia, coagulopathy, and metabolic acidosis. In trauma, metabolic acidosis occurs due to metabolism change, from aerobic metabolism to anaerobic metabolism resulting lactic acid accumulation. The aim of this study is to find out the correlation between severity of pre-operative acidosis and mortality rate in abdominal trauma patients who underwent exploratory laparotomy performed at RSUP H. Adam Malik Medan.

Methods The design of this study is a retrospective descriptive analytic study. The samples were 64 cases from the medical records of patients diagnosed with abdominal injury and underwent exploratory laparotomy at the digestive surgery division of RSUP H Adam Malik Medan during the period January 2011 to December 2013. The data was analyzed using Chi Square test.

Results From the 64 cases of abdominal trauma that underwent exploratory laparotomy, the mortality rate is 25 cases (39,1%). The exploratory laparotomy was performed in 61 cases (95,3%) and 3 cases (4,7%) with damage control surgery. The severity of acidosis showed mild acidosis in 55 cases (85,9%) and severe acidosis in 9 cases (14,1%). The results of Chi Square show a correlation between severity of preoperative acidosis and mortality in patients with abdominal trauma performed exploratory laparotomy ($p = 0,001$).

Conclusion The study shows significant relationship between the severity of pre-operative acidosis with mortality in patients with abdominal trauma who performed exploratory laparotomy in RSUP H. Adam Malik Medan.

Keywords : trauma; abdomen; acidosis; laparotomy.

Introduction

Abdominal Trauma is in the third place among the traumatic incident and around 25% of the cases requires surgical procedure.¹ Abdominal Trauma is classified into blunt trauma and penetrated trauma. Abdominal penetrated trauma usually can be diagnosed easily and reliably, whereas abdominal blunt trauma is often missed due to unclear clinical signs.² The mortality in trauma patients known as lethal triad of death including hypothermia, coagulopathy, and metabolic acidosis.³ Acidosis is a condition where there is an increase of acid in the blood caused by various conditions and diseases in which the body cannot remove the acid in

regulating the acid base balance. Acidosis is measured through blood gas analysis, that is pH. Acidosis based on it's severity is divided to: mild acidosis if pH is 7.20-7.35 and severe acidosis if pH < 7.2. In trauma, metabolic acidosis occurs due to metabolism change, from aerobic metabolism to anaerobic metabolism resulting lactic acid accumulation.⁴The aim of this study is to find out the correlation between severity of pre-operative acidosis and mortality rate in abdominal trauma patients who underwent exploratory laparotomy performed at RSUP H. Adam Malik Medan.

Methods

The design of this study is a retrospective descriptive analytic study. The samples were 64 cases from the medical records of patients diagnosed with abdominal injury and underwent exploratory laparotomy at the digestive surgery division of RSUP H Adam Malik Medan during the period January 2011 to December 2013. Mortality is the death of patients, assessed during and post-exploratory laparotomy. Abdominal trauma is a involving the area between the upper diaphragm and lower pelvis, either caused by blunt or penetrating trauma. Exploratory laparotomy is a laparotomy performed with the objective to obtain information not available through clinical diagnostic methods. Acidosis was measured through blood gas analysis which is pH. The samples were taken by arterial vessels, when the patient came to the emergency room before resuscitation, and were divided based on their severity: mild acidosis if pH was 7.20-7.35 and severe acidosis if pH < 7.2. The exclusion criterions of this study were patients with blood clotting disorders, previous chronic kidney abnormalities, diabetes mellitus, and chronic obstructive pulmonary disease. The Bivariate data analysis was performed to secondary data using statistical calculation (Chi Square test).

Results

Characteristic description of Abdominal Trauma

From 64 cases of abdominal trauma collected by medical record data, we found abdominal trauma occurred in 42 men (65.63%) and 22 women (34.37%). The mortality of abdominal trauma were 25 cases (39.1%) and 39 cases (60.9%) the patients survived. In the type of abdominal trauma, we found blunt abdominal trauma in 54 cases (84.4%) and penetrating abdominal trauma in 10 cases (15.6%). The severity of acidosis through interpretation of blood gas analysis showed the condition of mild acidosis in 55 cases (85.9%) and severe acidosis in 9 cases (14.1%). This may be seen in Table 1.

Table 1. Characteristic Description

Characteristic	Frequency	
	N	%
Gender		
Male	42	65.63
Female	22	34.37
Mortality		
Dead	25	39.1
Alive	39	60.9
Type of trauma		
<i>Blunt abdominal njury</i>	54	84.4
<i>Penetrating abdominal injury</i>	10	15.6
Severity of acidosis		
Mild Acidosis	55	85.9
Severe Acidosis	9	14.1

The Relationship between the Type of Trauma and Mortality

From 64 cases of abdominal trauma, we found the mortality rate in blunt trauma as much as 21 cases (32.8%) and in penetrating trauma as much as 4 cases (6.25%). From the result of *Chi Square* test there was no relationship between the type of trauma and the incidence of mortality ($p > 0.05$). This may be seen in Table 2.

Table 2. The Relationship between the Type of Trauma and Mortality

Type of trauma	Mortality		Total	
	Positive	Negative		
	N	N		
Blunt Trauma	21	33	54	
Penetrating Trauma	4	6	10	
Total	25	39	64	
$X^2 = 0.004$		df= 1	p= 0.947	RR= 0.97

The Severity of Acidosis Affecting Mortality

From 64 cases of abdominal trauma collected by medical record data, most of the patients had mild acidosis and whom survived were in 38 cases (59 %) and the patients who had severe acidosis and whom survived were in 1 case (2 %). From the result of *Chi Square* test, there was a relationship between the severity of acidosis and the incidence of mortality ($p < 0.05$). This may be seen in Table 3.

Table 3. The Severity of Acidosis Affecting Mortality

The Severity of Acidosis	Mortality		Total	
	Positive	Negative		
	N	N		
Mild Acidosis	17	38	55	
Severe Acidosis	8	1	9	
Total	25	39	64	
$X^2 = 10.923$		df= 1	p= 0.002	RR = 0.34

Discussion

In this study, we found the mortality rate of abdominal trauma in 25 cases (39.1%). In the study by Gad *et al* performed from December 2005 to January 2011 found that the mortality rate in abdominal trauma in 64 cases (25%).⁵ Also in the study by Hemmati found the mortality rate in abdominal trauma in 86 cases (40%). In the study by Howes (2012) showed the mortality rate in abdominal trauma as much as 18 cases (26%), with the cause of death from abdominal trauma included massive bleeding, renal failure, multiple organ failure due to sepsis. In the study by Frischknecht *et al* (2011) showed 74 patients (23.2%) died: Fifty two patients (16.3%) died in the first 72 hours after admission (early death), with seven deaths occurred during the early DC procedure. The cause of early death included hemorrhagic shock ($n = 18$), head injury ($n = 28$), and multiple organ failure ($n = 6$). Besides that, 267 patients (83.7%) survived in the first 72 hours. In the study by Ustundag (2010), the mortality rate was 7.8%. More than half of the cases were in the age range of 0 to 16 years old. This result was similar to the one reported by Wladis *et al* and Hsiao *et al*, both of them showed that age was a predictor of mortality in patients with trauma.

Abdominal trauma consists of blunt and penetrating trauma. In this study, the incidence rate of trauma based on the type were more blunt abdominal trauma, which were in 54 cases (84.4%). This is consistent with the study by Gad *et al*, from 248 cases of abdominal trauma, 172 cases (82,7%) suffered blunt abdominal trauma.⁵ Similar to Jansen (2008), blunt trauma was found to be the most common cause of abdominal injury in 65.2%. The incidence rate of this abdominal trauma was higher due to the clinical signs of abdominal trauma or not too clear so, that mistakes often happen.² Blunt trauma have been reported to dominate in the villages, however in our study there was no such demography pattern.

The relationship between the severity of acidosis and mortality rate showed a significant result ($p=0.001$) by using statistical test of *Chi Square*. In the study by Timmermans (2010) showed the similar matter that the pH value with the acidosis interpretation had a relationship with the incidence of mortality in abdominal trauma.⁶Aoki *et al* performed a retrospective to identify the risk factors associated to death in 68 patients who underwent *Damage Control Surgery*. They found that the overall mortality rate of 66% and concluded that the disability to improve pH and PTT in the end of early *Damage Control* can cause death.

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