



# Penetrating abdominal trauma: Difference in hematic biometry pre and post-surgical at the Hospital General de Ciudad Juarez in Chihuahua, Mexico

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## Abstract

### Introduction

Hematic biometry is the most used laboratory exam in the emergency room in every general or trauma hospital.

### Objective

To analyze and compare the levels of hemoglobin, hematocrit, platelets, leukocytes, and neutrophilia in both pre-surgical and post-surgical levels in penetrating abdominal trauma patients.

### Material and Methods

This is a descriptive and prospective study in patients with penetrating abdominal trauma that underwent exploratory laparotomy. The variables analyzed were: age, gender, type of trauma, pre-surgical and post-surgical count of hemoglobin; hematocrit; platelets; leucocytes; neutrophilia; perioperative bleeding, mortality, and hospital stay.

### Results

Of 508 patients studied, only 93 patients were included. The mean of age was 29.6 years old. 87 patients were males. 32 patients (34.4%) were SW injured whereas 61 (65.6%) were GW injured. According to the type of trauma: 78 patients (83.9%) underwent therapeutic laparotomy, 11 patients (11.8%) underwent non-therapeutic laparotomy, and 4 patients (4.3%) underwent damage control surgery. There were differences between pre-surgical and post-surgical levels, with major levels in pre-surgical means.

### Discussion

Presented values, represent the beginning of a major and multi-institutional study to show real and reliable values that we can expect in a patient with penetrating abdominal trauma during pre-surgical and post-surgical time. We cannot conclude that these data are conclusive; however these data can guide on the levels that we can expect in a multi-institutional study with a major number of patients.

**Keywords:** *Abdominal injury, blood platelets, hemoglobin, leucocyte count, penetrating, wounds.*

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## Introduction

Although violence index has diminished, penetrating abdominal trauma (PAT) continues to be a Public Health Problem in Ciudad Juárez, Mexico.<sup>1</sup> This city has a murder rate of 148 per 100,000 people<sup>2</sup>, and the Hospital General de Ciudad Juárez (HG CJ) remains the main Medical Center of reference of patients with this pathology.

In this Medical Center, all traumatized patients are examined initially in the emergency room (ER), and classified according to their severity. Analysis of each patient is based on observation and physical examination by an emergency specialist and a trauma surgeon. Radiographies and blood samples are taken into the first minutes in hospital setting. However, some patients according to the findings in the physical exploration and the presence of hemodynamic instability need to undergo exploratory laparotomy immediately and receive adequate treatment even without standard laboratory results.

Analysis of standard laboratory tests in PAT is a very used tool. However, this tool has not been measured, compared or researched, because the lines of research in the majority of medical centers are based on new forms of diagnostic. Without any doubt, hematic biometry is the most used laboratory exam in the emergency room in every general or trauma hospital.<sup>3,4</sup> The purpose of this study is to assess pre and post-surgical levels of leucocytes, neutrophilia, hemoglobin, hematocrit, and platelets in patients with PAT that underwent exploratory laparotomy.

## Material and Methods

This was a prospective and descriptive study conducted at the Hospital General de Ciudad Juárez, a second health care level, from April 1st 2008 to December 1st, 2010. The local institutional review board of the Universidad Autónoma de Ciudad Juárez (UACJ) approved this study.

The inclusion criteria were patients age  $\geq 15$  years, with primary admission for stab wound (SW) injury and gunshot wound (GW) injury who undergo for exploratory laparotomy. Patients were excluded from our study if they had not a complete file (lack of pre-surgical and/or post-surgical hematic biometry) and those who received a transfusion with any compound of blood pre-surgery, trans-surgery and post-surgery. The variables analyzed were: age, gender, type of injury, pre-surgical and post-surgical levels of hemoglobin, neutrophilia, platelets and leucocytes, perioperative bleeding, mortality and hospital stay. Complete blood count, including hemoglobin level, hematocrit, leucocytes count, neutrophilia, and platelet count were routinely studied in all patients, at ER arrival and post-surgical intervention. All parameters were measured at the same hematology laboratory. Exploratory laparotomy was divided into 4 categories: 1) therapeutic laparotomy, 2) non-therapeutic laparotomy, 3) negative laparotomy<sup>5,9</sup> and 4) damage control surgery.<sup>6-10</sup>

Demographic and clinical data are presented as mean and standard deviation (SD) or median with inter quartile range (IQR) for continuous variables according to the underlying distribution and as percentages for categorical variables. We

compared pre-surgical and post-surgical measures.

## Results

Of 508 patients studied, only 93 patients were included. The mean of age was 29.6 (SD 10.4) years old; age range from 15 to 68 years. 87 patients (93.5%) were males and 6 patients (6.5%) were females (ratio M:F, 14.5:1). 32 patients (34.4%) were SW injured whereas 61 (65.6%) were GW injured. According to the type of trauma: 78 patients (83.9%) underwent therapeutic laparotomy, 11 patients (11.8%) underwent non-therapeutic laparotomy, and 4 patients (4.3%) underwent damage control surgery.

The mean of pre-surgical leukocytosis was 15,130/mm<sup>3</sup> (SD 4,475); mean of neutrophilia was 72.4%; mean of hemoglobin was 13.8 g/dL, mean of hematocrit was 41.2% and mean of platelets was 285,500/mm<sup>3</sup>. The mean of post-surgical leukocytosis was 11,700/mm<sup>3</sup>, mean of neutrophilia was 74.2%, mean hemoglobin was 11.1 g/dL, mean of hematocrit was 32.8%, and the mean of platelets was 204,800/mm<sup>3</sup> (see Table 1).

The mean of perioperative bleeding was 720 mL (Ranging from 50 to 2500 ml). There were a total of 7 deaths; 5 by sepsis, and 2 by cardiac arrest. The mean of hospital stay was 6.5 days ( $\pm 4.7$ ); the mean of hospital stay for patients that were discharged for health improvement was 5.9 days, while the mean of hospital stay for dead patients was 9 days.

## Discussion

Patients included in this study, had an age mean of 29.6 ( $\pm 10.4$ ) years (economic active population), this situation has been observed in others similar studies, and having a similar male:female (14.5:1) ratio.<sup>7-10</sup> However, the major incidence of patient with penetrating trauma in our Hospital and in our city (considered the most dangerous city in the world from 2008 to 2011), is the result of the social and economic problems this part of the country is having.

We have a major incidence of GW vs SW injuries (58.8% vs. 41.2% respectively), results that are different to other reports of different regions of the country and the rest of Latin America.<sup>6-10</sup> Nevertheless, the lack of reports in hospitals in other states of the Mexican republic could not show a real statistics of penetrating trauma.

**Table 1.** Pre-surgical and post-surgical values in patients with penetrating abdominal trauma

Variable	Pre-surgery	Post-surgery	Difference
Leucocytes (/mm <sup>3</sup> )	15,130	11,700	3,430
Neutrophilia (%)	72.4	74.2	1.8
Hemoglobin (g/dL)	13.8	11.1	2.7
Hematocrit (%)	41.2	32.8	8.4
Platelets (/mm <sup>3</sup> )	285,500	204,800	80,700

Source: Surgery Service, General Hospital of Ciudad Juárez

The levels between laboratory parameters measured in these patients were major in the pre-surgical determination. We observed a decreased level of leukocytes ( $3,430/\text{mm}^3$ ): an augmentation in the level of neutrophilia (1.8%): a decreased level of hemoglobin (2.7 g/dL): a decreased level of hematocrit (8.4%): and finally, a decreased levels of platelets ( $80,700/\text{mm}^3$ ) in the post-surgical determination. We describe that laboratory values measured tended to lower, except neutrophilia. However, these values had not been previously measured, and with this work, we hope to cooperate to establish a standard values in both, pre and post-surgical states. Today, groups discuss if levels of hemoglobin obtained shortly after injury may or not detect occult bleeding

in trauma patients because of the time needed for plasma levels to equilibrate, or may be confounded by crystalloid-related hemodilution.

## Conclusions

Presented values, represent the beginning of a major and multi-institutional study to show real and reliable values that we can expect in a patient with penetrating abdominal trauma during pre-surgical and post-surgical time. We cannot conclude that these data are conclusive; however these data can guide on the levels that we can expect in a multi-institutional study with a major number of patients.

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