Original Article

Prediction of the need for laparotomy considering clinical and laboratory findings in abdominal blunt trauma patients referred to Rajaei hospital in year 2017 and 2018

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Abstract

Background and aim: Trauma is the most common cause of death in persons aged 1-44 years and the third most common cause of death regardless of age. Abdominal trauma is one of the most prevalent cases of trauma. Laparatomy is a therapeutic method which is applied for abdominal trauma. The aim of this study was prediction of the need for laparotomy considering clinical and laboratory findings in abdominal blunt trauma patients referred to Rajaei hospital.

Methods: This retrospective study was done on all patients who had undergone emergency laparatomy in at Shahid Rajaei hospital at Shiraz for abdominal trauma during, the years 2017-2018.The data were collected through a questionnaire. The statistical analysis was performed using the SPSS 21. P value was significant if was less than 0.05.

Results: Of the 81 trauma patients who had undergone laparotomy, 66 cases (81.5%) was male and 15 (18.5%) was female. 95.1% of laparotomies were positive. Patients who had positive laparotomy had lower systolic blood pressure ($p=0.02$), Glasgow coma scale (GCS) ($p<0.001$) and hemoglobin ($p=0.03$) and higher respiratory rate ($p=0.04$). Spleen and liver were the common damage organs.

Conclusion: This study showed that blood pressure, GCS, hemoglobin and respiratory rate can predict the need for laparotomy.

Keywords: Laparotomy, blunt trauma, abdominal trauma

Introduction

Trauma is one of the biggest problems of the global health system. It is the first cause of death among people aged 1-44 and the third cause of death for all ages (1). In Iran, trauma is the second cause of death among young people (2).

Traffic accidents are the most common cause of trauma (2). Each year, 1.2 million people lose their lives and 50 million are injured in traffic accidents globally. More than 90% of these accidents occur in low- and middle-income countries. The rate of fatal traffic accidents is 26.4 per 100,000 accidents for the Eastern Mediterranean Region and 17.5 per 100,000 accidents for Europe, while the global rate is 19 per 100,000 accidents (3, 4). Unfortunately, one of the highest rates of fatal traffic accidents in the world in 2007 belonged to

Iran with 31.8 deaths per 100,000 accidents (5). It is noteworthy that, according to a study carried out in 2008, this rate increased to 33 deaths per 100,000 people (6).

Following serious injuries, the most common causes of death are severe injuries to the brain, the heart, and the major vessel. Consequently, bleeding is the main concern. Undiagnosed abdominal injuries are the most important preventable cause of death in such patients (7).

The abdomen ranks third among the parts of the body that most frequently require surgery following traumas (1). Abdominal trauma, which is any type of injury to the abdominal region, can be penetrating or blunt. Blunt trauma is the most common type of abdominal trauma and occurs mostly in traffic accidents (8).

Currently, the methods used to evaluate blunt abdominal trauma are as follows: physical examination, diagnostic peritoneal lavage, CT scan, abdominal ultrasound, and diagnostic laparotomy (8).

In general, laparotomy is any incision through the abdominal wall to gain access into the abdominal cavity. Various diseases can lead to laparotomy. About 25% of people visit general surgeons after having abdominal symptoms (mostly abdominal pain), and 50% of them require abdominal surgery. The most important reasons for performing a laparotomy are severe abdominal pain and abdominal trauma (9).

Given the above-mentioned points, rapid treatment of people with blunt abdominal trauma is of obvious importance. Moreover, studies on predicting the need for Laparotomy have examined only a few of the signs and symptoms exhibited by patients. Therefore, this study, which was conducted to predict the need for laparotomy based on clinical and laboratory findings in patients with blunt abdominal trauma, attempted to evaluate a wider range of signs and symptoms in patients to examine the need for performing laparotomy.

Methods

This was a descriptive/cross-sectional study which was performed in Shahid Rajaee Hospital of Shiraz University of Medical Sciences. In this study, after the required permissions were taken from the Shiraz University of Medical Sciences, the history cases of all patients (all above 16 years of age) with abdominal blunt trauma who referred to the hospital in 2017 and 2018 and treated by laparotomy, were investigated.

The required data were extracted by a pre-prepared check list from the medical history of patients in the hospital. The checklist included the following sections: demographics (age and gender), findings about the trauma (mechanism and type of injury), clinical findings (co-morbidity, GCS, blood pressure, heart rate, and respiratory rate), laboratory findings (hemoglobin, hematocrit and plaque) and laparotomy findings.

After completion of the checklists, the data entered SPSS v. 21 for statistical analysis. The results were reported by descriptive statistics.

Results

A total of 81 patients were investigated, among whom, 66 (81.5%) were men and 15 (18.5%) were women. Average age of the patients was 32.03±15.96. The cumulative frequency of the age of patients shows that 75% of them were less than 35 years of age. Accidents included maximum traumas between the patients with 70 cases (86.4%).

Bike-car accidents had the highest frequency with 18 cases (26.86%), followed by car rolling with 15 cases (22.38%). Average GCS of the patients was 11.06± 4.73, ranged between 3 and 15. 83% of patients who died had a GCS less than 6. Also, average GCS was significantly higher among the laparotomy-positive patients ($p<0.001$). Clinical results showed that tenderness (30.9%) and abdominal pain (22.2%) were the most common symptoms observed. In this study, the most common injury was pelvic fracture with 25.9% followed by head and neck injury with 20 cases (24.7%) and pneumothorax with 14 cases (17.3%).

According to the clinical examinations, the average systolic pressure, average respiratory rate, average blood hemoglobin, and average hematocrit were significantly different among laparotomy-positive and laparotomy-negative patients. The average heart rate, average respiratory rate and the laboratory findings of patients are included in **Table 1**.

77 patients (95.1%) had a positive laparotomy, i.e., they needed laparotomy; however, 4 laparotomy patients (4.9%) didn't need it. Average stay time in ICU and in hospital were 7.98±10.08 and 15.2±18.03 days, respectively. The mean of admitted days is provided in **Table 2** for laparotomy-positive and laparotomy-negative patients. From among all patients, 20 (24.7%) died. Laparotomy results showed that internal bleeding was observed in 29 patients (35.80%). Splenic rupture in 22 patients (27.2%), retroperitoneal hematoma in 12 (14.8%) and hepatic rupture in 17 (21%) were observed. The most common findings in laparotomy are shown **Figure 1**.

In this study the average GCS was significantly lower in laparotomy positive than the laparotomy negative patients ($p<0.001$). The findings show that there is a significant negative correlation between age and GCS ($p=0.02$, $r=0.31$).

Discussion

In this study, 95% of patients under laparotomy showed a laparotomy-positive status. This is a high rate of laparotomy-positive prediction in this hospital. The rate is between 80 to 91 in various studies (7, 9, 10). As observed, the success rate in the identification of the need for laparotomy is higher in this study than other studies.

The most common trauma mechanism of this study was vehicle accidents, among which bike-car accidents and car-rolling had the highest share. In most similar studies, the most common mechanism has been non-invasive accident trauma (1,2,7,11-13). Unlike the abovementioned studies, in Quaas (14), Ono (15) and Turedi (16), the most common trauma mechanism was related to falling from height.

The most common injury in this study was pelvic fracture. Head and neck injury, fracture in lower limbs, and pneumothorax had the following ranks. In similar studies, the most common co-injury with abdominal trauma was related to the head and neck. In his study, Musiitwa mentions head and neck tearing as the most common injury (13). Also, Cherkasov (17), Zare' (18) and Afifi (9) and included head and rib cage injuries as the most common co-injury with the abdominal trauma. The prevalence of pelvic fracture in our study is probably due to the fact that our patients were mostly bike riders who are very susceptible to pelvic fracture.

In our study, the average GCS, systolic blood pressure, blood hemoglobin and hematocrit in the laparotomy-positive patients were significantly lower than the laparotomy- negative ones. The respiratory rate was higher in the laparotomy-positive patients, which was a significant difference. However, the average diastolic blood pressure, heart rate, and blood plaque were not significantly different between laparotomy-positive and laparotomy-negative patients. Also, the time duration of staying in the hospital and ICU was longer for laparotomy-positive than laparotomy-negative patients. The study by Erfantalab (12), like our study, reported a significant relationship between the systolic blood pressure, respiratory rate, blood hemoglobin, and GCS between laparotomy-positive and negative patients. In that study, however, the heart rate was significantly different between the two groups which is a contradictory result with our study.

In this study, 24.7% of patients died. This is a relatively high fatality percentage in the bdominal trauma patients who have undergone laparotomy. A study by Khorasani (10) reports the fatality is 10%, Stewart (19) 3% and Afifi (9) 5%.

The prevalent finding among our patients was hemorrhage, followed by splenic rupture, hepatic rupture and retroperitoneal hematoma. Almost all studies reported the splenic rupture as the most prevalent finding in laparotomy. In some studies, like Musiitwa (13), Stewart (19), Moti' (2), Smith (7), Khorasani (10) and Zare' (18), the most prevalent finding in laparotomy was the splenic rupture followed by hepatic rupture. Also, Cherkasov (17) and Afifi (9) reported small intestine injury as the second most prevalent finding after splenic rupture.

Finally, in this study, GCS, systolic blood pressure, respiratory rate, blood hemoglobin, and patient's age were important predictors of the need for laparotomy. Also, splenic and hepatic ruptures were the most prevalent laparotomy findings.

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Tables and Figures

Table 1. Laboratory and clinical findings of patients

Parameter	Laparatomy +	Laparatomy -	P.value
Systolic Blood Pressure	23.07±108.23	15.96±139.15	0.02
Diastolic Blood Pressure	10.24±71.16	6.60±79.60	0.07
Heart rate	25.07±101.25	21.25±98.21	0.80
Respiratory rate	12.52±21.12	1.70±17.10	0.04
hemoglobin	2.51±12.20	1.41±14.10	0.03
Hematocrit	6.99±36.14	4.23±43.40	0.03
Platelete	37.16±195.64	75.14±220.48	0.37

Table 2. The mean of admitted days

Admited unit	Laparatomy +	Laparatomy -	Overall	P.value
ICU	8.35 ± 10.22	1.25 ± 0.95	7.98 ± 10.08	<0.001
Hospital	15.53 ± 18.36	5.25 ± 1.50	15.02 ± 18.03	<0.001

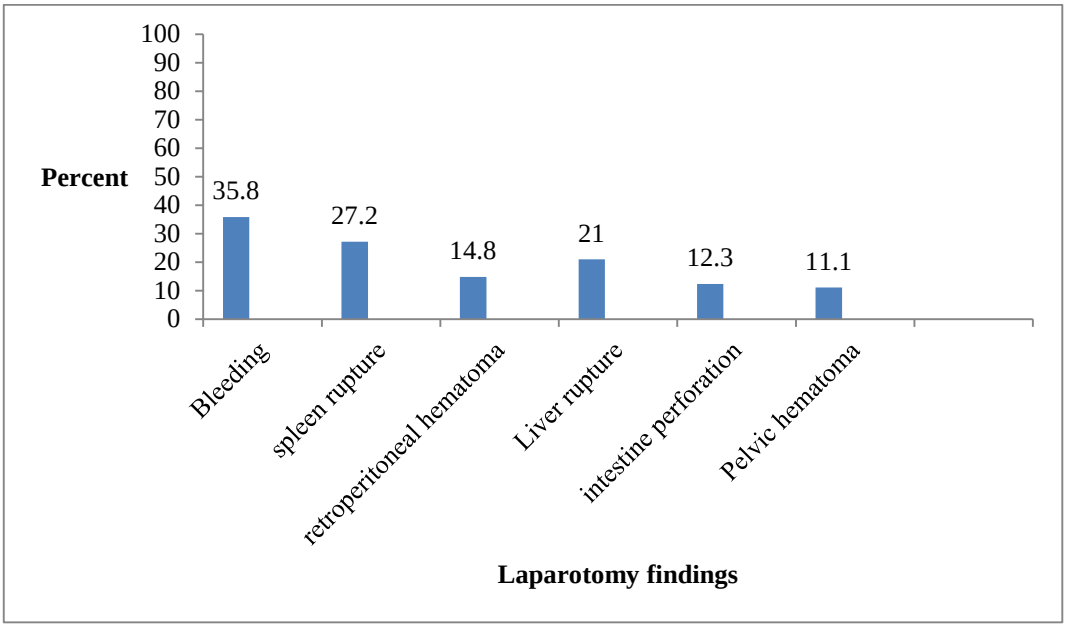

Figure 1. Laparotomy findings of patients