

# The Radiographic Findings in Travelers with Chest Trauma Referred to a Tertiary Hospital in South Khorasan, Iran

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## Abstract

**Introduction:** Currently, trauma is the main reason of mortality among 1-44 years old people and the third common reason of death throughout all ages. The aim of this study is to examine the radiographic findings in chest trauma patients referring to the Imam Reza Hospital in Birjand during the years of 2013-2014.

**Methods:** The patients meeting the criteria for the entrance to the study were examined and the frequency of radiographic findings in conventional x-ray and CT scan in the mentioned patients was recorded. After data collection, they were introduced to the SPSS 15 software, in which descriptive statistics and suitable statistical tests were analyzed at  $\alpha=0.05$ .

**Results:** Based on the results of this study, the most common radiologic finding in chest trauma patients was rib fracture (21.9%). Other radiologic findings, in order of prevalence, were: clavicle fracture (11.7%), pneumothorax (9.3%), spine fracture (7.6%), Hemothorax (6.3%), increased heart shadow (2.2%), wide mediastinum (1.9%), sternum fracture (1.7%), and pleural effusion (1.2%), respectively. There was a significant relationship between radiologic findings and the type of trauma ( $P<0.05$ ).

**Conclusion:** We found that clavicle fracture, pneumothorax, spine fracture, and hemothorax are the most common findings followings in chest trauma. Based on the results, as the type of trauma (penetrating or blunt) can have a direct relationship with its resulting pathology, modification of sociocultural structures should be considered in this regard.

**Keywords:** Chest X-Ray, Trauma, Chest, Fracture

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## 1. Introduction

Currently, trauma including car accidents and traffic injuries is the main reason of mortality among 1-44 year old people and is the third common reason of death throughout all ages. The main reason of chest injury is accidents caused by vehicles [1, 2]. One could say that trauma brings the greatest socioeconomic impact on all of the life stages of a person, and thus nowadays victims of trauma are studied more than other diseases [3]. In two thirds of vehicle accidents with damages to the chest, rib fracture is mostly observed [4-5]. In addition, in various studies it has been reported that 15-20% of victims have hidden damage of diaphragm through lower penetrating trauma of the chest [6]. A statistical analysis in the US has indicated that damages to the chest accounts for 25% of all mortality cases caused by trauma, out of which around 50% have occurred due to fatal accidents [7, 8]. Recently, thoracoscopy has been introduced as a measure with slight intrusion and high accuracy for investigation, diagnosis, and treatment of diaphragm traumas [9, 10]. Chest radiography is the preliminary test for all people suffering from non-penetrating trauma of chest [1, 11, 12]. Nowadays, with the advances emerged in the transportation of injured patients to hospitals and in presentation of medical services to these patients, it seems that the number of these injured individuals who reach hospitals alive is constantly increasing. Improvement of emergency services and rapid transfer of the injured to hospitals have increased the number of recovered patients [13, 14]. Almost in all references, the significance of early diagnosis and treatment has been emphasized in order to diminish the complications and mortalities [13, 14]. The

emergency physician should also deal with injured patients immediately by knowing the pathophysiological principles of trauma to the chest. It is possible to reduce the rate of mortality and morbidity by proper diagnosis of the type of damage to the chest. In both types of penetrating and non-penetrating traumas, one should consider the damages accompanying chest injuries as well [15]. The objective of this study is the examination of radiographic findings in chest trauma patients referring to Imam Reza hospital during 2013-2014. This was done in order to find a suitable framework for taking timely and proper therapeutic measures when dealing with these patients.

## 2. Methods

This cross-sectional study was conducted on 410 patients with trauma referring to Imam Reza Hospital in Birjand in 2013-2014. Their chest was injured and accordingly their physician requested chest radiography.

The criteria of entrance to this study included: chest trauma, request of chest radiography by the physician.

The criteria of exclusion from the study included: death of the patient before taking preliminary measures, leaving emergency with personal consent before conductance of diagnostic measures.

The selection of patients was done based on non-probabilistic sampling method. The patients participating in this study were suffering from chest trauma due to multiple trauma, accident, collapsing from height, accident during work, quarrel, etc. who referred to Imam Reza Hospital. At first, a thorough description was taken from the patient themselves or if unconscious, from their companions or

EMS. Next, if necessary, the measures of resuscitation and the stabilization of the patient were taken. Complimentary examinations were further carried out. These examinations included chest radiography, ECG, EEG, CT Scan, Blood and urine tests, etc. with the help of these tests, the diagnosis was made based on which proper therapeutic measures were taken.

For every referring patient, a questionnaire was filled in which the gender, age, the way damage was incurred, the background of any special disease, similar accidents, etc. were included. After collection of these information, findings, and the results obtained from the history, examinations, tests, and paraclinical investigations, the frequency of the radiographic findings in the mentioned patients was studied during the research.

### 3. Results

In this study, 84.6% of the patients were male and 15.4% were female.

The age of the patients was divided into four groups: 0-10 years, 10-30 years, 30-50 years, and 50 years above.

The highest frequency percentage belonged to the 10-30 - year-old age group (48%), while the lowest was related to the above-50-years age group (13.2%).

The patients participating in this study were examined in terms of the type of trauma (penetrating or blunt) and were then compared in terms of gender.

The frequency percentage of penetrating trauma was 23.2% and the blunt type was 76.8%.

The comparison of these two groups using the Chi-Square statistical test indicated a significant relationship between the type of trauma and gender ( $p < 0.05$ ). Both penetrating and blunt trauma were far more prevalent in males than in females.

A background of trauma to the chest, cardiovascular diseases, and respiratory diseases was investigated in the studied patients. 4.6% mentioned a background of trauma to the chest, 6.8% had a cardiovascular disease in their background, and 9% had a background of respiratory diseases.

The type of requested graphy (AP or PA) was also investigated in this study. The posterior-anteriorography was requested with a higher prevalence (76.1%).

The radiologic findings were investigated in the studied patients with the results provided in [Table 1](#).

The most common radiologic finding in chest trauma patients was rib fracture (21.9%).

In the radiographic cliché of 58% of patients (238 patients), no radiologic finding was observed.

The frequency distribution of the radiologic findings in the studied patients was investigated in terms of gender. No significant relationship was seen between various radiologic findings and the gender ( $p > 0.05$ ).

The frequency distribution of the radiologic findings in the studied patients was investigated in terms of age. No significant relationship was seen between various radiologic findings and the age group ( $p > 0.05$ ).

The frequency distribution of the radiologic findings in the studied patients was investigated in terms of the type of trauma. There was a significant relationship between various radiologic findings and the type of trauma ( $p < 0.05$ ).

In 37 patients (9%), CT-Scan was requested with its findings provided in [Table 2](#).

The most frequent finding in CT scan was damage to soft tissue (3.6%).

### 4. Discussion

This study was conducted with the aim of investigating the radiologic findings in chest trauma patients visiting the Imam Reza educational Hospital in Birjand in 2013-2014. This was done in order to find a suitable framework for taking timely and proper therapeutic measures when dealing with these patients.

Based on the findings of this study, 84.6% of patients who had chest trauma were male and 15.4% were female. This finding is congruent with similar studies where in numerous investigations this frequency has been reported to be 75-89% in males and 12-25% in females [16-18].

In this study, the highest and lowest frequency belonged to the patients in the age group of 10-30 (48%) and above 50 (13.2%) years of age, respectively. This finding was in accordance with the studies by Beyzani et al, done in Fasa town together with Ahmadi Amoli et al. which had been conducted in three therapeutic centers in Tehran to examine chest trauma [16, 19].

Based on the data of this investigation, the frequency percentage of penetrating and blunt traumas were 23.2 and 76.8%, respectively.

Similarly, both types of penetrating and blunt traumas were far more frequent in males than females. In a research by Dr. Zohreh Haratian et al, the prevalence of penetrating and blunt traumas were 21.9% and 78.1%, respectively congruent with this study [15].

Likewise, in the study by Bijani et al, the prevalence of penetrating and blunt traumas were 20 and 80%, respectively, in accordance with the present study [19].

In a similar vein, in the study by Ahmadi Amoli, the prevalence of penetrating and blunt traumas was 24 and 76%, respectively, very similar to the results of this study [16].

Based on the results of this study, 4.6, 6.8, and 9% of patients mentioned a background of trauma to chest, cardiovascular diseases, and respiratory diseases, respectively. In this regard, no other study addressing these indices were found. However, considering the prevalence rate of these diseases in the region and the mean age of the studied patients, these values can be considered acceptable.

**Table 1.** Radiologic findings among injured travelers

Findings	Frequency	Percentage
Rib fracture	90	21.9
Clavicle fracture	48	11.7
Spinal fracture	31	7.6
Sternal fracture	7	1.7
C/T Ration increase	9	2.2
Wide Mediastinum	8	1.9
Pleural effusion	5	1.2
Pneumothorax	38	9.3
Hemothorax	26	6.3

**Table 2.** Chest CT findings among traumatic travelers

Findings	Frequency	Percentage
Soft tissue injuries	15	3.6
Pulmonary contusion	13	3.2
Main vessels injuries	6	1.5
Aortic dissection	0	0
Hemothorax	14	3.4
Subcutaneous emphysema	8	1.9
Pneumothorax	11	2.7

In this study, posterior-anterior graphy was requested with a higher frequency (76.1%). Numerous studies confirmed this result including the studies conducted by Stuart et al. [23], Wiki et al. [17], Rasmusen et al. [18], and Wegner et al. [20]. Based on the results of this study, the most common radiologic finding in the patients suffering from chest trauma was chest fracture (21.9%).

Other radiologic findings in the order of prevalence are as follows:

Clavicle fracture (11.7%), pneumothorax (9.3%), fracture of spine (7.6%), hemothorax (6.3%), increased heart shadow (2.2%), wide mediastinum (1.9%), sternum fracture (1.7%), and pleural effusion (1.2%). The order of prevalence of the above findings was in accordance with the study by Bijani et al. in the Fasa town [19].

The prevalence of some findings in other studies was significantly different possibly due to regional differences and the discrepancies between common traumas along with different statistical population [15, 21, 22].

In this study, the participants had experienced no injuries. This can be due to two reasons: the studied profiles were chosen from outpatients and inpatients, where outpatients had no serious problems. Most incurred damages were due to driving accidents and accordingly the reason of visiting medical centers has been seeking reassurance about the health of an injured person in order to prevent incidences of further legal problems.

CT scan was performed on 37 patients (9%). In CT, the most frequent injury was related to soft tissues (3.6%) followed by hemothorax (3.4%). In this investigation, the crushing of lungs (3.2%), pneumothorax (2.7%), and subcutaneous emphysema (1.9%) were the next common injuries in the CT. In a similar study in Turkey, pneumothorax and hemothorax were reported to be 6 and 7% in patients, respectively.

## 5. Conclusion

According to the results obtained from this study, it can be concluded that fracture of chest, clavicle, pneumothorax, spine fracture, and hemothorax are the most prevalent pathologies following a trauma to the chest. Therefore, proper and timely diagnostic and therapeutic methods and especially approaches to preventing the incidence of these injuries are of significance. Furthermore, as the type of trauma can be directly related to pathologies resulting from that, reformation of sociocultural structures should be considered as well.

Similarly, proper planning for prevention from incidence of these damages should be considered in all age groups especially in children and the elderly. Because, based on the results of this study, damages caused by trauma were observed throughout all ages even in these two vulnerable groups with a relatively high prevalence.

Since most severely injured people lose their lives before arriving at medical centers, thus public education and giving instruction to special rescue teams and police with regard to the way traumatic patients should be dealt with can improve the quality and speed of therapeutic interventions. Similarly, this can be of great help in transferring the patients as quickly as possible to medical centers and construction of specialist centers of trauma.

One limitation of this study was the lack of investigation of the intensity of trauma due to the nature and type of the study. Moreover, determination of the number of

hospitalization days and the need for an artificial respiration device as well as the determination of the place and reasons of requiring surgical interventions were the other limitations. It is suggested that these under-investigated issues be further studied in the future.

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## Authors' Contributions

All authors had a role in designing the study, data interpretation and drafting the article. Mohammadi-Fard and Khalesi gathered the data. At the end, all the authors approved the final draft.

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