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Retrospective Analysis of Chest X Ray Findings in Trauma Patients: An Institutional Based Study

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ABSTRACT

Background: Data from the past studies suggest that chest X ray have poor sensitivity and specificity in detecting thoracic injury in hemodynamically normal blunt trauma patients. Hence; present study was planned to assess chest X ray findings in a trauma patients.

Materials & Methods: The present study was conducted in the Department of Radiodiagnosis, Vedantaa Institute of Medical Sciences, Palghar, Maharashtra (India) and it included assessment of chest X ray findings in a trauma patients. Complete demographic and clinical of all the patients was obtained. Chest X ray findings of all the patients from the data records was obtained. Sensitivity and specificity of the Chest X ray was assessed.

Results: Pneumothorax, rib fracture, lung contusion and sternal fractures were the most common findings of chest X-ray. Overall sensitivity of chest X ray was 20 percent while overall specificity was found to be 92 percent.

Conclusion: Chest X ray provides useful findings in case of

trauma patients. However; other higher diagnostic imaging techniques are also required simultaneously for better results.

Key words: Chest X ray, Pneumothorax, Specificity.

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INTRODUCTION

Pulmonary injuries resulting from blunt chest trauma remain a common clinical entity for critical care.¹ Major thoracic injuries are particularly devastating and hence, early identification of these injuries is imperative in management of trauma patients.² Lung contusions in particular contribute to the morbidity and mortality of patients who have suffered thoracic trauma and are independent risk factors for the development of acute respiratory distress syndrome, pneumonia, and long-term respiratory dysfunction, therefore, these x-rays are crucial in the prediction of outcome of trauma.³⁻⁵ In the present era, the use of computed tomography has gained importance in the early phase of trauma management.⁶ On the flip side, at least three major problems may be associated with the incremental use of CT in trauma. First, the exposure of potentially harmful ionizing radiation to a disproportionately young patient population may have a true effect on cancer induction risk. Chest CT is among the top three types of imaging in terms of this overall risk.⁷ Several studies suggest that CXR also has poor sensitivity and specificity in detecting thoracic injury in hemodynamically normal blunt trauma patients.⁸⁻¹¹

Kea B et al¹² determine the added diagnostic utility of chest CT performed after chest x-ray (CXR) in adults presenting to the ED with blunt trauma and suggested that if chest imaging is indicated in a blunt trauma patient, it should begin with a chest x-ray. In patients with an abnormal CXR, chest CT is a high yield test, and reveals many significant injuries.

Hence; present study was planned to assess chest X ray findings in a trauma patients.

MATERIALS & METHODS

The present study was conducted in the Department of Radiodiagnosis, Vedantaa Institute of Medical Sciences, Palghar, Maharashtra (India) and it included assessment of chest X ray findings in a trauma patients.

Data records of a total 100 patients were analyzed. Complete demographic and clinical profile of all the patients was obtained. Chest X ray findings of all the patients from the data records was obtained. Sensitivity and specificity of the Chest X ray was assessed. All the data records were analyzed by SPSS software.

RESULTS

Data of a total of 100 subjects was enrolled. Out of 100, 60 were males, while the remaining 40 were females. Mean age of the subjects of the present study was 49.2 years. Pneumothorax, rib fracture, lung contusion and sternal fractures were the most common findings of chest X-ray. Overall sensitivity of chest X ray was 20 percent while overall specificity was found to be 92 percent.

Table 1: Demographic data

Parameter	Number
Mean age (years)	49.2
Males	60
Females	40
Total	100

Table 2: Percentage of injuries observed on chest X ray

Findings	Percentage of injuries observed on Chest X ray
Pneumothorax	20
Rib fracture	20
Lung contusion	30
Sternal fractures	20

Table 3: Overall sensitivity and specificity of Chest X ray

Parameter	Value
Sensitivity	20
Specificity	92

DISCUSSION

In the present study, data of a total of 100 subjects was enrolled. Out of 100, 60 were males, while the remaining 40 were females. Ziegler K et al hypothesized that in hemodynamically normal, awake and alert blunt trauma patients, CXR can be deferred in those who will also receive a TCT with significant cost savings. They retrospectively reviewed the charts of trauma patients who received both a CXR and TCT in the trauma room. The sensitivity of CXR was 19% (95% CI: 10.8% to 31%) and the specificity was 91.7% (95% CI: 86.7% to 95%). The false positive rate for CXR was 35.8% (95% CI: 21.7% to 52.8%) and the false negative rate was 24.5% (95% CI: 18.8% to 31.2%). The precision of CXR was 42.3% (95% CI: 25.5% to 61.1%) and the overall accuracy was 74.1% (95% CI: 68.1% to 79.2%). If routine chest x-ray were eliminated in these patients, the estimated cost savings ranged from \$14,641 to \$142,185, using three different methods of cost analysis. In patients who are hemodynamically normal and who will be receiving a TCT, deferring a CXR would result in an estimated cost savings up to \$142,185.¹³

Trupka A et al evaluated whether early thoracic computed tomography (TCT) is superior to routine chest x-ray (CXR) in the diagnostic work-up of blunt thoracic trauma and whether the additional information influences subsequent therapeutic decisions on the early management of severely injured patients. In a

prospective study of 103 consecutive patients with clinical or radiologic signs of chest trauma (94 multiple injured patients with chest trauma, nine patients with isolated chest trauma), an average Injury Severity Score of 30 and an average Abbreviated Injury Scale thorax score of 3, initial CXR and TCT were compared after initial assessment in our emergency department of a Level I trauma center. In 67 patients (65%) TCT detected major chest trauma complications that have been missed on CXR (lung contusion (n = 33), pneumothorax (n = 27), residual pneumothorax after chest tube placement (n = 7), hemothorax (n = 21), displaced chest tube (n = 5), diaphragmatic rupture (n = 2), myocardial rupture (n = 1)). In 11 patients only minor additional pathologic findings (dystelectasis, small pleural effusion) were visualized on TCT, and in 14 patients CXR and TCT showed the same pathologic results. Eleven patients underwent both CXR and TCT without pathologic findings. The TCT scan was significantly more effective than routine CXR in detecting lung contusions ($p < 0.001$), pneumothorax ($p < 0.005$), and hemothorax ($p < 0.05$). In 42 patients (41%) the additional TCT findings resulted in a change of therapy: chest tube placement, chest tube correction of pneumothoraces or large hemothoraces (n = 31), change in mode of ventilation and respiratory care (n = 14), influence on the management of fracture stabilization (n = 12), laparotomy in cases of diaphragmatic lacerations (n = 2), bronchoscopy for atelectasis (n = 2), exclusion of aortic rupture (n = 2), endotracheal intubation (n = 1), and pericardiocentesis (n = 1). To evaluate the efficacy of all those therapeutic changes after TCT the rates of respiratory failure, adult respiratory distress syndrome, and mortality in the subgroup of patients with Abbreviated Injury Scale thorax score of > 2 were compared with a historical control group, consisting of 84 patients with multiple trauma and with blunt chest trauma Abbreviated Injury Scale thorax score of > 2 , prospectively studied between 1986 and 1992. Age (38 vs. 39 years), average Injury Severity Score (33 vs. 38), and the rate of respiratory failure (36 vs. 56%) were not statistically different between the two groups, but the rates of adult respiratory distress syndrome (8 vs. 20%; $p < 0.05$) and mortality (10 vs. 21%; $p < 0.05$) were significantly reduced in the TCT group. TCT is highly sensitive in detecting thoracic injuries after blunt chest trauma and is superior to routine CXR in visualizing lung contusions, pneumothorax, and hemothorax.²

Mean age of the subjects of the present study was 49.2 years. Pneumothorax, rib fracture, lung contusion and sternal fractures were the most common findings of chest X-ray. Overall sensitivity of chest X ray was 20 percent while overall specificity was found to be 92 percent. Wilkerson RG et al conducted an evidence-based review of the medical literature to compare sensitivity of bedside ultrasounds (US) and antero-posterior (AP) chest radiographs in identifying pneumothorax after blunt trauma. MEDLINE and EMBASE databases were searched for trials from 1965 through June 2009 using a search strategy derived from the following PICO formulation of our clinical question: patients included adult (18 + years) emergency department (ED) patients in whom pneumothorax was suspected after blunt trauma. The intervention was thoracic ultrasonography for the detection of pneumothorax. The comparator was the supine AP chest radiograph during the initial evaluation of the patient. The outcome was the diagnostic performance of US in identifying the presence of pneumothorax in the study population. The criterion standard

for the presence or absence of pneumothorax was computed tomography (CT) of the chest or a rush of air during thoracostomy tube placement (in unstable patients). Prospective, observational trials of emergency physician (EP)-performed thoracic US were included. Trials in which the exams were performed by radiologists or surgeons, or trials that investigated patients suffering penetrating trauma or with spontaneous or iatrogenic pneumothoraces, were excluded. The methodologic quality of the studies was assessed. Qualitative methods were used to summarize the study results. Data analysis consisted of test performance (sensitivity and specificity, with 95% confidence intervals [CIs]) of thoracic US and supine AP chest radiography. Four prospective observational studies were identified, with a total of 606 subjects who met the inclusion and exclusion criteria. The sensitivity and specificity of US for the detection of pneumothorax ranged from 86% to 98% and 97% to 100%, respectively. The sensitivity of supine AP chest radiographs for the detection of pneumothorax ranged from 28% to 75%. The specificity of supine AP chest radiographs was 100% in all included studies. This evidence-based review suggested that bedside thoracic US is a more sensitive screening test than supine AP chest radiography for the detection of pneumothorax in adult patients with blunt chest trauma.¹⁴

CONCLUSION

Under the light of above obtained results, it can be concluded that chest X ray provides useful findings in case of trauma patients. However; other higher diagnostic imaging techniques are also required simultaneously for better results.

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