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The use of chest computed tomography versus chest X-ray in patients with major blunt trauma

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KEYWORDS
Blunt chest trauma;
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Summary

Introduction: Computed tomography (CT) scans are often used in the evaluation of patients with blunt trauma. This study identifies the clinical features associated with further diagnostic information obtained on a CT chest scan compared with a standard chest X-ray in patients sustaining blunt trauma to the chest.
Methods: A 2-year retrospective survey of 141 patients who attended a Level 1 trauma centre for blunt trauma and had a chest CT scan and a chest X-ray as part of an initial assessment was undertaken. Data extracted from the medical record included vital signs, laboratory findings, interventions and the type and severity of injury.
Results: The CT chest scan is significantly more likely to provide further diagnostic information for the management of blunt trauma compared to a chest X-ray in patients with chest wall tenderness (OR = 6.73, 95% CI = 2.56, 17.70, $p < 0.001$), reduced air-entry (OR = 4.48, 95% CI = 1.33, 15.02, $p = 0.015$) and/or abnormal respiratory effort (OR = 4.05, 95% CI = 1.28, 12.66, $p = 0.017$). CT scan was significantly more effective than routine chest X-ray in detecting lung contusions, pneumothoraces, mediastinal haematomas, as well as fractured ribs, scapulas, sternums and vertebrae.
Conclusion: In alert patients without evidence of chest wall tenderness, reduced air-entry or abnormal respiratory effort, selective use of CT chest scanning as a screening tool could be adopted. This is supported by the fact that most chest injuries can be treated with simple observation. Intubated patients, in most instances, should receive a routine CT chest scan in their first assessment.

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Introduction

Two-thirds of patients with multiple injuries suffer from blunt chest trauma and severe thoracic trauma is associated with multiple injuries in 70–90% of cases.[5,7] Among blunt injuries to the chest, lung contusion is considered one of the most important factors contributing to the increased morbidity and mortality of patients with multiple injuries.[2,9]

The usual diagnostic work-up in the emergency department for blunt injuries to the chest includes a routine chest X-ray taken in the supine position and an ultrasound. Despite this approach, significant injuries, such as pneumothoraces, haemothoraces, and lung contusions can be missed during the initial trauma assessment.[1,8,11] Another investigation that is relevant to assess blunt trauma to the chest is computed tomography (CT) scanning. Several studies have shown that CT scanning is accurate in visualising intrathoracic injuries, such as pneumothoraces, haemothoraces, and lung contusions.[3,6,10] In addition, the availability, reliability, and low complication rate of CT scans has led to its widespread use in the evaluation of blunt trauma.

A number of authors have suggested that the CT chest scan should be routinely considered in the initial assessment of chest trauma.[6,12] However, this suggestion remains controversial. For example, some studies have reported clinical changes in management after CT scans in up to 70% of cases,[10] whereas others have suggested that routine CT scans do not have a major impact on the management of blunt trauma to the chest.[8,6]

With the wide availability of CT scanners and with the technical improvements in image quality and speed over the past decade, overuse and perhaps overdependence on CT results for the management of patients with chest trauma has occurred. Although CT is an excellent diagnostic tool for chest trauma, it is costly, requires radiation exposure, and removes the patient briefly from direct clinical care at a time when close monitoring of the patient is critical. In a busy trauma or emergency facility, overuse of CT scans can lead to inappropriate delays in patient care.

The purpose of the study is to identify the clinical features associated with further diagnostic information obtained on a CT chest scan compared with a routine chest X-ray in patients sustaining blunt trauma to the chest. This will help to guide decisions about the further investigation and management of blunt trauma to the chest; which is important given that two-thirds of patients with multiple injuries sustain blunt chest trauma.[5,7]

Methods

Study design

A retrospective review of patients with blunt chest trauma who were treated in a Level 1 trauma centre between January 2002 and December 2003 and who had received both CT chest scan and chest X-ray as part of their initial assessment.

Data collection from medical records and the trauma registry was approved by the Northern Sydney Health Human Research Ethics Committee.

Patients

Patients were identified from the hospital's trauma registry. The trauma registry collects data on all trauma patients with either an injury severity score (ISS) greater than 15, an intensive care unit (ICU) admission, a length of stay greater than 3 days, injuries to two or more body regions, who were transferred-into the Level 1 trauma centre, or who subsequently died in hospital. Over the 2-year period, a total of 1101 patients met this criteria and were included in the trauma registry. Of these, 148 (13.4%) had sustained blunt trauma to the chest and had received a CT chest scan (as well as a chest X-ray) during their initial assessment in the emergency department. Seven patients were excluded (2 had penetrating chest injuries and 5 were under the age of 16 years). Consequently, a total of 141 patients met the study's inclusion criteria.

Measurements

Data included in the trauma registry is completed by the trauma team leader (usually an emergency department consultant or registrar). Information on vital signs (Glasgow Coma Score, systolic blood pressure, heart rate, respiratory rate, respiratory effort); injuries sustained and the injury severity score; clinical findings, such as chest wall bruising or tenderness, reduced air-entry and surgical emphysema; laboratory findings including baseline haemoglobin and arterial blood gas results; therapeutic interventions; outcomes was transcribed, systematically, from the medical and trauma registry records into a data form developed for the study. The radiologist's written report was used to identify abnormal findings on both the chest X-ray and the CT scan. Where documented, information on the patient's management both before and after the CT scan was collected.

All CT scans during the study period were performed on a General Electric (Milwaukee, USA) Lightspeed Qxi scanner ("4 slice scanner") using