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Spectrum of MDCT findings in blunt chest trauma patients at a tertiary health care University Hospital: A single-centre experience

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ABSTRACT

Purpose: Evaluate MDCT findings in patients with blunt chest trauma with a demographic evaluation of number and percentage of each pattern over 6 months at University Hospital.

Patients and methods: This study involved 125 patients, including 90 males and 35 females with a mean age of 51.4 years. They were exposed to blunt chest trauma and were referred to the emergency radiology department. All patients were subjected to clinical examinations with medical history interview, plain chest X-ray, and MDCT of the chest with 3D reconstruction.

Results: Road traffic accidents were the most common mechanism of trauma, accounting for 56.8% of the 125 cases. Chest pain was the most common clinical presentation, observed in 76%. Both sides of the body were affected in 41.6%; the right side was affected in 29.6%; and the left side was affected in 28.8%. Radiological findings among the patients in the order of frequency were pleural injuries in 72% of the patients, parenchymal lung injuries in 56.8%, chest wall injuries in 40.8%, mediastinal injuries in 11.2%, diaphragmatic injuries in 4.8% and tracheo-bronchial injuries in 1.6% of the patients.

Conclusion: Chest trauma may cause significant morbidity, and MDCT could lead to critical changes in a patient's management.

1. Introduction

Multi-detector computed tomography (MDCT) is the preferred imaging modality for the evaluation of poly-trauma patients. It offers multi-planar and three-dimensional reconstructions and is generally more sensitive and specific than chest radiography. It has been shown to change patient management in up to 20% of patients with abnormal initial chest radiography [1].

MDCT can be used to evaluate a wide variety of thoracic injuries, including chest wall bony injuries such as rib fractures, which are the most common injuries in blunt chest trauma; clavicle fractures with or without sternoclavicular dislocation [2]; fractures resulting from high-energy deceleration, such as sternal and scapular fractures [3]; and dorsal spine fractures, in which MDCT plays a major role in guiding clinical management [4].

Chest wall soft tissue injuries include surgical emphysema [5] and soft tissue contusion, which may result in arterial or venous haematoma, with the latter often being self-limiting and slow-growing [6].

Pleural space injuries include haemothorax with arterial bleeding causes more significant progressive increase in volume and mass than venous haemorrhage [7], pneumothorax, which is the second most common finding in cases of blunt chest trauma [8], and hydro-pneumothorax, which is the concurrent presence of a pneumothorax and a hydrothorax (i.e., air and fluid) in the pleural space [9].

Injuries of the lung parenchyma appear as pulmonary contusions, which are the most common lung injury [10]; pulmonary lacerations, which are obvious tears in the lung parenchyma, and rare complications such as lung torsion and lung herniation can also be detected [11]. Injuries of the trachea and bronchi are also rare findings [12].

Diaphragmatic injuries can be caused by chest or abdominal trauma [13]. CT scan sensitivity for blunt diaphragmatic injury can be improved from approximately 60% with conventional CT scans to 77–100% with MDCT, with a specificity of approximately 93–98% using MDCT [14].

Mediastinal injuries can cause pneumo-mediastinum [15] and mediastinal haematoma; rarely, blunt oesophageal trauma can also

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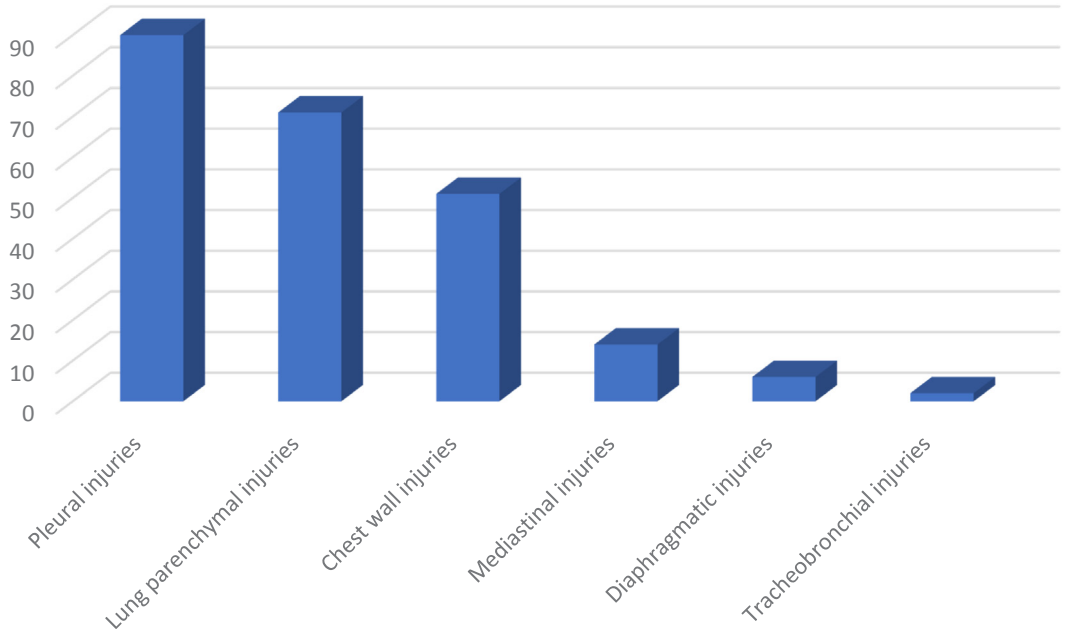

Fig. 1. Number of positive radiological findings among patients.

occur [16].

Pericardial injuries, such as haemopericardium [17] and pneumopericardium, are rarely seen with blunt chest trauma, but if they are extensive, they may cause cardiac tamponade [18].

The **aim** of this study was to evaluate the findings of MDCT in patients with blunt chest trauma in conjunction with a demographic evaluation of the number and percentage of each pattern over 6 months at Kasr Al-Ainy University Hospital.

2. Patients and methods

This study involved 125 patients, including 90 males (72%) and 35 females (28%) with an age range of 2–75 years (mean age = 51.4 years). Most of the patients were in the age group of 21–40 years (n = 74 patients, 59.2%).

They were exposed to blunt chest trauma and referred to the Emergency Radiology Department at Kasr Al-Ainy Hospital for MDCT of the chest over a period of 6 months from September 2016 to February 2017, with the following inclusion and exclusion criteria.

2.1. Inclusion criteria

All cases with blunt chest trauma as either the sole presentation or as part of poly-traumatic insults were included in this study.

2.2. Exclusion criteria

Patients requiring emergency surgery and patients who were haemodynamically unstable were excluded.

This study was conducted according to the guidelines of the ethics committee of Cairo University and was approved by our institutional review board. Informed written consents were obtained from the relatives of all participants in this study.

2.3. Methods

All patients were subjected to the following:

(1) A thorough clinical examination with a medical history review and general and chest evaluations.
(2) Plain chest X-ray with anteroposterior (AP; supine) views.
(3) Non-contrast MDCT of the chest was performed in all patients in the Emergency Radiology Unit using a 16-multislice GE bright speed CT scanner with the following parameters: helical acquisition, 120 kV, 25 mA, helical thickness of 1.25 mm, 1-mm interval, FOV of 351 mm down from the level of the renal arteries up to the root of the neck, and total exposure time of 0.8 s during a breath hold.Mediastinal window and lung window axial images with coronal and sagittal reconstruction were obtained. Oral contrast was given in cases of suspected oesophageal injuries.
(4) Virtual CT bronchography: three-dimensional reconstructions based on surface and volume renderings were conducted for two patients with suspected tracheo-bronchial injuries.
(5) Associated injury assessment by abdominal ultrasound (US) or brain CT according to the patient's condition.

3. Results

The most common **mechanisms** of blunt chest trauma were road traffic accidents in 56.8% (n = 71 patients) of the cases, followed by falling from height in 40% (n = 50 patients) of the cases and direct blow to the chest in 3.2% (n = 4 patients) of the cases.

Interventions that were applied included endotracheal tube insertion in the Emergency Department in 20 patients (16%), chest tube placement prior to MDCT scan in 34 patients (27.2%), and central venous line placement and nasogastric feeding tube insertion in 24 (19.2%) and 12 (9.6%) patients, respectively.

The most common **clinical presentations** were chest pain (n = 95 patients) (76%), dyspnoea (n = 88 patients) (70.4%), local chest tenderness (n = 30 patients) (24%) and haemoptysis (n = 25 patients) (20%). More than one presentation was encountered in some patients.

Regarding the **affected side**, both sides were affected in 52 patients (41.6%), the right side was affected in 37 patients (29.6%), and the left side was affected in 36 patients (28.8%).

The positive radiological findings among the patients in the order of frequency (Fig. 1) were pleural injuries in 90 patients (72%), parenchymal lung injuries in 71 patients (56.8%), chest wall injuries in 51 patients (40.8%), mediastinal injuries in 14 patients (11.2%), diaphragmatic injuries in 6 patients (4.8%) and tracheo-bronchial injuries in 2 patients (1.6%). The numbers and percentages of MDCT findings in