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Multidetector computed tomography Findings in Chest trauma

A Research submitted to Al-Nahrain University /Collage of Medicine In Partial Fulfilment for the Degree of M.B.CH.B

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Finally special thanks to ***my family*** for their support

Dedication

“To caffeine and sugar, my companions through many a long night of writing.”

My great thanks and respect to my supervisor

D r .Noor Kathem

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ABSTRACT

Introduction

Chest trauma is classified as blunt or penetrating, with blunt trauma being the cause of most thoracic injuries (90%). The main difference lies in the presence of an opening to the inner thorax in penetrating trauma, created by stabbing or gunshot wounds, which is absent in blunt chest trauma.

Aim

To Evaluate The MDCT findings in Patient with Chest Trauma.

Patient & Method

The study was designed as a cross sectional analytic study conducted in Al-Imammain Al-kadhymain medical city during the period from August 2018 to February 2019 for patient with chest trauma , CT scan examination were performed, interpreted and special questionnaire was filled.

Result and Conclusion

The study involved 10 patients half of them were male and other were female, there age range from 17 to 80 years old mostly at the third decade, 70% of them get injured by road traffic accident, The radiological finding of them showing pleural injury in all of them (50% isolated and 50% companied with other injuries include thoracic wall and lung parenchymal injury), rib fracture represent the majority of thoracic wall injury, regarding the pleural injury most of it was haemo-pneumothorax followed by pneumothorax, while lung contusion occur in 50% of them .

For all those patients who have thoracic injuries chest tubing done for 70% of them 30% of them were misplaced.

Introduction

Chest trauma is classified as blunt or penetrating, with blunt trauma being the cause of most thoracic injuries (90%). The main difference lies in the presence of an opening to the inner thorax in penetrating trauma, created by stabbing or gunshot wounds, which is absent in blunt chest trauma [1]. Blunt thoracic injuries are the third most common injury in polytrauma patients following head and extremities injuries. [2]. Although half of thoracic injuries are minor, 33% require hospital admission [3]. Overall, blunt chest trauma is directly responsible for 25% of all trauma deaths [3] and is a major contributor in another 50% of trauma-related deaths. Moreover, chest trauma is the second most common cause of death, following only head trauma, and is by far the most common cause of death in the young age group between 15 and 44 years old .[4]. Most blunt thoracic injuries are caused by motor vehicle crashes (MVC; 63–78%), with the remainder (10–17%) caused by falls from heights and a minority from blows from blunt objects or explosive devices .[5].

Portable chest radiography is the initial imaging method used at the emergency workup of the polytrauma patient, and it is useful for detecting serious life-threatening conditions, such as a tension pneumothorax or haemothorax, mediastinal haematoma, flail chest or malpositioned tubes. However, the superiority of CT over chest radiography has been documented in the literature; CT detects significant disease in patients with normal initial radiographs and in 20% will reveal more extensive injuries compared with the abnormal initial radiographs, necessitating a change of management .[6]. CT is far more effective than chest radiography in detecting pulmonary contusion, thoracic aortic injury and osseous trauma, especially at the cervicorthoracic spine. MDCT has dramatically decreased imaging times and offers readily available multiplanar reformatted images or more sophisticated volume-rendered and MIP images. Therefore, it has been established as the gold standard for the imaging evaluation of chest trauma and trauma in general. [7]. Due to its wide availability, speed, and ability to depict a variety of injuries, as well as being able to simultaneously evaluate other body regions (e.g., abdomen and pelvis), MDCT is now considered the gold standard imaging tool in the emergency department [4] , particularly in trauma centers (level 1) and larger hospitals that have CT technologists and radiologists available 24 hours per day .[7]. Drawbacks of MDCT include the radiation exposure and the potential adverse effects related with the use of contrast media. Additionally, MDCT is also associated with higher costs and increasing time spent in the emergency department .[10].

Chest Wall and Diaphragm injuries

1.Rib Fractures. Rib fractures are the most common lesion occurring in the setting of blunt chest trauma. They are usually identified on MDCT scans obtained following blunt chest trauma, being observed in 50% of patients [3]. The fourth to the eighth arches are the most commonly affected ribs. [3]. Fractures involving the first through the third ribs are a marker of high-energy trauma, as they are mostly protected by the clavicle, scapula, and upper chest wall musculature. Injury to the brachial plexus and subclavian vessels may be seen in 3% to 15% of patients who have upper rib fractures .[40] Fractures of the eighth to eleventh ribs should prompt careful evaluation for upper abdominal organ injuries.[7,26].

Flail chest is a traumatic condition in which there are three or more consecutive ribs with fractures in two or more places, often requiring surgical treatment. [7, 16]. Many of these rib fractures are not shown on the initial CXR. MDCT can determine the site and number of fractures, as well as other associated injuries (hemothorax, pneumothorax, subcutaneous emphysema, and pulmonary contusion) .[23]. Treatment should be aimed to maintain a good respiratory function and control the pain. If required, mechanical ventilation for pneumatic stabilization of the chest can be performed. Adequate results have been reported with noninvasive mechanical ventilation in CPAP (Continuous Positive Airway Pressure) mode. [19, 41]. Chest surgical stabilization is only indicated when the patient requires a thoracotomy for other reasons or has massive flail chest that might not be solved with mechanical ventilation. [19].

2.Sternal Fractures. Sternal fractures have been reported in approximately 8% of blunt chest trauma patients. [42] Approximately 90% of such fractures are secondary to motor vehicle accident (due to seat belt or air bag trauma). [7].

They usually involve the sternal body and manubrium (figure1) and are often associated with mediastinal hematoma, lung lesions, and cardiac or spinal injuries. If vascular compromise or impingement is a concern, intravenous contrast should be administered. The fracture is usually obvious at MDCT, often with an associated retrosternal mediastinal hematoma [15].

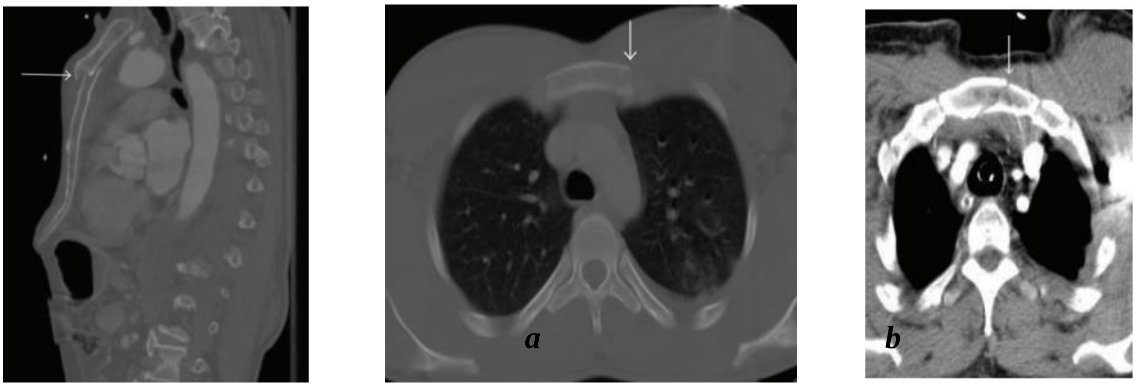


Figure 1: Sternum fracture in two different patients. Axial MDCT (bone window) in patient one (a) shows a complete sternum fracture at the level of the body, without displacement of the fragments (arrow). Axial MDCT (b) and sagittal reconstruction in bone window (c) in a second patient show a displaced sternal body fracture (arrows). A small retrosternal hematoma is also seen (b).

Figure S

Multiplanar and three-dimensional reconstructions greatly improve accuracy and diagnostic confidence. In this setting, sagittal images are particularly helpful for the detection of sternal fractures; however, stair-step artifacts of the sternum may be seen on sagittal reformations due to respiration. Another common pitfall is the presence of constitutional abnormalities of the sternum segmentation, mimicking sternal fractures. Treatment is usually based on pain control and chest physical therapy. [19].

3.Clavicle Fractures. Clavicle fractures are usually obvious on the clinical examination. The most important role of MDCT in clavicle fracture evaluation relies in the assessment of medial fractures and injuries affecting the sternoclavicular joint, especially in the diagnosis of sternoclavicular dislocation [16]. Anterior sternoclavicular dislocation is more common and it is a marker for high-energy trauma as patients usually have other chest injuries A posterior sternoclavicular dislocation may be a cause of serious morbidity, but it is often clinically and radiographically occult, only being detected on chest CT. [7]. Impingement of the underlying mediastinal vessels and nerves, such as the brachial plexus and recurrent laryngeal nerve, esophagus, and trachea, can occur by the displaced clavicle .[2, 3]. If vascular compromise or impingement is a concern, the study should be performed with intravenous contrast enhancement. Treatment often requires open reduction. [2]. .

4.Scapular Fracture. Scapular fractures are relatively common. Usually it is necessary a significant force for it to occur because the scapula is protected by the large muscle masses of the posterior. [2]. Although most scapular fractures are treated nonoperatively, any fracture involving the glenoid or scapular neck requires open reduction and internal fixation to allow normal scapulothoracic motion and stabilization of the shoulder girdle. [2]. They are often associated with pulmonary contusion, rib, clavicle, and vertebral fractures and arterial injuries (subclavian, axillary, or brachial). [3]. These injuries are usually well seen in MDCT and multiplanar reconstructions are helpful

5.*Thoracic Spine Fractures*. Fractures of the thoracic spine occur in 3% of patients with blunt thoracic trauma [43]]; a high percentage is associated with spinal cord injury. The most common site in this setting is the thoracoabdominal junction at the level of T9–T11 vertebral bodies [15]. MDCT is the modality of choice in the evaluation of spinal fractures. Signs of vertebral body fractures include disruption or fracture of the vertebral body, pedicle, and/or spinous processes, paraspinal hematoma, and confined posterior mediastinum hematoma (Figure2) [22]. MDCT shows the presence and extent of a spinal injury, predicts the degree of instability produced, and can show bony fragments in the neural canal. Reconstructed sagittal and coronal multiplanar images are often useful. [15, 23].

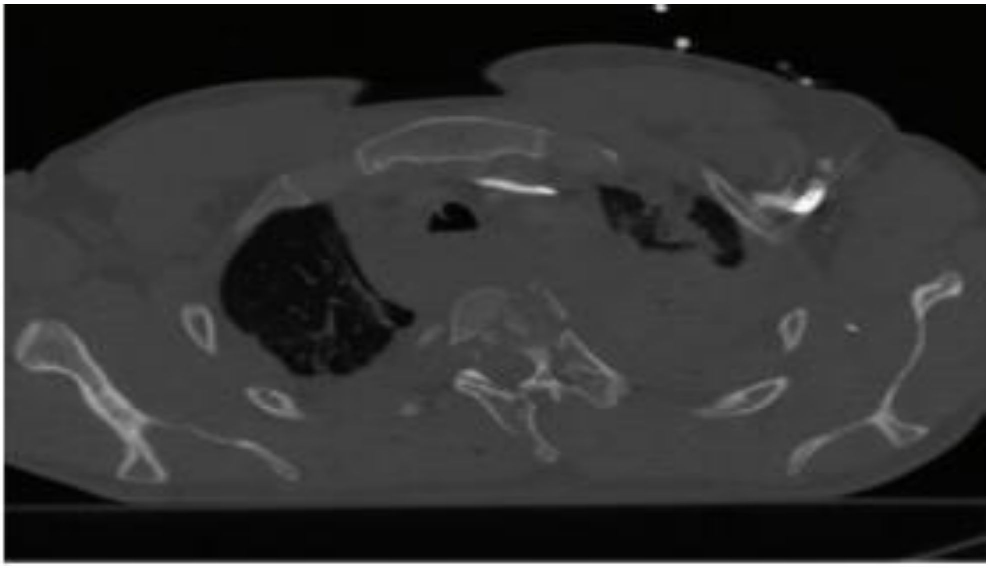
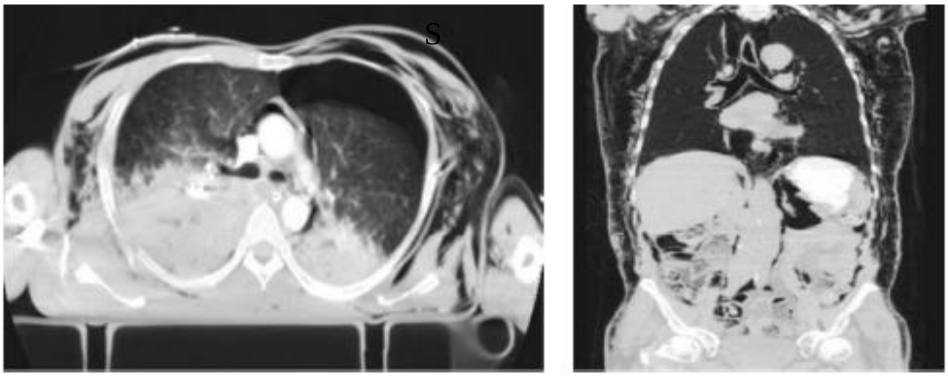


Figure 2 thoracic vertebral fracture in a patient who suffered a car crash. Axial MDCT in bone window. A comminuted thoracic vertebral fracture is depicted with multiple fragments of the body and spinous processes of the third thoracic vertebra. Hemomediastinum, hemothorax, and pulmonary contusions are also associated.

***5.Chest Wall Hematoma*.** Chest wall hematoma is a relatively infrequent complication of a chest wall injury or of dedicated chest interventions, including drainage or insertion of a central venous catheter. [16]. Hematomas may be of arterial or venous origin . Extrapleural hematomas are commonly associated with rib fractures that injure the intercostal, internal mammary, or subclavian arteries .[7]. Blood accumulates between the parietal pleura and endothoracic fascia. Larger hematomas have a biconvex shape. Active bleeding may be seen

6.Subcutaneous Emphysema. Air can spread through the fascial planes to the remainder of the chest wall, abdomen, or even into the head, neck, and extremities (figure3). [25]. Most of the times it has a tracheobronchial tear origin, but it can also be a consequence of esophageal rupture.



(b)

Figure 3: Subcutaneous emphysema. Axial MDCT (a) and coronal reconstruction (b) in lung window. An extensive subcutaneous emphysema is observed. A pneumomediastinum and retropneumoperitoneum are also associated.

6.Diaphragmatic Trauma. Diaphragmatic rupture occurs in 0.8–7% of patients hospitalized with a blunt trauma .[44]. It is a frequently overlooked injury but it is clinically very serious. Mechanisms of diaphragmatic rupture after blunt trauma include a sudden increase in intrathoracic or intraabdominal pressure while the diaphragm is immovable by a crushing force. [18]. MDCT not only detects small diaphragmatic discontinuities, but also identifies the herniated fat or viscera. Usually there is a waist like constriction of the herniated stomach or bowel (collar sign) or lack of visualization of the hemidiaphragm .[18, 25]. Coronal and sagittal reformations are essential in detecting diaphragmatic rupture. Most diaphragmatic ruptures originate in the posterolateral portion of the diaphragm at the site of embryonic diaphragmatic fusion [3] and it is more common on the left side (77–90%), presumably because the liver protects the right hemidiaphragm [18]. Notably, the stomach is the most common herniated abdominal organ. Falsepositive interpretations are usually due to the loss of continuity of the diaphragm seen in older patients with incidental Bochdalek hernias. [15]. Surgical repair is necessary to prevent late complications such as bowel incarceration or strangulation, thoracic organ compression, and diaphragmatic paralysis. [25].

Injuries of the Pleural Space

1. *Hemothorax*. Hemothorax is defined as a collection of blood in the pleural space, usually due to lesions of the lung parenchyma, pleura, chest wall, mediastinum, or abdomen (liver and splenic injuries with diaphragmatic rupture)figure5. It occurs in 30%–50% of patients who suffer blunt chest trauma [7]. MDCT easily characterizes the pleural fluid and determines the value of attenuation (typically presents with an attenuation of 35–70 H.U.) [26]. Blood can be seen in the pleural space at different degrees of coagulation, giving rise to a layered appearance, called the "hematocrit sign". MDCT is also more sensitive than CXR in detecting small hemothoraces. [2]. The combination of pneumothorax and hemothorax is common. .

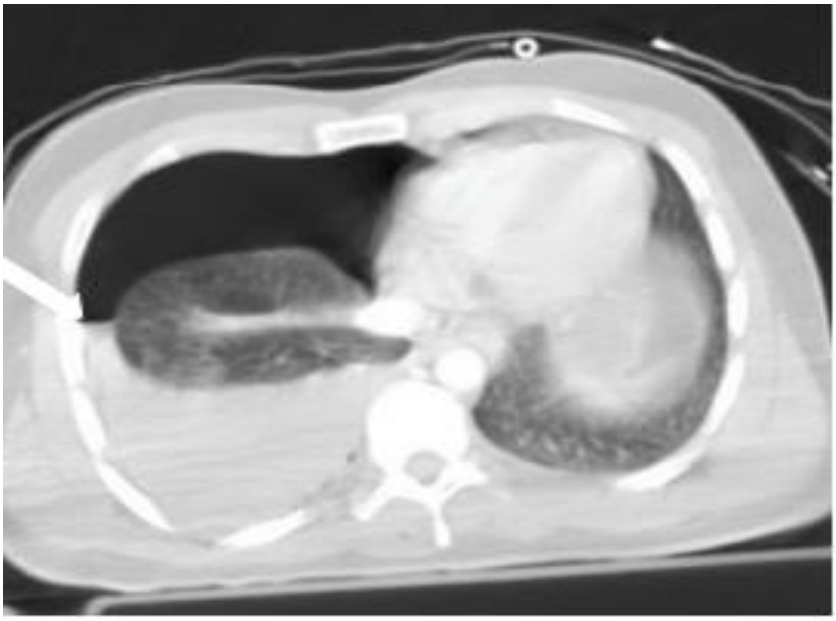


Figure 4 right side penumothorax with hemothorax

2.*Pneumothorax* occurs in 30–39% of cases of blunt chest trauma. [35–37]. It represents an abnormal collection of air in the pleural space between the visceral and parietal pleura. Mechanisms include broken alveoli due to sudden increase in the intrathoracic pressure, chest deceleration (with or without rib fractures), ruptured emphysematous bulla, pulmonary laceration, or tracheobronchial injury or due to the "Macklin effect". [38]. MDCT has higher sensitivity than CXR in the detection of pneumothorax, particularly in the supine trauma patient .[25, 39].

Pneumothoraces that are not apparent on the supine chest radiograph have been shown on CT in 10% to 50% of patients .[25]. The detection of small volume pneumothorax has clinical importance, since artificial ventilation may worsen this condition.

Tension pneumothorax develops when air enters the pleural space but cannot leave and progressively accumulates as a result of a one-way valve mechanism. It expands the ipsilateral hemithorax, collapses the associated lung, depresses the associated hemidiaphragm, displaces the mediastinum to the opposite side, produces atelectasis in the contralateral lung, and prevents adequate diastolic filling of the heart, by compressing of the vena cava.

Lung Parenchymal injuries

5.1.Pulmonary Contusion. Pulmonary contusion is the most common pulmonary lesion and is seen in 30%–70% of patients with blunt chest trauma. [7, 15]. It is a focal parenchymal injury of the alveolar epithelium, with interstitial edema and alveolar hemorrhage, produced at the time of injury and usually adjacent to the area of trauma, but can also occur in a countercoup location. [1, 3]. MDCT is precise in the diagnosis and quantification of the extent of pulmonary contusions.The appearance of pulmonary contusions depends on the severity of the parenchymal injury. In mild contusion, ill defined, patchy, “ground-glass” areas of heterogeneous opacities are generally seen and are related with interstitial or partial alveolar compromise (figure5)When alveolar injury is moderate to severe, it is seen as poorly defined areas of consolidation, with no air bronchogram sign, as a result of bronchial obstruction caused by secretions and/or blood. Massive pulmonary contusion may lead to the development of adult respiratory distress syndrome .[7]. Pulmonary contusions may be associated with other lesions, such as chest wall contusions or fractures in the overlying area of impact, hemothorax pneumothorax, or lacerations. Resolution is usually rapid and the lung often returns to normal within a week. Failure of resolution usually suggests superimposed infection, atelectasis, aspiration, or a blood clot in a laceration.

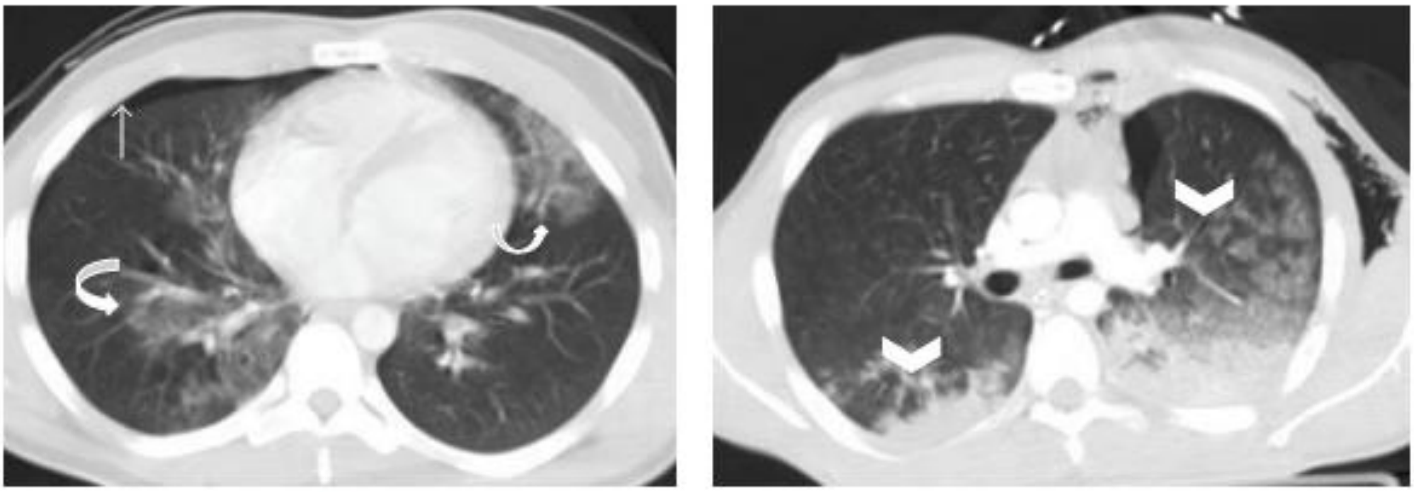


Figure 5 bilateral pulmonary contusion. Axial MDCT in lung window reveals (a) ill-defined nonsegmental areas of "ground glass" attenuation in middle lobe, right inferior lobe, and lingula in a polytraumatized patient, consistent with bilateral contusion focus (curved arrows). Also note a small right pneumothorax (straight arrow). Axial MDCT of another patient (b) shows "ground glass" lung contusions (arrowheads) and bilateral nonsegmental air space consolidations with a posterior distribution due to blood filling of the alveolar spaces.

2.Lung Laceration. Lung laceration refers to a traumatic disruption of alveolar spaces with cavity formation filled with blood (hematoma), air (pneumatocele), or, more frequently, a combination of both (hemato-pneumatocele). [7, 15]. Lacerations are commonly solitary, but multiple lacerations may occur. Laceration was previously considered a rare finding. Nowadays, due to the broad use of MDCT, lacerations appear relatively common in blunt chest trauma .[16]. Blunt chest trauma can produce substantial pulmonary lacerations; nevertheless s they are most commonly caused by penetrating traumas such as stab or bullet wounds. [17]. MDCT is superior to CXR to detect lacerations. The laceration may be lucent and filled with air, completely opacified as a result of blood accumulation within the cavity, or demonstrate an air-fluid level related to variable amounts of blood within its lumen. [18]. The resultant pneumatocele has a variable course; it may persist for several weeks, although it usually resolves within one to three weeks, resulting in a pulmonary parenchymal scar. [17]. Conservative treatment is the rule as most of these lesions usually resolve within weeks. Surgery is commonly indicated in cases of large parenchymal destruction, bleeding from a major vessel, or bronchovascular fistula. [19].

Mediastinal Trauma

1.Pneumomediastinum. Pneumomediastinum is defined as free air collections surrounding mediastinal structures and dissecting along the mediastinal fat. Both overt and occult pneumomediastinum may occur in the setting of blunt chest trauma. [20]. The presence of pneumomediastinum should raise suspicion for a tracheobronchial or esophageal rupture. Frequently it originates in an alveolar rupture. It fills the interstitium and then reaches the hilum and mediastinum, dissecting along the bronchovascular sheaths (Macklin effect). [3, 21]. If under pressure, air in the mediastinum might produce cardiovascular disturbance, which may be fatal if not treated immediately. [17].Pneumomediastinum may be mistaken for pneumothorax, but the presence of septa within it, delineated on lung window, helps in differentiating the two findings, especially if they coexist [3].

2.Tracheobronchial Laceration. Tracheobronchial injuries occur in less than 1.5% of blunt chest trauma patients. Bronchial tear is more common than tracheal tear and more often on the right side. Approximately 85% of tracheal lacerations occur 2 cm above the carina and are usually located at the cartilage-membranous junction .[7]. Blunt trauma may cause an abrupt increase in intrathoracic airways pressure. If this happens against a closed glottis, a tracheobronchial laceration may occur. [18, 22]. Discontinuity of the tracheal or bronchial wall may be seen, although infrequently, with air leaking around the airway. Other less specific signs of tracheobronchial tear include collapsed lung ("fallen lung" sign), persistent pneumothorax, and herniation or over distention of an endotracheal cuff in an intubated patient. [7, 23, 24]. MDCT is also very effective in evaluating central airway permeability. Repair of tracheobronchial lacerations should be performed promptly due to its high mortality rate and to avoid chronic pulmonary complications[18].

3.Esophageal Injury. Blunt trauma of the esophagus is rare, due to its position in the mediastinum. Usually it is secondary to violent vomiting (Boerhaave's syndrome) or compressive bone forces [25]. The cervical esophagus has been reported as the most common site of injury. When esophageal rupture occurs, it is a nearly fatal condition and the associated mortality approaches 90% (almost always secondary to mediastinitis [17]). MDCT findings that might suggest traumatic esophageal perforation include the presence of pneumomediastinum, mediastinitis, hydropneumothorax, or leakage of oral contrast material into the mediastinum or pleural space .[26].

4.Hemopericardium. Hemopericardium is a rare condition in the setting of blunt chest trauma, usually caused by venous hemorrhage but may also be caused by cardiac injury or secondary to ascending aorta rupture. MDCT can detect hemopericardium before the onset of pericardial tamponade. [23]. MDCT findings include pericardial blood effusion, with or without dilation of the superior and inferior vena cava. Other findings include reflux of contrast material into the azygos vein and inferior vena cava deformation and compression of cardiac chambers and other intrapericardial structures, and bulging of the interventricular septum . [34].

5..Pneumopericardium. Esophageal ruptures or pleuropericardial fistulas may initiate air into the pericardial cavity [25]. It is a very rare finding, but if large, it may result in cardiac tamponade [16]. Findings include air around the heart that does not rise above the level of pericardial reflection at the root of the great vessels

AIM OF THE STUDY

To Evaluate The MDCT findings in Patient with Chest Trauma.

Patient & Method

Study design

This study is a cross sectional analytic study conducted in Al-Imammain Al-kadhymain medical city during the period from August 2018 to February 2019.

Study population

The study included patient with chest trauma in the emergency department or the thoracic surgery ward at Al-Imammain medical city

- **Inclusion criteria** :
  1.Patients who had trauma to the chest whether blunt or penetrating.

  2. Patients for whom CT scan of the chest was done .

- **Exclusion criteria :**
  Patients who had no signs of chest trauma at CT scan

The net results were based on 10 patients with chest trauma who had CT scans showing signs of trauma to the chest

Image acquisition

CT scan examination were performed using the 256 slice CT scanner Magnetom definition edge ,siemens , Erlangen , Germany.

Image interpretation

For each patient the exam was loaded on a CD and reviewed on a personal computer using the software OsiriXLite 10.0.3

Image interpretation was done by the researcher and a specialist radiologist (the supervisor). Interpretation included viewing the study at mediastinal , lung and bone window settings in axial and coronal and sagittal reformats as required. 3D volume rendering was performed for patients with fractures.

A search for radiological signs of chest trauma was done including injuries to the thoracic wall , diaphragmatic injury , pleural injury , mediastinal injury and parenchymal injury to the lungs

Statistical analysis

the data were analyzed manually and represented in the form of frequency and percentage for certain variables in tables and graphics design using Microsoft excel software

Result:

The study involved 10 patients half of them were male (50.00%) and the other half were female (50.00%). Figure (6)

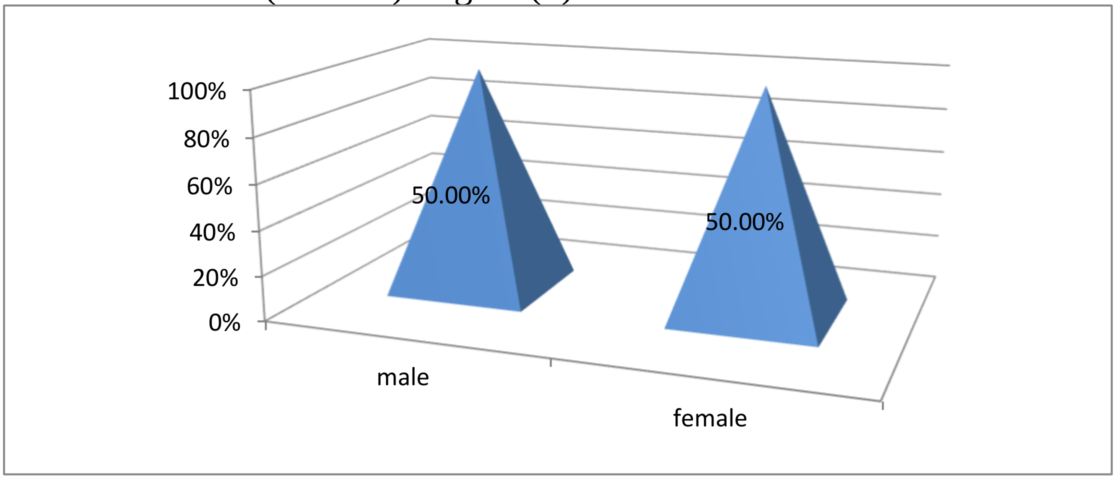


Figure 6: Distribution of the sample according to the gender

Figure (6): Distribution of the sample according to the gender

The participants age range from 17 to 80 years old with only 10% of them below 20 years old, 30% between 20 and 30 years old, 20% between 30 and 40 years old, 20% between 40 and 50 years old, 10% between 50 and 60 years old and 10% above 60 years old. Table (1)

Table (1): Distribution of the sample according to the age group.

Age group	male		female		total	
	No.	%	No.	%	No.	%
<20	0	0%	1	10%	1	10%
20-30	2	20%	1	10%	3	30%
30-40	1	10%	1	10%	2	20%
40-50	1	10%	1	10%	2	20%
50-60	0	0%	1	10%	1	10%
>60	1	10%	0	0%	1	10%
total	5	50%	5	50%	10	100%

Table 1: Distribution of the sample according to the age group

70% of the participants get injured by road traffic accident, 10% injured by crush, 10% by blast and anther 10% by falling from height. Table (2)

Table (2): Distribution of the sample according to the mechanism of trauma

Mechanism of trauma	**male**		**female**		**total**	
	No.	%	No.	%	No.	%
RTA	3	30%	4	40%	7	70%
CRUSH	1	10%	0	0%	1	10%
BLAST	1	10%	0	0%	1	10%
FALL	0	0%	1	10%	1	10%
OTHERS	0	0%	0	0%	0	0%
TOTAL	5	50%	5	50%	10	100%

Table 3Distribution of the sample according to the mechanism

The radiological finding of those patients with chest trauma showing pleural injury in all of them with 50% have only plural injury and anther 40% of them have pleural, wall and parenchymal injury and only 10% with pleural and parenchymal injury. Table (3)

Table (3): Distribution of the sample according to the radiological finding

Radiological finding	**male**		**female**		**total**	
	No.	%	No.	%	No.	%
thoracic wall injury only	0	0%	0	0%	0	0%
Pleural injury only	3	30%	2	20%	5	50%
Lung Parenchymal injury only	0	0%	0	0%	0	0%
Mediastinal injury only	0	0%	0	0%	0	0%
Diaphragmatic injury only	0	0%	0	0%	0	0%
Pleural and parechymal	1	10%	0	0%	1	10%
Wall, pleural and parenchymal injury	1	10%	3	30%	4	40%
TOTAL	5	50%	5	50%	10	100%

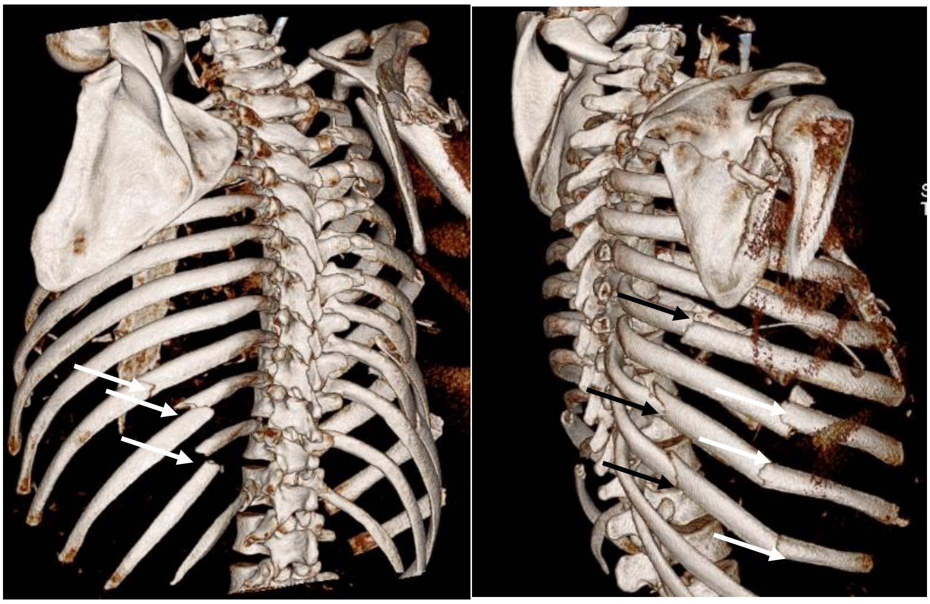
Table 3Distribution of the sample according to the radiological

Regarding the thoracic wall injuries it happened in 40% of the participants, 30% of them have rib fracture and the other 10% have dorsal spine fracture. Table (4)

Table (4): Distribution of the sample according to the radiological finding of thoracic wall injury.

Thoracic wall injury	male		female		total	
	No.	%	No.	%	No.	%
Rib fracture	1	10%	2	20%	3	30%
Sternal fracture	0	0%	0	0%	0	0%
Clavicular fracture	0	0%	0	0%	0	0%
Scapular fracture	0	0%	0	0%	0	0%
Dorsal spine fracture	0	0%	1	10%	1	10%
Surgical emphysema	0	0%	0	0%	0	0%
Chest wall haematoma	0	0%	0	0%	0	0%
TOTAL	1	10%	3	30%	4	40%

Table 4): Distribution of the sample according to the radiological finding of thoracic wall injury.



(a) *(b)*

Figure 7 : Three-dimensional CT image obtained from the same patient .(a) shows fractures of three contiguous ribs in the right side .(b) shows multiple displaced fractures of three contiguous ribs in the left side . Each rib has both a posterolateral fracture (white arrows) and a posterior fracture (black arrows), which together produce a flail segment.

While the pleural injuries which occur in all the participants the majority of it was haemo-pneumothorax (60%) 40% of it occur bilaterally and 10% for each left and right side, simple pneumothorax count 30% of it 20% on the right and 10% on the left, haemothorax only occur in 10 % of the participants all of them on the right. Table (5)

Table (5): Distribution of the sample according to the radiological finding of pleural injury

Table 5 Distribution of the sample according to the radiological finding of pleural injury

Pleural injury	right		left		bilateral		total	
	No.	%	No.	%	No.	%	No.	%
Haemothorax	1	10%	0	0%	0	0%	1	10%
Simple pneumothorax	2	20%	1	10%	0	0%	3	30%
Tension pneumothorax	0	0%	0	0%	0	0%	0	0%
Hydro-pneumothorax	0	0%	0	0%	0	0%	0	0%
Haemo-pneumothorax	1	10%	1	10%	4	40%	6	60%
TOTAL	4	40%	3	30%	4	40%	10	100%

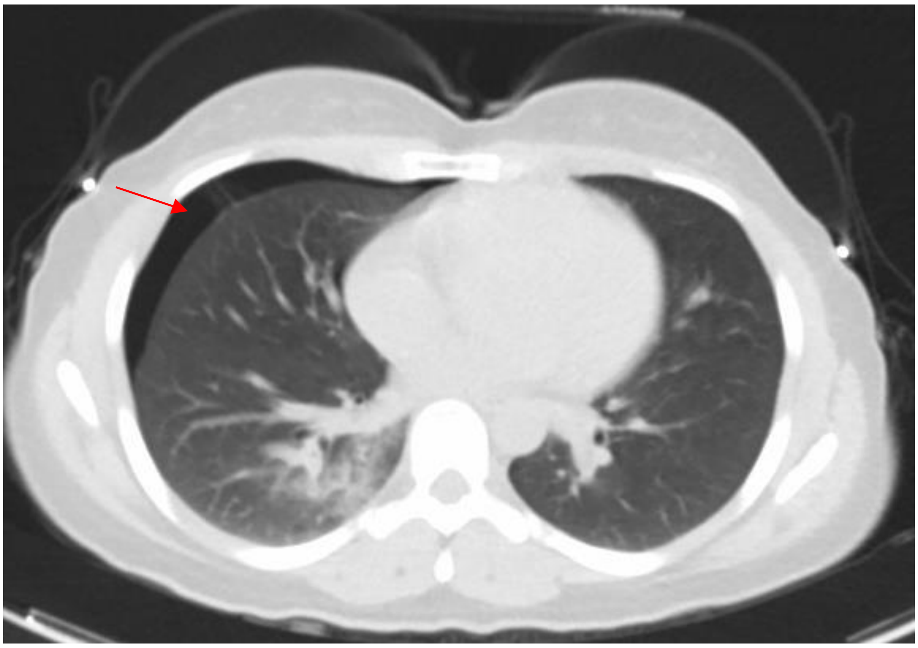


Figure 8: Axial MDCT in lung window reveals Right pneumothorax. (red arrow)

The lung parenchymal injuries occur in 50% of the participants all of it was lung contusion 30% occur bilaterally and 10% for each right and left side. Table (6)

Table (6): Distribution of the sample according to the radiological finding of lung parenchymal injury.

Lung parenchymal injury	right		left		bilateral		total	
	No.	%	No.	%	No.	%	No.	%
contusion	1	10%	1	10%	3	30%	5	50%
laceration	0	0%	0	0%	0	0%	0	0%
TOTAL	1	10%	1	10%	3	30%	5	50%

Table 6 Distribution of the sample according to the radiological finding of lung parenchymal injury.

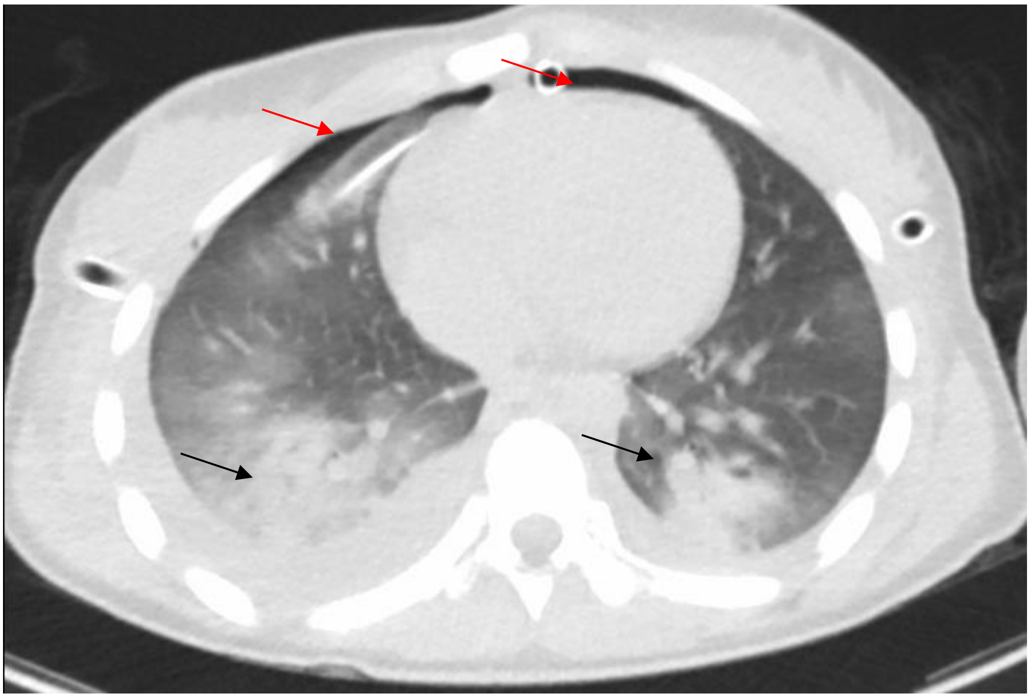


Figure 9 : Axial MDCT in lung window reveals areas bilateral nonsegmental air space consolidations with a posterior distribution due to blood filling of the alveolar spaces (black arrows). Also note a small pneumothorax with bilateral chest tube (red arrows)

For all those patients who have thoracic injuries chest tubing done for 70% of them. Figure (10)

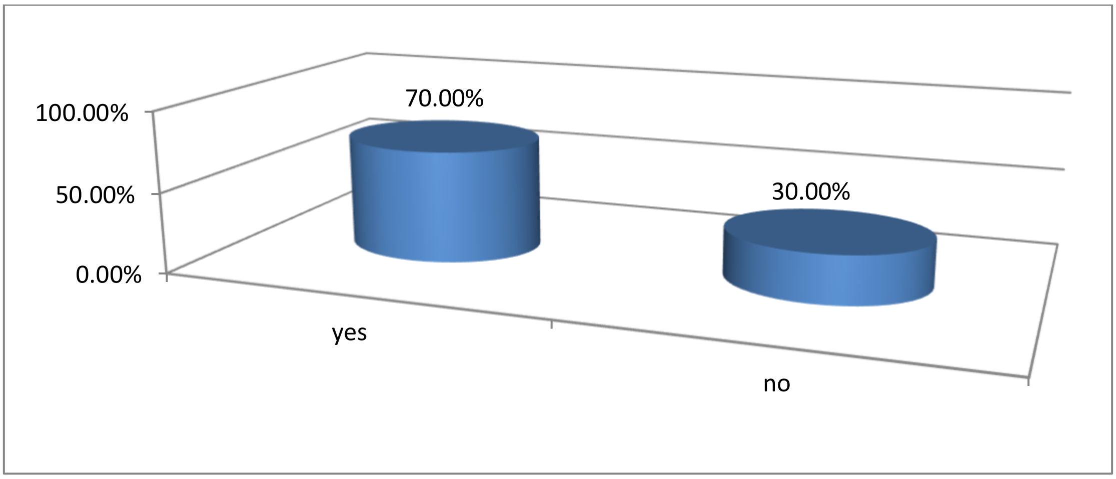


Figure 10: Distribution of the sample according to chest tube usage

Figure (10): Distribution of the sample according to chest tube usage

About the side of chest tube 30% of the 70% placed bilaterally ,30% on the right and only 10% on the left, while regarding the position of it 40% of the 70% placed intra-parenchymal and the other 30 % intra-pleural. Table (7)

Table (7): Distribution of the sample according to the chest tube side and position

	Chest tube position					
Chest tube side	**Intra-pleural**		**Intra-parenchymal**		**total**	
	No.	%	No.	%	No.	%
right	1	10%	2	20%	3	30%
left	1	10%	0	0%	1	10%
bilateral	1	10%	2	20%	3	30%
total	3	30%	4	40%	7	70%

Discussion

in this cross sectional study, 50% patients were male and other 50% were female however in other study Most of the patients were male (83.3%) this is probably explained by that our samples were randomly selected at specific period of time . [39]

In this study about 70% of traumas were caused by road traffic accident.in the study of Simon LV et al , it was found that the majority of serious traumatic injuries are due to blunt trauma from motor vehicle accident and pedestrian injuries ,This probably might be due to modern civilization and use of road traffic as main way to transportation ,in the absence of seat belt enforcement (among others traffic law). [40,41]

The most frequent age group participated in the study was between 20-30 years old similar to the study of William O. Odesanmi et al , this probably explain by most road traffic accident effected the productive age group since they are most mobile and more active so they are vulnerable to trauma. [42]

Regarding radiological findings, pleural injuries were the most common one similar to study of Recep damin et al. the reason may be explained by the fact that pleural injuries cause not only by direct trauma to the pleura, but also by a rupture of the alveoli or bronchi accompanied by increased pressure in the airways. [43,44]

While thoracic wall injuries were about 40% of the sample ,the vast majority of them was rib fracture ,similar to study of Recep damin et al [39] due to most of them were injured by blunt trauma and consequently rib fractures were high among them. [42]

The most common pleural injuries in this study was pneumothorax similar to study of Bassam Darwish et al as we said that injuries might be cause not only by direct trauma to the pleura, but also by a rupture of the alveoli or bronchi that lead to pneumothorax , An approximately two –third of them combined by hemothroax this probably explained by trauma itself , as complication of pulmonary contusion or malposition of chest tube. [41]]

In this study , the lung parenchymal injuries were 50% of sample all of them were lung contusion yet the lung contusion is the most common insult in blunt trauma while lung laceration was zere % due to small sample. [39] .

Tube thoracostomy was the main treatment modality for the majority (70%) of patients in our study and this goes with line of other study yet Tube thoracotomy is the choice of treatment in chest trauma complicated with rib fractures and haemopneumothorax. [41]] . however about 40% of chest tube were malpositioned (intra parenchymal) this probably due to insertion of chest tube in traumatic chest injuries occurs in suboptimal conditions nevertheless the diagnosis of malpostion is challenging require follow up as explain in the study of G GAYER, MD et al..[46-47]

Conclusion

1. Pleural injuries were the most common radiological finding in chest trauma patient isolated or accompanied by thoracic wall and lung parenchymal injuries.

2. Haemo-pneumothorax is the most common finding among the other pleural injuries.

3. Rib facture is the most common finding among the thoracic wall injuries.

4. Lung contusion is the most common finding among lung parenchymal injuries

Recommendation

- As MDCT can quickly and accurately help diagnose a variety of thoracic injuries in trauma patients we recommend it as essential imaging technique in evaluation of chest trauma patients in order to be diagnosed and managed correctly. .

- Further study should be done regarding diagnose of chest tube malposition by MDCT.

- The information provided by MDCT may lead to critical changes in patients' management; thus we recommend that clinicians, radiologists, and radiology residents should be familiar with the different aspects of MDCT evaluation of this subset of patients

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