Value of Multidetector CT Angiography in Evaluation of Vascular Injuries after Blunt Thoracic Trauma

Essay

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Amr Rashad Abbass

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LIST OF ABBREVIATION

Abbreviation	Meaning
CT	Computed Tomography
MSCT	Multi Slice Computed Tomography
MDCT	Multi Detector Computed Tomography
MSCTA	Multi Slice Computed Tomography Angiography
MIP	Maximum Intensity Projection
VR	Volume Rendering
3D	3 Dimensional
MPR	Multi Planar Reconstruction
CPR	Curved Planar Reconstruction
PACS	Picture Archiving and Communication System
MDCTA	Multi Detector Computed Tomography Angiography
TAI	Thoracic Aortic Injury
TAD	Thoracic Aortic Dissection
IRAD	International Registry of Aortic Dissection
IMH	Intra Mural Hemorrhage

INTRODUCTION
&
AIM OF WORK

In the modern age of high-speed vehicles and improved, coordinated emergency medical transportation, an increasing number of patients sustaining significant blunt chest trauma with thoracic aortic injury and blunt abdominal trauma are arriving alive at major trauma centers. To maximize survival, the physician managing such patients must be proficient at making an accurate diagnosis and prioritizing the approach to treatment (Fabian et al., 1997).

A variety of imaging modalities have been used to diagnose acute aortic disorders, including conventional aortography, ultrasonography (US), computed tomography (CT), and magnetic resonance (MR) imaging. The accuracy and ease of performing multi–detector row CT in patients in emergency settings who have presentations suggestive of aortic dissection or other aortic disorders have made this examination the first choice of referring physicians at hospitals (Hayter et al., 2006).

Assessment of thoracic vascular emergency is nowadays possible by using multirow CT angiography as a "one-stop shop" strategy. Thorough knowledge of anatomy, pathophysiology, and image rendering techniques, as well as precise description and

interpretation of thoracic vascular findings, are therefore essential in establishing the correct diagnosis and avoiding unnecessary and costly interventions (Alkadhi et al., 2004).

Multi–detector row computed tomographic (CT) angiography is an effective modality for vascular imaging in the thorax. It allows acquisition of high-resolution data sets during a single breath hold, making it the preferred method for evaluation of patients with acute vascular disease. The diagnoses can be established with multirow CT angiography in the emergency department. Thus, the time to diagnosis can be considerably decreased by obviating conventional angiography (Alkadhi et al., 2004).

Multirow CT angiography with two -and three-dimensional reformation can be used to diagnose vascular emergencies of the thorax after blunt and iatrogenic trauma (Alkadhi et al., 2004).

The introduction of multi–detector row CT has offered a number of advantages in the work-up strategy of emergency patients when compared with single-section CT. The shorter scanning time permits better opacification of the blood vessels and improved contrast material enhancement of parenchymal organs. Furthermore, faster data acquisitions allow multiple

consecutive CT examinations in the same patient in a shorter period of time (Novelline et al., 1999).

The Aim of This Work is:

To evaluate the utility and efficiency of multidetector CT angiography in the assessment of vascular injuries after blunt thoracic trauma.

VASCULAR ANATOMY OF THE THORAX

Major Thoracic Blood Vessels

The major blood vessels comprise the pulmonary trunk, the thoracic aorta and its branches, the superior and inferior venae cavae and their tributaries.

Arteries

1- PULMONARY TRUNK (fig 1-1)

The pulmonary trunk, or pulmonary artery, conveys deoxygenated blood from the right ventricle to the lungs. About 5 cm in length and 3 cm in diameter, it is the most anterior of the cardiac vessels and arises from the base of the right ventricle (from the pulmonary anulus surmounting the conus arteriosus) above and to the left of the supraventricular crest (Johnson and Shah., 2005).

It slopes up and back, at first in front of the ascending aorta, then to its left. Below the aortic arch it divides, level with

the fifth thoracic vertebra and to the left of the midline, into right and left pulmonary arteries of almost equal size. The pulmonary trunk bifurcation lies below, in front and to the left of the tracheal bifurcation (Johnson and Shah., 2005).

Relations

The artery is entirely within the pericardium, enclosed with the ascending aorta in a common tube of visceral pericardium. Anteriorly it is separated from the sternal end of the left second intercostal space by the pleura, left lung and pericardium. Posterior are at first the ascending aorta and left coronary artery, then the left atrium. The ascending aorta is finally on its right (Gabella., 1995).

An auricle and coronary artery are on each side of its origin. The superficial cardiac plexus is between the pulmonary bifurcation and the aortic arch; above, behind and right are the tracheal bifurcation, lymph nodes and nerves (Gabella., 1995).

Right Pulmonary Artery

Slightly longer and larger than the left artery, it runs horizontally to the right, behind the ascending aorta, superior vena cava and upper right pulmonary vein, then in front and below the tracheal bifurcation and thence in front of the oesophagus and right main bronchus to the right pulmonary hilum. It divides as it emerges from behind the superior vena cava into two large branches (Gabella., 1995).

Left Pulmonary Artery

Shorter and smaller than the right, it runs horizontally in front of the ascending aorta and the left principal bronchus to the left hilum. It emerges from within the concavity of the aortic arch and descends anterior to the descending aorta to enter the oblique fissure. The branches of the left pulmonary artery are extremely variable (Gabella., 1995).