Role of computed tomography (CT) in diagnosis of pericardial diseases

Essay

Partial Fulfillment of the Master Degree in Radiodiagnosis

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Dedication

I would like to thank my family especially my Parents and my Wife who encouraged and supported me all the time, to them I dedicate this work.

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List of Abbreviations

2D/3D	Two/ Three dimensional
AMI	Acute myocardial infarction
bSSFP	Balanced steady state free precession
BTFE	Balanced turbo field echo
CCT	Cardiac computed tomography
Cine	Cinema
CK	Creatine kinase
CMR	Cardiac magnetic resonance
CT	Computed tomography
CTR	Cardio-thoracic ratio
e.g.	For example
ECG	Electro-cardio-graphy (Electrocardiogram)
esp.	Especially
et al	And others
Fig.	Figure
Figs.	Figures
GRE	Gradient echo
HIV	Human immunodeficiency virus
i.e.	That is
IVC	Inferior vena cava
IVS	Inter-ventricular septum
LA	Left atrium
LV	Left ventricle
MFH	Malignant fibrous histiocytoma
MI	Myocardial infarction
ml	Milliliter
mm Hg	Millimeter mercury
MRI	Magnetic resonance imaging
MVP	Mitral valve prolapse
PA	Pulmonary artery
PA CXR	Postero-anterior chest x-ray
PMN	Poly-morph-nuclear white blood cells
PPD	Purified protein derivative
RA	Right atrium
RPA	Right pulmonary artery
RV	Right ventricle
SE	Spin echo
SLE	Systemic lupus erythematosus
SVC	Superior vena cava
T.B.	Tubercle bacillus
Tab.	Table
TTE	Trans-thoracic echocardiography

Abstract

Pericardial disease is an important cause of morbidity and mortality in patients with cardiovascular disease. Inflammatory diseases of the pericardium constitute a spectrum ranging from acute pericarditis to chronic constrictive pericarditis. Other important entities that involve the pericardium include benign and malignant pericardial masses, pericardial cysts, and diverticula, as well as congenital absence of the pericardium ***(Yared et al., 2010)***

Echocardiography is the method of choice for evaluating most pericardial diseases. When competently performed in patients with good acoustic windows, echocardiography accurately detects all pericardial effusions and provides clinically relevant information about their size and hemodynamic importance. The technique is less reliable than magnetic resonance imaging (MRI) and computed tomography (CT) in detecting pericardial thickening/constriction and calcification as well as small loculated effusions, but is still extremely useful in these conditions. ***(Foster et al., 2011)***

In the evaluation of pericardial diseases, computed tomography (CT) and magnetic resonance (MR) imaging traditionally have been used as adjuncts to echocardiography. However, CT is particularly useful as sensitive and noninvasive

methods for evaluating loculated or hemorrhagic pericardial effusion, constrictive pericarditis, and pericardial masses. CT provides excellent delineation of the pericardial anatomy and can aid in the precise localization and characterization of various pericardial lesions, including effusion, constrictive pericarditis and pericardial thickening, pericardial masses, and congenital anomalies such as partial or complete absence of the pericardium. It provides a larger field of view than does echocardiography, allowing the examination of the entire chest and detection of associated abnormalities in the mediastinum and lungs. Soft-tissue contrast on CT scans is superior to that on echocardiograms. Given the many potential applications of these modalities in the evaluation of pericardial diseases, familiarity with the CT features of these diseases is important.

(Wang et al., 2003)

The pericardium, consisting of a fibroserous sac that encloses the heart, is routinely imaged on CT. Multidetector technology, in allowing rapid acquisition of volumetric data in high resolution and multiplanar reformation, has improved anatomic imaging. Imaging with narrow collimation results in improved delineation of cardiovascular anatomy. The pericardial space normally contains a small amount of fluid (15–20 ml), and the fluid-filled recesses and sinuses can be misinterpreted as adenopathy or abnormality of an adjacent mediastinal structure.

In oncologic imaging, staging and prognostic implications of fluid in a pericardial recess misinterpreted as adenopathy can significantly alter management and therapy ***(Truong et al., 2003).***

AIM OF WORK

The aim of this essay study is to evaluate the role of CT in the diagnosis of pericardial diseases and to show the limitations of other modalities.

Key words

Role - CT- pericardial diseases

CHAPTER (1) ANATOMY

Pericardial Embryology

In the 25th day; the embryo consists of three cell layers, ectoderm, mesoderm and endoderm. The lateral plate mesoderm becomes split in the extraembryonic region into two layers, one covering the umbilical vesicle (The visceral layer) which forms the **splanchnopleura** together with the adjacent endoderm. The other one covers the amniotic cavity (The parietal layer) which together with the adjacent ectoderm is named **somatopleura**. As a result of uneven growth of the lateral plate mesoderm, it creates small, fluid-filled cleavages. These spaces fuse forming the pericardial cavity in the area of the head that corresponds to the cranial part of the U-shaped intraembryonic coelom. From the 25th day to the 28th day; the formation of the head fold occurs via cranial flexion of the embryo through a 180 degree rotation, making, the future outflow tract (arterial pole), which lies caudally to the inflow tract (venous pole) at the start of the cardiac formation, lies cranially. ***(Singh, 2014)***

The pericardial cavity expands on both sides of the cardiac anlage and invaginates the myocardiac mantle with the cardiac loop, resulting in the formation of the **mesocardium** being transiently formed on the dorsal side of the cardiac loop.

(Shabetai, 2012)

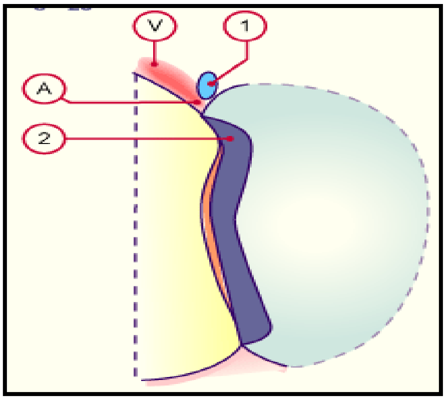

Fig. 1 Position of the pericardium before the rotation. The pericardial cavity as well as the cardiogenic plate lie cranially to the embryonic anlage. The pericardial cavity is found dorsal to the cardiogenic tissue. The venous (inflow tract) parts of the cardiac anlage.is found more cranially than the arterial (outflow tract).**A**=Arterial part (outflow tract), **V**=Venous part (inflow tract), **1**=Pericardial cavity, **2=**Cranial end of the embryo.

(Moore et al., 2015)

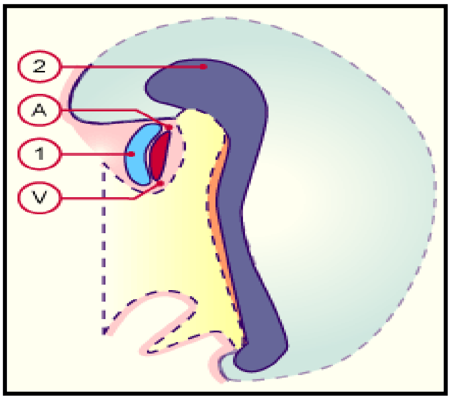

Fig. 2 Position of the pericardium after the rotation. After the 180 degree rotation, the pericardial cavity is found ventral to the cardiac anlage, also the venous part (inflow tract) of the cardiac anlage now lies caudal to the arterial