The Role of MRI in Assessment of Cardiac Tumors

Essay

Submitted for Fulfillment of
Master Degree in Radiodiagnosis

By

Mohammed Nabil Morgan
M.B, B.Ch

Under Supervision Of

Prof. Dr. Laila Ahmad Abdurrahman

Professor of Radiodiagnosis

Faculty of Medicine – Ain Shams University

Dr. Remon Zaher Elia

Lecturer of Radiodiagnosis

Faculty of Medicine – Ain Shams University

Faculty of Medicine
Ain Shams University
٢٠١٢

List of Contents

List of Abbreviations

Abbreviation	Word
AoA	Ascending aorta
Ao	Aorta
CMR	Cardiac Magnetic Resonance
CT	Computed tomography
ECG	Electrocardiography
FIESTA	Fast Imaging Employing STeady –State Acquisition
FSE-IR	Fast spin echo inversion recovery
IR	Inversion recovery
IR-GRE	Inversion-Recovery Gradient Echo
IVC	Inferior vena cava
I ١٣١ MIBG	Iodine ١٣١ metaiodobenzylguanidine
LA	Left atrium
LAA	Left atrial appendage
LV	Left ventricle
Li	Liver
MRI	Magnetic resonance imaging
MP	Main pulmonary artery
RA	Right atrium
RAA	Right atrial appendage
RV	Right ventricle
RVOT	Right ventricular outflow tract
PA	Pulmonary artery
SA	Short axis
SE	Spin echo
SVC	Superior vena cava
SP	Spleen
SPGR	SPoiled Gradient Echo
SSFP	Steady-State free Precession
St	Stomach

List of Figures

Introduction

Aim of the Work

Acknowledgement

First great thanks to "Allah" who gave me the power to complete this work. Without his care nothing could be achieved.

I am so grateful and most appreciative to the efforts of *Dr. Laila Ahmad Abdurrahman* Professor of Radiodiagnosis Faculty of Medicine, Ain Shams University.

No words can express what I owe her for her endless patience and continuous advice and support.

Also I would like to express my thanks to *Dr. Remon Zaher Elia* Lecturer of Radiodiagnosis Faculty of Medicine, Ain Shams University, for his kind assistance and valuable instructions.

Finally, I am deeply thankful and indebted to my family for their kind support and love.

M. Nabil

سورة البقرة الآية: ٣٢

Introduction

The overall frequency of cardiac tumors is quite low, with an estimated cumulative prevalence of ٠,٠٠٢٪–٠,٣٪ at autopsy and ٠,١٥٪ in echocardiography. The majority of primary cardiac tumors are benign; of these, myxoma is by far the commonest, with lipomas and fibromas occurring less frequently **(Sparrow et al., ٢٠٠٥).**

Metastatic involvement of the heart is approximately ٤٠ times more prevalent than primary cardiac tumors. Metastatic spread can be by direct invasion (from adjacent neoplasms such as those of the bronchus and breast), hematologic spread (such as malignant melanoma, lymphoma, or leukemia), or transvenous spread through the great veins (such as renal cell carcinoma or hepatoma) **(Sparrow et al., ٢٠٠٥).**

MRI techniques produce high spatial, contrast, and temporal resolution image data for evaluation of cardiac and great vessel anatomy, regional tissue characterization, vascular blood flow, cardiac chamber filling and contraction, regional myocardial dynamics, and myocardial perfusion **(Boxt and Lipton, ٢٠٠٨).**

MRI produces series of tomographic images of the heart and great arteries in arbitrary section, allowing tailoring of an

examination to address a specific clinical problem or a systematic analysis of cardiac structure and physiological function **(Boxt and Lipton, ٢٠٠٨).**

Recognition of a particular or general abnormality is based on recognition of variance between the instant image data at hand and the expected normal appearance of the heart and great arteries **(Boxt and Lipton, ٢٠٠٨).**

Anatomy as portrayed by MRI significantly differs from that observed in the dissection lab or operating room. MRI views these structures in tomographic images. That is, rather than viewing the entire organ and its relationship with surrounding organs, views the heart in slices **(Boxt and Lipton, ٢٠٠٨).**

Aim of the Work

The aim of this work is to evaluate the role of cardiac magnetic resonance imaging (CMRI) in assessment of cardiac tumors.

Gross Anatomy of the Heart

The heart is a hollow, fibromuscular organ of a somewhat conical or pyramidal form, with a base, apex and a series of surfaces and 'borders'; enclosed in the pericardium, it occupies the middle mediastinum (figure ١) between the lungs and their pleural coverings. It is placed obliquely behind the body of the sternum and the adjoining costal cartilages and ribs. Approximately one-third of the heart lies to the right of the midline (figure ٢) **(Johnson et al., ٢٠٠٨).**

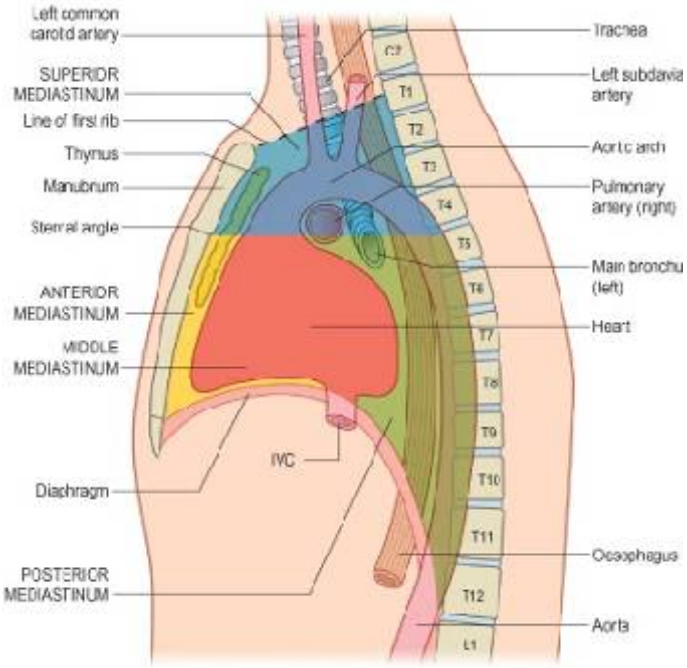

Fig. (١): The major divisions of the mediastinum **(Shah p et al., ٢٠٠٨).**

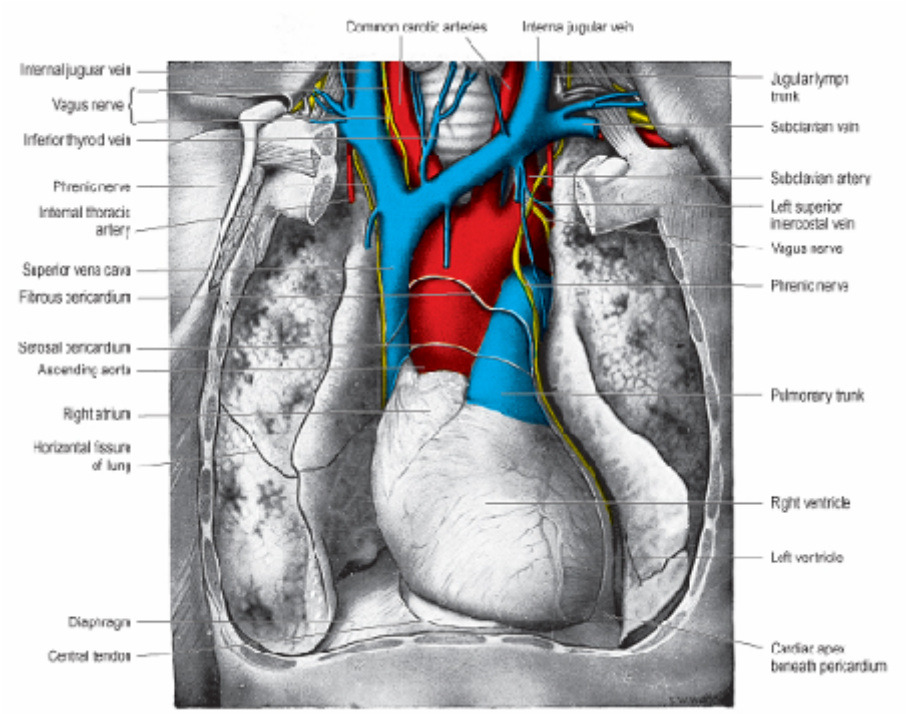

Fig. (٢): Dissection that displays the heart, the great vessels and the lungs in situ. The sternum and the sternal ends of the costal cartilages, together with the parietal pleura on each side, have been excised and the mediastinal pleura and parietal layer of the pericardium over the sternocostal surface of the heart have been removed. The lungs have been displaced to expose the heart and the epicardium dissected off the heart and roots of the great vessels. On the right side, the inferior cardiac branch of the vagus nerve descends between the brachiocephalic artery and the right brachiocephalic vein. On the left side, a communication descends from the left superior intercostal vein and crosses the aortic arch and the left pulmonary artery to become continuous with the oblique vein of the left atrium **(Shah P et al., ٢٠٠٨).**

The heart surfaces:

- The anterior (sternocostal) surface comprises the: right atrium, atrioventricular groove,right ventricle, a small strip of left ventricle and the auricle.
- The inferior (diaphragmatic) surface comprises the: right atrium, atrioventricular groove and both ventricles separated by the interventricular groove.
- The posterior surface (base) comprises the left atrium receiving the four pulmonary veins **(Faiz and Moffat, ٢٠٠٢).**

Margins and borders:

Some general descriptions of cardiac orientation refer to right, left, inferior (acute) and obtuse margins:

- The right and left margins are the same as the right and left pulmonary surfaces of the heart.
- The inferior margin is defined as the sharp edge between the anterior and diaphragmatic surfaces of the heart it is formed mostly by the right ventricle and a small portion of the left ventricle near the apex.
- The obtuse margin separates the anterior and left pulmonary surfaces it is round and extends from the left auricle to the