MRI Imaging of Cardiomyopathies

Essay

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تصوير مرض اعتلال عضلة القلب بالرنين المغناطيسي

رسالة

توطئه للحصول علي درجة الماجستير
في ألاشعة التشخيصية

مقدمة من

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Summary

At present, MRI is probably the best technique for studying cardiomyopathies, MRI is better than echocardiography in determining the type of cardiac hypertrophy. Myocardial hypertrophy (concentric, asymmetric) can be the result of a variety of disorders. A combination of serial MRI sequences may be extremely helpful in the differential diagnosis.

MRI plays an important role in differentiating between various types of cardiomyopathies using different sequences of MRI combined with contrast enhanced images.

Cardiac MRI has become an important imaging technique for the diagnosis and follow up of cardiomyopathies. cardiac MRI allows an accurate evaluation of myocardial morphology, function, perfusion, and tissue damage in a non invasive way. For these reasons, cardiac MRI has become an important diagnostic tool for cardiomyopathies and is the new reference standard for the assessment of cardiac function.

MRI is of good diagnostic value in differentiating between different types of cardiomyopathies with special emphasis to hypertrophic and restrictive cardiomyopathies where it can precisely detect the structural changes in the

بسم الله الرحمن الرحيم

قَالُوا سُبْحَانكَ لاَ علِمَ لَنَا إِلاّ مَا

عَلّمْتَنَا إِنَّكَ أَنتَ الْعَلِيمُ الْحَكِيمُ

صدق الله العظيم

سورة البقرة آية (٣٢)

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List of abbreviations

4ch : Four chambers
AO : Ascending aorta
ARVD : Arrhythmogenic right ventricular dysplasia
AV node : Atrioventricular node
b.SSFP : Balanced steady state free precession
CE-IR : Contrast enhanced inversion recovery
CMPs : Cardiomyopathies
Ct : Crista terminals
DCM : Dilated cardiomyopathy
EPI : Echo planar imaging
FSE : Fast spin echo
Gd-DTPA : Gadolinium DTPA
GE : Gradient echo
GRE.EPI : Gradient echo-echo planar imaging
HCM : Hypertrophic cardiomyopathy
HLA : Horizontal long axis
IR : Inversion recovery
LA : Left atrium
LAAP : Left atrial appendage
LAD : Left anterior descending coronary artery
LCC : Left coronal cusps
Lcx : Left Circumflex coronary artery
LMS : Left main stem
LPA : Left pulmonary artery
LV : Left ventricle
LVOT : Left ventricle outflow tract
MRI : Magnetic resonance imaging
NCC : Non-coronal cusps
NSSR : Non-surgical septal reduction
PA : Pulmonary artery
PCA : Right coronary artery
PTSMA : Percutaneous transluminal septal myocardial ablation
PRESTO : Precoding inversion recovery
RAAP : Right atrial appendage
RBC : Red blood corpuscles
RCC : Right coronal cusps
RF : Radiofrequency
RPA : Right pulmonary artery
RV : Right ventricle

RVOT : Right ventricle outflow tract
SA : Short axis
SEMRI : Spin-echo MRI
SENSE : Sensitivity encoding
SNR : Signal to noise ratio
SR : Saturation recovery
STIR : Short tau inversion
SVC : Superior vena cava
TI : Time of inversion
TOF : Time of flight
TR : Time of recovery
TSR : Turbo spin echo
VCG : Vector cardiography
VLA : Vertical long axis

Introduction

Cardiomyopathies (CMPs) are myocardial diseases that involve the heart muscle itself resulting in contractile and relaxation dysfunction of both ventricles leading to progressive chamber dilatation and then hypocontractile walls. They are classified as dilated CMP, hypertrophic CMP, restrictive CMP, arrhythmogenic right ventricular (RV) CMP, specific CMP, and non-classified CMP ***(Kramer et al., 2008).***

Cardiac magnetic resonance imaging (MRI) is a noninvasive tool which is able to diagnose and differentiate cardiomyopathies in a single study. The assessment of essential information such as alterations of myocardial and ventricular geometry and function is possible with a high degree of accuracy and reproducibility, based on a small inter- and intra-observer variability. Thus, very small morphological and functional changes in different types of cardiomyopathy are detectable, thereby enabling the cardiologist to increase the safety of therapeutic decisions. Furthermore, MRI bears the potential to characterize tissue transformation in the different types of myocardial affections including ischemic, toxic, infiltrative or inflammatory forms ***(Richardson et al., 2006).***

Cardiac MRI has become an important imaging technique for the diagnosis and follow up of CMP. In fact, echocardiography, usually the first step in CMP evaluation, has some pitfalls, mainly its limited acoustic window. On the contrary, cardiac MRI allows a reproducible and accurate

evaluation of myocardial morphology, function, perfusion, and tissue damage in a noninvasive and “one-stop shop” way. For these reasons, cardiac MRI has become an important diagnostic tool for CMP and is the new reference standard for the assessment of cardiac function ***(Earls et al., 2002)***.

MRI plays an important role in managing patients with cardiomyopathies by determining the presence or extent of ischemic scar or interstitial fibrosis using viability imaging. Delayed enhancement MRI is an excellent technique for accurate, reproducible detection and quantification of myocardial scar ***(Lori et al., 2009)***.

Aim of the Work

To evaluate the role of MRI in the diagnosis, assessment of severity and follow-up of cases of cardiomyopathies.