

Protocol



Role of Multidetector Computed Tomography in Evaluation of Myocardial Viability

Essay

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*Master Degree in Radiodiagnosis***

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Contents:

1. Introduction and aim of the work.

Introduction

Despite a recent decline, ischemic heart disease (IHD) is the commonest cause of premature death in the developed world. **(Sutton, 2006)**

The most serious manifestation of myocardial ischemia is contractile dysfunction. Jeopardized myocardium that manifests improved function after appropriate therapy is deemed **viable** in contrast to persistently dysfunctional, **nonviable** myocardium typically the result of completed infarction. **(Gropler et al, 1991)**

Left ventricular function is a major predictor of outcome in patients with coronary artery disease. Acute ischemia, postischemic dysfunction (stunning), myocardial hibernation, or a combination of these 3 are among the reversible forms of myocardial dysfunction. **(Birnbaum et al, 1996)**

Several treatment options have been developed for patients with left ventricular dysfunction. Significant progress has been achieved with medical treatment, including angiotensin converting enzyme inhibitors, spironolactone, and low dose β -blocking agents.**(Schinkel et al, 2005)** The available treatment choices, other than medical therapy, are cardiac transplantation and myocardial revascularization (coronary artery bypass surgery (CABG) or percutaneous transluminal coronary angioplasty (PTCA)). **(Maddahi et al, 1994)**

Myocardial revascularization in patients with viable myocardium can improve ventricular dysfunction and long-term survival, whereas revascularization in patients with predominantly nonviable myocardium increases exposure to the unnecessary risk of invasive procedures and increases late mortality. (*Lardo et al, 2006*)

Viability testing should be performed using one of the non-invasive imaging techniques, and based on the findings, the treatment can be tailored to the individual patient. (*Schinkel et al, 2005*)

There are essentially multiple imaging modalities for assessment of Myocardial Viability in clinical practice today such as echocardiography, single photon emission computed tomography, positron emission tomography (PET), and magnetic resonance (MR) imaging. (*Setser et al, 2005*)

Echocardiography is popular because it is relatively economical, portable, and widely available. Stress echo has numerous limitations that impair its sensitivity. Optimal acoustic windows are often difficult to obtain. Echocardiography is generally assessed qualitatively with high interobserver variation. Lastly, diagnostic accuracy is reduced in the setting of increasing extents of regional and global LV dysfunction. (*Wu et al, 2003*)

Nuclear scintigraphy with Single-photon emission computed tomography (SPECT) with ²⁰¹thallium (²⁰¹Tl) has been widely utilized for this purpose. This technique is fairly easy to perform with widely available equipment. However, a meta-analysis has shown that it can overestimate viability with a specificity of 49%, although the sensitivity is high (88%). (*Grand et al, 2006*)

With **PET**, positron-emitting radionuclides are utilized to obtain tomographic images of regional myocardial perfusion, metabolism and receptor density. (*Maddahi et al, 1994*) Although long considered the gold standard for viability assessment, PET has not been widely available, largely because of its high equipment and operational costs. (*Wu et al, 2003*)

Magnetic resonance imaging (MRI) is well established for the assessment of myocardial viability. (*Grand et al, 2006*). The assessment of both myocardial viability and infarct morphology with delayed contrast-enhanced MRI has been well validated over the past several years. However, as the clinical indications for implantable cardiac defibrillators and biventricular pacing therapy continue to expand, development and validation of alternative imaging modalities with similar anatomic, functional, and viability imaging capabilities are needed to accommodate this growing population of patients who are not candidates for MRI. (*Lardo et al, 2006*)

CE-MDCT (Contrast Enhanced Multidetector computed tomography) imaging of myocardial viability allows for the identification of the same contrast-enhancement patterns as CE-MR (contrast enhanced MR). This places CE-MDCT in a favorable position relative to other technologies for the assessment of myocardial viability in patients with coronary artery disease. (*Gerber et al, 2006*)

The recent advent of **Multidetector Computed Tomography (MDCT)** technology has greatly improved spatial and temporal resolution over conventional single-slice computed tomography imaging and has expanded its potential for a more comprehensive evaluation of myocardial viability.

Delayed MDCT myocardial imaging can accurately identify and characterize morphological features of acute and healed myocardial infarction, including infarct size, transmural, and the presence of microvascular obstruction and collagenous scar. (*Lardo et al, 2006*)

Aim of the work:

The aim of this study is to highlight the role of Multidetector Computed tomography in evaluation of Myocardial Viability.

2. Radiological Anatomy of the Heart.

3. Pathology of Ischemic Heart Disease and Myocardial Viability.

4. Physical and Technical aspects of Multidetector CT in cases of Ischemic Heart Disease.

5. Manifestations of Multidetector CT in evaluation of Myocardial Viability with illustrative cases.

6. Summary and Conclusion.

7. References.

8. Arabic Summary.

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المقدمة والمدفوع من البحث

أمراض انسداد شرايين القلب تعتبر السبب الأساسى للوفاة المبكرة فى دول العالم المتقدم .

إن أخطر أعراض أمراض انسداد شرايين القلب هو الخلل الوظيفى فى انقباض عضلة القلب التى تعتبر حية اذا حدث تحسن فى عملها بعد استخدام العلاج المناسب على عكس العضلة غير الحية التى لا تبدى أى تحسن.

إن وظيفة عضلة البطين الأيسر تعتبر مؤشر قوى للتكهن بتطور حالة هؤلاء المرضى، كما أن قابلية الخلل الوظيفى بعضلة القلب للإصلاح يعتبر مؤشر هام خاصة عند التخطيط للعلاج المناسب بالأدوية أو اجراء جراحة قنطرة شرايين القلب أو عمل قسطرة لتوسيع الشرايين و تركيب دعامات.

العديد من الدراسات تؤكد حدوث تحسن ملحوظ فى وظيفة عضلة القلب بعد اجراء هذه الجراحات فى غالبية حالات الخلل الوظيفى بها عندما تكون عضلة القلب بها خلل وظيفى لكنها فى الوقت نفسه حية. لذلك فان التمييز بين عضلة القلب الحية التى بها خلل وظيفى و بين عضلة القلب غير الحية أمر هام جدا لتحديد العلاج المناسب و جدوى الجراحة لهؤلاء المرضى.

يوجد الآن العديد من وسائل التصوير التشخيصى التى تستخدم لتقييم حيوية عضلة القلب مثل تخطيط صدى القلب، التصوير الومضائى بالنظائر المشعة، التصوير المقطعى البوزيترونى، الأشعة المقطعية متعددة اللواقط ، و التصوير بالرنين المغناطيسى.

تخطيط صدى القلب له انتشار واسع لأن تكلفته قليلة و متوافر بكثرة لكن له عدة عيوب مثل عدم دقة التقييم و وجود فوارق في النتائج حسب كفاءة المشاهد.

التصوير الومضائي بالنظائر المشعة انتشر استخدامه لنفس الغرض بسبب سهولته و توافره لكنه قد يخطئ في التقييم.

التصوير المقطعي البوزيتروني له دور هام فى تقييم حيوية عضلة القلب إلا أن استخدامه محدود لعدم توافره و تكلفته العالية.

التصوير بالرنين المغناطيسي فعال في تقييم حيوية عضلة القلب لكن بسبب موانع استعماله كان من الضروري ايجاد وسيلة أخرى لها نفس القدرات التصويرية.

الأشعة المقطعية متعددة اللواقط بالصبغة تعطى نتائج مشابهة للرنين المغناطيسي ،بالإضافة إلي ذلك فإن التطور الذي حدث في هذا الجهاز أدى الى تحسن كبير فى القدرة على توضيح دقائق الصورة.

الأشعة المقطعية متعددة اللواقط تحدد بدقة الخصائص الشكلية لاحتشاء عضلة القلب الحاد و الملتئم متضمنا حجم الجزء المصاب وعمقه و وجود انسداد بالشرابين الدقيقة او وجود ندبة . إذن ، الأشعة المقطعية متعددة اللواقط باستخدام الصبغة لها وضع ملائم ومحبذ بالنسبة لوسائل التصوير الأخرى فى تقييم حيوية عضلة القلب.

الهدف من البحث:

الهدف من هذا البحث هو توضيح دور الأشعة المقطعية متعددة اللواقط فى تقييم حيوية عضلة القلب.

المحتويات

. المقدمة والهدف من البحث

. التشريح الأشعاعى للقلب

. باثولوجيا امراض انسداد شرايين القلب و حيوية عضلة القلب

. المبادئ الفيزيائية و تقنيات الفحص بالأشعة المقطعية متعددة
اللواقط فى حالات امراض انسداد شرايين القلب

. دور الأشعة المقطعية متعددة اللواقط فى تقييم حيوية عضلة القلب
مصحوبة بالحالات التوضيحية

. الملخص و الاستنتاج

. المراجع

. الملخص بالعربية



دور الأشعة المقطعية متعددة اللواقط في تقييم حيوية عضلة القلب

بحث
مقدم كجزء متمم للحصول على درجة
الماجستير في الأشعة التشخيصية

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٢٠٠٧

List of Figures

Fig. no.	Title	Page no.
Fig.1.	Frontal view of the heart.....	7
Fig.2.	Axial CT scan of heart.....	7
Fig.3.	Coronal view of the heart with 4 chambers.....	8
Fig.4.	Axial CT scan of heart with four chambers....	9
Fig.5.	Axial CT scan of the heart with left and right coronary arteries.....	10
Figs. 6.1-6.26	Normal anatomy of the heart, as displayed in a contrast-enhanced ECG-gated 16-detector computed tomographic acquisition. The discussion of anatomy as depicted in axial section is supplemented by additional views reconstructed from the original axial data sets.....	11-19
Fig.7.	Axial contrast-enhanced CT scan shows a filling defect projecting from the lateral wall into the right atrium. The filling defect is seen in the characteristic location of the crista terminalis.....	22
Fig.8.	Contrast-enhanced CT scan shows areas of fat attenuation within the interatrial septum, findings that are consistent with LHIS. The fat spares the fossa ovalis, which should not be mistaken for an atrial septal defect.....	23
Fig.9.	(a) Drawing illustrates a cutaway view of the right ventricle. Arrowheads indicate the anterior and posterior papillary muscles; open arrow indicates the moderator band. (b, c) Axial contrast-enhanced CT scans show the anterior papillary muscle and the moderator band.....	26
Fig.10.	(a) Contrast-enhanced CT scan of the heart shows a modified long-axis view of the anterior papillary muscle. The thin chordae tendineae extending to the anterior and posterior mitral valve leaflets. (b) Contrast-	

	enhanced CT scan of the heart shows a modified long-axis view of the posterior papillary muscle and chordae tendineae.....	29
Fig.11.	Drawing illustrates a cutaway view of the anterior aspect of the heart. Note how the pericardium extends superiorly to cover the great vessels.....	31
Fig.12.	Pericardial recesses and sinuses. (a) Drawing illustrates the pericardial sac with the heart removed. (b, c) Axial contrast-enhanced cardiac-gated images of the heart obtained at (b) and inferior to (c) the level of the right inferior pulmonary vein show areas of fluid attenuation anterior, posterior, and inferior to the vein.....	31
Fig.13.	(a) Axial contrast-enhanced CT scan shows fluid in the anterior portion of the superior aortic recess, a finding that can sometimes be mistaken for aortic dissection. A small amount of fluid is also seen posterior to the ascending aorta in the posterior portion of the superior aortic recess. (b) Axial contrast enhanced CT scan obtained cephalad to (a) shows the superior extension of the superior aortic recess, which now lies in a right paratracheal location.....	33
Fig.14.	(a) Axial contrast-enhanced CT scan shows a small amount of fluid in the transverse sinus posterior to the ascending aorta. The transverse sinus extends laterally, where it communicates with the left pulmonic recess inferior to the left pulmonary artery. (b) Axial contrast-enhanced CT scan obtained slightly superior to (a) shows fluid in the left pulmonic recess.....	33
Fig.15.	(a) Axial contrast-enhanced CT scan shows a small collection of fluid in the posterior pericardial recess located below the level of the carina. (b, c) Axial contrast enhanced CT scans obtained inferior to (a) demonstrate the continuity between the posterior pericardial recess and the oblique sinus.....	34

Fig.16.	Coronary arteries and veins in left anterior oblique view.....	35
Fig.17.	Coronary artery anatomy at CT. (a) Oblique volume-rendered image of the top of the heart shows the origins of the right and left main coronary arteries, which demonstrate high-attenuation calcifications. (b) Coronal oblique volume-rendered and maximum intensity projection.....	37
Fig.18.	RCA. (a) Axial CT image shows origin of the RCA from the aorta and extension into the right atrioventricular groove. The artery is minimally calcified. (b) Coronal oblique volume rendered image shows the caudal course of the proximal RCA. (c) Coronal oblique volume-rendered image shows the RCA coursing in the groove between the right atrium (RA) and right ventricle (RV). (d) Posterior coronal oblique volume-rendered image shows the RCA, PDA branch, and posterolateral left ventricular branch.....	38
Fig.19.	Electron beam CT image shows mid RCA following right atrioventricular sulcus. This mid segment of artery is shown in cross section.....	39
Fig.20.	Proximal branches of right coronary artery (RCA). A, EBCT image shows conus branch of RCA. This branch passes anteriorly and upward over pulmonary trunk and right ventricular outflow tract. B, EBCT image shows acute marginal branch (AM) of RCA. This branch follows acute margin of heart.....	39
Fig.21.	PDA. (a, b) Coronal oblique maximum intensity projection images show the PDA branch and posterolateral left ventricular branches of the RCA.....	40
Fig.22.	Left main coronary artery. (a); Axial CT image shows origin of the left main coronary artery from the aorta. (b–d); Axial oblique (b) and coronal oblique (c, d) volume-rendered images show bifurcation of the left main	