Can technetium-99m Sestamibi SPECT Predict the Presence of Chronic Total Occlusion in Patients with Coronary Artery disease and No Evidence of Previous Myocardial Infarction

Thesis

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LIST OF ABBREVIATION

^{18}F-FDG	: ^{18}flouorine fluor deisxy glucose.
^{99m}Tc	: Technetium 99m
ATP	: Adenosine triphosphate
CAD	: Coronary artery disease
CCU	: Cardiac care unit
CK	: Creatinine kinase
CPI	: Carboxyisopropyl isonitrile
CT	: Computed tomography
CTO	: Chronic total occlusion
DM	: Diabetes mellitus
ECG	: Electrocardiography
Echo	: Echocardiography
FGF	: Fibroplastic growth factor tomography
IAVs	: Interconnecting anastomotic vessels
LAD	: Left anterior descending artery
LBBB	: Left bundle branch block
LCX	: Left circumflex artery.
LIMA	: Left internal mammary artery
LV	: Left ventricle.
LVEF	: Left ventricular ejection fraction
MI	: Myocardial infarction
MIBI	: Methoxyisobutyl isonitrile
M-Mode	: Motion mode
MRI	: Magnetic resonance imaging.
MSCT	: Multislice computed tomography
No	: Nitric oxide

No.	: Number
PCI	: Percutaneous coronary intervention
PDA	: Posterior descending artery
PET	: Pitrson emission tomography.
PT	: Patient
RCA	: Right coronary artery
RSTD	: Remote ST segment depression.
RV	: Right ventricle
SD	: Standard deviation
SPECT	: Single- photon emission computed tomography
TBI	: Technetium Butly isonitrile
Tc-99m	: Technetium 99m
TL-201	: Thallium-201
VEGF	: Vascular endothelial growth factor

Dedication

To The Soul of My Grand Father
To The Soul of My Mother
To the Soul of My Father
To My Sister & Brother

INTRODUCTION

Coronary heart disease is a leading cause of death in adults, accounting for more than one fourth of all deaths in individuals over the age of 35 years. **(Montbly ., 1989).**

Patients with chronic coronary artery disease and chronic total occlusion are defined as TIMI 0 are TIMI 1 type flow in the artery for more than three months. They have a more severe course of coronary artery disease. Thus, they more often suffer myocardial infarction and high grades of angina. Myocardial function is much more affected if there is occlusion of the left anterior descending artery or there are no signs of callaterals. **(Savchento et al., 2000).**

Stress myocardial perfusion study is an important component of clinical evaluation, stratification and management of these patients. Tc-99m sestamibi and thallium imaging have similar accuracy when used for assessing myocardial viability. **(Maddahi et al., 1990).**

Because of long half life of TI-201 which limits the injected dose of 3 to 4 Mci resulting in relatively low count density of images. This has encouraged the development and clinical testing of several Tc-99 m labeled myocardial perfusion tracers. **(Sinusas et al., 1990).**

Tc-99m sestamibi, like TI- 201 is positively charged particle, but its transport across the cell membrane is not dependent on ATP due to its high lipophilicity. Once inside cells, it is predominantly (84%) bound to the mitachondria and is directly related to myocardial blood flow over a wide range of flow rates with a “roll- off” in uptake occuring at high flow rates similar to that observed with TI- 201. **(Jones et al., 1990).**

At low flow rates Tc-99m sestamibi overestimates myocardial blood flow. This effect is most pronounced in myocardium with significant collateral flow and preserved viability, consistent with overextraction or redistribution of the tracer. This is markedly decreased in non viable myocardium regardless of blood flow. **(Chareonthaitawee et al., 2000).**

By convention when interperting myocardial perfusion SPECT study, reversible perfusion defects are considered to be ischemic areas. Irreversible perfusion defects **(Sinusas et al., 1989)** are described as representing scars of previous infarction. Moreover, partially reversible perfusion defects are usually considered as representing scars of infarction with surrounding ischemia (peri- infarct ischemia).

However, during our work at nuclear cardiology laboratory in Ain Shams University Hospital, we have noticed that some patients with no evidence of any previous myocardial infarction showed partially reversible perfusion defects in their Tc-99m sestamibi scans. When these patients were referred for coronary angiography, it was found that these patients had chronic total occulsion of vessels supplying the region which showed partially reversible perfusion defects. Moreover, some of these patients underwent revascularization wetheter interventinally or surgically and were referred once more for myocardial perfusion imaging as follow up for their condition-post-revascularization. Strongely enough, these patiens with no evidence of restenosis showed normal myocardial perfusion denoting that these partially reversible perfusion defects which were present in their first scans did not represent infarction but instead a condition of severely reduced regional myocardial perfusion.