

Original Research Article

Estimation of Rest Myocardial Perfusion Using Quantitative Analysis

Mohammed A. M. Ali^{1,2*}, Suhaib Alameen¹, Aya A. Saeed^{1,2}, Mohamed E. M. Gar-Elnabi¹

¹College of Medical Radiological Science, Sudan University of Science and Technology, Khartoum, Sudan

²Department of Nuclear Medicine Technology, Inaya Medical College, Riyadh Saudi Arabia

***Corresponding author**

Mohammed A. M. Ali

Email: tengasaheed@gmail.com

Abstract: Estimation of rest myocardial perfusion using quantitative analysis from patients information, and the estimation of heart function done by 99mTc sestamibi heart scintigraphy ranging from simple methods such as segmentation of the left ventricle, Therefore in this study from the patients information such as age and body mass index can estimate the rest myocardial perfusion from patients information without need it to rest scan by 99mTc sestamibi. The results show that the rest study can be estimated from patient's information, so that will the patients not exposed to radioactive material.

Keywords: Rest, Myocardial perfusion, Age, BMI

INTRODUCTION

Reliable information on causes of death is essential to the development of national and international health policies for prevention and control of disease and injury. The number of people affected by heart disease increases with age in both men and women. About four out of five people who die of coronary heart disease are 65 or older. Because heart disease becomes more common as you age, it's important to have regular checkups and watch your heart disease risk factors. Your doctor will work with you to help you lower your risk of heart disease. Heart disease was considered a man's disease. However, we now know that heart disease is the leading cause of death for women as well as men. Although men tend to develop coronary artery disease earlier in life, after age 65 the risk of heart disease in women is almost the same as in men [1]. Coronary heart disease is the leading cause of death worldwide [2]. Traditionally, coronary heart disease (CHD) has been considered as a disease predominantly affecting men and for a long time women were not included in cardiovascular research programs. Although the life-time risk of coronary heart disease is one in three for women. The lifetime risk of developing coronary heart disease at age 40 years is 50% for men and 33% for women [3]. In many of studies [4–6] found that this change in mortality was similar for men and women, although other reports

showed that mortality trends are more favorable in women than in men [6–10].

Worldwide the primary risk factors (hypertension, obesity, physical inactivity, poor diet, alcohol and smoking) are increasing as a result of urbanization. Tobacco smoking, physical inactivity, unhealthy diets and the harmful use of alcohol are the main behavioural risk factors of cardiovascular diseases. These risk factors are shared by other major No communicable diseases such as cancer, diabetes and chronic respiratory disease. Long-term exposure to behavioural risk factors results in raised blood pressure (hypertension), raised blood sugar (diabetes), raised and abnormal blood lipids (dyslipidaemia) and obesity. Major cardiovascular risk factors such as hypertension and diabetes link cardiovascular diseases to renal disease [11]. Studies showing that the relationships between history risk factors and knowledge of cardiovascular diseases are limited. Cardiovascular diseases will continue to be a health threat unless the history risk factors at population level are identified and actions implemented to reduce their impact [12].

Myocardial perfusion imaging (MPI) was developed more than 30 years ago initially as a 2-dimensional (planar) technique using a potassium analog, thallium-201, which was retained within

myocardial tissue in proportion to blood flow. Since then, new radiopharmaceuticals possessing the superior imaging properties of Tc-99 m have been developed and tomographic imaging (single-photon computed emission tomography; SPECT) has become the imaging standard, providing outstanding 3-dimensional localization and extent determination of perfusion abnormalities[13]. Myocardial perfusion imaging (MPI) techniques is an ideal approach to doing the assessment of myocardial perfusion. As non-invasive imaging modalities, it can examine the functions of the various segments of the heart muscle to reflect whether there is a malfunction on heart. In myocardial perfusion imaging studies, there are stress and rest sets of data [14]. Regional myocardial function and perfusion are important in coronary artery disease because they indicate myocardial viability and predict prognosis after revascularization at the regional level [15,16]. Studies showed that Single-photon emission tomographic (SPET) imaging is the preferred technique for assessment of myocardial perfusion and compares favorably with conventional planar methods [17-22].

The adequacy of characterization of heart disease using SPECT scintigraphy and ECG reduce medical problems from the diagnosis of coronary disease in intermediate-risk patients and to improve the effectiveness of treatment and decreasing the risk of premature death.

MATERIALS AND METHODS

Patient’s females and males with average age 59.3 year injected Tc99m sestamibi Scintigraphy, and

scanned by dual head SPECT gamma camera parameters Cardiac Gated SPECT, and the Data collected from 2013 to 2017 in Nuclear Medicine department at Riyadh care center. The patients suspected of suffering from disorders of the heart muscle patients that injected with 99mTc sestamibi perfusion and the percentage obtained under conditions of rest. The variables were being used for patients social background (age, sex, BMI and history), and the (End-diastolic volume, End-systolic volume and Ejection fraction).

Protocol rest

Patient waits 45–60 minutes after injection of 99mTc-sestamibi, 8–30 mCi before imaging and giving the patient a glass of cold water before imaging to clear thyroid, liver, and bowel. Patient was in the supine position with heart in center field of view and left arm up over head. If arm is down at side because of problems with shoulder joint or recent surgery, both the rest and stress images should be taken the same way. Images may include a static anterior picture first (300 seconds). Start SPECT images at appropriate time with camera right anterior oblique to left posterior oblique (Except for patients with dextrocardia).

RESULTS AND DISCUSSION

This study carried out to Estimation of rest myocardial perfusion using quantitative analysis, and the estimation of heart function done by 99m Tc sestamibi heart scintigraphy ranging from simple methods such segmentation of the left ventricle, and the results was as follow:

Table 1: show statistical parameters for all patients:

	Mean	Median	SD	Min	Max
Age	60.31	62	11.59	39	85
BMI	26.85	25	7.04	18	45
Rest end-diastolic	98.81	68	37.55	50	206
Rest end-systolic	51.17	35	49.24	16	348
Rest ejection fraction	55.93	59	13.78	31	87

Table 1 show statistical parameters for all patients as mean ±SD, in the age was 60.31±11.59 years, and the body mass index was 26.85±7.04 kg/cm², and the rest end-diastolic volume was 98.81±37.55 ml,

and the rest end-systolic volume was 51.17±49.24 ml, and the percentage of rest ejection fraction was 55.93±13.78.

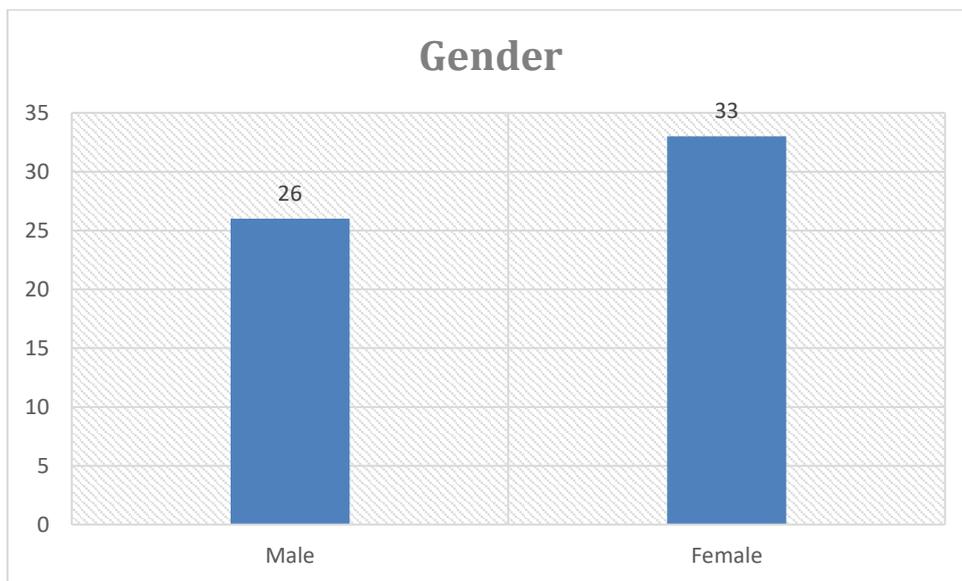


Fig-1: show the frequency and percentage of gender to the patients

Fig 1. show the frequency and the percentage of the gender, male frequency was 26 with percent 20% and female was frequency 33 with percent 25%.

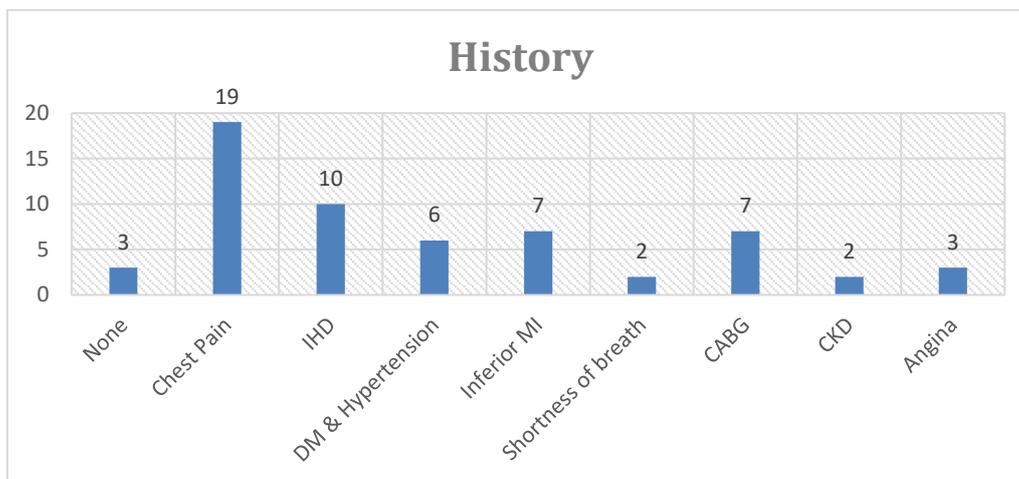


Fig-2: show the frequency and percentage of the histories for all patients

Fig 2. patients without history was frequency 3 with percent 2.3% and chest pain was frequency 19 with percent 14.6% and IHD was frequency 10 with percent 7.7% and DM& hypertension was frequency 6 with percent 4.6% and inferior MI was frequency 7 with

percent 5.4% and shortness of breath was frequency 2 with percent 1.5% and CABG was frequency 7 with percent 5.4% and CKD was frequency 2 with percent 1.5% and angina was frequency 3 with percent 2.3%.

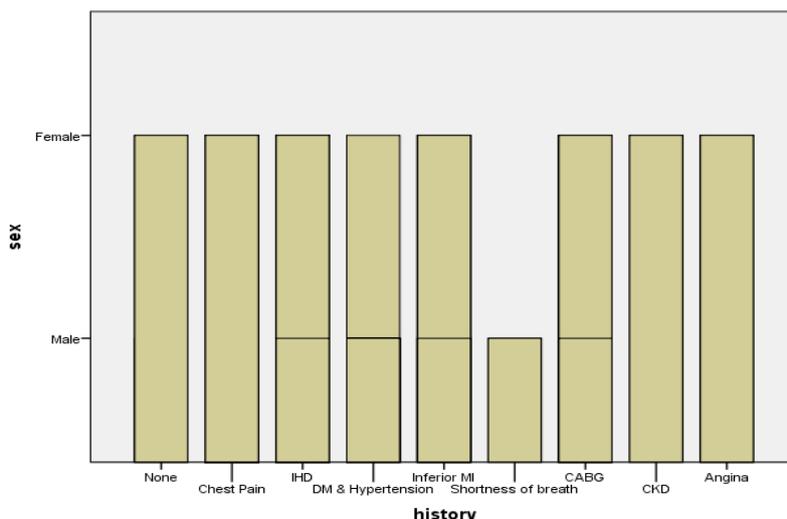


Fig-3: Show correlation between history and sex

Fig. 3. Show correlation between the history of patients disease with the patients gender were the number of history was 9 disease contributed as the all normal patients was a female same as the patients with chest pain, for ischemic heart disease was for both gender similar to diabetic maleates and hypertension and as same with inferior myocardia infraction and CABG, for the patients with shortness of breath was just a male, and the patients with chronic kidney disease and angina just with females patient.

CONCLUSION

This study carried out to Estimation of rest myocardial perfusion using quantitative analysis from patients information, and the estimation of heart function done by 99mTc sestamibi heart scintigraphy ranging from simple methods such segmentation of the left ventricle, Therefor in this study from the patients information such as age and body mass index can estimate the rest myocardial perfusion from patients information without need it to rest scan to 99mTc sestamibi and by following linear equations:

Equation for the regression values to estimate the rest test:

$$Rest\ EDV = Age \times (-0.090) + BMI \times (1.570) - 62.105$$

$$Rest\ ESV = Age \times (0.844) + BMI \times (1.642) - (-43.819)$$

$$Rest\ EF = Age \times (-0.227) + BMI \times (-1) - 96.452$$

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