

EVALUATION OF HEMODYNAMIC PARAMETERS ON CORONARY ARTERY DISEASE PATIENTS WITH NORMAL GROUP USING REAL-TIME 3-DIMENSIONAL CARDIOVASCULOGRAPHY

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Abstract: The study was designed to assess the hemodynamic parameters on both coronary artery disease patients and normal groups using non-invasive, real-time 3-dimensional cardiovascular system. The flow turbulence accelerometry technique was used to measure the myocardial blood flow between these two groups and the difference was found to be statistically significant.

1. INTRODUCTION

Angiography is a conventional imaging technique as an invasive procedure used to find the functional status of the heart in coronary artery disease patients. Although ECG and ECHO techniques are non-invasive methods, but both provides only minimal information of hemodynamic parameters. In order to find more information of heart status non-invasively, the 3D cardiovascular system is introduced. It is basically a real-time imaging system used to find the hemodynamic parameters in detecting early coronary heart disease. It also provides more information in preventing heart attack and controlling hypertension.

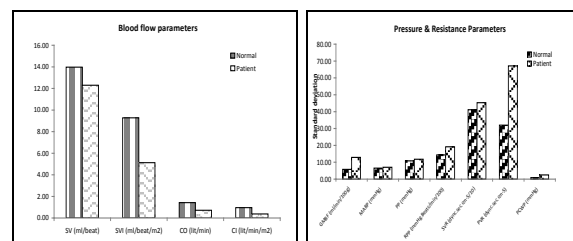
2. MATERIALS AND METHODS

In this study, hemodynamic parameters for 20 coronary artery disease patients and 20 normal persons were measured using real-time 3-D Cardiovascular system (3DCCG). 3DCCG uses the technique of time related flow turbulence accelerometry to measure the myocardial blood flows and trans aortic signal modulation for regionalization. For both patients and normal groups, ECG, impedance and heart sounds for 256 beats were recorded to measure the blood flow, pressure and resistance, intra cycle timings and functional parameters of the cardiovascular system. The difference in hemodynamic parameter values between both groups were analyzed using paired t-test statistical method and their results were plotted using MATLAB software.

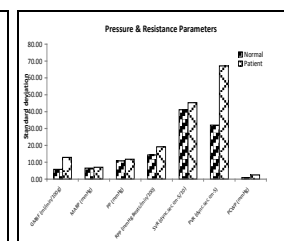
3. RESULTS

The mean values in hemodynamic parameters such as blood flow, pressure and resistance, intra cycle timing and functional parameters between both groups were shown in figures 1 - 4 respectively. The parameters such as global myocardial blood flow, cardiac efficiency, left ventricular ejection fraction, mean arterial blood pressure, systemic vascular resistance and systemic vascular resistance index and heather index, pre ejection period, systolic time ratio,

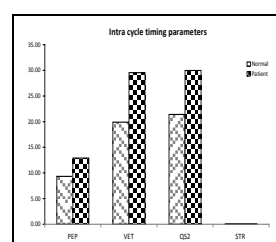
acceleration index, stroke work are showed more statistical significant differences between both groups (i.e. $p < 0.0001$ to $p < 0.005$). The stroke volume, stroke volume index, cardiac output, cardiac index, ventricular ejection time,



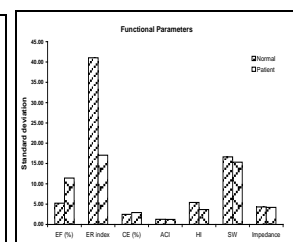
(1)



(2)



(3)



(4)

Figures: Various hemodynamic parameters for (1) blood flow (2) pressure & resistance (3) intra cycle timing (4) functional parameters of both patients and normal groups.

electromechanical systole, ejection rate index and impedance are showed less statistical significant differences between both groups ($p < 0.001$ to $p < 0.05$). The statistical difference was not significant between both groups for pulse pressure, rate pressure product, pulmonary capillary wedge pressure, pulmonary vascular resistance and diastolic systolic ratio.

4.CONCLUSION

From this study, we inferred that the feasibility of 3DCCG to assess the hemodynamic parameters is

possible. This can be further validated through clinical trials.