



Ankle Peak Systolic Flow Velocity (PSV) with Coronary Artery Disease in Diabetes Mellitus

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Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

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ABSTRACT

Introduction: Ankle peak systolic flow velocity can measure peripheral arterial blood flow which can predict extent of peripheral arterial disease. Atherosclerosis is more common in patients with diabetes mellitus and can affect simultaneously coronary circulation and peripheral circulation.

Aims and Objectives: The primary objective of the study was to determine the occurrence of peripheral vascular disease by ankle Peak Systolic Velocity (PSV) in patients admitted for coronary artery disease with diabetes mellitus. The secondary objective was to see the association between the ankle Peak Systolic Flow Velocity (PSV) with the extent of abnormality of coronary angiogram in diabetic patients.

Materials and Methods: All patients admitted in the hospital with coronary artery disease with diabetes mellitus in whom coronary angiogram was done were included in the study over a period of one year. Presence of significant vessel disease CAD was defined as at least >70 % stenosis at one or more major coronary arteries (left anterior descending, left circumflex and right coronary artery). Ankle Peak Systolic Velocity (PSV) was measured in all patients by the Duplex method. The peak systolic velocities in the distal posterior tibial artery and the distal anterior tibial artery was measured and the average peak systolic velocities within three cardiac cycles⁶ was recorded by the

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radiologist. The ankle peak systolic flow above 40cm/s was considered as good flow in the lower limb extremity [7]. The data was analysed using SPSS version 17.0 software and mean and standard deviation was used .

Results: Out of the cases studied 24 patients (80%) were males and 6 patients (20%) were females. All the Coronary angiograms was classified to single 13(43.3%), double 8(26.7%) and triple 9 (30%) vessel disease by the cardiologist. Out of the 13 patients with single vessel disease 3 patients had < 40 cm/s flow in the right anterior tibial artery and 10 patients had >40 cm/s flow in the right tibial artery indicating good perfusion. Out of the 8 patients with double vessel disease 4 patients had flow <40 cm/s and 4 patients had flow >40 cm/s. In triple vessel disease category 5 patients had flow <40 cm/s and 4 patients had flow>40cm/s. The p value was 0.2 was not significant and the chi square was 2.79 Similar results were obtained while compared with left ankle peak systolic flow velocity.

Conclusion: In this study patients with single vessel disease have higher ankle peak systolic velocity though statistically not significant. Lower ankle peak systolic flow velocity corroborates with peripheral arterial disease [12] and is seen in patients with coronary artery disease [13].

Keywords: Ankle peak systolic flow; peripheral arterial disease; diabetes mellitus; coronary artery disease.

1. INTRODUCTION

Peripheral arterial disease (PAD) is the occlusive disease of the arteries distal to the aortic bifurcation [1]. Coronary Artery Disease (CAD) is the main cause of death and disability in diabetic patients [2]. Diabetes mellitus patients are at a greater risk of atherosclerosis and peripheral arterial disease [3]. The macrovascular complications can affect the entire arterial tree, therefore all these complications often occur simultaneously [4].

There are not many studies in India using the ankle peak systolic flow velocity(PSV) as a marker of peripheral ischemia [5] and correlating it with coronary artery disease. The primary objective of the study was to determine the occurrence of peripheral vascular disease by ankle Peak Systolic Velocity (PSV) in patients admitted for coronary artery disease with diabetes mellitus .The secondary objective was to correlate the degree of abnormality of ankle Peak Systolic Flow Velocity (PSV) with the extent of abnormality of coronary angiogram in diabetic patients .

2. MATERIALS AND METHODS

It was conducted according to the standards of the declaration of Helinski. The study was conducted during a period of one year on patients admitted in the hospital with coronary artery disease with diabetes mellitus in whom coronary angiogram was done. The general clinical data like age, sex, height, body weight, body mass index (BMI), hypertension, smoking

habits was collected. The patients included in this study had to undergo fasting blood sugar, glycosolated Hb, fasting lipid profile, hemoglobin, serum creatinine, Coronary angiogram was done in all the patients and interpreted by the cardiologist .Presence of significant vessel disease CAD was defined as at least >70 % stenosis at one or more major coronary arteries (left anterior descending, left circumflex and right coronary artery). Ankle Peak Systolic Velocity (PSV) was measured in all patients by the Duplex method. The peak systolic velocities in the distal posterior tibial artery and the distal anterior tibial artery was measured and the average peak systolic velocities within three cardiac cycles [6] was recorded by the radiologist. The ankle peak systolic flow above 40cm/s was considered as good flow in the lower limb extremity [7]. The data was analysed using SPSS version 17.0 software using ANOVA, t-test Spearman's rank correlation coefficient and discriminant analysis.

2.1 Inclusion Criteria

1. Patients above 40 years of age with diabetes mellitus.
2. Angiographic confirmation of coronary artery disease.
3. Patient cooperation for the study

2.2 Exclusion Criteria

1. Patients with arrhythmia.
2. Thrombolytic therapy.
3. Lower limb revascularization surgery
4. Limb related disabilities.

5. unable to cooperate with the tests.

2.3 Study Design

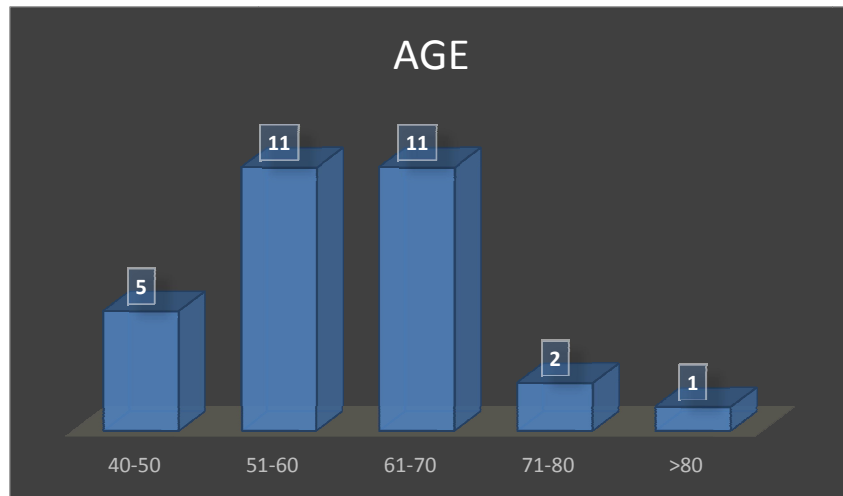
It was a cross sectional descriptive analytic study including all patients admitted with coronary artery disease in the current admission was assessed by coronary angiogram by the cardiologist .All patients whose fasting blood sugar was above 126, HbA1C levels above 6.5% was included as having diabetes mellitus. All the coronary angiogram reports was evaluated by the cardiologist and the divided into single vessel disease, double vessel disease and triple vessel disease. The ankle Peak systolic flow velocity (PSV) was recorded in all patients and then this data was analysed. The ankle peak systolic flow velocity above 40 cm/s was considered as good

perfusion. Continuous data was expressed as mean \pm standard deviation. Statistical comparisons between categorical parameters was performed with chi- square analysis. Comparisons between large groups of unpaired data was made with the unpaired Student t-test. Differences was considered significant at the $p < 0.05$ level.

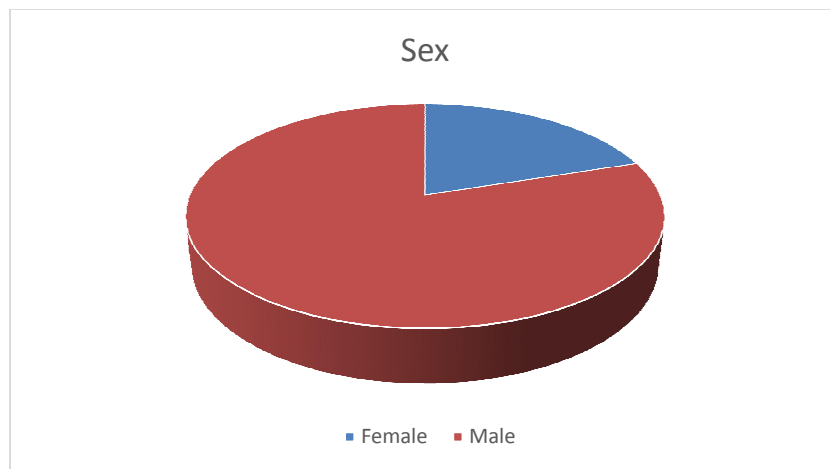
3. RESULTS

The total number of cases included was 30 as shown in Graph 1. Most of the patients were in the 5 th decade and 6 th decade respectively.

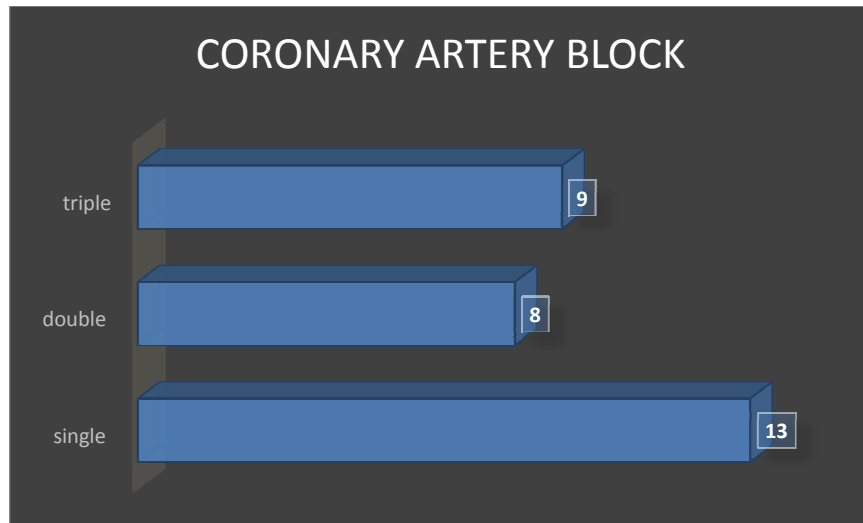
Out of the cases studied 24 patients (80%) were males and 6 patients (20%) were females (Graph 2).



Graph 1. Age distribution



Graph 2. Gender wise analysis



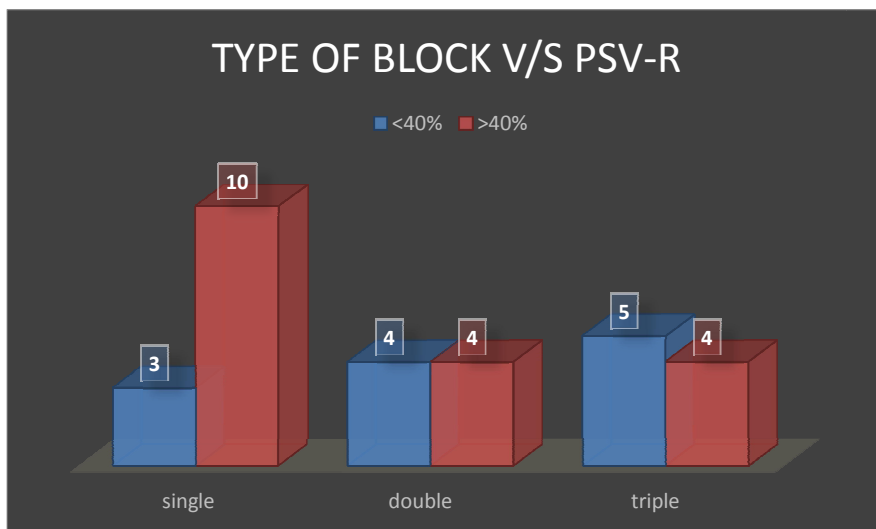
Graph 3. Coronary angiogram analysis

All the Coronary angiograms was classified to single 13(43.3%), double 8(26.7%) and triple 9 (30%) vessel disease by the cardiologist (Graph 3).

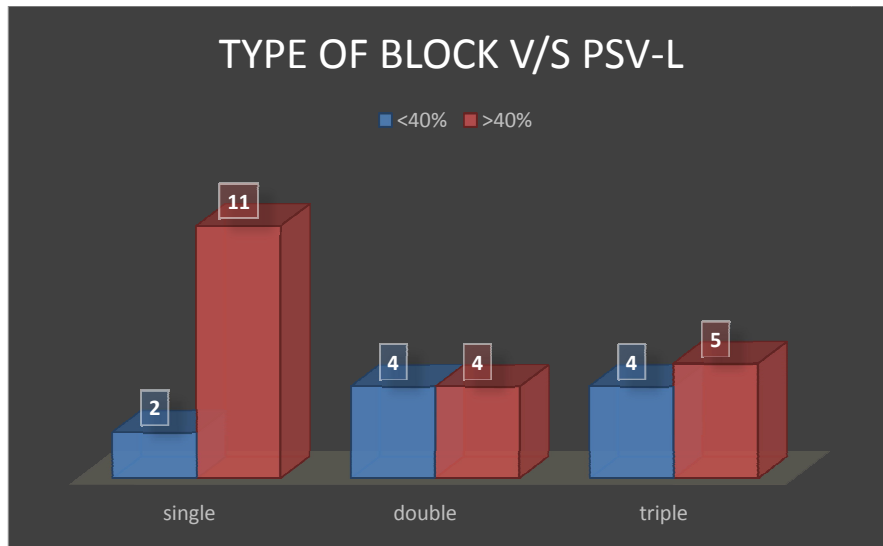
Ankle peak systolic flow velocity of the right lower limb and the extent of coronary vessel disease was correlated in the above Graph 4. Out of the 13 patients with single vessel disease 3 patients had < 40 cm/s flow in the right anterior tibial artery and 10 patients had >40 cm/s flow in the right tibial artery indicating good perfusion. Out of the 8 patients with double vessel disease 4 patients had flow <40cm/s and 4 patients had flow >40 cm/s. In triple vessel disease category 5

patients had flow <40 cm/s and 4 patients had flow >40cm/s. The p value was 0.2 was not significant and the chi square was 2.79.

The ankle peak systolic flow velocity in the left anterior tibial artery was correlated with coronary angiogram report. Out of the 13 patients with single vessel disease 2 patients had flow <40 cm/s and 11 patients had good flow >40 cm/s. In patients with double vessel disease 4 patients had flow <40 cm/s and 4 patients had flow >40 cm/s. In patients with triple vessel disease 4 patients had flow <40cm/s and 5 patients had flow >40cm/s. The p value was 0.18 was not significant and chisquare was 3.385.



Graph 4. Coronary angiogram with ankle peak systolic flow velocity – right ankle



Graph 5. Coronary angiogram with ankle peak systolic flow velocity in left ankle

4. DISCUSSION

The presence of peripheral arterial disease increases risk of cardiovascular disease [8]. An association between cerebrovascular disease and atherosclerotic disorders in different arterial beds namely peripheral vascular and cardiovascular was present in nearly 30% of patients. Ankle peak systolic flow velocity has a value in predicting peripheral vascular disease in diabetes patients as per study by Dzhemilovo et al. [9].

In this study though patients with single vessel disease on coronary angiogram had good flow in the lower limb we did not get statistical significance between the type of single/double/triple vessel disease versus ankle systolic flow velocity. An Indian study by Saran et al. [10] reported prevalence of peripheral vascular disease of 7.7% in patients with CAD based on only ABI measurement in lower limbs.

This present study revealed non significant statistical correlation between cardiovascular disease and ankle peak systolic flow velocity. This may be because of small sample size of the study. Lower limb angiography was not performed hence extent and burden of underlying atherosclerosis in the lower limbs may have not been accurately reflected [11].

In this study patients with single vessel disease have higher ankle peak systolic velocity though statistically not significant. Lower ankle peak

systolic flow velocity corroborates with peripheral arterial disease [12] and is seen in patients with coronary artery disease [13].

5. CONCLUSION

Ankle peak systolic flow velocity is a non invasive arterial flow measure which may be used to measure vascular status. Lower value of ankle peak systolic flow velocity is seen in patients with coronary artery disease. Earlier recognition of peripheral arterial disease may help to improve functional status of patients, early intervention for peripheral artery disease may foster better quality of life.

Larger studies are required to further support this conclusion as our sample size was small.

CONSENT

As per international standard or university standard, patient's written consent has been collected and preserved by the author(s).

ETHICAL APPROVAL

The study was approved by the ethics committee of Father Muller Medical College.

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COMPETING INTERESTS

Authors have declared that no competing interests exist.

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