

## Research Article

# A study to find out relationship in between ankle brachial index and severity of coronary artery disease as assessed by SYNTAX score

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### ABSTRACT

**Background:** Peripheral arterial disease and coronary artery disease shares common risk factors for Etiopathogenesis. Present study is designed to find out relationship between ankle brachial index (ABI) and SYNTAX Score.

**Methods:** Total 100 consecutive patients of stable coronary artery disease in whom angiography was indicated were taken for the study. ABI was measured by using 8 MHz vascular Doppler before coronary angiography and SYNTAX SCORE was calculated by using online SYNTAX score calculator. Statistical analysis was done by SPSS 21 software.

**Results:** There was significant correlation in between low ABI and presence of triple vessel disease in comparison to presence of single or double vessel disease for which it was not significant. ( $P < 0.001$ ) There was significant correlation in between high SYNTAX score  $> 32$  and low ABI group ( $P = 0.005$ ) although this relationship was not seen in case of low and intermediate SYNTAX Score and low ABI.

**Conclusions:** presence of low ABI signifies presence of high SYNTAX Score and presence of triple vessel disease.

**Keywords:** ABI, SYNTAX score, Peripheral arterial disease, Ankle brachial index

### INTRODUCTION

Peripheral arterial disease (PAD) is a major under-diagnosed vascular pathology. The prevalence of PAD is around 3% to 10% in epidemiological studies. PAD and coronary artery disease (CAD) shares similar risk factors profile and are believed to also share a common pathogenesis.<sup>1</sup> Obstructive atherosclerotic lesions in at least one coronary artery have been reported in 60%-80% of patients with PAD who had undergone cardiac catheterization. These patients had more extensive and calcified lesions, suggesting a more aggressive form of atherosclerosis.<sup>2</sup>

The ankle-brachial index (ABI), which is a non-invasive and inexpensive measurement used to identify PAD has remarkably high sensitivity and specificity (90%, for each), compared against invasive angiography and can be used as indirect measure of CAD severity.<sup>1</sup>

Severity of coronary artery diseases varies from minor plaque to diffuse triple vessel disease with different lesion characteristics. To objectively quantify the severity of coronary artery disease SYNTAX Score is used. It has demonstrated that an ABI  $< 0.9$  is significantly associated with the complexity and extent of coronary disease and higher average SYNTAX Score.<sup>2</sup>

This study was planned to find out relationship between ankle brachial index and severity of coronary artery disease on coronary angiography as assessed by SYNTAX Score.

### METHODS

The study was carried out in Nilratan Sircar Medical College and Hospital, Kolkata, India from Feb 2014 - Dec 2015. Total 100 consecutive adult patients of both sexes admitted in Department of cardiology with

presumed diagnosis of stable coronary artery disease in whom coronary angiography was indicated were taken for the study. It was an Observational, cross-sectional, hospital-based, single centre study. After history taking, Examination and investigation patient underwent coronary angiography. At the same time ABI was measured as mentioned below. SYNTAX score calculation was done and analysis was performed to find out relationship in between SYNTAX score and ABI.

**Inclusion criteria**

Adult patients of suspected stable coronary artery disease who underwent coronary angiography.

**Exclusion criteria**

- Prior history of confirmed coronary artery disease, valvular heart disease, LV Dysfunction, coronary artery bypass or Percutaneous coronary intervention because these were factors which may have interfered with the selection of cases.
- Previous surgery or intervention for PAD.
- Deformity in upper and lower limbs, unclear results of ABI and angiography.
- Presence of severe renal, lung and liver comorbidity.

**ABI measurement**

ABI was measured immediately before coronary angiography. After the patient had rested for at least 10 minutes in a supine position, ABI was performed by using a hand held vascular Doppler system of 8 MHz (EMCO Meditek, Gujarat, India) and an aneroid sphygmomanometer with cuff inflators appropriate for brachial circumference. Systolic blood pressure measurements of the brachial, posterior tibial and/or dorsalis pedis arteries were taken on both sides of the limb. ABI was calculated as the ratio between the highest ankle systolic pressure and the highest brachial systolic pressure in each arm and leg. Patient were divided into those with an ABI <0.9 and >1.4(Abnormal ABI group) and those with 0.9 to 1.4 (Normal ABI group)

**Calculation of the SYNTAX Score (SS)**

The SS evaluates stenosis that has caused a reduction of more than 50% in luminal diameter, in vessels of 1.5 mm or larger diameter. The number and extent of lesions, the tortuosity of the affected segments, the presence of thrombus or calcification, total occlusion, and involvement of bifurcation or trifurcation will be evaluated. Each selected lesion was then scored, according to its complexity. The SS is the sum of the individual Scores for each lesion, and it was calculated by using SYNTAX Score Calculator software version 2.11 (SYNTAX Score Working Group, www.syntaxscore.com).

Apart from SYNTAX Score, the vessel involvement in form of no vessel involvement single vessel involvement double vessel involvement and triple vessel involvement was assessed.

Patient with Coronary artery disease were divided into three SYNTAX Score groups, those with low ( $\leq 22$ ), intermediate (23-32) and High ( $\geq 33$ ) Scores.

**Analysis of data**

Categorical variables are expressed as percentages, while normally distributed numeric variables are expressed as average and standard deviation. The patient’s clinical characteristics are shown according to their frequency distribution. Pearson’s chi-square and student’s t-tests were used to compare variables between groups. Values of  $p \leq 0.05$  were statistically significant. SPSS 21 was used to analyze the variables.

**RESULTS**

In present study 4% patients were having normal coronary artery, 45% shown single vessel involvement, 31% double vessels involvement and 20% triple vessel involvement. Here it can be seen that 49% patients were suffering from triple vessel disease were having ABI of less than 0.9. There was significant correlation in between Low ABI and Presence of triple vessel disease in comparison to presence of single or double vessel disease for which it was not significant.

**Table 1: Relationship in between coronary artery disease and ABI.**

Variable	ABI <0.9	ABI ≥0.9	Total
Normal Vessels	00 (00%)	04 (6%)	04
Single Vessel	08 (27%)	37 (52%)	45
Double Vessels	07 (24%)	24 (33%)	31
Triple Vessels	14 (49%)	06 (9%)	20
Total	29	71	100

Relationship between Presence of ABI <0.9 and triple vessel disease (P Value<0.001).

**Table 2: Relationship in between ABI and SYNTAX score.**

SYNTAX score	ABI <0.9	ABI ≥0.9	Total
00-22	18 (62%)	59 (83%)	77
23-32	03 (10%)	07 (10%)	10
>32	08 (28%)	05 (7%)	13
Total	29	71	100

For high SYNTAX Score (SS>32) and Low ABI (<.9) (p-value 0.005).

Total 45 patients were suffering from single vessel coronary artery disease, in which 28 were having LAD involvement, 08 were having LCX involvement and 09

were having RCA involvement. There was no significant relationship found in between presence of any particular coronary artery disease and low ankle brachial index (Table 1).

In present study 62% patient with pad having low syntax score, 10% were having intermediate syntax score and 28% were having high syntax score in comparison to normal ABI group in whom it was 83%, 10%, 07% in low, intermediate and high syntax score group. There was significant correlation in between high syntax score >32 and low ABI group although this relationship was not seen in case of low and intermediate syntax score and low ABI (Table 2).

## DISCUSSION

In present study prevalence of peripheral arterial disease was 29%. All of them were suffering coronary artery disease. It is higher than other studies which have reported it to be 60-80% in patient with symptomatic peripheral arterial disease.<sup>2</sup> This higher prevalence of CAD in patient with Low ABI in our study may be due to inclusion of all patients with ABI less than 0.9 irrespective of presence of absence of symptoms and very selective angiography of patient with Stable ischemic heart disease.

In present study total 4% patient were found to have normal coronary artery, all of these patients were having ABI in normal range. In low ABI group 27% were having single vessel disease, 24% were having double vessel disease and 49% were having triple vessel disease. In comparison to patients with normal ABI in whom these percentages were 52%, 33% and 8% for single, double and triple vessel respectively. Significant correlation was found in between presence of CAD and low ABI. It was highly significant in case of presence of triple vessel disease (P= 0.001).

In case of single vessel coronary artery disease LAD is most common artery to be involved followed by RCA than LCx. There was no significant correlation found in between involvement of any particular coronary artery and low ankle brachial index (P= .06).

These findings are similar to Oliveira et al who reported low ABI is significantly associated with presence of CAD.<sup>3</sup> Sadheghi et al reported that patient with PAD had higher prevalence of triple vessel disease (63% vs. 11%); in our study it was (49% vs. 8%). This finding is similar to findings by Sadheghi et al.<sup>4</sup> Here it can be stated that presence of peripheral arterial disease significantly associated with presence of coronary artery disease, particularly signifies multivessel involvement.

Mean SYNTAX Score in this study was 16±11.25. In this study 28% patient with PAD were having high SYNTAX Score (SS>32) in comparison to 7% in normal ABI group. This relationship was statically significant, but

there was no significant correlation found in between low SYNTAX Score (SS<22) vs. SYNTAX Score >22. This finding is similar to study by Falcao et al who showed no significant correlation in between SYNTAX Score >16 vs. <16 in patient with peripheral arterial disease although mean SYNTAX Score was higher in patients with peripheral arterial disease<sup>2</sup>. Naoto Hashizume et al. have shown significant correlation in between SS >22 and Presence of peripheral arterial disease.<sup>5</sup> In our study we found only higher SYNTAX Score (SS>32) to be positively correlated with presence of PAD. So it can be stated that presence of low ABI may predict high SYNTAX Score and multivessel involvement.

## Limitations

This small study has many limitations, including the small number of patients and the lack of clinical follow-up. The inclusion of patients who had established coronary artery disease selected a population with a higher incidence of coronary heart disease and PAD. Although in present study low ABI signified higher SYNTAX Score it can only be affirmed in large randomized studies specifically designed for this purpose.

## CONCLUSION

Presence of low ABI signifies presence of high SYNTAX Score and presence of triple vessel disease.

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