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Screening of asymptomatic peripheral arterial disease in patients of acute myocardial infarction and cerebrovascular accident using alternative ankle brachial pressure index

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Abstract

Background: Peripheral artery disease (PAD) is usually caused by atherosclerosis. Patients with acute myocardial infarction (AMI) and cerebrovascular accident (CVA) are at increased risk. In symptomatic cases ABPI is a simple non-invasive test to diagnose PAD. In the present study we aim to assess the utility of alternative formula for ABPI as a screening tool for asymptomatic PAD in AMI and CVA.

Methods: This is a prospective observational study. Patients were recruited from Medicine IPD and ER in MGM Medical College & LSK Hospital, KIshanganj, Bihar. Patients included were those of AMI or CVA. Sample size calculated was to be 243. ABPI was measured using a handheld Doppler of 8 MHz and a standard sphygmomanometer. Statistical analysis was performed using SPSS software.

Results: A mean value of 0.9+/-0.073 was observed. In this study 63.2% was found to have abnormal ABPI (less than 0.9) which is nearly 2/3rd of the study population. The ROC was plotted against sensitivity and specificity for the co-morbidities considered. The area under the curve was statistically significant for both acute MI and acute CVA with a positive correlation.

Conclusion: In patients with acute MI and CVA, alternative ABPI is a good screening tool to detect asymptomatic PAD. However, further studies are required in a larger population to confirm its utility.

Keywords: ankle brachial pressure index, atherosclerosis, peripheral arterial disease, cardiovascular diseases

Introduction

Peripheral artery disease (PAD), which comprises atherosclerosis of the abdominal aorta, iliac, and lower-extremity arteries, is underdiagnosed, undertreated, and poorly understood by the medical community. Patients with PAD may experience a multitude of problems, such as claudication, ischemic rest pain, ischemic ulcerations, repeated hospitalizations, revascularizations, and limb loss. This may lead to a poor quality of life and a high rate of depression. From the standpoint of the limb, the prognosis of patients with PAD is favorable in that the claudication remains stable in 70% to 80% of patients over a 10-year period. However, the rate of myocardial infarction, stroke, and cardiovascular death in patients with both symptomatic and asymptomatic PAD is markedly increased. The ankle brachial index is an excellent screening test for the presence of PAD. Imaging studies (duplex ultrasonography, computed tomographic angiography, magnetic resonance angiography, catheter-based angiography) may provide additional anatomic information if revascularization is planned. The goals of therapy are to improve symptoms and thus quality of life and to decrease the cardiovascular event rate (myocardial infarction, stroke, cardiovascular death). The former is accomplished by establishing a supervised exercise program and administering cilostazol or performing a revascularization procedure if medical therapy is ineffective. A comprehensive program of cardiovascular risk modification (discontinuation of tobacco use and control of lipids, blood pressure, and diabetes) will help to prevent the latter.

Peripheral artery disease (PAD) is underdiagnosed, undertreated, poorly understood, and much more common than previously thought [1, 2]. In the current article, the term *peripheral artery disease* will be used to denote vascular diseases caused by atherosclerosis of the abdominal aorta, iliac, and lower-extremity arteries leading to stenosis or occlusion.

In primary care practices across the United States, 29% of patients who are older than 70 years or who are older than 50 years with a history of smoking or diabetes have been reported to have PAD [1, 3-5]. Not only was the diagnosis of PAD frequently overlooked, but the cardiovascular risk factors were not treated as appropriately as in patients with CAD.

The diagnosis of PAD should not be overlooked for 2 important reasons. First, patients with PAD may experience many problems, such as claudication, ischemic rest pain, ischemic ulcerations, repeated hospitalizations, revascularizations, and limb loss [4]. These lead to a poor quality of life and a high rate of depression [6, 7]. Even patients who have no leg symptoms have a poorer functional performance, poorer quality of life, smaller calf muscle area, and greater calf muscle fat than an age-matched group of patients without PAD [8]. Second, patients with PAD have a greater likelihood of experiencing a myocardial infarction (MI), stroke, and cardiovascular death and have a higher rate of all-cause mortality compared with patients without PAD [9-11].

Methods and Materials

It was a cross sectional study. The study participants were those between age 18-75 years and those having acute MI or CVA in the Medicine IPD and ER in MGM Medical College & LSK Hospital, KIshanganj, Bihar. The sample size was calculated which was found to be 243, with 95% confidence interval. Patients with symptomatic PADor/and with gangrenous changes, Chronic Kidney Diseaase, Post menopausal women and pregnant women were excluded from the study as these are confounding factors. Once informed consent was sought, patient was made to lie in supine position after a duration of rest of half an hour. Peripheral pulses were palpated (Posterior Tibial artery for lower limb and Brachial artery for upper limb). The prerequisite for our study was that patients have a palpable peripheral pulse. Once this was confirmed, Ankle brachial pressure index was measured. A standard hand-held doppler with a probe of 8 MHz was used, with a standard sphygmomanometer. ABPI was indicative of PAD if less than or equivalent to 0.90 and normal if more than or equal to 1.00. We utilised an alternative formula for ABPI measurement, which is mentioned below:- ABPI (alternative)- SBP of ankle (lower of the two limbs)/ SBP of the brachial (lower of the two limbs)

Statistical Analysis

The statistical analysis was performed using SPSS software v20. ROC curve for ABPI utility for each co-morbidity (Acute MI and CVA) was plotted separately, and the area under the curve was measured for sensitivity and specificity of ABPI as a screening tool for PAD.

Results

Total number of patients included in the study were 243 out of which 183(75.30%) were males. Majority of the patients belong to 41-50 years of age group.

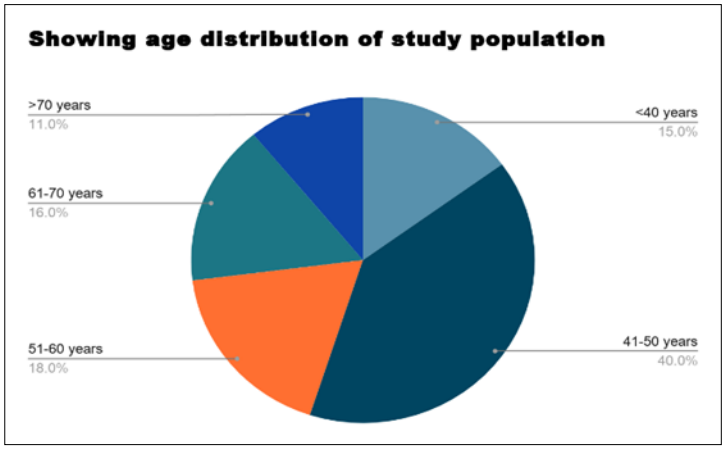

Fig 1

of the 243 cases, 145 patients suffered from Acute Myocardial Infarction, whereas 98 patients had Acute Cerebrovascular Accident. When ABPI was measured, it was found that mean ankle systolic pressure in the right limb was 128.35 +/-12.9, with it being marginally lower in the left lower limb. However, the brachial systolic blood pressure was found to be 142.87 +/-14.9, which was marginally lower than the left upper limb. Alternate ABPI showed a mean value of 0.9 +/- 0.073. In the study population, 63.2% was found to have abnormal ABPI i.e less than 0.9, which is nearly 2/3rds the population.

Table 1

ABPI	Frequency
</=0.9	154(63.2%)
0.91-0.99	56(23.04%)
>/=1	33(13.76%)
Total	243(100)

Distribution of ABPI in the study populatiom

The ROC was plotted against ABPI for sensitivity and specificity for the co-morbidities considered in the study. It was found that the AUC (area under the curve) was statistically significant for acute MI and acute CVA, with a fair positive correlation.

Discussion

Peripheral artery disease is one of the most important complication of atherosclerosis and can increase the risk of myocardial infarction and CVA. It has been estimated that 2/3rd of the patients with PAD are incidentally diagnosed with CAD and reverse is also true. Since atherosclerosis is a systemic disease and can affect arteries of any calibre, there is a coexistence of PAD with CAD and CVA. Risk of CVA and MI are higher with lower ABPI values. Patients with PAD are 6-8 times more likely to succumb to CVA or MI. Hence, it is necessary to diagnose PAD in such high risk patients.

In a consensus conference report, ABPI was defined as the ratio of the higher of the systolic blood pressure of the pressure in the anterior tibial/posterior tibial artery to the average of the right and left brachial arteries. If the difference between the right and the left brachial arteries was more than 10 mmHg, then the higher of the two values is taken.. However, recent American Heart Association (AHA) guidelines doesn't clearly define whether the higher or lower of the two ankle pressures are to be used. This along with the inter-observer variability and improper technique is the reason that there are several inconsistencies in the ABPI values. Hence, a standardized formula for the same is necessary to diagnose accurately the underlying PAD, especially in asymptomatic patients in high risk cases such as those with Acute MI and Acute CVA.

In our study we found that there was a positive correlation between "alternate" ABPI values and the presence of Acute MI or CVA. This depicts the role of "alternate" ABPI as a fair screening tool in such high-risk cases.

Conclusion

Alternate ABPI is a fair screening tool for identifying PAD in asymptomatic yet high risk patients with previous history of Acute MI and Acute CVA. Further studies are required to compare the findings with Duplex scan or CT Angiography to confirm the validity of the same.

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