

**Original article:**

**Evaluation of efficacy of Toe Brachial index in comparison to Ankle brachial pulse index for diagnosis of Peripheral Vascular Disease.**

<sup>1</sup>Dr.Ahmed Faraaz Patel , <sup>2</sup>Dr.Basavaraj Narasanagi\* , <sup>3</sup>Dr.Tejaswini Vallabha

<sup>1</sup>Post graduate , Dept of surgery , B.L.D.E University's Shri.B.M.Patil Medical college Hospital & R.C.Vijayapur

<sup>2</sup>Associate Prof , Dept of surgery , B.L.D.E University's Shri.B.M.Patil Medical college Hospital & R.C.Vijayapur

<sup>3</sup>Professor & Head , Dept of surgery , B.L.D.E University's Shri.B.M.Patil Medical college Hospital & R.C.Vijayapur

Corresponding author \*

---

**ABSTRACT:**

**Introduction:** A hand-held Doppler ultrasound probe is very useful in the assessment of occlusive arterial disease. A continuous-wave ultrasound signal is transmitted from the probe at an artery and the reflected beam is picked up by a receiver within the probe itself. With this view present study was planned to evaluate efficacy of Toe Brachial index in comparison to Ankle brachial pulse index for diagnosis of Peripheral Vascular Disease.

**Methodology:** All patients included in the study will be subjected to hand-held Doppler examination of their bilateral peripheral vessels, notably brachial vessels, Anterior tibial artery, Posterior tibial artery, dorsalis pedis artery and artery of the great toe.

**Results:** Hand held Doppler examination of the lower limb arteries provides a cheap & quick diagnosis of peripheral vascular disease in diabetics and therefore is a viable modality for prevention of morbidity in these patients.

**Conclusion:** Toe Brachial Index is a more Sensitive & Accurate diagnostic modality when compared to Ankle Brachial Pulse Index for the diagnosis of PVD in patients with diabetes and is therefore a better screening tool for the diagnosis of PVD in diabetics.

---

**Introduction**

A hand-held Doppler ultrasound probe is very useful in the assessment of occlusive arterial disease . A continuous-wave ultrasound signal is transmitted from the probe at an artery and the reflected beam is picked up by a receiver within the probe itself. The change in frequency in the reflected beam compared with that of the transmitted beam is due to the Doppler shift, resulting from the reflection of the beam by moving blood cells. The frequency change may be converted into an audio signal that is typically pulsatile. Doppler ultrasound equipment can be used in conjunction with a sphygmomanometer to assess systolic pressure in small vessels.<sup>1,2</sup> With this view present study was planned to evaluate efficacy of Toe Brachial index in comparison to Ankle brachial pulse index for diagnosis of Peripheral Vascular Disease.

## **Methodology**

### **Inclusion Criteria**

All cases of Diabetes admitted in B.L.D.E.U's Shri B. M. Patil Medical College, Hospital & Research Centre / attending surgical OPD will be included in the study.

### **Exclusion Criteria**

1. Patients with peripheral vascular disease with no evidence of diabetes.
2. Patients with bilateral amputations of great toe or bilateral lower limb amputation.

### **Procedure**

All patients included in the study will be subjected to hand-held Doppler examination of their bilateral peripheral vessels, notably brachial vessels, Anterior tibial artery, Posterior tibial artery, dorsalis pedis artery and artery of the great toe.

The Ankle Brachial Pressure Index (ABPI) is derived from the ratio of arm systolic pressure, taken as the best non invasive estimate of central systolic pressure, and the highest ankle systolic pressure, as measured in each of the above mentioned vessels at the ankle for each limb.

$$ABPI_L = P_L/P_A$$

where **ABPI<sub>L</sub>**: Ankle Brachial Pressure Index for that leg

**P<sub>L</sub>**: Highest pressure obtained from the ankle vessels for that leg

**P<sub>A</sub>**: Highest brachial pressure of the two arms

ABPI normally >1.0

ABPI < 0.9 indicates arterial pathology

ABPI > 0.5 & <0.9 associated with claudication

ABPI < 0.5 indicates severe arterial disease and maybe associated with gangrene, ischemic ulceration or rest pain.

The Toe Brachial Pressure Index (TBPI) is derived from the ratio of arm systolic pressure, taken as the best non invasive estimate of central systolic pressure, and the highest Toe systolic pressure, as measured in artery of the great toe of each limb.

$$TBPI_L = P_T/P_A$$

where **TBPI<sub>L</sub>**: Toe Brachial Pressure Index for that toe

**P<sub>T</sub>**: Highest Pressure obtained from the toe vessels for that leg

**P<sub>A</sub>**: Highest Brachial pressure of the two arms

TBPI normally >1.0

TBPI <0.75 indicates arterial pathology

**All suspected cases will be advised Colour Doppler Imaging as a control test.**

**Results :**

**Table 1: Truth table for ABPI with Colour Doppler**

ABPI	Colour Doppler		
	PVD +ve	PVD -ve	Total
+ve (<1.0)	9	0	9
-ve ( $\geq$ 1.0)	71	0	71
Total	80	0	80

Truth Table comparing ABPI with colour doppler

**Table 2 : Truth table for TBI with Colour Doppler**

TBI	Colour Doppler		
	PVD +ve	PVD -ve	Total
+ve (<0.7)	68	0	68
-ve ( $\geq$ 0.7)	12	0	12
Total	80	0	80

Truth table comparing TBI with Colour Doppler.

**Table3 : Sensitivity analysis of TBI vs ABPI**

	TBI	ABPI
<b>Sensitivity</b>	85.0%	11.3%
<b>Specificity</b>	NA	NA
<b>PPV</b>	100.0%	100.0%
<b>NPV</b>	0.0%	0.0%
<b>Accuracy</b>	85.0%	11.3%

Sensitivity & Accuracy of TBI to diagnose PVD in diabetics is more than ABPI.

**DISCUSSION**

In this study, Toe Brachial Index (TBI) was compared with Ankle Brachial Pulse Index (ABPI) to ascertain which one would be a better diagnostic test for the diagnosis of PVD in patients of Diabetes. The study was performed using Hand held Doppler and the results were confirmed using Colour Doppler. The hand held Doppler is a portable device, now widely used by general surgeons as well as vascular surgeons to assess the blood flow to a limb.

Early diagnosis of both Diabetes as well as PVD in those patients, coupled with regular treatment & follow-ups are key to the management of both Diabetes & PVD, and their complications. Prevention of morbidity should be aggressively pursued so as to provide a viable lifestyle to the patient. Cessation of smoking, exercise, low fat diet & weight control should be incorporated to the lifestyle modification that should be strenuously advised to the patients.<sup>3,4,5</sup> Hand held Doppler examination of

the lower limb arteries provides a cheap & quick diagnosis of peripheral vascular disease in diabetics and therefore is a viable modality for prevention of morbidity in these patients.

### **Conclusion**

Toe Brachial Index is a more Sensitive & Accurate diagnostic modality when compared to Ankle Brachial Pulse Index for the diagnosis of PVD in patients with diabetes and is therefore a better screening tool for the diagnosis of PVD in diabetics.

### **References:**

1. Norgren L, Hiatt WR, Dormandy JA, et al: Inter-Society Consensus for the Management of Peripheral Arterial Disease (TASC II). *J Vasc Surg* 45(Suppl):S5 S67, 2007.
2. Orchard Tj, Strandness DE: Assessment of peripheral vascular in diabetes. Report and recommendations of an international workshop. *Circulation*, 1993; 88:81 Conrad MC. Large and small artery occlusion in diabetics and non diabetics with severe vascular disease. *Circulation* 1967;36:83-91
3. Huysman E, Mathieu C : Diabetes And Peripheral Vascular Disease. *Acta Chir Belg*. 2009 Oct; 109(5): 587-594
4. Coni N, Tennison B, Troup M: Prevalence of lower-extremity arterial disease among elderly people in the community. *Br J Gen Pract* 42:149–152, 1992
5. Federman DG, Trent JT, Froelich CW, Demirovic J, Kirsner RS: Epidemiology of peripheral vascular disease: a predictor of systemic vascular disease. *Ostomy Wound Manage* 44:58–62, 1998