"EFFICACY OF TOE BRACHIAL INDEX COMPARED TO ANKLE BRACHIAL PULSE INDEX AS A DIAGNOSTIC MODALITY IN PERIPHERAL VASCULAR DISEASE IN DIABETICS"

By

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Dissertation submitted to

In partial fulfillment for the degree of

MASTER OF SURGERY

IN

GENERAL SURGERY

Under the guidance of

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2017

DECLARATION BY THE CANDIDATE

I hereby declare that this dissertation entitled **"EFFICACY OF TOE BRACHIAL INDEX AS A DIAGNOSTIC MODALITY IN PERIPHERAL VASCULAR DISEASE IN DIABETICS COMPARED TO ANKLE BRACHIAL PULSE INDEX"** *is a bonafide and genuine research work carried out by me under the guidance of* ***DR.*** **BASAVARAJ S NARASANAGI,** *Associate Professor, Department of General Surgery, Shri. B.M. Patil Medical College, Hospital and Research centre, Vijayapur.*

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"To study the phenomenon of disease without books is to sail an uncharted sea, while to study books without patients is not to go to sea at all"

-Sir William Osler

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LIST OF ABBREVIATIONS

ABI	**–**	Ankle Brachial Index
ABPI	**–**	Ankle Brachial Pulse Index
AHA	–	American Heart Association
BP	–	Blood Pressure
CAD	**–**	Coronary Artery Disease
CVD	**–**	Cerebrovascular Disease
CLI	–	Chronic Limb Ischaemia
DM	-	Diabetes Mellitus
DP	**–**	Dorsalis Pedis
DVT	**–**	Deep Vein Thrombosis
ECG	–	Electrocardiogram
ESRD	–	End Stage Renal Disease
FBS	–	Fasting Blood Sugar
GTT	–	Glucose Tolerance Test
HbA1c	–	Glycosylated Hemoglobin
HDL	–	High Density Lipoprotein
IC	**–**	Intermittent Claudication
IDDM	–	Insulin Dependent Diabetes Mellitus
LDL	–	Low Density Lipoprotein
LEAD	–	Lower Extremity Arterial Disease
PVD	–	Peripheral Vascular Disease
TBI	–	Toe Brachial Index
TG	–	Triglycerides

ABSTRACT

Introduction:

Peripheral vascular disease (PVD) is a major cause of morbidity and mortality especially affecting the elderly population. The prevalence of PVD is multifold higher in patients with diabetes compared with age- and sex matched non-diabetic subjects, and this may be because of hyperglycemia, hypertension, hyperlipidemia, platelet factors, and other factors that are increased in diabetic subjects. Ankle Brachial Pulse Index (ABPI) has continued to be a well trusted diagnostic and prognostic modality in people suffering from PVD but its efficacy is reduced in diabetics with PVD due to the concomitant calcification in the crural vessels which gives a false high ankle systolic pressure. Toe Brachial Index (TBI) is another diagnostic modality that utilizes the great toe artery pressure instead of the anterior tibial and posterior tibial arteries. It is hypothesized that the great toe artery is not affected by medial sclerosis in diabetics and therefore could be utilized to get the correct value of the index between peripheral pressure and central pressure, thereby improving their prognosis by shortening the delay between diagnosis and treatment.

Objective of the Study:

To evaluate the efficacy of Toe Brachial index in comparison to Ankle brachial pulse index as a diagnostic modality in patients of diabetes for the diagnosis of Peripheral Vascular Disease.

Materials and Methods:

Data is collected from Diabetic disease cases admitted in B.L.D.E.U's Shri B. M. Patil Medical College, Hospital & Research Centre/attending surgical OPD from October 2014. Details of cases will be recorded including history, clinical

examination, measuring ABPI & TBI, Colour Doppler imaging & other routine investigations.

Procedure:

Patients diagnosed with diabetes based on their Fasting Blood Sugar (FBS) and Post Prandial Blood Sugar OR those who are already on drugs for the treatment of diabetes i.e. insulin or oral hypoglycemic agents are included in the study. The Ankle brachial pulse index (ABPI) and Toe brachial index (TBI) are then calculated using Hand held xioppler and the findings extrapolated using Arterial Colour Doppler as a confirmatory study.

Results:

Maximum numbers of cases were in the age group of 56 to 65 years with a mean of 53 years with a male: female ratio of 3:1. Majority of the patients (70%) were newly diagnosed diabetics. Poor control of diabetes was present in 85% of cases but none of the patients had any evidence of ESRD. TBI was able to diagnose PVD in 85% (68 patients) of patients of diabetes in the study group when compared to ABPI which could diagnose only 11.3% (9 patients) of patients in the study group.

Conclusion:

Toe Brachial Index is a more Sensitive & Accurate diagnostic modality than Ankle Brachial Pulse Index for the diagnosis of Peripheral Vascular Disease in diabetics.

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INTRODUCTION

The prevalence of Peripheral Vascular Disease is strikingly higher in a younger diabetic population, affecting one in three diabetics older than 50 years[3]. Hyperlipidemia, hypercholesterolemia, hypertension, diabetes mellitus, and exposure to infectious agents or toxins such as from cigarette smoking are all important and independent risk factors. Regardless of plans for intervention, it is recommended that asymptomatic patients at risk for PAD and those with symptoms undergo ABI testing[4]. The presence of DM involves a two- to fourfold increased risk of PVD by causing endothelial and smooth muscle cell dysfunction in peripheral arteries. Diabetics account for up to 70% of nontraumatic amputations performed, and a known diabetic who smokes has an approximately 30% risk of amputation within 5 years. PVD is common among patients with diabetes[1]. Ischaemic change is twice as common among diabetic patients than among nondiabetic patients. An increase in HbA1C by 1% can result in more than a 25% risk of PAD. Major amputation rates are five to ten times higher in diabetics than nondiabetics[2-5].

Insulin-dependent diabetic patients may have calcified walls of the medium and small arteries that can falsely elevate the segmental pressures of the leg. In this situation, digital pressures of the toes can be accurately measured and a pressure higher than 30 mm Hg is predictive of healing after local amputation and debridement. The presence of DM involves a two- to fourfold increased risk of PVD by causing endothelial and smooth muscle cell dysfunction in peripheral arteries[8,13].

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.

This is possible even when the arterial pulse cannot be palpated. Ankle pressures <50 mmHg or toe pressures <30 mmHg are indicative of critical limb ischemia. The toe pressure is normally 30 mmHg less than the ankle pressure, and a toe-brachial index of <0.70 is abnormal. False-positive results with the toe-brachial index are unusual. The main limitation of this technique is that it may be impossible to measure pressures in the first and second toes due to preexisting ulceration[17,19].

OBJECTIVE

To evaluate the efficacy of Toe Brachial index in comparison to Ankle brachial pulse index as a diagnostic modality in patients of diabetes for the diagnosis of Peripheral Vascular Disease.

REVIEW OF LITERATURE

Harrison, Michelle L & et al: Preliminary assessment of an automatic screening device for peripheral arterial disease using ankle-brachial and toe-brachial indices - Assessed 80 limbs from 40 normotensive and hypertensive individuals (17 men and 23 women) with a mean age of 45 +/- 18 years.

RESULTS: There was a statistically significant correlation (r=0.92) between toe systolic blood pressures obtained manually with photoplethysmography compared with those obtained through the automated device. The same significant correlation was also seen between the two with ankle (r=0.87) and brachial (r=0.88) systolic blood pressures[17].

Williams DT, Harding KG, Price P : An Evaluation of the efficacy of methods used in screening for lower-limb arterial disease in diabetes. They studied 130 limbs in 68 individuals with no critical ischemia over 8 months & concluded that screening tools that are effective in screening for lower limb PVD in the non-diabetic population are less efficacious in diabetes[31].

Coni N, Tennison B, Troup M: Prevalence of lower-extremity arterial disease among elderly people in the community – studied 56 individuals aged more than 65 years with diabetes and peripheral vascular disease using hand held Doppler sonography and concluded that early diagnosis of PVD in the elderly improved the prognosis compared to those who were diagnosed later[23].

Maya S Huijberts (Univ Hosp Maastricht, Maastricht, The Netherlands); Jacqueline M Dekker (Vrije Univ Med Cntr, Amsterdam, The Netherlands); Coen D Stehouwer (Univ Of California) : Ankle Brachial Pressure Index is a better predictor of cardiovascular mortality than toe brachial index or abnormal Doppler flow curves in both diabetic and non-diabetic subjects : THE HOORN STUDY – followed 631

patients through 15 years of follow up after which 141 had died of cardiovascular causes. They concluded that only ABPI <0.9 was an independent predictor of Cardiovascular mortality in non-diabetics (P=0.002). In diabetic individuals this effect was as least strong (P=0.007)[32]

Seong Chul Park (Soonchunhyang University College of Medicine,Gumi,Korea) & et al : Utility of Toe-brachial index for diagnosis of Peripheral artery disease[33] – measured ABI & TBI values in 51 patients with diabetic gangrene who were suspected of having lower extremity arterial insufficiency had ABI values of 0.9-1.3 despite presenting with diabetic gangrene or ulcers but had TBI values <0.6[28].

The Chennai Urban Population Study (CUPS) done to assess the Prevalence and Risk Factors of Peripheral Vascular Disease in a Selected South India Population was an epidemiological study involving 2 residential areas in Chennai in South India. Of the 1,399 eligible subjects (20 years of age), 1,262 (90.2%) participated in the study. All of the study subjects underwent an oral glucose tolerance test and were categorized as having normal glucose tolerance (NGT), impaired glucose tolerance (IGT), or diabetes. Peripheral Doppler studies were performed on 50% of the study subjects, and PVD was defined as an ankle-brachial index (ABI) <0.9. The limitations included the use of Peripheral Doppler to measure ABPI because calcified non-compressible arteries occur with increased frequency in patients with diabetes [34].

Hospital based descriptive, cross-sectional, knowledge, attitude and practice (KAP) study on diabetes in Bijapur, Karnataka conducted by Diabetic clinic of SHRI B.M PATIL MEDICAL COLLEGE & RESEARCH HOSPITAL with a sample size of 726 was calculated with a prevalence rate of 12.1% were interviewed over one & half year period (2005-2006). The questionnaire for the assessment included risk

factors contributing to diabetes, self care, treatment, complications and their prevention. Overall in the study population, 15.35% had poor knowledge scores, 59.9% had average knowledge scores and 24.8% had good knowledge score. Chi square test showed association between duration of illness and level of knowledge to be significant. They concluded that diabetes and its complications can largely be prevented if appropriate measures are taken[33].

Peripheral artery occlusive disease, commonly referred to as peripheral arterial disease (PAD) or peripheral vascular disease (PVD), refers to the obstruction or deterioration of arteries other than those supplying the heart and within the brain. The common denominator among these processes is the impairment of circulation and resultant ischemia to the end organ involved.

Diabetes Mellitus is an important risk factor of lower extremity arterial disease (LEAD) in India. Smoking and insulin resistance are frequently present in patients with diabetes and contribute an additional risk for vascular disease. Peripheral Vascular Disease (PVD) in diabetes is complicated by peripheral neuropathy and susceptibility to infection, which leads to foot ulceration, gangrene and amputation of the affected extremity. Diabetes accounts for ~ 50% of all non traumatic amputations in India. Mortality is increased in diabetic patients with PVD. Three years survival after an amputation is < 50%.

In population based and epidemiology based studies,[5,6] it is estimated that 20-30% of diabetic patients over 65 years of age have peripheral arterial disease. Approximately 30% of these diabetic patients with peripheral vascular disease require surgical or percutaneous revascularization. 10% require an amputation of the affected limb within 5-10 years of diagnosis. Progression from intermittent claudication to

critical limb ischemia occurs at the rate of 1.4% per year. Five year mortality of diabetic patients with PVD approaches 30%[4,26].

Vascular Wall Microanatomy

The arterial wall consists of three concentric layers:

1. The innermost layer is the intima. This is structurally a tube of endothelial cells in which the long axis of each cell is oriented longitudinally. The cells are aligned in a single layer and interface with the blood, providing metabolic reactivity and signaling via transport of mediators through their internal cellular architecture. The intima is separated from the media by the internal elastic membrane.
2. The media is the major structural support for the artery. It is composed predominantly of circumferentially arranged smooth muscle cells, collagen, elastin, and proteoglycans. Proteoglycans are formed of disaccharides bound to protein; they serve as binding or cement material in the interstitial spaces. The blood supply for the inner part of the media is by direct diffusion through the intima whereas the outer part is supplied by smaller penetrating arteries, known as *vasa vasorum*. The media is separated from the outermost layer, the adventitia, by the external elastic membrane.
3. The adventitia contains fibroblasts, collagen, and elastic tissue and is the strength layer of the artery.

The prevalence of PAD is strikingly higher in a younger diabetic population, affecting one in three diabetics older than 50 years. Hyperlipidemia, hypercholesterolemia, hypertension, diabetes mellitus, and exposure to infectious agents or toxins such as from cigarette smoking are all important and independent risk factors. Some abnormalities in the microcirculation in diabetics are not occlusive but

can alter the biology of the foot. There is evidence for thickening of capillary basement membrane,[3] which is key in the exchange of nutrients and metabolic products between the capillary lumen and the interstitium. The chemical structure of the membrane is altered by glycosylation, causing crosslinking of proteins and a decreased in the number of highly charged sulphur groups.[7] This may explain why molecules such as albumin leak through the capillary membrane in diabetics. There is no impairment in oxygen diffusion. In fact, diabetics with foot ulceration have higher levels of transcutaneous pO2 than non diabetics.[8]

Further evaluation of microanatomy reveals more tortuous capillaries in diabetics, appearing as tufts instead of the typical hair pin loops. With ischemia there is less recruitment of new capillaries into the circulation, although per gram there is no difference in capillary concentration. Atherosclerotic occlusion in diabetes commonly involves tibial and peroneal arteries and spares superficial femoral artery and the arteries of the foot, especially the dorsalis pedis artery.[9-13]

Clinical Classification of Peripheral Arterial Disease: Fontaine and Rutherford Systems

Fontaine Classification

STAGE	CLINICAL
I	Asymptomatic
IIa	Mild claudication
IIb	Moderate to severe Claudication
III	Ischemic rest pain
IV	Ulceration or gangrene

Rutherford Classification

GRADE	CLINICAL
0	Asymptomatic
1	Mild claudication
2	Moderate claudication
3	Severe claudication
4	Ischemic rest pain
5	Minor tissue loss
6	Major tissue loss

TASC II Classification of Femoral Popliteal Occlusive Lesions

Type A lesions

- Single stenosis ≤10 cm in length
- Single occlusion ≤5 cm in length

Type B lesions

- Multiple lesions (stenoses or occlusions), each ≤5 cm
- Single stenosis or occlusion ≤15 cm not involving the infra geniculate popliteal artery
- Single or multiple lesions in the absence of continuous tibial vessels to improve inflow for a distal bypass
- Heavily calcified occlusion ≤5 cm in length
- Single popliteal stenosis

Type C lesions

- Multiple stenoses or occlusions totaling >15 cm with or without heavy calcification
- Recurrent stenoses or occlusions that need treatment after two endovascular interventions

Type D lesions

- Chronic total occlusions of CFA or SFA (>20 cm, involving the popliteal artery)
- Chronic total occlusion of popliteal artery and proximal trifurcation vessels

CFA = common femoral artery; SFA = superficial femoral artery; TASC II = Trans-Atlantic Inter-Society Consensus

The presence of DM involves a two- to fourfold increased risk of PVD by causing endothelial and smooth muscle cell dysfunction in peripheral arteries.

Diabetics account for up to 70% of nontraumatic amputations performed, and a known diabetic who smokes has an approximately 30% risk of amputation within 5 years. Diabetic Foot PVD is common among patients with diabetes (Fig. 63-12). IC is twice as common among diabetic patients than among nondiabetic patients. An increase in HgbA1C by 1% can result in more than a 25% risk of PAD. Major amputation rates are five to ten times higher in diabetics than nondiabetics[12].

Because of these causal relations, the American Diabetes Association recommends ABI screening every 5 years in patients with diabetes.[8] The care of diabetic patients should start with preventive measures, and it is important to avoid infections in patients with insensate feet because of neuropathy. These patients need to wear properly fitted shoes at all times for protection. Orthotic inserts should be used to distribute weight evenly to avoid pressure on the metatarsal heads of the foot. Diabetic patients may be unaware of the presence of infections or ulcerative lesions because of peripheral neuropathy and a decreased ability to sense pain. In this population, infections can progress rapidly, with significant tissue damage from a combination of delayed presentation and compromised immune function[8].

On presentation, a careful physical examination is important to plan for appropriate treatment. The overlying cellulitis is assessed, and any possible underlying abscess is examined by palpation for crepitus or detection of drainage of purulent fluid. Cellulitis should not be confused with dependent rubor caused by severe ischemia in patients with PAD. The presence of an abscess requires immediate drainage prior to revascularization. The status of arterial circulation is documented. The presence or absence of lower extremity pulses in the common femoral, popliteal, and pedal arteries is examined. The pulses may be difficult to palpate because of

swelling from foot infection; noninvasive arterial ultrasound can be useful in assessing the extent of arterial disease[1,5,14].

The physical examination begins with vital signs, which often reveals hypertension and tachycardia. Blood pressure in both arms should be documented. The presence or absence of carotid bruits, cardiac murmurs, abdominal, flank, or groin bruits should be noted. The abdomen should be palpated for the aortic pulsation. Incision scars should be noted. Bilateral carotid, radial, ulnar, femoral, popliteal, dorsalis pedis (DP), and posterior tibial (PT) pulses should be palpated and characterized. If pulses are not palpable, a continuous wave Doppler can be used to check for signals.

Common physical findings of PAD include hair loss and dry shiny skin with nail hypertrophy. In Chronic Limb Ischaemia (CLI), the classic findings of dependent rubor and pallor with elevation of the limb can be observed. In cases of severe rest pain, patients may have peripheral edema because they are unable to take their legs from the dependent position without pain. The feet should be meticulously inspected for wounds and signs of skin breakdown. A neurologic examination documenting equivalent strength and sensation in the limbs and cranial nerves should be performed.

Routine laboratory work should include a complete blood count, chemistry (to evaluate renal function and glucose), and a lipid panel. An albumin level can be helpful in delineating the adequacy of a patient's nutritional status, if this is in question. The hemoglobin A1c (HbA1c) level indicates the patient's level of glycemic control over the previous 120 days. A baseline electrocardiogram should be obtained. Any previous cardiac testing, including echocardiography, stress echocardiography, dobutamine-adenosine sestamibi scan, and coronary catheterization, should be reviewed and documented[9].

Insulin-dependent diabetic patients may have calcified walls of the medium and small arteries that can falsely elevate the segmental pressures of the leg. In this situation, digital pressures of the toes can be accurately measured and a pressure higher than 30 mm Hg is predictive of healing after local amputation and debridement. The presence of DM involves a two- to fourfold increased risk of PVD by causing endothelial and smooth muscle cell dysfunction in peripheral arteries. Diabetics account for up to 70% of nontraumatic amputations performed, and a known diabetic who smokes has an approximately 30% risk of amputation within 5 years[1,3,26].

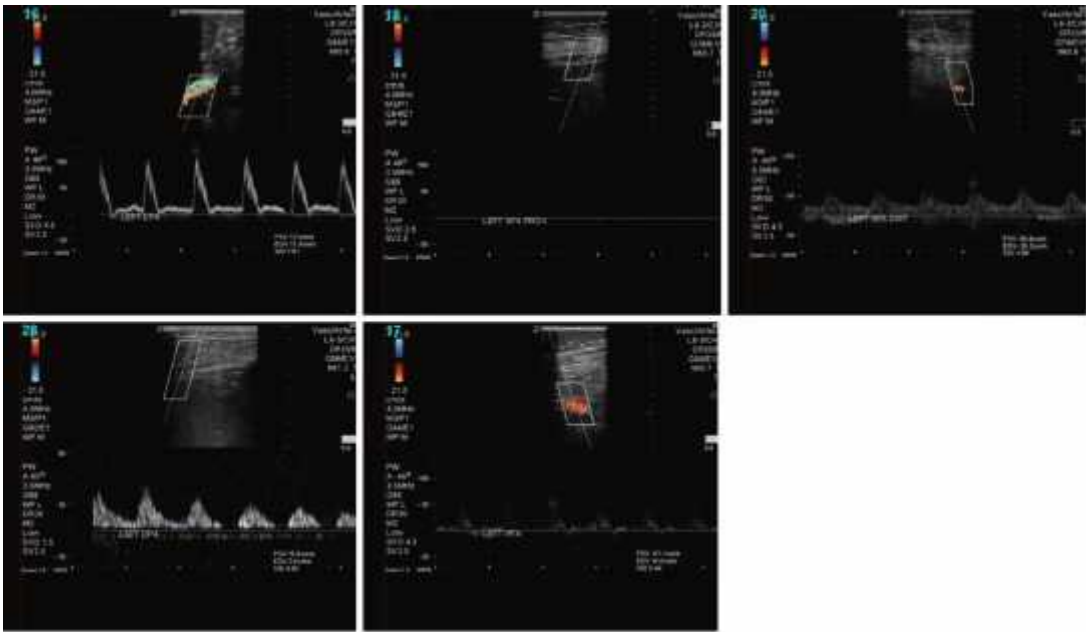
Regardless of plans for intervention, it is recommended that asymptomatic patients at risk for PAD and those with symptoms undergo ABI testing. This examination can be performed simply with a manual blood pressure cuff at the ankle and a continuous wave Doppler probe. With the patient in a supine position, after several minutes of rest to allow limb pressure to return to baseline, the cuff is inflated at the ankle, with the Doppler probe held at the location of the distal DP or PT signal. The systolic pressure is recorded as the pressure in the cuff when the Doppler signal returns. This process can be performed with multiple cuffs allowing for segmental pressure determination, which is helpful in localizing the level of the obstructing lesion. The ABI for a limb is calculated using the higher of the two ankle pressures divided by the higher of the two brachial pressures. Patients with an ABI of 0.90 or less have a three- to sixfold increased risk of cardiovascular mortality.

By placing serial BP cuffs down the LE (lower extremity) and then measuring the pressure with a Doppler probe as flow returns to the artery below the cuff, it is possible to determine segmental pressures down the leg. These data can then be used to infer the level of the occlusion. The systolic pressure at each level is expressed as a

ratio, with the highest systolic pressure in the upper extremities as the denominator. Normal segmental pressures commonly show high thigh pressures 20 mmHg or greater in comparison to the brachial artery pressures. The low thigh pressure should be equivalent to brachial pressures. Subsequent pressures should fall by no more than 10 mmHg at each level. A pressure gradient of 20 mmHg between two subsequent levels is usually indicative of occlusive disease at that level. The most frequently used index is the ratio of the ankle pressure to the brachial pressure, the ABI. Normally the ABI is >1.0, and a value <0.9 indicates some degree of arterial obstruction and has been shown to be correlated with an increased risk of coronary heart disease.

Limitations of relying on segmental limb pressures include: (a) missing isolated moderate stenoses (usually iliac) that produce little or no pressure gradient at rest; (b) falsely elevated pressures in patients with diabetes and end-stage renal disease; and (c) the inability to differentiate between stenosis and occlusion.2 Patients with diabetes and end-stage renal disease have calcified vessels that are difficult to compress, thus rendering this method inaccurate, due to recording of falsely elevated pressure readings. Noncompressible arteries yield ankle systolic pressures of 250 mmHg or greater and an ABI of >1.40. In this situation, absolute toe and ankle pressures can be measured to gauge critical limb ischemia. Ankle pressures <50 mmHg or toe pressures <30 mmHg are indicative of critical limb ischemia. The toe pressure is normally 30 mmHg less than the ankle pressure, and a toe-brachial index of <0.70 is abnormal. False-positive results with the toe-brachial index are unusual. The main limitation of this technique is that it may be impossible to measure pressures in the first and second toes due to preexisting ulceration. The diagnosis of PAD is given to ABI <0.9. ABI >1.3 is interpreted as abnormal because of

incompressible tibial arteries, frequently seen in diabetes and end stage renal disease[18,27].



Arterial duplex scanning, left critical limb ischemia. Although both ABIs are abnormal **(A)**, the right limb waveforms are multiphasic and the left-sided waveforms are monophasic. Arterial duplex images show normal left CFA **(B)** and no flow in the proximal SFA **(C)**; however, flow in the distal SFA **(D)** and dorsalis pedis arteries **(E)** is present because of collateral flow from the profunda femoris**(F)**

Doppler ultrasound blood flow detection:

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. This is possible even when the arterial pulse cannot be palpated. Both the pressure and signal quality are important; a normal artery has a triphasic signal that can be detected by a trained observer. However, although the presence of a Doppler signal indicates moving blood, it does not necessarily indicate that the blood flow is sufficient to maintain limb viability and prevent limb loss[16].

The ankle–brachial pressure index (ABPI) is the ratio of systolic pressure at the ankle to that in the arm. The highest pressure in the dorsalis pedis, posterior tibial or peroneal artery serves as the numerator, with the highest brachial systolic pressure being the denominator. Resting ABPI is normally about 1.0; values below 0.9 indicate some degree of arterial obstruction (claudication), less than 0.5 suggests rest pain and less than 0.3 indicates imminent necrosis[6,7.13]. However, the values are merely a guide and normal values may be present with intermittent claudication. Retesting after exercise can be useful; a normal ABPI may subsequently fall in patients with ischaemia. Artificially high readings can be caused by calcified, incompressible arteries which are often found in diabetics.

A meta-analysis of 71 studies by Koelemay and associates confirmed that duplex scanning is accurate for assessing arterial occlusive disease in patients suffering from claudication or critical ischemia, with an accumulative sensitivity of 80% and specificity of over 95%.[33]

Management Of Lower Limb Peripheral Vascular Disease

Management of Peripheral Vascular Disease can be divided into two categories :

i. Medical Therapy

ii. Lower limb revascularization

I. Medical Therapy

Exercise: Supervised exercise therapy has been shown to improve claudication in patients with PAD. In a metaanalysis of exercise programs, supervised exercise therapy increased the average distance walked to the onset of claudication by 179% and the maximal distance walked by 122%. The exercise schedule should be of at least 30 minutes duration at least twice a week. Supervised exercise therapy benefits by development of collateral vessels, expression of angiogenic factors, improvement in the endothelial functions and cardiovascular fitness. Control of risk factors (e.g. Diabetes Mellitus, Dyslipidemia, Hypertension and others) and total abstinence from smoking are corner stone of medical therapy[9,12].

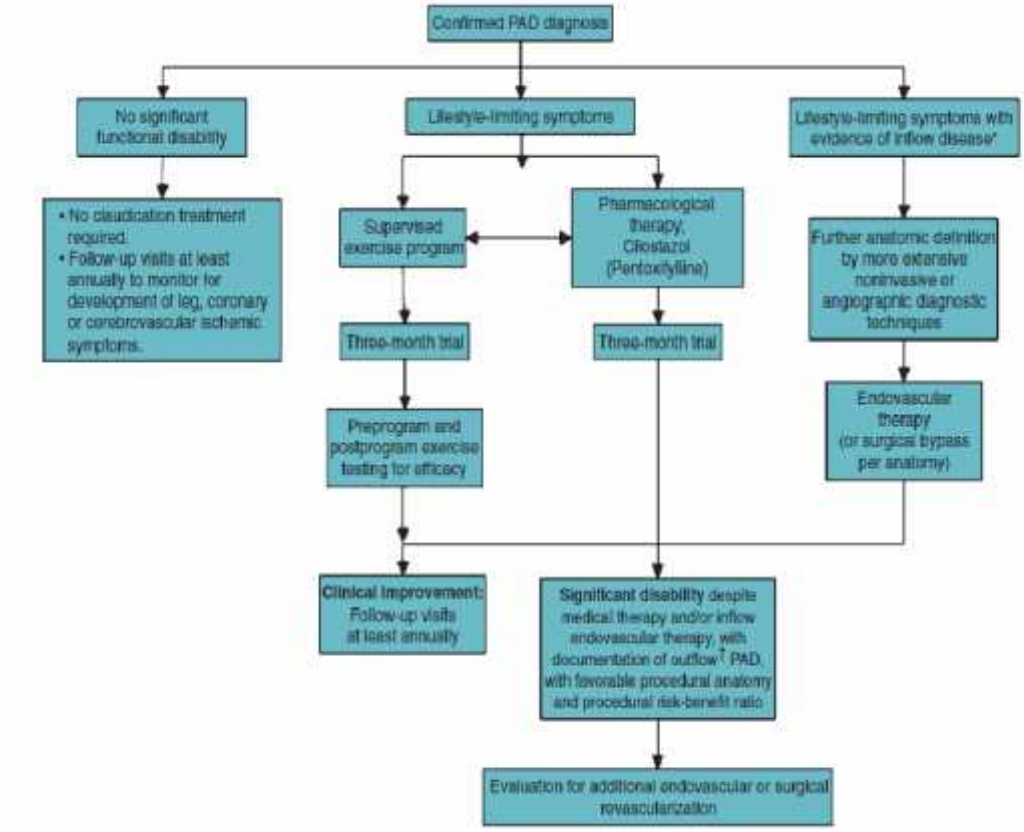
Aspirin therapy remains the most commonly prescribed therapy among patients with PAD. However, both **clopidogrel** and **cilostazol** have evolved in recent years as promising new therapies for patients with peripheral vascular disease. In the large multi-national CAPRIE Trial, 20 patients randomized to clopidogrel had a significant reduction in atherosclerotic events like vascular death, myocardial infarction and stroke compared with those randomized to aspirin[22].

Cilostazol is a quinolinone and has many beneficial effects such as prevention of platelet aggregation; vasodilatation and inhibition of smooth muscle cell proliferation. When compared with pentoxifyline and placebo in patients with peripheral arterial disease, cilostazol results in a significant increase in the walking distance on the treadmill[22].

Unfortunately, uptil now, medical therapy has not provided a great deal of benefit in eliminating symptoms or progression of peripheral arterial disease. Currently, medical therapy is focused on reducing the morbidity and mortality from accompanying cerebrovascular and cardiovascular disease.

There are numerous novel pharmacologic therapies being actively investigated in patients with peripheral arterial disease. These include **arterial gene therapy** and metabolic agents such as **l-propionyl carnitine** and **glycoprotein llb/llla receptor antagonist**. Each of these modalities will require further investigations[20].

Intermittent claudication treatment algorithm:



Guidelines for Risk Factor Modification (AHA):

1. Lipid Management

Goal: Primary—serum LDL <100 mg/dL; secondary—HDL >35 mg/dL, TG <200 mg/dL

Approach: Diet: <30% fat, <7% saturated fat, <200 mg/day cholesterol; specific drug therapy targeted to lipid profile

2. Weight Reduction

Goal: Ideal body weight

Approach: Physical activity, diet as outlined

3. Smoking

Goal: Complete cessation

Approach: Behavior modification, counseling, nicotine analogues

4. Blood Pressure

Goal: <140/90 mm Hg

Approach: Weight control, physical activity, sodium restriction, antihypertensive drugs

5. Physical Activity

Goal: At least 30 minutes of moderate exercise 3 to 4 times per week

Approach: Walking, cycling, jogging, lifestyle and work activities.

In contemporary surgical practice, lipid modification, antiplatelet and antihypertensive control, and smoking cessation strategies are all becoming standard management issues for the patient with vascular disease.

II. Revascularisation of Peripheral Vessels

Revascularization therapy could be achieved by either surgical operation or by percutaneous interventional procedures. Maintaining functional limb viability with the lowest procedural and long-term mortality should be the objective in the care of these patients. When chosen appropriately, both surgical bypass and endovascular techniques may benefit these patients. Whatever technique is used, the result should achieve a straight-line distal flow to the foot, preferably leading to distal pulsation. The patient should be followed closely for wound healing with vascular surveillance.

1. **Percutaneous endovascular revascularisation**

   For the purpose of revascularisation, PVD is described in terms of inflow (Aorto-iliac), out flow (Infra-Inguinal) and Runoff (below knee) disease. Increasingly percutaneous endovascular treatment and/or Surgery is being used to optimise the patient outcome while minimising morbidity & limb loss. Intra arterial thrombolysis by urokinase is an important adjunct to the above treatment modalities. Peripheral angioplasty is better and more accepted technique then bypass surgery[4,28].

2. **Aortic / iliac revascularization**

   The iliac arteries are technically the easiest vessels to approach percutaneously. The results of PTA are very good because of the large size and high flow rates. Although aortofemoral bypass has a patency of 93% at 42 months, it is still a major surgical procedure with potential of systemic complications in patients with preexisting significant comorbid conditions. With the advent of peripheral stents, the outcomes have improved, especially where the results of PTA are suboptimal. With this technique, large complex lesions and occlusions and aortic bifurcation disease can be treated with ease. In these cases the technical success is 96%, primary & secondary patency at 5 years is 63% & 86% respectively, approaching that of surgical bypass[15].

3. **Infrainguinal Revascularization**

   The role of infrainguinal angioplasty and stenting in the treatment of lower-extremity ischemia is more controversial than PTA and stenting for aortoiliac occlusive disease. Because of the small size of the infrainguinal vessels above and below the knee, dissections are more likely to be flow limiting, spasm is more common and relatively mild intimal hyperplasia or recoil of treated

lesions may lead to recurrence of clinical symptoms. In contrast, infrainguinal surgical bypass carries a lower rate of morbidity than iliac bypass and retains a high patency rate. Although percutaneous revascularization plays a less prominent role in the infrainguinal vasculature than in the aorto-iliac system, it remains attractive as a minimally invasive alternative to surgical bypass requiring shorter hospital stays and permitting faster recovery. Although dilatation of the common femoral and profunda femoral arteries is sometimes indicated, the most commonly treate femoropopliteal vessels are the superficial femoral artery(SFA) and popliteal artery. The technical success rate of femoropopliteal PTA is high at 93-95%[13].

III. Amputation

Amputation should be considered when part of a limb is dead, deadly or a dead loss. A limb is dead when arterial occlusive disease is severe enough to cause infarction of macroscopic portions of tissue, i.e. gangrene. The occlusion may be in major vessels (atherosclerotic or embolic occlusions) or in small peripheral vessels (diabetes, Buerger's disease, Raynaud's disease, inadvertent intra-arterial injection). If the obstruction cannot be reversed and the symptoms are severe, amputation is required[10,11].

Indications for amputation

1. Dead limb – Gangrene
2. Deadly limb - Wet gangrene, Spreading cellulitis Other (e.g. malignancy)
3. 'Dead loss' limb - Severe rest pain with unreconstructable critical leg ischaemia.

The major choice is between an above- or below-knee operation. A below-knee amputation preserves the knee joint and gives the best chance of walking again

with a prosthesis. However, an above-knee amputation is more likely to heal and may be appropriate if the patient has no prospect of walking again. If the femoral pulse is absent, the amputation should be above the knee. Unfortunately, the presence of a femoral pulse does not guarantee healing of a below-knee amputation and sometimes a failed below-knee amputation may require revision to an above knee procedure[2,16].

METHODOLOGY

Source of data:

Diabetic disease cases admitted in B.L.D.E.U's Shri B. M. Patil Medical College, Hospital & Research Centre / attending surgical OPD.

Method of collection of data:

Diabetic disease cases admitted in B.L.D.E.U's Shri B. M. Patil Medical College, Hospital & Research Centre / attending surgical OPD during period of Oct 2014 to July 2016.

Details of cases will be recorded including history, clinical examination, measuring ABPI & TBI and Colour Doppler imaging & other routine investigations done. Detailed information regarding Peripheral Vascular Disease & Diabetes will be entered in the proforma. These patients with confirmed Peripheral Vascular Disease and Diabetes will undergo treatment as deemed necessary.

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.

Research Hypothesis

Toe Brachial Index (TBI) is better than Ankle Brachial Pressure Index (ABPI) as a diagnostic modality for the diagnosis of peripheral vascular disease in diabetics.

Procedure

Patients will be diagnosed with diabetes based on their Fasting Blood Sugar (FBS) more than 120mg/dl and Post Prandial Blood Sugar (PPBS) more than 180mg/dl OR those who are already on drugs for the treatment of diabetes i.e. insulin or oral hypoglycemic agents.

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.

$\mathbf{ABPI_L = P_L/P_A}$

where **$ABPI_L$: Ankle Brachial Pressure Index for that leg**

P_L: Highest pressure obtained from the ankle vessels for that leg

P_A : 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 < 0.5indicates 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 **$TBPI_L$: Toe Brachial Pressure Index for that toe**

P_T : Highest Pressure obtained from the toe vessels for that leg

P_A : 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.

INVESTIGATIONS

Investigations or interventions required in this study are routine standardized procedures. There is no animal experiment involved in this study.

Complete blood count

Urine – microscopy, sugar, albumin

Fasting blood sugar (FBS)

Post Prandial blood sugar (PPBS)

HbA_{1C}

Blood Urea

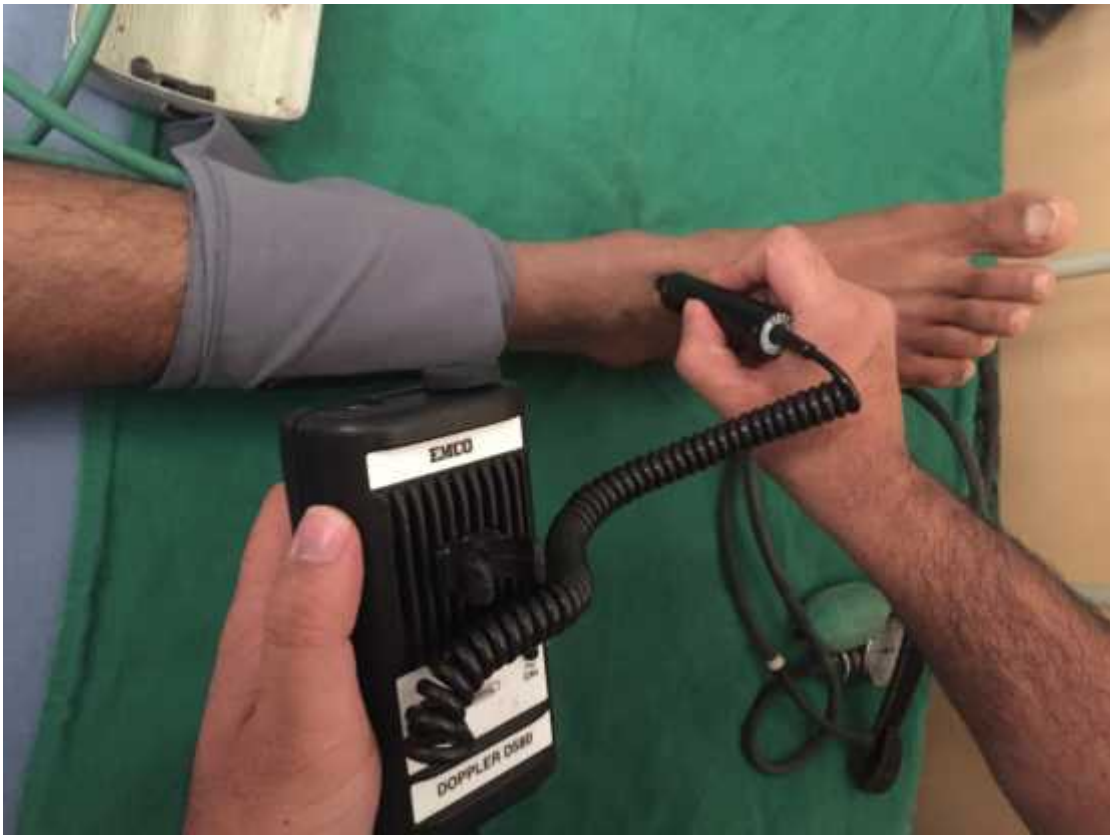
Serum Creatinine

Ankle Brachial Pulse Index & Toe Brachial Index using Hand held Doppler

Colour Doppler Imaging

HAND HELD DOPPLER WITH BLOOD PRESSURE GAUGE AND TOE CUFF

HAND HELD DOPPLER MEASUREMENT OF POSTERIOR TIBIAL ARTERY PRESSURE



HAND HELD DOPPLER MEASUREMENT OF ANTERIOR TIBIAL ARTERY PRESSURE

HAND HELD DOPPLER MEASUREMENT OF ARTERY OF GREAT TOE PRESSURE.

RESULTS

Table: Distribution of cases according to Age

Age (Yrs)	N	%
≤35	7	8.8
36-45	16	20.0
46-55	20	25.0
56-65	29	36.2
66-75	8	10.0
Total	80	100

Parameters	Min	Max	Mean	SD
Age	24	75	53.0	11.6

Maximum number of cases were in the age group of 56 to 65 years with a mean of 53 years.

Figure: Distribution of cases according to Age

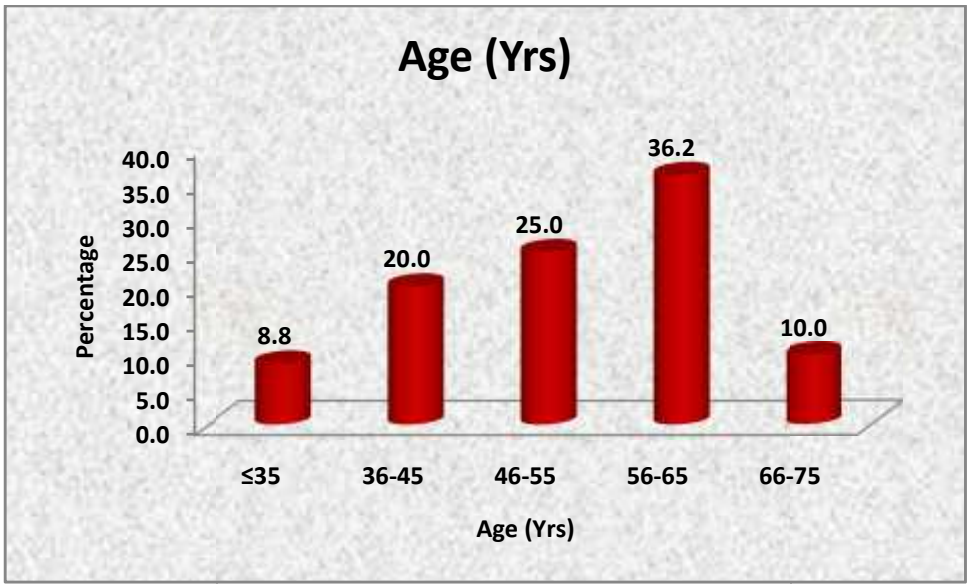
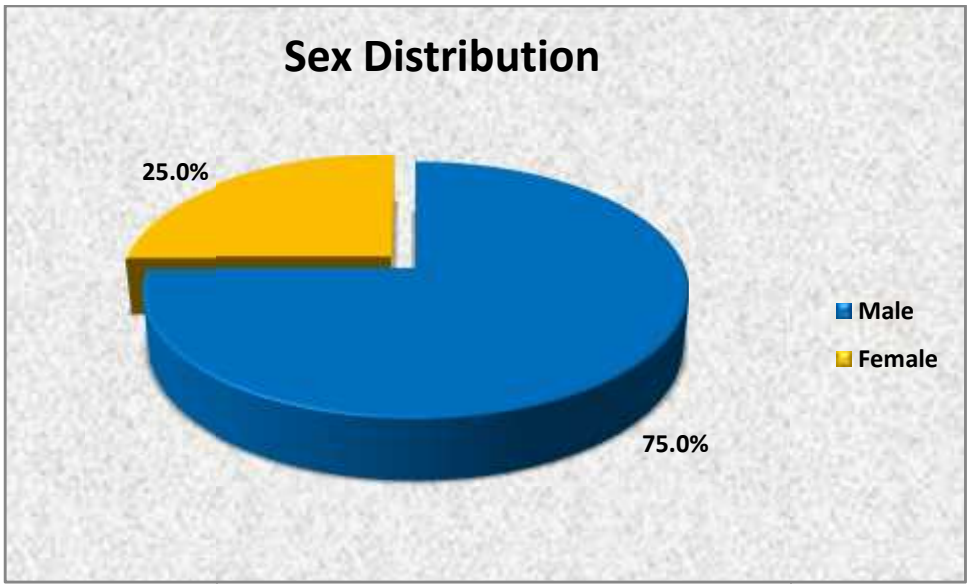


Table: Distribution of cases according to Sex

Sex	N	%
Male	60	75
Female	20	25
Total	80	100

Figure: Distribution of cases according to Sex



A male preponderance of 75% (60 patients) when compared to female patients (25%; 20 patients) is noted with the male : female ratio of 3:1.

Table: Distribution of cases according to Age and Sex

Age (Yrs)	Male		Female		p value
	N	%	N	%	
≤35	7	11.7%	0	0.0%	0.575
36-45	12	20.0%	4	20.0%	
46-55	15	25.0%	5	25.0%	
56-65	20	33.3%	9	45.0%	
66-75	6	10.0%	2	10.0%	
Total	60	100.0%	20	100.0%	

Figure: Distribution of cases according to Age and Sex

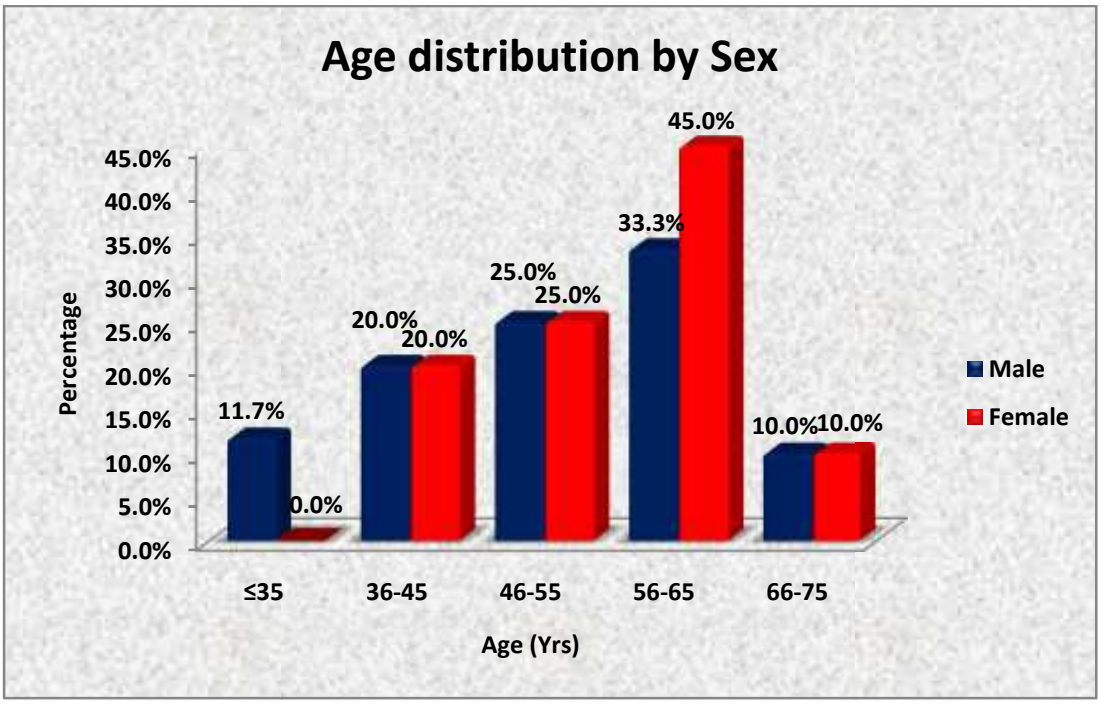


Table: Distribution of cases according to Diabetes

Diabetes (New/Old)	**N**	**%**
New	56	70
Old	24	30
Total	80	100

Majority of the patients (70%) were newly diagnosed diabetics.

Figure: Distribution of cases according to Diabetes

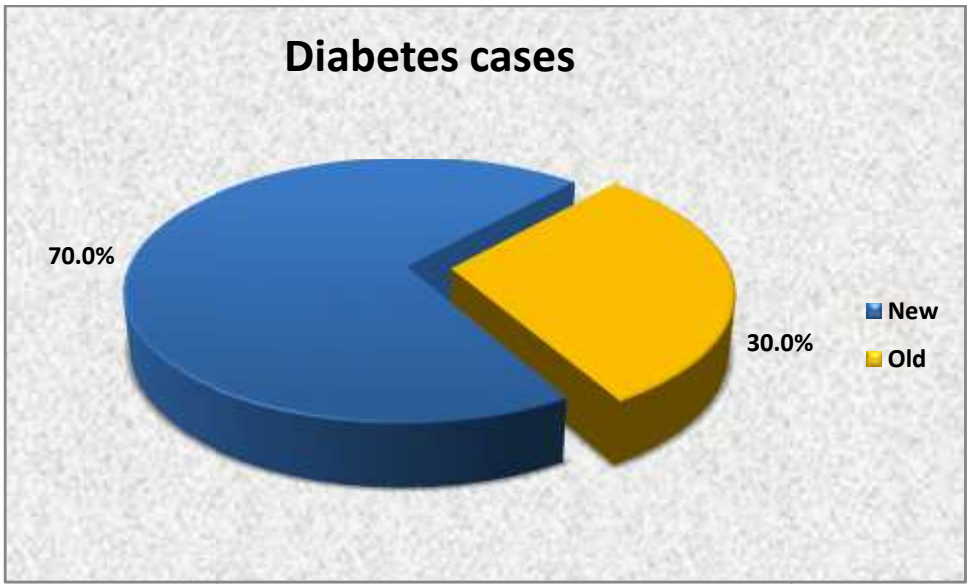


Table: Distribution of cases according to Procedure

Procedure	N	%
Appendicectomy	3	3.8
Below knee amputation	37	46.2
conservative	30	37.5
Excision of mass	1	1.2
Fistulectomy	1	1.2
hemorrhoidectomy	1	1.2
Herniotomy	1	1.2
Jaboulay's Procedure	2	2.5
lipoma excision	1	1.2
Mesh Hernioplasty	3	3.8
Total	80	100

Figure: Distribution of cases according to Procedure

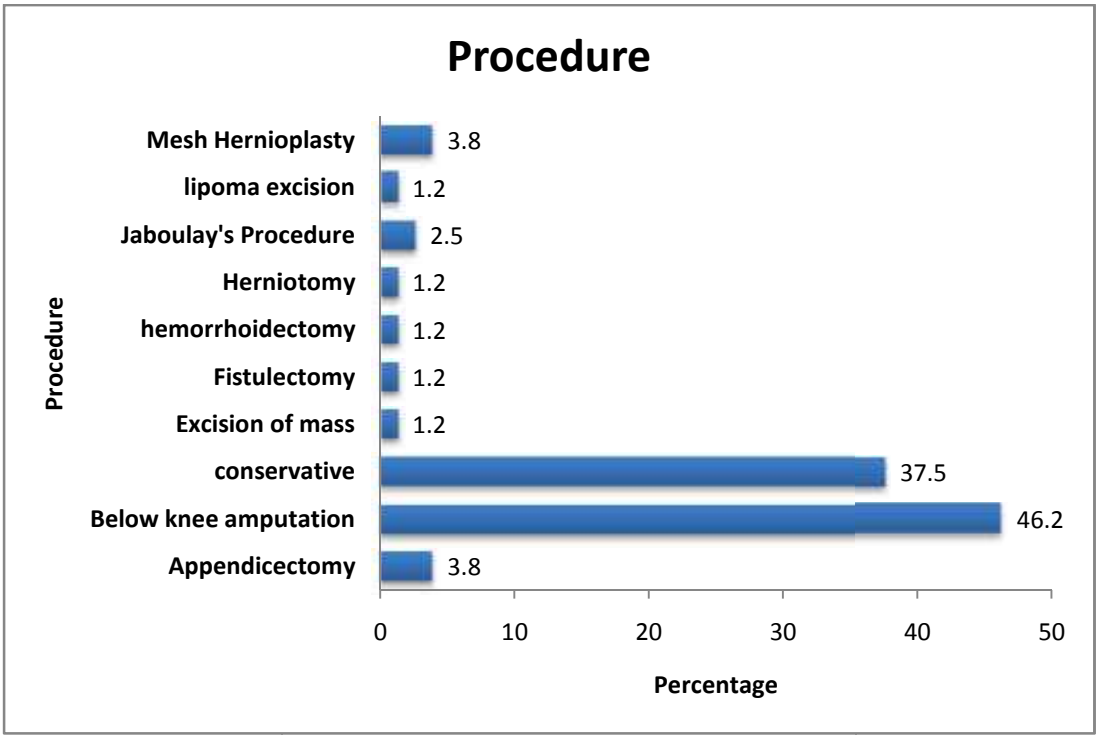


Table: Distribution of cases according to Outcome

Outcome	N	%
Recovered	31	38.8
Wound healed after amputation	39	48.8
Revision amputation	10	12.5
Total	80	100

Figure: Distribution of cases according to Outcome

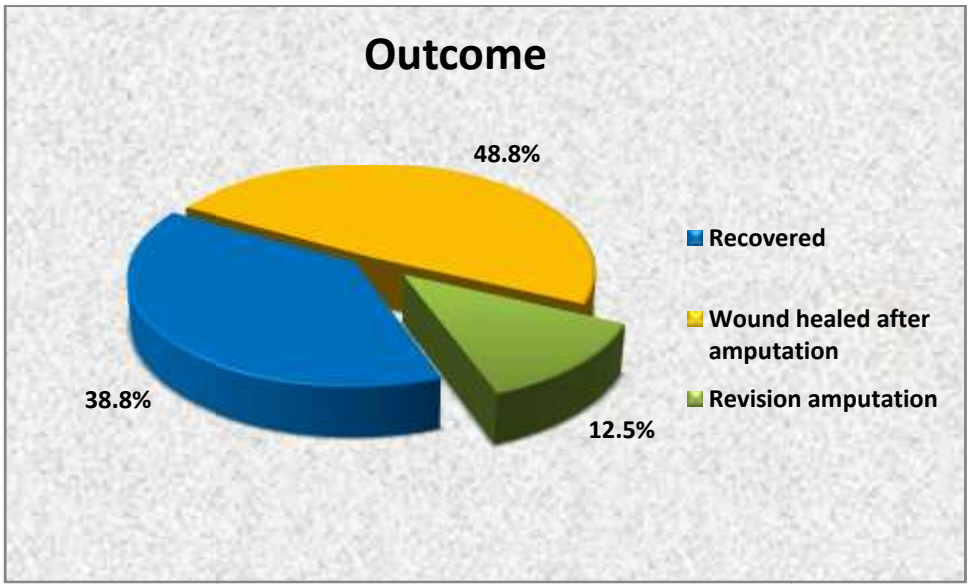


Table: Distribution of Parameters

Parameters	Min	Max	Mean	SD
HbA1c	6.4	11	9.0	1.1
B Urea (mg/dl)	24	48	36.9	5.5
S Creatnine (mg/dl)	0.8	1.6	1.3	0.2
ABPI	0.8	1.62	1.2	0.2
TBI	0.5	0.7	0.6	0.1

Table: Distribution of cases according to HbA1c

HbA1c	N	%
<8	12	15
>8	68	85
Total	80	100

The mean HbA1c was 9, signifying a poor control of diabetes in 85% (68 patients) of cases with Peripheral Vascular Disease.

Figure: Distribution of cases according to HbA1c

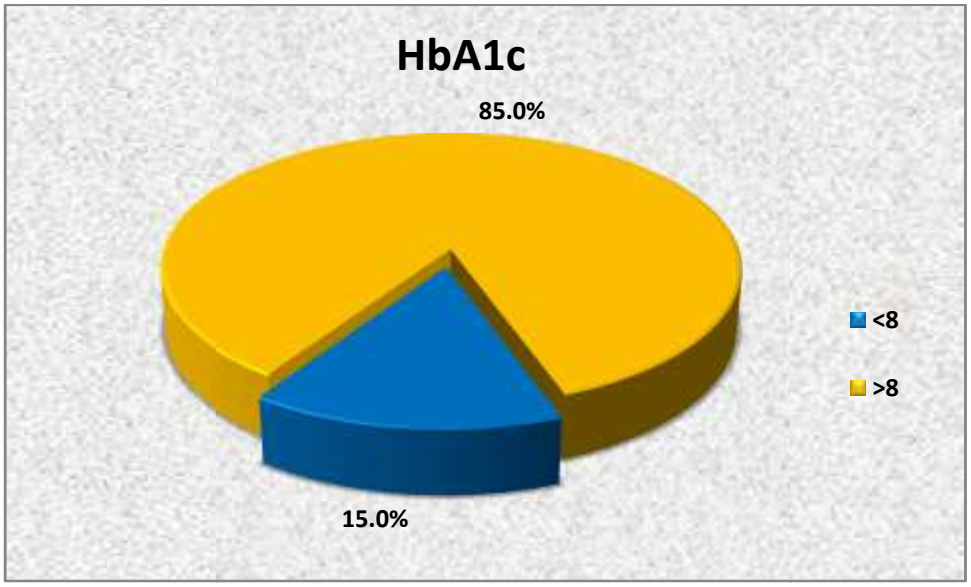


Table: Distribution of cases according to Blood Urea (mg/dl)

Blood Urea (mg/dl)	N	%
<50	80	100
>50	0	0
Total	80	100

Figure: Distribution of cases according to Blood Urea (mg/dl)

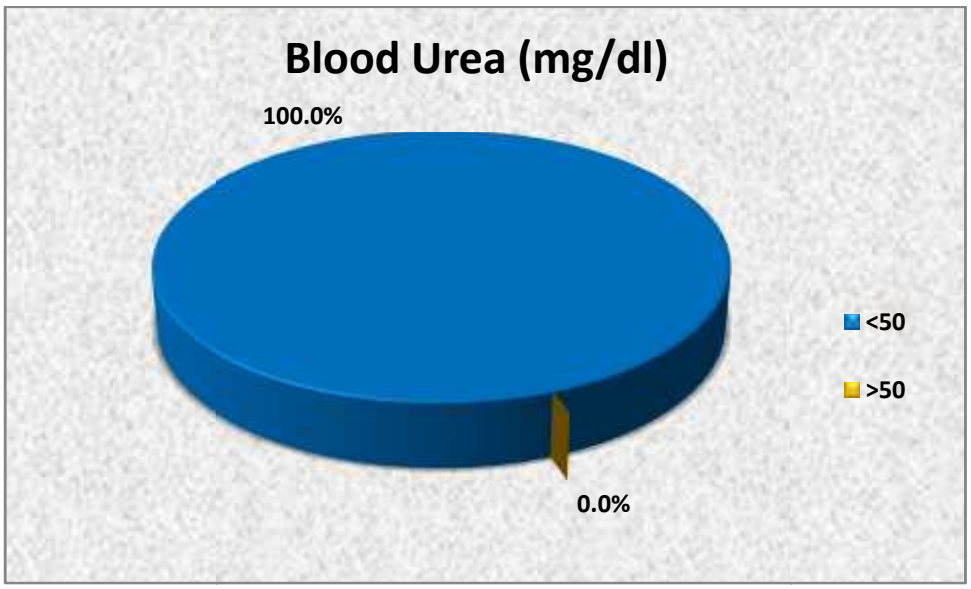
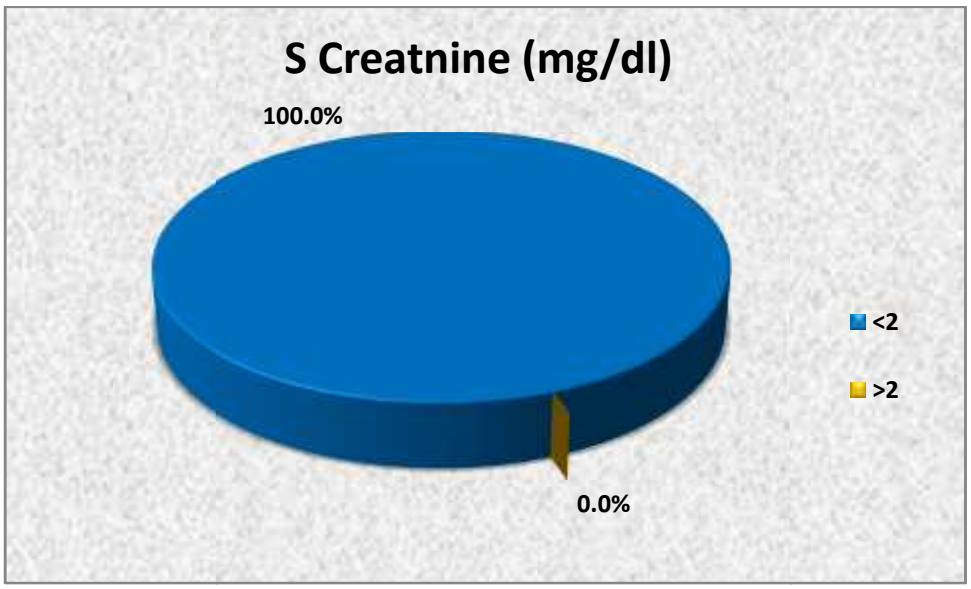


Table: Distribution of cases according to S Creatnine (mg/dl)

S Creatnine (mg/dl)	N	%
<2	80	100
>2	0	0
Total	80	100

Figure: Distribution of cases according to S Creatnine (mg/dl)



All the patients' Blood Urea & Serum Creatinine were within normal limits, signifying absence of End Stage Renal Disease (ESRD).

Table: Distribution of cases according to ABPI

ABPI	N	%
+ve (<1.0)	9	11.2
-ve (≥1.0)	71	88.8
Total	80	100

Amongst 80 cases, only 9 (11.2%) of diabetics were diagnosed with PVD accurately using ABPI.

Figure: Distribution of cases according to ABPI

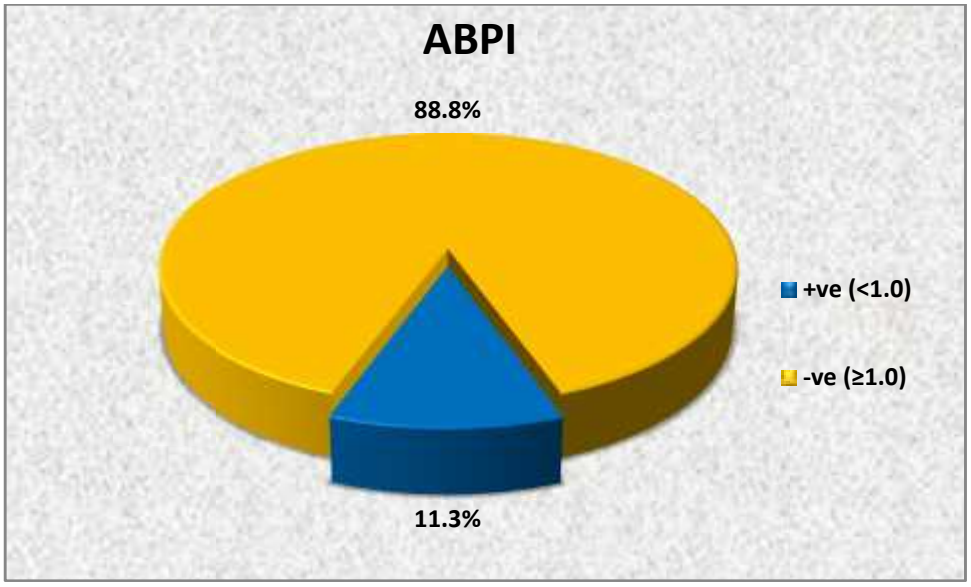


Table: Distribution of cases according to TBI

TBI	N	%
+ve (<0.7)	68	85
-ve (≥0.7)	12	15
Total	80	100

TBI was able to diagnose PVD in 85% (68 patients) of patients of diabetes in the study group.

Figure: Distribution of cases according to TBI

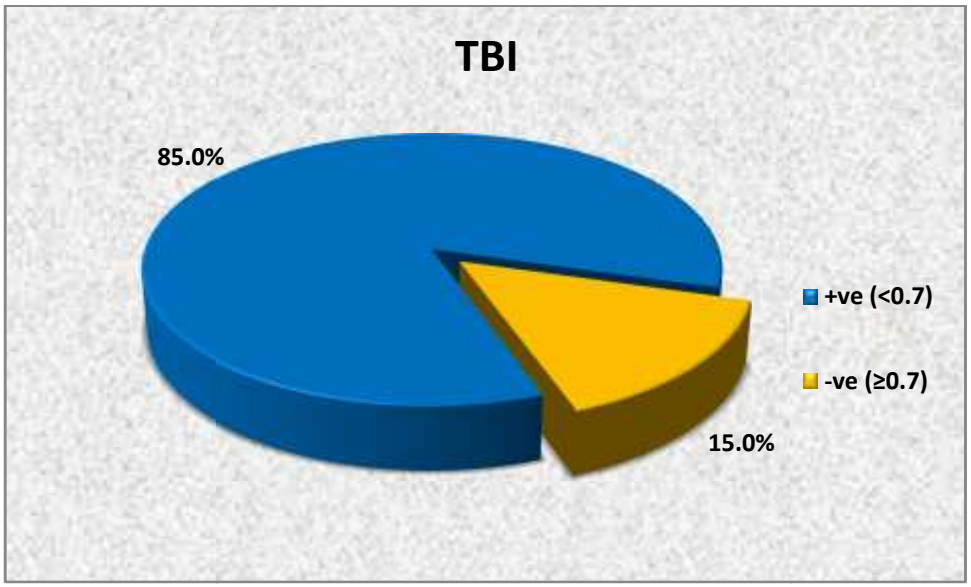


Table: Distribution of cases according to ABPI and TBI

ABPI	TBI				Total	p value
	+ve (<0.7)		-ve (≥0.7)			
	N	%	N	%	N	
+ve (<1.0)	9	100.0%	0	0.0%	9	0.181
-ve (≥1.0)	59	83.1%	12	16.9%	71	
Total	68	85.0%	12	15.0%	80	
Agreement between TBI and ABPI= (9+12)/80 = 26.3%						

Agreement table between TBI & ABPI showing number of cases diagnosed by ABPI & TBI.

Table: Truth table for ABPI with Colour Doppler

ABPI	Colour Doppler		
	PVD +ve	**PVD -ve**	**Total**
+ve (<1.0)	9	0	9
-ve (≥1.0)	71	0	71
Total	80	0	80

Truth Table comparing ABPI with colour doppler

Table: Truth table for TBI with Colour Doppler

TBI	Colour Doppler		
	PVD +ve	**PVD -ve**	**Total**
+ve (<0.7)	68	0	68
-ve (≥0.7)	12	0	12
Total	80	0	80

Truth table comparing TBI with Colour Doppler.

Table: Sensitivity analysis of TBI vs ABPI

	TBI	ABPI
Sensitivity	85.0%	11.3%
Specificity	NA	NA
PPV	100.0%	100.0%
NPV	0.0%	0.0%
Accuracy	85.0%	11.3%

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

Statistical analysis

All characteristics were summarized descriptively. For continuous variables, the summary statistics of N, mean, standard deviation (SD) were used. For categorical data, the number and percentage were used in the data summaries. Chi-square (χ^2)/ Freeman-Halton Fisher exact test was employed to determine the significance of differences between groups for categorical data. Sensitivity- specificity analysis was done to check relative efficiency. If the p-value was < 0.05, then the results will be considered to be significant. Data were analyzed using SPSS software v.23.0.

DISCUSSION

A key principle in the treatment of peripheral atherosclerosis is the hemodynamic assessment of circulatory impairment, which assumes paramount importance in comparison to the anatomic presence or distribution of lesions. The most common source of error in the ABI is false elevation resulting from extensive vascular calcification, as is common in diabetic patients. In these instances, other measures of distal perfusion (e.g., toe pressures, transmetatarsal pulse volume recording, transcutaneous oximetry) may be more reliable indicators of physiologic impairment.

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.

In this study, the mean age of presentation of patients was 53 years with maximum number of patients in the age group of 56 to 65 years. The number of newly diagnosed diabetics (70%) also greatly outnumbered the previously diagnosed or known diabetics (30%). This shows that late diagnosis of diabetes was due to late presentation of the patients to the hospital and that more number of complications were to be expected, including peripheral vascular disease.

The most common presentation of diabetics who were later diagnosed with peripheral vascular disease was Ulcer Over the Foot (26 patients; 32.5%) and 21 of those patients underwent below knee amputation. Revision amputation with above knee amputation was required in 6 of these patients, signifying a virulent form of the

disease. ABPI was normal in all these patients signifying the low sensitivity in patients with late presentation, most probably due to medial sclerosis that affects the peripheral arteries in long standing/ untreated diabetics. The mean HbA1c was 9, signifying a poor control of diabetes in 85% (68 patients) of cases with Peripheral Vascular Disease. Overall, 37 patients (46.2%) underwent below knee amputations signifying the high morbidity associated with late diagnosis of peripheral vascular disease in diabetes.

Amongst 80 cases, only 9 (11.2%) of diabetics were diagnosed with PVD accurately using ABPI when compared to TBI which was able to diagnose PVD in 68 patients (85%) of diabetes in the study group. This signifies the high sensitivity & accuracy of TBI (85%) when compared to ABPI (11.3%), thereby making it an ideal screening test for diabetes.

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.

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.

SUMMARY

In this study, 80 patients admitted with diabetes were diagnosed with PVD using handheld Doppler & Colour Doppler. Male sex preponderance with a ratio of 3:1and mean age of 53 years with maximum number of cases recorded in the age group of 56 to 65 years.

70% of patients were newly diagnosed diabetics with a mean HbA1c of 9 with poor control of diabetes in 85% of patients in the study. None of the patients had features of End Stage Renal Disease (ESRD).

TBI was found to be more sensitive & accurate when compared to ABPI in the diagnosis of PVD in diabetics, as seen in the Truth Table & sensitivity analysis of TBI vs ABPI, thereby proving the hypothesis of the study.

Medial sclerosis of the peripheral arteries can cause false high ABPI values thereby hindering the diagnosis of PVD in diabetics, resulting in higher rates of amputation & subsequent morbidity.

Early diagnosis & treatment of PVD is key to reduce morbidity in diabetics and thereby providing a healthier lifestyle & increased life expectancy.

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. With the widespread use of Handheld Doppler, TBI can be used to diagnose PVD earlier & more accurately in patients with diabetes, thereby reducing the lag time between diagnosis & treatment.

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29. Maya S Huijberts (Univ Hosp Maastricht, Maastricht, The Netherlands); Jacqueline M Dekker (Vrije Univ Med Cntr, Amsterdam, The Netherlands); Coen D Stehouwer (Univ Of California) : Ankle Brachial Pressure Index is a better predictor of cardiovascular mortality than toe brachial index or abnormal Doppler flow curves in both diabetic and non-diabetic subjects :

    The Hoorn Study
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ANNEXURE I

ETHICAL CLEARANCE CERTIFICATE

B.L.D.E UNIVERSITY'S
SHRI.B.M.PATIL MEDICAL COLLEGE, BIJAPUR-586 103
INSTITUTIONAL ETHICAL COMMITTEE

INSTITUTIONAL ETHICAL CLEARANCE CERTIFICATE

The Ethical Committee of this college met on 22-11-2014 at 3-30pm to scrutinize the Synopsis of Postgraduate Students of this college from Ethical Clearance point of view. After scrutiny the following original/corrected & revised version synopsis of the Thesis has been accorded Ethical Clearance.

Title "Efficacy of Toe Brachial Index as a Diagnostic modality in Peripheral Vascular Disease in Diabetics Compared to Ankle Brachial Pulse Index"

Name of P.G. student Dr Ahmed Faraaz Patel.
Dept of General Surgery

Name of Guide/Co-investigator Dr Basavaraj Deerasanagi Asso. Professor
Dept of General Surgery

for
DR.TEJASWINI. VALLABHA
CHAIRMAN
INSTITUTIONAL ETHICAL COMMITTEE
BLDEU'S, SHRI.B.M.PATIL
MEDICAL COLLEGE, BIJAPUR.

Following documents were placed before E.C. for Scrutinization
1) Copy of Synopsis/Research project.
2) Copy of informed consent form
3) Any other relevant documents.

ANNEXURE II

INFORMED CONSENT FORM

B.L.D.E UNIVERSITY'S SRI B M PATIL MEDICAL COLLEGE

HOSPITAL VIJAYPUR

DEPARTMENT OF SURGERY

Informed Consent For Participation In Dissertation/Research

I, the undersigned……s/o.d/o.w/o……aged……. Yrs ordinarily resident of ……. do hereby state / declare that Dr. Ahmed Faraaz Patel of B.L.D.E University's Sri B M Patil Medical College Hospital has examined me thoroughly on…… at B.L.D.E University's Sri B M Patil Medical College Hospital and has explained to me in my own language i.e. …… that I am suffering from Diabetic Disease.

Further, Dr. Ahmed Faraaz Patel has informed me that he is conducting Dissertation / Research tiled : **"To study the Efficacy Of Toe Brachial Index As A Diagnostic Modality In Peripheral Vascular Disease In Diabetics Compared To Ankle Brachial Pulse Index"** under the guidance of Dr. Basavaraj Narasanagi, requesting my participation in the study. Apart from the routine treatment , procedure of doing Hand Held Doppler Examination, the pre-operative, operative, post operative & follow-up observations will be utilized for the study as reference data.

Dr. Ahmed Faraaz Patel has also informed that during conduct of this procedure, mild pain like adverse effects may be encountered. Among the above complications, most of them are treatable but are not anticipated hence there is chance

of aggravation of my condition and in rare circumstances it may prove fatal in spite of anticipated diagnosis & best treatment made available. Further, Dr. Ahmed Faraaz Patel has informed me that my participation in this study will help in evaluation of results of the study which is useful reference for treatment or cure of the disease in near future, and also I may be benefitted in getting relieved of suffering or cure of the disease I am suffering.

The doctor has also informed me that information given by me, observations made/ photographs/ video graphs taken upon me by the investigator will be kept secret and not accessed by the person other than me or my legal hirer except for academic purposes.

The Dr. did inform me that though my participation is purely voluntary based on information given to me, I can ask any clarification during the course of the treatment / study related to the diagnosis, procedure of treatment, result of treatment or prognosis. At the same time, I have been informed that I can withdraw from my participation in this study at anytime I wanted or the investigator can terminate me from the study at any time but not the required procedure or treatment & follow up unless I request for a discharge.

After understanding the nature of dissertation or research, diagnosis made, mode of treatment I the undersigned Sri/Smt …… under my full conscious state of mind agree to participate in the said research or dissertation

Signature of Patient Signature of Doctor

Witness 1

Witness 2

Date: Place:

ANNEXURE III

SCHEME OF CASE TAKING

1) Name : CASE NO :

2) Age/sex : IP NO :

3) Religion DOA :

DOS :

4) Occupation : DOD :

5) Residence :

6) Chief Complaints :

7) Past History-

8) Treatment history – Any surgery

Systemic illnesses

9) Personal History – Diet

Appetite

Bowel/Bladder

Sleep

Habits

10) Family History -

11) General Physical Examination -

Built Nourishment

Pulse rate Pallor:

Blood pressure Respiratory rate

Temperature Jaundice

Clubbing Cyanosis

Edema Lymphadenopathy

12) Examination of Peripheral pulses: RIGHT LEFT

Temporal artery:

Radial artery:

Ulnar artery:

Femoral Artery:

Popliteal artery:

Brachial Artery:

Tibialis Posterior Artery:

Tibialis Anterior Artery:

Dorsalis Pedis Artery:

Great Toe artery

13) Hand held Doppler: RIGHT LEFT

Brachial Artery Pressure (in mm Hg):

Tibialis Posterior Artery Pressure (in mm Hg):

Tibialis Anterior Artery Pressure (in mm Hg):

Dorsalis Pedis Artery Pressure (in mm Hg):

Great Toe artery Pressure (in mm Hg):

14) ABPI & TBPI: RIGHT LEFT

ABPI

TBI

15) Colour Doppler Report:

13) Other systemic examination

- Abdominal system
- Respiratory system.
- Cardiovascular system.
- Central nervous system.

14) INVESTIGATIONS UNDERGONE BY PATIENT:

Complete blood count

Urine- sugar, albumin, microscopy

Fasting blood sugar

Post Prandial blood sugar

HbA_{1C}

Blood urea

Serum creatinine

15) FINAL DIAGNOSIS

ANNEXURE VI - MASTER CHART

Sl no.	Name	Age	Sex	IP No.	Diagnosis	FBS (mg/dl)	PPBS (mg/dl)	Diabetes(New/Old)	HbA1c	B Urea (mg/dl)	S Creatnine (mg/dl)	ABPI	TBI	Colour Doppler	Procedure	Outcome
1	Bhimraya Vittal	60	M	2014/23408	Ulcer over foot	180	248	New	9.9	46	1.3	1.2	0.6	PVD Present	Below knee amputation	wound healed
2	Iranna Balvantappa	50	M	2014/23460	fissure in ano	160	200	New	7.6	44	1.1	1.3	0.62	PVD Present	conservative	recovered
3	Ramesh Honnutgi	35	M	2014/25886	Ulcer over foot	194	230	New	8.6	35	1.2	1.2	0.58	PVD Present	Below knee amputation	wound healed
4	Veeresh Huggi	54	M	2014/29378	acute appendicitis	148	180	Old	7.2	45	1	1.2	0.64	PVD Present	Appendicectomy	wound healed
5	Subhashchandra	59	M	2104/29751	Inguinal Hernia	140	190	New	7.4	32	1.3	1.2	0.68	PVD Present	Mesh Hernioplasty	wound healed
6	Mahadev Ramchandra	65	M	2014/30132	Ulcer over foot	240	290	Old	9.4	40	1.4	1.2	0.56	PVD Present	Below knee amputation	wound healed
7	Suresh Hiremath	45	M	2014/30332	Gastritis	150	200	New	8	38	1.2	1.3	0.64	PVD Present	conservative	recovered
8	Vishwanath Biradar	31	M	2014/31523	fissure in ano	140	190	New	8.2	30	0.9	1.2	0.7	PVD Present	conservative	recovered
9	Anand Bhimrao	48	M	2014/31739	Cellulitis of left leg	240	300	Old	9.3	28	1.3	0.9	0.6	PVD Present	Below knee amputation	wound healed
10	Sadiq Malesab	62	M	2014/31784	Gastritis	138	190	New	6.6	40	1.1	1.3	0.64	PVD Present	conservative	recovered
11	Chikkaya Yallappa	58	M	2014/31829	Right Varicocoele	120	180	Old	7.1	37	1.2	1.3	0.66	PVD Present	Herniotomy	wound healed
12	Saddam Hussain	48	M	2014/31890	Ulcer over foot	228	310	New	8.8	32	1.4	1.3	0.62	PVD Present	Below knee amputation	wound healed
13	Shivamma Adagi	54	F	2014/32103	Ulcer over foot	264	298	New	9	28	0.9	1.4	0.58	PVD Present	Below knee amputation	wound healed
14	Adiveppa Malagi	64	M	2014/32334	Cellulitis of right leg	324	401	New	8.5	36	0.8	1.4	0.6	PVD Present	Below knee amputation	wound healed
15	Madivalappa Gouda	58	M	2014/32345	Hemorrhoids	146	194	Old	7.2	42	1	1.3	0.66	PVD Present	conservative	recovered
16	Anand Adagal	62	M	2014/32446	Foot Abscess	350	400	New	10.4	44	1.2	0.9	0.56	PVD Present	Below knee amputation	revision amputation - Above knee
17	Basamma Aihole	44	F	2014/32478	Ulcer over foot	286	340	New	9	37	1.4	1.2	0.58	PVD Present	Below knee amputation	wound healed
18	Mallikarjun Hanchinal	38	M	2014/32675	Fistula In Ano	194	260	New	9.4	28	0.9	1.4	0.68	PVD Present	Fistulectomy	recovered
19	Allasab Bandiwal	72	M	2014/33475	Ulcer over foot	258	320	Old	10.2	30	0.8	1.2	0.6	PVD Present	Below knee amputation	wound healed
20	Prakash Devendrappa	46	M	2015/116	Pain in right leg	384	463	Old	8.1	34	0.9	1.3	0.62	PVD Present	conservative	recovered
21	Manjunath Balsaheb	52	M	2015/386	Pain in left leg	282	340	New	9	42	1	1	0.58	PVD Present	Below knee amputation	wound healed
22	Gouramma Satish	62	F	2015/1054	Right leg Cellulitis	274	386	New	7.9	44	1	1.2	0.64	PVD Present	conservative	recovered
23	Hanumanthappa Gouda	38	M	2015/1456	Healing ulcer over foot	198	268	Old	7.1	30	1.1	1.2	0.68	PVD Present	conservative	recovered
24	Amina Jagirdar	45	F	2015/1674	Road traffic accident	194	205	New	7.5	46	1.4	1.2	0.64	PVD Present	conservative	recovered
25	Ammanna Jadhav	44	M	2015/1872	Ulcer over foot	208	280	New	9.8	28	1.3	0.8	0.56	PVD Present	Below knee amputation	revision amputation - Above knee
26	Sameena akhtar	57	F	2015/3046	Gastritis	132	240	New	6.4	32	1.1	1.2	0.7	PVD Present	conservative	recovered

27	Gangamma Bagewadi	75	F	2015/3585	Ulcer over foot	162	252	Old	9.1	38	1.2	1.2	0.7	PVD Present	Below knee amputation	wound healed
28	Ishwar Gawali	24	M	2015/6023	Pain in B/L Feet	280	360	Old	10.6	40	1.1	1.1	0.56	PVD Present	Below knee amputation	revision amputation - Above knee
29	Mahadev Ganamote	65	M	2015/6649	Ulcer over foot	300	390	New	9.8	36	1.4	1.4	0.6	PVD Present	Below knee amputation	wound healed
30	Sidlingappagouda Biradar	48	M	2015/8524	acute appendicitis	144	256	Old	9	32	1.2	1.5	0.66	PVD Present	Appendicectomy	wound healed
31	Malappa Hagari	60	M	2015/9147	Ulcer over foot	280	368	New	9.6	34	1.3	1.4	0.7	PVD Present	Below knee amputation	wound healed
32	Basavaraj Talwar	45	M	2015/9981	Left Hydrocoele	152	270	New	9.2	36	1	1.1	0.68	PVD Present	Jaboulay's Procedure	wound healed
33	Harish Joshi	30	M	2015/11030	Ulcer over foot	198	310	New	8.4	38	1.2	1.2	0.7	PVD Present	Below knee amputation	wound healed
34	Devibai Chavan	50	F	2015/12503	Left Leg Cellulitis	320	400	New	8.6	40	1.4	1.4	0.64	PVD Present	conservative	recovered
35	Sahebgouda Kolli	70	M	2015/14644	Ulcer over foot	286	368	Old	10.2	38	1.2	1.1	0.6	PVD Present	Below knee amputation	wound healed
36	Neelkantrao Deshmukh	65	M	2015/17933	Road traffic accident	168	250	New	9.1	32	1.3	1.4	0.7	PVD Present	conservative	recovered
37	Gurappa Madar	36	M	2015/20430	acute appendicitis	204	270	New	10	38	0.9	0.9	0.68	PVD Present	Appendicectomy	wound healed
38	Kushi Gujari	56	F	2015/20533	Ulcer over foot	328	390	New	9.6	36	1.5	1.2	0.66	PVD Present	Below knee amputation	wound healed
39	Shivamma Kapse	68	F	2015/20625	Healing ulcer over foot	220	310	Old	9.9	30	1.4	1.1	0.68	PVD Present	conservative	wound healed
40	Basappa Talwar	50	M	2015/20677	Left Inguinal Hernia	138	240	New	8.6	36	1	1.2	0.7	PVD Present	Mesh Hernioplasty	wound healed
41	Tarabai Rathod	65	F	2015/21265	fissure in ano	140	210	Old	8	28	1.2	1.4	0.64	PVD Present	conservative	wound healed
42	Nagappa Hunshyal	50	M	2015/21935	Gastritis	138	225	New	8.1	24	1.1	1	0.7	PVD Present	conservative	wound healed
43	Kasturi Nanadi	40	F	2015/22050	Hemorrhoids	148	230	Old	7.6	32	1.4	1.1	0.64	PVD Present	conservative	wound healed
44	Mahadev Chandrashekhar	65	M	2015/22574	Ulcer over foot	268	330	Old	9.4	34	1	0.9	0.6	PVD Present	Below knee amputation	wound healed
45	Balappa Madar	60	M	2015/23130	Ulcer over foot	240	300	New	10	30	0.9	1.3	0.68	PVD Present	Below knee amputation	wound healed
46	Mohammed Punekar	75	M	2015/28690	Ulcer over foot	320	389	N	8.8	46	1.6	1.2	0.62	PVD Present	Below knee amputation	revision amputation - Above knee
47	Pavan Hosamani	57	M	2015/29437	Left Foot Abscess	200	310	N	9.6	40	1.4	1	0.56	PVD Present	Below knee amputation	wound healed
48	Nagaraj Santappa	50	M	2015/21935	Pain in right leg	278	320	N	9	38	1.5	1.4	0.5	PVD Present	Below knee amputation	revision amputation - Above knee
49	Kasappa Shival	52	M	2015/22050	Right Hydrocoele	186	240	N	7.4	32	1.1	1.2	0.66	PVD Present	Jaboulay's Procedure	wound healed
50	Pandit Myageri	55	M	2015/22574	Ulcer over foot	350	460	O	10.8	46	1.4	0.9	0.5	PVD Present	Below knee amputation	revision amputation - Above knee
51	Gurappa Nimbargi	63	M	2015/23130	Cellulitis of right leg	412	490	N	11	48	1.6	1.2	0.64	PVD Present	conservative	recovered
52	Sidamma sindhe	58	F	2015/28690	Fibroadenoma breast	280	340	N	10.4	40	1.3	1.1	0.7	PVD Present	Excision of mass	recovered
53	Mahantayya Hiremath	45	M	2015/29437	Abscess in Left foot	300	368	O	9.9	36	1.6	1.2	0.6	PVD Present	Below knee amputation	wound healed
54	Chanappa Bekanal	55	M	2015/29451	UTI	264	320	N	8.4	32	1.5	1.1	0.58	PVD Present	conservative	recovered
55	Bindiya Chavan	50	F	2015/31513	Cellulitis right leg	260	368	N	9.2	36	1.4	1.2	0.66	PVD Present	conservative	recovered
56	Amarinder Singh	34	M	2015/31797	Road traffic accident	200	320	N	11	44	1.6	1.4	0.64	PVD Present	conservative	recovered
57	Sharanappa Madar	42	M	2015/35732	B/L leg pain	244	328	N	10.8	40	1.5	1.3	0.54	PVD Present	Below knee amputation	revision amputation - Above knee
58	Yamanappa Kadabagavi	65	M	2015/36207	Cellulitis right leg	340	410	N	9.8	38	1.3	1.1	0.6	PVD Present	conservative	recovered

59	Chandawwa Loni	65	F	2015/36318	Hemorrhoids	264	330	N	8.8	36	1.2	1.2	0.68	PVD Present	hemorrhoidectomy	recovered
60	Bhimanna Karjagi	34	M	2015/36423	Ulcer over foot	346	400	O	9.2	44	1.6	1.3	0.54	PVD Present	Below knee amputation	wound healed
61	Gangabai Patil	60	F	2015/36578	fissure in ano	188	220	O	8.1	36	1.3	1.3	0.64	PVD Present	conservative	recovered
62	Bheemangouda Biradar	70	M	2015/37101	Inguinal Hernia	220	300	N	8	32	1.4	1.1	0.7	PVD Present	Mesh Hernioplasty	recovered
63	Jumanna Chalawadi	60	M	2015/37289	Abscess in right foot	340	440	N	10.4	40	1.6	1.4	0.56	PVD Present	Below knee amputation	wound healed
64	Shailaja Bentoor	46	F	2015/37590	Lipoma Over the back	286	350	N	9.1	38	1.4	1	0.64	PVD Present	lipoma excision	recovered
65	Dharappa Parshe	32	M	2015/38259	fissure in ano	184	240	O	8.1	30	0.9	1.2	0.7	PVD Present	conservative	recovered
66	Sidappa Bajantri	70	M	2015/38298	Cellulitis right leg	300	386	N	11	42	1.6	1.4	0.58	PVD Present	conservative	recovered
67	Huvanna Balagnur	65	M	2015/38314	Upper GI Bleeding	280	356	N	9.4	44	1.6	1.2	0.68	PVD Present	conservative	recovered
68	Sahebgouda Bantanur	60	M	2015/38327	Ulcer over foot	258	339	N	10.4	40	1.4	1.3	0.54	PVD Present	Below knee amputation	wound healed
69	Kashibai Hiremath	65	F	2015/38331	Road traffic accident	220	310	N	9.6	36	1.1	1.1	0.66	PVD Present	conservative	recovered
70	Rukmini Subbanappagol	60	F	2015/38338	Cellulitis of left leg	340	400	N	11	46	1.46	1.6	0.56	PVD Present	Below knee amputation	wound healed
71	Satawwa Kotyal	55	F	2015/38369	Ulcer over foot	225	350	N	8.6	38	1.32	1.3	0.64	PVD Present	Below knee amputation	wound healed
72	Sarojini Reddy	44	F	2015/38370	Gastroenteritis	190	258	N	8.4	29	1.2	1.1	0.62	PVD Present	conservative	recovered
73	Veeresh Havaldar	46	M	2015/38413	Ulcer over foot	368	432	O	9.8	44	1.4	0.9	0.64	PVD Present	Below knee amputation	revision amputation - Above knee
74	Rajesh Salunkhe	45	M	2015/38429	Ulcer over foot	380	440	N	10.9	46	1.6	1.4	0.52	PVD Present	Below knee amputation	revision amputation - Above knee
75	Sidappa Kerur	66	M	2015/38431	abscess over right foot	348	428	N	9.8	40	1.4	1.3	0.56	PVD Present	Below knee amputation	wound healed
76	Tavaru Rathod	48	M	2015/41267	Gastritis	194	260	N	8.4	36	1.2	0.9	0.66	PVD Present	conservative	recovered
77	Jagadev Talawar	40	M	2015/41324	fissure in ano	175	224	N	8.1	32	0.9	1.2	0.7	PVD Present	conservative	recovered
78	Hanumanthraya Biradar	36	M	2015/41331	Hemorrhoids	158	240	New	8	34	1	1.1	0.62	PVD Present	conservative	recovered
79	Abukalam Risaldar	56	M	2015/41347	Ulcer over foot	288	350	Old	10.4	36	1.4	1.4	0.56	PVD Present	Below knee amputation	revision amputation - Above knee
80	Abdulrehman Bannatti	44	M	2015/41369	Ulcer over foot	340	410	Old	9.8	38	1.6	1.3	0.58	PVD Present	Below knee amputation	wound healed