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Risk of Peripheral Vascular Disease in Patients with Type 2 Diabetes Mellitus at One Outpatient Clinic

Steven Marinos and Theresa Galakatos*

Assistant Professor of Nursing, Maryville University, USA

***Corresponding author:** Theresa Galakatos, Assistant Professor of Nursing, Maryville University, USA
E-mail: tgalakatos@maryville.edu

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Abstract

Background: Perhiperal vascular disease (PVD) is linked to type 2 diabetes mellitus (T2DM), hyperlipedemia, obesity, and lack of exercise. PVD symptoms are commonly undetected. Yet, a paucity of evidence exists for routine use of ankle-brachial pressure index (ABPI) with ultrasound (US) Doppler to prevent, delay, or reverse PVD risk in patients with T2DM.

Purpose: To evaluate PVD status in patients with T2DM during the first visit or follow-up visit in order to optimize treatment outcomes that prevent, delay, or reverse leg ulcers, wounds, and amputations.

Design: A retrospective chart review was performed using a convenience sample of 25 patients at one Southeastern outpatient free-clinic between January 2017 and December 2017. Inclusion criteria included charts with PVD and T2DM billing codes and patient age at or between 45-65 years old.

Results: Results showed 72% of cases had weak or absent pedal pulses and 56% had abnormal or critical US Dopplers. Further, at the first clinic appointment, 40% required surgical follow-up, 32% were referred to the emergency room for surgery, and 12% were prescribed new medications. PVD risk in this patient population showed obesity status (BMI >25; 84%, 21), history of smoking or recently quit smoking (76%, 19), taking Metformin (adverse effects, peripheral neuropathy; 76%, 19), physically inactive (52%, 13), and hypertensive (BP>130/80; 32%, 8).

Conclusions: The conventional focus on PVD symptoms only in patients with T2DM may fail to diagnose asymptomatic PVD whose ABPI may require immediate treatment or surgical intervention. Therefore, providers must routinely utilize the Gold Standard of ABPI with US Doppler at the first visit in patients with T2DM to evaluate PVD risk. Further, providers must create policies that compare clinical ABPIs every 3-4 months for abnormal or critical values (0.9 mm/Hg, and at or below 0.65 mm/Hg, respectively) and every year for normal ABPIs (between 0.9 mm/Hg to 1.20 mm/Hg) in symptomatic or asymptomatic patients.

Keywords: Type-2 Diabetes Mellitus (T2DM), Peripheral Vascular Disease, Lower Extremity Ulcers, Ankle-Brachial Pressure Index, Doppler Ultrasound, Prevention and Treatment

Introduction

Over 34.2 million Americans are diagnosed with diabetes and 6.5 million have a diagnosis of peripheral vascular disease ([PVD]; Centers for Disease Control and Prevention [CDC] [1,2]. Factors that increase risk of PVD include history of diabetes, smoking, age greater than sixty years, hypertension, and high cholesterol [2]. However, 4 out of 10 patients diagnosed with PVD are asymptomatic [2,3]. Therefore, it is crucial that primary care providers (PCPs) assess for PVD risk in patients with T2DM using non-invasive procedures. The ankle-brachial pressure index (ABPI) with ultrasound (US) Doppler has successfully identified PVD risk with normal values between 0.9 mm/Hg to 1.20 mm/Hg and abnormal or critical values below 0.9 mm/Hg, and at or below 0.65 mm/Hg, respectively. Patients with ABPIs below 0.8 mm/Hg are at high risk for peripheral artery disease (PAD) and potential leg ulcers due to decreased blood flow [4,5]. ABPIs are calculated using a systolic blood pressure measurement in the arterial artery at the ankle level and that number is divided by the reading from the brachial artery. A fall in blood pressure at the ankle would suggest a stenosis in an artery between the central body arteries and ankle. Monitoring the range of ABPI with US Doppler, maintaining glycemic control of blood sugars, adherence to medication recommendations (statins, anti-platelet therapy), and supporting life-style changes (smoking cessation, exercise/activity regimens) are important steps towards reducing PVD risk and other vascular problems [2,5,6].

Patients with T2DM benefit most from early assessment and prompt interventions using PVD guidelines can experience improvements to pain, numbness, and coldness in lower extremities and prevent diabetic foot ulcers, venous stasis ulcers, multiple toe or limb amputations, and mortality [2,7-12]. Further, PCPs can empower patients to choose healthy lifestyles including following a low fat diet, routine exercise, smoking cessation, lowering cholesterol and blood pressure, and controlling blood sugars in order to reduce risk and burden of PVD [9,13]. Finally, the patient experience is complex, nonetheless, PCPs who offer resources to prescribed care despite socioeconomic status, ethnicity or race, and geographic location improved quality of life on mobility, activities of daily living, and pain status. The purpose of this study was to evaluate PVD status in patients with T2DM at one Southeastern free clinic during the first visit or follow-up visit in order to optimize treatment outcomes to prevent, delay, or reverse leg ulcers, wounds, and amputations. Findings from this study can inform policy decisions in the treatment of symptomatic or asymptomatic PVD in patients with T2DM.

Methodology

A retrospective chart review was performed on a convenience sample of 25 patients diagnosed in T2DM and PVD at one outpatient free-clinic in the southeastern region of the United States. This clinic serves approximately 2500 patients annually who meet poverty level criteria and have no insurance. The sample size was calculated using the clinic's annual census of 2500 patients and a confidence interval of 19.51. Inclusion criteria included medical charts with 1) an ICD-10 billing code for diabetes and PVD, 2) at least two patient visits between January 1, 2017 and December 31, 2017, and 3) patients age 45-65 years old. Exclusion criteria included history of amputation(s) or surgery related to PVD. Demographics, US Doppler scores (normal, abnormal, critical), plan of care recommendations, Metformin status, current smoking status, physical activity status, hypertension, and BMI data were collected onto an Excel spreadsheet for analysis. This study received IRB approval from Maryville University.

Discussion

In this study, a retrospective chart review was utilized to evaluate the PVD status in patients diagnosed with T2DM during the initial or second clinic appointment. Evidence supports the evaluation of PVD status using ABPI with US Doppler in patients with T2DM in order to expedite treatment to prevent, delay, or reverse leg ulcers, wounds, and amputations. A total of 25 charts were reviewed which included 56% (14) females and 44% (11) males, average age of 57.36 (5.54), and age range of 48 and 65 years old. Eleven cases (40%) were African American, 8 (32%) were Caucasian, 4 (16%) were Hispanic, 2 (8%) were Other, and 1 (4%) was Asian. Findings showed weak (44%) or absent (28%) pedal pulses and abnormal (40%) or critical (16%) ABPI with US Dopplers, 0.9 mm/Hg, and at or below 0.65 mm/Hg, respectively (see Table 1). Further, at the first clinic visit, 40% of cases required surgical follow-up, referrals to the emergency room for surgery (32%), or new medications (12%; see Table 2). The American Heart Association, American College of Cardiology (AHA/ACC; CDC, 2016) include the following risk factors for PVD: obesity, or overweight demonstrated by body mass index (BMI) greater than 25, currently or recently quit smoking, currently taking Metformin which can mask peripheral vascular disease such as peripheral neuropathy, absent exercise program, or inactivity, and hypertension demonstrated by systolic reading or greater than 130, and diastolic reading greater than 80. PVD risk in this patient population showed that 84% (21) were obese with BMI >25, 76% (19) had a history of smoking or recently quit smoking, 76% (19) were taking Metformin (adverse effects, peripheral neuropathy), 52% (13) were physically inactive, and 32% (8) were hypertensive (BP>130/80; see Table 3).

Table 1: Clinical Evaluation of PVD (N=25)

Pedal Pulses	Weak 44% (11)	Absent 28% (7)	Strong 28% (7)	
ABPI with US Doppler	Abnormal 40% (10)	Normal 28% (7)	Critical 16% (4)	Refused 16% (4)

Table 2: PVD Interventions (N=25)

Vascular Surgery Referral	40% (10)
ER Surgery Referral	32% (8)
New Medications	12% (3)
No Change in Medications	16% (4)

Table 3: PVD Risk Factors (N=25)

Overweight/Obesity BMI >25	84% (21)
Current Smoker, or Recently Quit	76% (19)
Currently Taking Metformin	76% (19)
No exercise, or physical inactivity	52% (13)
Hypertension >130/80	32% (8)

The evidence from this study supports the use of ABPIs with US Doppler to evaluate PVD risk in patients with T2DM to expedite quality care and patient safety. Merely assessing peripheral pulses may result in failure to adequately diagnose PVD or the severity of the disease. ABPI with US Dopplers can help providers diagnose PVD, determine degree of PVD, and expedite treatment interventions. With early detection, foot and leg ulcers and amputations can be prevented, delayed, or reversed.

Conclusion

The literature included in this study showed that patients with T2DM are linked to an increased risk in morbidity from PVD and require medical and or urgent surgical interventions. Providers who focus on PVD assessment in patients with T2DM, using ABPI with US Doppler, can successfully reduce PVD risk. Reduced healthcare costs may be realized as a result of early detection and treatment. The conventional focus on PVD symptoms in patients with T2DM may fail to diagnose asymptomatic PVD whose ABPI may require immediate treatment or surgical intervention. ABPI with US Doppler can measure both the strength of peripheral pulses and pressure from blood flow identifying restrictions noted from the Doppler tone. In this study, 72% of cases at their first clinic appointment were referred for urgent surgical interventions due to the abnormal and critical scores from the ABPI with US Doppler. However, four patients refused ABPI with US Doppler. It is important to address reduced patient participation. Providers must consider the national Cultural and Linguistically Appropriate Services when informing patients of non-invasive procedures i.e., ABPI with US Doppler in order to improve health equity, improve quality care, and eliminate health disparities [14]. Further, it is important to include provider-patient education on healthy lifestyle choices that impact glycemic control, diet, exercise regimens, and weight control to reduce risk of morbidity from PVD and T2DM at each clinic visit. When patients are better informed, they are empowered to make daily positive changes that improve their health.

More research is needed to evaluate outcomes from routine assessment of PVD using in patients with T2DM using ABPI with US Doppler. Because outpatient free-clinics operate with limited resources and limited access to providers, ideally, providers can access grant opportunities to help purchase resources and staff training i.e., use of US Doppler equipment and or utilize grant money to reimburse providers for follow-up services [7]. Providers must routinely utilize the Gold Standard of ABPI with US Doppler at the first clinic visit in patients with T2DM to evaluate PVD risk. Further, providers must create policies to assess ABPIs every 3-4 months for abnormal or critical values (0.9 mm/Hg, and at or below 0.65 mm/Hg, respectively) after surgical interventions and every year for normal ABPIs (between 0.9 mm/Hg to 1.20 mm/Hg) in symptomatic or asymptomatic patients.

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