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Zaina N. Khoury
zaina.khoury@med.wayne.edu

Adam Pearl
adam.pearl@med.wayne.edu

Ahmad Hassan
ahmad.hasan@med.wayne.edu

Mohamed Awad

Khaled Saleh
kjsaleh@gmail.com

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Towards Standardized, Safe and Efficacious Screening Approaches to Patients with Lower Extremity Peripheral Arterial Disease in the setting of Lower Extremity Arthroplasty

Zaina Khoury¹, Adam Pearl¹, Ahmad Hasan¹, Mohamed Awad¹, Khaled J. Saleh²
¹Wayne State University, Detroit, MI, ²Detroit Medical Center, Detroit, MI
 zaina.khoury@med.wayne.edu

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INTRODUCTION: Peripheral arterial disease (PAD) impedes the ability to recover from lower extremity arthroplasties (LEA), while simultaneously increasing risks of peri- and postoperative complications, morbidity, and mortality¹. Reduction in intra- and postoperative blood circulation increases the risks of deep vein thrombosis, delayed surgical site healing or skin necrosis, deep infections, and possible amputation. Despite the known risks that PAD presents, there currently are no standards outlining how practitioners should screen patients prior to undergoing LEA. The purpose of this manuscript is to facilitate improved diagnosis of PAD, leading to appropriate vascular surgery consultation prior to undergoing orthopedic surgeries. In this interdisciplinary comprehensive review, investigators aim to identify the most important risk factors for those with PAD, which should be assessed during the preoperative screening process for possibly reduced lower extremity vascular integrity (LEVI) and to propose a standardized approach toward preoperative evaluation for safely undergoing LEA.

METHODS: This comprehensive review utilized PubMed, Cochrane, and Google Scholar databases to search for relevant articles with a combination of the search terms “PAD,” “TJA,” “peripheral artery disease,” “total joint arthroplasty,” “vascular,” and “arterial.” Articles were excluded if they were not published in English or if they did not relate to lower extremity arthroplasty. Duplicates were then removed. Articles were then cross-referenced to find other relevant papers. A total of 111 articles were used in this review.

RESULTS SECTION: Prevalence of CAD in those with PAD were found to be as high as 49.2%. The Wagner Grading Scale aids in staging the severity of lower extremity ulcers. Wagner grade III or IV ulcers have increased incidence of amputation and reduced incidence of wound closure. The Wound, Ischemia, and Foot Infection (WIFI) system has since been published to provide more accurate limb ischemia assessment and hence provide clinically actionable data. Failure to identify PAD in patients undergoing surgery has also been linked to adverse sequelae related to tourniquet use. Arterial calcification without proper preparation runs risk of increased perioperative blood loss due to compression of veins and incompressible arteries, anemia, and critical limb ischemia. Compounding risk factors for PAD (increasing age, male gender, non-white race/ethnicity, hypertension, diabetes, chronic kidney disease, and smoking) disproportionately increase probabilities of a future PAD diagnosis. The American Diabetes Association (ADA) has advocated the optimal A1c for patients undergoing elective surgery (e.g., LEA) is to be less than 7%.

Current recommendations state elective surgery should be cancelled if the SBP is higher than 180 mmHg or the DBP supersedes 110 mmHg. ACC/AHA guidelines recommend those with hypertension undergoing elective, non-cardiac surgery be placed on a beta blocker one day prior to surgery and continued perioperatively to reduce the risk of operative complications (depending on comorbidities). Smoking leads to poor wound healing and cessation prior to invasive procedures may reduce risk and occurrence of wound complications. There are no current guidelines, but numerous studies have recommended that patients quit four weeks prior to their surgery and continue to abstain from nicotine-based products for an additional four weeks postoperatively. These practices have been shown to reduce perioperative and postoperative complications by 50%.

Absent or asymmetrical pulses alone are another indication for vascular referral prior to LEA. Patients with intermittent claudication, rest pain, or previous arterial ulcers indicating PAD should be considered at risk for arterial compromise with a LEA. ABI values may be falsely normal in asymptomatic patients with moderate aortoiliac stenosis (e.g., diabetics). There currently are no guidelines regulating the return to orthopedic surgery following revascularization procedures, but the known high risk of hematoma formation and possibility of infection with LEA may suggest waiting 1-year while continuing antiplatelet therapy (APT) to prevent risk of DVT or PE with early discontinuation of treatment in order to undergo LEA.

DISCUSSION: The need for adequate blood flow is amplified both peri- and postoperatively in those undergoing LEA to ensure adequate healing. Prior to orthopedic surgery, we suggest beginning with a thorough history and focused assessment for risk factors for development of PAD. For patients positive for risk factors or symptoms, a focused physical exam, including skin assessment and pulse characterization, is required to determine tolerance for surgical intervention. ABI should be performed to assess severity of vascular stenosis. Patients should be stratified for risk of amputation and benefit of revascularization using the WIFI classification system. If necessary, refer the patient for a vascular surgery consultation, especially for ABI < 0.9. Following consultation, reassess candidacy to safely tolerate a LEA procedure. Implementation of these recommendations into clinical practice could aid in deciding which patients require vascular intervention prior to LEA, minimizing complication rates and reoperations, truncating medical spending, and most importantly, improving patient satisfaction, safety, and well-being in undergoing a LEA in those with diagnosed or underlying PAD.

SIGNIFICANCE/CLINICAL RELEVANCE: This study is significant because it provides an interdisciplinary approach to standardizing criteria for LEA candidacy, with respect to optimal post-operative outcomes, for patients with PAD and associated risk-factors. These recommendations can improve clinical practice by combining expertise from vascular and orthopedic surgeons with that of endocrinologists and cardiologists as well as discrete, evidence-based classification values to prevent vascular complications following LEA.

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IMAGES AND TABLES:

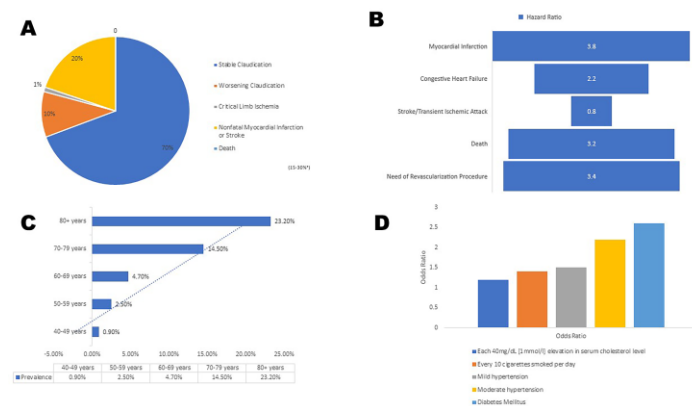


Figure 1: (A) Estimated rates of limb and cardiovascular outcomes in five years in those with PAD according to ACC/AHA guidelines. (B) Surgical hazard ratios associated with underlying PAD compared to those without it. (C) Prevalence of PAD per age group. Results are based off an ABI ≤ 0.9 per NHANES study. (D) Risk factors for progression of PAD. The Framingham Heart Study demonstrated an increased risk of intermittent claudication in asymptomatic patients with various comorbidities.