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The prevalence of occult peripheral arterial disease among patients referred for orthopedic evaluation of leg pain

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Abstract: Lower extremity peripheral arterial disease (PAD) and musculoskeletal conditions both produce symptoms of leg pain, and may coexist. This study assesses the prevalence of PAD among patients referred to orthopedic surgery for evaluation of lower extremity pain. Fifty consecutive patients aged 50 years or more who had a chief complaint of leg pain, no history of trauma, and no previous history of PAD were studied prospectively. The presence of known risk factors for PAD and classic claudication symptoms was assessed by telephone interview and medical record review. Individuals were then evaluated by measurement of the ankle–brachial index (ABI) using Doppler and pulse volume recordings (PVR). A patient was deemed to have PAD if the ABI was below 0.9 or if the PVR demonstrated significant abnormalities. Occult PAD was detected in 10 of the 50 patients (20%) on the basis of the non-invasive vascular studies. There were no differences between patients with PAD and those without PAD regarding the presence of risk factors for PAD. None of the patients without PAD had claudication, while only one of the 10 patients with PAD had symptoms of classic claudication. In conclusion, 20% of patients referred by primary care providers to the orthopedic surgery clinic for lower extremity pain were discovered to have occult PAD. The majority of these patients did not have claudication. Orthopedic surgeons and primary care providers must maintain an appropriately high index of suspicion for PAD when evaluating patients with non-traumatic lower extremity pain.

Key words: claudication; degenerative joint disease; peripheral artery disease

Introduction

Among older patients presenting to orthopedic surgery for evaluation of lower extremity pain, musculoskeletal conditions such as degenerative joint disease (DJD) and peripheral arterial disease (PAD) may be found concurrently; both are afflictions associated with advanced age. In some patients, PAD not musculoskeletal disease, may be the source of their symptoms. In those cases where a diagnosis of DJD is suspected, it is important to exclude the possibility of concurrent occult PAD, especially when surgical treatment for arthritis is contemplated. There is evidence indicating that primary care providers may be unaware of PAD in many patients.[1] Patients presenting to orthopedics for evaluation of atraumatic lower extremity pain may have been inadequately assessed for the condition, and may indeed have undiagnosed PAD. The purpose of this study is to determine the prevalence of occult PAD in these patients.

Materials and methods

All new patients 50 years of age or older presenting to the orthopedic surgery practice at the Philadelphia Veterans Affairs Medical Center (VAMC) between July and December of 2005 were screened consecutively for possible inclusion in the study. This practice serves as the primary orthopedic service for the hospital and its outpatient clinics, as well as the tertiary referral service for other nearby VAMCs. Only patients who have been referred by another physician are seen; patients cannot refer themselves to the orthopedic clinic. Patients with a chief complaint of leg pain and no history of trauma were contacted by the study nurse to determine study eligibility. Inclusion criteria for the study included: aged 50 years or more, leg pain, no history of trauma within the last 3 years, no previous

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Table 1 Telephone interview protocol

1 Do you consent to be interviewed?
2 Do you have leg pain?
3 *If yes to number 2* Do you have pain on exertion, with every bout of activity, that increases with activity and improves with rest?
4 Have you suffered trauma to the affected leg within the last 3 years?
5 Have you smoked within the last 10 years?
6 Do you have now or have a history of heart attack or heart disease, stroke, high blood pressure, diabetes, peripheral arterial disease, hyperlipidemia?
7 Does anyone in your family have a history of heart attack or heart disease, peripheral arterial disease, stroke?
8 Do you agree to undergo vascular testing?

history of PAD, and referral to orthopedic surgery by a primary care provider.

Eligible patients completed a brief telephone interview regarding risk factors for PAD and symptoms of claudication (Table 1). The electronic medical record was also utilized to determine the presence or absence of risk factors, history of claudication, previous history of PAD, and presence or absence of the diagnosis of DJD.

Patients were evaluated in the non-invasive vascular laboratory with pulse volume recordings (PVRs) and ankle–brachial indexes (ABIs). Pressure measurements and PVRs were obtained at the level of the proximal thigh, distal thigh, calf and ankle using a Parks Flo-Lab system (Parks Medical Electronics, Inc., Aloha, OR, USA). For each leg, the ABI was calculated as the ratio of the highest ankle pressure measured (dorsalis pedis or posterior tibial) to the highest arm pressure measured. These studies were reviewed by a blinded, board-certified, attending vascular surgeon both for accuracy and to provide further vascular surgery consultation if needed. The study protocol defined PAD as an ABI < 0.9. Patients with an ABI of 0.9 or above were given the diagnosis of PAD if PVRs demonstrated significant arterial occlusive disease by waveform analysis. Waveform criteria used to make the diagnosis of PAD included loss of the dicrotic wave, decrease in the amplitude of the waveform, decrease in the slope of the up-stroke, decrease in the slope of the down-stroke, and bowing of the down-stroke away from the baseline.

Appropriate statistical testing was conducted to determine differences in risk factors between the group of patients identified with PAD and the group without PAD. The protocol was approved by the institutional IRB and informed consent was obtained.

Results

Fifty consecutive patients were included in this study. All were male, with an average age of 63 years (range 50–86, standard deviation 10.7). Ten patients were determined to have occult PAD. Nine had an ABI below 0.9 and one had an ABI of 0.93, but was given the diagnosis of PAD based on an abnormal PVR with significant abnormalities of the arterial waveforms. Only one of the 10 patients with PAD had symptoms consistent with claudication. None of the 40 patients without PAD had claudication.

Twenty-nine of the patients in the sample (58%) carried the diagnosis of DJD prior to referral for orthopedic surgery evaluation. Five of the 10 patients in the group with PAD (50%), and 24 of the 40 patients with no PAD (60%) had DJD. This difference was not statistically significant ($p = 0.83$).

The distribution of risk factors is shown in Table 2. No statistically significant differences in risk factors were seen between the two groups. The mean number of risk factors present per patient was 2.4 in the group with PAD versus 2.1 in the group without PAD. This difference was not statistically significant ($p = 0.45$).

Discussion

This study demonstrates that a significant number of older patients referred to orthopedic surgery for evaluation of lower extremity pain, have occult

Table 2 Prevalence of risk factors for peripheral arterial disease

Risk factor	Prevalence in sample population $n = 50$	Prevalence in subgroup with PAD $n = 10$	Prevalence in subgroup without PAD $n = 40$
Hyperlipidemia	22 (44%)	7 (70%)	15 (38%)
History of cardiac disease	7 (14%)	1 (10%)	6 (15%)
History of stroke	3 (6%)	0	3 (8%)
Smoking within the last 10 years	12 (24%)	4 (40%)	8 (20%)
Diabetes	10 (20%)	3 (30%)	7 (18%)
Hypertension	23 (46%)	5 (50%)	18 (45%)
Family history of myocardial infarction, stroke or PAD	29 (58%)	4 (40%)	25 (63%)

PAD. Furthermore, neither the presence of known risk factors for PAD, nor symptoms of claudication were useful predictors of occult PAD in these patients. Along with prior reports,[1–5] this study serves to remind physicians that occult PAD is an important diagnostic entity, worthy of heightened clinical suspicion.

It is not surprising that 20% of this group of patients over the age of 50 were found to have PAD by non-invasive vascular testing. There have been many other studies demonstrating a similar incidence of PAD.[1,3,4] The low incidence of claudication in these patients with PAD has also been reported in previous studies.[3,4] It has been previously demonstrated that 45% of patients with PAD have coexisting orthopedic disease.[6] It is, however, interesting that in a group of patients with a complaint of leg pain severe enough to warrant referral for an orthopedic surgery evaluation, 20% were found to have undiagnosed PAD. Although the majority of these patients did not have symptoms of classic claudication, this finding suggests that despite efforts to increase awareness regarding PAD, it continues to be underdiagnosed.

The presence of PAD may be an important consideration in the management of patients with DJD. Radiographically confirmed DJD does not necessarily result in symptoms commensurate with the severity of the abnormalities seen on imaging studies.[7] Thus, the mere presence of radiographically severe DJD may not in and of itself provide a complete diagnostic explanation for the patients' symptoms. The same can be said of PAD. Clinicians experienced in the management of PAD are aware of how difficult it can be to differentiate claudication from other types of leg pain.[8] This study demonstrates that coexistent DJD and PAD is not uncommon, and that the latter is not always recognized prior to orthopedic surgery evaluation. In patients with both DJD and PAD, it is entirely possible that neither is responsible for the symptoms. More sophisticated testing may be required to determine the cause of the symptoms.

The treating orthopedic surgeon must be attuned to the possibility of PAD, as this condition may influence the outcomes of surgical treatment for arthritis, either by increasing the risk of perioperative complications, or by constraining the benefits of treatment. In a series of 18,443 knee replacements performed at the Mayo Clinic,[9] 24 patients (approximately one out of every 750) required above the knee amputation for complications secondary to vascular disease. In a study by DeLaurentis, *et al.*,[10] one out of four patients with demonstrable PAD had complications of knee replacement attributable to vascular insufficiency. The association between PAD and coronary artery disease is well known.[11–13] Patients with coexistent PAD and DJD may be at increased risk for perioperative cardiac complications when undergoing major orthopedic procedures. The overall mortality risk for knee replacement surgery is approximately 1 in 200. Although not specifically addressed in this study, patients with coexisting PAD are at higher risk for perioperative cardiac morbidity and mortality. Theoretically, PAD may also increase the risk of wound complications or infection among patients undergoing lower extremity orthopedic surgery.

Occult PAD may also mar an otherwise successful joint replacement procedure. As noted by Stewart and Baird,[14] symptoms of PAD are seen only if "exercise tolerance is not restricted … for this reason, patients with disabling arthritis of the knee may not experience the early symptoms of intermittent claudication if their exercise tolerance is restricted primarily by arthritis." There may be a group of patients with no claudication prior to joint replacement surgery because they do not walk far enough, who become severely limited by claudication once their arthritis is successfully treated. The potential for successful rehabilitation in these patients following surgery could be significantly impaired by their PAD.

There are limitations associated with this study: primarily its location and size. This investigation was conducted within a VAMC. As such, the patients were disproportionately male, and may represent a cohort with greater risk factors for PAD compared with the general population. It must be further acknowledged that the small sample size likely limits the ability to detect differences in risk factors between the subgroups. Lastly, the study could have been improved if all patients were subjected to an expert vascular examination, but that was not logistically feasible.

In conclusion, this study demonstrates that occult PAD is frequently present in patients with no history of trauma or claudication, who are referred by primary care providers to orthopedic surgeons for evaluation of leg pain. Moreover, the presence or absence of risk factors for PAD is not a useful discriminator between patients with and those without PAD. Assessing patients for PAD is neither costly nor invasive. Based on the current study, physicians who treat patients with lower extremity pain should have a low threshold for obtaining lower extremity non-invasive vascular testing, even in the absence of symptoms of claudication.

Acknowledgements

Conflicts of interest

None.

Ethical Board Review

Approved by institutional IRB.

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