ORIGINAL ARTICLE

Chronic venous ulceration of leg associated with peripheral arterial disease: an underappreciated entity in developing country

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Abstract

Chronic venous ulcer can often be associated with asymptomatic peripheral arterial disease (PAD), which usually remains undiagnosed adding significantly to the morbidity of these patients. The Ankle-Brachial Pressure Index (ABPI) is suggested for PAD evaluation. Many PAD studies were conducted in western countries, but there is a scarcity of data on the prevalence of PAD in clinical venous ulcer patient in developing countries. We conducted a study in a tertiary care hospital of eastern part of India to find out the prevalence of PAD in venous ulcer patients, and also to find the sensitivity of ABPI as a diagnostic tool in these patients. We evaluated clinically diagnosed patients with venous ulcer using ABPI and Colour Doppler study for the presence of PAD. Possible associations such as age, sex, body mass index (BMI), smoking, hypertension and atherosclerosis were studied. All results were analysed using the software Statistica version 6. PAD was present in 23 (27·71%) patients. Older age, longer duration, smoking, high BMI and hypertension were found to be significantly associated with PAD. A very strong level of agreement was found between venous Doppler and ABPI. Assessment for the presence of PAD is important in all clinically diagnosed venous ulcer patients. ABPI being a simple, non-invasive outpatient department (OPD)-based procedure, can be routinely used in cases of venous ulcer to find out the hidden cases of PAD even in developing countries.

Introduction

Chronic venous ulcer in the lower leg is a common cause of considerable physical and social morbidity (1). Recent studies showed that a significant proportion of venous ulcer may also be associated with peripheral artery diseases (PAD) (2,3). Compression therapy is the most widely used treatment in the management of venous leg ulcers (3,4). This may not only be ineffective but can also be harmful by further compromising the arterial circulation in the settings of coexisting PAD (5). Most clinicians diagnose PAD in patients with symptoms of intermittent claudication, rest pain and signs of diminished peripheral pulses, digital ulceration or gangrene, although majority of the patients with PAD may remain asymptomatic (6). So a simple low-cost outpatient department (OPD)-based test was the need of the day to find out these 'hidden cases' of PAD amongst venous ulcer patients especially in developing countries where the patient load is more than the infrastructure. The Ankle-Brachial Pressure Index (ABPI) had gained popularity in recent times in western countries as a simple non-invasive tool to detect PAD (7,8). We conducted an analytical observational (cross-sectional) study to evaluate the prevalence of PAD by a simple, non-invasive, OPD-based ABPI measurement in clinical venous ulcer patients.

> **Key Messages**
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> - Peripheral arterial disease (PAD) assessment is very much important in all clinically diagnosed venous ulcer patients
> - Ankle-Brachial Pressure Index being a simple, non-invasive OPD-based procedure, can be routinely used to find out the hidden cases of PAD even in developing countries

Methods

Patients

Patients, who were clinically diagnosed with venous ulcer, attending the dermatology OPD (Figure 1) were included after duly signed inform consent form. Clinical diagnosis was based on the site of ulcer (gaiter area), signs of chronic venous insufficiency (oedema, varicosity, lipodermatosclerosis, pigmentation and eczema) and characteristics of ulcer (shallow margin, granulation tissue in ulcer bed). Factors such as age, sex, body mass index (BMI), duration of ulcer, smoking history, hypertension and dyslipidemia were noted.

ABPI measurement

Measurement were performed with the patient in supine position by a hand-held Doppler (8 MHz) device (Figure 2).

Figure 1 Venous leg ulcer.

Figure 2 Ankle-Brachial Pressure Index measurement by hand-held Doppler (8 MHz).

ABPI was calculated by dividing the systolic blood pressure (SBP) obtained at ankle level of one leg with the SBP of brachial artery.

ABPI assessment

PAD was defined as ABPI ≤ 0.9 (9) as per the criteria of the American College of Cardiology (ACC) and American Heart Association (AHA) for the diagnosis of PAD (10).

ABPI of the leg with lower value was taken to determine the presence of PAD (11).

Colour Doppler study

We also conducted arterial-venous colour Doppler study on all the patients of this study.

Statistical analysis

Data were entered into a Microsoft Excel spreadsheet and then analysed by Statistica version 6 (StatSoft Inc., 2001, Tulsa, OK) software. Data have been summarised as mean and standard deviation for numerical variables (also median and interquartile range where applicable) and counts and percentages for categorical variables. Numerical variables have been compared between groups by Student's independent samples t-test, if normally distributed, and by Mann–Whitney U-test if otherwise. The Fisher's exact test was used to compare categorical variables between groups. Extent of agreement between ABPI and Doppler as diagnostic tool for PAD in venous ulcer cases was quantified by Kappa statistic. All analyses have been two-tailed and $P < 0.05$ was considered statistically significant.

Results

After 1 year of study a total of 83 patients were evaluated. Of these, 24 patients (28·9%) had ulcer on the right side, 32 patients (38·5%) on the left side and, in 27 patients (32·5%), both sided ulcer.

Prevalence of PAD

Of the 83 patients studied, prevalence of concomitant PAD as calculated by ABPI was 23 [27·71% (95% CI: 18·08–37·34%)].

Among the 23 PAD patients, 14 patients (60·8%) were asymptomatic. History of intermittent claudication was found in eight (34·7%) patients, and signs of diminished peripheral pulses in one patient. None of the patients complained of rest pain.

The arterial-venous colour Doppler study showed venous abnormality in the form of valve incompetence, deep vein thrombosis or varicosities, or perforator defects in all the patients of this study. That points out very high quality of clinical diagnosis of chronic venous leg ulcer.

Arterial Doppler showed that 22 of our the patients had PAD in the form of atherosclerosis, narrowing or block. Extent of agreement between ABPI and Doppler as diagnostic tool for

PAD in venous ulcer cases by Kappa statistic was 0·906 (95% CI: 0·691–1·121) indicating a strong agreement.

Age

Mean age of presentation was 45·0 ± 14·5 years in clinical venous ulcer associated with PAD patient and 36·6 ± 11·4 years in non-PAD patient. Older age patients were found to be more prone to developing PAD with the *P* value being 0·007.

Sex

Of 83 patients, 73 (87·95%) were male and, among the PAD patients, 22 (95·65%) were male.

Body mass index (BMI)

Average BMI in PAD patient was 25·5 ± 2·1 and in non-PAD patient 24·1 ± 2·3. A statistically significant association was found between obesity and PAD.

Duration of ulcer

A very strong association could be found between longer duration (7 ± 3·4 months) of ulcer and PAD.

Smoking, hypertension and dyslipidemia

Although a strong association was observed for smoking and hypertension with PAD, the same was lacking for elevated serum triglyceride and cholesterol (Table 1).

Discussion

The prevalence of PAD in general population is variable (11) and was found to be 3·2% in a study from south India (12). PAD was associated with 21% of chronic leg ulcer irrespective of aetiology (5). In another study, among the venous ulcer patients 17% had PAD (13).

A study from Portugal observed that the diagnosis of leg ulcer was performed on clinical basis in 56% cases and only 8% had undergone PAD evaluation by ABPI (14). We evaluated 83 clinically diagnosed venous ulcer patients and PAD was found to be associated in 23 (27·71%) patients.

Majority of PAD patients (14; 60·8%) were asymptomatic, which supports the finding of earlier studies (6). Compression therapies that are routinely used in cases of venous ulcers can actually compromise the blood supply in these patients, furthermore adding to the morbidity and complications. Necrosis, limb lost by amputation following compression therapy, is not an unusual complication even with recently available superior compression stockings (5). So the results of this study clearly suggest that careful assessment for PAD in clinical venous ulcer patients is mandatory even in the absence of symptoms of PAD before treating them with compression therapy. Ulcer present in the classical venous site (gaiter area) should not lead to the assumption that arterial disease is not present (5).

Risk of PAD increases with age, obesity, diabetes and smoking (5,12) male patients (15). In this study, PAD was significantly more with older age, obesity, hypertension and smoking. Mean age of presentation (45 years) was lower than western studies.

PAD of the leg is an important manifestation of systemic atherosclerosis (16,17). Studies suggest that both symptomatic and asymptomatic PAD are associated with an increased risk of morbidity and mortality including cardiovascular disease, stroke (18), increase in serum creatinine level (19) and dementia (20). However, in this study no significant association of PAD with dyslipidemia was observed.

We found that ABPI is a simple, low-cost and yet reliable tool for the diagnosis of PAD with a very strong level of agreement with a more conventional Doppler Studies. International guidelines on leg ulcers also recommend ABPI to assess and diagnose PAD (13).

We suggest that every patient with clinical diagnosis of venous ulcer should be carefully evaluated for PAD by a simple, non-invasive OPD-based ABPI measurement even in the absence of symptoms. It not only helps to arrive at a correct diagnosis and management, but also prevents dreaded complications arising from the indiscriminate use of compression therapies.

Table 1 Clinical characteristics of the study group*

Risk factor	PAD (*n* = 23)	Non-PAD (*n* = 60)	*P* value[†]
Age (Years)	45·0 ± 14·5	36·6 ± 11·5	0.007
Sex (Male/Female)	22 (95·6%)/1 (4·3%)	51(85%)/9(15%)	0.270
BMI	25·5 ± 2·1	24·1 ± 2·3	0.011
Duration (Months)	7 ± 3·4	4·4 ± 2·3	<0.001
Smoking	19 (82·61%)	28 (46·67%)	0.003
Hypertension	7 (30·4%)	5 (8·3%)	0.017
Dyslipidemia	3 (13%)	4 (6·7%)	0.390
ABPI	Median 0·9	4 (6·67%)	<0.001
	Lower quartile 0·8	Lower quartile 1·0	
	Upper quartile 0·9	Upper quartile 1·2	

PAD, peripheral arterial disease; BMI, Body mass index; ABPI, Ankle-Brachial pressure index.

*Values are presented as the mean ± standard deviation, number (%) or median with lower and upper quartile.

[†]*P* < 0·05 was considered significant.

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