

Variations in the anatomical distribution of peripheral vascular disease according to gender

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ABSTRACT

BACKGROUND While large epidemiological studies have suggested that the male gender is more frequently afflicted with intermittent claudication, there is little data whether there are gender differences in the distribution of peripheral vascular disease (PVD). The aim of this study was to clarify this issue on the basis of angiographic findings in patients presenting with claudication.

PATIENTS AND METHODS The radiology department computerised database was used to identify all lower limb angiograms performed for investigation of PVD. Patients undergoing incomplete assessment and those with normal angiograms were excluded. Demographic details for each patient were collected together with details of uni- or bilaterality of disease, the number of lesions present and their anatomical distribution according to the major named vessels. Only lesions reported as radiologically significant were included in the analysis.

RESULTS Five hundred consecutive angiograms fitting the defined study criteria were assessed. There were 310 males and 190 females giving a male to female ratio of 1.6:1. The most common distribution for both genders was multiple bilateral lesions. There were no significant differences in the number of stenoses in terms of ratio of bilateral to unilateral (2.39 vs 2.77) or ratio of multiple to single lesions (1.5 vs 1.7) between the female and male groups. Disease was more common in males at all anatomical locations, the most significant differences being for lesions of the common femoral and profunda femoris arteries.

CONCLUSIONS PVD is more commonly diagnosed in males than females. The disease process is more commonly bilateral in both genders and PVD affects more numerous sites in the male claudicant than in the female claudicant. Nevertheless, there does not appear to be any difference in the anatomical distribution of disease between genders.

KEYWORDS

Peripheral vascular disease – Demographics – Arteriography

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Peripheral vascular disease (PVD) is a common manifestation of atherosclerosis and is said traditionally to be significantly more prevalent in males than females.^{1,2} Haimovichi assessed 321 lower limbs using angiography and noted a male predominance at 3:1.¹ He also noted isolated tibial disease as the most frequent distribution at 25.9%, with extensive disease in all segments from iliac to tibial in 3% being the least common. A tendency to a distal distribution of PVD has also been well characterised for certain subgroups such as patients with diabetes.¹⁻⁴ However, no studies to date have assessed the distribution of PVD in relation to patient gender.

The aim of this study was to compare the distribution of angiographically detected stenoses in male and female patients presenting with symptomatic peripheral vascular disease.

Methods

The study group consisted of 500 new vascular patients undergoing lower limb digital subtraction angiography fol-

lowing presentation to the vascular unit with symptomatic atherosclerotic disease. All patients included in the study were bipeds and had complete arteriograms from aorta to pedal vessels. None had undergone previous surgery or angioplasty. Patients with no evidence of PVD in either limb were excluded.

The gender and age at presentation were noted and the case notes were reviewed to obtain details of concurrent cardio- and cerebrovascular disease. The presence or absence of atherosclerotic risk factors including smoking, diabetes mellitus, hypertension and hyperlipidaemia were also recorded. Hypertension, hypercholesterolaemia and diabetes mellitus were defined as the need for medication to control these factors, namely antihypertensive medications, lipid-lowering agents and hypoglycaemic (oral or insulin) respectively. Patients who had quit smoking following a review in clinic prior to their arteriograms were regarded as smokers for the purposes of the study.

The angiograms were reported by one of two consultant vascular radiologists and the presence of uni- or bilateral disease was noted, as were the number of segments affect-

Table 1 Demographics and disease laterality in patients presenting with claudication; numbers represent numbers of patients with unilateral or bilateral disease

| | Number of patients | Mean age (years) | Unilateral disease | Bilateral disease | Ratio of bilateral to unilateral lesions |
|--------|--------------------|------------------|--------------------|-------------------|--|
| Female | 190 | 72.3 | 56 | 134 | 2.39 |
| Male | 310 | 68.7 | 83 | 227 | 2.73 |

Table 2 Segmental distribution of peripheral vascular disease in relation to single or multiple site disease

| | Number of limbs | Single segment | Multiple segments | Ration of multiple to single segments |
|--------|-----------------|----------------|-------------------|---------------------------------------|
| Female | 324 | 132 | 192 | 1.5 |
| Male | 537 | 200 | 337 | 1.7 |

ed and the detailed anatomic distribution of the PVD. Only stenoses of 50% or more were considered radiologically significant.

Male and female cohorts were compared for proportions with unilateral versus bilateral and single versus multiple site disease using the chi-square test. A *p*-value of <0.05 was considered significant.

Results

Of the 500 patients with angiographically proven PVD, the majority, with a ratio of 3:2, were male (Table 1). The female patients presented with a slightly older mean age than their male counterparts at 72.3 versus 68.7 years.

Bilateral disease was more common in males than in females, with a ratio of bilateral to unilateral of 2.73 for males and 2.39 for females but this did not reach statistical significance.

As 139 patients had unilateral disease, this provided 861 limbs for assessment of distribution of PVD (Table 2). Overall, multiple site disease was more common than single site disease (529 versus 332) and multiple site disease was more common among males than females, although not statistically significant, with a multiple to single site ratio of 1.7 for men and 1.5 for women.

A detailed breakdown of disease distribution according to gender and anatomical distribution is summarised in Table 3. Atherosclerotic stenoses were more common in males at all the anatomic segments of the lower limb arterial supply and, in particular, that found in the common femoral and profunda femoris arteries.

The cardiovascular risk factor profiles for the male and female cohorts are summarised in Table 4 together with medications being taken by each cohort. As per the study definitions, all patients with hypertension and hypercholesterolaemia were taking prescribed antihypertensive drugs and lipid-lowering agents. The number of patients on aspirin/clopidogrel was low and did not include all those with a history of cardio- or cerebrovascular disease. The percentage of patients with risk factors is comparable for the two groups, with no statistically different differences.

Discussion

This study has demonstrated that, as per conventional teaching, PVD is more common in men than women. There are surprisingly few demographic data in relation to the distribution of PVD and the majority that do exist are from the 1960s. Interestingly, in the 1960s the gender ratio was 3:1 whereas in the current study it is 3:2.⁴ Given the limitations in comparing diverse populations over a 50-year period, it is difficult to be certain whether this represents a true change in gender distribution or whether it is artefactual. If this is a real change in prevalence, then the reasons for this are uncertain but may be related, at least in part, to an increase in popularity of smoking among females during the latter half of the 20th century. Indeed, the most recent national statistics suggest that the gender ratio is 1:1 and the prevalence has fallen to 25% for men and 23% for women.⁵ Although the total number of individuals smoking has declined, the fall has been slower in females and the gender ratio is now approximately equal. Female patients were also noted to be older at presentation, which may reflect the positive effect of oestrogen on the cardiovascular system until the menopause.⁶

Despite not being statistically significant, it is interesting that males exhibited both bilateral and multiple site disease more frequently than the female population. Again, the reason for this is not clear. Overall, 86% of patients had radiologically significant bilateral disease although the vast majority reported predominantly unilateral symptoms. Stenoses were more common at all levels of the arterial tree among male claudicants. However, the gender ratio was particularly marked (>2:1) for stenoses affecting the common femoral and profunda femoris arteries.

The cardiovascular risk factor profiles were similar for males and females. As stated previously, this was particularly so for smoking, a habit that was predominantly male in the series of the 1960s. There has been a well documented increase in the prevalence of cardio- and cerebrovascular disease among females during the second half of the 20th century.⁷ The percentage of women in the US who are hypertensive is now greater than for males at all quintiles from 55 years upwards and there have been recent upward

Table 3 Distribution of peripheral vascular disease according to anatomical segments of distal limb vasculature with evidence of stenoses; numbers represent numbers of lesions present

| | Female, n=324 | | | | Male, n=537 | | | | Male to female ratio |
|---------------------|---------------|-------|-----------|-------|-------------|-------|-----------|-------|----------------------|
| | Left | Right | Bilateral | Total | Left | Right | Bilateral | Total | |
| Common iliac | 20 | 10 | 19 | 68 | 32 | 34 | 29 | 124 | 1.8:1 |
| External iliac | 10 | 12 | 13 | 48 | 26 | 21 | 12 | 71 | 1.5:1 |
| Common femoral | 12 | 11 | 2 | 27 | 19 | 20 | 9 | 57 | 2.1:1 |
| Superficial femoral | 31 | 25 | 74 | 204 | 56 | 41 | 112 | 321 | 1.6:1 |
| Profunda femoris | 7 | 6 | 6 | 25 | 26 | 19 | 9 | 63 | 2.5:1 |
| Popliteal | 20 | 21 | 26 | 93 | 45 | 39 | 21 | 126 | 1.4:1 |
| Distal | 15 | 19 | 73 | 180 | 44 | 38 | 125 | 332 | 1.8:1 |

Table 4 The cardiovascular risk factor profiles according to gender

| Risk factor | Female, n=190 | Male, n=310 |
|-----------------------|---------------|-------------|
| Hypertension | 105 (55.3%) | 173 (55.8%) |
| Smoking | 62 (32.6%) | 104 (33.5%) |
| Angina/MI | 34 (17.9%) | 58 (18.7%) |
| CVA/TIA | 16 (8.4%) | 27 (8.7%) |
| Diabetes mellitus | 74 (38.9%) | 131 (42.3%) |
| Hypercholesterolaemia | 124 (65.3%) | 198 (63.9%) |
| Aspirin/clopidogrel | 40 (21.1%) | 52 (16.8%) |

MI = myocardial infarction; CVA = cerebrovascular accident; TIA = transient ischaemic attack

trends in the prevalence of obesity and diabetes mellitus, which have been more significant among females. As such, women are now considered to have an equal pro-atherogenic risk compared with men. As this trend continues, the demographics of PVD may change even further in favour of an equal distribution. This is important since the total number of patients is unlikely to remain static and hence, as the female population of claudicants grows, more resources will be required for investigation and treatment.

Claudication affects 1 in 20 of the over-55 population in the UK.⁸ It is therefore vitally important that risk factor profile modification in relation to PVD is given the same recognition as is currently the case for cardiovascular disease, including control of hypertension, optimisation of cholesterol and sugar levels, and encouragement to participate in exercise, as the risk factors for the two atherosclerotic processes are clearly the same.⁹ The importance of PVD in relation to cardiovascular risk was highlighted by Smith *et al*, who reported that age-adjusted mortality was 4-fold higher in claudicants than non-claudicants, with 80% dying of cardiovascular disease.¹⁰

In the current study, despite all patients presenting for investigation of peripheral vascular disease, very few were on aspirin or clopidogrel. Those who were taking these agents had documented cardio- or cerebrovascular disease.

The figures for antihypertensives (55.6%) and lipid lowering agents (64.4%) were better but not all patients had been formally assessed prior to referral and hence more patients may have required therapy. These figures are in keeping with a previous study from our unit that demonstrated that general practitioner treatment of risk factors in patients with PVD alone is significantly less than for PVD in association with cardio- or cerebrovascular disease in terms of prescription of statins, antihypertensives, antiplatelet agents, hypoglycaemic drugs and advice on smoking cessation.

Conclusions

This is the first series to examine the gender ratio of PVD for four decades and suggests a change in gender distribution with increasing numbers of females being investigated for claudication. While there was no significant difference in terms of the proportion of bilateral or multiple site stenoses, PVD in males was more common at all anatomical locations than in females.

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