Epidemiology of chronic venous ulcers

A metropolitan population of 238,000 in Perth, Western Australia, was screened for chronic ulceration of the leg. Patients with a chronic leg ulcer and a venous abnormality comprised 37 per cent of all patients with a chronic leg ulcer, giving a prevalence of 0.62 per 1000 population. There was an increasing prevalence with age: 90 per cent of patients were 60 years and older. This group comprised 16.7 per cent of the population, and had a prevalence of 3.3 per 1000. Although chronic venous ulcers were more common in women there was no difference in age related prevalence. In 36 per cent of patients with a venous abnormality, there was at least one other aetiological factor contributing to chronic ulceration of the leg; 96 per cent had either a history of deep venous thrombosis or a condition known to predispose to deep venous thrombosis.

Chronic venous ulceration is frequently encountered in clinical practice; however, little information is available about its prevalence and natural history. This information can only be reliably obtained by screening a large population for chronic ulceration of the leg, and further examining a representative sample to identify those with a venous abnormality.

Existing published data from population based studies has focused on leg ulcers of heterogeneous aetiology. Two studies have examined small European populations, and suggest that about 1 per cent of people have leg ulcers at some time. Active or healed leg ulcers were found in 153 of 15,000 adults surveyed by Bobek et al., and in 46 of 4,529 adult factory workers studied by Widmer.

Two reports from large populations in the United Kingdom enable the prevalence of venous ulcers to be derived. In a postal survey of the Lothian and Forth Valley Health Districts, with a population of about one million, Callam et al. found the prevalence of chronic leg and foot ulcers to be 1.48 per 1000 population. In 600 patients 827 ulcerated limbs were examined clinically, and venous disease was diagnosed in 76 per cent of legs. If this proportion of patients in the study area had a venous ulcer, the prevalence of venous ulceration would be 1.12 per 1000 population.

Cornwall et al. studied a health district with a population of about 200,000. The prevalence of leg ulcer (isolated ulceration of the foot was excluded) was 1.8 per 1000 population. In 100 patients 117 ulcerated limbs were examined; venous disease was diagnosed by photoplethysmography in 81 per cent of limbs. Assuming the same proportion of all patients had venous ulcers, the prevalence of venous ulceration would be 1.46 per 1000 population. (When the study was repeated 18 months later, the prevalence of leg ulcers had fallen to 1.1 per 1000 population, with a derived figure for venous ulcerators of 0.89 per 1000 population. The change was attributed to improved treatment.)

In this study a large metropolitan population was examined to determine the prevalence and clinical characteristics of chronic venous ulceration. Venous disease was identified with photoplethysmography.

Patients and methods

A Perth metropolitan population of 238,000 located south of the Swan River was studied. Demographic data were provided by the Australian Bureau of Statistics (Catalogue No. 3203.7 Estimated Resident Population Western Australia 30 June 1988).

Patient accrual was by referral from health professionals and institutions in the study area, and by self-referral. Following an introductory letter, a personal visit was made to all general practitioners, relevant medical specialists, podiatrists, directors of nursing homes, and Silver Chain (District) nurses in the study area to explain the purpose of the study and to provide information about the mechanism of referral. Self-referral was facilitated by publication of an article describing the study in local newspapers at the beginning of the recruitment period. Patients were recruited to the study over 3 months from 1 March to 31 May 1988.

For this study chronic ulceration of the leg was defined as a defect in the dermis at a site below the knee, persistent for 1 month or longer. An attempt was made to contact each patient entered into the study, to undertake a detailed history and assessment of the cause of ulceration. Most patients were seen at their home, and some were seen at the Vascular Laboratory at Fremantle Hospital. The history included enquiry about the duration of the current ulcer, and the chronicity of ulceration. Specific enquiry was made for a past history of venous thrombosis, pulmonary embolus, events predisposing to venous thrombosis (limb trauma, general anaesthesia, and pregnancy), previous venous surgery, diabetes mellitus, rheumatoid arthritis, hypertension, and peripheral arterial disease. Patient mobility was graded as follows: Grade 1 - unrestricted; Grade 2 - limited mobility beyond the home; Grade 3 - housebound; Grade 4 - mobile with walking aid; Grade 5 - chairbound.

The ulcerated legs were examined, and the side of ulceration and the status of the pedal pulses were recorded. The site of ulceration was recorded using the method of Callam: Zone 1 - the foot; Zone 2 - the gaiter area extending from 2.5 cm below the malleoli to the point where the calf muscles become prominent posteriorly; Zone 3 - extending above this to the knee.

To assess the cause of ulceration all patients had venous refilling assessed by photoplethysmography, using a Parks' Vascular Minilab 3 (Model 1059, Parks Medical Inc., Beaverton, Oregon, USA), according to the method of Abramowicz et al. With this apparatus we have found that 61 of 62 patients (98 per cent) with venous ulceration have a refilling time less than 25 s, while 119 of 122 patients (97.5 per cent) with no history of venous disease or leg ulceration have a refilling time greater than 25 s. If unable to flex the ankle adequately, the patient sat with the ulcerated limb dependent and unsupported. The calf was manually compressed eight times and venous refilling was recorded. Venous disease was considered to be part of the ulcer aetiology when there was an abnormal venous refilling time of less than 25 s on photoplethysmography in a limb with a chronic leg ulcer.

The resting arterial Doppler ankle:brachial pressure index was measured, and significant arterial ischaemia was considered to be present when the index was less than 0.9. In patients with diabetes mellitus, who may have incompressible arteries, the absence of pedal pulses was also taken to indicate significant ischaemia. The following haematological data were also measured: urea, creatinine, random blood glucose, rheumatoid serology (rheumaton and latex tests) and autoantibody studies (antineutal, antiparietal cell, antismooth muscle, and antimitochondrial antibodies).

Patient and ulcer variables were compared with χ² tests.
Results

The study accrued 259 patients with chronic ulceration of the leg; 242 patients (with 286 ulcerated limbs) were fully assessed using the method outlined and 17 were unavailable for full assessment. An abnormal venous refilling time on photoplethysmography was found in 138 patients (with 163 ulcerated limbs), representing 57 per cent of the patients who were fully assessed. Assuming that the 242 patients assessed are representative of the whole 259 patients referred, the prevalence of chronic venous ulceration in this study population was 0·62 per 1000. In this paper the features of only the 138 patients with abnormal venous refilling time are described.

If patients with ulceration confined to the foot (Zone 1) are excluded, as was done in the study by Cornwall et al.5, there were 222 patients of whom 204 (with 239 ulcerated limbs) were fully assessed; 136 of these patients (with 160 ulcerated limbs) had an abnormal venous refilling time (67 per cent of those fully assessed).

Age and sex distribution

The median age of patients with chronic venous ulcer was 75 years (range 20–99 years). There were 49 men and 89 women, (male:female ratio of 1:1·8). This difference was statistically significant ($\chi^2=9·31, P<0·01$) but the female predominance occurred only in patients over 70 years old (Table 1). In this age group there is also a female predominance in the general population, and the prevalence of chronic venous ulcer for men and women was almost identical ($\chi^2=0·909, P=0·34$). Indeed, prevalence was similar for men and women at all ages (Table 1).

The prevalence of chronic venous ulceration increased progressively with age (Figure 1). Ninety per cent (124) of patients with chronic venous ulcer, and 16·7 per cent of the population were over 60 years old. The prevalence in this subset was 3·3 per 1000 population.

Additional aetiological factors

An abnormal venous refilling time was the only abnormality demonstrated in 104 of the 163 limbs (64 per cent). Additional aetiological factors were found in the other 59 limbs (36 per cent) (Figure 1 and Table 2). Arterial ischaemia was found in 36 limbs (22 per cent), while 14 patients with 19 ulcerated limbs (12 per cent) had rheumatoid arthritis, and 15 patients with 17 ulcerated limbs (10 per cent) had diabetes mellitus.

Significant arterial ischaemia was present in only two of 40 patients (5 per cent) under 70 years of age, whereas it was found in 30 of 98 patients (31 per cent) who were over 70. This difference was significant ($\chi^2=8·50, P<0·01$). The presence of any other aetiological factor plus venous disease was also significantly less common in patients under 70 years (18 per cent) compared with those over 70 (45 per cent) ($\chi^2=8·01, P<0·01$).

Side of ulceration

Of the 163 limbs with chronic venous ulcers, 71 were ulcerated on the right side and 92 on the left. In 25 patients the ulcers were bilateral.

Site of ulceration

Ulceration was present in the gaiter area (Zone 2) in 147 limbs (90 per cent) (Figure 2). Ulceration was also present in Zone 1 in five of these limbs, and in Zone 3 in a further five limbs. Isolated ulceration occurred in Zone 1 (on the dorsum of the foot) in three limbs, and in Zone 3 in 13 limbs.

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Table 1 Prevalence of chronic venous ulcer related to age and sex

<table>
<thead>
<tr>
<th>Age (years)</th>
<th>Men</th>
<th>Number</th>
<th>Prevalence per 1000</th>
<th>Women</th>
<th>Number</th>
<th>Prevalence per 1000</th>
</tr>
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<td>0-39</td>
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<td>0·015</td>
<td>2</td>
<td>0·029</td>
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<td></td>
</tr>
<tr>
<td>40-49</td>
<td>0</td>
<td>0·00</td>
<td>2</td>
<td>0·15</td>
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<td></td>
</tr>
<tr>
<td>50-59</td>
<td>4</td>
<td>0·18</td>
<td>5</td>
<td>0·46</td>
<td></td>
<td></td>
</tr>
<tr>
<td>60-69</td>
<td>13</td>
<td>1·5</td>
<td>13</td>
<td>1·3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>70-79</td>
<td>16</td>
<td>3·3</td>
<td>29</td>
<td>4·0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>80+</td>
<td>15</td>
<td>8·3</td>
<td>38</td>
<td>9·1</td>
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</table>

Figure 1 Age related prevalence of all patients with a venous abnormality (●) and for patients with a venous abnormality only (□) as a cause for ulceration

Figure 2 Site of ulceration

Table 2 Aetiological factors in 163 limbs with venous abnormality and chronic ulceration

<table>
<thead>
<tr>
<th>Aetiological factors</th>
<th>Number</th>
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</thead>
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</tr>
<tr>
<td>Venous and diabetic</td>
<td>9</td>
</tr>
<tr>
<td>Venous and rheumatoid</td>
<td>11</td>
</tr>
<tr>
<td>Venous, diabetic and rheumatoid</td>
<td>2</td>
</tr>
<tr>
<td>Venous and arterial</td>
<td>24</td>
</tr>
<tr>
<td>Venous, arterial and diabetic</td>
<td>4</td>
</tr>
<tr>
<td>Venous, arterial and rheumatoid</td>
<td>6</td>
</tr>
<tr>
<td>Venous, arterial, diabetic and rheumatoid</td>
<td>2</td>
</tr>
<tr>
<td>Venous and essential thrombocythaemia</td>
<td>1</td>
</tr>
</tbody>
</table>

Chronicity of ulceration
The median duration of current ulceration was 26 weeks (range 4 weeks to 30 years). In 46 per cent of limbs the duration of ulceration was longer than 26 weeks, and in 15 per cent it was longer than 2 years (Figure 3). The longest time an ulcer had remained unhealed during any episode of ulceration exceeded 26 weeks in 60 per cent of patients, and 2 years in 23 per cent.

Ulceration of the legs had been occurring for more than 5 years in 47 per cent of patients, and this duration of ulcer diathesis was over 10 years in 34 per cent (Figure 4a). Although 24 per cent of patients were suffering their first episode of ulceration, recurrence had developed in the other 76 per cent, with more than ten episodes of ulceration in 28 per cent (Figure 4b).

Past history of venous thrombosis
A history of deep venous thrombosis was present for 23 patients (17 per cent). Of these patients, three had a history of pulmonary embolus and four had sustained a limb bone fracture. A history of major injury to the limb was given by 35 other patients (25 per cent); 33 suffered a limb bone fracture, one sustained a chain saw laceration and another a crush injury with amputation of the opposite leg. Of the remaining 80 patients, 74 had undergone general anaesthesia or had had a pregnancy of 26 weeks or more on at least one occasion. Only six patients (4 per cent) had no evidence of a predisposing factor for deep venous thrombosis.

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Previous venous surgery
A primary procedure for varicose veins had previously been carried out on 41 patients (30 per cent); in 29 patients the long saphenous vein had been stripped and in 12 the communicating veins had been divided (the only procedure in four). Individual ligation of varicosities was performed in two patients, with sclerotherapy in six others. One patient underwent thrombectomy of the iliofemoral vein.

Treatment dressings
Local dressings were used for 121 patients, and compression bandages for 31. In 30 patients elevation of the leg had been recommended. Of 103 patients suffering more than one episode of ulceration, 39 had been prescribed stockings for prophylaxis. Twelve wore them regularly, ten occasionally and 17 patients never wore them.

Patient mobility
The mobility of patients was unrestricted (Grade 1) in 47 per cent, with a further 20 per cent mobile beyond the home (Grade 2); 33 per cent of patients were housebound, of whom 10 per cent required a walking aid (Grade 4). Another 5 per cent were chairbound (Grade 5).

Discussion
Detailed information about patients with chronic venous ulceration has not been provided by previous population based studies of leg ulcers, although prevalence could be derived from the studies conducted in the United Kingdom by Callam et al., and Cornwall et al.\(^3\) These authors described the characteristics of all ulcers together and did not attempt to examine venous ulcers alone. In this study we have reported only patients with a venous component to their ulceration.

An Australian population of 238,000 were screened for chronic ulceration of the leg, and to avoid sampling error in the collection of data from patients with leg ulcers, an attempt was made to assess fully all patients reported to the study. It was possible to assess 93 per cent. This differs from Callam et al.\(^4\) who sampled 41 per cent (600 of 1477) and Cornwall et al.\(^5\) who sampled 31 per cent (100 of 327).

Prevalence data from such a study is almost certainly an underestimation of the true prevalence in the general population. This is because all cases with ulceration are not reported and all reported cases are not fully assessed. The prevalence of venous ulcers derived from the studies by Callam et al.\(^3\) and Cornwall et al.\(^5\) is higher than that of the present study, even though a similar methodology was used in all three.
...The differences between Australian and British communities are probably less than is suggested by a comparison of the overall prevalence figures. The proportion of the study population that is elderly has considerable influence on this figure, due to the increasing prevalence of leg ulcer with age. In the present study 12.4 per cent of the study population was over 65 years old, whereas 16.3 per cent of the health district examined by Cornwall et al. was over 65 years old. Comparisons between studies can be facilitated by reporting prevalence for the subset of population at particular risk of leg ulceration (in the present case 3.3 per 1000 population for those over 60 years old). Furthermore, this study deals with chronic leg ulcers present for a month or longer, whereas Cornwall et al. screened for all leg ulcers and Callam et al. appear to have done the same.

An abnormal filling time on photoplethysmography was the criterion used to identify venous disease. Photoplethysmography has advantages over other laboratory methods in that it is portable, non-invasive, and can be used in patients with restricted mobility; 10 per cent of our patients used a walking aid and 5 per cent were chairbound. Only 57 per cent of limbs with chronic ulcers in this study had a venous abnormality. This is considerably less than the 76 per cent reported by Callam et al., who made a clinical assessment of the presence of venous disease. Cornwall et al. used photoplethysmography, and found venous disease in 81 per cent of limbs studied. However, patients with isolated ulceration of the foot were excluded from that study. In the present study, when patients with ulceration confined to Zone 1 (the foot) were excluded from analysis, venous disease was noted in 67 per cent of limbs. This remains considerably less than was found by Cornwall et al., and may indicate that a real difference does exist in the prevalence of chronic venous ulcer between Australia and the United Kingdom.

Although more patients with chronic venous ulcer were women, the prevalence of chronic venous ulcer was not significantly different between men and women at any age. The apparent difference reflected the increased prevalence of venous ulcer among the elderly, who are mostly women.

A past history of venous thrombosis in only 17 per cent of patients is in keeping with reviews of outpatient records. However, we found that another 79 per cent of patients had a predisposing factor to deep venous thrombosis (major leg injury, general anaesthesia, or pregnancy). This supports the view that many patients with venous ulcer have previously had a subclinical deep venous thrombosis. The present study showed that venous ulcer is more common on the left leg, which is consistent with the increased frequency of deep venous thrombosis on the left.

Each of the indices of chronicity of ulceration underscores the persistence of the condition. However, the observation that only 22 per cent of patients were treated with compression bandaging and that only 12 per cent with more than one episode of ulceration wore elastic stockings regularly indicates that more can be done to improve the management of venous ulceration in this Australian community.

Arterial disease was present in 22 per cent of limbs with a venous disorder. This is of particular importance since the methods of treatment of venous ulcers and ischaemic ulcers are very different, and the treatment of mixed ulcers depends on which is the major abnormality. There are, however, no analytical grounds for determining which abnormality is the dominant influence on wound healing.

The definition of a chronic leg ulcer as a lesion that has failed to heal after 1 month is arbitrary, but embodies the notion of delayed healing. The definition of a chronic venous ulcer used in this study was the presence of a venous abnormality in a limb with a chronic ulcer. This enabled the scope of ulceration due to venous disease in the community to be assessed. Browse et al. define a venous ulcer as a lesion 'caused by an abnormality of the veins draining the limb', and it is worthy of note that at least one other aetiologic factor was present in 36 per cent of limbs reported in the present study. How much each factor contributes to delay in healing is unknown and so it is important to consider other concurrent aetiologic factors for ulcer when assessing studies of venous ulcer treatment.

References

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