

## CLINICAL REPORT

# The Role of Vascular Surgery in Chronic Leg Ulcers: Report From a Specialized Ulcer Clinic

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Experience gained from cooperation between dermatologists and vascular surgeons in 177 patients evaluated at a joint leg ulcer clinic is reported. Patients were divided into two subgroups: (i) 86 patients with healed ulcers and (ii) 91 patients with ongoing therapy-resistant ulcers. Venous insufficiency was the most common etiology in both subgroups (87% and 55%, respectively). Of previous therapy-resistant ulcers, 71% were healed after the combined effort. The pattern of venous incompetence differed between the two subgroups; patients with isolated superficial disease constituting 68% and 26% of patients, respectively. In patients with therapy-resistant ulcers, those with isolated superficial venous insufficiency were found to have a better prognosis than those with deep venous insufficiency. Cooperation between the dermatologist and vascular surgeon is a mainstay in order to take advantage of the possibilities offered by modern vascular surgery. **Key words:** venous insufficiency; multidisciplinary treatment; venous surgery; arterial surgery.

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Leg ulceration is a common disease that inflicts considerable suffering on the patient and puts great economic strain on the healthcare system. In several recent studies in Sweden, the prevalence of ulceration in the healthcare system has been found to vary between 0.12 and 0.3% (1, 2). It has been shown that an equal number of patients suffer from disease without seeking professional help (3). Leg ulcer disease has a considerable negative impact on quality of life, especially with regard to pain and mobility (4, 5). Duration of disease is protracted over decades in many patients and at great cost to the healthcare system. Leg ulceration is not a disease *per se* but a symptom of an underlying disease in large or small blood vessels, physical agents such as trauma, hydrostatic or mechanical pressure and neoplasms. In previous years, the establishment of an etiological diagnosis has been poor. In recent years simple diagnostic tools have become available as well as new

knowledge and improved therapeutic possibilities, making etiological diagnosis simple and mandatory.

All patients undergoing a multidisciplinary approach at a specialized leg ulcer clinic during the period 1990–1996 are reported in the following report. The results of the first 43 patients in the present report have been published by us elsewhere (6).

## MATERIAL AND METHODS

### Patients

Patients considered eligible for vascular surgery were selected by the dermatologist (MB) from some 250 new patients attending the leg and foot ulcer clinic yearly for discussion at a monthly interdisciplinary clinic with the vascular surgeon (HA). After clinical evaluation, the necessary additional pathophysiological and radiological investigations were carried out, after which appropriate therapeutic action was agreed upon. The first 177 consecutive patients are reported. Patients were subdivided into two groups according to the reason for interdisciplinary evaluation: (i) patients with ulcers that had healed with our conventional therapy but who it was thought would benefit in the future from prophylactic vascular surgery, and (ii) patients with ongoing ulcer which had proved to be resistant to our best conventional conservative therapy. The number of individuals, median age, gender, duration of ulcer disease and duration of present ulcer within each of the two groups are reported in Table I.

### Methods

All patients attending the leg ulcer clinic underwent a standardized investigation according to a computerized protocol,

Table I. Ulcer etiology in 177 patients divided into subgroups

	Healed ulcer	Therapy-resistant ulcer
N	86	91
Age, years, median	65	76
Female, %	49	63
First ulcer, median, years	2	4
Present ulcer, median, months	4	7
Venous etiology, <i>n</i> (%)	75 (87)	50 (55)
Arterial etiology, <i>n</i> (%)	5 (6)	16 (18)
ABI	0.60	0.42
Veno-arterial etiology, <i>n</i> (%)	0 (0)	13 (14)
ABI		0.51
Other, <i>n</i> (%)	6 (7)	12 (13)

ABI: ankle-brachial index.

including relevant anamnestic information concerning general health and previous vascular and ulcer disease. A clinical investigation was carried out including vascular assessment using a hand-held ultrasound Doppler. Doppler investigation included measurement of ankle pressure and calculation of the ankle-brachial index (ABI). The apparatus was also used in testing for venous reflux over the great saphenous vein on the level of the thigh and lower leg and over the popliteal vein. When reflux was found over the popliteal vein, the test was repeated with a tourniquet 10 cm below knee level to exclude possible reflux of the small saphenous vein. Patients were thus preliminarily classified as having either superficial and/or deep venous incompetence. As logistics have developed over time, supplementary investigations, especially venous duplex ultrasonography, was already decided upon at the leg ulcer clinic and was thus at hand at the joint evaluation. At the interdisciplinary clinic the patients were once again evaluated for underlying pathology. Supplementary radiological and pathophysiological investigations were decided upon, such as venous duplex ultrasonography, contrast phlebography, venous pressure, ankle and toe arterial pressure and angiography.

After supplementary investigations had been carried out, a final decision was made concerning the most probable etiological factor, after which the most appropriate therapeutic action was taken. The proportion of the two dominating etiologies, venous and arterial insufficiency, of the two subgroups are shown in Table I. Examples of other reasons are hydrostatic ulcer, non-inflammatory small-vessel disease, rheumatic ulcer, inflammatory small-vessel disease and pyoderma gangraenosum. Hydrostatic ulcer has been defined as a post-traumatic ulcer between knee and ankle without evidence of any large or small-vessel disease (7). Venous insufficiency has been subdivided into two groups, i.e. superficial or deep insufficiency. By superficial is meant restricted to the great or small saphenous vein or communicating veins and different combinations of the three. Deep insufficiency means insufficiency in the popliteal vein with or without superficial insufficiency as defined above. The rationale behind this subclassification is that superficial disease as defined above is entirely curable with venous surgery, whereas deep disease is not treated surgically except in certain highly specialized clinics. The two subgroups are presented next. Within the groups, patients with venous disease have also been investigated separately, including subdivision into superficial and deep disease.

#### *Patients with healed ulcer evaluated for prophylactic vascular surgery*

Eighty-six patients belonged to this group (Table I). Median age was 65 years. Etiology was dominated by venous insufficiency (87%). The proportion of superficial and deep venous insufficiency was 68% and 32%, respectively.

#### *Patients with therapy-resistant ulcer*

Ninety-one patients belonged to this group (Table I). Median age was 76 years. Etiology was dominated by venous disease (55%) and arterial disease (18%). Concerning venous disease, the proportion of superficial and deep insufficiency was 26% and 74%, respectively.

#### *Therapy*

After final evaluation, the most suitable therapeutic action was decided upon and therapy was recommended to the patient. Venous and arterial surgery was performed using standard methods. Incompetence of the great saphenous vein was treated by ligation at the sapheno-femoral junction com-

bined with stripping to below knee level. Incompetent perforating veins were treated by subfascial ligation, sometimes using an endoscope. Incompetence of the small saphenous vein was treated with ligation at the sapheno-popliteal junction. Arterial stenosis/occlusion above knee level was treated either with femoro-popliteal bypass using a synthetic graft or percutaneous transluminal angioplasty (PTA) with/without stenting. Stenosis/occlusion below knee level was treated with *in situ* femoro-pedal bypass using the long saphenous vein. Of 20 skin graftings performed, 14 were pinch grafts performed by the dermatologist and 6 split-thickness skin grafts performed by the vascular surgeon or plastic surgeon. Conservative treatment was dominated by stay-on compression therapy with either a low-stretch adhesive bandage or a medium-stretch cohesive bandage, both changed on a weekly basis.

#### *Follow-up*

The mean follow-up time for ulcer patients evaluated for prophylactic surgery was 1,151 days and for patients with therapy-resistant ulcer 1,055 days. To evaluate the effect of the therapy, two measures have been used: (i) time to healing given in days and (ii) percentage of ulcer-free time. To calculate the latter, ulcer-free time during follow-up has been divided by length of follow-up. This calculation gives an estimate of the risk for relapse.

#### *Statistics*

Missing values that have been impossible to avoid with the great number of patients are accounted for. When *p*-values are given, an unpaired *t*-test has been used.

## RESULTS

### *Patients with healed ulcer evaluated for prophylactic vascular surgery*

Venous insufficiency dominated the etiological spectrum with 75/86 patients (see Table I). For both venous and arterial disease a mean percentage ulcer-free time of over 90 was recorded with a mean observation time of 1,151 days.

Analysis of patients with venous insufficiency is presented in Table II. Venous Duplex was performed in 60 cases. Insufficiency was found to be superficial in 68% of patients and deep in 32%. Venous surgery was offered

Table II. Result of completed therapy in patients with healed venous ulcers subdivided into superficial and deep venous insufficiency

	All	Superficial	Deep
N <sup>a</sup>	75	48 (68%)	23 (32%)
Venous surgery done (n)	47	32 (74%)	11 (26%)
Observation time, days, mean	1,284		
% Ulcer-free time, mean	94	93	95
Conservative therapy (n)	16	5 (31%)	11 (69%)
Observation time, days, mean	1,180		
% Ulcer-free time, mean	86	100	81
Patient abstains offered surgery	11		

<sup>a</sup>Venous Duplex performed in 60 patients. Data concerning superficial vs deep were missing in 4 patients.

in 58/74 patients and eventually performed in 47. For venous surgery, the follow-up revealed a percentage ulcer-free time of 94 compared with 86 for conservative treatment (difference non-significant).

#### Patients with therapy-resistant ulcer

Venous insufficiency dominated the etiological spectrum with 50/91 patients, followed by arterial (16/91) and combined venous/arterial (13/91) insufficiency (see Table I). Surgical treatment was recommended in 57/91 patients while conservative treatment was chosen in 32/91 patients. The overall healing rate for patients accepting recommended therapy was 71%. Four patients had amputations, two with arterial insufficiency (ABI 0.39 and 0.50), one with diabetes and arterial insufficiency (ABI 0.48) and one with veno-arterial insufficiency (ABI 0.47). Mean observation time was 1,055 days and mean percentage ulcer-free time 48%. Mean time to healing in patients with arterial ulcer was 381 days.

An analysis of patients with venous insufficiency is presented in Table III. Venous Duplex was performed in 39 cases and phlebography in 25 patients. Insufficiency was found to be superficial in 26% of patients and deep in 74%. Venous surgery was offered to 31/50 patients and eventually performed in 28. Healing rate was 79%. Mean time to healing after venous surgery was 229 days. When subdivided into superficial and deep disease, healing time was 151 and 295 days, respectively ( $p = 0.05$ ). Follow-up revealed a percentage ulcer-free time of 70 (superficial 82% and deep 60%,  $p = 0.01$ ). Conservative treatment was given to 14/50 patients. Healing rate was 64% with a mean time to healing of 297 days. Follow-up revealed a percentage ulcer-free

Table III. Result of completed therapy in patients with therapy-resistant venous ulcers subdivided into superficial and deep venous insufficiency

	All	Superficial	Deep
N	50	11 (26%)	32 (74%)
Therapy completed			
Venous surgery	28	11 (39%)	17 (61%)
LDS excision	2		1
Graft	2		1
Conservative	14		9
Venous surgery result			
Healed	22 (79%)	10	12
Time to healing <sup>1</sup>	229	151	295*
Observation time <sup>1</sup>	1,271	1,264	1,277
% ulcer-free time <sup>2</sup>	70	82	60**
Improved	3	1	2
Unchanged/worse	3		2

Venous Duplex performed in 39 patients. Phlebography performed in 25 patients. Data concerning superficial vs deep were missing in 7 patients.

LDS: lipodermatosclerosis. <sup>1</sup>Mean days; <sup>2</sup>Mean.

\* $p < 0.05$ ; \*\* $p < 0.01$ .

time of 58. When comparing healing rate and percentage ulcer-free time between venous surgery and conservative treatment, no significant difference was found.

#### DISCUSSION

Conservative treatment is relatively effective in many types of leg ulcer. For example, effective compression therapy using a 4-layer bandage has been shown to heal 85% of all venous ulcers within a 3-month period (8). Healing rates are lower at specialized dermatological ulcer clinics, probably because of a selection of complicated cases (9, 10). However the underlying disease is not corrected with this therapy and recurrence after longer or shorter latency is the rule.

The present investigation deals with the therapeutic possibilities of modern vascular surgery in cooperation with a specialized leg ulcer clinic. The aim was to find patients with curable vascular disease in order either to prevent recurrences or achieve healing in therapy-resistant cases. It should be pointed out that this report does not include any randomized trials but instead describes the clinical reality. Selected points of interest will be discussed.

A clinically meaningful subdivision of the material was found to be: first, patients with leg ulcer that healed with conventional compression therapy and where vascular surgery is discussed in order to prevent recurrence. This group was predominantly patients with isolated superficial venous insufficiency, and venous surgery was performed in most cases. Follow-up verified the effectiveness of this therapy with a very low risk of recurrence. Similar results in a small group of patients were achieved with conservative treatment. However, venous surgery in cases with superficial disease has the decisive advantage of eliminating the need for life-long prophylactic compression treatment. Most patients regard this as a substantial improvement in quality of life; The second group comprised patients with ulcers that did not heal with conventional therapy. This group was dominated by patients with deep venous insufficiency or with arterial and combined venous-arterial disease. In this group of selected difficult cases, it is notable that healing was achieved in as many as 71% after the multidisciplinary effort. It should also be pointed out that in a third of these cases conservative treatment was chosen as the most appropriate.

When restricting the analysis to patients with venous insufficiency, some striking features are revealed concerning different types of venous reflux. For decades the prevailing opinion has been that venous ulceration is always secondary to deep venous insufficiency with or without superficial incompetence. Deep insufficiency, in turn, is usually secondary to earlier deep venous thrombosis. Superficial venous incompetence thus has been looked upon mostly as a cosmetic problem that never on its own gives rise to venous ulceration. During recent years this view has been challenged. Several

investigations indicate that about 40% of venous ulcers are secondary to isolated superficial incompetence defined as incompetence of the great or small saphenous vein with or without incompetent perforators but without popliteal incompetence (11, 12). In a large patient material of 736 patients attending the specialized leg ulcer clinic in Malmö, 250 were found to have venous ulceration, whereof 44% were of isolated superficial type (Bjellerup, unpublished observation). The present investigation supports this view and adds some supplementary findings. Thus it seems that the proportion of superficial disease differs between different clinical groups, with a large proportion in the more benign cases that heal with compression. As opposed to this, therapy-resistant ulcers are dominated by deep venous insufficiency. The prospective part of the present investigation also verifies the better prognosis for patients with superficial disease. This is in concordance with a previous report (13).

This new knowledge should change our view on the patient with venous ulceration. Thus, since superficial incompetence is curable with venous surgery (14), the previously prevailing nihilism concerning curative opportunities should be replaced with optimism and an active search for those patients. As a consequence, investigation for venous reflux must be considered mandatory in every patient with a leg ulcer.

In the venous ulcer patients evaluated for prophylactic venous surgery, 78% were recommended such treatment. Subdivided into superficial or deep malfunction, surgical treatment was chosen in 90% of the former and 52% of the latter cases. This discrepancy is explained by the prospect of the definitive cure expected in superficial disease, whereas patients with deep disease are only partially cured and a continued need for prophylactic compression treatment.

Venous surgery has undergone development in recent years. Among the major improvements is the introduction of subfascial perforant ligation using an endoscope (15). Using this technique, no incisions are made through lipodermatosclerotic tissue on the distal lower leg and healing problems are thus avoided.

In some exceptional cases with deep venous insufficiency and ulceration, healing is not achieved despite extensive efforts. In such cases, where venous incompetence cannot be corrected, excision of the entire lipodermatosclerotic area down to the muscle fascia combined with split-thickness skin grafting may be an option (16). We have reported 8 such desolate ulcers where healing was achieved in 7 (17).

We conclude that interdisciplinary cooperation between dermatologist and vascular surgeon is an indispensable feature of a specialized leg ulcer clinic. Structured investigation in every patient, especially concerning ulcer etiology, will involve the vascular surgeon in a larger number of patients and, it is hoped, at an earlier time point.

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