

# Etiology of chronic leg ulcers in 31,619 patients in Germany analyzed by an expert survey

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## Keywords

- leg ulcers
- chronic venous insufficiency
- peripheral arterial disease
- vasculitis
- pyoderma gangrenosum

## Summary

**Background:** The etiology of chronic leg ulcers is heterogenous and they exhibit quite different healing rates depending on the underlying cause. Although the prevalence and incidence of chronic leg ulcers appear to be increasing, data on these patients in Germany are lacking.

**Patients and Methods:** Altogether 100 German wound care professionals were asked to complete a questionnaire regarding the diagnosis and etiology of their patients with chronic leg ulcers.

**Results:** We received the data on 31,619 patients. In these patients, venous insufficiency was the dominating causative factor in 47.6 % and arterial insufficiency in 14.5 %, 17.6 % of ulcers were due to combined arterial and venous insufficiency. Rarer causes included vasculitis (5.1 %), exogenous factors (3.8 %), pyoderma gangrenosum (3.0 %), infection (1.4 %), neoplasia (1.1 %), calciphylaxis (1.1 %) and drug-induced (1.1 %). The used diagnostic methods used varied widely between the medical and surgical specialties.

**Conclusions:** Even though the results of our study cannot claim to be a representative overview, they demonstrate clearly that next to known etiologies, e. g. chronic venous insufficiency or peripheral arterial insufficiency, which are relevant in 79.7 % of all patients a multitude of other causes exist, which are responsible in 20.3 % of all patients for the development of chronic leg ulcers.

## Introduction

Chronic wounds represent a worldwide increasing medical and economic problem. At present in Germany, as in many nations, patients with chronic wounds are not registered centrally. Therefore, all statements on prevalence and incidence are based solely on estimates or studies on small patient collectives. According to the sparse data available, it is estimated that in Germany 2–3 million people have chronic wounds of highly variable cause [1]. The worldwide most common chronic wounds manifest in at least 60 %

of the patients as leg ulcers [2, 3]. The causes of a leg ulcer are quite diverse. In addition to the in practice most frequently occurring vascular ulcers due to chronic venous insufficiency (CVI), peripheral arterial occlusive disease or combined vascular damage, termed mixed ulcer, many other, often less well-known entities exist [4, 5].

The aim of our study was – by means of a standardized questionnaire of experts of various medical specialties in Germany – to collect current data on the genesis of chronic leg ulcer in the

patients they treat and the fundamentals of diagnostics performed.

## Patients and methods

A specific questionnaire designed by us was sent in a targeted fashion to 100 experts in the therapy of chronic wounds (Figure 1). Experts were defined as wound-treating physicians from various medical specialties, who had either scientifically and/or through long-standing work in a specialized outpatient wound service and had treated a large number of patients with chronic wounds. In case of

## Causes of chronic leg ulcers

Dear wound therapist,  
dear colleague,

We would like to ask your help in an epidemiological survey on the causes of chronic leg ulcers by answering several questions. Please try to answer the questions after reviewing available patient records, if possible, and not only make estimates.

In the following, leg ulcers are defined purely as wounds found on the lower leg from below the knee to the ankle. Wounds on the feet or other anatomic regions are not a subject of this study.

In the following, chronic wounds denote exclusively wounds that have existed for at least 3 months.

For our survey we also require some personal information

.....  
Surname, first name

.....  
Institution, position

.....  
Catchment area from which your patients come

Many thanks for your friendly cooperation!!!

Please send the completely filled questionnaire per fax to  
Fax +49 201 7233174

or by mail to

PD Dr. J. Dissemond  
Klinik für Dermatologie  
Universitätsklinikum Essen  
Hufelandstraße 55, 45122 Essen

1. Are you yourself responsible for diagnostics and/or therapy (performance and/or giving orders) of patients with a chronic leg ulcer?	<input type="checkbox"/> Yes <input type="checkbox"/> No
2. How many patients with a chronic leg ulcer, where diagnostics of the causes have been performed, do you care for currently or have you cared for in the past 5 years?	_____ pat.
3. In how many percent of your patients were the following diagnoses made? Please take care that a total of 100 % results.	
Venous leg ulcer (this means all patients with chronic venous damage regardless if a postthrombotic syndrome or another cause of CVI is relevant for the etiology of the chronic leg ulcer)	_____ %
Arterial leg ulcer (this means all patients in whom an arterial disease such as e. g. peripheral arterial disease is relevant for the etiology of the chronic leg ulcer)	_____ %
Mixed leg ulcer (this means exclusively patients in whom both a venous disease as well as an arterial disease are relevant for the etiology of the chronic leg ulcer)	_____ %
Vasculitis (meaning here both primary as well as secondary vasculitides that are relevant for the etiology of the chronic leg ulcer)	_____ %
Exogenous factors (meaning here, for example, physical or chemical factors such as e. g. trauma/injury/accident, pressure, irradiation, cold injury, etc.)	_____ %
Neoplasias/metastases	_____ %
Infectious diseases	_____ %
Pyoderma gangrenosum	_____ %
Calciphylaxis	_____ %
Drugs	_____ %
Other	_____ %
Unclear etiology	_____ %
<b>Total (Please take care that the total number results in 100 %)</b>	<b>100 %</b>
4. Which diagnostics were performed in the patients you care for to clarify the cause?	
Doppler/duplex sonography (ultrasound of the venous system)	<input type="checkbox"/> Always <input type="checkbox"/> Often <input type="checkbox"/> Rarely <input type="checkbox"/> Never
Serological tests (blood)	<input type="checkbox"/> Always <input type="checkbox"/> Often <input type="checkbox"/> Rarely <input type="checkbox"/> Never
Arm-ankle index (arteries) (Brachiotibial index, systolic pressure measurement)	<input type="checkbox"/> Always <input type="checkbox"/> Often <input type="checkbox"/> Rarely <input type="checkbox"/> Never
Biopsy (tissue sample)	<input type="checkbox"/> Always <input type="checkbox"/> Often <input type="checkbox"/> Rarely <input type="checkbox"/> Never
Bacteriological investigations	<input type="checkbox"/> Always <input type="checkbox"/> Often <input type="checkbox"/> Rarely <input type="checkbox"/> Never
Angiography and/or phlebography	<input type="checkbox"/> Always <input type="checkbox"/> Often <input type="checkbox"/> Rarely <input type="checkbox"/> Never
5. How many percent of the patients cared for by you for a chronic venous leg ulcer regularly receive compression therapy or regularly perform this themselves?	_____ %
6. How many of your patients with a chronic leg ulcer regularly receive modern moist wound care? (meaning here wound dressing, for example with foams, alginates, hydrocolloids, etc.)	_____ %

Figure 1: Questionnaire which was sent to the experts.

**Table 1:** Summary of the results of chronic leg ulcers etiologies. Tabular description of all data sorted by etiology.

Etiology	Number (absolute)	Number (%)	Mean	Median
Vasculitis	1 587	5.0	30	21
Venous leg ulcer	15 048	47.6	212	135
Mixed leg ulcer	5 571	17.6	79	40
Arterial leg ulcer	4 583	14.5	65	30
Exogenous factors	1 206	3.8	17	6
Pyoderma gangrenosum	947	3.0	13	3
Infectious diseases	429	1.4	6	0.8
Neoplasias/metastases	367	1.2	5	1
Calciphylaxis	355	1.1	5	1.4
Drugs	334	1.1	5	0
Other etiology	405	1.3	6	0
Unclear etiology	797	2.5	11	2

non-response to the first letter, all experts were written to a second time after 6 weeks.

All therapists contacted were classified according to their specialties as dermatologists, surgeons or internists. We requested, that on the basis of studies performed the percentage of the various causes of chronic leg ulcers be reported. Further, via an inquiry into diagnostic measures, we wanted to determine how the diagnoses of the patients were objectified.

### Results

We received a total of 72 responses, of which 70 could be evaluated completely. In one response the colleague noted that the requested data was not centrally registered, so that he would have to make an estimate; another colleague was not able to determine the total number of patients registered. Thus the data of 31,619 patients with a chronic leg ulcer were included. On the questionnaire, between 5–3,000 patients (mean: 445, median: 250) per therapist were reported. The colleague who reported of having only 5 patients currently in treatment, noted that he did head-up an outpatient wound service, but that patients with chronic leg ulcers were treated at other sites in the region. The statements on etiology are depicted in Table 1 and Figure 2 in a differentiated manner.

In the survey on diagnostics performed, 48 therapists conducted Doppler or du-

plex sonography “always”, 21 therapists “often” and 1 of the total of 70 “rarely”. Serological studies were employed by 20 therapists “always”, by 25 therapists “often” and by 24 “rarely” as well as “never” by 1 therapist. Measurement of the ankle-arm-index, also synonymous with brachiotibial index (BTI) or systolic arterial pressure measurement was done by 45 therapists “always”, by 18 therapists “often”, by 6 therapists “rarely” and by 1 therapist “never”. Biopsies were performed by 8 therapists “always”, by 23 therapists “often”, by 37 therapists “rarely” and by 2 therapists “never”. As to bacteriological studies 43 therapists implemented them “always”, 21 therapists “often” and 6 therapists “rarely”. Finally, as to the question on performance of angiography or phlebography 6 therapists responded with “always”, 30 therapists with “often”, 27 therapists with “rarely” and 1 therapist with “never”. A differentiated depiction of distribution in dependence on the respective medical specialty is found in Table 2.

### Discussion

A group of very diverse diseases is described as leg ulcer. The current world literature contains little, and in part contradictory, information on the incidences and prevalences of the different types of ulcers [2, 6–12]. In Germany the vast majority of patients with a leg ulcer – after a variable long period of self-treatment – is seen by the family physician, who usu-

ally initiates treatment, often without performing an adequate diagnostic evaluation. Many patients are referred to a specialist or to one of the still few specialized wound centers only after a therapy-refractory course. The relevant medical specialties in Germany that care for patients with chronic wounds are mainly dermatologists, surgeons and internists [13]. In order to initiate a lastingly successful therapy it is always also necessary to diagnose underlying factors correctly and completely and, if possible, to treat them. The causes for the development of chronic leg ulcers are highly variable [4]. In our study, too, in part significant differences in the frequency of underlying etiologies among the different specialties of the surveyed experts were seen. This was most obvious in the difference among the specialties in the incidence of venous leg ulcers, which had a frequency of 54 % among dermatologists, but only of 36 % among internists. In contrast, in the group of internists an accumulation of calciphylaxis and of vasculitides is found (Figure 2). The further diagnostic approach, which differs in the individual groups, also appears to depend on this (Table 2).

In the data collected, on the whole, venous leg ulcer is the most frequent diagnosis in 47.6 % of patients. As patients with mixed leg ulcers also have CVI, the proportion rises to 65.2 %. In German-speaking nations a mixed leg ulcer denotes a leg ulcer where both CVI and peripheral arterial disease are clinically relevant. As this term is not in uniform use everywhere, a clarification was made in our questionnaire. When this constellation is viewed as a separate entity, it can constitute the second most frequent etiology in 17.6 % of patients. Arterial leg ulcers were the sole cause of the chronic leg ulcer and thus the third most common cause in 14.5 % of patients. By adding the patients with mixed leg ulcer, who by definition have peripheral arterial disease, peripheral arterial disease can be found in a total of 32.1 % of patients. With the vasculitides, present in 5.0 % of patients, at the latest, the obviously rarer causes of chronic leg ulcers begin. Nonetheless, it may be assumed here – as in other documented diseases –, that indeed the diagnosis has not been made correctly in all patients. This is demonstrated by the fact that, for example, more than one-half (55.7 %) of

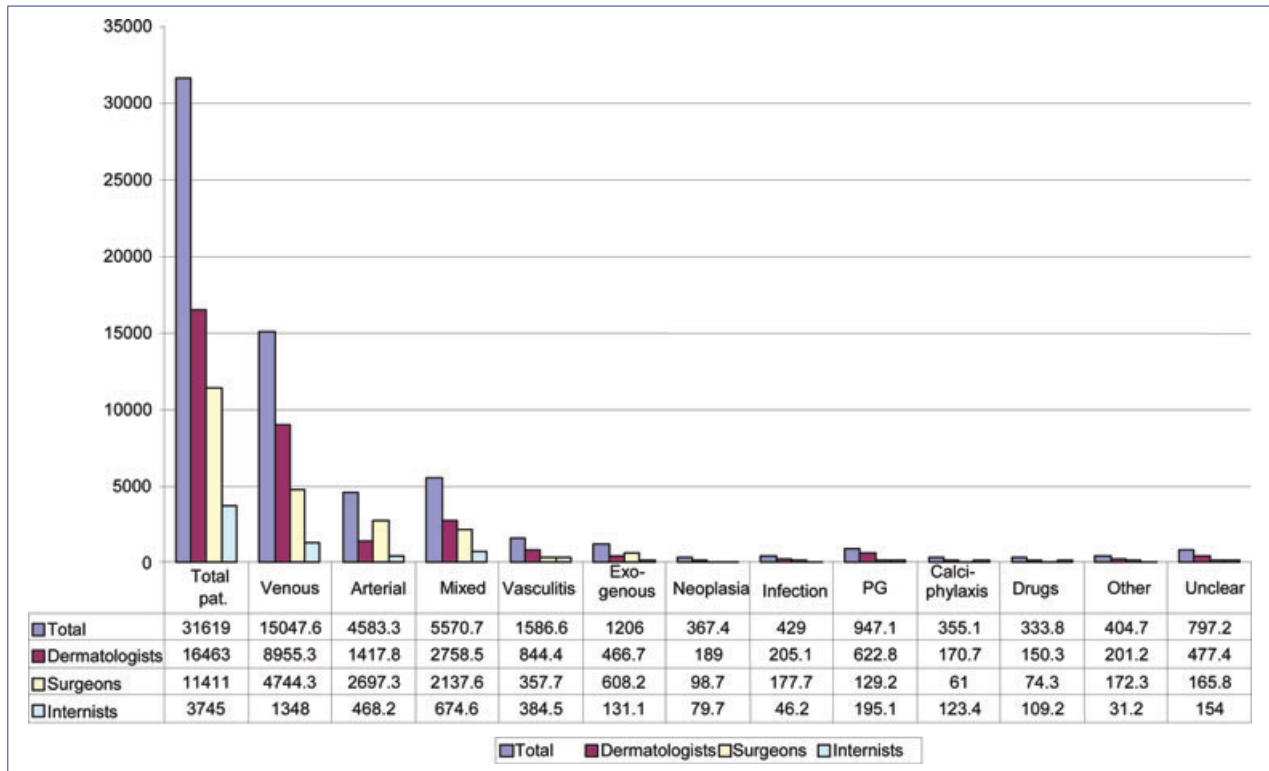


Figure 2: Summary of the results of chronic leg ulcers etiologies. Differentiated description sorted by etiology and area of expertise.

**Table 2:** Percentages of the conducted diagnostic investigations sorted by area of expertise. ABI: ankle-brachial index, D: dermatologists (n = 31); S: surgeons (n = 30); I: internists (n = 9).

Diagnostics	Always			Often			Rarely			Never		
	D	S	I	D	S	I	D	S	I	D	S	I
Doppler/duplex	74	66	56	26	30	44	0	4	0	0	0	0
Serology	39	23	11	32	37	45	29	40	33	0	0	11
BTI	58	70	67	39	13	22	3	13	11	0	4	0
Biopsy	13	13	0	39	26	33	48	57	56	0	4	11
Swab	61	70	33	26	30	45	13	0	22	0	0	0
Angiography/ phlebography	0	20	0	39	67	45	61	13	44	0	0	11
Specialty	D	S	I	D	S	I	D	S	I	D	S	I

all therapists perform biopsies only rarely or never, so that various etiologies such as, for example, vasculitides and neoplasias are not securely diagnosed. It has been known for many years that vascular disorders are the most common relevant causal factors for leg ulcers. Especially CVI is cited as a fundamental cause of leg ulcers in 50-75 % in the literature [4-10]. In our patient collective, too, vascular disorders such as CVI and peripheral arterial disease were the most

frequent entities resulting in leg ulcers in 79.7 %. In the remaining 20.3 % of patients treated by the experts other factors otherwise considered rare causes and described in the literature as having a share of maximally 10 % were found [2]. In comparison, other studies, e. g. a survey in cooperation with the German Society for Wound Healing (Deutsche Gesellschaft für Wundheilung, DGfW) found a higher proportion of purely vascular causes of chronic leg ulcers. It is also

notable that here fewer diagnostic procedures were performed in comparison to our study collective of the experts. For example, in only 75 % of patients was BTI determined always or often, in comparison to 98.6 % among the experts [13]. The results of our own patients differ distinctly both from the results of the expert group as well as from the sub-group of dermatologists. In our own internal analysis of our patients a significantly greater proportion of vasculitides with 13.25 % was seen than in any other comparative group, but a distinctly lower proportion of purely arterial leg ulcers with only 3.7 % of all patients [14]. In our own internal analysis in only 76 % of all patients are vascular causes found and in comparison to current literature a considerably higher share of otherwise rarely reported causes. In differential consideration of the numbers reported in the current literature with regard to the most frequent causes of leg ulcers, it becomes clear that already on formal grounds a comparison is hardly possible. On a worldwide and even on a national level, the definition of a chronic leg ulcer differs widely. In Germany, for example, the definition of what constitutes a chronic wound varies

from 4 weeks to 12 months [1]. Further, especially in Anglo-American studies wounds of the lower extremities are termed "leg ulcers" with inclusion, for example, of the diabetic foot syndrome despite the fundamentally different underlying pathogenesis [4, 5]. In studies by Nelzon et al. on the etiology of leg ulcers an exclusively venous cause was found in 54 % of all examined patients. In this study a population of 270,000 people in Sweden were examined. On total 827 ulcers were identified; in 382 these were studied differentially [15, 16]. A further differentiation of etiologies beyond venous diseases was not conducted.

Moffat et al. examined patients in London with a leg ulcer that had existed for at least 4 weeks. A total of 113 patients with a leg ulcer among 252,000 test persons examined were found. The most frequently identified entity was CVI in 43 % of all patients. In a total of 35 % of patients a combined etiology consisting of CVI and lymphedemas (42 %), diabetes mellitus (35 %) or rheumatoid arthritis (26 %) was diagnosed [17]. In a further study Baker et al. examined 259,000 patients in Australia. Here, too, the most common causes were CVI in 67 % of all patients, followed by an arterial etiology in 29 %. Diabetes mellitus as a concomitant factor was observed only in 29 % of the patients. Nonetheless 47 patients with ulcers on the feet were included in this study. As rare causes, among others, rheumatoid arthritis was reported as exclusive cause in 3 patients as well as a complicating factor in another 24 patients. A differentiation if, for example, otherwise often mentioned vasculitides served as the concrete cause of the leg ulcers in these patients, was not made. Only the ulcer of one patient was judged to be a vasculitic ulcer [18]. In contrast to our study in most of the studies presented one finds a distinctly more uncritical examination of the causal entities with usually an emphasis on vascular etiologies or their combinations. In none of the studies found was a comparable differentiated work-up of the etiology reported. Grounds for this might be limited knowledge on many rarer diagnoses or also methodic problems of performing exhaustive diagnostics in such in part very large patient collectives. So, for example, in the study by Moffat et al., the

patient interviews were performed by nurses and the additional questionnaires were filled out by nurses or the family physicians. Despite the fact, that in comparison to Germany, nurses in Great Britain often have more further training with respect to wound treatment and have more responsibilities, it must be noted critically that an etiological differentiation of the various entities surely does not correspond to the standard of a specialist with experience in an outpatient wound service. In the Australian study by Baker et al. interviewing of the patient was performed only by nurses or the family physician. In both studies neither technical studies nor biopsies or advanced diagnostic measures were performed to ensure a clear etiological classification.

The results of our studies as well as the little data published to date demonstrate that documented data depend on a multitude of factors. It is, for example, of significance in which institution these examinations have been done, as usually already a pre-selection of the patients has taken place. In a specialized outpatient wound service, as an example, more patients with therapy-refractory wounds will present. One reason for a therapy-refractory course might have been the presence of a rare, previously not correctly diagnosed disease entity. Indeed, patients are often referred to different institutions depending on the suspected etiology. Patients admitted as inpatients again represent a negative selection of this patient group.

We suggest that with our approach with surveying interdisciplinary wound experts we come close to the actual distribution of the various entities of leg ulcers at least in specialized wound centers in Germany. Truly reliable and representative data will only then be collected, when not only all patients with leg ulcers are registered centrally, but also all patients are provided with extensive and comparably complete diagnostics by specialized physicians.

### Conclusions

A chronic leg ulcer can have the most varied causes. In our interdisciplinary survey we have confirmed the central role of CVI and peripheral arterial disease in about 80 % of patients. Nevertheless, in comparison to other both national and international studies a

displacement in the direction of other more rarely reported entities in about 20 % of patients is observed. It thus becomes clear that adequate diagnostics and therapy of patients with a chronic leg ulcer should, if possible, be on an interdisciplinary basis. <<<

### Conflict of interest

None.



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