

# Differential diagnosis of leg pain in phlebology

## Differentialdiagnose von Beinschmerzen in der Phlebologie

### Authors

Erika Mendoza

### Affiliations

Venenpraxis Wunstorf

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### Correspondence

Dr. Erika Mendoza

E-Mail: [erika.mendoza@t-online.de](mailto:erika.mendoza@t-online.de)

### ABSTRACT

It is very common that patients with acute leg pain suspect a thrombosis as a cause. In fact, after experiencing pain the patient has a look at his leg discovering a varicose vein which he perhaps hadn't discovered earlier. This, also, leads to the association, that the varicose vein is the origin of the pain. As a rule, it is very seldom to find veins as a cause of leg pain. They simply happen to be there, as varicose veins have a high prevalence. Typical clinical signs of varicose veins are itching, swelling, feelings of heaviness, skin changes. Leg pain is mostly provoked by neurologic, orthopedic or muscular disorders. The article describes venous reasons for leg pain and offers information to help with the differential diagnosis.

### ZUSAMMENFASSUNG

Beinschmerzen, besonders wenn sie plötzlich auftreten, sind oft mit der Angst vor einer Thrombose belegt. Die Tatsache, dass viele Menschen ihre Beine betrachten, nachdem sie dort Schmerzen fühlen und eine Krampfader beobachten, die sie vielleicht vorher noch nicht wahrgenommen haben, führt oft zu der Assoziation, dass die Krampfadern die Schmerz verursachende Grund-Erkrankung darstellen. Grundsätzlich sind venös bedingte Beinschmerzen sehr selten, es ist vielmehr so, dass Krampfadern einfach zusätzlich vorhanden sind. Venös bedingte Beschwerden sind eher Juckreiz, Schweregefühl, Ödeme, Hautveränderungen. Weitaus häufigere Ursachen für Beinschmerzen sind neurologischer, orthopädischer, arthrogen oder muskulärer Natur. Der Artikel beschreibt venös bedingte Beinschmerzen und bietet Hilfen zur differentialdiagnostischen Abgrenzung gegenüber den anderen Ursachen.

## Introduction

Fortunately, education in recent years has raised the awareness of serious diseases such as deep and superficial vein thrombosis in the general population. The other side of the coin, however, is that many people now immediately think of thrombosis when they experience even the slightest pain in the leg. They become particularly anxious if they notice something unusual at the site of the pain. It may be the discovery of spider veins or a visible varicose vein that has actually been there for some time and similar changes are present in the other leg. But it is found close to the site of the pain and therefore a plausible reason for the discomfort. It is a legitimate question as to whether a change that is present in some 59.1 % of

the adult population [1] is really to be viewed as something out of the ordinary. For this reason, it is important to ensure that not only the general population but also primary care physicians, including general practitioners, emergency doctors, and those working in the accident and emergency department, are sufficiently well educated in the various causes of leg pain. This article offers a structured differential diagnosis and provides a simple tool for the preliminary work-up and first-line treatment of leg pain.

## Visible veins and pain

The frequency of visible venous skin changes in the general population is very high: only 9.6% of people aged over 18 do NOT have any signs of varicose veins [1]. This means that only one in ten adults with leg pain has no outward sign to suggest that their veins are causing the pain. 73.4% of the adult population have visible veins without any sign of chronic venous insufficiency (59.1% spider veins, 14.3% visible tributary veins [1]). That is to say, approximately 75% of the population have visible but usually harmless varicose veins, which come under suspicion as soon as there is any pain in the leg concerned.

It is very rare, however, that acute or chronic pain is really caused by these harmless varicose veins. Explanations on the internet, as well as those given by primary care physicians, are important to allay people's fears.

## Venous pain in the leg

The following are plausible reasons for venous pain in the leg:

- Superficial vein thrombosis (previously known as "phlebitis")
- Deep vein thrombosis
- Tension pain due to oedema (C<sub>3</sub>)
- Inflammatory changes in (post inflammatory) hyperpigmentation, e. g. atrophie blanche (C<sub>4</sub>)
- Venous leg ulcers (C<sub>6</sub>)
- Heat-induced venous dilatation (at the start of summer, in saunas)
- Enlargement of a varicose vein

**Superficial vein thrombosis (SVT)** is usually of acute onset but may sometimes be a chronic recurrent condition. As a rule, it is found along a previously existing and usually very obvious varicose vein (► **Fig. 1**) but may rarely occur in a previously healthy vein. The patient can feel an indurated cord with a brownish colour that is often surrounded by reddened tissues; the skin is then usually also warm to the touch. An older SVT still has the brownish discolouration but a painful cordlike segment of vein can no longer be felt. This may be the case for several months. The danger of SVT lies in the fact that it may only be the tip of the iceberg and may extend uninterrupted into the deep venous system via perforating veins or the trunk veins. In addition, 30% of patients with an extensive SVT may have a completely separate deep vein thrombosis and 4% have pulmonary embolism [2, 3].

When a vein that lies over the painful area is soft and can easily be compressed with the fingers, it is highly unlikely to contain thrombus. The only condition in the differential diagnosis that may cause some difficulty for the doctor inexperienced in vein diseases is pain newly arising in the region of venous hyperpigmentation (C<sub>4</sub>) (see below).

## Deep vein thrombosis (DVT)

This is by far the most dreaded diagnosis whenever there is acute leg pain or swelling. On the other hand, DVT may not cause any pain at all and the first clinical sign is pulmonary embolism. Leg pain should therefore be taken seriously but not every patient with leg pain should be referred for diagnostic investigation to rule out a



► **Fig. 1** Superficial vein thrombosis: outer aspect of the right knee with brown discolouration of a known varicose vein, surrounded by redness. Findings on palpation: tenderness, induration in the brown area, warmth in the red area. Ultrasound scan confirms thrombosis of the varicose vein (source: Arrien GmbH with kind permission).

DVT even when the diagnosis is unlikely – this would surely overload the system. Clinical signs and symptoms of thrombosis have to be differentiated.

The clinical signs and symptoms of DVT are newly occurring unilateral swelling, pain, a feeling of tension, bluish discolouration, and (new!) increased venous markings (these are the collaterals around the obstruction in the deep venous system) (see ► **Fig. 2a** and ► **Fig. 2b**). The classical signs of DVT are summarised in ► **Table 2** and ► **Fig. 3** and ► **Fig. 4**. Signs and symptoms in ambulant patients have a sensitivity of 60–90% but are very non-specific, since the differential diagnosis encompasses numerous other conditions.

The Wells score was initially developed as a three-stage score [4] but the two-stage version has become well established clinically (see ► **Table 3**). If the total number of points is two or above, the prevalence of thrombosis in studies is 30% [5]. Diagnostic imaging has to be carried out. If the score is less than two, the risk is low. An additional D-dimer test is now meaningful. If the result is negative, thrombosis can be ruled out; if it is positive, diagnostic imaging should be performed [3, 5].

## Oedema

Oedema may have an acute or insidious onset. Unilateral acute oedema – especially when it is accompanied by a certain livid dis-



► **Fig. 2 a** Unilateral swelling and bluish colour of the leg with thrombosis. Unilateral swelling (on the right) of thigh and calf (1 point), difference in calf circumference of 3 cm (1 point), extreme tenderness over the inner aspect of the thigh and of the calf (1 point), oedema (1 point), flu with bed rest for 4 days (1 point): Wells score 5. Ultrasound confirmed thrombosis of the posterior tibial veins, the popliteal vein, the femoral vein and the common femoral vein. **b** Unilateral swelling (left) with loss of the venous markings on the dorsum of the left foot as compared with the right, loss of the calf contours (gastrocnemius muscle) compared with the right (right shapely, left rounded out), slight redness of the inner aspect of the calf, the calf is indurated and tender, particularly over the inner aspect. History of presenting complaint: Healthy man who had just completed a cycling tour and returned home by car. Difference in leg circumference of 3 cm (1 point.), tenderness along the deep vein (1 point), oedema (1 point), alternative diagnosis probable (-2 points): Wells score 1. The D-dimer test was positive, so further diagnostic investigation carried out. Ultrasound scanning showed a ruptured Baker's cyst (source: Arrien GmbH with kind permission).

► **Table 1** Diagnostic investigation and measures in various types of venous and non-venous leg pain.

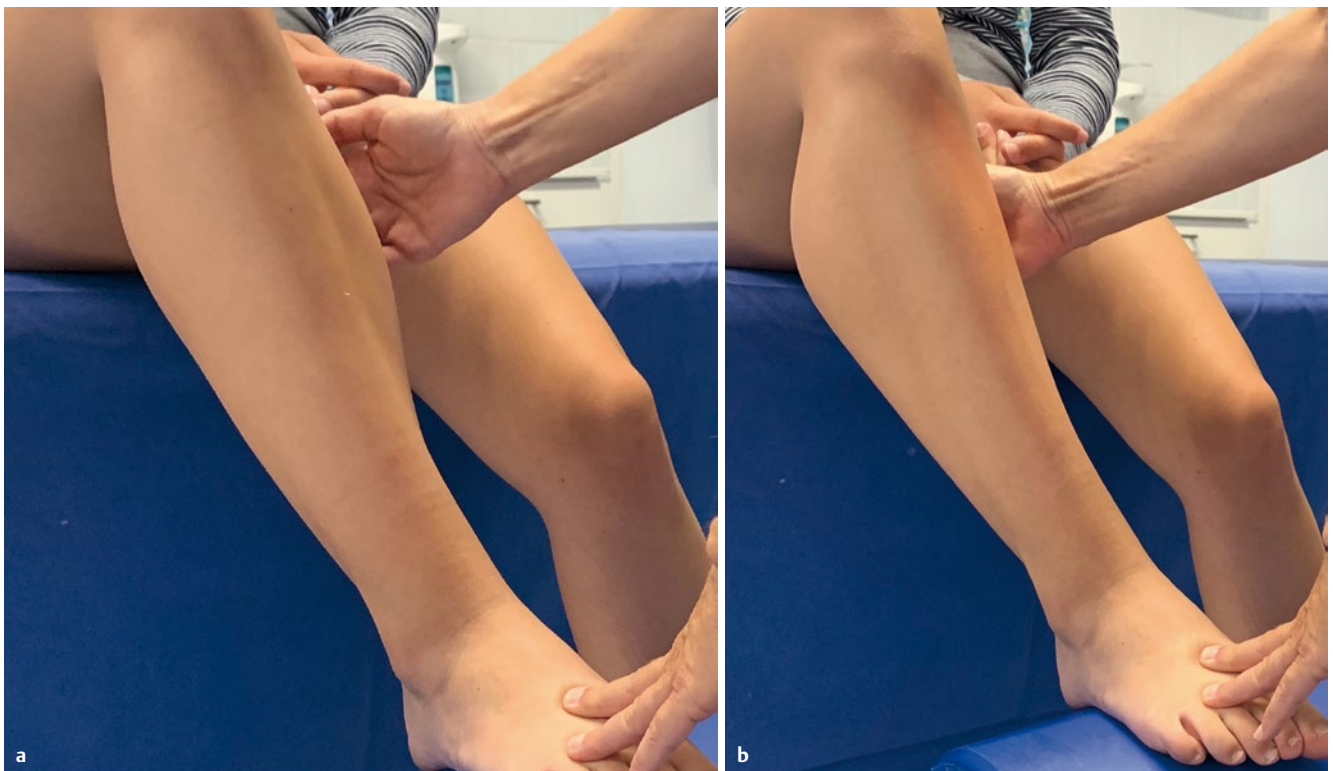
Diagnosis	Signs	Measures	Diagnostic investigation
Superficial vein thrombosis (SVT)	Induration with or without redness of a vein lying superficially, mostly a previously known varicose vein ► <b>Fig. 1</b>	Compression (bandage, prescription for stockings), anti-inflammatory drug, with palpable segment more than 5 cm and risk factors for thrombosis: fondaparinux 2.5 mg until definitive diagnosis	Duplex ultrasonography to rule out progression into the trunk veins/deep veins, within the next 24–48 hours
Deep vein thrombosis (DVT)	See ► <b>Table 2</b> and ► <b>Table 3</b> , bluish-purple colour of the entire leg/calf ► <b>Fig. 2</b>	Compression, therapeutic anticoagulation	Duplex ultrasonography depending on the clinical probability and Wells score (see ► <b>Table 3</b> ), within 24–48 hours
Erysipelas	Redness, warmth and swelling	Antibiotic therapy, compression therapy once antibiotics have been introduced	Full blood count, CRP
Swelling	Bilateral with lipoedema or general internal medical conditions, unilateral or bilateral with lymphoedema	Compression: starting with bandages, depending on the severity; manual lymphatic drainage (MLD), depending on the severity	Look for the cause
Feeling of numbness	Area of numbness compared with the contralateral side	Physiotherapy, osteopathy, further measures depending on the cause	Neurological work-up
Pain radiating down the leg	Pain corresponding to a dermatome or the path of a nerve	Physiotherapy, osteopathy, further measures depending on the cause	Orthopaedic or neurosurgical work-up

colouration – indicates a deep vein thrombosis (see the section on DVT). Oedema as a result of varicose veins represents stage C3 and is most marked in the leg with the most conspicuous varicose veins – the differentiation is obviously difficult when both legs have conspicuous varicose veins. It may cause tension pain. The patient is already aware of the swelling, as it has gradually increased over the years and, if a compression stocking relieves the pain, it is the reason why the varicose veins should be treated. If there is an acute exacerbation of this oedema – or oedema suddenly oc-

curs with a previously uncomplicated varicose vein – we can usually find a trigger: for example, hot weather increases vasodilatation and thus oedema of any origin. However, the reason for new swelling or exacerbation is often that the patient has started taking a drug which induces oedema, such as Parkinson's medication or antihypertensive agents, or that the patient has put on weight. And certainly, one of the most common causes of oedema in patients with varicose veins at the start of the summer season is that they stop wearing their prescribed medical compression stockings.

► **Table 2** Clinical signs of thrombosis.

Sign	Description	Differential diagnosis (list not exhaustive)
Deneke's sign	Calf pain on plantar flexion	Achilles tendinitis, ruptured Baker's cyst
Homans' sign	Calf pain on dorsiflexion of the foot	Achilles tendinitis, ruptured Baker's cyst
Payr's sign	Pain on pressure to the sole of the foot	Foot conditions
Bisgaard's sign	Tenderness posterior to the malleoli	Ankle conditions, tenosynovitis
Liscard's sign	Pain on percussion of the tibial head	Bone diseases
Ducuing's sign	To and fro movement of the calf ► <b>Fig. 3</b>	Haematoma, ruptured Baker's cyst
Lowenberg's sign	Pain on the affected side when cuff is inflated	Haematoma, ruptured Baker's cyst
Meyer's sign	Tenderness of the proximal medial aspect of the calf ► <b>Fig. 4a</b>	Haematoma, torn muscle fibres, ruptured Baker's cyst
Sigg's sign	Knee joint pain on hyperextension	Knee conditions, Baker's cyst
Pratt's sign	Knee joint pain on flexion	Knee conditions, Baker's cyst
Louvel's sign	Pain in the thigh on coughing	Inguinal hernia, muscle pain
Adductor canal pain	Tenderness over the adductor canal ► <b>Fig. 4b</b>	Muscle pain
Rielander's sign	Tenderness in the inguinal region ► <b>Fig. 4b</b>	Orthopaedic problems
Homans' sign	Calf pain on dorsiflexion of the foot	Haematoma/ruptured Baker's cyst



► **Fig. 3** Clinical examination of suspected thrombosis: Moving the calf to and fro: the foot is supported, the calf hangs loosely, the leg is not stretched. If the gastrocnemius muscle can be pushed slightly inwards **a** (to the left) and outwards **b** (to the right) without any pain, this argues against a thrombosis (source: Arrien GmbH with kind permission).

Oedema may, of course, have many underlying causes. Lymphoedema and venous oedema may be painful if they increase in volume. If there is an increase in fatty tissue (lipohypertrophy) that is tender to the touch, this may be a case of lipoedema. Rapidly occurring oedema for general medical reasons (heart failure, liver failure or acute kidney injury) also causes tension pain. Oedema ac-

companying leg injuries is obviously very painful (caution: oedema sometimes also occurs with an undetected fatigue fracture of the ankle or foot.)

Whatever the cause of the oedema, however, compression reduces its extent and relieves the pain (compression is contraindicated only in the case of heart failure and raised troponin levels and

► **Table 3** Wells score with evaluation (the author's comments appear in italics) [3, 5].

History, findings	Score
Active cancer	1.0
Paralysis or recent immobilisation of the leg	1.0
Recently bedridden (more than 3 days) or major surgery within the past 12 weeks	1.0
Tenderness/induration along the deep vein	1.0
Swelling of the entire leg	1.0
Calf swelling 3 cm greater than other leg ( <i>checked with a tape measure</i> )	1.0
Oedema in the symptomatic leg (in this leg only or clearly greater than in the other leg)	1.0
Collateral veins (new veins, not known varicose veins)	1.0
Past history of DVT (confirmed with ultrasound or X-rays and subsequently treated with anticoagulants)	1.0
Alternative diagnosis more likely than DVT (e. g. ruptured Baker's cyst in a patient with osteoarthritis of the knee)	-2.0
Total points	
Estimation of the risk of thrombosis:	
Score $\geq 2.0$ – High risk, prevalence of thrombosis: 30%	
No D-dimer test necessary, initiate diagnostic imaging	
Score $< 2.0$ – Low risk, prevalence of thrombosis: 6% → perform a D-dimer	
D-dimer test negative: no further diagnostic investigation	
D-dimer test positive: diagnostic imaging	

advanced arterial disease). In addition, whenever new oedema occurs, thrombosis must at least feature in the differential diagnosis.

## Chronic inflammation of the skin

Changes as a result of chronic venous insufficiency or a disorder of lymphatic drainage may lead to chronic skin inflammation. The skin becomes indurated, has a brownish discolouration, and forms palpable sheets of tissue that are sometimes penetrated or at least surrounded by varicose veins, although the veins may no longer be individually palpable in this area. These skin changes usually develop gradually and are more or less ignored or unsuccessfully treated by compression (and are well known to the patient and the doctor in such cases) (see ► **Fig. 5**). But sometimes pain suddenly occurs in the area. It may be due to an increase in the oedema (see causes for acute oedema above) or a superficial vein thrombosis in this area (very rare, see section on SVT). It is difficult to make a clinical distinction in these cases and ultrasound scanning is required.

## Venous leg ulcers

Venous leg ulcers are not usually painful. Should acute pain occur, it is most likely due to infection in the lesion. Appropriate wound management must be introduced. Neuropathy and an arterial component have to be ruled out in patients who present for the first time with painful venous leg ulcers.



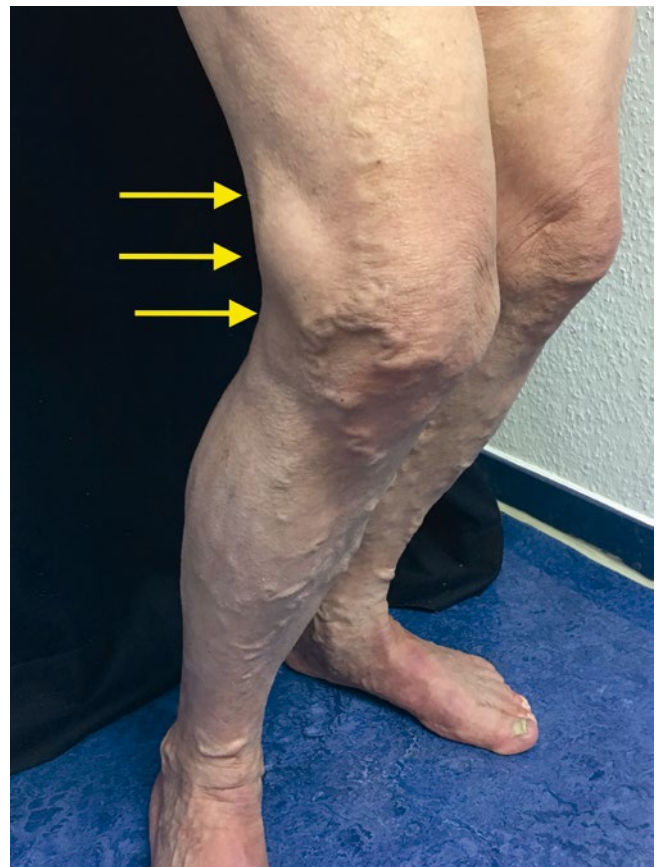
► **Fig. 4** Tenderness along the deep v.in in the calf **a** (left) above the knee **b** (middle), and proximal thigh **c** (right) (source: Arrien GmbH with kind permission).

## Venous dilatation due to heat

Especially at the start of summer – but sometimes also with the heat of a sauna – patients complain of pain around their varicose veins or even in their starburst/spider veins which have suddenly become palpable.



► **Fig. 5** Oedema and skin changes of  $\frac{2}{3}$  of the calf due to varicose veins. The skin is thin and brown and the subcutaneous tissue indurated. In case of new pain in this area it is difficult to differentiate a redness or vein induration from the surrounding alterations (source: Arrien GmbH with kind permission).



► **Fig. 6** Sudden appearance of a lateral mass proximal to the right knee (see arrows) in the presence of varicose veins. The patient was referred to rule out thrombosis. The vein clearly runs past the clinical “problem”. All other signs of thrombosis are absent (source: Arrien GmbH with kind permission).

## Pain with the enlargement of varicose veins

Time and again, patients report a dull pain in a particular area of the leg and a varicose vein appears there a few weeks later. This is sometimes the case after successful varicose vein surgery, e. g. in the region of the adductor canal, in which an incompetent perforating vein can still be seen weeks or months later on ultrasound. The pain is possibly due to “stretching” of the surrounding tissues and lasts as long as it takes the tissue to adapt to the development of a varicose vein.

## Pain in the leg unrelated to the veins

Most often, leg pain is not due to varicose veins or venous disease. As mentioned previously, however, varicose veins are incidental findings in 90% of the population (see ► **Fig. 6**).

The main causes of non-venous leg pain are:

- Neurological/orthopaedic pain (due to conditions of the lumbar spine or sacroiliac joints) mostly radiates down the leg, is associated with numbness, tingling or paraesthesia, and becomes worse when lying down or sitting in a comfortable chair (car seat, television chair).
- Arterial leg pain due to peripheral arterial occlusive disease is exacerbated by sporting activities and abates with rest or

standing still. It may be worse if the leg is elevated (see article by Christoph Kalka in this issue).

- Lipoedema (pain with lipohypertrophy, cause unknown)
- Arthrogenic pain localised to the joint (knee, hip, ankle) or radiating – classical feature of a ruptured Baker’s cyst
- Muscular pain with tenderness or pain on moving the affected muscle

## Rules of thumb in the differential diagnosis

When the pain shows the following characteristics:

- radiates down the leg
- is associated with numbness
- persists on lying down
- occurs on the outer aspect of the thigh or around the hip joint

it would be most untypical of a venous cause. These symptoms are more likely to occur with neurological/orthopaedic conditions.

Venous pain can easily be treated by wearing compression stockings, it occurs especially when standing or sitting and is relieved by walking or lying down.

## Tension pain after standing still for a long period

Tension pain after standing motionless seems to be a special case. Blättler et al. showed that pain may occur after standing still for some time, irrespective of any pre-existing venous disease, and is not dependent on the actual increase in volume. It can always be relieved by compression [6, 7]. However, this symptom arises only after standing motionless for a long time, as people automatically move to overcome any discomfort.

**In summary**, it can be said that most cases of acute or chronic pain in the leg are not of venous origin. As a rule, it is easy to identify the cause after taking the history and performing a clinical examination.

### Conflict of interest

The author declares that he has no conflict of interest.

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