THE DIAGNOSIS OF VARICOSE VEINS

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The treatment of varicose veins has developed until, when the correct remedy is selected for each presentation it has become curative. This article aims to sketch the diagnosis of this ubiquitous condition which causes a degree of incapacity and suffering. It is an interesting clinical exercise and leads to effective treatment satisfying alike to patient and doctor. Ochsner and Mahorner, Varicose Veins, p.7, say '...the use of appropriate diagnostic tests permits the formulation of a rational therapy.'

Other ailments causing pain in the legs

First it must be recalled that there are other causes of discomfort in the legs besides varicose veins; for such ailments are often attributed to varicosities when they are present. There may be complaints of weight, weakness, weariness, burning, swelling, bursting sensations, coldness, early tiredness, excessive perspiration, itching, eczema or incapacitating pain. These symptoms are associated also with flat feet, neuritis, fibrosis and joint lesions of the feet, ankles and knee or hips. Patients whose postures are bad, whose habits are slack (e.g., housewives working in soft slippers) and those in whom unnecessary joint and muscle strain about the pelvis, knees and feet occur are also troubled, as are the constitutionally debilitated and fatigued. Dead teeth are a source of variable and persistent pain, which is sometimes referred to the lower limbs. Pain in the legs may follow the resumption of duty after tonsillitis, a quinsy or toxic condition, from loss of muscle tone.

Obliterative arteriosclerosis (in men mostly and occasionally women), and a failing heart will cause early tiredness and weakness in the lower limbs, as well as a previous white leg. Some of these factors may be concurrent with varicose veins and when they are recognized and treated the results are further enhanced.

It has been claimed by American writers that tonsillar sepsis is an etiological factor in varicose veins, and since testing this theory, my experience is that the tonsils, especially remnants, merit critical inspection in cases of varicose veins without apparent cause, such as pregnancy or an inherited tendency.

Compensatory or Varicose veins?

Another question is, 'Are the enlarged veins truly varicose, or are they distended vessels, compensatory to obliterated main deep veins or to the pressure on the iliac veins by an abdominal tumour such as a pregnant uterus, an impacted ovarian cyst or fibroid?'

The deep veins accompanying the arteries of the lower limb are usually patent, but they are blocked occasionally as, after the white leg of pregnancy, typhoid, a compound infected fracture of the tibia, fibula or femur, septic peritonitis, etc. In these circumstances their function is transferred in part to the superficial veins and gradually these enlarge and look like varicose veins. Attempts to obliterate superficial compensatory vessels, as if they were varicosities is a disservice to patients. Fortunately, injections of sclerosing fluids usually fail, the circulation in them is too brisk to allow time for effective scarifying of the endothelium and the pain from the resulting chemical phlebitis is so great as to dissuade patients from further treatment.

The Diagnosis of Compensatory Veins.—
Compensatory veins can be detected by signs and tests. The previous history of white leg, phlebitis, etc., is important and should always be taken. A limb so affected, including the foot is coolish, heavy with non-pitting oedema, white with scaly eczema, possibly ulcerated. It has an unshapely or 'elephant' leg outline, and is soon fatigued, aches and is weak. The veins may be visible or if not obvious, feel like soft elastic gutters under the skin.

A dependable although not completely certain test for blocked deep veins is as follows:—

A tourniquet is applied to the middle of the thigh, tight enough to occlude the superficial veins. The person is requested to walk round the Out-patient Hall. If the deep veins are not functioning, blood can only escape by the superficial venous conduits, and as these are compressed by the tourniquet the limb becomes dusky and the vessels tense. The patient shortly suffers great pain and urgently requests to be released from the constricting band. By contrast, if the deep vessels are patent, the test causes no difficulty or discomfort and the conclusion is made that the enlarged superficial veins are truly varicose. The tourniquet must not be tight enough to occlude the deep veins and should be reasonably padded, otherwise the pain of the constriction will affect the results of the trial. The final certain test is to expose the femoral vein at the groin and see if it is patent.

Varicose Veins

A varicose vein is one whose elasticity is lost, and as a result it has become dilated, elongated, tortuous, pouched, friable, and its valves incompetent. From this dilation and possibly from defects congenital or acquired in the valves themselves, the terminal valve guarding the union of the internal saphenous vein with the femoral vein and less often of the external saphenous vein with the popliteal vein, ultimately become inefficient and blood regurgitates into them from the trunk veins, in a retrograde circulation away from the heart. The varying pressures in the main venous system is exerted on these superficial veins setting up a vicious circle increasing the distension and vascular stagnation and converting the subcutaneous venous system of the legs into a cul-de-sac of the main venous system.

Another source allowing a back-flow to the surface vessels is in the communicating veins which connect them to the deep veins—their valves also may become defective. There are several such connections in the thigh and leg, especially in the lower third of each. They are not conspicuous as causes of the varicosity nor so frequent, as incompetent long or short saphenous veins.

The Diagnosis and Evaluation of Varicose Veins.—Varicose veins which are incurable by injection but are curable by the operation of ligation and injection are denoted by a positive Trendelenberg test and in the more advanced cases, by the presence in them when the patient coughs or strains of an impulse. In advanced cases a thrill is palpable. Both tests need some experience to assess.

The Exposure of the Patient.—To diagnose varicose veins the patient must be undressed to above the groins. A good light is essential. Frequent errors are made through insufficient exposures and shadows cast by clothes. Associated conditions like herniae, hydroceles, abdominal tumours and intertrigo are discovered. A partial diagnosis leads to irritating failures or qualified successes in treatment. An explanation for this unexpected amount of disrobing is given to patients.

The Cough Impulse.—The cough impulse is a less delicate but easier test than the Trendelenberg. A hand is placed on the enlarged veins in the leg or thigh, the patient turns the face to the ceiling and is asked to cough vigorously. Nothing, grading up to a just perceptible impulse, to an expansile impulse and a thrill may be felt. The impulse is felt best at the termination of the internal saphenous vein in the groin. The landmark for this is where a line starting from the pubic spine intersects the crease of the groin at right angles. (The pubic spine is found by tracing the pubic crest outwards.) Sometimes a varix is seen here or an enlarged vein can be felt in the thinnish subject and occasionally enlarged saphenous glands when there is varicose eczema or ulcers.

A possible error in the cough impulse test is to mistake for an expansile impulse, the slight jerk in the leg when some patients cough. The
cough impulse is a coarser test than the Trendelenberg sign, and when it is present, then operation is needed to cure these vessels, no injection is of permanent use. Less often a cough impulse is present over the external saphenous vein in the popliteal space, so denoting its incompetence and also its ligature and injection to cure.

**The Trendelenberg and Tourniquet Tests.**—The findings are accurate and significant. Trendelenberg’s name is given to the single tourniquet test, but two bands at varying levels are also necessary.

The patient undressed to the umbilicus, lies on a couch. The affected limb is raised and the veins are stroked from the ankle to the groin to empty them completely. This step is done thoroughly to obtain clear-cut results. A tourniquet is applied moderately tight round the upper thigh, and the patient stands, in a well-lighted position. An assistant removes the band (taking care not to cast a shadow) whilst the surgeon watches the prominent vessels, which if necessary are marked out. The veins may slowly re-appear so that it is difficult to say whether the filling is from above or below, this would be regarded as a negative result, or a vigorous down-filling wave or cascade may promptly distend the vein which is a positive response. Repetition is often necessary for a clear result. Veins normally fill imperceptibly from below and any degree of obvious filling from above indicates incompetent valves and back pressure in the internal saphenous vein. An additional step to decide if the varicosities fill from above is to place another band below them, therefore they can only fill from above when the upper constriction is released. Should they fail to distend then clearly the test is negative.

Sometimes the thickness of the skin and fat makes observations uncertain. A possible alternative then is by palpation, and the fingers are placed lightly on the prominent vessels (the veins having been emptied, the tourniquet applied and the patient standing). When the constriction is released the vessels can, in mature varicosities, be felt to distend under the fingers from above downwards, the filling appears in a variable period after the band is undone, sometimes surprisingly long, i.e. several seconds. The test is applied also to the external saphenous vein with a slight modification. An estimation of the pressure of the distension in the vein is also made by palpation and is most helpful when the visual result is doubtful.

**The Efficiency of the External Saphenous Vein.**—The competence or otherwise of the external saphenous vein is determined by the use of two constricting bands.

First filling from the saphena magna must be excluded, this is done by raising the leg vertically, emptying the veins, and placing a clipping garter at the lower third of the thigh. Another band is placed round the leg immediately below the crease behind the knee, this prevents blood flowing backwards through a possibly defective short saphenous vein (this vessel joins the popliteal vein about the centre of the back of the knee, its last two inches or so lies under the deep fascia and it is therefore not visible and possibly not palpable). The patient stands and the lower tourniquet is released. If there is a downward filling it can only have come by the blood leaking past an ineffective valve at the termination of the external saphenous vein. In this case ligature and injection of this vessel is needed.

Difficulty may arise when the varicosities are only in the leg and not in the leg and thigh. Do they fill from the groin or from the popliteal space? Differentiation is as follows:—The veins are emptied, the upper tourniquet is applied below the groin, the patient stands and the veins are watched. They may fill steadily suggesting that they have filled from the external saphenous vein or possibly from the communicating veins between the deep and superficial venous systems. Both possibilities are rare. Differentiation between these two will be mentioned shortly.

If the veins remain comparatively empty, the upper band is released and the probable filling from above observed thus declaring the defect in the long saphenous vein, easily the commonest finding.

On the other hand, the result may be doubtful in which event the leg is again raised, the veins emptied and an upper band applied above the knee while the end of the external saphenous vein is controlled by the fingers of
the surgeon pressing on the end of the small saphenous vein in the middle of the popliteal space. The patient then stands and the band holding the long saphenous is released and the vessels watched. If they fill with a down-filling wave, the long saphenous vein is varicose because the external saphenous vein is controlled by the diagnostician’s fingers.

By contrast when the test is repeated and the band is released if nothing happens in the varicosities the internal saphenous vein is efficient, but if on releasing the fingers, the varicosities fill, then this is clear proof of the small saphenous vein being inefficient.

When the test is done as above and a wave is not seen then palpation of the varicosities during and after release of the band or fingers will sometimes confirm that they have become tense indicating filling from above. Perhaps no clear observation may be forthcoming and if tests have been carefully done then consideration of defective communicating veins arises.

Indefinite Findings.—Occasionally, when the constrictions are still in place, and the person stands the veins appear filled, but on palpating them there is no pressure in them, they are but slightly filled, possibly from incomplete emptying, a too tight or too loose constriction or from slightly defective communicating veins. Repetition of the tests may be necessary three or four times before the results are clear enough to articulate a diagnosis.

It may be apposite here to mention the variability of veins and that their anatomical situation is of qualified significance as to where the defect is. For instance, vessels on the inside of the leg can be filled by an inefficient short saphenous vein and those on the outside of the calf and ankle from the internal saphenous defects whilst those in the lower two-thirds of the thigh may be filled from the back and upward pressure from a faulty external saphenous vein below. Even a defective communicating vein will distend veins for an appreciable amount above it. An open mind and systematic and repeated testing of the possibilities leads to correct diagnosis.

Incompetent Communicating Veins.—Incompetence of the valves in the communicating veins connecting the deep and superficial venous systems is a third primary diagnosis; they are situated mainly in the lower third of the thigh and leg.

In testing for communicating vein failure, the tourniquet is applied as before, first in the upper thigh and later at various lower levels. When the patient stands it is kept on and the varicosities are watched for 30 seconds, during which the veins will refill in some amount from slight to tense distension. Veins normally fill from below, but it takes longer than 30 seconds for healthy ones to fill to distension and it is almost imperceptible. When the communicating veins allow an outward and downward flow then filling of the subcutaneous varicosities is prompt and the back pressure is surprisingly high, easily within half a minute. The filling occurs mainly downwards but can also be upwards. Again, some experience assists in the interpretation of the results and many patients must be examined to find clear cut examples. In my experience, it is much less common than internal saphenous failure.

Ochsner and Mahorner describe a test whereby applying two tourniquets and varying the levels and space between them, and watching the sections of the limb between the bands, e.g., the thigh, upper and lower parts and also below the knee, it is possible to locate with precision the part of the legs where the communicating veins are defective, because where defects are, the affected vessels after emptying and constricting bands applied above and below them, they fill up within 30 seconds on standing. In the lower third of the leg the defective communicating vein can often be palpated with the tip of the finger, it feels like a button-hole in the deep fascia. When oedema is present, this may be the only way to locate them. In some instances, there is a bulb-like distension or ‘blow-out’ of the superficial vein immediately at the defective communicating vessels. In the extreme case blood can be felt running through a faulty communicating vein like water from a tap; this is just as the constricting band is released.

Three primary diagnoses have now been described, i.e., incompetence of the internal saphenous, external saphenous, and communicating veins. Combinations of these three may occur and these will now be described.
The Diagnosis of Simultaneous Incompetence of the Internal and External Saphenous Veins.—The diagnosis of simultaneous incompetence of the internal and external saphenous veins has already been hinted at. The limb is raised and the varices are emptied. Two tourniquets are applied, one below the groin and the other below the knee. The two main superficial venous groups are thereby controlled. The patient stands up and the upper tourniquet is removed. The external saphenous vein being held, therefore, if the varices in the thigh fill from above, they must do so from the internal saphenous vein. The test is repeated with the upper band at the lower third of the thigh and the second at the crease of the knee. The person stands and the lower grip is released, a down filling wave incriminates the short saphenous branch. If the veins are only in the leg, then the varices are emptied again, the end of the external saphenous vein is controlled by the surgeon’s fingers pressing in the middle of the popliteal space, whilst the saphena magna is held by an upper thigh band. The patient stands, the latter is released. If the leg varices dilate from above, the internal saphenous vein is defective.

The observations vary from being clear-cut to doubtful and they may require repetition to clinch the diagnosis. I find that there is some degree of internal saphenous fault in nearly all short saphenous deficiencies.

Simultaneous Incompetence of the External Saphenous Vein and Communicating Veins.—This is detected by carrying out the appropriate tests with one or two constrictions as described for the individual veins. These varices are mainly in the leg, but are somewhat unexpectedly occasionally in the lower third of the thigh. The efficiency of the internal saphenous is first ensured.

The tests for the short saphena vein and the communicating veins are performed. One result may be more positive than another.

Simultaneous Incompetence of the Internal Saphenous and Communicating Veins.—This is declaredly doing the appropriate tests and finding them negative for the external saphenous vein and positive for the internal saphenous and communicating veins.

Simultaneous Incompetence of the Com-

municating Veins and of the Internal and External Saphenous Vessels.—This rare diagnosis is found by applying the two tourniquets above and below the knee and seeing the varicosities distend within 30 seconds. This proves the fault in the communicating veins. Further palpation of the prominent varicosities will generally reveal the button-holes in the deep fascia and frequently the bulbous veins immediately close to them. This is more difficult in fat patients.

The tests described in the previous paragraphs for simultaneous incompetence of the internal and external saphenous veins are carried out. They are performed carefully and quickly so that the results are not obscured by the communicating vein failure. The cough impulse over the terminations of the major and minor veins when present is certain evidence of their failure in function.

Discussion

The diagnosis of the type of veins may require 5–15 minutes observation and possibly a second session. Occasionally incompetence of the internal saphenous system will be found in one leg and of the external saphenous system in the other. Less often, the internal and external saphenous system are incompetent in the same leg.

Effective treatment depends on the true diagnosis, for the operation is but an elementary surgical exercise requiring meticulous attention to asepsis and detail.

There are seven basic diagnoses of varicose veins made up of combinations of lesions of the internal and external saphenous and of the communicating veins. All require operation varied according to the type and degree of development. The diagnoses are varicosity and incompetence of the valves controlling:

1. The Internal Saphenous Vein.
2. The External Saphenous Vein.
3. The Internal and External Saphenous Veins together.
4. The Communicating Veins in the thigh or leg or both.
5. The Internal Saphenous Vein and Faulty Communicating Veins together.
6. The External Saphenous and Defective Communicating Veins.
7. The Great and Small Saphenous Veins plus leaky Communicating Veins.

There are lesser groups of varicose veins not fulfilling these conditions, found either in the leg or thigh; these will respond to injection.

Upper Thigh and Buttock Varicosities.—Other varices develop in the upper and postero-internal parts of the thigh.

They arise from the gluteal and pudendal veins. They are infrequent and part of extensive varicosities affecting the whole limb. They are amenable to injection treatment after the key conditions have been recognized and dealt with.

Pudendal and Superficial Epigastric Veins.—The pudic and superficial epigastric veins in particular should be recalled as possible compensatory pathways when the external iliac vein is blocked. They should not be injected. They raise also critical evaluation of the varicose veins in the leg.

The Abdomen.—Surgeons who handle numbers of patients with varicose veins will find, once or twice a year, an abdominal tumour, particularly in women. Therefore this possibility is kept in mind. An eye and a hand examines the abdomen, thereby fibroids, ovarian cysts, unsuspected pregnancies and a distended bladder are occasionally found.

Constitutional Disease.—Further sensitivity to the general health of the patient is essential for other constitutional diseases have been found with varicose veins and ulcers, such as pernicious anaemia, diabetes and syphilis. Particularly in the case of varicose eczema and ulcer. Phlebitis migrans will suggest a septic focus somewhere and occasionally thrombo-angitis obliterans even in women. An ulcer unassociated with varicose veins may very rarely be a manifestation of acholuric familial jaundice or lymphatic leukaemia. Further in the aged obliterator arteritis is a possibility to be considered and can be quickly excluded by palpating the dorsalis pedis artery and feeling the temperature of the foot. A calcified artery is revealed by an X-ray.

Varicose Veins recurring after operation

These are a fairly common occurrence and they depend on the operation performed. They were frequent after all the operations except after the modern procedure of ligature of the main trunk and of all their associated branches and introduction of an adequate amount of an efficient sclerosing agent. Even after this radical procedure all the veins may not be sclerosed if the agent has not reached the offending vessels, they do, however, readily respond to injection.

Again varicose veins may persist after even the modern operation when the complete diagnosis has not been made; e.g., incompetence of the external saphenous or communicating veins may have been overlooked. (The plan I follow is that of making a systematic diagnosis as described here, and to treat the condition accordingly. Almost invariably they fall into one of the seven types.)

Pregnancy and Varicose Veins.—Pregnancy is often associated with the appearance of varicose veins, generally these should be treated radically after parturition.

Conception often considerably aggravates already established varicosities; these can then with advantage be treated according to the diagnosis by injection or operation. I do the operation up to seven months.

Age and Varicose Veins.—Age is no bar to radical cure of varicose veins for many patients over 70 and one over 80 have been operated on. They are diagnosed as already described and treated appropriately. Particular care to exclude arterial and constitutional disease is necessary.

Conclusion

The types and diagnoses of varicose veins are detailed with particular reference to those requiring treatment by operation. There are seven possibilities and these make the diagnosis attractive but essential, leading to permanently effective treatment.
FIG. 1.—NORMAL VENOUS ANATOMY OF LEGS

Note the communicating veins between the great and small saphenous veins; there is usually one above and below the knee. Note especially that the last 2 in. of the external saphenous vein is under the deep fascia also the upward running branches from the end of this vein.
(a) Superficial epigastric veins (usually 3).
(b) External iliac vein.
(c) Internal or (great) saphenous vein (saphena magna).
(d) Communicating veins between the internal and external saphena veins in thigh and leg.
(e) Communicating veins between the superficial venous system (internal and external saphenous veins) and the deep return vessels (femoral, anterior and posterior tibial).
(f) Anterior tibial vena comites.  (Continued at foot of next column)

FIG. 2.—COMPENSATORY VEINS due to thrombosed external iliac vein (f) with compensatory enlargement of the internal saphenous vein. These might be mistaken for varicose veins. The tortuous veins (a) on the lower abdomen (if the patient is sufficiently undressed) will raise the surgeon’s suspicion of the possibility. The bars (i) indicate competent valves at the terminations of the internal and external saphenous veins.
(g) Common femoral vein
(h) Popliteal vein.
(i) A fairly constant upward branch given off from the end of the short saphenous vein. This must always be tied in the operation on the external saphenous vein.
(j) Posterior tibial vein
(k) External saphenous vein.
FIG. 3.—Compensatory veins (c) due to a thrombosed common femoral vein (g). The history, the tourniquet and walking tests differentiate from varicose veins.

FIG. 4.—Thrombosis of the anterior and posterior tibial venae comites (f and j). It may occur after a compound fracture of the tibia and fibula. Compensatory superficial veins of the leg (c) and (k).
Fig. 5.—Varicosity of the internal (great or saphena magna) saphenous vein (c) with an incompetent valve (i.v.) at its termination, notice the open or incompetent valve (i.v.) in the groin.

Fig. 6.—Varicosity of the external (or small) saphenous vein (j), the valve (i.v.) at its termination, in the popliteal space is inefficient. Note the varicose veins in the lower thigh which unexpectedly may arise from this defect.
FIG. 7.—Varicosity of the internal and external saphenous combined both of their terminal valves (i.v.) have failed.

FIG. 8.—Varicosity and incompetence of the communicating veins between the superficial and deep venous systems in the thigh and leg.
FIG. 9.—Varicosity and incompetence of the communicating veins between the superficial and deep venous systems in the thigh and leg confined to the communicating veins in the thigh.

FIG. 10.—Varicosity and incompetence of the communicating veins between the superficial and deep venous systems in the thigh and leg confined to the communicating veins in the leg.
Fig. 11.—Varicosity of the internal saphenous veins and communicating veins combined. Note the open valve (i.v.) at the groin.

Fig. 12.—Varicosity of the external saphenous vein and communicating veins in the leg.
Fig. 13.—Varicosity of the internal and external saphenous and communicating veins combined.

Fig. 14.—A further stage than Fig. 13 is when there are varicose branches from the pedenal and gluteal veins.
Patient aged 44 years suffering from Simmonds' disease.

*Note normal nutrition and absence of axillary and pubic hair.*