# AN APPROACH TO THE PROBLEM OF RECURRENT VARICOSE VEINS

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On asking for a return of the number of cases of athlete's foot in a 30-bed military ward during the last war and getting the reply '29' I should have forborn to pursue the matter further. The one exception was, of course, a bilateral amputee. A rather similar reply would have been received, one felt in one's gloomier moments, had the enquiry been directed towards the number of relapses at a varicose-vein follow-up clinic. Those were the days of friendly intimate little ligations of isolated segments of the saphenous vein or voluminous drenching of the venous bed of a limb with large quantities of sclerosing solution. Happily, all that has gone by the board—or to the board the cynical might add having military pensions in mind.

Although treatment of varicose veins has undergone considerable modification and improvement since that time the percentage of relapses still seems lamentably high—at any rate in this country. It is difficult to arrive at actual figures. From my own experience I should say that 1 out of every 5 cases referred to me has been operated on for the condition previously, especially amongst railway employees I see—a genus with an apparent predilection for this disease, a rail worker without varicose veins being about as rare as a shunter with 10 intact digits.

Operations of sorts for varicose veins, being relatively non-lethal procedures, are carried out by all and sundry throughout the country without adequate experience or, apparently, a true appreciation of the pathology of the condition.

The evolution of the modern treatment of varicose veins during the last 2 decades has been brought about through several stages, viz. (1) high ligation combined with extensive sclerosing therapy, (2) high ligation supplemented by subsidiary incisions plus moderate sclerosing therapy, (3) incomplete stripping, i.e. groin-to-knee stripping plus limited sclerosing therapy, (4) complete stripping. The last, which is the method of choice at present, involves a radical Trendelenburg operation with groin-to-ankle stripping, ligation through separate incisions of all main tributaries and perforators, excision of all visible varicosities, and post-operative sclerosing of minor residual varices.

The justification for these evolutionary steps is clearly substantiated by statistics. Thus Lofgren *et al.*[1] showed that after 5 years the results in 140 limbs treated according to method 1 were: good 40%, fair 5%, poor 55%. On the other hand in 128 limbs treated according to method 4 (complete stripping) the results were: good 94%, fair 6%, poor *nil*. Comparing the results of methods 3 (incomplete) and 4 (complete stripping), Myers and Smith[2] showed a recurrence rate after 2½ years of 19% in 114 cases in the former, and 2% in 153 cases in the latter. The whole picture has thus changed completely. Operations for varicose veins which were previously relegated to the intern now fall within the province of an experienced vascular surgeon, and what appeared at first to be a simple little procedure is really an elaborate affair.

Many years will elapse before Utopian results like those just quoted will have become universal. In the meantime surgeons will continue to be faced by that depressing entity—the relapsed varicose vein. In dealing with these cases results will depend upon accurate investigation of the condition rather than on technical skill. It is futile to 'go for' the varicosities hoping for the best, without finding out why they are there; and it is as well to start with the rather unpalatable assumption that the previous surgeon was as competent as oneself, and to attempt to discover the pitfalls which eluded him.

## CAUSES OF RELAPSE

From personal experience and a survey of the literature I find that the causes for relapse are as follows:

1. *Incomplete Trendelenburg.* This has always been the main cause for relapse. In the series of 510 operations for recurrent varicosities at the Mayo Clinic (1950-1954) reported by Lofgren *et al.*[3] 61% were found to have undergone incomplete Trendelenburgs although they had been performed by competent surgeons—about one-quarter of them in fact at the Mayo Clinic itself. The operation demands more care than is usually afforded it. As pointed out by Dodd and Cockett,[4] no Trendelenburg can be considered complete until half an inch of the femoral vein above and below the saphenous opening has been visualized by the surgeon. It is therefore essential to review the Trendelen-

burg—a tedious and depressing task involving a lengthy dissection through fibrous tissue with often at the conclusion a 'bag' of one or two rather insignificant mildly expostulatory veins. There is, however, always the prospect of finding a big medial cutaneous vein or even an accessory saphenous or (in hushed tones) the main vein itself intact!

2. *Reopening of tributaries.* When one realizes that the venous pressure in the veins of the leg can rise during straining to 200 mm. Hg it is not difficult to imagine how small tributaries left in communication with unobliterated portions of the superficial system can soon enlarge to produce varicosities. In fact it is surprising that there are not more recurrences. Nature has such an amazing power of restoring the *status quo ante* that it would seem reasonable to accept the premise that no operation for varicose veins can ever be claimed as a 100% cure. The most radical is at best an approximation. Even where complete stripping is done and all the major tributaries ligated it must be a question of time before some small insignificant veins dilate sufficiently to produce some degree of recurrence. When they are small these can be dealt with in the early stages by sclerosants; if they increase and cause symptoms they have to be dealt with surgically and the problem is to discover their source. Here I think venography, that much maligned handmaiden of vascular surgery, is of incalculable help.

The recurrent varicosities which frequently appear—e.g. at the outer side of the thigh or knee—may have remote sources and it is futile to attempt to excise them without dealing with their origin. By venography this is technically not difficult to determine. A low-sited varix is cannulized with a No. 2 polythene tube, and the patient put in the slightly head-up position on the X-ray table. Dye is then injected as rapidly as possible, a light tourniquet having been applied proximally to direct this into the deeper channels. By watching the course of the dye under the screen the basic source of the varices can usually be determined, though the examination may have to be repeated with a tourniquet at different levels.

3. *Leaking perforators.* If the indirect perforators often show a tendency to re-form how much more must the direct perforators do so, particularly in the lower leg. These wide channels, if not incompetent before operation, are probably often rendered so by stripping, and their tributaries must inevitably dilate under the venous pressure of the deep veins into large varicosities, unless they are specifically ligated under the deep fascia at the time of operation. In the lower leg venographic information of these channels is perhaps more readily obtained by using Gunnar Bauer's technique:[5] A vein on the dorsum of the foot is cannulized and dye injected with the patient erect in front of the X-ray table, a light tourniquet having been applied above the ankle. Antero-posterior and lateral pictures are then taken (or the patient screened) (*a*) immediately after the dye has been injected and (*b*) after exercise—3 vigorous press-ups. By this means information can often be obtained of the exact site of reflux from the deep to the superficial systems and which of the perforators are incompetent. Further, an indication will be given of how the deep system is functioning—complete emptying of the dye from the calf should, according to Bauer, occur after the press-ups, non-clearance implying obstruction or incompetence of the deep veins at the popliteal level or higher.

It might be argued that all this is somewhat unnecessary because a generous incision would inevitably show up the sites of the perforators. These legs, however, are often poor material, showing delayed healing of wounds and sometimes skin necrosis; so that any means of limiting surgical incisions should be eagerly adopted.

4. *Neglect of the small saphenous.* Although this vein is incompetent only 1/8th times as often as the great saphenous it is responsible for quite a number of so-called relapses—particularly where it shunts its flow to the inner side of the leg and tries to throw the blame on its big brother. As the terminal part of the small saphenous lies for a good deal of its course under a tough deep fascia, clinical examination is often difficult and incompetence may easily be overlooked (Fig. 1). Ligation of this vein, as with the great saphenous, must be done flush with the deep vein and calls for a generous transverse incision behind the knee with adequate retraction.


*Fig.* 1. Venogram of an incompetent small saphenous in a patient who had undergone stripping of both systems 18 months previously. When the popliteal area was re-explored the vein, lying deep in the muscle, was found only after a careful search which, but for the venogram, would have been abandoned—as it probably had been on the first occasion.

5. *Congenital arterio-venous shunts.* When at all extensive these present at an early age and are usually readily diagnosed by the characteristic clinical picture—a naevoid appearance of the skin, local heat, often a thrill, and coldness with possible ulceration distally, accompanied usually by increase in the length of the limb. Minor degrees of this condition, however, may occur later in life and present as 'recurrent varices'. This entity is to be suspected after rapid recurrence of varices in an unusual situation. It can generally be diagnosed by means of an arteriogram with carefully taken serial pictures of the affected area. Although no known surgical treatment is of any use, establishing the diagnosis is of importance for maintaining the *amour propre* of the surgeon and preventing the patient from undergoing a series of useless and unnecessary operations.

VARICOSITIES ASSOCIATED WITH GRAVITATIONAL CHANGES

It is accepted that the clinical picture of the fully developed 'gravitational leg'—gross oedema, induration, cyanosis with or without ulceration—is nearly always due to femoral or ilio-femoral thrombosis (and that these changes are directly proportional to lateness of diagnosis and lack of adequate preventive measures taken at a stage before the condition has become irreversible). Quite a different picture is presented by the early gravitational leg, with mild oedema, pigmentation, slight induration and possibly ulceration. This category, commonly referred to as the 'varicose' leg, has been shown to be due to primary incompetence of the superficial venous system in a certain proportion of cases only. The remainder (according to Dodd and Cockett[4]) are due to antecedent thrombosis of the deep veins of the calf, with extension of the process to the perforators; this results in re-canalization and subsequent incompetence of these vessels, the increased pressure being transmitted to the adjacent superficial veins, which accordingly dilate and also become incompetent. The distinction between these two categories is a matter of some moment, for treatment will depend upon the underlying pathology. In the first group the incompetence starts at the groin even though the effects are most manifest in the lower leg; treatment is therefore the radical operation for incompetence of the great saphenous system. In the second group, on the other hand, the incompetence starts in the lower leg; treatment is primarily directed to the leaking perforators and calls for subfascial ligation of these vessels, only those superficial veins which are secondarily involved needing excision. These are often localized to the lower leg, the saphenous above the knee being quite normal. As they add a burden to the already handicapped deep venous return their removal will be of benefit to the patient, whereas a blind stripping of the entire saphenous system including those portions which are functioning normally is bad and meddlesome surgery.

Proper assessment of the venous return in this condition is therefore of fundamental importance. There are some who claim to be able to arrive readily at a diagnosis clinically. Personally I find I am not adequately gifted. The extent and localization of reflux of an incompetent superficial venous system in a thin-skinned individual with big soft-walled veins is a matter of elementary hydrodynamics, without having recourse to the numerous tests by which various surgeons in the past have gained eponymity. It becomes a very different problem, however, in the obese, in those with thick-walled veins, or where some oedema is present. In such cases I have come to appreciate the value of venous pressure estimation. The following method, based on that of Warren *et al.*[6] is simple and, I find, adequate (Fig. 2).

A No. 2 polythene tube about 3 foot long is tied into the great saphenous at the base of the 1st metatarsal (this incision heals quicker and causes less discomfort than one higher up). It is joined by a 3-way cock to a 4-foot length of similar tubing fixed alongside a centimetre tape-measure against the wall, zero being at floor level. The tubing is filled with a solution of indigo-carmine in saline with citrate or heparin added, by means of a syringe attached to the 3-way cock, further solution being introduced when necessary to displace blood which has gravitated into the tube and thus prevent clotting. With the patient standing relaxed against the wall the stopcock is opened and a reading taken

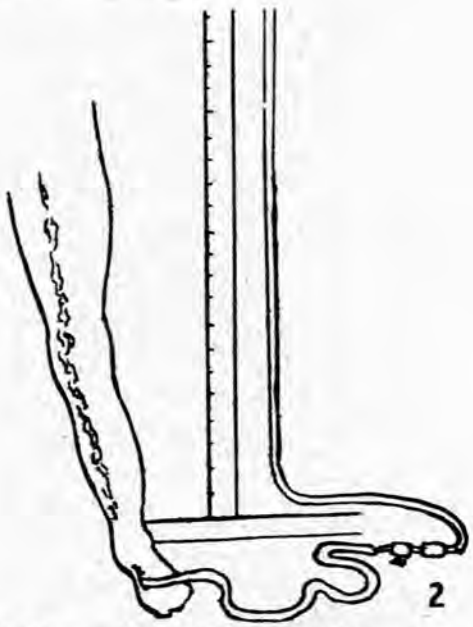


*Fig.* 2. Diagram of a simple method of taking venous pressures. The cannulizing tubing (about 3 feet) is long in order to prevent blood from reaching the stopcock when the pressure rises after exercise, and to facilitate marking time.

by the tape-measure of the level of the dye in the tube; this will represent the height of a column of venous blood corresponding roughly to the level of the right auricle. The patient is then told to mark time—a double pace per second with a 6-inch lift—for 30 seconds (or longer if the pressure continues to fall) and a reading is then taken. The process is repeated 3 or 4 times and an average taken. The results are interpreted as follows: In a normal individual the resting venous pressure of about 130-140 cm. should drop on exercise by round about 70-80 cm. A drop in pressure of considerably less than this means that the calf pump is ineffective, i.e. there is a block to the deep venous return or part of the blood which is being pumped out is leaking back because of incompetence in the valves of either the deep or superficial system or both.

A rise in venous pressure on exercise or only a small drop (0—10 cm.) is almost certainly indicative of deep-vein obstruction or incompetence, probably ilio-femoral. On the other hand a moderate drop (40-50 cm.) is probably due to superficial incompetence (varicose veins) or a mild degree of deep incompetence (calf-vein thrombosis); or it may be due to a combination of the two.*

* The extent of the drop in venous pressure on exercise in varicose veins and deep-vein thrombosis shows considerable variations in published reports.[6-10] The figures quoted above are an approximation of the majority and correspond closely to my own recent results. Wide variations in my earlier figures (and, I presume, in some of the published reports) was due to using a needle or too fine a polythene tube, cannulizing too small a vein and having too wide a tube relatively for the manometer, and not getting the patient to exercise vigorously enough. The use of a mercury baumanometer instead of the water manometer I found quite useless because of the prolonged time-lag. Further corroboration of these findings can be obtained by recording the rate of rise in pressure after ceasing exercise, the rate being proportionate to the degree of incompetence; but I found this index of little value, for only in gross cases did there seem any kind of parallel between the two.

The test is now repeated with a tourniquet applied to the calf. If a normal or near-normal drop on exercise is now obtained, it can be accepted that the pathology is purely that of varicose veins. Further information may be obtained by taking the pressure on exercise with the tourniquet applied at various levels down the leg. This may give an indication of the level to which incompetence has progressed in pure varicose veins and of which system is involved. In superficial incompetence consequent on calf-vein thrombosis it may indicate the site of the major leaking perforators. Obviously equivocal results are to be expected at times, as for instance where the gravitational changes are due to leaking perforators following a calf-vein thrombosis in addition to the incompetence of pre-existing varicose veins. This simple test is of considerable value, therefore, in deciding in border-line cases whether the pathology is primarily that of the deep or of the superficial system. Where further information is required venography can be carried out immediately after the test, making use of the same polythene tube in the vein into which the dye is to be injected (Fig. 3).

In gross chronic gravitational leg due to ilio-femoral thrombosis the problem is even more difficult. Here superficial veins enlarge primarily as a compensatory mechanism; and in so doing a certain proportion will inevitably become incompetent. The difficulty is to decide whether, and if so to what extent, these vessels should be ablated. Gravitational legs produce such a disability, and definitive surgery has so little to offer in this condition, that there is a temptation to strip all enlarged superficial veins at sight. It is, however, one which should be resisted, for the deprivation of a possible actively functioning superficial venous return will handicap the unfortunate patient even further. Clinical appraisement of the situation is extremely difficult. Venous pressure estimations are here of value, although the results may sometimes be inconclusive for, as Wright[11] has pointed out, it is difficult to assess the degree of pressure necessary in these thick legs to obstruct the superficial veins with a tourniquet. This much, however, can be claimed: Any increased drop in the venous pressure on exercise after the application of a tourniquet, must of necessity imply some incompetence of the superficial veins somewhere (although the converse is not necessarily true) and selective surgery will therefore be of help. Repeating the test with the tourniquet at various levels may further enable one to establish the level at which this incompetence begins and ends. Where doubt still exists I find the most practical criterion is the taking of the venous pressures at operation.

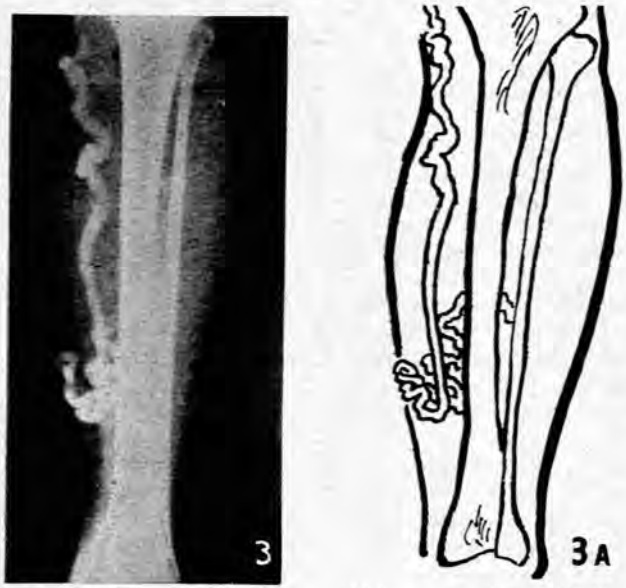


*Fig.* 3. The clinical picture, which suggested a calf-vein thrombosis syndrome seemed substantiated by a venous pressure drop on exercise of only 20 cm. With a tourniquet applied to the lower third of the leg there was a further drop of 45 cm., indicating gross incompetence of the superficial system. This venogram, which was then done, demonstrates clearly the real pathology.

This is done by tying the polythene manometer into the vein whose function is open to doubt, and tilting the patient into a 45° head-up position. A rise in the dye level to that of the heart will indicate incompetence of the whole saphenous system, whereas a halt at a lower level will indicate the site of the lowest functioning valves. Interruption of the superficial veins can therefore be limited to the appropriate levels.

In conclusion, it must not be lost sight of that the present treatment of varicose veins is also merely an evolutionary phase which will probably be modified in a decade or two, and it is only by maintaining an observant and enquiring attitude to those recurrences we see, that their incidence will be reduced.

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