VARICOSE VEINS

Anatomic Findings and an Operative Procedure Based Upon Them

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The published results of the therapy of varicose veins and post-thrombophlebitic processes in the thigh and leg still leave much to be desired. Though high ligation offers many advantages over older methods of treatment, too often (as pointed out by Harkins,[1] Ochsner and Mahorner,[2] and others), the desired improvement is not achieved because other sites in the lower limb possess incompetent or potentially incompetent perforator veins not controlled by the operative procedure. Our own study of 214 patients who had had high ligation combined with retrograde injections of sclerosing solution showed that, in 46 per cent, the result was not wholly satisfactory (Table I), some even requiring further operative procedures.

Table I

Results* in 214 patients (372 lower limbs) treated by high ligation and retrograde injection of sclerosing solution

	No.	Per Cent
Faulty high ligations	19	5
Improvement — Objective		
Reflux flow of blood 16–40 seconds†	201	54
Reflux flow of blood 0–15 seconds†	171	46
Improvement — Subjective		
75–100%†	189	51
50– 75%†	82	22
Less than 50%†	101	27

* Average length of time since operation 3 years, 8 months.

† Multiple tourniquet tests were employed and observations taken with the tourniquet applied at the groin in order to rule out inaccuracy of the high ligation procedure.

Of the various tests designed to locate the incompetent perforator veins. contributing to the poor results mentioned, probably the most important is the multiple tourniquet test. This yields valuable information but is not sufficiently precise to disclose the exact location of the incompetent perforator veins.

The evident failure of therapy in a considerable number of cases and the inadequacy of the tests for the location of incompetent perforator veins in the thigh led to anatomic studies on the cadaver. In a preliminary report[3] the results of dissections on 19 cadavers (36 thighs), and 43 surgical dissections were outlined. Since that time, anatomic dissections have been carried out on 54 additional cadavers (101 thighs) and 703 surgical dissections have been made. These not only have confirmed the studies previously reported but have yielded additional anatomic data which form the basis of a surgical procedure giving promise of materially improving the therapy of varicose veins by aiding in the elimination of incompetent or potentially incompetent perforator veins of the thigh.

It is the purpose of this paper to present the results of these anatomic studies and describe the operative procedure to which they contributed.

ANATOMIC STUDIES

The location and number of perforator veins connecting the saphenous system with the deep veins of the thigh vary greatly. Nevertheless, certain generalizations can be made. For instance, the long saphenous vein consistently joins the femoral vein in the inguinal region. Despite many variations, the superficial epigastric, superficial iliac and superficial pudendal veins are always represented in some manner. Dissections of the thigh disclosed the fact that, although variations are numerous, there is a scheme of placement of the long saphenous vein and the perforator veins of the thigh, so that there may be said to be a general pattern (Fig. 1, Type I) with three main variations in type (Types II, III and IV) described below.

The embryonic pattern of the saphenous system (Type I, Fig. 1) consists of two saphenous stems in the thigh. The main long saphenous vein (B) is usually larger, deeper and more medial than the accessory vein (A). In the upper part of the thigh both tributaries of the long saphenous vein (A, B) are found in the expected location, superficial to the deep fascia. At a varying level (C) in the upper half of the thigh, however, one tributary (B′) of the main long saphenous vein B pierces the superficial layer of the deep fascia, thereafter coursing deep to the deep fascia, whereas the accessory saphenous vein A remains superficial to the deep fascia throughout its entire course. This tributary (B′) which courses beneath the superficial layer of the deep fascia, assumes great importance because from it arise the main perforator tributaries which connect it with the femoral and popliteal veins of the thigh (Fig. 1, H, J, K), discussed later. After coursing down the thigh for six centimeters, or more, this deep saphenous tributary again divides. One tributary (B‴) emerges from beneath the deep fascial layer at D to reoccupy a position superficial to the deep fascia and the other (B″) continues down the thigh and leg between deep fascial layers.

Type II (Fig. 2) varies from Type I in the absence of the accessory saphenous vein A. Type III (Fig. 3) varies from Type I in that the accessory saphenous vein A, although present, does not connect with the femoral vein near the saphenous-femoral junction, but does connect with the main saphenous vein at C just above the site where the main saphenous vein dips beneath the deep fascia. Type IV (Fig. 4) is like Type I except for an apparent lack of connection at C between the lower end of the accessory saphenous vein A and the main saphenous vein B. The saphenous vein, or any of its divisions or tributaries, may be double or even triple, and considerable variation may exist in the manner in which the perforator tributaries of vein B′ connect with the deep circulation.

MID-HUNTER CANAL PERFORATOR VEIN

Along with the observations made on the saphenous vein and its subdivisions, described above, it was noted first in anatomic then in surgical

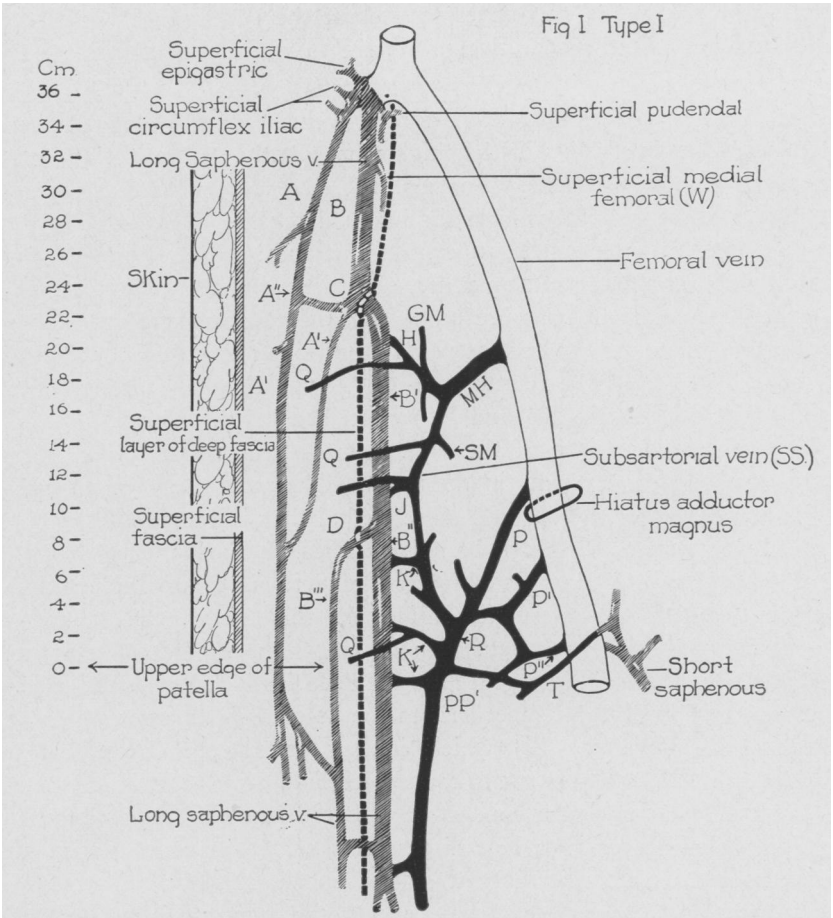

FIG. 1.—Drawing showing the saphenous system as A, A′, A″, and B, B′, B″, B‴. Veins A, A′, A″, B lie superficial to the deep fascia, whereas distal to C, veins B′, B″ lie beneath the superficial layer of the deep fascia. Vein B‴ emerges from beneath the deep fascia at D.

Perforator vein H connects the main saphenous vein B′ with the constant mid-Hunter canal perforator vein MH.

The genicular venous plexus is composed of the highest genicular vein, P, superior medial genicular vein, P′, inferior medial genicular vein, P″, and a tributary, T, of the short saphenous vein. A tributary, PP′, of the deep saphenous drains the medial aspect of the leg and empties into the genicular plexus.

The subsartorial vein connects the mid-Hunter canal vein with the genicular plexus at R.

Accessory perforator veins, Q, emerge into the superficial fascia without making direct connections with the main saphenous stem B′ B″. Perforator veins J, K make direct connections between the main saphenous stem B″ and the subsartorial vein.

SM and GM are tributaries draining the sartorius and gracilis muscles.

dissections, that at a point in the thigh varying from 16 to 22 cm. above the upper edge of the patella, lies a constant tributary (MH) of the femoral vein. This tributary, accompanied by a branch of the femoral artery and one of the saphenous nerve, pierces the deeper fascial layers to become more superficial than the femoral vein. It divides into several tributaries which drain adjacent muscles, especially the gracilis (GM) and sartorius (SM). Of utmost importance is the fact that, with great constancy, *at least one of these tributaries of vein MH connects with the deep saphenous vein* (*B′*) in the midthigh. Because this perforator vein (MH, H, Fig. 2) connects

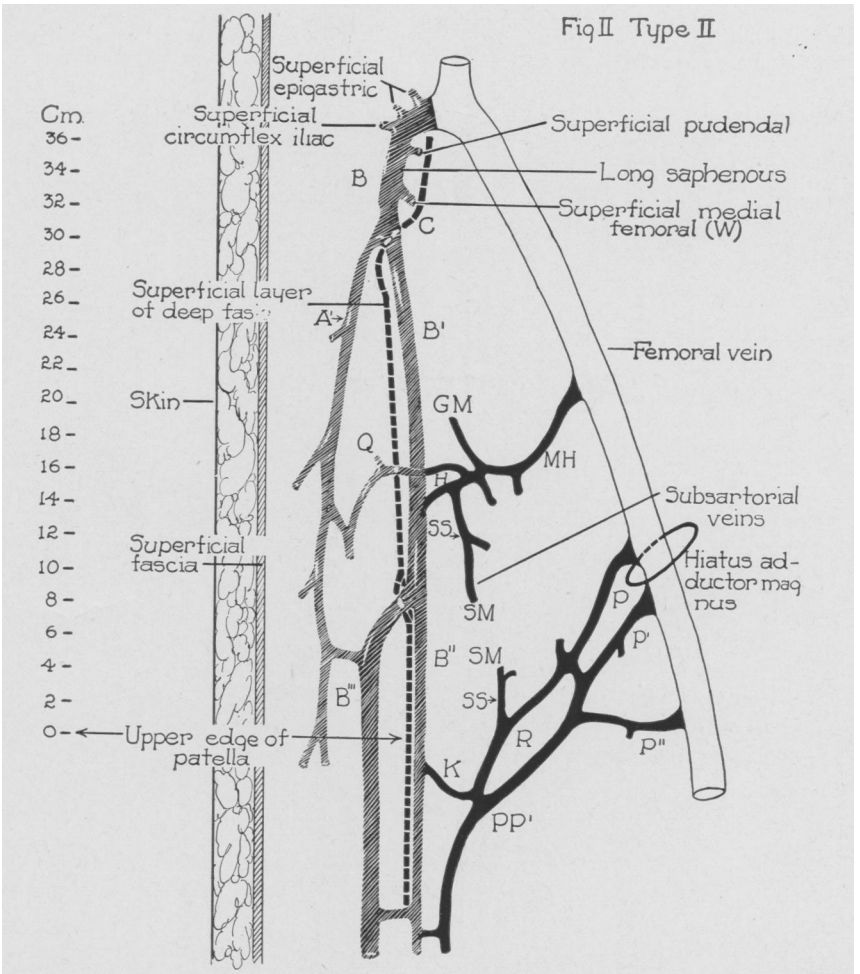

FIG. 2.—Drawing showing the saphenous system as B, B′, B″, B‴, A′. (Note that the saphenous system in the upper thigh consists of a single stem, B). Veins B, A′, B‴ lie superficial to the deep fascia, whereas distal to C, Veins B′, B″ lie beneath the superficial layer of the deep fascia.

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The subsartorial vein (SS) consists of a proximal segment which drains into the mid-Hunter canal plexus and a distal segment which drains into the genicular plexus at R.

Accessory perforator vein Q emerges into the superficial fascia without making direct connection with the main saphenous stem B′. Perforator vein K makes direct connection between the main saphenous stem B″ and the genicular plexus.

SM and GM are tributaries draining the sartorius and gracilis muscles.

with the femoral vein at about the middle of Hunter's canal it has been designated as the mid-Hunter canal perforator vein. In a total of 56 consecutive anatomic examinations, this vein was found in each.

Another constant tributary of the mid-Hunter canal vein (MH) is one that drains the sartorius muscle. This tributary (SS) has been given the name of subsartorial vein. After coursing distally for a few centimeters, it most often terminates within the sartorius muscle (Fig. 2) but in a con-

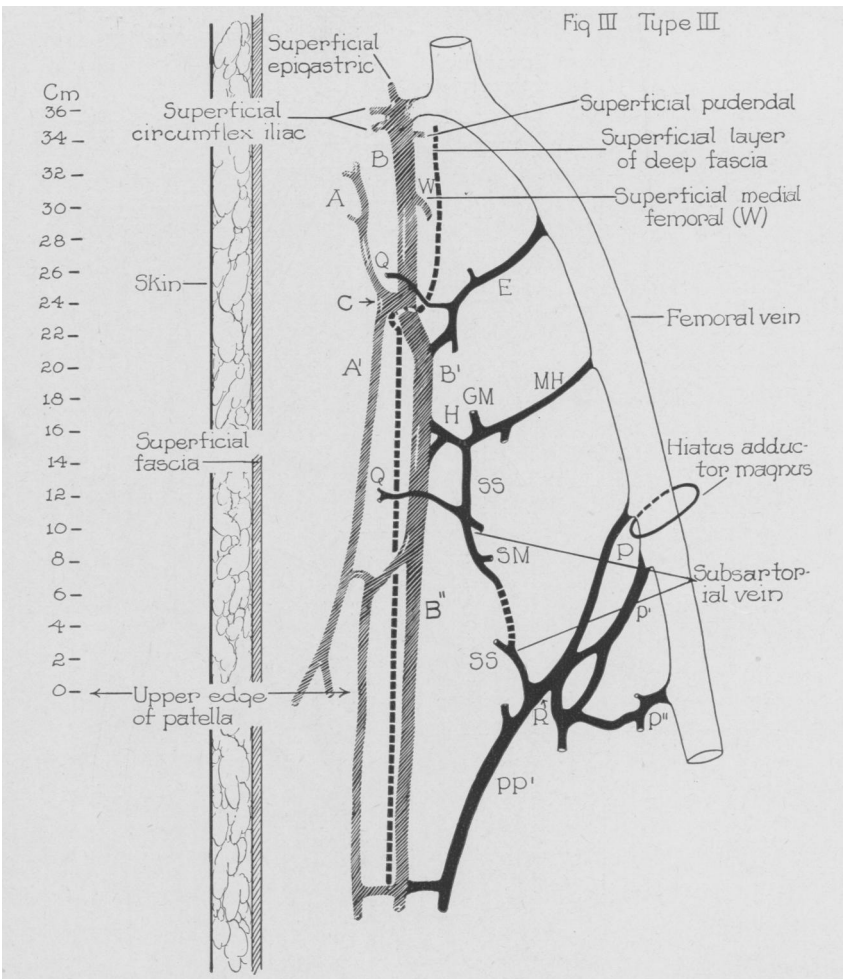

FIG. 3.—Drawing showing the saphenous system as A, A′, B, B′, B″. Note that vein A connects with the main saphenous stem B at point C but makes no apparent connection with the proximal end of vein B. Veins A, A′, B lie superficial to the deep fascia, whereas distal to C, veins B′, B″ lie beneath the superficial layer of the deep fascia.

A high-Hunter canal perforator vein, E, occasionally connects the proximal portion of vein B′ with the femoral vein. Perforator vein H connects the main saphenous vein B′ with the constant mid-Hunter canal perforator vein MH.

The genicular venous plexus is composed of the highest genicular vein. P, superior medial genicular vein, P′, inferior medial genicular vein, P″. A tributary, PP′, of the deep saphenous drains the medial aspect of the leg and empties into the genicular plexus.

The subsartorial vein SS makes connections within the sartorius muscle between the mid-Hunter canal vein and the genicular plexus at R. Accessory perforator veins, Q, emerge into the superficial fascia without making direct connections with the main saphenous stem B′.

SM and GM are tributaries draining the sartorius and gracilis muscles.

siderable number of cadavers it was found not only to drain this muscle but to continue distally to connect with the vein PP′ at R (Fig. 1). The importance of this subsartorial vein lies in the fact that from it often arise perforator tributaries which connect with the deep saphenous vein B′ or B″. It is interesting to note that, whenever the upper subsartorial vein ends within the sartorius muscle, a tributary of the vein PP′, arising at R, travels

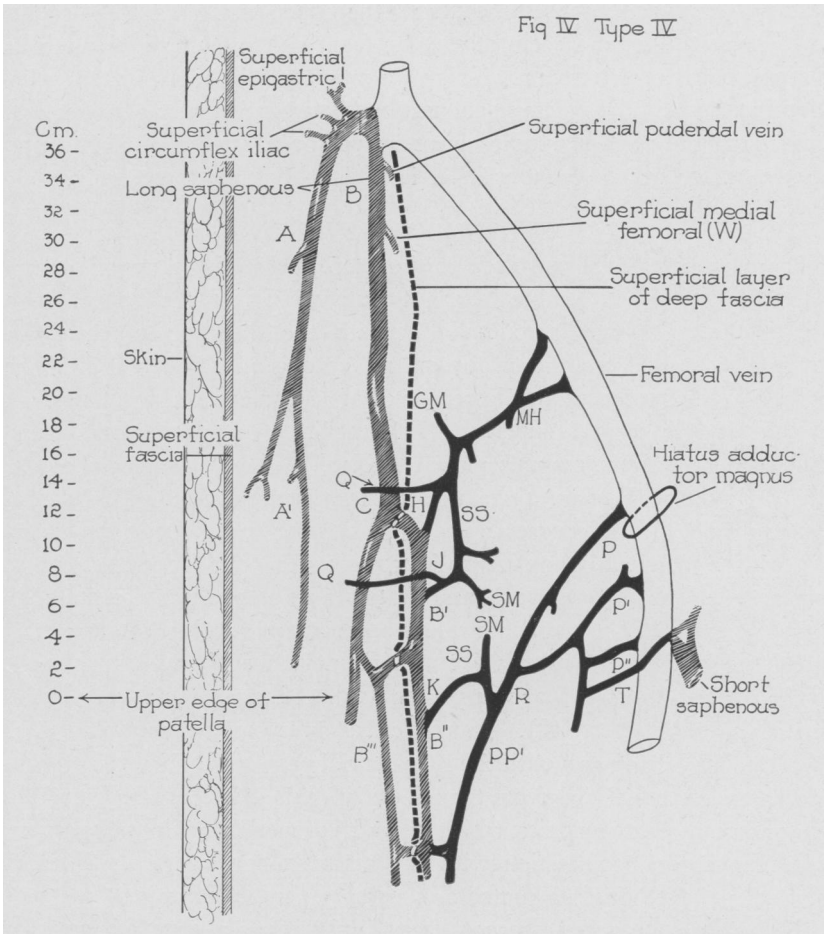

FIG. 4.—Drawing showing the saphenous system as A, A′, B, B′, B‴, Note that vein A, A′ makes no apparent connection with vein B at C. Veins A, A′, B lie superficial to the deep fascia, whereas distal to C, veins B′, B″ lie beneath the superficial layer of the deep fascia.

Perforator vein H connects the main saphenous vein B′ with the constant mid-Hunter canal perforator vein MH.

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The subsartorial vein, SS, consists of a proximal segment which drains into the mid-Hunter canal venous plexus and a distal segment which drains into the genicular plexus at R.

Accessory perforator veins, Q, emerge into the superficial fascia without making direct connections with the main saphenous stem B′. Perforator veins J, K make direct connections with the main saphenous stem B′B″ and the subsartorial vein SS.

SM and GM are tributaries draining the sartorius and gracilis muscles.

proximally to enter the sartorius muscle (Figs. 2 and 4) and sometimes connects with the upper subsartorial vein within the sartorius muscle (Fig. 3). Again, even though the lower subsartorial vein apparently has no direct connection with the upper subsartorial vein, it also may possess perforator tributaries (K) which connect with sapheous vein B″ (Fig. 4).

In four cadavers and twelve surgical dissections a relatively rare tributary (E, Fig. 3) was found. This particular vein, aside from furnishing

tributaries to adjacent muscles, connects the upper part of the deep saphenous vein B′ with the femoral vein at a point from six to eight centimeters below the sapheno-femoral junction. This vein may possibly be a constant tributary of the femoral vein, but because connections between it and the saphenous vein B′ are rare, no detailed studies have as yet been attempted. In future dissections, however, this vein will be investigated more thoroughly.

GENICULAR VEIN PLEXUS

The area superficial and deep to the deep fascia of the upper and medial aspects of the leg is drained by a tributary PP′ of the saphenous vein. This tributary extends proximally beneath the insertion of the sartorius muscle, passes between the sartorius and gracilis muscles, and lies beneath the deep fascial layer at the lower level of the knee . It anastomoses with the inferior (P″) and superior (P′) medial genicular veins below the hiatus of the adductor magnus muscle. Also, it often possesses a connection with a triubtary (T, Fig. 4) of the short saphenous vein. This saphenous tributary (PP′) then courses upward to become the highest genicular vein (P) which pierces the aponeurotic covering of the adductor canal and connects with the femoral vein immediately above the hiatus of the adductor magnus muscle. The saphenous nerve accompanies this saphenous tributary of the highest genicular vein. The importance of the saphenous tributary PP′ lies in the fact that veins often connect it with the deeper saphenous vein B″ by tributaries (K). Moreover, as previously mentioned, this vein PP′ occasionally connects with the subsartorial vein at R (Fig. 1). Of utmost importance is the fact that from the tributary veins MH, H, SS, J and K often arise one or more tributaries which extend independently into the superficial tissues, having no connection with the main saphenous vein. These veins (Q, Fig. 4) have been designated as accessory perforator veins.

Figures 1, 2, 3 and 4 are composite illustrations abstracted from studies on the cadaver and are designed to indicate the most important variations in the placement of the veins of the medial portion of the thigh.

It is to be noted that the constant veins B′, B″, H, MH, SS, PP′, P and P′ are present in all four types. Also the inconstant veins, J, K, E and Q may be present in any of these types. Again, although in all types the vein B usually pierces the superficial layer of the deep fascia at about the junction of the upper with the middle third of the thigh, there may be some variation in this arrangement and to emphasize such variation, vein B is depicted in Figure 2 as piercing the fascia high in the thigh, while other possible sites are indicated in Figures 1, 3, and 4. The distribution of veins by type in the cadaver and in surgical dissections is shown in Table II. Table III shows measurements taken from dissections on the cadaver.

Figures 1 to 4 show main groups of perforator veins on the medial aspect of the thigh: namely those of (a) the sapheno-femoral junction; (b) the mid-Hunter canal vein; and (c) the genicular plexus. In the literature upon this subject, it has been stated that there are from one to seven perforator

TABLE II

CLASSIFICATION ACCORDING TO TYPES OF VEINS IN THIGH

	Dissections‡			
	Anatomic		Surgical	
	No.	Per Cent	No.	Per Cent
Type I	9	8.91	43	7:5
Type II	62	61.38	365	64.0
Type III	3	2.97	14	2.5
Type IV	27	26.74	149	26.0
Total typed	101		571†	

* A total of 137 anatomic and 703 surgical dissections (465 patients) formed the series, of which 101 and 571, respectively, were typed.

† The cases before 1942 were not classified, as a sufficiently definite pattern had not been established.

TABLE III

MEASUREMENTS‡ NOTED IN ANATOMIC DISSECTIONS

	Greatest Length Cm.	Shortest Length Cm.	Average Length Cm.	No. of Dissections
Sapheno-femoral junction	37.00	32.00	35.25	137
Point C (Fig. I)	33.00	13.50	20.37	101
Junction, mid-Hunter perforator with saphenous	20.30	11.10	15.60	67
Junction, mid-Hunter perforator with femoral	23.00	15.00	18.50	56
Junction, highest genicular with femoral	13.00	9.00	10.60	34

‡ All measurements were taken from the upper edge of the patella.

veins connecting with the long saphenous vein. In 101 anatomic dissections the largest number found was six, the smallest, one, the average number being 1.94. All these perforator veins were found to arise from the mid-Hunter canal vein, the genicular plexus or the subsartorial vein which connects them.

Further anatomic studies on the veins of the thigh demonstrated that many other perforator veins exist, but with the exception of three main sites, discussed under operative treatment, they pierce muscles, and the protection afforded by these muscles seems to preclude the possibility that these veins will become incompetent.

Six principal findings resulted from the anatomic dissections described above: (1) The recognition of a pattern in the placement of the long saphenous vein and its tributaries, with the occurrence of four anatomic types. (2) The fact that the main stem (B) of the long saphenous vein lies deep to the deep fascia somewhere along its course (B', B") rather than remaining superficial to the deep fascia. (3) A constant tributary (MH) of the femoral vein, named the "mid-Hunter canal perforator vein" by reason of its position, connects by one or more tributaries with the long saphenous vein as it courses beneath the deep fascia. (4) The genicular vein plexus is constant. (5) The subsartorial vein occasionally connects the mid-Hunter canal vein with the genicular system. (6) The so-called perforator veins on the medial aspect of the thigh arise mainly from the sapheno-femoral junction, the mid-Hunter canal vein, the genicular plexus, and the subsartorial vein.

SURGICAL APPLICATION

The treatment of incompetent or potentially incompetent perforator veins in the thigh depends upon a full realization of the importance of the pattern described under anatomic findings and especially of the rôles played by the deep saphenous tributary B′, the mid-Hunter canal perforator system and the genicular plexus. Eradication of the deep long saphenous stems B′ and B″ disconnects the direct communication of the saphenous vein with the femoral or popliteal veins, but does not eliminate the indirect accessory perforator (Q) veins. To efface all incompetent or potentially incompetent perforator veins of the medial thigh requires, in addition, transection of the mid-Hunter canal vein (MH) near the femoral vein, transection of the vein PP′ deep to the point R and excision of certain parts of the subsartorial vein. This should prevent the reflux flow of blood from the deep veins of the thigh by severing those incompetent veins which communicate between the deep and superficial systems.

The surgical procedure based upon the information gained from the anatomic studies described is one which, in our hands, has materially improved the results of the therapy of varicose veins. Furthermore, it involves a minimal amount of trauma and has the advantage of keeping patients in bed for very short periods of time. It consists of a combination of injection of veins, high ligation of the saphenous vein, elimination of the main saphenous stem (B′, B″), eradication of the mid-Hunter canal vein and, in certain cases, excision of the high-Hunter canal vein (Fig. 5) and elimination of as much of the genicular venous plexus as may seem to be required. The basically new approach is the employment of sclerosing solution as an agent for suppression of hemorrhage so that the surgical procedure can be performed without danger of postoperative bleeding. Patients can be out of bed and active within 24 hours after operation. The early activity combined with firm thrombosis of the cut veins also reduces the danger of pulmonary infarcts by emboli.[4]

OPERATIVE PROCEDURE

Varices below the knee are thoroughly sclerosed by local injection previous to operation. Under local or spinal analgesia, sodium pentothal or other general anesthesia, the sapheno-femoral junction is exposed through a longitudinal incision. After identification of the saphenous vein, a clamp is applied to stem B of this vein and a retrograde injection of about four cubic centimeters of a sclerosing solution is used. An interval of from 10 to 15 minutes is then allowed to elapse during which time the upper ends of the long saphenous vein or veins are dissected and their upper tributaries exposed, ligated and divided. The procedure of the high ligation[5, 6] is now so fully standardized that further comment on this aspect of the operation is unnecessary. In the majority of patients with double long saphenous veins, most of the tributaries at the upper end of the saphenous system arise from vein A. A ligation performed as indicated by M (Fig. 5) would

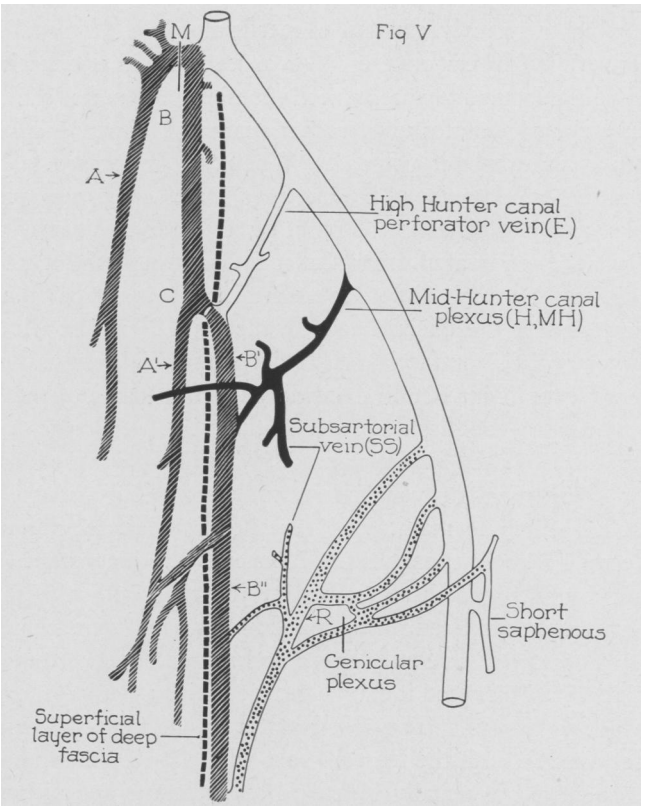

FIG. 5.—Drawing showing the saphenous system as A, A', B, B', B''. Veins A, A', B lie superficial to the deep fascia, whereas distal to C, veins B, B'' lie beneath the superficial layer of the deep fascia.

R designates the point at which the subsartorial vein connects with the genicular plexus.

Line M illustrates the danger of mistaking superficial vein A for the main saphenous vein, in patients who possess double long saphenous veins.

leave vein B patent and the operative procedure would fail to accomplish its purpose.

At the end of 10 or 15 minutes it will be found that the sclerosing solution has caused a thrombosis in the affected vessels which usually will prevent bleeding when the veins are transected. It is important, however, to test the effectiveness of the sclerosis by momentarily releasing the clamp and observing that no fresh blood flows from the open end of the vein. If bleeding should occur, as rarely it does, more sclerosing solution should be injected. If there is doubt that the sclerosing solution has effectually suppressed all hemorrhage, the tributaries of the offending vessel should be ligated, or if the bleeding cannot be exactly located, firm bandaging of the limb will control it.

The next step is the elimination of the perforator veins of the thigh. Although the point at which the main saphenous vein dips beneath the superficial layer of the deep fascia is usually located at about the junction of the upper and middle thirds of the thigh, its exact position is variable.

After transecting the nearly constant superficial medial femoral vein which lies in the superficial fascia on the inner aspect of the upper eighth of the thigh, a Mayo stripper may be placed outside the main saphenous vein and the vein stripped distally until rather marked resistance is encountered, which is usually at or about point C. When this is located, a longitudinal incision about eight centimeters in length is made over, and parallel with, the saphenous vein just distal to the point of resistance. Vein B′ is identified and tributary A′ is separated from the main saphenous vein B, B′. Once the vein B′ is identified it is simple to ascertain that it pierces the fascia and, by making traction on the excised vein B, the vein B′ can be felt beneath the superficial layer of the deep fascia. This deep fascia is longitudinally incised, the vein B′ is separated from the tissues superficial to it, great care being taken not to disturb the tissues beneath the vein. A large self-retaining thyroid retractor is placed in the wound. Vein B is grasped with a clamp and by distal retraction of vein B′ its undersurface is carefully dissected free. Constant search is maintained for the high-Hunter canal perforator vein and the mid-Hunter canal vein. Whenever the inconstant high-Hunter canal vein is found, it is dissected to its junction with the femoral vein, where it is ligated and excised. The mid-Hunter canal vein, which is usually present, varies greatly in size and length and much diligence may be required to locate it. When discovered it can be grasped with a hemostat and separated from the saphenous vein. The mid-Hunter canal vein is dissected to its approximate junction with the femoral vein where it is ligated and transected. The femoral vein is not usually identified as such, the approximate junction of the mid-Hunter canal vein with the femoral vein being ascertained by feeling the pulse of the femoral artery. The subsartorial vein and the deeper portion of the mid-Hunter canal vein are usually exposed simultaneously. The subsartorial vein should be followed distally as far as is practical, usually from five to seven centimeters, transected and ligated.

Although the sclerosing solution usually controls any bleeding from the subsartorial vein, its efficacy in such control of the proximal end of the cut mid-Hunter canal vein cannot be relied upon, hence the necessity of ligation.

Upon completion of the eradication of the mid-Hunter canal perforator system, the vein B′ is again picked up with a hemostat, and if any portion of this incision remains unexplored, dissection of the vein B′, B″ is carried further caudal, a search being made for any perforating vein that might possibly be present.

If the multiple tourniquet test previously performed indicated no incompetent perforator veins in the lower fourth of the thigh, a Mayo stripper can be applied to the vein B′, B″, and it can be excised by stripping. If, however, previous tests have disclosed the presence of incompetent perforator veins in the vicinity of the adductor tubercle, they must be searched for and eradicated. A longitudinal incision about eight centimeters in length is made over the deep saphenous vein B″ in the vicinity of the adductor tubercle, and this vein is exposed by incising the super-

ficial layer of the deep fascia over it. A search for a perforator vein is instituted in a manner similar to that described in locating the mid-Hunter canal in the midthigh. Once identified, the perforator vein should be followed deeply until point R is exposed. The highest genicular vein, the superior and inferior medial genicular veins of the genicular plexus, and, if present, any tributary making connections with the short saphenous vein, are then followed deeply and ligated near their junctions with the femoral, popliteal, or short saphenous veins.

The next step consists of elimination of varices and incompetent perforator veins in the leg. If the preliminary examination of the patient disclosed no incompetencies of the perforator veins below the knee, varices are removed wherever present. If, however, the multiple tourniquet test demonstrated deficiencis of the perforator veins in this area, the treatment is more complicated. Linton[7] and Warwick[8] pointed out that the perforating veins of the medial aspect of the leg usually make direct and nearly horizontal communications between the deep veins and the saphenous system. For this reason the multiple tourniquet test is valuable in locating the sites of incompetent perforator veins of the leg. Although we have made no exhaustive studies on the leg of the cadaver, surgical dissections have indicated three important locations for deficient perforator veins on the medial aspect of the leg. In order of their frequency they are: 1. From 18 to 22 cm. above the sole of the foot. 2. At about the junction of the upper and lower half of the leg. (Medial margin of the tibia.) 3. At about the middle of the proximal third of the leg. When indicated, these incompetent perforator veins are followed to a point beneath the deep fascia where they are ligated and excised. The rent in the fascial layer is obliterated by appropriate sutures. Whenever the short saphenous vein is found to be incompetent it is ligated and transected at its junction with the popliteal vein. All tributaries within approximately six centimeters of this junction are also ligated. If incompetent perforator veins are found on the lateral aspect of the thigh, they are followed to a point three or four centimeters beneath the deep fascia, within the intramuscular septa, where they are ligated and excised.

Discussion.—Patients who have had one lower limb treated by means of the combined high ligation operative procedure and retrograde injections of sclerosing solution, and the companion extremity treated in the manner described in this paper, observe that the postoperative discomfort is much less noticeable in the latter procedure. This lessening of pain probably results, at least partly, from the fact that the veins, although exposed to the action of the sclerosing solution, are removed and, thus, the usual inflammatory reaction from the injection is avoided.

In the removal of veins so treated, some of the sclerosing solution may remain in the wound, though every effort is made to remove it. In no case did it cause any evident damage. Substantiating this view is the fact that sylnasol, an excellent chemical for sclerosing veins, has also been in-

jected into tissues for treating inguinal hernia without causing appreciable damage to tissue. Indeed, sylnasol is not very different chemically from any other sclerosing soap. In patients who exhibited sensitivity to monolate or similar compounds, the necessary use of quinine hydrochloride and urethane or sugar solutions caused no obvious difficulty.

Insufficient time has elapsed for proper evaluation of the late effects of this procedure. It would appear, however, that the method should reduce the incidence of recurrence. In the entire group of 465 patients, no deaths, massive hematomata or pulmonary embolisms occurred. There were ten mild infections, one rather severe infection and two traumatic cysts. Of these infections only two involved the thigh. The average time of hospitalization was 2.8 days. All patients were walking within 28 hours after operation.

SUMMARY

1. A general scheme of arrangement of the saphenous system in the thigh exists but variations are common.

2. The occurrence of a heretofore unrecognized location of the saphenous vein between the deep fascial layers, of a constant mid-Hunter canal perforating vein at about the junction of the upper and middle thirds of the thigh, and of an inconstant perforator vein connecting with the medial genicular venous plexus and the subsartorial vein is described.

3. Although anatomic variations are common, a definite plan exists, the surgical significance of which is emphasized.

4. Suggestions are made for what appears to be a more effective operative therapy.

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