Ambulatory Stab Evulsion Phlebectomy for Truncal Varicose Veins

Gabriel Goren, MD, Encino, California, Albert E. Yellin, MD, FACS, Los Angeles, California

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The management of primary varicose veins is evolving. Recovery time, cost, recurrence rate, and cosmesis are critical determinants. Classic "high ligation" and ankle-to-groin stripping is expensive, results in a long convalescence, and may produce unacceptable scarring and possible permanent nerve injury. This report describes the technique of stab evulsion phlebectomy performed in an outpatient setting. Under loco-regional anesthesia, and after high ligation, existing tributary and trunk varicosities are excised with specially designed hooks. The multiple stab incisions, 1.5- to 3-mm long, are closed with adhesive strips. Fifty-six patients, with 69 involved limbs, have been operated on during the past 9 months. Postoperative pain and complications were minimal. Convalescence was eliminated and all patients immediately resumed normal daily activities. Cosmesis was excellent.

This technique is based on hemodynamically accurate principles. It effectively removes all varicosities, eliminates the proximal source of reflux, and disconnects potentially outflowing perforators, yet leaves in situ undamaged trunk veins, which may be used as potential vein grafts.

Varicose veins are one of the commonest maladies of the civilized world. They produce discomfort, aching, tiredness, itching, and cosmetic distress. They can develop complications such as phlebitis, bleeding, lipodermatosclerosis, and ulceration. These factors may be appropriate indications for surgery. However, the saphenous vein trunk are invaluable vascular graft material for revascularization of coronary as well as peripheral arteries. Therefore, all attempts should be made to preserve them, unless they are too damaged to be useful.

There is ample evidence to support the ankle-to-groin stripping [1,2], which necessarily involves "high ligation," as the treatment of choice for primary truncal varicose veins. Unfortunately, the results and the statistics quoted are based on the assumption that all these patients have a junctional valve, i.e., sapheno-femoral (SFJ) or sapheno-popliteal (SPJ) incompetence or escape, and that the entire saphenous vein trunk is incompetent, requiring its complete removal. However, in many instances, junctional groin incompetence, coupled with incompetence of the thigh segment of the long saphenous vein, is associated with a totally normal and competent infrapopliteal segment of the same vein [3]. Existing varicosities will relate to the more superficial and thin-walled thigh and/or calf tributaries.

In our recent series of 230 varicose limbs tested with a continuous wave (c.w.) Doppler ultrasound flowmeter, the incidence of junctional incompetence was only 71% [4]. In 147 limbs (64%), it was localized at the SFJ, and in 17 (7%), it was localized at the SPJ. Moreover, in 23 (16%) of the 147 limbs with SFJ incompetence, the long saphenous vein trunk demonstrated little or no incompetence, the varicosities being localized in the territorial distribution of either the anterolateral (16 limbs) or the posteromedial (7 limbs) accessory saphenous veins. Thus, if "high ligation and stripping" had been carried out traditionally in all cases of truncal varicose veins, at least 24% of stripped saphenous veins would have been needlessly sacrificed despite their excellent graft potential. Additionally, in 29% of patients with proximal escapes localized elsewhere, it would have destroyed normal, i.e., competent, junctional (SFJ and SPJ) escapes as well.

Similar observations have been published by Large [5]. In 722 varicose limbs studied, he found a lower (52%) incidence of SFJ incompetence. Furthermore, he concluded that routine stripping would have destroyed 50% of saphenous veins that had graft potential.

Moreover, the case against the routine or blind removal of the long saphenous vein (ankle-to-groin stripping) is supported by the known anatomic observation that the distal ankle perforators connect the deep venous system with the tributaries (posterior arch vein of Leonardo) rather than with the main saphenous trunk. Therefore, a routine or "blind" ankle-to-groin stripping would have no effect on them.

The purpose of this article is to present an anatomically and hemodynamically supported surgical protocol for treatment of truncal varicose veins as a solid alternative to routine or blind stripping. The procedure, performed under loco-regional anesthesia in an ambulatory setting, effectively and completely removes all incompetent superficial varicose veins regardless of whether they are tributaries or main trunks. Proximal ligation (SFJ and/
or SPJ) is performed only when there is demonstrated incompetence. By removal of the tributary varicosities, all distal perforators are disconnected and thus eliminated as a cause of recurrence.

The principles of the method ("multiple cosmetic phlebectomy") were first introduced by Rivlin [6] of London, who in 1975 reported an excellent 10-year recurrence rate of 7% in 1,993 operated varicose limbs. Müller [7] of Switzerland called it "phlebectomy ambulatoire" and in 1978 introduced his modified crochet hooks (instead of clamps) to "catch" the vein. These hooks facilitated the removal of the varicosities through far smaller (1.5 to 3 mm) incisions. This ensured the cosmetic effect of the procedure, later reported by others as well [8,9]. Oesch [10] of Bern ("mini-incision phlebectomy") and Varady [11] of Frankfurt ("micro-surgical varicectomy or phlebectomy"), advocated the use of differently designed hooks. The term "stab evulsion venectomy" was, however, coined in 1985 by Large [12] of Tasmania. Thus, "ambulatory stab evulsion phlebectomy" is a combination of already existed terminology that seems to us to correctly reflect the true nature of the procedure.

PATIENTS AND METHODS

Fifty-six patients with primary and recurrent varicose veins in 69 limbs were seen in a private phlebologic practice between June 1990 and March 1991. All patients were evaluated by careful physical examination as well as noninvasive c.w. Doppler ultrasound venous studies.

Fifty-four patients (96%) were females and 2 (4%) were males. Thirty-one patients (55%) were less than 50 years old and 25 (45%) were 50 years and older. Unilateral involvement was present in 43 patients (77%) and bilateral involvement in 13 (23%). Thirty-three limbs (49%) were right limbs, and 36 (52%) were left limbs, for a total of 69 involved limbs. Fifty-seven (83%) limbs had primary and 12 (17%) had recurrent varicose veins.

Three groups of varicosities were observed. Group I. Fifty-two (75%) legs had long saphenous varicosities. SFJ incompetence was found in 31 (60%) limbs. Concomitant saphenous trunk incompetence and reflux, requiring saphenectomy, were present in 22 limbs, while in 9 limbs, the saphenous trunks were normal and competent with varicosities limited to the medial and lateral accessory veins. In the remaining 21 cases, no escape could be detected in 12 limbs (2 primary and 10 recurrent varicose veins), mid-thigh perforators were found in 2 cases, and pelvic escapes (belonging to the territorial distribution of the internal iliac veins) were detected in 7 limbs.

Group II. Eleven (16%) legs had short saphenous varicosities. SPJ incompetence was found in all 10 primary varicosities. In one limb with recurrent varicosities, no escape could be detected.

Group III. Six (9%) limbs had non-saphenous varicosities. The varicose veins were limited to the lateral thigh venous system.

Ambulatory stab evulsion phlebectomy was performed in all 69 varicose limbs. Twenty-nine (42%) limbs were followed for at least 6 months or longer, 21 (30%) limbs between 3 and 6 months, and 19 (28%) limbs for less than 3 months.

Procedure: A careful preoperative examination is mandatory to appropriately tailor the procedure to the needs of each patient. Since the clinical examination may not identify all escape points, a c.w. Doppler examination is required [4] for the correct mapping of the most proximal escape point and for evaluating the extent of the existing reflux.

Clinical examination: With the patient standing on a two-level footstool, the following clinical parameters were used to assess the varicose veins: (1) visual examination and palpation to determine the overall pattern and territorial distribution of prominent veins, with particular attention to tortuosity or sacculation; (2) mapping of veins by tap impulse test (percussion wave); (3) examination of the cough impulse over prominent veins and groin; and (4) inspection for evidence of venous stasis (edema, induration, pigmentation, eczema, overt ulceration). A modified Trendelenburg test was always carried out. With the patient supine, the leg was elevated for optimal gravitational emptying. A 5-cm tourniquet cuff inflated to 60 to 70 mm Hg was applied over the proximal thigh (or calf) to selectively occlude only the superficial venous system. Frequently, finger occlusion of the suspected and previously marked pathway of incompetence was preferred. Because of lack of reproducibility, a simple rubber tourniquet was never used as a substitute.

With the patient standing, the test was considered positive when the proximal occlusion controlled and thus prevented the filling of the varicosities from above. With the superficial venous system still occluded, patients tip-toed 10 to 15 times in order to activate the calf pump. The leg was observed for filling of the varicosities by distal perforator outflow (Perthes' test).

Doppler examination: A Parks Vascular Mini-Lab III (model #1059, Parks Medical Electronic Inc., Aloha, Ore) with c.w. bidirectional Doppler ultrasound was used exclusively to assess the venous flow. The examination was carried out in conjunction with the clinical examination with the patient standing (on a two-level footstool) to produce maximal gravitational load. Non-weight-bearing of the examined leg is mandatory; all weight is borne on the opposite leg. A pencil probe (8 MHz) was applied over the vein being examined with the transducer pointing upward at a 45° angle. Occasionally, the pencil probe was exchanged for a flat-headed probe taped to the skin. This freed the examiner's hand and facilitated the examination.

A thigh vein was initially selected for examination when it was thought to be the pathway of incompetence. This vein was either prominent, dilated, or tortuous and was easily mapped and localized with the tap test or percussion wave. The probe was most often used over the mid-thigh portion of the long saphenous vein and over the SFJ.

Observations were made with the patient standing while taking a deep breath, coughing, or performing a Valsalva test. These are all equivalent to a venous augmentation maneuver proximal to the probe. A distal aug-
mentation maneuver (compression-release) was performed with the nondominant thumb applied over a varicosity in the calf. The detected downward "away-from-the-heart" signal or a "to-ard-fro" venous signal, in case of venous incompetence, was also noted by the chart recorder.

The aforementioned observations were repeated with the examined superficial vein temporarily occluded by either the pencil Doppler probe itself or by finger pressure applied below the examining probe. An abolished signal served as validation of the above mentioned findings and proved that the signals did in fact belong to the superficial venous system.

Examination of the short saphenous vein and the popliteal fossa was carried out in a similar fashion. With the patient turned away from the examiner, the knee was well flexed. In almost all cases of incompetence of the short saphenous vein trunk, the vein could be palpated, facilitating the placement of the Doppler probe directly on the vein. For information on the gastrocnemius veins as well as the accurate assessment of the frequently elusive SPJ, Duplex imaging or pre- or perioperative varicoangiography [13] may be necessary. Clinical as well as Doppler ultrasound assessment of the deep venous status (common femoral vein, popliteal vein, posterior tibial vein) was done in all patients. The clinical and Doppler examinations were done in succession, and the complete Doppler examination was accomplished in 2 to 3 minutes. Detailed venous Doppler ultrasound examination protocols have been previously described [5,14,15].

Other noninvasive tests: The calibrated air plethysmograph (APG-1000, ACI Inc., Sun Valley, Calif), introduced by Christopoulos and Nicolaides [16], permits assessment and quantification (in mL/second) of the reflux volume, as well as the efficiency of the venous calf pump, by determining, through a regimen of exercise, the ejection fraction and the residual volume fraction. The test can help to differentiate between those varicose veins that are only a cosmetic problem and those with hemodynamically significant reflux. Repetition of certain stages of the test, with finger occlusion of the superficial venous system, can distinguish between deep and superficial venous pathology. The preoperatively obtained hemodynamic baseline permits objective evaluation of the results of any treatment protocol.

Duplex imaging, used for mapping the long saphenous vein prior to its removal by bypass procedures, can be used to evaluate the anatomic (i.e., size of veins) as well as hemodynamic (reflux) profile of the superficial and deep venous system. It complements the Doppler ultrasound findings and, in cases of short saphenous varicosities, is indispensable for localizing and functionally assessing the sometimes intricate venous anatomy and hemodynamics of the popliteal fossa [13].

The ambulatory stab evulsion technique: Special instrumentation. The operation is designed to cause minimal tissue trauma and maximal cosmesis. Specially devised hooks (phlebektectors) in different sizes have been introduced by various practitioners such as Müller [7], Oesch [10], and Varady [11], among others. These hooks permit the removal of varicocities through minute incisions of 1.5 to 3 mm. At least one set of these hooks should be available. The regular surgical tray should also have curved and straight Kocher and mosquito forceps to facilitate the grasping and the removal (evulsion) of the veins.

Preoperative marking: Prior to surgery, the patient is asked to stand and the veins are marked with an indelible marker. The most proximal escape point is revalidated with Doppler ultrasound (or duplex imaging when necessary) and marked. Precise marking of the veins will ensure the success of the operation. It is imperative that the surgeon performing the operation do it personally. No particular attention is given to the sites of supposed incompetent perforators, since removal of the varicose trunks and mainly the tributaries will automatically disconnect them.

Local anesthesia: The leg is cleaned and draped in the usual fashion. Local anesthesia is obtained by the paravascular technique of lumbar plexus anesthesia, the "3-in-1" block introduced by Winnie [17] and colleagues in 1973. It uses minimal (20 to 40 mL) local anesthetic. It is a modification and refinement of the standard femoral block [18]. When successful, this technique will block the obturator, femoral, and lateral femoral cutaneous nerves, resulting in skin anesthesia of the entire anteromedial surface of the limb, except for the lateral aspect of the calf, which is supplied by the sciatic nerve. In cases of incomplete anesthesia, mainly due to anesthetic volumes less than 20 mL, additional local infiltration of the existing varicocities, preferably via a spinal needle, becomes mandatory. In the majority of cases, the incision site for the ligation of the SFJ has to be separately infiltrated. The SPJ ligation, as well as short saphenous varicocities, are excised strictly under local infiltration. The customary anesthetic used is either lidocaine HCL (Xylocaine) 1% or bupivacaine HCL (Marcaine) 0.25%. Lidocaine 1% with epinephrine (1:200,000) is preferred for the "3-in-1" block. The addition of the epinephrine results in delayed reabsorption and consequent reduction in the peak concentration. This will lower the chance of systemic toxicity and will provide longer-lasting anesthesia, extending well into the postoperative period. When supplementation of the local anesthesia along the existing varicocities is needed, bupivacaine 0.25% (without epinephrine) is the preferred anesthetic since it permits administration of a larger volume while still avoiding toxic levels. It is a long-acting local anesthetic that will also extend into the postoperative period, reducing the need for pain medication.

Patients drive to and from the office; therefore, premedication is not administered on a routine basis. Anxious patients can be premedicated with diazepam (Valium) 5 mg orally half an hour before the procedure. Patients receiving premedication are forbidden to drive.

Division of the proximal escape point—the high ligation: A flush ligation of the saphenous vein at the SFJ when incompetence is detected (together with division of
existing tributaries) is the sine qua non of successful varicose vein surgery. Failure to properly perform the juxtafemoral or juxtapopliteal ligation was found to be responsible for causing recurrent varicosities in greater than 70% of cases [10].

In the presence of long saphenous varicosities with SFJ incompetence, the incision should be made in the skin crease of the groin or above it. This will promote a good exposure of the junction and will result in a good cosmetic effect as well. The long saphenous vein should be transected. A slight traction on the proximal stump will facilitate the dissection and ligation of the three main tributaries, the external pudic, the external epigastric, and the circumflex iliac. With the patient's leg in outward rotation, the knee flexed (resting on the operator) and the hip flexed and adducted, the surgeon should apply traction on the distal stump of the long saphenous vein to facilitate finding and dividing the postero medial accessory saphenous vein tributary. The anterolateral accessory tributary can be found anywhere from the SFJ to below the origin of the postero medial accessory vein. Closure of the skin incision is done with a subcuticular stitch.

In the presence of short saphenous varicosities, one should remember that the SPJ has to be precisely localized. A blind incision in the popliteal fossa may not lead to the SPJ. Only in 60% of cases will the SPJ be localized in the popliteal fossa. In 10% of the cases, it will be below and in 30%, it will be above it. Even an experienced operator of a c.w. Doppler ultrasound may have difficulty in localizing the SPJ. Therefore, for addition accuracy, one should use either duplex imaging or preoperative varicography. Similarly, preoperative localization of a possible incompetent gastrocnemius vein (3% to 6%) is mandatory for a successful ligation.

The ligation of the SPJ, especially under local anesthesia, can be a difficult procedure. With the patient prone, the leg should be well flexed at the knee level. The dorsum of the foot rests on an elevated Mayo stand. The skin incision should be transverse and the fascial incision (the SPJ is always beneath the fascia) should be longitudinal. When the short saphenous vein cannot be located with the fascia opened, a short stripper, a baby feeding tube, or a J-wire is introduced from below through an exteriorized varicosity and pushed into the operative wound to identify the vein. Once the vein has been localized and transected, maximal flexion (90°) of the knee will permit removal of a long distal segment of the short saphenous vein through the existing skin incision.

**Stab evulsion tributary phlebectomy:** Located above the membranous fascia and just beneath the skin, tributary varicose veins are amenable to stab evulsion. With an 11 blade tip held in a Kelly or a needle holder, small 1- to 3-mm long stab (puncture) wounds are made along the border of the marked varicosities, making sure that the dermis is split as well (Figure 1). Due to the small openings, no effort is made to stay in Langer's lines; however, whenever possible, the skin incisions should be made along the longitudinal axis of the leg. The Varaady phlebodisector is introduced through the skin opening and, with gentle forward and rotating movements, the varicosity is freed from the subcutaneous tissues along its longitudinal axis (Figure 2a). With the help of the existing hooks that are introduced into the skin opening, the varicosities are engaged (hooked) and teased out to the surface of the skin (Figure 2b). A concomitant gentle traction of the skin in the opposite direction will facilitate the exteriorization of the varicosity (Figure 3a). Once outside the skin opening, if difficulty is encountered during "delivery" of the vein, it may be necessary to grasp the vein loop with a forceps and pull more forcefully (Figure 4a). The two arms of the exteriorized vein loop are separated (Figure 3b and 4b), grasped with two small mosquito or baby Kocher clamps, and transected (Figure 5a). With the varicosity in slight traction, the phlebodisector can be reintroduced into the skin opening to further dissect the vein away from its subcutaneous attachments. Gentle rotatory and/or "to-and-fro" rocking movements or pulling (Figure 5b) or even twisting the vein on the grasping forceps (Figure 5c) will further exteriorize additional lengths of varicosities that are evulsed. In this way,
it is possible to remove (evulse), through each stab wound, up to 5 to 6 cm and even longer segments of vein.

The procedure is repeated many times (25 to 40) until all the marked varicosities of the limb are removed. To further facilitate locating the varicosities, in addition to the preoperative markings, slight traction applied on the forceps grasping the vein will enable the palpation of the varicosity 1 to 2 inches below or above the stab wound. This palpatory finding is an excellent guide for placing the next stab incision. In case there are technical difficulties in anchoring the veins, the different types and sizes of hooks should be alternated. Personal experience will, however, lead to a preference for one type or another.

Bleeding is usually minimal, and slight finger pressure for 20 to 30 seconds will easily control any “heavier” oozing. Elevation of the limb is not routinely needed.

Stab evulsion truncal saphenectomy: The saphenous trunk, if competent, is left intact and only the tributaries are evulsed. However, if the saphenous trunk is enlarged and has moderate-to-severe axial reflux, it is removed using the previously described stab evulsion technique.

In the thigh, the trunk of the long saphenous vein is situated deeper than the tributaries (beneath the membranous fascia); therefore, engaging the vein with the hooks may result in technical difficulties. When the juxtaprofemoral flush ligation is accomplished and while the operative wound is still open, the hip is flexed and abducted and the knee flexed and outwardly rotated. Moderate traction is applied to the distal stump of the long saphenous vein. The thigh segment of the vein is now easily palpated as a taut cord through the skin, up to 2 to 4 inches distally. A stab wound is made along the border of the palpated vein and with the aid of the biggest size Oesch or Muller hook the vein is engaged, exteriorized, and transected. It is often possible to remove 7- to 10-cm segments of vein. This maneuver is repeated until evulsion of the desired length of saphenous trunk has been completed.

If the vein cannot be hooked despite traction, a small flexible stripper, a J-wire, or an 8F baby feeding tube is inserted in the upper end of the divided long saphenous vein. This will facilitate palpation of the vein and permit it to be readily anchored.
In cases of grossly dilated saphenous trunks with hemodynamically significant axial reflux, a limited groin-to-knee stripping, just distal to the tibial tubercle \([6,20,27]\), should be performed. The remainder of the varicosities are then removed by stab evulsion. The traditional ankle-to-groin stripping should be performed only in extreme cases in which the entire saphenous trunk is markedly dilated and incompetent.

**Dressing and postoperative care:** The skin is cleaned and dried, and the stab wounds are closed with narrow adhesive strips. This is then covered with Tegaderm. Direct pressure with cotton balls is used to control bleeding. The cotton balls are applied on top of the Tegaderm and secured with hypoallergenic tape. The entire leg is placed in a groin level 30 to 40 mm Hg gradient elastic (Medi-Strumpf, Medi-USA, Arlington Heights, Ill) stocking. An extra outer layer of Coban self-adhering wrap dressing is applied over the stocking to promote a tighter hemostatic compression. The patient removes this layer before bedtime; however, the rest of the dressing is kept undisturbed until the next day. The leg is rechecked after 24 hours, and the cotton balls and wool are removed. The stocking is kept on the leg for a total of 2 to 3 weeks, although the Tegaderm and the adhesive strips are removed after 7 to 10 days. If the incisions are small, the scars will be barely noticeable after 3 to 4 months. Care should be taken to make the stab wounds as small as possible in patients who are known to develop keloids.

**After care:** Post-surgical discomfort is remarkably minimal. Fewer than 50% of patients will need 1 to 2 tablets of ibuprofen 200 mg for pain control in the evening after surgery. All patients may resume normal daily activities, including returning to work, on the same day as the surgery.

**Complications:** Transient neurologic complication from the loco-regional anesthesia can occur. Motor fibers of the peroneal and femoral nerves may be infiltrated. However, the resultant nerve palsy is transient, clearing within several hours. Permanent nerve damage can occur if a nerve is inadvertently hooked and evulsed. Bleeding from the wound sites might occur. This is likely to manifest itself immediately after surgery when the patient stands up. As a precaution, patients are asked to walk 10 to 15 minutes after surgery and are re-examined before driving away. If bleeding does occur, it can be readily controlled by additional pressure with cotton balls and by reinforcement of the pressure dressing.

A phlebitic reaction may occur days or weeks after surgery and is probably due to a retained and clotted vein that was partially evulsed or missed. Incision and drainage of a fresh clot, compression, ambulation and 800 to 1,200 mg ibuprofen/day (by mouth) for 3 to 5 days will resolve the symptoms.

Lymphatic fistulas, wound infection, and hypertrophic scarring have been reported.

**Relative contraindications:** Veins encased in dense scar or fibrotic tissue may be difficult to evulse. These include varicose veins in the ankle area with dermatosclerosis, post-sclerotherapy veins, post-ambulatory phlebectomy residual veins, and veins after recent phlebitis, as well as veins localized over the patella and tibia. In these cases, sclerotherapy may be indicated.

**RESULTS**

Long saphenous vein varicosities were encountered in 52 (75%) of the total 69 limbs. Thirty-one limbs (30 primary and 1 recurrent, representing 60%) had an incompetent SFJ. All 31 limbs had a mandatory juxtafemoral ligation and tributary stab evulsion phlebectomy. Only 22 had associated main saphenous truncal incompetence as well: 20 had incompetence of the thigh segment only, necessitating a limited (groin-to-knee) stab evulsion saphenectomy, and in 2 limbs, a total (ankle-to-groin) stab evulsion saphenectomy had to be performed. In the remaining nine limbs with SFJ incompetence, only tributary stab evulsion saphenectomy was necessary. The competent and normal main saphenous trunks were left undisturbed. No traditional intraluminal stripping had to be performed. In 12 limbs (10 recurrent and 2 primary) in which no escapes were identified, only stab evulsion of the tributaries was performed. Two limbs had a mid-thigh perforator escape that was ligated. Both required a...
limited saphenectomy from the mid-thigh perforator to the knee. In seven limbs with pelvic escapes, only tributary stab evulsion was performed since the main long saphenous trunks were only minimally incompetent.

Short saphenous varicosities were encountered in 11 (16%) limbs. All but one had the SFJ ligated. Incompetent varicose tributaries and trunks were evulsed in all 11.

Nonsaphenous varicosities that belonged to the lateral thigh venous system were encountered in six (9%) limbs and were easily evulsed.

Three patients developed transient nerve palsies as a result of the loco-regional anesthesia. In two patients, the peroneal nerve adjacent to the fibular head was inadvertently anesthetized, and in one patient a quadriceps palsy occurred after a femoral "1:3" block. All symptoms resolved within 24 hours. Three patients developed bleeding from wound sites when they stood up from the operating table. Two patients bled from ankle wounds and one from the dorsum of the foot. Bleeding was promptly controlled by pressure reinforcement of the dressing. There were no cases of delayed hemorrhage.

Localized phlebitis occurred in two patients 2 weeks after surgery, presumable from a clotted vein segment left in situ. The phlebitis resolved within 5 to 7 days after therapy with ibuprofen (800 to 1,200 mg/day), compression, and continued ambulation. Prophylactic antibiotics were not used, and there were no wound infections.

Four patients had residual varicose veins. These were treated by compressive sclerotherapy, with total obliteration. No recurrent varicose veins have been identified; however, the duration of follow-up is only 3 to 9 months.

COMMENTS

The historic and traditional definitive surgical treatment of uncomplicated primary varicose veins, namely the routine ligation of the SFJ plus ankle-to-groin stripping of the entire greater saphenous veins, has been based on a series of hemodynamic assumptions that have been shown to be erroneous. It is important to examine these outdated assumptions and modify our current operative procedures based on the newer hemodynamic data.

Except for the few patients with an incompetent SPJ, it had been thought that the remaining patients all had an incompetent SFJ and therefore required a high or flush ligation of the SFJ. This is not true! All truncal varicose veins do have a proximal escape point, although this is not necessarily the SFJ. As occlusion of these escape points only will result in a reduction of the existing elevated ambulatory venous pressure [23], their precise localization is imperative. Using a Doppler flow meter, Large [5] identified SFJ incompetence in only 52% of 722 limbs [5]. We found, using the same diagnostic criteria, clinically relevant SFJ incompetence requiring high ligation in 64% of 240 limbs [4]. SFJ incompetence was found in 7%, 24% had escapes through mid-thigh or pelvic perforators, and 5% had an escape point identified. Therefore, 36% of the patients did not require routine ligation of the SFJ but needed careful localization and obliteration of the non-SFJ escape if recurrence was to be minimized.

Another outmoded concept is that all patients with varicose veins present with an incompetence of the major saphenous trunk(s), meaning that mandatory total saphenectomy, i.e., ankle-to-groin stripping, is always required. This is similarly inaccurate!

In many cases of primary varicose veins with proximal valve incompetence, the trunk of the saphenous vein is not damaged [24]. At least 50% of these routinely stripped saphenous veins are potential vascular conduits [5]. In many patients with the classic presentation of varicose veins, namely SFJ incompetence and tributary calf varicosities, although there is incompetence and axial reflux in the thigh segment of the long saphenous vein trunk, the infrapopliteal segment is normal in size and competent [3]. The varicosities usually belong to the tributaries such as the anterior and/or posterior arch veins. Moreover, tributary varicosities of the lateral or medial accessory saphenous veins with junctional (SFJ) escape may have an entirely normal and competent long saphenous vein trunk. This was found to be the case in 10% of the 230 varicose limbs examined [4].

Therefore, blind ankle-to-groin stripping to control axial reflux is often unnecessary. A limited groin-to-knee stripping is sufficient in most of these cases [6,20,21]. This approach is consistent with the newest available hemodynamic data. It maximizes preservation of the saphenous vein for possible future vascular bypass procedures without increasing the likelihood of long-term recurrence. It also minimizes possible damage to the saphenous nerve [21].

Many texts suggest that all primary varicose veins have incompetent distal calf perforators that require individual ligation or disconnection. Most surgeons assume that these perforators are factors in the formation and perpetuation of the varicose disease. Similarly, many surgeons still believe that ankle-to-groin stripping will automatically disconnect all distal incompetent Cockett perforators. This assumption serves as additional reasoning in favor of blindly performed total stripping. Contrary to these assumptions, the distal perforators connect the deep venous system with the varicose tributaries of the saphenous vein, such as the posterior arch vein, rather than with the main infrapopliteal segment of the long saphenous vein. Therefore, "blind" classic saphenectomy, i.e., ankle-to-groin stripping, may not disconnect these conduits. The classic studies of Bjordal [23], recently revalidated by Tibbs and Fletcher [22] with noninvasive techniques, have unequivocally demonstrated that hemodynamically significant outflow in the distal perforators is nonexistent in uncomplicated primary varicose veins. By concomitantly measuring venous pressure and flow (with an electromagnetic flow meter) in all three components of the venous system (deep, superficial, and perforator veins), Bjordal [23] found that during ambulation, the existing distal perforators conduct blood inward from the superficial to the deep, thereby draining and deflating the varicose system exactly as they do with the normal superficial system. In long-standing varicosities, however, with hemodynamically significant reflux (175 to 600 mL/minute), the perforator(s) as well as the deep system dilates in order to accommodate the high volume regurgitant flow, rendering their valvular apparatus incompetent. These cases will manifest clinical signs of
chronic venous insufficiency and will demonstrate mild-to-moderate systolic perforator outflow (deep to superficial). However, the recorded mean flow is still inward (superficial to deep)! Bjordal also observed that occlusion of these perforators had no effect on the increased ambulatory venous pressure in varicose veins, unless the regurgitant flow was concomitantly interrupted as well.

We cannot conclude, however, that in primary varicose veins the perforators should be ignored. When Bjordal [25] occluded the incompetent SFJ and interrupted the axial reflux, the existing venous ambulatory hypertension dropped but there was also a concomitant significant increase in the systolic (deep to superficial) perforator outflow. This was probably facilitated by the greater pressure gradient now created between the deep and superficial venous systems.

Perforator disconnection is necessary not because of the possible role of the perforators in causing or perpetuating varicose veins but because of their possible role in facilitating postoperative recurrences. A tedious search to individually ligate these perforators is, however, futile. Bjordal [25] pointed to the confluence between the perforator(s) and the varicose superficial venous system and demonstrated that by disconnecting this confluence not only was the regurgitant flow responsible for the elevated ambulatory venous pressure eliminated, but it also prevented possible systolic perforator outflow. Practically, the simple removal or evulsion of the superficial varicose tributaries will effectively abolish the regurgitant flow and will, at the same time, neutralize the potential pathophysiologic effect of the offending perforator(s). The resultant improved long-term results are, therefore, the correct rationale for disconnecting the potentially outflowing perforators.

CONCLUSIONS

The correct surgical treatment protocol for primary truncal varicose veins is aimed at reducing the existing increased ambulatory venous pressure. Since the clinical examination alone may be misleading, a meticulous preoperative mapping of the origin and extent of reflux, with c.w. Doppler ultrasound, is mandatory in every case. The meticulous high ligation of the most proximal escape point is the sine qua non for successful varicose vein surgery because it ensures normalization of the elevated ambulatory venous pressure. In the case of coexisting truncal valvar incompetence, which is responsible for a hemodynamically significant axial reflux, the long saphenous vein should be removed, either partially (knee-to-groin) or totally (ankle-to-groin), depending on the individual case. In cases of varicosities strictly limited to tributary veins, without incompetence of the main saphenous trunks, performance of any form of saphenectomy is contraindicated.

The current practice of indiscriminate blind ankle-to-groin stripping in primary truncal varicose veins should be avoided.

The high ligation, performed in conjunction with removal of the varicosities through the stab evulsion technique using special hooks, not only will take care of dilated, diseased, and incompetent veins, it will also automatically disconnect any potentially outflowing perforators, guaranteeing the long-term results of the procedure. Neglecting one of the aforementioned elements or performance of an incomplete surgery will jeopardize the excellent 7% 10-year recurrence rates published by Rivlin [6].

This hemodynamically sound technique, when performed under loco-regional anesthesia [25–28] and in an outpatient setting, will obviously eliminate the need for hospitalization and general anesthesia.

Minimizing the size of the skin incisions and eliminating the use of the traumatic intraluminal stripper not only improves the cosmetic result but also markedly reduces postoperative pain. Convalescence and loss of income are totally eliminated; therefore the cost-efficiency of the method is obvious. Moreover, possible injury to the saphenous or sural nerve is avoided as well. Finally, in many of these cases, the trunk of the long saphenous vein will be preserved, partially or in its entirety, as a possible future vascular bypass conduit.

The minimal trauma stab evulsion phlebectomy performed under loco-regional anesthesia in an ambulatory setting may become the ideal surgical procedure for the treatment of primary varicose veins.

REFERENCES

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