

Original Papers

Invaginated axial stripping and stab avulsion (hook) phlebectomy: a definitive outpatient procedure for primary varicose veins

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The classical high ligation and ankle-to-groin intraluminal saphenous vein stripping requires hospitalization, general anaesthesia, long convalescence, loss of income, unacceptable scarring and possible permanent nerve injury. This report describes the technique of invaginated axial stripping in conjunction with tributary stab avulsion (hook) phlebectomy. Using femoral block anaesthesia with supplemented local infiltration, the varicose tributaries are avulsed, through multiple stab incisions only 1.5–3 mm long, with specially designed hooks. This is performed in an ambulatory (office) setting, making varicose vein surgery a minimally-invasive procedure. Two hundred and fifteen patients with 261 involved limbs were operated on during a two-year period. Postoperative pain and complications were minimal. All patients immediately resumed normal daily activities. Cosmesis was excellent. There have been no recurrences in up to 3 years follow up. This procedure adheres to strict haemodynamic principles. Elimination of hospitalization, reduced postoperative morbidity, immediate ambulation, minimal nerve damage, excellent cosmesis and finally, obvious cost efficiency should make this form of varicose vein surgery appealing to surgeons and patients alike by making the future surgical care for varicose veins available today.

Key words: Varicose vein surgery, stab avulsion phlebectomy, vein stripping, outpatient surgery, femoral block anaesthesia

Varicose veins are a common and progressive disease, which, if untreated, often leads to discomfort and pain, as well as to thrombophlebitic, inflammatory, and stasis complications, including chronic venous ulceration. Because the valvular incompetence and the resultant reflux, which is responsible for the ambulatory venous hypertension¹, are confined to the superficial system, primary varicose veins should be, theoretically, easy to treat.

Since venous competency cannot be restored, varicose veins must be ligated and removed. The classical internal stripping, regardless of the stripper type used, ends with the vein wrapped together as a thick plug on the stripper's hard 'acorn' shaped head, traumatizing the surrounding tissues. It leaves behind a large tunnel in which blood accumulates. This causes postoperative pain and the subsequent convalescence is prolonged. This thick

tissue plug can cause damage to the adjacent lymphatics and nerves. Removal of the tributary varicosities requires separate and generous incisions which may also produce unacceptable scarring. Since this is usually performed under general anaesthesia in a hospital setting, this classical approach is also expensive. Coupled with the emphasis on maximal preservation of the main saphenous trunk as possible future vascular graft material, the 'routine' and 'blind' ankle-to-groin stripping becomes 'overkill' in most cases.

The purpose of this article is to present a haemodynamically correct surgical protocol for treatment of primary varicose veins as an alternative to routine and blind stripping. It calls for the ligation of the most proximal source of reflux, such as sapheno-femoral or sapheno-popliteal junctions, only when there is demonstrated incompetence. The report describes the technique of the limited (knee-to-groin, rather than ankle-to-groin) and less traumatic invaginated form of axial stripping, in conjunction with tributary hook (stab avulsion) phlebextraction. It is a more detailed protocol than the one previously described². Using the paravascular technique of lumbar plexus anaesthesia, the 3-in-1 femoral block

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with supplemented local infiltration and performed in an ambulatory (office) setting, the method has placed varicose vein surgery in the realms of minimally-invasive procedures.

Patients and methods

Two hundred and fifteen patients with primary varicose veins with a total of 261 limbs were seen in a private phlebological practice between May 1990 and May 1992. All patients were evaluated by physical examination and non-invasive continuous wave (cw) Doppler ultrasound venous studies. Of these patients 187 (87%) were female and 28 (13%) were male; 146 (68%) were less than 50 years old, 69 (32%) were 50 years or older; 169 (79%) had unilateral and 46 (21%) bilateral involvement; 122 (47%) were right, and 139 (53%) were left legs for a total of 261 involved limbs.

Three major groups of varicosities were identified:

Group I. 180 (69%) legs had varicose veins in the territorial distribution of the long saphenous vein. A sapheno-femoral junctional (SFJ) escape was found in 124 (69%) limbs. It was associated with concomitant saphenous trunk incompetence exhibiting various degrees of reflux in only 90 limbs. In 34 limbs the main saphenous trunk was found normal and competent with varicosities limited to the medial and lateral accessory veins. Non-junctional escape points were detected in the remaining 56 (31%) limbs; no escapes could be detected in 21, a mid-thigh perforator (MTP) escape was found in 13, and pelvic escapes (belonging to the territorial distribution of the internal iliac vein) were detected in 22 limbs.

Group II. 29 (11%) legs had short saphenous varicosities and sapheno-popliteal junction (SPJ) incompetence was found in all of them.

Group III. 52 (20%) legs had nonsaphenous varicosities. The varicose veins were mainly limited to the lateral thigh venous system.

Preoperative assessment

A careful preoperative examination was mandatory in order to tailor the procedure appropriately to the haemodynamic pathology of each patient. The clinical examination alone (observation, percussion wave, Trendelenburg test, etc.) may not accurately identify all the components of the regurgitant circuit³. Therefore, a cw bidirectional Doppler ultrasound examination (Parks Vascular Mini-Lab III, model 1059, Aloha, OR), performed with the patient standing, is mandatory in all cases to detect venous flow, pathway of incompetence and the most proximal escape point accurately. Duplex imaging (Biosound Phase 2, Biosound, Indianapolis, IN) was only used in cases in which it was believed that the clinical and Doppler examination failed to provide the required information. It was also used for mapping the long saphenous vein in cases where stripping was contemplated. The detailed clinical and noninvasive examination protocol has been published elsewhere^{2,4}.

The technique

Special instrumentation

The operation is designed to be performed in an ambulatory or office setting, to cause minimal trauma, little or no convalescence, and result in maximal cosmesis. Specially devised hooks in different sizes have been introduced by different practitioners such as Muller*, Oesch†, Varady‡ and Villavicencio§. These hooks permit removal (avulsion) of varicosities via minute incisions, not longer than 1.5–3 mm, which do not require sutures. The surgical tray should also have the 'mini strippers' introduced by Varady and Villavicencio, the Varady phlebodissector(s), straight and curved baby Kochers or Halsted's to assist in grasping the veins, and regular mosquito forceps.

Preoperative marking

With the patient standing in a warm room all veins are marked with an indelible marker. A successful procedure demands precise and accurate marking, therefore the operating surgeon should do it in person. The most proximal escape point is revalidated with Doppler ultrasound and marked too. If stripping is contemplated, duplex mapping of the long saphenous vein is helpful to mark the entry sites of its tributaries precisely.

Loco-regional anaesthesia

After the leg is cleansed and draped, local anaesthesia is obtained using either lidocaine HCL (Xylocaine) 1% of bupivacaine HCL (Marcaine) 0.25%. In the event that stripping of any length of the long saphenous trunk is required, the paravascular technique of lumbal plexus anaesthesia, or the 3-in-1 block introduced by Winnie⁵ is performed. This requires 20–40 ml of Xylocaine 1% delivered via a 22 gauge, 1½ inch long needle. Mepivacaine (Carbocaine) 1% which has less systemic toxicity is also an excellent anaesthetic choice.

This is a modification and refinement of the standard femoral block anaesthesia and has been successfully used in varicose vein surgery, including stripping^{6,7}. When successful, this technique will ensure complete anaesthesia of not only the territorial distribution of the femoral (and saphenous), but obturator and lateral femurocutaneous nerves as well, resulting in skin anaesthesia of the entire antero-medial aspect of the limb down to the ankle. However, should ligation of the sapheno-femoral junction be necessary, this form of nerve block will not provide anaesthesia of the groin area, which should be separately infiltrated. In case stripping/removal (proxi-

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mal third being usually sufficient) of the short saphenous vein is necessary, simple local infiltration of the vein's track will be sufficient. Ligation of both junctions, as well as avulsion of the tributaries is done with simple local infiltrative anaesthesia.

The customary anaesthetic used is lidocaine HCL (Xylocaine) 1% and it is delivered through a 22 gauge spinal needle. In order to avoid possible systemic toxicity and dose and volume limitations, dilution (in normal saline) of the commercially available 1%, to 0.5% and even 0.25%, should be done. The pH of Xylocaine is acidic, which is a source of patient discomfort. Therefore, 5 ml of 8.4% sodium bicarbonate is added to the original 50 ml to minimize pain. Bupivacaine HCL (Marcaine) 0.25%, a long acting agent, is another excellent choice for anaesthesia for the ligation of the junctions as well as for avulsion of the varicose tributaries. Dilution of the commercially available 0.25% solution to 0.125% can be used without diminished efficiency. Sodium bicarbonate will precipitate with Marcaine and should be avoided. Marcaine should not be used for regional (femoral 3-in-1) block anaesthesia due to possible transient quadriceps motor paresis, and inability to ambulate for 4–8 h. The addition of epinephrine, especially to Xylocaine, could result in delayed reabsorption, lower chances of systemic toxicity, and provide a longer lasting anaesthesia with a reduced anaesthetic volume. However, due to the possible secondary effects of epinephrine such as palpitations, chest discomfort, etc. its use in our office setting was omitted. Patients drive to and from the office, therefore premedication is not routinely administered. Anxious patients can be premedicated with 5–7.5 mg of per os diazepam (Valium). All patients ambulate immediately and leave the office 15–20 min after the procedure. Patients receiving premedication are, however, forbidden to drive themselves after the surgery. Due to dose limitation of the local anaesthetic, a bilateral case is never operated on in the same session.

Division of the proximal escape point – the high ligation

When incompetence is detected, a flush ligation of the saphenous vein at the junction(s) is the sine qua non of successful varicose vein surgery. Failure to perform the juxtafemoral or juxtapopliteal ligation properly, or failure to identify, divide and ligate the existing tributaries properly was found to be responsible for causing recurrent varicosities in more than 70% of cases⁸. A detailed description of the techniques of both junction ligation has been previously published².

Invaginated axial stripping

Blind ankle-to-groin stripping of cases of long saphenous varicose veins is rarely necessary. In most of our cases, short groin-to-(below)-knee stripping was all that was haemodynamically necessary. This is in concordance with other reports^{9–11}. We perform the invaginated stripping using the flexible mini vein stripper of Varady. It has three interchangeable heads, all smaller than the

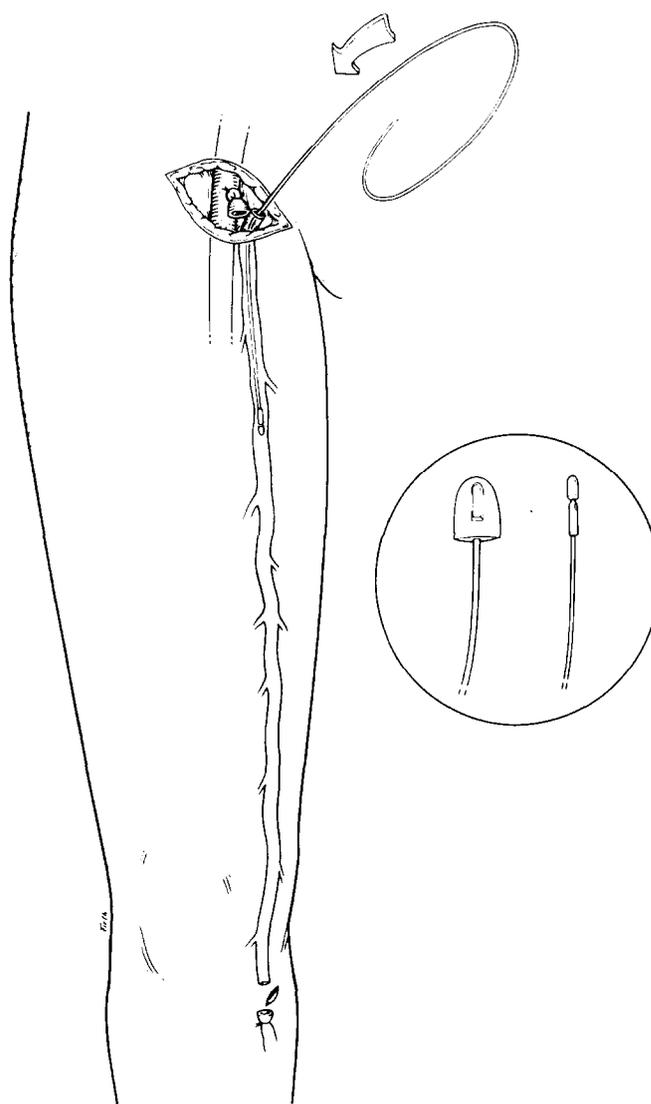


Figure 1. The Varady intraluminal mini vein stripper. Insert: its relation to the Codman disposable stripper head.

saphenous vein lumen. The instrument is always passed in a retrograde (from above downward) fashion (Figure 1) through the already transected juxtafemoral end of the long saphenous vein and is removed, just beneath the knee, through a 2–4 mm stab incision (tip of an 11 blade) with the help of the phlebextractor hooks previously described. Placement of this below-knee incision is guided by the previously marked vein as well as by palpation of the intraluminal stripper through the skin. With the stripper protruding from the lumen the distal end of the vein is tied to the stripper's small head with a $\frac{1}{8}$ in silk (umbilical) tape. The tape should be twice as long as the vein segment to be stripped. For cosmetic reasons, the saphenous trunk is normally stripped and removed through the already existing groin incision (Figure 2). If the stripper cannot be passed from above downward, the vein is exposed in the same place and the same way. The stripper is then passed in an orthograde (from below upward) fashion.

Tearing of the vein is minimized by avulsing and dis-

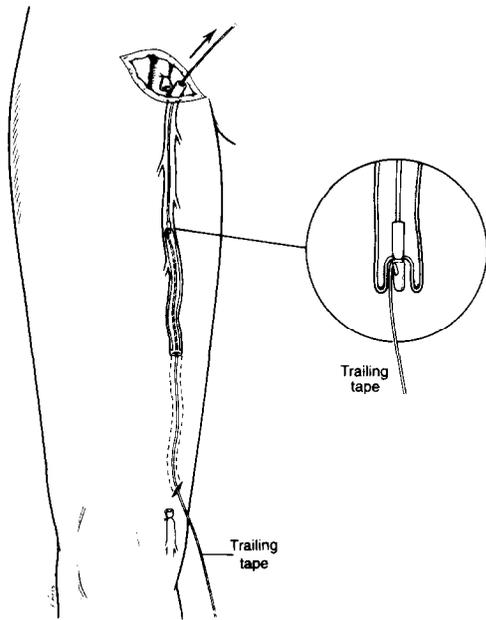


Figure 2. Invaginated knee-to-groin stripping. Insert: the trailing tape tied to the distal end of the vein.

connecting joining tributaries which anchor the saphenous trunk. In addition to the judicious preoperative duplex mapping, a continuous and gentle traction on the stripper, emerging with the vein turned inside out through the groin incision, will reveal their exact location by causing puckering of the skin above each tributary. To be effective, the tributary avulsion or disconnection should be done as close as possible to the vein trunk, using the same phlebextraction hooks and minimal incisions.

The moment the vein, turned inside out, becomes visible in the groin incision the traction on the stripper is exchanged for direct traction on the vein trunk itself, using two small grasping forceps. If, in spite of all these precautions the vein has torn, the stripper is removed in its entirety through the groin incision. The upper end of the exteriorized tape, localized in the vein's lumen, is tied into a knot, while the juxtafemoral end of the vein is firmly attached to it with the help of a second long 'trailing' tape. By pulling on the tape protruding from the below-knee skin opening, stripping of the retained segment is completed (Figure 3). However, for better cosmesis, the trailing tape will enable the delivery of this vein segment in an orthograde fashion through the still open groin incision as described by Conrad¹². In case technical difficulties preclude axial stripping, the previously mapped and marked saphenous trunk can be avulsed in segments using the hook phlebextraction technique that will be described below. The invaginated ankle-to-groin stripping should not be done in one single step. The above described technique should be repeated in those cases where stripping of the infrapopliteal segment of the long saphenous vein is required. For similar

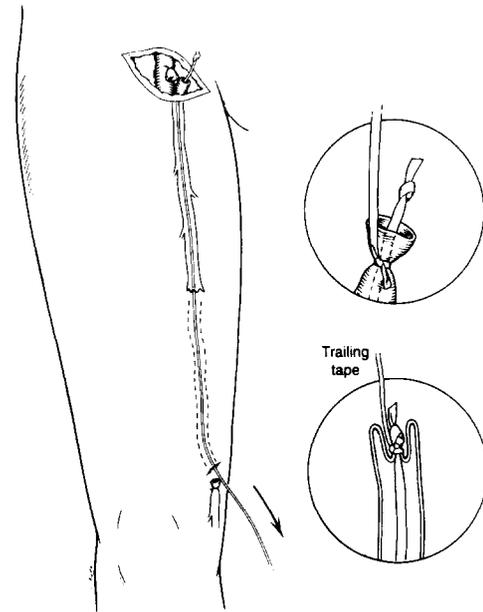


Figure 3. The torn long saphenous vein trunk is removed with the intraluminal trailing tape. Inserts: the attachment of the two tapes to the upper end of the vein.

reasons, the ankle incision, rather than the below-knee skin opening, is used for the delivery of the stripped segment. A detailed, but somewhat different variation of the technique, using a nylon thread instead of silk tape was recently published¹³.

Stripping the entire length of the short saphenous vein trunk is rarely necessary. In most cases the removal of the proximal refluxive third will be sufficient. This can be accomplished by a limited stripping following the guidelines previously described for the long saphenous vein. Occasionally, avulsion of the short saphenous vein trunk through the incision used for the ligation of the SPJ, is possible as well. With patient in a prone position, maximal flexion of the knee (90°), is however necessary for removal of short saphenous vein segments 10 cm or longer.

Stab avulsion tributary phlebectomy

Due to their superficial location, i.e. just below the skin and above the membranous fascia, tributary varicose veins are easily amenable to avulsion by hook phlebextraction. With an 11 blade tip held in a Kelly or a mosquito forceps, or even with an 18 or 16 gauge needle, a small 1–3 mm long stab (puncture) wound is made along the border of the previously marked varicosities, making sure that the dermis is split as well (Figure 4). Due to the small openings, no special effort is made to stay in the Langer's lines. Whenever possible, however, the skin incisions should be made along the longitudinal axis of the leg. The exception is the area surrounding the knee where the stab wound should be placed transversally parallel to Langer's lines.

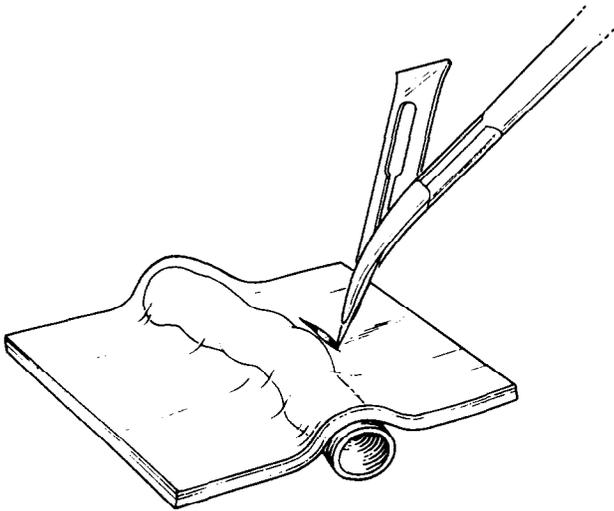


Figure 4. The preferred mode of holding the tip of the 11 blade with a small mosquito forceps.

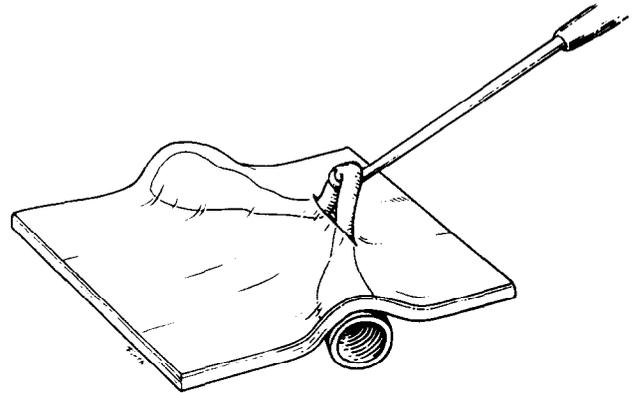


Figure 6. The varicose vein loop is exteriorized.

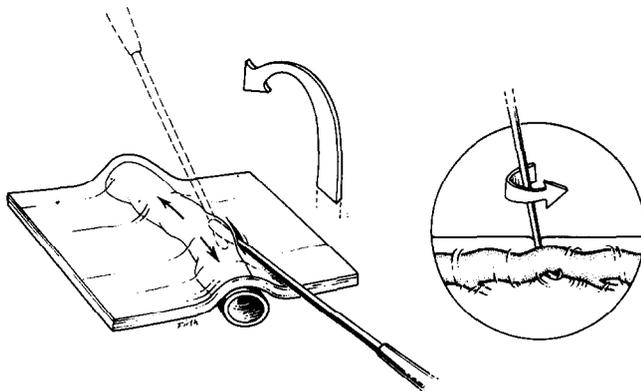


Figure 5. The Varady phlebodissector introduced through the stab wound is freeing the varicosity from the subcutaneous tissue along its longitudinal axis. Insert: the introduced hook is engaging the varicosity.

The Varady phlebodissector is introduced through the skin openings and pushed up and down along the longitudinal axis of the varicosity. With gentle forward and rotating movements, the varicosity is freed from its attachments to the subcutaneous tissues. With the help of the existing hooks which are introduced into the skin openings, the varicosities are engaged (hooked) and teased to the surface of the skin (Figure 5). Concomitant gentle counter traction of the skin by the thumb of the non-dominant hand will facilitate exteriorization of the varicosity (Figure 6). Occasionally, the hook will only engage the adventitia, making it difficult to deliver the varicosity. In such cases the skin opening should be

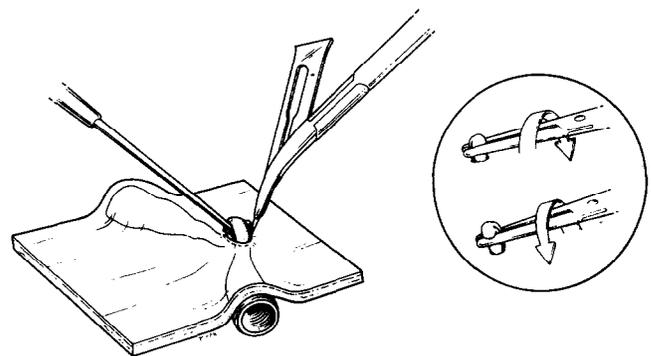


Figure 7. When difficulty is encountered in delivering the vein, the skin opening is enlarged. Insert: grasping the varicosity with a mosquito or Kocher forceps. The 'to and fro' twisting movements will facilitate the delivery of the vein.

slightly enlarged and the vein grasped with a forceps. To and fro forceful twisting movements, by pronation and supination of the wrist holding the forceps, will help exteriorize the vein (Figure 7). The two limbs of the exteriorized vein loop are separated and individually grasped with two small mosquito or baby Kocher clamps, and transected with a Metzenbaum scissor (Figure 8). With the varicosity in slight traction, the phlebodissector can be reintroduced into the skin opening to further dissect the vein away from its subcutaneous attachments. Gentle pulling on each limb separately, or rotatory and/or to and fro rocking movements, or even twisting the vein on the grasping forceps, will further exteriorize additional lengths of varicosities, which are avulsed. In case of small diameter and/or fragile veins, avulsion of both limbs should be done concomitantly (Figure 9). Using both these movements, it is possible to remove (avulse) up to 5–6 cm and even

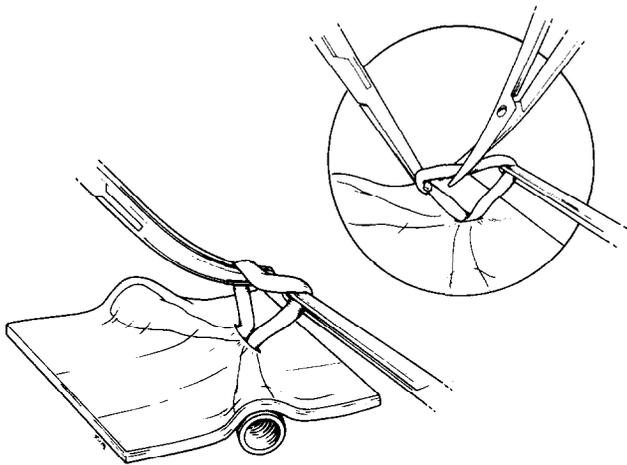


Figure 8. The two limbs of the varicose loop are individually grasped. Insert: the varicose loop is transected with a Metzenbaum scissor.

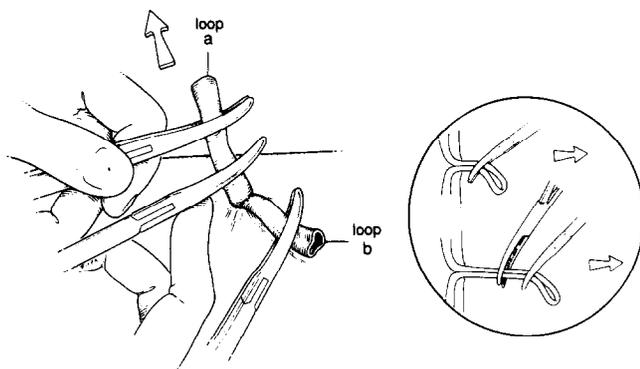


Figure 9. Preferably each limb is separately avulsed. Insert: In case of small diameter and fragile veins the avulsion is done by simultaneously pulling on both limbs of the loop. No ligatures are needed.

longer segments of vein through each stab wound. Ligation of the vein ends is not necessary.

The procedure is repeated as often as needed (20–40 times), until all the marked tributary varicosities of the limb are removed. To facilitate locating the varicosities, in addition to the preoperative markings, slight traction applied on the forceps while pulling on the vein, will enable one to palpate the varicosity 1–2 in below or above the stab wound. This taut cord-like palpatory finding is an excellent guide for placing the next stab wound and should override the preoperative marking of the veins in case the two do not coincide.

In case the veins are tightly anchored and cannot easily be teased out, one should alternate the different types and sizes of hooks. Personal experience will lead one to favour one type or another. In our hands, for the more

superficially located veins the Oesch hook proved to be the best, while for deep-situated varicosities and especially the saphenous trunks, the Muller hook seemed to be better. Right-handed surgeons should use right-handed hooks. A right-handed Oesch hook, used in the left hand in a 'back-hand' fashion, can be beneficial when the hook, held in the right hand, missed the marked vein. Bleeding is usually minimal and slight finger pressure, for a few seconds, will easily control any heavier oozing. The stretching of the vein wall, and particularly the intima, results in an excellent haemostatic plug. Elevation of the limb during the procedure is not required.

Stab evulsion truncal saphenectomy

In the majority of cases the incompetent saphenous trunk is removed via the previously described invaginated stripping. Occasionally this is impossible and the saphenous vein trunk itself is removed by the stab avulsion technique previously described for the tributary varicosities. In the thigh, the long saphenous vein trunk is situated deeper, i.e. beneath the membranous fascia, therefore, engaging the vein with the hooks may be difficult, especially in overweight patients. Careful preoperative marking, occasionally supplemented with duplex mapping of the vein will facilitate this stage of the operation. Following the juxtafemoral flush ligation and with the operative wound still open, the ipsilateral hip is flexed, abducted, and the knee flexed and outwardly rotated. Moderate traction is applied to the distal stump of the long saphenous vein. In thin patients, the thigh segment of the vein is now easily palpated, or visible, as a taut cord, causing puckering of the skin. A stab wound is made along the border of the palpated vein and with the aid of the biggest size Muller or Oesch, or the smallest Villavicencio hook, the vein is engaged, exteriorized, and transected. It is often possible to remove 7–10 cm segments of vein. This manoeuvre is repeated until the desired length of the saphenous trunk is avulsed. If the vein cannot be hooked despite traction, the flexible mini-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 engaged by the phlebextraction hooks. Likewise, no ligatures are necessary on the evulsed vein ends.

The avulsion of the infrapopliteal segment of the long saphenous vein trunk may be more difficult than the thigh segment because of possible attachments to the deep pretibial fascia.

Dressing and postoperative care

The skin is cleaned, dried and the stab wounds closed with narrow steristrips. This is then covered with Tegaderm sheeting. Direct pressure with cotton balls, taped to the Tegaderm, over the stab wounds is used to control possible bleeding. The balls are applied on top of the Tegaderm sheet and secured with hypoallergenic tape. The entire leg is placed in a groin level, with waist attachment, 30–40 mmHg gradient elastic stocking. An extra

outer layer of Coban self-adhering wrap dressing (3M) is applied over the stocking to promote a tighter haemostatic 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 h when the haemostatic cotton balls are removed. The skin dressing and the stocking are kept on the leg for one week only. The first night the patient sleeps with the entire external dressing, thereafter, the stocking is used only during the day.

If the incisions are small, the scars will be almost invisible after 3–4 months. With patients that are known to develop keloids, the stab wounds should be kept as small as possible. In our experience, topical application of a combination of equal parts (5.0 gm) of hydroquinone (Solaquin Forte) 4% gel with clobetasol propionate (Temovate) 0.05% cream and tretinoin (Retin-A) 0.1% cream, might be beneficial in minimizing keloid formation and occasional hyperpigmentation. It is applied twice daily for 2–3 months.

After care

Patients leave the office 15–20 min after the procedure. Post-surgical discomfort is usually minimal and 1–2 tablets of 200 mg ibuprofen (Advil, Motrin) suffices for pain control in the evening after surgery. No leave of absence from work is necessary. All patients are permitted to resume normal daily activities, including returning to work, on the same day of the surgery. Patients are permitted to resume all sporting activities as well, except weight lifting, on the first post operative day. Showering is permitted 24 h after surgery with proper leg coverage. Obligatory follow-up visits are at 1 week, 2–3 weeks and 2–3 months after surgery.

Complications

Transient neurologic complications from the loco-regional anaesthesia can occur. Motor fibres of superficial mixed nerves (femoral, peroneal) may be affected, especially when higher concentrations of anaesthetic are used. After femoral block anaesthesia, the tone and strength of the ipsilateral quadriceps muscle should be checked before the patient is asked to stand up. Nerve palsies are invariably transient, clearing within several hours. Permanent nerve damage can occur only if a nerve is inadvertently hooked and avulsed.

Bleeding from the wound sites might occur. This is likely to manifest itself immediately following surgery when the patient stands up. As a precaution, patients are asked to walk in the office 10–15 min after surgery and are re-examined before leaving. If bleeding does occur, it can be readily controlled by additional pressure with reinforcement of the pressure dressing.

A phlebotic reaction may occur days or weeks after surgery and is due to a retained and clotted vein that was partially avulsed or missed. Incision and drainage of a fresh clot, local compression, ambulation and po 800–

1200 mg ibuprofen (Motrin) qd for 3–5 days, will resolve the symptoms.

Lymphatic accumulations (lymphocele) or fistulas, wound infection, hypertrophic scarring, have been reported.

Relative contraindications

Veins encased in dense fibrotic tissue or previous scar may be difficult to avulse. These include varicose veins in the gaiter or ankle area with liposclerotic skin, post sclerotherapy veins, post surgery residual veins, post phlebotic veins, as well as prepatellar and pretibial veins that may be closely attached to the fascia. In these cases, compressive sclerotherapy may be indicated.

Results

All 261 varicose limbs were operated on in an office setting and under loco-regional anaesthesia as described. The 209 limbs with (long and short) saphenous vein varicosities, 166 (80%) limbs with a clearly detectable proximal escape (124 incompetent SFJ, 29 incompetent SPJ and 13 incompetent MTP), were all divided and ligated and existing tributaries were properly identified and disconnected.

Of 180 limbs with long saphenous varicosities, removal (saphenectomy) of the incompetent saphenous trunk by stripping (or stab avulsion) was required in only 71 (40%) limbs: 52 of 124 limbs displaying SFJ incompetence, all 13 with MTP incompetence, 4 of 22 with pelvic escapes and 2 of 21 with ill-defined escapes. Of 71 limbs that required axial saphenectomy, 10 (6%) were total (ankle-to-groin) while 61 (34%) were limited (groin-to-knee). Of 29 limbs with short saphenous varicose veins, complete saphenectomy was mandated in one limb only; in the remaining 28, removal of the incompetent proximal third was sufficient to control the high pressure backflow properly. The total number of saphenectomies was therefore mandatory in only 100 (48%) of 209 limbs with saphenous varicosities; 89 (43%) were limited and 11 (5%) were complete saphenectomies. Stab evulsion tributary phlebectomy was performed in all 261 (180 long saphenous, 29 short saphenous and 52 non saphenous) varicose limbs.

Forty (15%) limbs were followed between 2 and 3 years, 137 (53%) between 1 and 2 years and 84 (32%) limbs were followed up to 1 year.

Neurologic complications were detected in six patients. Five developed transient nerve palsies as a result of the loco-regional anaesthesia. In two patients the peroneal nerve adjacent to the fibular head was inadvertently anaesthetized and in three patients quadriceps palsy occurred after a femoral 3-in-1 block. All symptoms resolved within a few hours. The only patient that underwent complete removal (hook phlebectomy) of the short saphenous trunk was left with a limited sensory deficit in the territorial distribution of the sural nerve.

Three patients had immediate bleeding from wound sites when they stood up from the operating table. Bleed-

ing was promptly controlled by pressure reinforcement of the external dressing. In one case of delayed bleeding, manifested by bleeding from the groin incision, wound exploration disclosed a slipped ligature from the distal end of the long saphenous vein.

Localized superficial phlebitis occurred in six patients, 1–2 weeks following surgery, and presumably caused by a clotted vein segment left in situ. The reaction resolved within 5–7 days following therapy with ibuprofen (Motrin) 800–1200 mg day⁻¹, compression, and continued ambulation. Nine patients had residual varicose veins which were obvious 1–2 weeks following surgery. Five patients with larger varicose segments had avulsion under local anaesthesia when they were detected. Three patients with smaller residual varicosities were treated by compressive sclerotherapy, with total obliteration.

Two patients developed pretibial small lymphatic collection or lymphocele. They were treated with needle aspiration, sclerotherapy (sodium tetradecyl sulfate – Sotradecol 1%) and local compression resulting in total reabsorption in 2–3 weeks. Prophylactic antibiotics were not used, and there were no wound infections. No deep phlebitis or pulmonary emboli was encountered. As of yet there have been no recurrent varicose veins identified.

Discussion

Since the beginning of the century, stripping of the long (and short) saphenous vein has been widely used in the surgical management of primary varicose veins. Keller¹⁴, Babcock¹⁵ and Mayo¹⁶ are among the early pioneers. The techniques used subsequently can be summarized by the following four steps: (a) division of the saphenous vein and ligation of the junction(s); (b) stripping (internal) of the entire saphenous vein; (c) excision and ligation of the varicose tributaries and (d) division and ligation of all incompetent perforators.

Unfortunately, the rationale for this procedure, even today, is based on the assumption that all varicose vein patients have a junctional valve escape, i.e. sapheno-femoral (SFJ) or sapheno-popliteal (SPJ) incompetence, and that the entire saphenous vein trunk is incompetent. This makes high ligation and routine ankle-to-groin (or to the popliteal fossa) stripping mandatory for all forms of truncal varicosities. However, the recently accumulated haemodynamic and topographic data on varicose veins clearly contradict most of these assumptions^{2,4,10,17}.

Bjoridal¹ clearly demonstrated that haemodynamically significant distal perforator systolic (deep-to-superficial) outflow is nonexistent in uncomplicated primary varicose veins, making the search and the wholesale ligation of perforators a futile surgical exercise in varicose vein surgery. Moreover, the distal ankle perforators connect with the posterior arch vein, which is a tributary, rather than with the infrapopliteal segment of the main saphenous vein. Avulsion of the varicose tributaries in the calf will, therefore, automatically disconnect any outflowing distal perforator. Additionally, the infrapopliteal segment of the saphenous vein, in many instances, was not found to be involved in the variceal process¹⁸.

This relatively new topographic and haemodynamic data, coupled with the quests for maximal preservation of the main saphenous trunk as possible vascular graft material, make the classical routine and blind ankle-to-groin stripping 'overkill'. The limited groin-to-knee stripping that we usually perform is haemodynamically satisfactory in most forms of primary varicose disease^{9–11}. The detailed haemodynamic principles of surgical care for primary varicose veins have been the subject of previous communications^{2,4,19}.

The principles of stab avulsion were independently introduced by Muller^{20,21} and Rivlin⁹. Muller coined the term 'phlebectomie ambulatoire' or ambulatory phlebectomy and Rivlin named the procedure 'multiple cosmetic phlebectomy'. Both used small existing or makeshift instruments to grab and avulse the varicosities through small skin openings. While Muller was the first to introduce his modified crochet hooks that facilitated the removal of the varicosities through even smaller (1.5–3 mm) incisions, it was Rivlin, in 1975, who reported an excellent 10 year recurrence rate of 7% in 1993 operated varicose limbs. Oesch^{22,23} ('mini-incision phlebectomy') and Varady^{24,25} ('micro-surgical varicectomy or phlebextraction'), designed different hooks. The term 'stab avulsion venectomy' was coined by Large^{26,27} in 1985. Thus the 'ambulatory stab avulsion phlebectomy' is a combination of already existing terminology that seems to us to correctly reflect the true character of the procedure.

In the face of recently published evidence that sclerotherapy, in any of its forms, is not a definitive therapeutic alternative for truncal varicose veins due to the high recurrence rates^{28–31}, surgery remains the treatment of choice for primary varicose veins. The invaginated form of stripping in conjunction with tributary stab avulsion (hook) phlebextraction does not necessitate any haemodynamic compromise¹⁹. On the contrary, it is a haemodynamically correct procedure, provided the preoperative examination is judiciously executed. Using loco-regional (femoral 3-in-1 block) anaesthesia and performed in an ambulatory (office) setting, the method has placed varicose vein surgery in the realms of minimally-invasive procedures.

Elimination of hospitalization, reduced postoperative morbidity, immediate ambulation, lack of nerve damage, excellent cosmesis and finally, obvious cost efficiency should make this unique form of varicose vein surgery appealing to surgeons and patients alike.

Summary

The surgical management of primary varicose veins is evolving. Recovery time, cost efficiency, level of trauma, recurrence rate and cosmesis are critical determinants. The classical and conventional high ligation and blind ankle-to-groin stripping are associated with hospitalization and general anaesthesia, long convalescence, loss of income, unacceptable scarring and possible permanent nerve injury to the long saphenous or sural nerve.

The selective high ligation and invaginated axial stripping performed in conjunction with tributary stab avul-

sion (hook) phlebectomy is a haemodynamically sound procedure provided it is preceded by an accurate Doppler ultrasound mapping of the existing regurgitant circuit. Postoperative pain and complication rate is minimal. Convalescence is eliminated and all patients are capable of immediately resuming normal daily activities. Cosmesis is excellent and nerve damage is eliminated. Performed in an ambulatory (office) setting and under loco-regional anaesthesia the cost efficiency of the approach is obvious. It is our belief that stab avulsion (hook) phlebectomy is a major advance in varicose vein surgery and it will rightfully become standard of care.

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