Treatment of Varicose Veins

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Abstract: Varicose vein is a condition that was first described about 1550 BC. The mechanism of varicose vein formation is reflux of blood into the superficial venous system through the perforating veins, including both saphenous veins. Although very common, the etiology of this reflux remains unclarified. The disease progresses slowly from mild swelling of the leg to lipodermatosclerosis and venous ulcer formation around the ankle joint. The mainstay of conservative treatment is compression applied by elastic stocking. Although sclerotherapy has become popular in Japan, its usefulness in the presence of saphenous reflux is questionable. While many patients seek treatment for cosmetic reasons, the absolute indication for operative intervention is changes in the skin. Stripping of the saphenous veins accompanied with varicectomy is a time-honored treatment, and the introduction of segmental stripping has eliminated the once-common complication of saphenous neuralgia. In the presence of dermal sclerosis or venous ulcers, the major drawback of the classical Linton’s operation was a high rate of wound dehiscence and infection. The recent innovation of endoscopic subfascial division of incompetent perforators and removal of saphenous veins (SEPS) has eradicated the complications and helped to promote patient comfort.

Key words: Varicose vein; Stripping; Sclerotherapy; SEPS

Introduction

Varicose veins of the lower limbs have a long recorded history. The oldest known description of this condition is found in Ebers Papyrus, which has been dated to approximately 1550 BC. In addition, legs with bulging varicose veins appeared on a lithograph from the Acropolis of Athens in the fourth century BC. This historical lithograph is often used in brochures of academic meetings related to veins. A 1992 survey carried out in London of people aged 35–70 years revealed that 17% of men and 31% of women had varicose veins. In Japan, varicose veins occur less frequently, but the condition is fairly common and it is not rare to find people who exhibit it on the street. Varicose veins are more common in women,
particularly in the early stage of pregnancy, suggesting the involvement of progesterone. According to a previous survey by the Conjoint Meeting on Vascular Surgery, the male:female ratio of patients with varicose veins in Japan was about 1:3, and patients aged 30 years or older accounted for 96% of cases.3)

Anatomy and Physiology

The muscles of the lower limbs are covered by the fascia lata and the fascia cruris. Veins lying shallower and deeper than these fascias are called, respectively, superficial veins and deep veins. The main superficial veins include the greater and lesser saphenous veins, both of which have many branches. The greater saphenous vein flows into the femoral vein at the fossa ovalis in the upper part of the thigh, whereas the lesser saphenous vein flows into the popliteal vein at the popliteal fossa. In addition, many communications, known as perforators, exist between the superficial and deep venous systems. Venous valves in the perforators are arranged in the direction of blood flow from the superficial to deep veins. The greater and lesser saphenous veins can be regarded as perforators in view of their function.

Etiology and Pathophysiology

Dilated tortuous veins are called varicose veins regardless of their size. Secondary varicose veins include superficial veins dilated as collateral pathways owing to deep venous thrombosis, those associated with arteriovenous fistula, and those resulting from congenital vascular anomaly. Varicose veins not caused by these conditions are called primary varicose veins. Most of the commonly observed varicose veins are primary.

Although primary varicose veins are frequent, the pathogenesis is controversial and has not been well established. The development of varicose veins formerly was explained by a mechanism through which the hydrostatic pressure of blood disabled the valves of the greater saphenous vein serially in a descending manner. If this hypothesis were true, varicosity of the greater saphenous vein should precede tributary vein varicosity. In actuality, however, some cases do not present dilatation of the greater saphenous vein. Moreover, it is apparent that varicosity of the main stem of the greater saphenous vein begins with dilatation of the vein just beneath a valve rather than above a valve, creating another inconsistency in the above hypothesis. In addition, the greater

Fig. 1 Lipodermatosclerosis accompanied with brown pigmentation
Sites of perforators are marked.

Fig. 2 Venous ulcers
Ulcers occur predominantly on the medial side of the leg above the ankle.
saphenous vein is often used as an arterial bypass conduit. It is known that no varicose dilation occurs in normal greater saphenous vein grafts that have been under arterial pressure for years. Other suggested mechanisms include arteriovenous fistula, metabolic disorder of the venous wall, and incompetence of perforator veins. In addition, adhesion and activation of leukocytes and enzyme abnormalities have been cited recently as possible mechanisms. In any case, the venous wall itself is considered to be vulnerable in patients with varicose veins.

Clinically, varicose veins occur more frequently in women, particularly in early pregnancy, as mentioned previously. In relation to occupation, the condition is common in jobs associated with prolonged standing, for example, among those who work in restaurants, factories, and the like. Familial occurrence of varicose veins is also observed.

Venous varicosities range widely, from simple types to those accompanied with edema, eczematoid changes, pigmentation, lipodermatosclerosis (hardening of the skin and subcutaneous tissue), or venous ulcers (Figs. 1 and 2). Patients may perceive no symptoms, or may complain of heaviness, fatigue, itching, or pain. Female patients often notice the severest symptoms on the first day of their menstrual period, suggesting hormonal involvement.

It is important to note that no correlation exists between the apparent severity of varicosities and subjective symptoms. Some patients who have prominent varicosities may report hardly any symptoms, whereas others who have modest varicosities may have severe dermal changes and experience severe pain. The latter patients are considered to have tensed varicose veins even if they are mildly tortuous, resulting in a state of venous hypertension. The presence of varicosities may not be detected visually or by palpation when dermal sclerosis is severe. In such cases, ultrasonic tomography using a high-frequency probe reveals varicose veins subcutaneously at the site of skin pigmentation.

Skin lesions occur frequently on the medial side of the leg just above the ankle joint (gaiter area). This locational feature is in contrast to the location of ischemic ulcers resulting from insufficiency of arterial blood flow, which frequently occur in toe tips and heels. Venous ulcers do not reach the crural fascia, another characteristic feature. Unlike ischemic ulcers, venous ulcers are often painless, and thus may be left untreated for a long period of time.

Treatment
1. Indications
As mentioned previously, the subjective symptoms of varicose veins are not well correlated with the apparent severity of varicosities. Furthermore, patients may seek medical consultation for cosmetic reasons (“unsightly”, “show when wearing a skirt”), even if they have no pain or other symptoms. In our opinion, the treatment of varicose veins should be indicated for the following conditions.

First, dermal changes including eczematoid changes, pigmentation, skin sclerosis, and ulcers are absolute indications for treatment, particularly surgical treatment, because they progress to intractable ulcers if left untreated. In addition, surgery is recommended for cases of bleeding from ruptured varicosities, past history of thrombophlebitis, and varicosities measuring 2 cm or more in diameter and thus at risk for developing thrombosis. Otherwise, treatment is implemented only when the patient requests it. Patients who complain of pain or fatigue often experience relief of symptoms after treatment. However, patients who request treatment for cosmetic reasons should clearly understand that surgical treatment causes scarring and that sclerotherapy is frequently associated with recurrence.

2. Conservative treatment
The basis of conservative treatment is compression therapy. Elastic compression stockings designed for patients with varicose veins are currently in widespread use. These stock-
ings provide graded pressure, with the greatest pressure at the ankle and less pressure in the upper parts. These types of stockings were first developed by Conrad Jobst in the 1950s. Jobst, who himself suffered from varicose veins, realized that his symptoms were improved by standing in a swimming pool, and he subsequently developed the elastic stockings.\(^4\) Compression therapy is worth trying as the initial treatment in patients who have relatively mild varicosities not accompanied with dermal changes. Weariness and heavy sensation of the legs may be improved to a great extent. If the patient’s compliance with the elastic stockings is favorable, he or she may be followed without any other treatment. The use of stockings also aids in preoperatively predicting the efficacy of surgical treatment (surgical procedures will be discussed later). Specifically, if the patient’s symptoms are improved by the stockings, the symptoms are very likely attributable to varicose veins, and thus surgery is expected to be effective.

Various types of elastic stockings are available. Long stockings covering the thigh are used for patients who have large varicosities in the femoral region, as in Klippel-Trenaunay syndrome. However, such long stockings are apt to slide down and can be inconvenient. Therefore, for the treatment of general varicose veins, below-knee stockings are practical, are associated with minimal sliding, and provide adequate efficacy even when some varicosities are present in the thigh as well. Stockings that provide 40 mmHg of pressure at the ankle are generally used. Among medical elastic stockings, moderate compression stockings are recommended.

One drawback of compression stockings is their price, generally 8,000–10,000 yen per pair. Since the stockings are not covered by health insurance in Japan, the patient must assume the entire cost. However, below-knee stockings that offer about 30 mmHg of compression have recently been marketed at prices less than 2,000 yen. These seem to be effective for mild cases. Patients are instructed to remove compression stockings at bedtime and sleep with the lower limbs elevated.

3. Sclerotherapy

Sclerotherapy has a relatively long history. It was introduced in the late 1920s, because the technique of greater saphenous vein extraction, which was introduced at the beginning of the 20th century, was initially associated with frequent complications. However, sclerotherapy showed a recurrence rate as high as 60% at 5 years, even when combined with high ligation of the greater saphenous vein, and therefore was out of favor for some time.\(^5\) In recent years, sclerotherapy is again being practiced mainly in Europe, because of the advent of new sclerosing agents and the desire to preserve the greater saphenous vein for possible future bypass surgery. In Japan as well, sclerotherapy is becoming better known, and a number of patients visit medical institutions to request “treatment with injection”. However, randomized controlled studies carried out in 1974 and 1993 showed high recurrence rates similar to those obtained previously.\(^6,7\) In particular, the presence of reflux of the greater saphenous vein appears to lead to poor outcome.

Currently, we are limiting the application of sclerotherapy to the following conditions: 1) spider angioma; 2) varicosities measuring 1–3 mm without apparent reflux owing to saphenous vein incompetence; and 3) varicosities remaining or occurring after surgery. As sclerosing agents, we use polidocanol or hypertonic saline. It has become apparent that foam sclerosing agents are more effective, and some institutions have begun to use such agents on a trial basis. In the practice of sclerotherapy, it is important to employ the sclerosing agent at the minimum necessary concentration and amount, and to apply compression securely.

4. Stripping

Extraction of the greater and lesser saphenous veins with resection of varices constitutes the current most common surgery for
varicose veins, i.e., stripping surgery. This is a relatively simple operation, and some modifications have recently been made for this procedure.

First, the lower limbs of the patient are subjected to ultrasound examination for mapping varicose veins and incompetent perforators. Previously, incompetent perforators were located by milking or palpation of the fascia, but these procedures seldom enabled us to confirm the location of incompetent perforators. Duplex ultrasonography accurately reveals the location of perforators and permits a reliable diagnosis of the presence/absence of saphenous vein reflux.

Second, stripping of the greater saphenous vein is restricted to as far as the knee level. This is because anatomically there is no perforating vein that directly enters the greater saphenous vein distal to the perforator from the popliteal vein (Boyd’s perforator), thus precluding further extraction of the vein as a rule. Lack of extraction of the below-knee greater saphenous vein decreases the frequency of injuries to the saphenous nerve, thereby preventing postoperative paraesthesia in the instep of the foot. Some institutions in the US have recently begun to use catheterization into the greater saphenous vein to carry out thermal coagulation of the vein.

5. Linton’s operation

In many cases, the surgical treatment for varicose veins consists of stripping and resection of varices. However, varices are difficult to resect in patients with severe sclerosis of the skin or those with ulcers. Although varices with pigmentation or ulcers can exist below the skin, they are difficult to resect, and, even if they are resected, healing of the wound cannot be expected. For the treatment of such conditions, Linton proposed subfascial perforator ligation in 1938. In this technique, a long longitudinal skin incision is made on the medial side of the leg, and the fascia cruris is incised to ligate incompetent perforators subfascially. If the saphenous vein is incompetent, stripping of the vein is added. Although this method is effective, a major drawback is frequent dehiscence of the long skin incision. The causes of this complication include incision in morbid skin and high susceptibility to infection via ulcers.

6. SEPS

Subfascial endoscopic perforator surgery (SEPS) has recently been employed to overcome the drawbacks of Linton’s operation. As mentioned previously, skin lesions caused by varicose veins occur frequently just above the ankle. Therefore, a small incision is made in the upper part of the leg, where dermal changes are not substantial, and a trocar is inserted from the incision to detach the subfascial tissue and cut off incompetent perforators under endoscopic observation. Finally, stripping of the greater saphenous vein is performed from the inguinal region to the site of trocar insertion. In our institution, this operation is carried out using apparatuses generally used for laparoscopic surgery, with the femoral region covered by pneumatic tourniquet and with carbon dioxide insufflation to areas under the fascia cruris (Fig. 3). It is both easy and convenient to use an ultrasonic coagulator (LCS) for cutting off perforators. According to our experience over the past 4 years, this is a useful method...
and is associated with fewer complications of the surgical wound. It is expected that this technique will become more widespread in the future.

REFERENCES