

# Varicose vein surgery: more complications than other procedures?

## Varizenchirurgie: Belastender als andere Verfahren?

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### Key words

varicose vein surgery, endovenous therapy, sclerotherapy, complications, quality of life

### Schlüsselwörter

Varizenchirurgie, endovenöse Therapie, Sklerosierungstherapie, Komplikationen, Lebensqualität

received 18.09.2018

accepted 14.03.2019

### Bibliography

DOI <https://doi.org/10.1055/a-0887-6161>

Phlebologie 2019; 48: 170–175

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ISSN 0939-978X

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### ABSTRACT

All methods used in varicose vein therapy go along with a certain amount of risk. Varicose vein surgery is widely spread, and the health risks are described at great length in literature. Referring to the health risks of new methods such as endovenous therapy or foam sclerotherapy one can barely find any reliably facts and figures.

Overall, varicose vein surgery including crossectomy, stripping and phlebectomy is accompanied with a higher risk of bleeding and postinterventional infection. Generally, these risks are estimated to be marginal.

The risk of perioperative nerve injury appears to be similar in both therapeutic methods. Yet the poor amount of available data regarding endovenous therapy has to be pointed out.

The risk of postoperative thrombosis and pulmonary embolism as well as cosmetically affecting proinflammatory hyperpigmentation appear more often after endovenous therapy and foam sclerotherapy than in varicose vein surgery.

Complications, such as stripping of the deeper great vein or artery during varicose vein surgery or recovered broken metal parts in the vena cava after endovenous therapy are extremely rare events.

Nevertheless, current metanalysis rarely describe any disparity concerning mobility, mortality and health-related quality of life by comparison to the various varicose vein therapies.

### ZUSAMMENFASSUNG

Sämtliche in der Varizenchirurgie angewandten Verfahren beherbergen Risiken. Die Risiken der klassischen operativen Sanierung der Varikosis mittels Stripping sind in der Literatur sehr ausführlich beschrieben.

Bei den neueren therapeutischen Optionen, wie z. B. den endovenösen Therapien oder der Schaumsklerosierung werden die möglichen Komplikationen erst in jüngerer Zeit systematisch ausgewertet. Dementsprechend liegen derzeit im Vergleich wenige Daten hierzu vor.

Betrachtet man die Lebensqualität des Patienten in den neuesten Vergleichsstudien und Metaanalysen, zeigt sich, dass perioperativ kaum Unterschiede in der Mobilität, Mortalität und Lebensqualität des Patienten bei den unterschiedlichen Therapieverfahren bestehen [1].

Insgesamt ist davon auszugehen, dass die klassische operative Sanierung der Varikosis mittels Crossektomie, Stripping und Miniphlebektomien im Vergleich zu den endovenösen Therapieverfahren sowohl mit einem erhöhten Blutungsrisiko, also auch mit einem erhöhten postoperativen Infektionsrisiko einhergeht. Grundsätzlich ist das Blutungsrisiko, als auch das Infektionsrisiko jedoch auch bei der Operation als niedrig einzuschätzen.

Das perioperative Nervenverletzungsrisiko scheint bei beiden Verfahren ähnlich häufig zu sein, wobei repräsentative Daten aus Vergleichsstudien fehlen.

Das postoperative Thromboserisiko mit ggf. konsekutiver Lungenarterienembolie ist unseres Erachtens nach bei den endovenösen Verfahren höher einzustufen als nach einer klassischen operativen Sanierung der Varikosis.

Kosmetisch beeinträchtigende, postinflammatorische Hyperpigmentierungen im OP-Gebiet treten häufiger nach endovenösen Therapieverfahren und nach Sklerosierungstherapien auf.

## Introduction

The original ideas on the surgical treatment of varicose veins, as practised today, were first postulated by Babcock in 1907. Since then, surgical techniques have improved considerably and the risks minimised.

Varicose vein surgery today is expected to deliver not only a good cosmetic result, but also an excellent functional outcome with a low complication rate.

These demands can be met by operating with tumescent local anaesthesia (TLA) alone or under a general anaesthetic in association with TLA. This approach not only significantly reduces haematoma formation, but also postoperative pain [2]. Microsurgical removal of tributary veins using phlebectomy hooks also achieves excellent cosmetic results [3].

The aim of today's surgical techniques is to ligate the great saphenous vein (GSV) flush with the femoral vein or place a ligature around the small saphenous vein (SSV) with the popliteal vein close to the saphenopopliteal junction. The suture material used should be non-absorbable and non-degradable. In addition, to prevent a recurrence of the varicose veins, all tributary veins (pudendal vein, superficial epigastric vein, superficial circumflex iliac vein, anterior accessory vein) should be ligated and the endothelial stump then closed by suture or electrical coagulation. Performance of an extended high ligation is recommended, whereby the tributaries draining at the saphenofemoral or saphenopopliteal junctions are traced and ligated after the first division [4].

Today, phlebologists have a wide range of alternatives to the classical varicose vein surgery with high ligation and stripping of the diseased veins. Thermal endovenous ablation (radiofrequency ablation and laser ablation) and non-thermal endovenous procedures (cyanoacrylate adhesive embolization or mechanochemical ablation (MOCA)) can be mentioned as first-line methods of treatment. Foam sclerotherapy of trunk varicose veins with 1 % or 2 % polidocanol foam offers another possibility.

Cutting-edge medicine has refined the techniques and considerably reduced the complication rate of varicose vein surgery. Overall, data on the complications of varicose vein surgery is fairly comprehensive, but it has to be remembered that some of the data is relatively old and the use of tumescent local anaesthesia is often not taken into account in the interpretation.

In contrast, data on the newer endovenous techniques is weak and insufficient, particularly where the complication rate is concerned.

In this article, we compare the complication rates of varicose vein surgery and endovenous procedures. Typical complications of treating varicose veins include postoperative infections and disorders of wound healing, deep vein thrombosis (DVT), nerve lesions, seromas, thrombophlebitis, bleeding and hyperpigmentation.

## Risk of haemorrhage

The risk of haemorrhage with varicose vein surgery is low. As a rule, the blood loss with high ligation is less than 100 mL when tumescent local anaesthesia is used. As there is no significant perioperative fall in the haemoglobin levels, the procedure is also a good option for patients with a low baseline haemoglobin. If the Hb level is

below 10 mg/dL, however, the decision should be made according to the individual circumstances.

Injury to major blood vessels with severe intraoperative bleeding is an extremely rare occurrence in varicose vein surgery [5]. In the approximately 40,000 operations carried out in our hospital over the last 15 years, there was no injury to a major vessel with a subsequent need for transfusion.

For the sake of completeness, it must be mentioned that isolated cases have been described in the literature, in which the deep vein or artery has been divided or stripped by mistake [6]. However, such cases are absolute rarities and we consider that they can be attributed to a lack of surgical experience.

In comparison, the risk of haemorrhage is lower for both thermal ablation and non-thermal endovenous procedures, as the veins are not exposed or divided proximally, but are punctured distally. Nevertheless, there is a minimal risk of bleeding with the simultaneous elimination of tributary vessels by phlebectomy.

## Postoperative thrombosis

The risk of postoperative thromboembolism is given as about 0.5 % in the literature [7]. This is in agreement with our own experience. As only patients with symptomatic thrombosis present for medical attention and receive appropriate treatment, this is the only patient population from which data can be collected.

In comparison, open abdominal surgery carries a risk of postoperative thrombosis of about 1.6–5 % [8, 9].

With simple varicose vein surgery, patients, who are below the age of 70, have not had any previous thromboembolic events, do not have a high-risk profile and whose surgery lasts less than 60 minutes, usually do not require any perioperative thromboprophylaxis with low molecular weight heparin. In our experience, perioperative thromboprophylaxis for a period of 7 days is also sufficient in all other cases. Immediate postoperative compression therapy and mobilisation combined with risk-adapted pharmaceutical thromboprophylaxis govern the low postoperative thrombosis profile after varicose vein surgery.

With endovenous thermal ablation procedures, there is a risk of endovenous heat-induced thrombosis (EHIT). This describes how the thrombus intended for endovenous ablation grows from the great or small saphenous vein into the femoral or popliteal vein. Four grades of EHIT can be distinguished thereby. Grade 4 signifies complete occlusion of a deep vein, i. e. deep vein thrombosis (DVT) [10]. Studies and publications on the risk of postoperative DVT following endovenous thermal ablation report a thrombosis risk of approximately 1–1.8 % [11–13]. This is a clearly higher risk of thrombosis than that seen after conventional varicose vein surgery. In view of this data, the frequently suggested omission of a postoperative compression stocking has to be regarded critically. Also after an operation, from about the third postoperative day onwards, the compression stockings are used only as thrombosis prophylaxis and to reduce oedema.

Thromboembolic events after foam sclerotherapy of varicose veins have frequently been described. The percentage ranges between 1 % and 3 % [14]. The postinterventional risk of thrombosis is therefore higher after foam sclerotherapy than varicose vein surgery.

Barker et al. [7], however, reported a lower incidence of thromboembolic events in the first 30 days after foam sclerotherapy and an overall similar risk (after 90 days) of thromboembolic events following surgery, endovenous therapy and foam sclerotherapy.

The risk of postoperative thrombosis following mechanochemical ablation (MOCA) is estimated to be similar to that of foam sclerotherapy, but here too there are no meaningful data available.

In cyanoacrylate embolization in the great or small saphenous vein, there are isolated cases, in which the non-absorbable glue has been carried into end organs or into the deep veins or arteries, where it has given rise to serious complications [15]. No figures can be found in the literature, so it is not possible to assess the risk with respect to post-therapeutic thromboembolism. Just how extensive the complications of the non-absorbable glue are in the long-term is not clear at the present time.

## Postoperative seroma formation

A typical complication after varicose vein surgery is the postoperative seroma, a collection of lymphatic fluid in the area of the wound.

Seromas usually affect the groin, but may occur in other areas of the body with little subcutaneous fatty tissue, e. g. the edge of the shin bone may be affected. Seromas often occur after surgery for recurrent varicose veins, frequently on the medial aspect of the thigh or in the region of the edge of the shin bone.

Thin patients have a noticeably higher risk of postoperative seroma than obese patients. The probability of developing a seroma is 4.2 % with a body mass index (BMI) < 30, but falls to 2.3 % with a BMI > 30 [16].

Compared with the primary operation, the chances of developing a postoperative seroma are considerably higher after redo surgery for recurrent saphenofemoral or saphenopopliteal incompetence. Sharp incision of the fibrous scar tissue causes more lymph vessel lesions, thus favouring seroma formation in the groin. This also applies to recurrence after endovenous thermal ablation, as considerable adhesions sometimes form in the groin after these procedures too and require invasive dissection.

Even though seromas are harmless complications, patients often find them to be bothersome. The first line of treatment is aspiration followed by a compression dressing. In addition, foamed Aethoxysklerol [polidocanol] 1 % or doxycycline may be injected to force adhesion of the tissue layers.

If all these minimally invasive procedures fail and the seroma has not regressed significantly, the treatment options of choice consist of either a percutaneous Redon drain through a stab incision or open wound healing with a wick for drainage and a two-layer dressing (► Fig. 1–► Fig. 4). Open wound treatment may require more than ten days and is often very tedious for the patient. It does, however, lead to healing of postoperative seromas without lasting consequences. Seromas in the region of the shin bone edge are particularly tenacious.

Overall, the seroma risk can be assessed as much lower for all endovenous procedures. Miniphlebotomy to treat tributary varicose veins represents the only risk of postoperative seromas developing.

With respect to endovenous therapy, it has often been postulated that visible varicose veins will disappear after ablation of the trunk vein. In our experience, however, the success rate is far less

than reported. In our clinic, we regularly see patients with persistent tributary varicose veins, who have had endovenous ablation performed elsewhere. These veins must then be eliminated with a miniphlebotomy or sclerotherapy.

## Nerve lesions

Injury to cutaneous nerves is a typical risk of varicose vein surgery.

With great saphenous vein surgery, the saphenous nerve is particularly at risk of injury, while the sural nerve may be damaged during surgery on the small saphenous vein. Miniphlebotomy can also damage small branches of cutaneous nerves, giving rise to sensory disorders in the affected areas. To minimise the rate of postoperative sensory disorders, treatment is targeted to the stage of the disease. As a rule, the great saphenous vein should be stripped only as far as just below the knee, and the small saphenous vein as far as the distal point of incompetence.

The lateral cutaneous nerve of the thigh is particularly at risk during surgery for recurrent saphenofemoral incompetence. After dissecting out the surgical field using the modified surgical technique of Klein/Junod [17], the nerve lies over the femoral artery and over the deep vein and can thus be divided.

After two or three months, some 2.5 % of our patients had persistent sensory disorders at the operation site [16]. A large proportion of the postoperative sensory disorders improved spontaneously over several weeks or months. Overall, however, it is specified that these sensory disorders may still continue to improve for up to a year after surgery.

The risk of perioperative nerve injury with non-thermal procedures (foam sclerotherapy, mechanochemical ablation, cyanoacrylate embolization) is negligible unless the surgical elimination of tributary varicose veins is necessary.

The effects of heat during thermal ablation procedures carry a not inconsiderable risk of nerve injury, especially in the region of the saphenous or sural nerve [18, 19]. Here too, postoperative sensory disorders should be given up to a year to show signs of spontaneous recovery. When the tributary veins are treated by miniphlebotomy, we can assume that endovenous therapy carries the same risk of nerve injury as surgery.

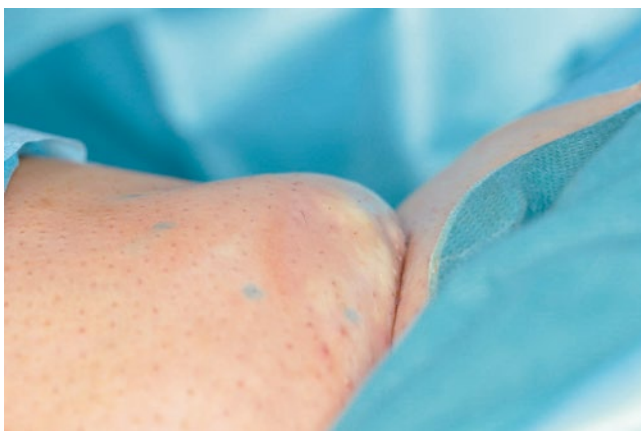
## Risk of infection

The perioperative risk of infection with conventional high ligation and stripping is low, at approximately 1 % [16].

Perioperative single-shot antibiotic cover can be discussed in principle. The risk of infection is thought to be considerably higher, if a leg ulcer is present, so that a perioperative single-shot antibiotic cover should always be considered in this case.

The risk of infection correlates closely with the duration of the operation [20]. In our opinion, therefore, the surgery of recurrent varicose veins carries a higher risk of infection. Apart from being a more invasive procedure, we can also expect redo surgery to take longer. The infection risk then rises to about 3 % [16]. The elimination of tributary veins by miniphlebotomy alone carries a low risk of infection.

The publication by Poder et al. reported the risk of infection with endovenous radiofrequency ablation as 0.4 % [13]. It is difficult to



► **Fig. 1** Postoperative seroma in the left groin.



► **Fig. 2** Opening the seroma after several failed aspirations and injection of 1% Aethoysklerol [polidocanol] foam.



► **Fig. 3** Insertion of a glove finger drain for the continuous flow of lymphatic fluid.



► **Fig. 4** Two-layer dressing: the first layer consists of 2–3 sterile compresses that are firmly fixed in place with adhesive non-woven tape. A hole is cut in this layer so that serous fluid can drain. It is covered with a second layer of loosely fixed absorbent compresses that the patients can change themselves.



► **Fig. 5** Postoperative cord-like hyperpigmentation running along the great saphenous vein, about two months after treatment.

find more data on the infection risk with endovenous procedures and sclerotherapy in the literature. Therefore, it is virtually impossible to make any comparisons at present. However, as the most invasive part of varicose vein surgery lies in the inguinal incision, high ligation and stripping, we can assume a lower risk of infection with the other procedures.

### Postoperative hyperpigmentation and thrombophlebitis in residual veins

Postoperative hyperpigmentation is usually caused by a haematoma or a persistent thrombophlebitic residual vein. This postinflammatory hyperpigmentation poses a considerable cosmetic problem for the patient. It often persists over a long period of time or may even be permanent.

After thermal ablation, hyperpigmentation is more likely to develop, if the great saphenous vein or small saphenous vein runs very superficially (► **Fig. 5**) [21].



Hyperpigmentation may also develop after the thrombosis of post-operative persistent tributary veins or following foam sclerotherapy or mechanochemical ablation (MOCA). Figures of 10–30 % can be found in the literature for postinterventional hyperpigmentation with foam sclerotherapy [22]. There is no data on cyanoacrylate glue.

Overall, we can conclude that varicose veins surgery with complete elimination of tributary veins and few remaining residual veins carries a much lower risk of postoperative hyperpigmentation than endovenous procedures or sclerotherapy. However, no data from comparative studies is available.

## Rare complications

Apart from the classical complications mentioned above, there are also some rare complications of varicose vein surgery, such as injury of motor nerves and stripping of the deep vein or even the artery.

In the 40,000 cases of varicose vein surgery that we have monitored in our clinic, there were two cases of transient partial loss of peroneal nerve function following surgery on the small saphenous vein. We attributed these lesions to pressure damage from the hooks used. In both cases, the motor deficits were completely reversible within six months. Even so, the patients found the symptoms to be very distressing.

There are reports in the literature of accidental stripping of the deep vein and even the artery [23, 24]. In our opinion, this risk depends almost entirely on the experience of the surgeon; these reports are absolute exceptions and the complication has not so far been reported in our clinic. Primary cerclage of the epifascial vein (great saphenous vein) with a ligature and subsequent anatomical dissection to expose the deep vein are all-important for increasing the safety of the procedure and virtually eliminate the risk of error.

The risk of major complications with thermal ablation methods is also generally described as low. Even so, there are reports of serious complications from these procedures in the current literature and in conference reports (e. g. a colleague from The Hague at the UIP congress in Monaco) [25]. The reports include two cases of Seldinger wires in the vena cava and also catheter tips breaking off and being retrieved from the patient's right atrium. In all cases, the foreign body had to be removed surgically [26]. There are also descriptions of the postinterventional formation of an arteriovenous fistula and a pseudoaneurysm from the accidental puncture of the artery during the local anaesthesia for endovenous laser therapy [27, 28].

These risks are, of course, rarities, but they also have to be mentioned and taken into consideration when comparing the methods.

Several cases of visual loss [29] and transient ischaemic attacks [30] following foam sclerotherapy have been reported in the literature. In *Phlebologie* 2017, Frings reported a case of paraplegia following foam sclerotherapy [31]. Overall, therefore, the risks of foam sclerotherapy cannot be ignored.

## CONCLUSIONS

In comparison with other therapeutic options for varicose veins, surgery carries higher risks of infection and nerve injury. Endovenous procedures give rise to more postoperative hyperpigmentation and deep vein thrombosis. Overall, however, there is a zero-sum situation with respect to peri- and postoperative morbidity and mortality. There are no clear-cut advantages to any of the individual procedures regarding the peri- and postoperative quality of life. Over the long-term, endovenous procedures currently show an increased rate of saphenofemoral or saphenopopliteal reflux with a similar rate of clinical recurrence. This reflux correlates with the increase in diameter of the vein that was treated, so that patients with larger trunk vein diameters will probably benefit more from conventional surgery than from endovenous therapy [32, 33].

## Conflict of interest

Bruning: travel expenses reimbursed by Bauerfeind AG

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