Thieme

Surgery of small saphenous vein – endoluminal or open surgical procedure

Die Chirurgie der Vena saphena parva – endoluminal oder operativ

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ABSTRACT

There exists, hitherto, no unifying standard for the surgical or endovenous treatment of small saphenous vein incompetence. Thus, a direct comparability of these two treatment modalities has been, so far, restricted. Particularly, differing definitions of recurrent small saphenous vein incompetence impede this comparability. There is a lack of prospective randomised studies of long term results. On account of this scanty data, a basic recommendation for or against one treatment option or the other is currently not possible. However, in daily practice, there are significant advantages for both, the surgical as well as endovenous therapies, even without the corresponding comparative studies. The recurrence rates are high among both approaches. A complete removal of the pathologically altered vein is, nonetheless, undertaken during neither surgical nor endovenous therapy. The extent to which a complete removal of the sapheno-popliteal junction, with implementation of the crossectomy (or high ligation) principle, can contribute to the amelioration of outcomes should be clarified by future studies.

ZUSAMMENFASSUNG

Bislang existiert kein einheitlicher Standard in der operativen oder endovenösen Therapie der Parvainsuffizienz. Daher ist eine direkte Vergleichbarkeit operativer und endovenöser Verfahren bislang nur eingeschränkt möglich. Insbesondere erschweren unterschiedliche Definitionen eines Rezidivs die Vergleichbarkeit der unterschiedlichen Therapieoptionen. Prospektive randomisierte Studien zu den Langzeitergebnissen fehlen. Aufgrund der schwachen Datenlage sind grundsätzliche Empfehlungen für oder gegen die eine oder andere Therapieoption derzeit nicht möglich. Dennoch gibt es in der täglichen Praxis eindeutige Vorteile für die Operation oder für die endovenöse Therapie, auch wenn entsprechende Vergleichsstudien fehlen. Die Rezidivraten sind sowohl bei operativer- als auch bei endovenöser Behandlung hoch. Allerdings wird weder bei der Operation, noch bei der endovenösen Therapie eine komplette Ausschaltung der krankhaft veränderten Vene vorgenommen. Zukünftige Studien sollten klären, inwieweit die komplette Ausschaltung der Parvacrosse mit Umsetzung des Prinzips der Crossektomie zu einer Verbesserung der Ergebnisse beitragen kann.

Background

Venous disease is one of the most common clinical conditions in the western world. The German Society of Phlebology (DGP) guidelines and the National Institute for Clinical Excellence (NICE) guidelines recommend early treatment of the epifascial venous system by surgical or endovenous procedures, in order to prevent the various possible complications and sequelae of chronic venous insufficiency (CVI), such as skin changes, venous ulcers, deep vein thrombosis and pulmonary embolism, as far as possible [39]. Some 350,000 procedures are carried out on the epifascial venous system in Germany each year [32]. We ourselves find small saphenous vein (SSV) incompetence in about 15 % of our patients. There are no precise data on the frequency of saphenopopliteal surgery in Germany. Noppeney et al. [30], reported that saphenopopliteal junction (SPJ)

surgery had been carried out in 13 % of nearly 50,000 documented operations; 60 % of these SSV procedures had been carried out in an inpatient setting. In their large-scale retrospective study on 245 legs followed up for 14 years after surgery, Hartmann et al. [22] listed 10 % as saphenopopliteal ligations. In nearly 40,000 operations, Frings et al. [14] found the percentage of SPJ surgery to be 16 %. The patient population (11,650 operated legs) investigated by Helmig and Stelzer [24] suggests that saphenofemoral incompetence is present in 18.9 % of men but only in 9.5 % of women. O'Donnell et al. [33] detected SSV reflux in between 14 % and 32 % of the patients studied. The incidence of reflux in veins of CEAP classes 3–6 was significantly higher than in veins of CEAP classes 1–3. Furthermore, they demonstrated that SSV reflux was far more often associated with segmental reflux in the popliteal vein than is to be found in the femoral vein when there is saphenofemoral incompetence.

Ligation with stripping of incompetent vein segments has long been the method of choice for treating the SSV. In recent years, however, new endovenous methods have become more popular [35, 6, 5, 25, 27]. In 2011, the US guidelines on the treatment of varicose veins [16] gave preference to endovenous procedures (laser therapy, radiofrequency ablation) over conventional surgical methods (high ligation and stripping) for the treatment of trunk varicosities of the great saphenous vein (GSV). However, a recently published meta-analysis [18] with 5-year results on varicose veins of the GSV clearly showed that the reflux rate found on duplex ultrasound five years after treatment was significantly lower in the high ligation/stripping group than in the comparator group with endovenous procedures (laser, radiofrequency) [11, 12, 13, 41]. So far, there have not been any comparative studies on SSV surgery.

Correctly performed high ligation

The surgical procedure at the saphenofemoral junction (SFJ) is clearly defined [17], but there is no such clear-cut standard for the SPJ. High ligation at the SFJ is defined as ligation of the great saphenous vein flush with the femoral vein, together with ligation of all the tributary veins opening into the femoral vein around the SFJ. A ligature tied precisely at the femoral vein is possible in all cases. In the English-language literature, the procedure is no longer referred to as 'crossectomy' but as 'high ligation', 'flush ligation' or 'saphenofemoral ligation'. These terms suggest an analogy to the ligation of the great saphenous vein flush with the femoral vein stipulated by Hach and Mumme, as in the DGP guideline. Careful analysis of various papers published in leading journals, however, shows that saphenous vein stumps are often left after flush/high ligation [48]. Pronk et al. [37] state that high ligation was performed 0.5 cm distal to the SFJ. Peräla et al. found that the average length of the saphenous vein stump was 4.9 mm in the stripping group. Both research groups talk of high ligation but actually leave a 5 mm long saphenous vein stump. This is a technical error and not a correctly performed high ligation!

Subramonia et al. [49] did not place the main ligature flush with the femoral vein but "close to the sapheno-femoral junction (high ligation)". In actual fact, high ligation was not performed correctly in any of the previously mentioned studies, even though they were published in leading journals. The high reflux rate in the surgical group of the randomised controlled trials (RCTs) can therefore be attributed to inadequate saphenofemoral ligation, i. e. to technical error. It is interesting to note that the above-mentioned publications with inadequate high ligation influenced the decision in the US guidelines.

Unlike the case for the GSV, there are still no recognised guidelines for the SSV with respect to treatment around its junction with the main deep vein. Hach and Mumme [17] describe saphenopopliteal ligation as amputation of the SSV directly at its opening into the popliteal vein, together with any necessary ligation of the muscle veins. This recommendation has not been incorporated into any of the English-language professional literature. After a comprehensive literature search on SSV surgery, Rashid et al. [40] did not find any publications describing systematic exposure of the SPJ. Interestingly enough, the stereotypical terms 'saphenopopliteal ligation' and 'flush ligation' can be found in the literature, even though the ligation was not performed correctly in the majority of cases and consisted of subfascial saphenous ligation or a modified subfascial ligature. A technique of this nature was described by Fisher and Vogel [10] and Feuerstein [8] more than 30 years ago.

Anatomy of the saphenopopliteal junction

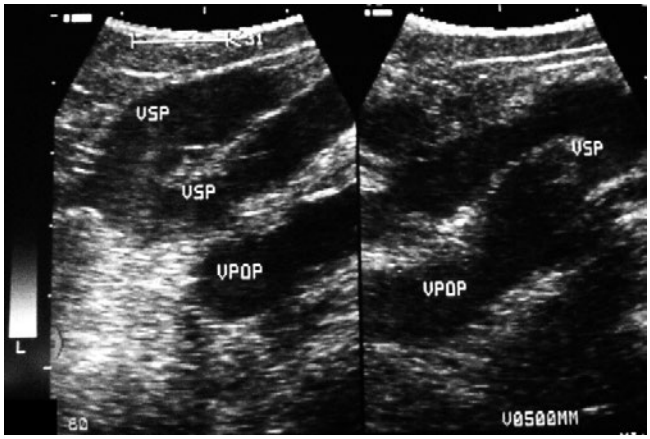
Saphenopopliteal ligation differs from saphenofemoral ligation in three main characteristics:

- Anatomical variations with respect to the level where the SSV terminates in the popliteal vein in relation to the popliteal fossa are common.
- There is often a very twisted anomalous opening at the SPJ. The anatomical variants of the vessels draining around the saphenopopliteal junction are much greater than at the saphenofemoral junction. Unlike the GSV, where the vessel empties into the deep vein system immediately below the fascia, the SSV terminates somewhere in the subfascial layer and is therefore subject to much greater variation.
- The anatomical vicinity of the saphenopopliteal junction to branches of both sensory and motor nerves makes dissecting out the SPJ more difficult and increases the risk of recurrent incompetence [14, 9, 28, 43].

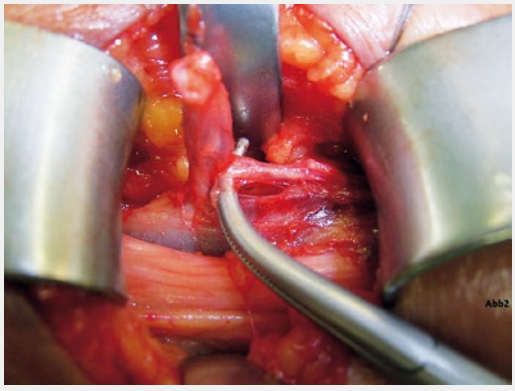
The different anatomical anomalies and the frequency of their occurrence have been described in detail by Hach and Mumme [17]. Our own investigations of the SPJ using phlebography with a Valsalva manoeuvre [46] have shown that the SSV opens into the popliteal vein 2–5 cm above the radiological knee joint line in about 50 % of cases.

In a further 30 % of cases, the opening was 5–8 cm above the knee joint line. Variants include anterior drainage, posterolateral drainage, and thin-walled muscle veins running parallel into the SPJ (see ▶ **Table 1**). Besides the classical acute-angled termination of the SSV in the popliteal vein, typically found 3–4 cm above the crease of the knee, there is sometimes also very twisted anomalous drainage presenting with siphon-like or double siphon-like openings of the SSV (▶ **Fig. 1**). Muscle veins terminating directly at the SPJ or in the popliteal vein near the SPJ make it difficult to perform saphenopopliteal ligation correctly (▶ **Fig. 2**).

A 2011 prospective study [47] found parallel draining muscle veins at the time of saphenopopliteal ligation in 50 out of 55 cases



▶ **Fig. 1** Double siphon-like SSV opening.



▶ **Fig. 2** Muscle vein draining directly into the SPJ, tibial nerve displaced laterally.

▶ **Table 1** Variations in the level of the saphenopopliteal junction (in cm above the knee joint line, n = 116).

2–5 cm above	n = 66 (58 %)
5–8 cm above	n = 42 (33 %)
8–11 cm above	n = 8 (6 %)

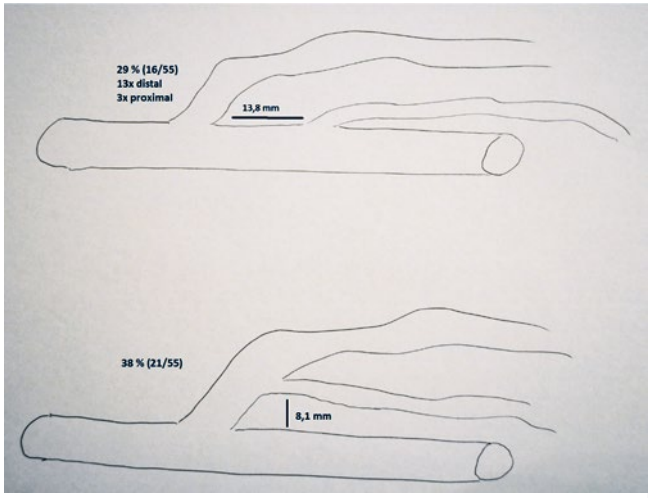
(91 %). The muscle veins terminated directly in the popliteal vein in 29 % and in the central SSV segment in 38 % (▶ **Fig. 3**). In 33 out of 39 the cases, muscle veins draining directly into the SFJ were ligated with Ethibond; 14 days postop., muscle vein thrombosis was found on duplex ultrasound in only two of these 33 patients (6 %). Muscle veins draining directly into the SPJ make it more difficult to perform a flush ligation.

Each surgical procedure on the SSV has therefore to be preceded by meticulous duplex ultrasonography. Using preoperative duplex diagnostics back in 1991, Engel et al. [7] were able to locate the junctional region correctly during the operation and perform a flush ligation in 93 % of cases. Preoperative duplex scans are carried out with the patients standing and most useful when done by the surgeons themselves. Even though sometimes much more demanding and difficult in the individual case, imaging allows the termination of the SSV in the popliteal vein to be demonstrated clearly and identifies the exact level of the opening.

Both the course of the SSV and the level where it opens into the popliteal vein can then be indicated on the leg with a coloured marker ('crosshair').

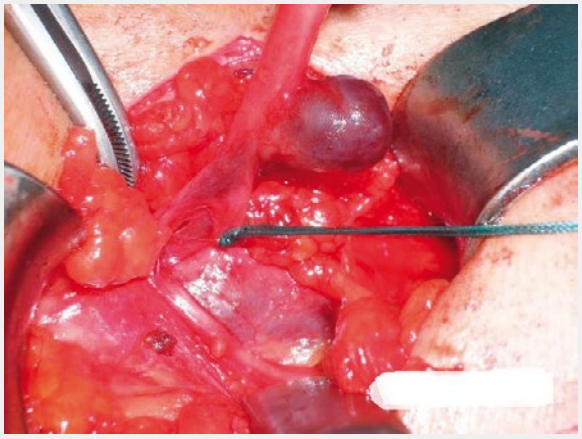
Surgical technique

The operation must be carried out with the patient lying prone and with the knee bent at an angle of 30° [31, 17]. A 4–5 cm long transverse skin incision is made according to the preoperative marking, the fascia is split longitudinally, and the SSV dissected out, ligated, and divided. It is then exposed down to the point where it joins the deep vein system, taking all the precautionary measures customary in vascular surgery. We ourselves make every effort to free the popliteal vein from the roof and sides of the surgical field over

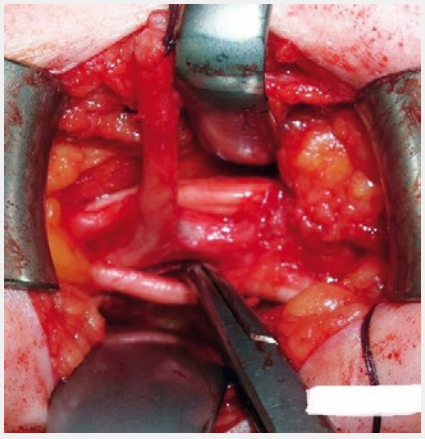


▶ **Fig. 3** Variations of the muscle veins terminating in the popliteal fossa, in relation to the SPJ.

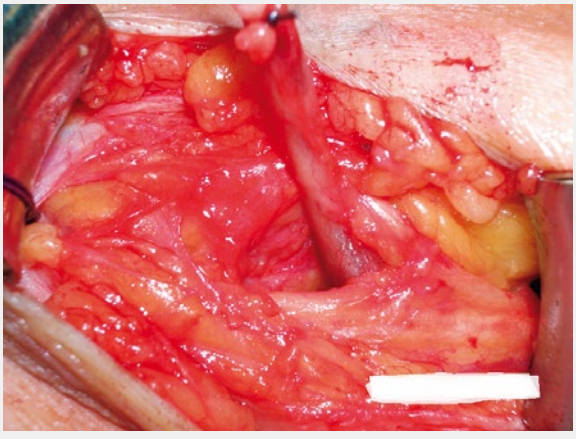
a distance of 2–3 cm from the SPJ. Muscle veins draining into the SPJ are ligated. We then tie a double ligature around the SSV flush with the popliteal vein, using non-absorbable sutures (▶ **Fig. 4**). As mentioned previously, ligation of these muscle veins does not inevitably lead to thrombosis in the vessels concerned, even though the proximal flow is interrupted. The very close proximity of the two motor nerves means that it may sometimes be necessary to free a long segment of the tibial or peroneal nerve and displace it, in order to be able to tie the SSV ligature flush with the popliteal vein (▶ **Fig. 5** – ▶ **Fig. 7**). Unwanted bleeding from a nearby aneurysm or ectatic muscle veins can be treated with less stress by the application of a Löfqvist cuff. There must not be any blind clamping or suture cerclage in the popliteal fossa. Saphenopopliteal ligation has to be done in a dry surgical field. Any bleeding should be avoided. Performing a saphenopopliteal ligation correctly often requires two assistants/scrub nurses (4 hands needed to hold: 2 × Roux retractors, 2 × Langenbeck retractors).



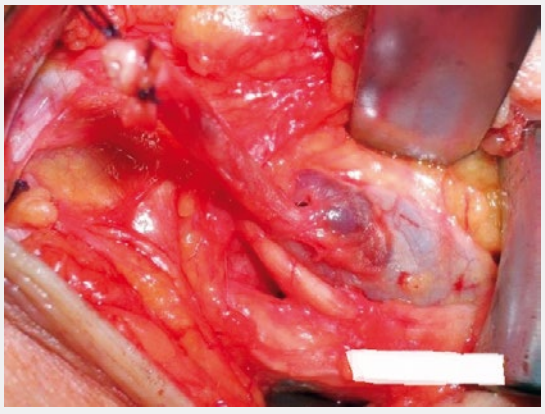
▶ **Fig. 4** Flush saphenopopliteal ligation with Ethibond thread.



▶ **Fig. 5** The figure shows a thick tibial nerve, the popliteal vein, the vertically slung SSV, and the peroneal nerve displaced laterally by the Overholt forceps.



▶ **Fig. 6** In order to perform a flush ligation, the SSV has to be displaced laterally beneath the peroneal nerve.



▶ **Fig. 7** The figure shows the situation following this manoeuvre. It is now possible to perform a flush ligation without difficulty.

Results of surgical treatment

Compared with saphenofemoral ligation, saphenopopliteal ligation is a more challenging procedure that carries certain risks, especially with revision (redo) surgery for recurrent saphenopopliteal incompetence.

These risks should not, however, lead to 11.5 % of vascular surgeons in Great Britain and Ireland advising their patients against surgery for small saphenous varicose veins, as Winterborn et al. reported in 2004 [54] in their study confirming the plight of conventional SPJ surgery. Rebecca Winterborn asked 379 vascular surgeons in Great Britain and Ireland about their routine practice for SPJ surgery. Only about 50 % of the surveyed surgeons performed precise preoperative duplex scanning of the SPJ; 20 % of them did not operate with the patient prone. 13 % ligated the vessel immediately below the fascia while 76 % placed the ligature deeper, but where? No further details are given in this paper. Only 10 % of the surgeons formally exposed and identified the vessels of the SPJ prior to ligation. In 2008, O'Hare et al. [34] from Earnshaw and Winterborn's research group reported a multicentre retrospective study on saphenopopliteal ligation. They compared saphenopopliteal ligation and stripping with saphenopopliteal ligation alone. One year later, duplex ultrasound scanning revealed recurrent saphenopopliteal incompetence in 13 % after ligation and stripping, and in 32 % after ligation alone.

O'Hare characteristically talks of high ligation. However, this view contradicts the results of Winterborn et al., who found that only 10 % of surgeons actually expose the popliteal vein. Analogous to high ligation at the SFJ, there is reasonable doubt that the term 'high ligation' was used in O'Hare's paper to mean saphenopopliteal ligation performed correctly.

It is, therefore, not really surprising that the results of conventional SSV surgery are so poor: recurrence rates of between 30 % and 70 % have been reported (▶ **Table 2**). After an average follow-up of four years, we found rates of recurrent saphenopopliteal incompetence, identified on duplex ultrasound, to be 10 % and 3 % in two of our own cohort studies, with a postoperative SSV stump

▶ **Table 2** Saphenopopliteal ligation and stripping.

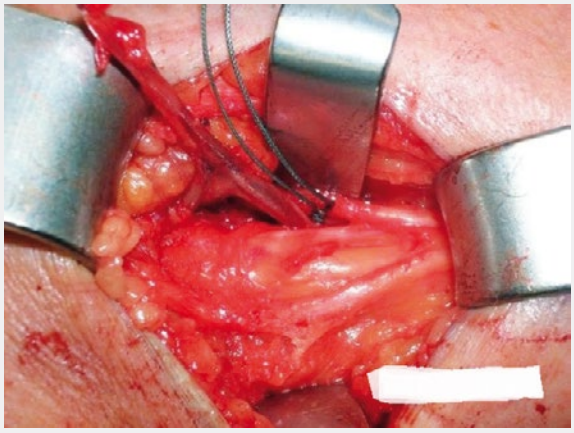
Year	Author	n	Follow-up	Recurrence	Stump	orig. SSV	Neovasc.	Other points of incompetence
1993	Feuerstein	503	13 years					
1996	Tong	70		61 %	27 %	29 %	3 %	
1999	Hanzlick	41	5 years		65 %			
1999	Creton	125			61 %	14 %		
2001	Vin	77	9.2 years	68 %	15 %	32 %	3.80 %	28 %
2003	Pukacki	42	4.9 years	78 %	26 %	52 %		
2007	Allegra	132	5 years	30 %				
1995	Stenger	140	3.75 years	10 %	14 %		3 %	
2007	Stenger	137	4.5 years	3 %	7 %		4 %	23 %
2006	Hartmann	25	14 years	12 %				
2006	Whiteley	52			2 %			
2012	Samuel	50	1 year	0 %				

visible in 14 % and 7 %, respectively. Operations in these studies had been carried out with the intention of performing saphenopopliteal ligation correctly, but did not achieve this goal in all cases. The second cohort study with the better postoperative results was carried out 12 years after the first. Increased surgical experience had obviously improved the outcome considerably. Looking critically at the results of the studies listed in ▶ **Table 2**, it can be seen that there was no uniform surgical technique and that 'recurrence' is defined very differently [50]. The high rates of obvious SSV stumps are evidence that the initial saphenopopliteal ligation was not flush in many cases. All possible variations are represented, from simple subfascial ligation [8, 10] to true high ligation of the SSV lying flush with the popliteal vein [44, 53]. The paper by Allegra et al. [1], for example, does not give any clue to the surgical technique used and only notes "stripping of SSV from the saphenopopliteal junction to lateral malleolus", which suggests that saphenopopliteal ligation was performed. The high rate of recurrent saphenopopliteal incompetence, being 30 % five years after surgery, argues against flush ligation. O'Donnell et al. [33] view saphenopopliteal ligation critically and, in their opinion, the risk of postoperative complications rises with the extent of dissection around the SPJ. Rashid et al. [40] provided evidence that, despite preoperative duplex scanning, the SPJ is not exposed in 22 % of cases and flush ligation not achieved in 59 %. In summary, it can be said that the previous publications on open SSV surgery involve very different surgical techniques and do not conform to the principles pertaining in Germany today.

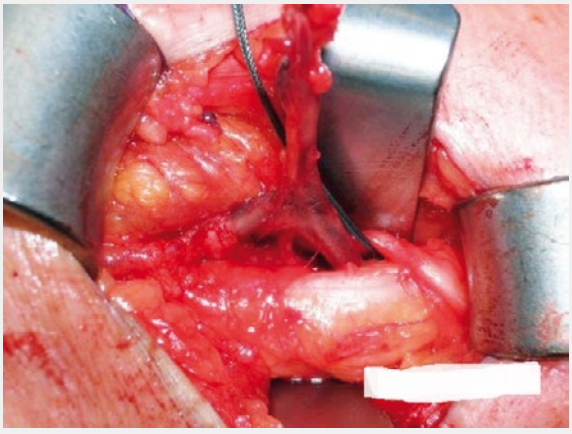
Results of endovenous therapy

Numerous studies on endovenous therapy of the SSV with laser or radiofrequency ablation techniques are available (see the meta-analysis by Boersma et al. [2]). The cohort studies often have smaller case numbers with shorter follow-up periods (6–12 months). The publication by Boersma et al. [2] lists 49 papers on the treatment of trunk varicose veins of the SSV but only one has postoperative results of four years. The success rates mentioned in the papers lie between 90 % and 100 %; quite often at exactly 100 %. There is no great difference between treatment with laser therapy and radiofrequency ablation. To date, there are 3 RCTs that compare endovenous laser therapy with open saphenopopliteal surgery. In two of these RCTs, laser therapy was compared with high ligation and stripping of the SSV [42, 29]. The endovenous technique came out better in both studies. In a third RCT, Brittenden et al. [3] compared high ligation and stripping with laser therapy and foam sclerotherapy. They found that foam sclerotherapy was not as good as the other two methods but here, too, laser therapy was superior to conventional surgery. Brittenden et al.'s comprehensive work was based on the results of trials carried out in the United Kingdom. For this reason, the problems raised by the above-mentioned studies of Winterborn et al. [54], Rashid et al. [40] and Samuel et al. [44] should not be forgotten. Saphenopopliteal ligation was not carried out correctly or at least only on rare occasions (10 % in the analysis of Winterborn et al.). All the studies, including that of Brittenden et al., compared saphenopopliteal ligation with a laser or VNUS closure technique, even though only subfascial ligation had been carried out on the SSV somewhere in most cases. The poor results of open saphenopopliteal surgery are therefore clearly due to an erroneous surgical technique.

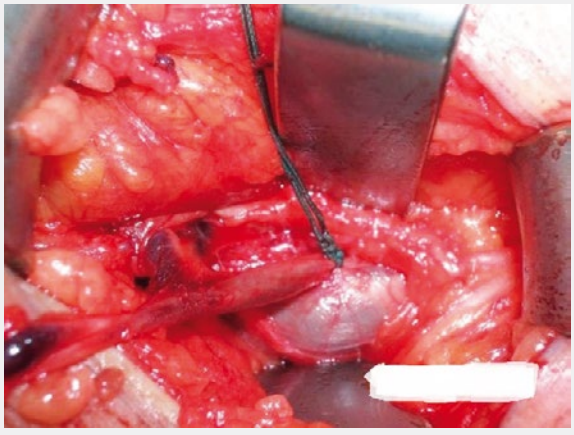
An RCT from Nandra et al. [29] showed saphenopopliteal reflux after 2 years in 19 % of cases who had endovenous laser therapy and in 34 % of the surgical group. After just six weeks, 28 % of the surgical group had pathological saphenopopliteal findings compared with only 8 % in the endovenous group. Once again, the reason for the significant difference was the modified subfascial SSV ligature customary in the UK. Although the authors called it a flush ligation [45], we doubt this claim, as they wrote "The sural nerve, where seen, was protected during SSV dissection; no other nerves were exposed". This anatomical description of the surgical procedure is remarkable in that the sural nerve is by no means always to be seen in correctly performed saphenopopliteal ligation. In nearly every case, however, a long segment of the tibial nerve has to be dissected out and displaced to the side to allow the saphenopopliteal ligation to be performed correctly (▶ **Fig. 8** – ▶ **Fig. 10**): flush ligation (i. e. tying the ligature exactly at the level of the pop-



▶ **Fig. 8** Muscle veins opening into the SSV, peroneal nerve, tibial nerve.



▶ **Fig. 9** Long exposed segment of the tibial nerve.



▶ **Fig. 10** Flush ligation of the SSV carried out after medial displacement of the tibial nerve with a Langenbeck retractor.
NB: Do **not** displace the peroneal nerve with a Langenbeck retractor if it is not absolutely necessary.

liteal vein) is not possible until this surgical step has been taken, as the tibial nerve usually lies along the roof of the popliteal vein. There is some doubt, therefore, that a flush ligation was actually performed in this RCT as well. The fact that the rate of pathological reflux found in the endovenous group within a follow-up period of two years was more than in the surgical group (15 % vs 6 %) is of particular note in this clinical trial.

The third RCT, by Ropram et al. [42], contains several points open to criticism. The trial compared the results of laser therapy six weeks after the intervention with those of open surgery.

Despite randomisation by envelope, the laser group consisted of 118 patients and the surgical group 57 patients. Saphenopopliteal ligation was not performed during the operation, as the expression "ligation of the saphenopopliteal junction" used in the summary would suggest, but rather the SSV was ligated somewhere in the subfascial tissue. This is confirmed by the description in the text "The SSV was identified and dissected toward the SPJ". The authors found pathological changes in the popliteal fossa on duplex ultrasound in one third of the cases six weeks after surgery, comparable to the results after subfascial ligation.

In the laser group, 91 % of the patients showed complete occlusion six weeks after intervention, i. e. the outcome was not optimal in 9 % of the patients after an endovenous procedure. In the summary, however, the failure rate in the laser group was given as 0.9 %. When reading this RCT, we gain the impression that the endovenous technique has per se to perform better. Besides the high recurrence rate of 30 % after 6 weeks in the surgical group, the postoperative neurological problems in more than 30 % and the infection rate of 10 % suggest a surgical technique that is not quite mature and could certainly be optimised. The fact that the surgeons in this research group considered only one in five operations to be easy, and three-quarters to be moderately difficult or difficult, may be taken as evidence for this assertion.

What are the other reasons for the good results after endovenous methods? In the endovenous papers, surgical success, i. e. the primary outcome measure, was equated with anatomical success. This means occlusion of the treated vein as seen on duplex ultrasound scanning. In conventional saphenopopliteal surgery, recurrent incompetence is defined as reflux at the popliteal level as demonstrated by duplex ultrasound. In this way, the definition of 'recurrence' is completely different for the two techniques. We have mentioned the problems encountered in comparing the results of open surgical and endovenous techniques earlier [23] and called for a uniform definition of recurrence. The secondary outcome measure in endovenous studies is defined as follows: Technical success = lack of technical error and carrying out the operation as planned with no reflux seen in the target vein on duplex ultrasonography. There are no available studies where saphenopopliteal ligation and stripping have been carried out according to these primary and secondary outcome measures. Any comparison of the two techniques is therefore limited.

Surgical treatment or endovenous therapy?

In summary, the following has to be said. There is no standard consensus on saphenopopliteal surgery. At present, the evidence from published results is weak. There are no multicentre studies where

saphenopopliteal ligation has been carried out correctly and such studies, analogous to the Lavacross study on saphenofemoral surgery, need to be carried out in the near future. According to current standards for endovenous therapy, the laser probe is placed 2–3 cm distal to the SPJ and therefore corresponds to the position of subfascial SSV ligation. On the basis of the data with very short follow-up periods published so far, higher recurrence rates after 7–8 years have to be reckoned with, analogous to the experience with saphenofemoral surgery [15]. No studies with such a long follow-up period have yet been published. Complex SSV openings with a siphon or double siphon-like appearance are not accessible endovenously and are primarily excluded from the published studies [29, 42]. Conventional saphenopopliteal surgery does not allow the proper surgical technique to be applied to all the possible anatomical anomalies and, of course, has the disadvantage of scar formation in the popliteal fossa, which is usually not troublesome.

According to our own observations, a residual patent SSV stump often closes completely within ten days of radial laser treatment. Siphon-like anatomical variations where the SSV opens into the popliteal vein can also be treated by the injection of a highly concentrated sclerosant through the radiofrequency catheter, giving a good occlusive reaction. Of course, long-term follow-up is also lacking here.

And finally, there remains the question about the criteria which should be used to decide between surgical and endovenous therapy. It is generally recommended that venous surgical procedures should be carried out in a dedicated phlebology centre. A vein centre will offer all the surgical and endovenous options. Nevertheless, statutory health insurance usually accepts only surgical treatment. Endovenous procedures are reimbursed only as part of a specific medical care contract. The possibility of reimbursement therefore also plays a role in the choice of treatment. Patients who are covered by statutory health insurance should not be talked into becoming self-payers if the SHI will not reimburse endovenous therapy. Otherwise the patient's wishes should, of course, be taken into account. Patients often want to have endovenous therapy. Although there are still many advantages of open surgery (all types of SPJ anomaly, very large SSV, convoluted SPJ), there are also advantages attached to endovenous techniques, including for older patients with comorbidities or on anticoagulant therapy, young women who want to have children, or uncomplicated trunk varicose veins of an SSV following a straight line.

Further RCTs are needed to determine whether the results of surgery are sustained for longer, that is to say, whether freedom from recurrent saphenopopliteal incompetence seen on duplex ultrasound is greater after correctly performed high ligation (as is the case with saphenofemoral surgery). It is essential that state-of-the art radial laser therapy or radiofrequency ablation be included in the treatment arms. All currently available RCTs were carried out using first-generation lasers.

Conclusions

Published data on open saphenopopliteal surgery show high rates of recurrent saphenopopliteal incompetence. This can be largely attributed to the fact that saphenopopliteal ligation was not performed correctly, in the sense of flush ligation. The results of endovenous therapy in small saphenous varicose veins correspond more or less to those of a subfascial SSV ligature, inasmuch as a 2–3 cm long patent segment of the SSV remains after both the surgical and the endovenous procedures. However, the completely different definition of recurrence is the key. After endovenous procedures, an obliterated SSV is taken as the criterion of success. In conventional open surgery, however, recurrent saphenopopliteal incompetence is defined as the demonstration of reflux at this level on duplex ultrasound scanning. An unconditional comparison of the results of open saphenopopliteal surgery with endovenous therapy is therefore limited.

Summary

To date, there is no standard consensus on saphenopopliteal surgery. The published results on open surgery are poor; endovenous studies show a high occlusion rate of the SSV after thermal ablation. A direct comparison – open surgery vs laser therapy or radiofrequency ablation – is possible to only a very limited extent because of the inconsistent definitions of recurrent saphenopopliteal incompetence in the available studies. A thorough literature search confirms that saphenopopliteal ligation has been carried out correctly only in exceptional cases. In most studies there has only been a modified subfascial SSV ligature. There are still no multicentre studies with the aim of flush ligation and this lack should be rectified in the near future. Long-term studies after endothermal treatment of the SSV are not yet available. The complex SPJ with siphon-like or double siphon-like SSV openings is not accessible to endovenous techniques and primarily excluded from the published studies. It can, however, be treated successfully with highly concentrated sclerosant injected through the radiofrequency catheter. All the SPJ anomalies can also be treated by conventional open surgery if the correct surgical technique is employed.

Conflict of interest

The authors declare that they have no conflicts of interest.

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