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Light at the Junction

The status of branchvaricosis after great saphenous vein ablation

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Summary

Thermal ablation of saphenous veins has become a standard procedure in the treatment of varicose vein disease. Much is said about „occlusion rates," recurrence rates," and „recanalizations," but little attention is paid to the medical status of the side branches that open in the saphenofemoral-junction (SFJ) area. Yet we know from surgical crossectomy that recurrences via side branches in the SFJ area are not uncommon, and a correct surgical crossectomy therefore includes the ligation of all side branches opening in the junction area. However, endovenous thermal treatment is predominantly performed only on the saphenous (truncal) vein, and the side branches are left untouched. In recent medical publications, untreated side branches in the SFJ area are considered the most frequent cause of recurrence after endovenous thermal ablation (between 8% and 32%). Therefore, it is important to perform a precise vein mapping prior to endovenous ablation and to plan the ablation of the saphenous vein and, if necessary, relevant side branches precisely.

Introduction

Endoluminal procedures, especially endovenous thermal vein ablation, have become an integral part of the treatment spectrum for varicose veins in Germany. The most common procedures are radiofrequency ablation (RFA) and laser ablation (EVLA). In endovenous procedures, the focus is on the treatment of the saphenous truncal vein; sufficient side branches are usually not treated. In surgical crossectomy, however, each side branch (which, by the way, are usually all sufficient!) opening in the SFJ area is carefully dissected, ligated, and transected; the goal is the flush closure of the SFJ (9).

Few studies have shed light on the medical status of branchvaricosis after endovenous treatment, and little is reported on the precise placement of the endovenous catheter in the SFJ area. However, we now know that leaving the saphenous-stump of the SFJ too long, for example, with unligated/untreated side branches opening into it, promotes recurrence (5, 12).

Current data and discussion

What happens to side branches after endovenous thermal therapy?

After one year, the sufficient side branches left seem to have no influence on the success or recurrence rate of endovenous ablation (17). In 2007, **Theivacumar et al.** showed that in 59% of 81 treated legs, one or more sufficient side branches were visible in the SFJ area after one year.

However, long-term data such as that of **Pröbstle et al**. 2015 documented that after four years, 32% of 93 treated legs had recurrence via an anterior accessory saphenous vein (AASV) (14). Interestingly, Pröbstle was also able to show that a AASV was detectable by duplex sonography in 46% of cases before treatment of the great saphenous vein; after four years, an AASV could then be detected in as many as 71% of treated legs. Of these patients, in whom an AASV was already visible from duplex sonography before endovenous treatment, varicose vein disease recurred in 55% after four years via this very vein!

A recurrence incidence of 8% via AASV two years after EVLA was shown by **Rasmussen et al.** in their 2010 study; overall, recurrence after EVLA occurred in 22% of cases (n=137) (16).

Disselhoff et al. compared „EVLA alone" with surgical crossectomy + EVLA (n=86) and found that after five years, recurrences via AASV occurred in 14% of cases in the group of legs treated with EVLA alone versus 0% in the group that also underwent surgical crossectomy. However, 33% neovascularization also occurred in the crossectomy group (0% in the „EVLA alone" group), and 9% recanalizations occurred in the „EVLA alone" group (2).

Recurrences via side branches in the SFJ area five years after EVLA occurred more frequently in the EVLA group (31%) than in the crossectomy and stripping (HL+S) group (17% neovascularizations) in **Gauw et al.** (4).

In 2016, **O`Donnell et al.** performed a systematic meta-analysis of seven randomized trials (n=686) with the aim of determining types of recurrence after endovenous therapy. The minimum follow-up period was two years, and the recurrence rate after EVLA was comparable to the recurrence rate after crossectomy and stripping (HL+S) and was 22% (n=125). However, the type of recurrence differed: after HL+S, neovascularization occurred in 18% (n=22), whereas after EVLA, AASV insufficiency occurred in 19% (n=23) (13).

A meta-analysis by **Hamann et al.** from 2017 screened 3004 studies on crossectomy and stripping (HL+S) versus endoluminal procedures (EVLA, RFA, and foam sclerotherapy), twelve of which could be used for the meta-analysis. The definition of surgical success in the groups was „no reflux in the treated vein after five years (anatomic success)" and showed no significant difference between HL+S compared with EVLA and RFA, and also no significant difference in the incidence of SFJ recurrences detected by duplex ultrasound (DUS). A significant difference in efficiency was shown only when compared with foam sclerotherapy. What the meta-analysis did show, however, was that when sapheno-femoral recurrences did occur, they differed between HL+S and EVLA/RFA: After HL+S, neoangiogenesis was more likely to develop in the SFJ area, whereas after EVLA/RFA, recurrence via the AASV was most common (6).

Another 2018 study by **Wallace et al.** showed anatomic success at five years with EVLA of 93% and HL+S of 85% (n=140 per group). The number of recurrences in the SFJ detected by DUS did not differ between HL+S and EVLA in this study, except that neoangiogenesis formed in equal numbers (~15%) in HL+S and recurrence via the AASV in EVLA (18).

Let us now take a look at the two major German studies on this topic: **Flessenkämper et al.** (3) and **Rass et al.** (15) from 2016 and 2015. Both studies concluded that HL+S produced significantly fewer DUS-detected sapheno-femoral crosse recurrences than EVLA. It is important to note in these studies that HL+S was performed by excellent surgeons from vein centers with many years of experience. This is certainly not the general standard in Germany. However, the laser technology was still in its early days at the beginning of the study (data collection started in 2004/2005) and was performed with low wavelength lasers (810 nm Rass (15), 980 nm Flessenkämper (3)) and barefiber use. The applied laser energy was very low in the study by Rass, and there was frequent recanalization of the treated great saphenous vein (62% of DUS-detected junctional recurrences!). In the study by Flessenkämper, in which we ourselves were involved (surgical and endovenous), the laser energy was higher, but the distance of the barefiber to the SFJ was clearly more than 2cm! The methodically very well performed studies by Flessenkämper and Rass thus show that HL+S, realized at a very high level, has a low five-year risk of SFJ recurrence of less than 10%. But the two studies do not prove a failure of the endoluminal procedures, but have clearly shown that the laser power and laser energy as well as the distance of the laser fiber to the SFJ and the nature of the laser fiber play an important role for the endoluminal result.

A 2019 review analysis by **Anwar et al.** showed that untreated side branches in the SFJ area are considered the most common cause of recurrence after endovenous thermal ablation (between 8% and 32%) (1).

All of the above mentioned studies refer to older generation lasers with wavelengths of about 980 nm and barefibers.

The first five-year data regarding the 1470-nm laser with radial probe and segmental RFA were published by **Lawson et al.** 2018, with 97% (EVLA) and 96% (RFA) anatomic success. DUS-detected SFJ recurrence occurred in 15% of cases via AASV at five years (n~171 per group) (10).

But how do the large differences of 8-32% SFJ recurrences over previously sufficient side branches in the recent publications come about?

Three possibilities come into consideration here:

1. Positioning of the EVLA fiber/RFA catheter: Positioning of the laser fiber used to take place with the barefibers at least 2cm distal to the SFJ. If post-laser obliteration of the proximal portion with flush closure of the SFJ area did not subsequently occur, a 1-2cm junction stump remained. However, some side branches open in the 1-2cm area of the SFJ (> fig. 1) (11).

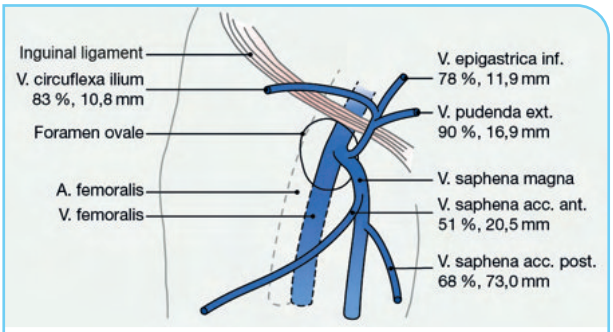

fig. 5 > The anatomical diversity in the area of the SFJ of the great saphenous vein (VSM), e.g. SFJ of the VSM with proximal junction of the V. circumflexa ileum, V. epigastrica inferior und V. pudenda externa and separate junctions of Vena saphena accesoria anterior and posterior with percentages of how frequently the side branches are present and at what distance (in mm) they join the VSM on average from the SFJ (mod. after Hartmann M, De Gruyter 1991 (9) and Mühlberger D et al. J Vasc Surg. 2009;49(6):1562-9 (11))

There are many anatomical variants of the confluence of various side branches, for example, the AASV can often also enter the epigastric vein into the VSM via the epigastrical junction or, rarely, directly into the femoral vein.

Positioning of the RFA catheter was a similar distance away from the SFJ, as the manufacturer's protocol requires.

2. Use of radial fibers as opposed to barefibers. Radial fibers allow the catheter to be advanced flat to the SFJ, because the laser energy is delivered laterally rather than anteriorly.

3. Accurate DUS vein mapping especially of the AASV before the endovenous procedure. If this is not done, an initially very small but insufficient AASV could be missed before ablation of the VSM. This could be an explanation why recurrence may become visible via an AASV after only a very short time after an endovenous procedure.

If all three points are taken into account, meaning the EVLA radial fiber (no use of barefibers!) or the RFA catheter is placed flat at the SFJ and a precise focus is placed especially on an existing insufficient AASV, then very low recurrence rates similar to the surgical operation can be achieved in the long-term analysis. If even an existing sufficient AASV is treated in a second step during endovenous ablation, meaning that the sufficient AASV in the SFJ area is ablated endovenously (surgically the AASV is ligated and cut), even lower recurrence rates can be achieved compared to surgical crossectomy, since there is no neoangiogenesis after laser therapy! This procedure is called endovenous crossectomy (7, 8). As mentioned above, Pröbstle demonstrated that AASV was detectable by duplex sonography in 46% of cases before VSM treatment. In 55% of these patients, the disease recurred after four years via the AASV (14)!

In conclusion, a prophylactic closure of the AASV in the SFJ area is to be demanded, as it has always been standard in surgical crossectomy. There are no data on this, a first study on this topic is currently being launched by the „Endovenous Therapy Working Group" of the German Society of Phlebology. An exact analysis of the side branches in the SFJ area before endovenous therapy is essential to achieve an optimal result and requires great experience, because inaccurate vein mapping and incorrect placement of the endovenous catheter in the SFJ area leads to a loss of quality of the endovenous techniques.

Therefore, endovenous procedures have to be laid into the hands of experienced phlebologists and/or physicians with in-depth knowledge of the anatomy who regularly undergo continuing education in phlebology. Endovenous crossectomy should be the standard of treatment.

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Compliance with ethical guidelines
Conflict of interest: K. Hartmann declares no conflict of interest.
This contribution does not include any studies on humans or animals performed by the author.

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The Freiburg Vein Center was founded in 1981 from Dr. Hartmann's father and is a Germany-wide training center. Varicose veins, thromboses, lipedema, rectal disorders and also external dermatological and aesthetic treatments have been performed there using the most modern diagnostic and therapeutic procedures at the highest level.

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+++ MARKET SPOTLIGHTS +++

Multifunctional laser systems in hospital settings

Medical lasers are used in a whole range of diagnostic and therapeutic applications. The focus here is on different modes of action. Lasers are mainly used for tissue sclerotherapy (insufficient veins, shrinking of hemorrhoids or prolapsed intervertebral discs) or to remove excess tissue (enlarged prostate, myomas or thyroid nodules, tumors). For medical care centers (MVZs) and hospitals, this raises the question of procuring multifunctional medical technological equipment for the wide range of treatments so that the budget is not overly burdened. After personnel costs, material costs (including technical equipment) continue to be the largest item in cost accounting.

Accordingly, medical laser systems that ideally offer one energy source (laser device) with which different power levels (wavelength and wattage) as well as special fibers can be applied for the respective applications are beneficial. It is of great advantage if the laser fibers are compatible with existing standardized accessories. Otherwise, manufacturers of medical laser systems offer matching handpieces and introducers (catheters, cannulas), laser safety goggles, pumps, covers and tubing for their products. A requirement for the use of medical laser systems is the establishment of a special treatment room, which ensures mandatory protective devices for the operation of a laser device. Another requirement is special training of medical personnel for the operation and handling of a medical laser. ■


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