

Diameter reduction of the great saphenous vein and the common femoral vein after CHIVA

Long-term results

E. Mendoza

Private Practice, Wunstorf

Keywords

Varicose veins, CHIVA, vein diameter, long-term results

Summary

Introduction: The diameters of the great saphenous vein (GSV) and the common femoral vein (CFV) seem to give a hint about the severity of venous illness. A reduction of these diameters 8 weeks after CHIVA of the GSV was demonstrated earlier (3), but the long-term effect has not been published so far. As the GSV persists in situ and drains the leg blood through distal perforators into the deep vein, an overload of the CFV after CHIVA has been postulated. The aim of this study was to discover long-term effects of CHIVA on diameters of the CFV.

Methods: 43 patients included in the first trial were evaluated 5 years after CHIVA of the GSV or SSV. Diameters were measured in the standing position: CFV diameter immediately after the confluence with the GSV and GSV diameter 15 cm distally to the groin. Clinical class (CEAP) and refilling time were compared to preoperative values and values after 8 weeks.

Results: 43 patients (mean age 52.7 years) were evaluated 5.36 years after CHIVA operation of their saphenous veins. The diameter of the CFV was reduced from

15.39 ± 2.93 mm preoperatively (15.11 ± 2.73 after 8 weeks) to 14.18 ± 2.56 mm ($p < 0.05$). In the case of treatment of the GSV the diameter of the CFV changed from 16.07 ± 2.65 mm preoperatively via 15.29 ± 0.41 mm after 8 weeks to 14.30 ± 2.81 mm ($p < 0.001$). The diameter of the GSV was reduced from 7.13 ± 2.05 mm preoperatively (4.98 ± 1.49 mm after 8 weeks) to 4.38 ± 1.44 mm after 5 years ($p < 0.001$). The C class was reduced from 2.77 ± 0.81 preoperatively to 1.72 ± 1.10 after 5 years ($p = 0.007$). Refilling time was prolonged from 15.24 ± 6.18 s to 21.61 ± 9.2 s preoperatively after 5 years ($p = 0.022$).

Conclusion: As already shown in the short-term results, CHIVA reduced the diameter of the CFV and GSV as well as the C class of CEAP and improved the refilling time. These results were also stable after 5 years.

Schlüsselwörter

Varikose, CHIVA, Venendurchmesser, Langzeitergebnisse

Zusammenfassung

Einleitung: Die Durchmesser der V. saphena magna (VSM) und der V. femoralis communis (VFC) gelten als Hinweis auf den Schweregrad der Venenerkrankung. Eine Kaliberreduktion 8

Wochen nach Operation nach CHIVA wurde bereits belegt (3), offen blieb die Langzeitwirkung.

Methode: Bei 43 Patienten wurde 5 Jahre nach einem Eingriff nach CHIVA an den Stammvenen der Durchmesser der VSM und der VFC, das C(CEAP) und die Wiederauffüllzeit im Vergleich zum präoperativen Wert erfasst.

Ergebnis: 43 Patienten (Durchschnittsalter 52,7 Jahre) stellten sich im Mittel 5,36 Jahre nach Operation nach CHIVA vor. Der Durchmesser der VFC verringerte sich von präoperativ $15,39 \pm 2,93$ mm über $15,11 \pm 2,73$ mm nach 8 Wochen auf $14,18 \pm 2,56$ mm ($p < 0,05$), bei Behandlung der VSM verringerte sich der Durchmesser der VFC von $16,07 \pm 2,65$ mm über $15,29 \pm 2,41$ mm nach 8 Wochen auf $14,30 \pm 2,81$ mm ($p < 0,001$). Der Durchmesser der VSM verringerte sich von präoperativ $7,13 \pm 2,05$ mm über $4,98 \pm 1,49$ mm nach 8 Wochen auf $4,38 \pm 1,44$ mm nach 5 Jahren ($p < 0,001$). Das C reduzierte sich von präoperativ $2,77 \pm 0,81$ mm über $1,51 \pm 1,19$ mm nach 8 Wochen auf $1,72 \pm 1,10$ mm nach 5 Jahren ($p = 0,007$). Die Wiederauffüllzeit verlängert sich von präop. $15,24 \pm 6,18$ s über $17,9 \pm 6,47$ s nach 8 Wochen auf $21,61 \pm 9,2$ s nach 5 Jahren ($p = 0,022$).

Fazit: Auch in der Langzeitstudie nach CHIVA konnte keine Belastung der tiefen Beinvenen nachgewiesen werden.

Correspondence to

Dr. Erika Mendoza
Venenpraxis Wunstorf
Speckenstr. 10, 31515 Wunstorf
E-Mail: erika.mendoza@t-online.de

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The diameters of the veins are considered to be an indicator of disease. Since the consensus document of the UIP (International Union of Phlebology) 2006 (1), the accepted recommendation is to document the diameters regularly preoperatively in the standing position. The value of the diameter of the great saphenous vein (GSV) as an indicator of the severity of venous disease has only recently been confirmed (2).

In 2002, the German Society for CHIVA planned a long-term study, among other things on the development of the diameter of the GSV and the common femoral vein after an intervention using the CHIVA method. The development of the diameter of the two veins after 8–25 weeks was already evaluated and published in *Phlebologie* 2011 (3). The author refers to this publication for a detailed description of the methods.

The multicentre study was planned to last three years. In the author's practice, patients who presented for renewed examination after the conclusion of the study still had the diameter of their veins checked. The results are presented in this article. In addition, the measured data of the great sa-

phenous vein and the common femoral vein were also evaluated for patients with pathological findings of the small saphenous vein, whose disease counted as an exclusion criterion in the above-mentioned publication, but was taken into account in the overall analysis.

Method

The present paper examines the further development of the diameter of the GSV and common femoral vein, as well as the small saphenous vein in the patients who were originally enrolled in the long-term investigation on CHIVA vs. stripping and who spontaneously attended the practice over the further course after conclusion of the three-year study. No patients were asked to attend specifically for this purpose. Only those patients were evaluated who originally took part in the study, gave their consent, and additionally came to the first follow-up after eight weeks.

Patients who received treatment for the small saphenous vein were also included in this investigation for the first time. The inclusion criteria for these patients were the

same as those for the investigation of the great saphenous vein (3):

- exclusion of current or previous thrombosis of the deep leg veins,
- reflux directly from the deep leg vein via the sapheno-popliteal junction,
- no previous treatment of the leg veins of any kind,
- age over 18 years,
- no current pregnancy or consumptive disease.

The diameters of the veins were evaluated at the following points:

- common femoral vein immediately distally of the junction of the great saphenous vein
- great saphenous vein 15 cm distally of its junction
- small saphenous vein 5 cm distally of the knee fold

All measurements were taken in the standing position on a GE Logic 5 device with a 7.5 MHz probe. In addition, the C from the CEAP and the refilling time after muscle pump (light reflection rheography, Elcat Vasoquant®) were evaluated.

Tab. 1 Reduction in the diameter of the common femoral vein and development of the diameter of the great saphenous vein, depending on the vein treated.

Treated Vein		Preoperative diameter		Diameter after 8 weeks		Diameter after 5 years	
		CFV	GSV	CFV	GSV	CFV	GSV
SSV	N	15	15	15	15	15	15
	Mean	14.1	4.7	14.8	3.5	14.0	3.5
	STD	3.1	3.4	2.0	1.0	2.1	1.0
	Minimum	5.8	1.9	12.0	1.8	11.0	1.8
	Maximum	19.0	15.8	19.0	5.8	19.0	5.8
GSV	N	28	27	28	27	28	27
	Mean	16.1	7.0	15.3	5.0	14.3	5.0
	STD	2.7	2.0	2.4	1.5	2.8	1.5
	Minimum	11.5	3.5	12.0	1.3	9.8	1.3
	Maximum	22.0	11.7	21.3	7.9	23.0	7.9
Total	N	43	42	43	42	43	42
	Mean	15.4	6.2	15.1	4.4	14.2	4.4
	STD	2.9	2.8	2.3	1.5	2.6	1.5
	Minimum	5.8	1.9	12.0	1.3	9.8	1.3
	Maximum	22.0	15.8	21.3	7.9	23.0	7.9

STD: standard deviation

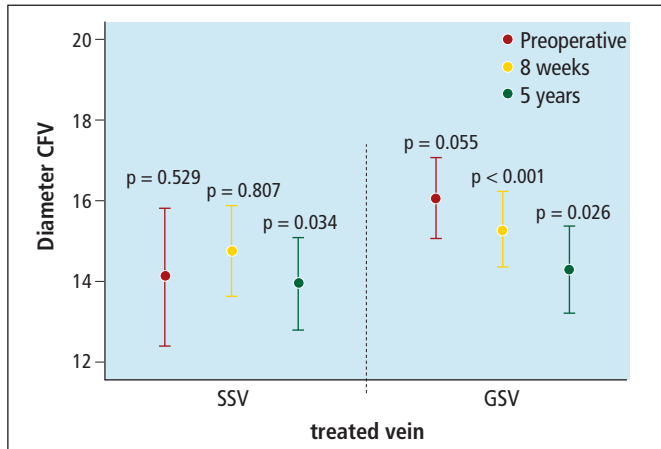


Fig. 1 Development of the diameter of the common femoral vein after 8 weeks and 5 years, depending on the vein treated.

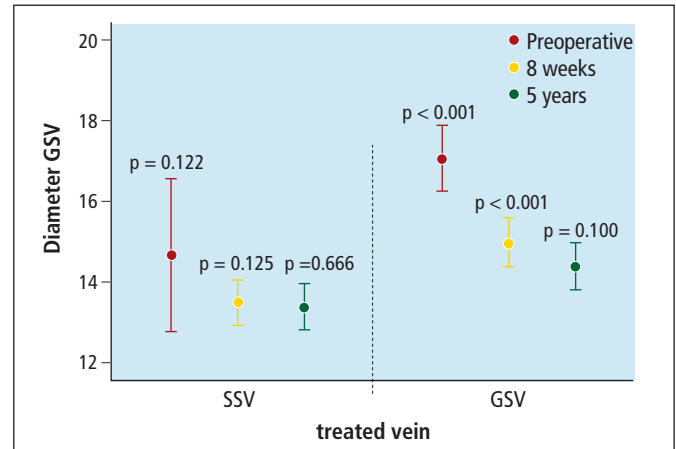


Fig. 2 Development of the diameter of the great saphenous vein after 8 weeks and 5 years, depending on the vein treated.

For statistical analysis, the same instruments were used as in the first study: the data were analysed using SPSS for Windows 13.0 (SPSS Inc., Chicago, IL, USA). All statistical tests were two-tailed, a p-value of <0.05 being assumed as significant. For comparisons of the mean of normally distributed, interval-scaled variables, Student's t-test was used, with the version for independent samples being used for the comparison of subgroups and the version for dependent samples for confirming the difference between pre- and post-operative diameters.

Z-values of the Mann-Whitney U-test were used to compare the non-normally distributed Hach and CEAP stages, and Chi-squared tests were used for categorical data. Mean values (MV) and the 95% confidence interval (CI) were shown in the figures.

Results

A total of 43 patients presented, 15 men and 28 women, the right leg was treated 22 times, and the left leg 21 times. The average age was 52.68 years (29–73 years). The mean follow-up period was 5.36 years (± 1.63 years, range 3–8.6 years). The patients had been operated on the great saphenous vein in 28 cases and on the small saphenous vein in 15 cases. The development of the diameter of the common femoral vein depending on the vein treated is presented in ► Table 1 and ► Fig. 1.

In the original study, 557 legs of 458 patients were included, of whom 383 patients with 470 treated legs returned for follow-up examinations within the observation period (return of 84.4%).

In this patient group, a greater diameter of the common femoral vein was seen preoperatively in the case of disease of the great saphenous vein than in the case of disease of the small saphenous vein (CFV with pathology of the GSV: $16.1 \text{ mm} \pm 2.7$, CFV with pathology of the SSV $14.1 \text{ mm} \pm 3.1$). The diameter of the CFV decreased in the overall group from 15.4 mm preoperatively via 15.1 mm after 8 weeks to 14.2 mm after 5 years. The reduction in diameter of the CFV after treatment of the GSV ran from 16.1 mm preoperatively via 15.3 mm after 8 weeks (not significant) to 14.3 mm after 5 years (significant compared with preoperatively and with 8 weeks postoperatively).

The development of the diameter of the great saphenous vein depending on the vein treated is presented in ► Table 1 and ► Fig. 2. A significant reduction in diameter results between the preoperative finding and the two postoperative measurements with pathology of the great saphenous vein: the diameter decreased from $7.0 \text{ mm} \pm 2.0$ preoperatively via $5.0 \text{ mm} \pm 1.15$ after 8 weeks to $4.4 \text{ mm} \pm 1.4$ after 5 years. The jump in diameter between the preoperative value and the value after 8 weeks as well as after 5 years is significant. The further reduction in diameter between the first postoperative follow-up

and the follow-up after five years is no longer significant. The reduction in diameter of the (healthy) great saphenous vein after intervention on the small saphenous vein is not significant.

The development of the CEAP in the overall group of patients who returned for follow-up examinations, and broken down according to pathology of the great or small saphenous vein, can be seen in ► Table 2 and ► Fig. 3. The mean of the highest C per patient in the overall group was 2.8 ± 0.8 preoperatively. It then declined significantly after 8 weeks to 1.5 ± 1.2 and increased slightly but not significantly after 5 years in the overall population to 1.7 ± 1.1 . The initially significant reduction in the highest C value after treatment of the SSV (from 3.0 ± 1.0 to 1.1 ± 1.0) increased after 5 years (not significant) to 1.6 ± 0.8 . After treatment of the GSV, the C value decreased significantly from 2.6 ± 0.6 preoperatively to 1.8 ± 1.2 postoperatively and was stable after 5 years.

The refilling time was only measured in 17 patients with treatment of the great saphenous vein. The values developed from an average of 15.9 seconds (± 6.6) preoperatively to 18.5 seconds after 8 weeks (± 6.5) and further to 21.7 seconds (± 10) after 5 years. The difference between the preoperative value and 5 years postoperatively is significant, despite the low N. The development of the values can be seen in ► Table 2 and ► Fig. 4.

In 39 of the 43 patients, it was determined which further measures were rec-

Tab. 2 Development of the C (CEAP) total and development of the refilling time in total depending on the vein treated.

Treated Vein		Preoperative		after 8 weeks		after 5 years	
		CEAP	Refilling time	CEAP	Refilling time	CEAP	Refilling time
SSV	N	14	4	14	2	14	5
	Mean	3.0	12.4	1.1	13.2	1.6	21.4
	STD	1.0	3.5	1.0	5.6	0.8	5.9
	Minimum	2	8.3	0	9.2	0	14.0
	Maximum	6	16.9	3	17.1	3	27.0
GSV	N	25	17	25	16	25	21
	Mean	2.6	15.9	1.8	18.5	1.8	21.7
	STD	0.6	6.6	1.2	6.5	1.3	10.0
	Minimum	2	6.7	0	8.3	0	7.0
	Maximum	4	25.0	4	25.0	5	41.0
Total	N	39	21	39	18	39	26
	Mean	2.8	15.2	1.5	17.9	1.7	21.6
	STD	0.8	6.2	1.2	6.5	1.1	9.2
	Minimum	2	6.7	0	6.7	0	7.0
	Maximum	6	25.0	4	25.0	5	41.0

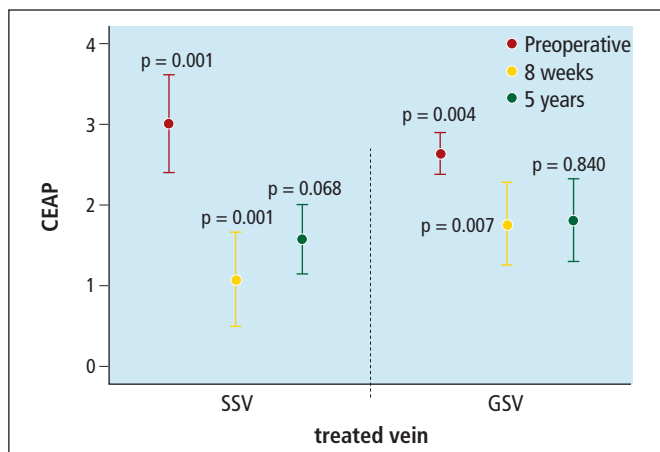
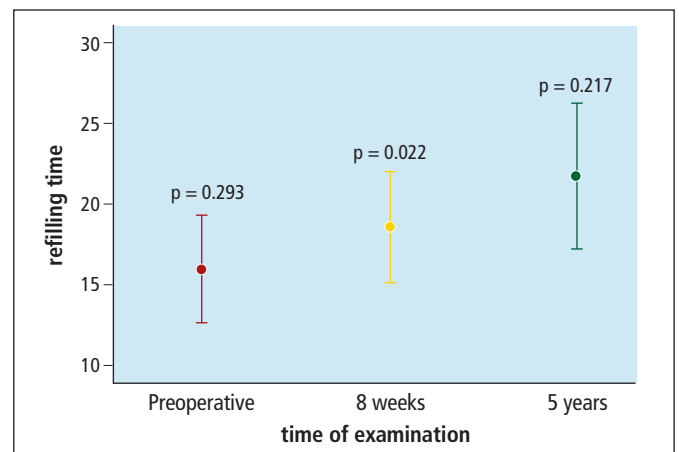
STD: standard deviation

ommended to the patient at this 5-year follow-up. Eight patients (20.5%) received the recommendation to undergo an intervention, it being the physician's opinion that the intervention should be conducted in the near future in five of these patients (12.8%), and that an improvement in the outcome could be achieved through the intervention without it being absolutely necessary in three patients (7.7%). Twenty-

one patients (53.8%) did not require any further measures, while sclerotherapy was recommended to 10 patients (25.6%) for cosmetic reasons.

Comparison of the preoperative data on the original patient investigation with the analysis after 8 weeks (3): The diameters of the common femoral vein and the great saphenous vein in patients with disease of the GSV in this series were above the mean

preoperative diameter of the prospective study with published results after 8 weeks. Preoperative diameter of the CFV: 14.7 mm \pm 2.3 mm, GSV 6.2 mm \pm 1.9 mm. Preoperative diameter of the GSV 6.2 mm \pm 1.91 mm. The mean C value of the baseline population was 2.9.

**Fig. 3** Development of the CEAP depending on the vein treated.**Fig. 4** Development of the refilling time in the 13 patients with treatment of the great saphenous vein and values on all three dates (second line of Table 4). Significance only between time of surgery and follow-up after 5 years.

Discussion

This long-term analysis is not a systematic prospective evaluation of all patients who enrolled in the study, as this study officially ended after three years. It is only a retrospective evaluation of the data of those patients who happened to attend the practice by chance over the further course. They may have done this because they were dissatisfied, or because they simply wanted to have a check-up. It is possible that patients who were particularly dissatisfied did not attend at all. The N is relatively small, at 43 patients in total and 28 patients who received treatment for the great saphenous vein, compared with the original study in which 557 legs were included. The sample is certainly not representative for the overall population. Only the data of the patients who returned for the follow-up examination were evaluated for this study.

Nevertheless, it can be assumed that the data provide interesting information on the long-term results of CHIVA. The baseline diameter of the veins in the group that was analysed here is greater than the baseline diameter in the overall population. The mean diameter of the great saphenous vein of the patients who received treatment for it and were analysed in this investigation was 7.1 mm, and was thus much higher than the overall population of the published prospective study, at 6.2 mm (3). A similar result is found for the common femoral vein, the diameter of which was around 16.1 mm in the great saphenous vein population of this long-term investigation, compared with a diameter of 14.7 mm of the common femoral vein in the population with short-term follow-up results (3). Thus, it can be excluded that the patients with the better baseline conditions now returned for follow-up examinations. In this group, only the C value was slightly, but not significantly below the C of the overall population (2.9 in the overall population at that time, 2.6 in the present investigation with pathology of the great saphenous vein, 2.8 for the great and small saphenous veins).

20% of the patients were recommended renewed intervention and 25.6% sclerotherapy for cosmetic reasons. This is consistent with the trend shown by publi-

cations with long-term results after CHIVA: Parés found 47% of the patients to be free of recurrence (corresponding to our 53.8% without further therapy being recommended) (4), Carrandina found 18% with indications for surgical therapy after 10 years (5).

It can thus be assumed that the patients presented tend to be more pathological as regards the baseline finding than the patients presented in the first publication. In addition, they are similar in development to the patients in other studies on CHIVA. They therefore represent an evaluable population. All of the data presented here in the tables and figures include only the values of those patients who appeared for the 5-year follow-up.

On the assumption that the common femoral vein and the treated great saphenous vein decrease in diameter after the intervention on the trunk varicosis, if anything it would have been expected that the values would slightly increase again after 5 years. This is particularly true if one considers that 20% of the patients required renewed intervention and that the C had also slightly increased again. A subgroup analysis for the patients without recommendation of surgery does not make sense for this small sample.

Nevertheless, these data can be used to convincingly demonstrate that haemodynamic correction after CHIVA does not place an excessive strain on deep leg veins and that their diameters remain stable or continue to decrease, even after long-term observation. The deep leg veins are considered to be an indicator of the severity of chronic venous incompetence (6). The decrease in its diameter can thus be regarded as direct and conclusive evidence of the efficacy of a procedure for treating varicosis.

Recently, the diameter of the superficial leg veins was also confirmed to be an indicator of the severity of venous disease (2). It correlates with the C and the refilling time. In people with healthy veins, a mean diameter at the proximal thigh of 3.7 mm ± 0.9 was demonstrated in this study. The values for the great saphenous vein after 5 years, at an average of 4.4 mm, were within the standard deviation of the people with healthy veins.

All measurable results, such as the diameter and the refilling time, developed further in the direction of „healthy“ after 5 years, even if there was no further statistical significance between the measured values after 8 weeks and after 5 years.

Summary

The CHIVA method reduces the diameter of the treated vein, as well as that of the common femoral vein and the refilling time, not only in the short term but also in the medium term (5 years). An excessive strain on the deep leg veins due to preservation of the saphenous trunks could be disproved. The haemodynamic correction after CHIVA in the case of incompetence of the superficial leg veins is therefore not only demonstrable in the short term but also has a sustained effect in the long term.

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