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venenkleber.koeln – Erfahrungen und Ergebnisse nach 1015 Stammvenenbehandlungen/Die bessere Alternative zur Stripping Operation?

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ABSTRACT

Endovenous treatment of incompetent veins is well established in Germany. Being an effective alternative to surgery nevertheless endovenous procedures are not first choice. This is totally different to the guidelines of other countries. Non-thermal procedures can reduce risks and side effects such as nerve-lesions. Is it possible to improve outcome by using cyanoacrylate adhesive? We present our results after 1015 procedures of cyanoacrylate gluing of incompetent veins.

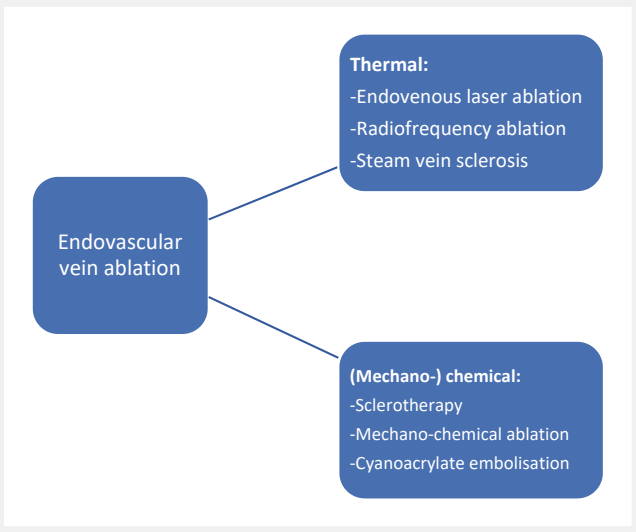
ZUSAMMENFASSUNG

Endovenöse Methoden in der Behandlung inkompetenter Venen haben sich in Deutschland etabliert. Obwohl sie eine effektive Alternative zur chirurgischen Therapie darstellen, handelt es sich unverständlicherweise nicht um Eingriffe der ersten Wahl. Ganz im Gegensatz zu internationalen Empfehlungen. Risiken und Nebenwirkungen lassen sich durch die nicht-thermischen Verfahren weiter reduzieren. Ist die Varizen-Verklebung mit Cyanoacrylat eine weitere Verbesserung? Nach 1015 Prozeduren mit dem Venenkleber an inkompetenten Stammvenen werden die eigenen Ergebnisse vorgestellt und diskutiert.

Introduction

Despite the availability of excellent alternatives, stripping operations remain the standard treatment for incompetent saphenous veins in Germany. Approximately 350 thousand procedures are carried out on varicose veins every year. Endovenous treatment options are still being presented as modern, less invasive procedures although they have been part of the standard repertoire in daily practice for years. These options include endovenous laser ablation, radiofrequency ablation, glue treatment and mechanochemical ablation. The VenaSeal™ Closure System was licensed in Europe in 2011. In February 2015, the Food and Drug Administration (FDA) granted unrestricted marketing authorization to the venous glue for endovenous ablation of superficial veins and saphenous veins.

Both open surgery and endovenous procedures aim to remove venous reflux, which is the main cause of chronic venous insufficiency (CVI). According to the currently available medical literature, there is no significant difference in the occlusion rates of the various available methods [1, 2, 3]. Every vascular surgeon or physician can therefore confidently advertise their preferred method, be it surgical or endovenous, to their patients. Nevertheless, are there differences between the procedures? Can an alternative that is better suited to the individual perhaps be set apart from other procedures?



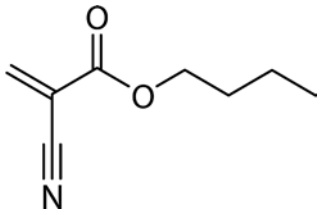
▶ **Fig. 1** Overview of the different techniques.

Besides open surgical high ligation of the saphenofemoral junction and BABCOCK stripping, which are often called 'gold standard' treatment, there are also thermal and non-thermal procedures (▶ **Fig. 1**).

History

The American chemist Harry Coover worked at Eastman Kodak. In 1942 he noticed a chemical compound which stuck to and onto everything. Cyanoacrylate, the 'superglue' had been discovered (▶ **Fig. 2**).

However, the adhesive properties of the substance led to it being left hidden away at the bottom of the drawer initially. Harry Coover only recognized the significance of cyanoacrylate as an adhesive in 1951. Eastman Kodak marketed the adhesive in 1958. The product gained popularity quickly. In 1964, the Eastman company first applied to the FDA for permission to use cyanoacrylate to glue human tissues and wounds. In Germany, the Paediatric Surgeon Professor Heiss from Heidelberg worked on cyanoacrylate and obtained his professorial title at the University of Heidelberg in 1968 through his paper *Polymers as substitute sutures* (Polymerisierende Kunststoffe zum Nahtersatz) He played a substantial role in the development of modern wound adhesives (such as Histoacryl® or Vulnocoll®) and of new surgical techniques and their application. Cyanoacrylate is the name for polymerizable chemical compounds (monomers) that are liquid at room temperature. As cyanoacrylate can stop significant bleeds, it quickly started playing a major role in surgery. Cyanoacrylate sprays were used as instant wound dressings during the Vietnam War [4]. The public have been able to purchase these sprays from any pharmacy since 1998 [5]. The surgical adhesive is categorized as a class III accessory for use in surgery and as a skin closure in various medical sub-specialities under the name of N-butyl-2-cyanoacrylate [6], Glubaran 2, (EU Council directive 93/42/EEC and subsequent updated versions). The product rapidly polymerises on contact with live tissues and in moist environments [6]. This reaction occurs at a maximum temperature



▶ **Fig. 2** n-Butyl-2-cyanoacrylat.

of 44° C. If used correctly, the adhesive will start to harden in 1 to 2 seconds, and the chemical hardening process is complete after 60 to 90 seconds. The adhesive is removed from the tissue by hydrolytic degradation and is excreted. The effect of the adhesive is maintained for extended periods of time when used in the vascular system [6]. Cyanoacrylates are fast-setting and solvent-free. They do not pose a danger to humans or animals. There is no evidence of a mutagenic, carcinogenic or allergenic potential. Cyanoacrylates are biocompatible [7].

n-butyl-2-cyanoacrylate:

- heat of polymerisation: maximum 44° C
- no systemic or local toxicological findings
- non-mutagenic
- non-pyrogenic
- antimicrobial effect against gram-positive
- no allergical irritation
- biocompatible
- bioresorptive
- not placental

Method

Venous reflux is stopped by the application of n-Butyl-2-Cyanoacrylate via an endovenous catheter system. The catheter is advanced using the same technique as in other endovenous procedures. Every step of the procedure can be visualized and monitored by ultrasound. In accordance with the instructions for use, the catheter tip is to be positioned approximately 4 to 5 cm distal to the saphenofemoral junction. This is one of the procedures used to accomplish occlusion of the saphenofemoral junction. The delivery catheter is usually withdrawn in a peripheral direction in steps of 3 cm, and the vein sealed in segments (0,1 ml per glue point). The procedure is certainly not restricted by large-diameter veins, as even diameters of 20 mm are not a hindrance [8, 9]. In such large veins, more adhesive per glue point is deposited. Side branches identified by ultrasound may be targeted and glued. If several long veins require treatment, e. g. both the long and short saphenous veins, both procedures can be carried out in one session using the amount of glue (5 ml) available. Patients can change their position themselves, as an anaesthesia is not required during the use of venous adhesives. In most patients both the vein and the adhesive have been absorbed to such an extent that they can no longer be visualized by ultrasound two years after the procedure. The adhesive is metabolised by hydrolyzation and completely excreted [6, 10, 11].

▶ **Table 1** VenaSeal procedures n = 1015.

VSM unilateral	n = 159
VSM bilateral	(267 × 2) n = 534
VSP unilateral	n = 74
VSP bilateral	(8 × 2) n = 16
VSM + VSP unilateral	(68 × 2) n = 136
VSM bilateral + VSP unilateral	(28 × 3) n = 84
VSP bilateral + VSM unilateral	(4 × 3) n = 12
	total: n = 1015

Results

1015 incompetent saphenous veins (great and short saphenous veins) in 608 patients (▶ **Table 1**) with signs of chronic venous insufficiency (CVI) were occluded with cyanoacrylate under ultrasound control. (11/2013 to 07/2019). The procedures did not require the use of anaesthesia or post-procedure compression. Currently, the maximum follow-up time is six years. Standard follow-up is scheduled on day 10, and after 3, 12 and 18 months. The mean diameter of the saphenous vein was 68 mm (range from 55 to 190 mm). Post ablation glue extension (PAGE) did not occur in any patient. One procedure was followed by a venous thrombosis at the level of the thigh. This was not caused by glue displacement, but a valve lesion in the femoral vein, caused by the guide wire could be detected. An external vascular department has provided a macroscopic and histological assessment. The most common post-procedural effect is periphlebitis, which affected 125/1050 in our sample, i. e. 12.31 % and most commonly occurred at the end of the second week following the procedure. During the first follow-up examination on day 10, all glued saphenous veins were shown to be completely occluded. The occlusion rate at 18 months was 96.5 % (855/886). 41 patients had the longest follow-up. At 65 months post procedure, the glued segments of 39/41 (95.1 %) of the treated saphenous veins were shown to be successfully occluded.

The average time taken to occlude a saphenous vein is less than 10 minutes, assuming that a length of 50 cm is treated. The mean quantity of adhesive used per saphenous vein was 1.42 ml (1.1 to 1.7 ml). Local anaesthesia with 3 to 4 ml Meaverin 1 % was applied only to the puncture site for the catheter. An overview is shown in ▶ **Table 2**.

▶ **Table 2** Overview.

Patients		n = 608
Saphenous veins (VSM/VSP)		n = 1015
Age		16–19 (mean 54.3)
CEAP stage		3–4 foremost
Rate of occlusion	after 10 days	1015/1015 ≙ 100 %
	after 3 months	1015/1015 ≙ 100 %
	after 12 months	995/995 ≙ 100 %
	after 18 months	855/886 ≙ 96.5 %
Periphlebitis in the first 14 days post operation		125/1015 ≙ 12.31 %
Nerve damage		0/1015
DVT		1/1015 ≙ 0.098 % (Valve lesion in the femoral vein, caused by the guide wire)
PAGE (= post ablation glute extensions)		0/1015

Discussion

The venous glue VenaSeal is one of the established options for the treatment of CVI. The available data (1,2) and our own results show obviously reproducible facts, confirming the equality of cyanoacrylate-gluing of varicose veins with other endovenous procedures or surgery. If we wish to engage in a respectable discussion, we should be motivated as therapists to treat our patients with a method that is both effective and as straightforward as possible. The effectiveness of the VenaSeal procedure has been shown. Where do the main advantages of the venous glue procedure lie? On the one hand, general anaesthesia or tumescence anaesthesia are superfluous. On the other hand, there is no risk of nerve or lymphatic system damage. Pre-existing anesthetic risks or any necessary prescription medicines are not a contraindication to the procedure. The fact that there is no need for postprocedural compression [1, 2] is perceived by the patients as a practical and comfortable aspect. Even veins with large diameters exceeding 15 mm can be successfully occluded using this system [8, 9]. Erythema along the glued vein, especially the great saphenous vein on the inner side of the knee, is due to macrophage and lymphocyte activation. Topically or systemically applied symptomatic treatment with NSAIDs plus local cooling eliminate this problem within a few days. Heat-induced nerve and lymphatic system damage is not an issue [13]. Genuine allergic reactions are not known. Patients can return to their private or professional everyday life on the day of the procedure or on the next day at the latest. In the meantime, this venous glue has been used for almost 10 years and its closure results match those achieved by other endovenous procedures or surgery [1, 2, 12]. Experiences made in other medical specialities (neurosurgery, gastroenterology and many others) in the last decades underline the significance of the cyanoacrylate venous glue procedure in the treatment of CVI.

Summary

Taking the aspects of anaesthesia, procedure duration, compression, risks, pain, sick leave and recovery time into consideration, venous glue can prove itself through its effectiveness and minor side effects.

Conflict of interest

The author declares that he has no conflict of interest.

References

[1] Yang G, Parapini, M, Chen J et al. Comparison of Cyanoacrylate (VenaSeal) and Radiofrequency Ablation for Treatment of Varicose Veins in a Canadian Population. J Vasc Surg 2017; 66 (I3): e65

[2] Morrison N, Gibson K, McEnroe S et al. Randomized trial comparing cyanoacrylate embolization and radiofrequency ablation for incompetent great saphenous veins (VeClose). J Vasc Surg 2015; 61 (4): 985–994

[3] Morrison N. VenaSeal Closure System vs. Radiofrequency Ablation for Incompetent Great Saphenous Veins (VeClose). 36 Month Results presented at: IVC; April 20, 2017; Miami, FL

[4] Im Internet: https://de.wikipedia.org/wiki/Cyanacrylate; Stand: 15.08.2019

[5] Im Internet: https://www.zeit.de/2004/33/Stimmts_33; Stand: 15.08.2019

[6] Im Internet: http://pdf.medicalexpo.de/pdf-en/gem-italy/glubran-2/68563-197349.html#open; Stand: 15.08.2019

[7] Im Internet: https://www.cyberbond.de/wp-content/uploads/cyberbook_kap04_ca_dt.pdf; Stand: 15.08.2019

[8] Park I. Successful use of VenaSeal system for the treatment of large great saphenous vein of 2.84 cm diameter. Ann Surg Treat Res 2018; 94 (4): 219–221

[9] Gibson K. Cyanoacrylate Closure of Incompetent Veins without the use of Post-Procedure Compression: A Post-Market Evaluation of the VenaSeal System (WAVES trial): Twelve Month Data. Results presented at: Charing Cross; 2017: London, UK

[10] Alm J. Minimalinvasive Therapie der Varikosis. In:Endovenöse Verfahren. Hartmann K (Hrsg.). Schattauer: Stuttgart; 2015

[11] Zierau U. Im Internet: www.saphenion.de, accessed on 16.6.2019

[12] Proebstle TM, Alm J, Dimitri S et al. The European multicenter cohort study on cyanoacrylate embolization of refluxing great saphenous veins. J Vasc Surg Venous Lymphat Disord 2015; 3: 2–7

[13] Park JY, Galimzahn A, Park HS et al. Midterm results of radiofrequency ablation for incompetent small saphenous vein in terms of recanalization and sural neuritis. Dermatol Surg 2014; 40: 383–389