INDEX COPERNICUS INTERNATIONAL

REVIEW ARTICLE

The role of compression therapy after endovenous laser ablation (EVLA) – review

Authors' Contribution:
A – Study Design
B – Data Collection
C – Statistical Analysis
D – Data Interpretation
E – Manuscript Preparation
F – Literature Search
G – Funds Collection

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Article history: Received: 24.09.2023 Accepted: 13.11.2023 Published: 27.11.2023

ABSTRACT:

Introduction: Chronic venous disease (CVD) is a rising problem in Western countries. There are several stages of CVD that can be treated in different ways. One of the methods of treating varicosity, Stage C2 of CVD, is through endovenous laser ablation (EVLA). While still being developed, this method is popular due to its short operation time, less bleeding, quick recovery, and lack of surgical scars. Compression therapy with compression stockings has been widely used as a conservative treatment of early-stage CVD and it's also used after EVLA. However, there are no strong recommendations to use compression therapy after this kind of surgery.

Aim and method: The aim of this paper is to review existing knowledge about the benefits of compression therapy and to identify a recommended time period for its use after EVLA. The databases used in the review were Pubmed and Cochrane.

Results: Studies focusing on compression therapy for varicose veins after EVLA have questioned the prolonged use of compression therapy, as it brings no additional benefits and might be difficult for patients to adhere to. The existing studies recommended a period no longer than 1–2 weeks. No significant differences were found in reoccurrence rate or return to normal activities between compression and non-compression groups. It has been proven that compression therapy significantly reduces postoperative pain and the consumption of analgesics.

Discussion: Compression therapy seems to be a safe option for low pain management. There is a need for further research involving the impact of compression therapy after EVLA, especially in group of low energy delivered settings, as the results of treatment are promising.

KEYWORDS: compression therapy, CVD, edema, EVLA, EVLT, varicose veins

ABBREVIATIONS

BMI – body mass index
CEAP – Clinical-Etiology-Anatomy-Pathophysiology
CT – computed tomography
CVD – chronic venous disease
DUS – duplex ultrasound
DVT – deep vein thrombosis
EVLA – endovenous laser ablation
GECS – graduated elastic compression stockings
HHD – hand-held doppler
MD – mean difference
NRS – Numerical Rating Scale
QoL – quality of life
RCTs – randomized controlled trials
VAS – Visual Analogue Scale

INTRODUCTION

Chronic venous disease (CVD) is a condition that has a significant impact on quality of life (QoL). Symptoms reported by patients include leg pain, itching, tingling, discomfort, or heaviness. The clinical presentation of CVD is varicose veins, edema, skin discoloration, lipodermatosclerosis, or venous ulcers [1]. The classification used to describe the severity of lesions is CEAP (Clinical-Etiology-Anatomy-Pathophysiology); it ranges from C1 to C6 [2]. The economic burden of CVD is estimated to be 2% of Western countries' healthcare budgets. The prevalence of varicose veins (C2) varies between 5% and 65%, being higher among Western countries [3]. The mechanism of lower extremity venous insufficiency is thought to be caused by valve damage or failure [4]. The risk factors which increase the prevalence of CVD are an age of >70 years, female sex, a BMI of >30, and a family history of CVD. A summary of the risk factors is presented in Fig. 1. [5]. The progression of CVD is estimated to be 2.4% annually for the C2 population and one third of patients might develop chronic venous insufficiency (≥C3) during their lifetime [6].

CLASSIFICATION OF CHRONIC VENOUS DISEASE

The CEAP classification is a standard which helps to classify, understand, and report the clinical manifestations of CVD. Its usefulness has proven that it is a crucial element of choosing the right treatment for the patient [2]. The clinical (C) classification, as the most widely used part of the 2020 revision of CEAP, is presented in Tab. I. [2]. Diagnosis of CVD is based on the clinical presentation and duplex ultrasound (DUS), which helps to identify the location, size, and reflux time and helps to differentiate the veins. It has been the standard since the 1980s, as DUS is more objective and more useful than hand-held doppler (HHD) [7].

TREATMENT

The choice of method is based on the severity of the venous insufficiency, risk of postoperative complications, cost, and patient

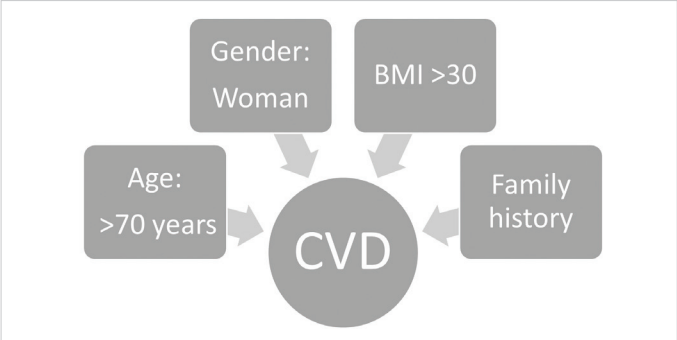

Fig. 1. Risk Factors of Chronic Venous Disease.

Tab. I. Clinical (C) classification from CEAP, 2020 revision.

CLASS	DESCRIPTION	STAGE	
C_0	No visible or palpable signs of venous disease	Asymptomatic	
C_1	Telangiectasias or reticular veins		
C_2	Varicose veins	Chronic venous disease	
C_{2r}	Recurrent varicose veins		
C_3	Edema		Chronic venous insufficiency
C_4	Changes in skin and subcutaneous tissue secondary to CVD		
C_{4a}	Pigmentation or eczema		
C_{4b}	Lipodermatosclerosis or atrophie blanche		
C_{4c}	Corona phlebectatica		
C_5	Healed venous ulcer		
C_6	Active venous ulcer		
C_{6r}	Recurrent active venous ulcer		

preferences. Symptomatic patients are offered various methods of treatment, which can be divided into the three categories summarized in Tab. II. [8].

The 2013 National Institute for Health and Care Excellence clinical guidelines recommend EVLA or RFA as the first line of treatment, then sclerotherapy and classical surgery as the third line [8]. EVLA treatment is the most cost-effective therapeutic option in the UK, with RFA in a close second place [9].

Treatment of C2–C3

There are many methods for surgical treatment of varicose veins (C2), one of which is EVLA. This minimally invasive therapy of varicose veins is characterized by a short operation time, less bleeding, quick recovery, and no surgical scars. The method involves using a semiconductor laser at infrared wavelengths (808, 810, 940, 980, 1064, 1320, 1470, 1510, or 1920 nm) to damage the venous endothelial cells and the venous wall, which leads to fibrosis and finally to vein stripping [10, 11]. Compression therapy is a standard after EVLA and is initiated by a 24-hour period of bandage compression [12].

Compression Therapy

Compression therapy (CT) is a widely used conservative CVD treatment. Due to technological advancement, different methods can be used, for example, hosiery, bandages, intermittent pneumatic compression, and complex compression systems. The compression can be adjusted to the symptom's severity and the patient's preferences. It increases the chances of achieving the best possible QoL [13]. There is a range of recommendations for pressure grades of compression stockings: for patients with varicose veins, it is 20–30 mmHg (C2 to C3) [8]. Graduated elastic compression stockings (GECS) are a common type of CT that provide decreasing pressure from the distal to the proximal part. They are used for treating both venous and lymphatic disorders [14]. The mechanism of GECS relies on the elastic fibers of the stockings exerting pressure on the skin and increasing blood flow in the superficial veins by reducing their diameter. It also reduces edema by augmenting the skeletal-muscle pump and facilitating venous return [15]. For patients with C6 CEAP, compression therapy has been classified as a 1B grade recommendation (strong recommendation, moderate quality evidence) as compression helps to heal venous ulcers [16]. Compression therapy is reported to be beneficial for orthopedic immobilized patients, reducing the risk of post-operative deep vein thrombosis (DVT) [17]. Fig. 2. summarizes the mechanism of action and the benefits of compression stockings. Although CT has a lot of benefits, it does not solve the problem of varicose veins. When comparing the compression treatment versus surgical treatment after 2 years, 94.9% of the patients in the compression treatment group were still at C2–C3, as opposed to 27.0% of the surgical group. This finding highlights the benefits of surgical treatment of varicose veins [18]. Other drawbacks of GECS are possible: allergies to textiles, skin discoloration, or blisters [15].

Clinical Limitations of Compression Therapy

The major problem in compression therapy is adherence to the prescribed hosiery, related to the patients' knowledge about their condition, the depression score, and their level of self-efficacy. A study published in 2010 by Finlayson et al. indicated that only 47% of patients diagnosed with chronic venous insufficiency wore their compression stockings every day; 20% of patients did not wear the prescribed hosiery at all [19]. A large cohort study, which included 54.4% of patients graded C0–C2, highlighted the major complaints of those patients who were prescribed compression therapy. Among the most frequent reasons for non-compliance were "uncomfortable" (49.4%), "too difficult to put on" (34.6%), and "not specified" (25.9%). Only 31.8% of patients used the compression as prescribed during the mean 90.9-day follow--up [20]. The multi-study analysis on CVD and post-thrombotic syndrome patients who were prescribed CT showed that there is greater compliance with compression hosiery for ≤25 mmHg (77%) *vs.* >25 mmHg (65%) [21].

Compression therapy adherence is a significant problem for the majority of patients. The aim of this study is to review the existing knowledge to find the optimal time and potential effects of compression therapy after EVLA treatment. English-language studies were included in this review. The databases used for the review were Pubmed and Cochrane.

Tab. II. Methods of treatment for varicose veins.

SURGICAL	THERMAL	NON-THERMAL
High ligation and stripping (HL/S)	Endovenous laser ablation (EVLA)	Foam sclerotherapy (FS)
Ambulatory phlebectomy (AP)	Radiofrequency ablation (RFA)	Cyanoacrylate embolization (CAE)

Time Period for Compression after EVLA

There are no strict recommendations for the duration of compression therapy after thermal ablation or stripping of the saphenous veins. The guidelines of the Society for Vascular Surgery indicate the absence of evidence and recommend best clinical practice to determine the period for compression therapy. However, the National Institute for Health and Care Excellence recommends no more than 7 days compression therapy after interventional treatment, as there is no convincing evidence either for or against compression therapy [16]. According to the latest meta-analysis, there are no significant differences in QoL between compression and control groups after endovenous laser ablation at either 2 weeks or 6 months [22]. One of the studies about compression after EVLT on mostly C2–C3 patients (86%) suggests 1–2 weeks of CT after an initial 24 h of bandaging. This is because the benefits are modest and for some elderly patients, putting on compression stockings might be difficult and uncomfortable [12]. The systematic review made by Al Shakarchi et al. drew the conclusion that there is no need to extend CT for more than 2 days, as prolonged compression causes discomfort to patients and leads to a low compliance rate [23].

Effects of Compression after EVLA

A 2022 metanalysis on seven randomized controlled trials (RCTs) with a total of 1146 patients ranging between C2 and C6 on the CEAP classification confirmed that postoperative compression therapy significantly reduces pain in patients (mean difference [MD], –8.00; CI, –12.01 to –3.99; $p < 0.001$). However, there were no significant changes in terms of a faster return to normal activities (MD, –0.43; CI, 1.06–0.19) or QoL (standardized mean difference, 0.45; 95% CI 0.14–1.04) [24]. A study by Ye et al. which included only C2 patients after EVLA revealed that the patients which were using compression therapy had a significantly lower rate of edema during the first week after surgery ($p < 0.04$), though the difference between groups was not statistically significant at 2 weeks [25]. The patients receiving CT during the first week presented significantly greater physical function than the control group (85.1 [11.2] *vs.* 95.7 [10.1]; $p < 0.001$). Also, there was a difference in vitality in favor of the CT group (75 [13.0] *vs.* 83.7 [13.4]; $p < 0.03$) [26]. In a study in which a 1470-nm laser with a 2ring fiber was used, there was a significant decrease in pain in the first week. The pain level after surgery was very low and said to be not clinically relevant (0.9 for the non-compression group and 0.4 for the compression group [$p = 0.009$] on a scale of 0 to 10) [27]. The one RCT strictly focusing on EVLT surgeries in C2–C4 patients reported that the patients using compression therapy tended to take fewer analgesics and had higher satisfaction scores [12].

DISCUSSION

Compression therapy after EVLA treatment seems to be beneficial for some groups of patients. It has been proven that it reduces postoperative pain and the consumption of analgesics. It can also increase the patients' physical function during the first postoperative week. However, there are no significant changes in the rate of reoccurrence or QoL between the compression and non-compression groups. The low-invasive nature of EVLA treatment has evolved over time. Lower energy settings combined with long wavelengths have led to decreased incidence of bruising and postoperative pain. This is due to less energy being exerted on the vein wall. Moreover, the introduction of radial tip and "jacket--tipped" tip fibers instead of bare-tipped fibers has reduced the risk of vein perforation, and thus of bruising and pain, by the low energy of the laser used [11]. A 2021 study with 1470-nm wavelength and 2ring fiber EVLA treatment confirmed the excellent effect of the procedure with a lower level of postoperative pain. The compression after treatment did bring a significant change in pain reduction, but was not clinically relevant due to minimal changes. Moreover, 83–86% of patients did not develop any pain following the surgery [27]. The Visual Analogue Scale (VAS), used in most of the studies reviewed in this paper, is one of the most popular disease-related symptom severity scales available. It is characterized with a simple line form on a 50-mm or 100-mm scale [28]. However, the VAS scale was reported to be difficult for elderly patients, especially for those with moderate cognitive impairment and communication problems. The VAS has been deemed difficult for those patients and should thus be used with other scales, such as the NRS [29]. The accuracy of the pain measurement can be incorrect due to several factors, such as educational level, age, or cultural background. The VAS requires abstract thinking and can be difficult when used for the first time [30]. The minimal changes in pain management after compression therapy, together with measuring pain errors, can bias the outcomes of studies. There is a need for larger RCTs that would examine the effect of compression therapy after EVLA, especially using low energy settings and modern tips, because there is not much evidence that compression is necessary after surgery. When it is prescribed, the reason for compression should be thoroughly explained to the patients, since many patients do not adhere the therapy because the stocking is too uncomfortable or difficult to use. The evidence suggests that CT longer than 2 weeks after EVLA does not bring any additional benefits. The abovementioned studies in general propose compression for approximately 1–2 weeks.

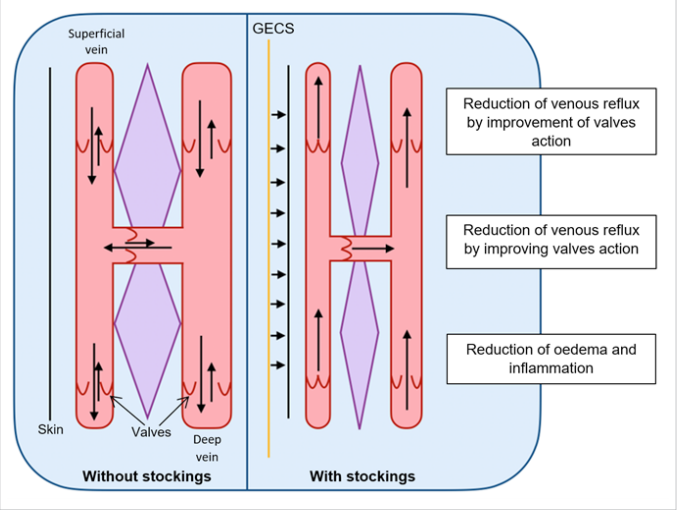

Fig. 2. Mechanism of action and benefits of GECS for patients with varicose veins.

CONCLUSIONS

Compression therapy seems to be a safe option after EVLA treatment. However, when used for more than one week, it does not bring any additional benefit. The studies included in this review highlight the pain-relieving effect of compression and increased vitality during the first week. The development of the EVLA method changed the approach towards compression after treatment. The

treatment has become less invasive with less energy used to seal the vein. The improving effects of EVLA treatment bring into question the significance of compression, as many patients struggle to wear the compression hosiery and do not adhere to recommendations.

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Table of content: https://ppch.pl/issue/16065 Page of count: 5 Tables: 2 Figures: 2 References: 30

Competing interests: The authors declare that they have no competing interests.

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Cite this article as: Swiatek L., Stepak H., Krasinski Z.; The role of compression therapy after endovenous laser ablation (EVLA) – review; Pol Przegl Chir 2024; 96 (Supl. 1): 1–5; DOI: 10.5604/01.3001.0053.9855