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Four Years Experience with 1940NM Diode Laser and Total EVLA Method. Short Term Outcomes

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ABSTRACT

Background: The use of endovenous laser ablation (EVLA) combined with other techniques, typically miniphlebectomy, is recommended to avoid undesirable complications. We decided to compare the safety and efficacy of two treatment methods – EVLA and the new breakthrough TOTAL EVLA (side brunches and perforator veins are closed by laser) and to investigate whether the TOTAL EVLA is associated with a lower complication risk.

Methods: Clinical study of patients who had undergone TOTAL EVLA or EVLA with miniphlebectomy. Evaluation of intraoperative pain, haematoma, duration of wearing compression stockings, postoperative pain and neuropathy, sick leave duration and return to physical activity. Symptoms and complaints were surveyed using a questionnaire at least 4 weeks after the operation.

Results: 60 TOTAL EVLA and 48 EVLA with miniphlebectomy patients. Patients who underwent TOTAL EVLA had a shorter period of compression usage – average 16,9 days, with EVLA - 36,16 days. Duration of haematoma: 2,16 weeks for TOTAL and 3,13 weeks for EVLA. The TOTAL group measured intraoperative pain at 4,1 (from 1 to 10), EVLA – 4,3. Six TOTAL EVLA patients didn't feel any postoperative pain, the rest had pain for 7,6 days. All of EVLA had pain for on an average of 15,8 days. In TOTAL sick leave was for 2,8 days, in EVLA – 14,5 days. TOTAL patients returned to physical exercises in an average 8,3 days, EVLA – 39,5 days.

Conclusions: The study demonstrates that TOTAL EVLA has lower postoperative complication risks and a faster recovery than EVLA. TOTAL EVLA patients have shown better pain improvement. Treatment method proved clear impact on patients quality of life.

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Abbreviations
EVLA - Endovenous Laser Ablation
QoL – Quality of Life

Introduction

Varicose veins are frequently encountered medical condition and their extraction could be associated with some undesirable complications. That's why the use of minimal invasive techniques such as EVLA combined with other techniques, typically side brunch phlebectomy, are highly recommended [1-3]. Endovenous laser treatment has become a very popular minimal invasive treatment method for saphenous vein reflux [4]. EVLA is a safe endothermal treatment option. Vein occlusion is caused by laser induced thermal damage of the endothelium [5]. An overdose of radiation is accompanied with an increased complication rate. It is seen that the larger the wavelength of laser is, the safer is the procedure [3,6,7].

Nowadays, there are several wavelengths of lasers, such as 980nm, 1470nm and 1940nm. Compared to other lasers, the 1940 nm laser needs less energy to destruct the vein wall. It has a lower risk of complication such as nerve injuries, deep vein thrombosis and recanalization [3,8-10].

Usually in the treatment of varicose veins, EVLA is used together with other techniques like miniphelebctomy (side brunch phlebectomy/ Muller phlebectomy), which can lead to several side effects like haematoma, ecchymosis, intraoperative pain, postoperative pain. Thinking of how to reduce these common side effects of EVLA, we tried out to close all side brunches using the same laser.

We decided to compare the safety and efficacy of two treatment methods – EVLA combined with miniphlebectomy and the new breakthrough minimal invasive technique TOTAL EVLA (where truncal vein,side brunches and perforator veins are closed by laser) and to investigate whether the TOTAL EVLA is associated with a lower complication risk.

Materials and Methods

A retrospective clinical study including 108 patients from 2018 to 2021 who had undergone TOTAL EVLA (60 patients) surgery or EVLA with miniphlebectomy (48 patients) for treatment of

primary varicose veins. All the patients were operated in the Baltic Vein clinic, Riga, Latvia. Before the surgery for all the patients the diagnosis of venous insufficiency was made by Duplex ultrasound studies and clinical evaluation. In study there were included all – bilateral and as well as unilateral treatments. No patients were excluded from the study. Patients were classified according to the treatment method – TOTAL EVLA or EVLA with miniphlebectomy. There were evaluation forms of clinical indicators of methods' efficacy and safety which included:
a) intraoperative pain (it was evaluated with the scale from 0 – 10, where 0 – no pain, 10 – severe pain),
b) haematoma or ecchymosis (days, weeks, months)
c) duration of wearing compression stockings (7 days, 14 days, 21, days or more),
d) postoperative pain (duration of pain),
e) postoperative neuropathy (yes or no),
f) sick leave duration (for how many days, weeks, months),
g) return to physical activity (days, weeks, months).

The status of patients' symptoms and complaints was surveyed using a questionnaire either during consultation or by phone call. It was 4 weeks after the operation.

The technique of the TOTAL EVLA surgery is the same as for EVLA. Before the surgery, all the patients have a duplex ultrasound when the surgeon is doing mapping of the venous system. Truncal veins are closed using a 1940 nm diode laser.

Side-brunches and perforator veins are marked on the skin. All the patients were operated with tumescent anaesthesia, it is injected under ultrasound control. After closing of truncal vein, all side brunches and perforator veins are punctured with intravenous cannulas under ultrasound control and closed by TOTAL EVLA using a third generation *Eufoton* 1940 nm diode laser (400 qkm radial fibers). For veins thicker than 6mm – 600 qkm radial fiber.

Table 1: Intravenous cannulas size used in TOTAL EVLA depending on radial fiber

Fiber size	Cannula size
400 qkm	16 G
600 qkm	14 G

Figure 1: Before TOTAL EVLA

Figure 2: Mapping of Insufficient Veins

Figure 3: Cannulation of Side Brunches Under US Control

Figure 4: TOTAL EVLA for Side Brunches

Figure 5 and 6: Before and 7 days after TOTAL EVLA

Figure 7, 8, 9: Before, First Day After and 18 Months After TOTAL EVLA

All the patients had compression stockings applied after surgery, the duration of wearing was analysed. Patients went home on the day of surgery. They were encouraged to return to physical activities as soon as possible. A clinical follow-up was one month after surgery.

The data was analysed using Microsoft Excel and SPSS 26.0.

Results/Observations

In total, 108 patients were included in the study, out of those, 60 underwent TOTAL EVLA (group A) and 48 had EVLA with mini phlebectomy (Group B). There were no people excluded from the study.

The mean age was 49,5 years (SD 10,06; range 30-66 years).
Both women and men were included in the study. 63% of the total were women.
All the patients were examined postoperatively at least 4 weeks after the operation.

In group A (patients who had TOTAL EVLA) had shorter time of compression stocking usage – for average of 16,9 days (SD 8,56), in group B (EVLA + mini phlebectomy) the duration of usage was 36,16 days (SD 16,8). Comparing these results, patients in 2nd group were wearing compression socks two times longer.

During postoperative period, in TOTAL EVLA group haematoma or ecchymosis was for an average of 2,16 weeks, but in the group B it was for 3,13 weeks. 2 patients in the latter group admitted haematomas/ecchymosis still after 6 months.

Intraoperative pain was measured using a scale from 0 to 10, where 0 – no pain and 10 – severe pain. The TOTAL group measured intraoperative pain at 4,1; while in EVLA group – 4,3.

Postoperative pain was also measured using scale from 0-10. Six out of 60 TOTAL EVLA patients did not feel any postoperative pain, the rest (50) had pain for 7,6 days.
All of those in group B had pain for an average of 15,8 days.

Most of the patients in both groups noted no clinical postoperative neuropathy.
In group A sick leave was for an average of 2,8 days (SD 5,5), but in group B – 14,5 days (SD 10,7).
Group A patients returned to physical exercises in average of 8,3 days, group B – 39,5 days.

Discussion

Minimal invasive treatment, such as endovenous laser ablation, is considered to be safer and the first choice of treatment rather than phlebectomy in venous insufficiency as it is associated with lower complications risk and faster recovery postoperatively. Overall, patients undergoing EVLA show low intraoperative and postoperative complication rates, low pain levels and faster recovery. EVLA is a well-established and scientifically confirmed treatment option for venous insufficiency. There are a lot of meta-analyses and controlled trials that show faster recovery, lower complication rate compared to phlebectomy. Minimal invasive treatments are associated with long-term effectiveness. International guidelines recommend minimal invasive treatments as the first choice treatment for varicose veins. As all procedures, also endovenous procedure requires additional theoretical and practical training, to minimize the complication risks and use the potential of these procedures.

This study demonstrates that the minimal invasive treatment method TOTAL EVLA has a lower postoperative complication risk and faster recovery compared to usual EVLA with mini phlebectomy.

Individuals who underwent TOTAL EVLA treatment have shown better pain improvement than those who had EVLA with mini phlebectomy.

TOTAL EVLA method proved to have a clear impact on patients quality of life. Patients had much shorter time for compression stocks usage and a shorter period of postoperative pain, which means less usage of analgesics.

Overall, TOTAL EVLA patients were able to return to job faster than those patients who had EVLA with mini phlebectomy, which means a shorter period of sick leave and also most of them returned to regular physical activities much faster than patients who underwent EVLA with mini phlebectomy.

It is important to note that all these TOTAL EVLA results are compared to patients who were treated with EVLA + mini phlebectomy and that these are short term results.

The main feature of the TOTAL EVLA method is that it can be used to remove vessels of any diameter, including side branches, which previously were removed surgically. After surgery there are no marks of incisions and punctures.

It is important to mention that for TOTAL EVLA there is no need for special equipment, everything is standard equipment that is available in every clinic, which means operating costs are low.

There is a disquotable question about time of operation, because TOTAL EVLA method at the beginning needs more time than EVLA and the surgeon needs to practice and have a good hand in the injection of an intravenous cannula.

The study still continues, more patients are being included and long term results are being evaluated.

Conflict of Interests

This study is based on a part of the doctoral dissertation of Ints Udris at the University of Latvia, Riga Latvia. Other authors have nothing to disclose.

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