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Treatment of lower limb telangiectasias with Nd: Yag 1064 nm laser with and without tumescent anesthesia – TIt technique

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Abstract

Introduction: Transdermal laser is an option for varicose veins treatment, yet it may be painful. In this study, we will present a technique for performing tumescent anesthesia associated to transdermal laser (TTL) to reduce pain during treatment.

Objective: The study compares pain during treatment of telangiectasias in lower limb with and without tumescent anesthesia to offer a less painful procedure.

Methods: 50 CEAP C1 patients with bilateral telangiectasias on thighs underwent transdermal laser treatment, using tumescent anesthesia on one side and standard technique on the other. Pain was assessed via the Visual Analogue Scale. The outcomes were compared with Student's t-test. Significance was set at $p < .05$.

Results: Laser treatment without tumescent anesthesia resulted in a VAS pain score of 7.9, versus 0.0 with anesthesia, showing a significant statistical difference.

Conclusion: Tumescent anesthesia and transdermal laser (TTL) is capable of reducing pain in laser treatment of telangiectasias and reticular veins.

Keywords

Varicose veins, sclerotherapy, anaesthesia, leg telangiectasia

Introduction

Reticular veins and telangiectasias are common signs of chronic venous disease (CVD), causing discomfort and cosmetic complaints, even in the absence of other signs of the disease. There are numerous techniques described for treating this condition. Transdermal laser (TL) has emerged as a treatment option with low complication rates.¹

However, its application can cause pain, that could vary from just a small discomfort to high levels of pain, depending on the patient's tolerance. Cooling and local anesthesia are techniques described to alleviate pain during the procedure.¹

Tumescent local anesthesia (TLA) is an anesthetic technique that uses the infiltration of a highly diluted local numbing agent into the tissue to achieve an anesthetic effect while at the same time minimizing side effects due to anesthetic components. This study aims to evaluate the use of local anesthesia as an alternative for pain reduction during TL treatment of telangiectasias.

Methods

This is a case-control study where each participant acted as their own control. Inclusion criteria is patients with Fitzpatrick skin types 1 to 3 and telangiectasias and reticular veins on the lateral thigh of both limbs. Exclusion criteria was the requirement for phlebectomy for treatment. Tumescent anesthesia was administered in the right lower limb. The aesthetic result of the procedure was not assessed in this study.

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Technique

After skin antisepsis, a 20 cm × 20 cm (400 cm²) area was marked on each lateral thigh (Figure 1(a)). On the right side, anesthetic buttons were made near the target area. Through the anesthetic buttons, tumescent anesthesia was performed using a fan block technique with a 25G spinal needle, underneath the telangiectasias (Figure 1(b)). An average of 20 mL of 0.32% anesthetic solution (0.9% SF 100 mL + 2% lidocaine without vasoconstrictor 20 mL + 8.4% sodium bicarbonate 5 mL) was used (Figure 2). After three minutes, the treatment was initiated (Figure 3). A 400 cm² area was also marked on the left lower limb, but no anesthesia was performed.

A series of 100 laser shots was administered on each lateral thigh, both with a skin cooler set to intensity 4 out of 8. A ND:Yag 1064 nm laser with ZYE® dedicated platform (Vyndence, Brazil) was used, using a spot size of 3 mm, a pulse duration of 15 ms, and a fluence of 200 J/cm².

A visual analogic scale of pain (VAS) was used during the procedure (Figure 4). It was offered in the procedure printed on paper for patients to indicate how their pain was best expressed in each lower limb. If the patient reported that she had no pain, it was considered zero. The VAS model was inspired by the one used in other study of the institution.²

Statistic

Student's t-test for two independent samples with equal variances was used to analyze differences between groups. The level of statistical significance adopted in this study was $p < .05$.

Results

From June to November 2023, 50 patients were included in the study. The patients were all female with an average age of 45.6 (± 20) years. All 50 patients

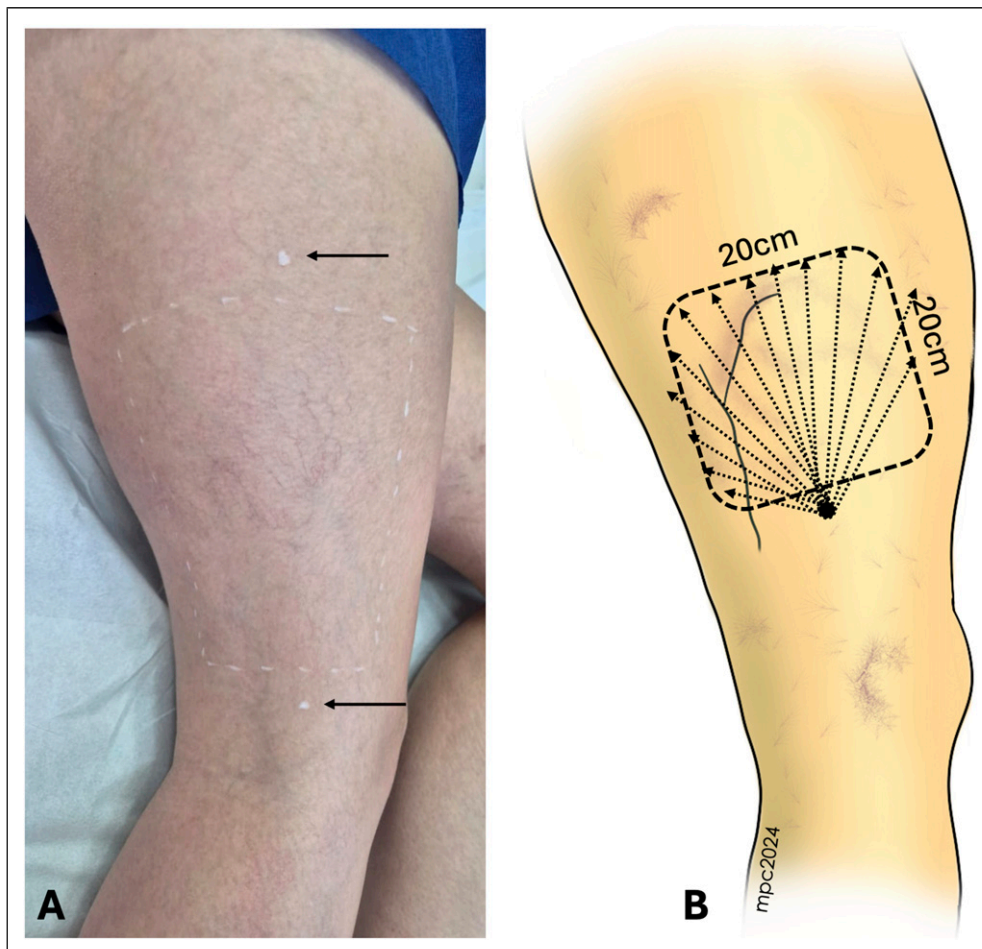


Figure 1. (a) Study area. A 20 × 20 cm area was selected in each leg. (b) Schematic representation of the tumescent anesthesia transdermal laser (TTL) technique. Arrows - planned injection sites.



Figure 2. Components of the anesthetic solution (2% lidocaine without vasoconstrictor, 8.4% sodium bicarbonate, and 0.9% saline).

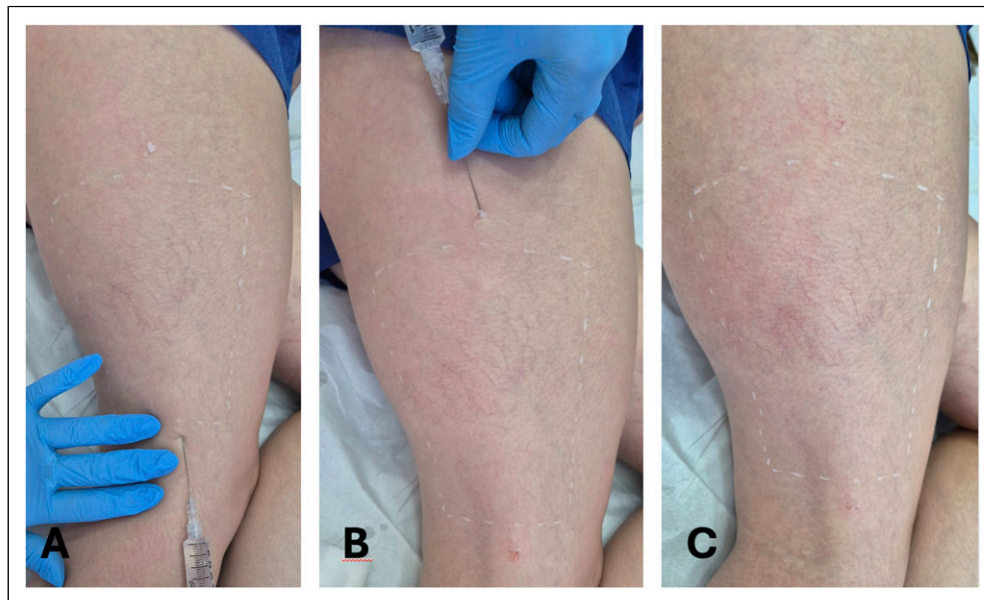


Figure 3. Tumescent anesthesia fan-shaped injection in the lower (a) and upper (b) thigh. (c) Post-application anesthesia result after 3 min. Note the identification of all telangiectasias and reticular veins even after tumescent anesthesia.

reported no pain during the procedure on the anesthetized limb (grade 0). The intensity of pain reported on the VAS for the non-anesthetized limb can be seen in [Table 1](#).

Statistical analyses revealed a significant difference ($p < .05$) between the means of the two groups ([Table 1](#)). During and after the procedure, there were no allergic reactions, burns, or crust formation on the skin in all patients.

Discussion

Telangiectasias, while not providing health risks to patients, are aesthetically displeasing and can cause leg discomfort, itching, and redness in the affected area.³ Due to their high prevalence, especially among women, there is an increasing demand for treatment to improve the condition.

Currently, transdermal laser is recommended in guidelines as an alternative to sclerotherapy for the treatment of telangiectasias.⁴ A systematic review has shown that the clearance rate of telangiectasias is similar between transdermal laser and sclerotherapy, without increasing the incidence of matting and with a lower incidence of hyperpigmentation.⁵ However, pain remains one of the major limitations to its use, with publications reporting severe pain that have reduced patient satisfaction with the outcome.^{6,7}

Among the analgesic alternatives used during the procedure are topical anesthetics and skin cooling systems, that can reach temperatures of up to -30°C , which also provide skin protection.¹ Pain reduction is significant, but may not be sufficient.

Topical anesthetics (TAs) have also been shown to be effective in controlling pain during the application of various types of lasers such as Nd:YAG for laser hair removal,⁸ Q-switched lasers for tattoo removal,⁹ and other lasers for the treatment of vascular and pigmented lesions.¹⁰⁻¹² Despite the success of TAs, their use is limited by the area due to the risk of anesthetic intoxication, often making it challenging to treat large areas like the lower limbs.

Since Jeffrey Klein introduced tumescent local anesthesia (TLA) in the 1980s in dermatologic surgery, there has been widespread interest in the technique by the medical community.¹³ Its application has expanded to include surgeries for breast reconstruction, hand surgeries, and burn treatments among others due to its many benefits.¹⁴⁻¹⁷

TLA involves injecting a solution of anesthetic at a low concentration and high volume into the subcutaneous layer.¹⁸ Despite its widespread use in outpatient surgeries, it has never been described as an analgesic method for the treatment of telangiectasias with transdermal laser. This study was able to demonstrate that this type of anesthesia can minimize discomfort and even nullify pain during the procedure.

Some factors should be taken into consideration about the technique. Firstly, various concentrations of lidocaine were tested beforehand to find the optimal anesthetic concentration, and a 0.3% lidocaine concentration was the minimum concentration to achieve a grade zero on the VAS. Lower concentrations were previously analyzed in other patients but were not sufficient to obtain zero pain during the treatment. For this reason, a concentration of 0.3% was used in the study.

Secondly, although the time spent on the Tumescent Transdermal Laser (TTL) technique may seem laborious and increase the duration of the procedure, the reduction of pain permits an increment in the frequency of shots, offsetting the time invested in administering the anesthesia. However, it is important to highlight that greater care must be taken to prevent thermal injuries when increasing the frequency of the shots. Furthermore, due to the complete anesthesia achieved in all cases, the detection of a potential excessive thermal injury may be compromised.

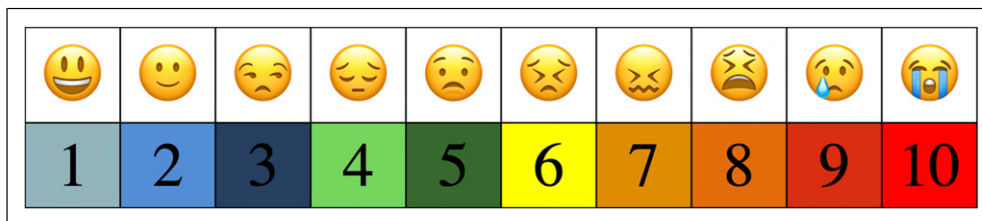


Figure 4. Visual Analogue Scale (VAS) for pain used in the study.

Table 1. Degree of pain in the lower limbs during the procedure.

Number of patients	VAS in the LLL without anesthesia	VAS in the RLL with anesthesia	Teste T Student
1	5	0	$p < 0,5$
4	6	0	$p < 0,5$
12	7	0	$p < 0,5$
19	8	0	$p < 0,5$
10	9	0	$p < 0,5$
4	10	0	$p < 0,5$

VAS: visual analogue scale; LLL: left lower limb; RLL: right lower limb

Lastly, the transdermal laser parameters selected for this study are suitable for the treatment of telangiectasias. However, any spot size, pulse duration, and fluence can be used with this concentration of anesthetic, provided that proper care is taken regarding the skin's thermal exposure.

It is important to highlight that, although tumescent anesthesia may cause discomfort for the patient due to the perforation of the needle in the subcutaneous tissue, it is less significant to the pain felt during shots in the non-anesthetized limb. Patients did not complain of that after the procedure was completed. It is also worth noting that the objective of the study was to compare pain during the application of the laser alone, not the anesthesia.

Although the pain reduction achieved statistical significance, this study is limited by the small number of cases and being conducted at a single center. Studies with a larger number of cases, more centers, and the application of the technique over larger areas may be useful in confirming the results.

Conclusion

This study demonstrates that the tumescent anesthesia with transdermal laser (TTL technique) is effective for pain control during the treatment of telangiectasias, with a low complication rate and high patient satisfaction.

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Author contributions

JCB, MPC: design of the study.

JCB: performed the procedures.

CBG, JBT: statistical analysis.

JCB, CBG, JBT, EAN, JNS, RSN, MPC: written and performed critical review of the paper.

JCB: overall responsibility.

Declaration of conflicting interests

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

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Ethical statement

Ethical approval

This is a case-control study where each participant acted as their own control. Study was approved by the Ethical committee with number 52368120.7.0000.5342

Informed consent

Informed Consent was created and approved at the University of Passo Fundo ethical committee.

Guarantor

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