

The comparison of radiofrequency and Cyanoacrylate embolization therapy in vena saphena magna ablation

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Abstract

Aim: Chronic venous insufficiency is a frequent and disabling illness causing loss of life quality and labor. In this study, we aimed to compare the cyanoacrylate embolization and radiofrequency methods in vena saphena magna ablation therapy.

Material and methods: Two hundred twenty patients with symptomatic venous insufficiency were involved in this study between November 2015 and January 2020 in Bozok University faculty of medicine cardiovascular surgery department. Patients were grouped into two groups. Group 1 included patients who were applied radiofrequency, and Group 2 included patients who underwent cyanoacrylate embolization. Preoperatively, Doppler ultrasound showed venous reflux and VSM diameter in all patients. Patient with non-tortuous veins and VSM diameter of more than 5.5 mm and a reflux duration of more than 0.5 seconds in the saphenofemoral junction were taken into consideration. This study included 110 cases in each group with similar demographic characteristics. After discharge, patients were called for control after one week, and in the first and sixth months they were evaluated with Doppler ultrasound.

Results: A month later, during the procedure in Doppler USG control, we found that VSM in 108 out of 110 patients (%98.18) was obliterated in the RF group. In the cyanoacrylate embolization (CAE) group, VSM was totally obliterated in all patients. Six months later, obliteration was 107 (%97.27) in RF and 109 (%99.09) in the cyanoacrylate group. In a month, %8.18 ecchymosis, %0.9 cellulitis and %1.81 thrombophlebitis were seen in the RF group. Complications in the cyanoacrylate group were ecchymosis in %10.9, cellulitis in %2.72 and thrombophlebitis in %0.9. The duration of the procedure was 32.14 minutes in the RF group and 15.32 minutes in the CAE group. Preoperatively, the patients were asked 8 questions about the symptoms. After six months, the same questions were asked and answers were compared with the previous ones. In both groups, the recovery was similar.

Discussion: Although the classical surgical procedure of venous insufficiency is a successful method, it has complications. When deciding the therapy method, cosmetic results should be kept in mind. Also, the short operation duration affects the choice. Frequently applied methods are EVLA, RFA, foam sclerotherapy, and CAE. RF and CAE techniques were effective as classical surgery in chronic venous insufficiency. Effectiveness and complication rates were not different, but the shorter duration of procedure makes CAE more advantageous.

Keywords

Radiofrequency ablation; N-Butyl Cyanoacrylate; Embolization; Venous insufficiency

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Introduction

Chronic venous insufficiency and varicose veins are disabling illnesses causing loss of life-quality and labor. Its prevalence is %25-50 among the adult population [1]. Pain, venous claudication, swelling, itching are the most encountered symptoms of venous insufficiency. As it may cause only cosmetic problems, ulceration can be a serious symptom of venous insufficiency [2]. In parallel with medical and technical improvements, alternatives to the surgical treatment of chronic venous insufficiency have begun to be used. These methods can be classified as endovenous laser ablation (EVLA), radiofrequency ablation (RFA), foam sclerotherapy, and cyanoacrylate embolization (CEA). EVLA was first used in 1999. It prevents the reflux in the saphenofemoral junction by producing thermal injury that causes occlusion of saphenous vein endothelium [3]. Side effects as postoperative ecchymosis, paresthesia, pain, thermal injury to skin, flebitis can be seen [4]. Although foam sclerotherapy is a widely used, minimally invasive method, its disadvantages are higher recurrence rate, air embolism, pulmonary embolism, deep venous thrombosis, and headache [5]. It is not recommended as a primary therapy in trunkal vein reflux in guidelines [6]. RFA is a process of bipolar energy formed by sound waves. Endothelium contracts as a result of heat produced by the electrode upon contact with the endothelium. [7] CAE is an ablation technic that does not need tumescent anesthesia. IV application of N-butyl cyanoacrylate results in hardening by polymerization. After injection and application of pressure to the vein, the vessel closes. [8] In our clinic, we compared the results of examination of complications.

Material and Methods

Two hundred twenty patients with symptomatic venous insufficiency who applied to Bozok University Medical Faculty Cardiovascular Surgery Department between November 2015 and January 2020 were enrolled in the study. Demographic properties are classified in Table 1. Patients aged between 19 to 70 and those with Venasaphena magna diameter between 5.5 to 16 mm identified by Doppler examination, patients with a reflux period in saphenofemoral junction of morethan 0.5 seconds, C2-C5 in CEAP classification, and veins without

tortuosity were included in the study. Exclusion criteria were symptomatic peripheric arterial disease, deep venous thrombosis, and pulmonary embolism history, pregnancy, and cyanoacrylate allergy. Patients were grouped into two groups. RFA was applied to the first group and CEA was applied to the second. Each group consisted of 110 patients with similar demographic characteristics. Preoperatively, each patient was examined with Doppler ultrasound in order to see reflux and vein diameter. All of them were admitted to the hospital after one week for examination and at the first and sixth months, they were examined with Doppler ultrasound. Questions were asked about eight symptoms, including pain, tiredness, swelling, itching, cramps, tingling, neuropathic symptoms, and a burning sensation, and six months later, at the control visit they were asked again about symptoms, and changes were noted.

Surgical Procedures

Cyanoacrylate Embolization

N-butyl cyanoacrylate is a fast glue used in industry and medicine. After contact with moisture, blood and tissue, its monomer form rapidly polimerizes, and within 10 seconds tension force increases. It stabilizes in one to three minutes. In last stage, tension force increases logarithmically. With Doppler ultrasound guidance, saphenous vein catheterization was made and 5F introducer sheath was replaced. The J-Guide wire was inserted and after reaching to SFJ, a 4F catheter was placed 3 cm distal to the SFJ. The guide wire was pulled out and the syringe mechanism was attached. Compression was applied to the SFJ with an ultrasound probe. The catheter was pulled 2 cm per second and 0.3 ml of glue was inserted simultaneously with every shot. After 10 seconds of compression to SFJ, saphenous vein track obliteration was checked with Doppler ultrasound.

Radiofrequency Ablation

In order to prepare a tumescent solution, we added 50 ml of lidocaine, 1 ml of adrenalin and 10 mEq NaHCO₃ into 1000 ml NaCl. A 7 F vascular sheath was inserted in VSM, and an RFA fiber catheter was placed at least 2 cm away from SFJ under Doppler guidance. Later, the tumescent solution was injected throughout VSM. For every 7 cm of VSM, 10-40 watt and 120 OC ablation was applied twice every 20 seconds.

Results

In the first month, during Doppler examination, in the RFA group, 108 out of 110 were found to be obliterated, while in CAE group, all were completely obliterated. At the sixth months, obliteration in the RFA group was 107 (%97.27) and in the

Table 1. Demographic data of the patients

	Radiofrequency Ablation Group 1	Cyanoacrylate Embolization Group 2
Gender	n(%)	n(%)
Female	67(60,90)	62(56,36)
Male	43(39,09)	48(43,63)
Age	39,27±12	42,58±14
Right leg	51(46,36)	54(49,10)
Left leg	59(53,63)	56(50,90)
CEAP classification		
C2	91(82,72)	32(29,09)
C3	12(10,90)	57(51,81)
C4	6(5,45)	19(17,27)
C5	1(0,90)	2(1,81)
Saphenous mean diameter (mm)	9,26±3,2	8,21±2,6

Table 2. Results and complications

	Radiofrequency Ablation 1.Group n (%)	Cyanoacrylate Embolization 2.Group n (%)
Ecchymosis	9(8,18)	12(10,90)
Cellulitis	1(0,90)	3(2,72)
Thrombophlebitis	2(1,81)	1(0,90)
Hematoma	5(4,54)	2(1,81)
Paresthesia	3(2,72)	1(0,90)
Recanalized vein	7(6,36)	5(4,54)
Saphenous vein mean diameter (mm)	6,8±2,1	8,21±2,6
Mean operation duration (min.)	32,14	15,32

Table 3. Comparison of symptoms after therapy

	Preoperative Symptoms n (%)		Postoperative total cure at sixth months n (%)		Postoperative subtotal cure at sixth months n (%)		Postoperative no change in symptoms compared to preoperative at sixth months n (%)	
	RFA	CAE	RFA	CAE	RFA	CAE	RFA	CAE
Pain	110(100)	109(99,09)	94(85,45)	92(84,40)	10(9,09)	12(11,00)	6(5,45)	5(4,58)
Burning sensation	67(60,90)	74(67,27)	42(62,68)	57(77,02)	16(23,88)	14(18,91)	9(13,43)	3(4,05)
Tiredness	81(73,63)	86(78,18)	53(65,43)	49(56,97)	24(29,62)	29(33,72)	4(4,93)	8(9,30)
Itching	65(59,09)	52(47,27)	34(52,30)	22(42,30)	19(29,23)	24(46,15)	12(18,46)	6(11,53)
Swelling	32(29,09)	46(41,81)	17(53,12)	19(41,30)	7(21,87)	20(43,47)	8(25,00)	7(15,21)
Cramp	59(53,63)	50(45,45)	35(59,32)	24(48,00)	21(35,59)	22(44,00)	3(5,08)	4(8,00)
Numbness	41(37,27)	49(44,54)	12(29,26)	16(32,65)	9(21,95)	10(20,40)	20(48,78)	23(46,93)
Tingle	28(25,45)	33(30,00)	9(32,14)	11(33,33)	4(14,28)	8(24,24)	15(53,57)	14(42,42)

CAE group it was 109 (%99.09). Within the first month, %8.18 ecchymosis, %0.9 cellulitis, %1.81 thrombophlebitis was seen in the RFA group. In the CAE group, %10.9 ecchymosis, %2.72 cellulitis, %0.9 thrombophlebitis was seen as a postoperative complication. VSM diameter was 6.8 ± 2.1 in the RFA group and 8.21 ± 2.6 in the CAE group. The mean operation duration was 32.14 in RFA and 15.32 in the CAE group. Preoperatively, 8 questions were asked again to see the differences. Six months later, the same questions were asked and noted. No significant difference was detected.

Discussion

Although the classical surgical procedure of venous insufficiency is a successful method, it has complications such as infection on the incision side, lymphoedema, haemorrhagia, arterial and venous injury, deep venous thrombosis, keloid scar. [9] When deciding the therapy method, cosmetic results should be kept in mind. Besides surgery, sclerotherapy, RFA, EVLA (endovenous laser ablation) are the therapy methods. Endovenous ablation is easy, and better cosmetic results make it the first choice for surgery. [10,11] Also, the short operation duration affects the choice. Frequently applied methods are EVLA, RFA, foam sclerotherapy, and CAE. Foam sclerotherapy may cause amaurosis fugax, migraine, allergic reaction, confusion. Therefore, it is not recommended as the primary method for truncal reflux lesions. [12,6] Both EVLA and RFA obliterate the vein as a result of thermal injury. In CAE embolization, vascular obliteration is obtained by the chemical action of n-butyl cyanoacrylate. There are many studies comparing the treatment of chronic venous insufficiency with surgical and catheter-based techniques. Van Den Bos conducted 119 research on 12320 patients. The success rate was %78 with classical surgery, %77 with foam sclerotherapy, %84 with RFA and %94 with EVLA. [13] In our country, Bozkurt and his team investigated 310 patients, comparing EVLA (156) and CAE (154), and a statistically short operation period, less pain, fewer ecchymosis in CAE were found significant. Permanent or temporary paresthesia was % 4 in EVLA, while it was not observed in CAE. [14]

In our study, we compared RFA and CAE techniques. Demographically they were similar. The shorter operation period made CAE more preferable. The aforementioned operation duration differences, in our opinion, were caused by

the application of tumescent anesthesia. In the literature, deep venous thrombosis (%1-3), thrombophlebitis (%1-2), sensorial damage (%1-3), hyperpigmentation (%1-2), skin burn (less than %1) are noted [15].

There was no deep venous thrombosis in our study. The most frequently seen complication was ecchymosis, which was cured medically. At the follow-up visit six months later, there was no significant difference between the groups.

RFA and CAE techniques for minimally invasive therapy of venous insufficiency are as effective as surgery. No significant difference in effectiveness and complications were detected, but a shorter operation period makes CAE more preferable.

Scientific Responsibility Statement

The authors declare that they are responsible for the article's scientific content including study design, data collection, analysis and interpretation, writing, some of the main line, or all of the preparation and scientific review of the contents and approval of the final version of the article.

Animal and human rights statement

All procedures performed in this study were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards. No animal or human studies were carried out by the authors for this article.

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Conflict of interest

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References

- Jeanneret C, Karatolios K. Varicose veins: A critical review of the definition and the therapeutic options. *Vasa*. 2011; 40(5): 344-58.
- Chiesa R, Marone EM, Limoni C, Volontè M, Petrini O. Chronic venous disorders: correlation between visible signs, symptoms and presence of functional disease. *J Vasc Surg*. 2007; 46(2):322-30.
- Pannier F, Rabe E. Endovenous laser therapy and radiofrequency ablation of saphenous varicose veins. *J Cardiovasc Surg*. 2006;47(1):3-8.
- Morrison N. Laser treatment of the incompetent saphenous vein. In: *Gloviczki P, Dalsing MC, Eklöf B, Moneta GL, Wakefield TW, editors. Handbook of Venous Disorders, 3rd ed. American Venous Forum. London: Edward Arnold; 2009. p.418-28.*
- Almeida JI, Kaufman J, Göckeritz O, Chopra P, Evans MT, Hoheim DF, et al. Radiofrequency endovenous ClosureFAST versus laser ablation for the treatment of great saphenous reflux: a multicenter, singleblinded, randomized study (RECOVERY study). *J Vasc Interv Radiol*. 2009;20(6):752-9.
- Gloviczki P, Comerota AJ, Dalsing MC, Eklöf BG, Gillespie DL, Gloviczki ML, et al. The care of patients with varicose veins and associated chronic venous disease: Clinical practice guidelines of the Society for Vascular Surgery and the American Venous Forum. *J Vasc Surg*. 2011; 53(Suppl. 5): S2-48.
- Nicolaidis AN, Allegra C, Bergan J, Bradbury A, Cairns M, Carpentier P, et al. Management of chronic venous disorders of the lower limbs: Guidelines according to scientific evidence. *Int Angiol*. 2008;27(1):1-59.
- Almeida JI, Javier JJ, Mackay E, Bautista C, Proebstle TM. First human use of cyanoacrylate adhesive for treatment of saphenous vein incompetence. *J Vasc*

Surg Venous Lymphat Disord. 2013;1(2): 174-80.

9. Yang GK, Parapini M, Gagnon J, Chen JC. Comparison of cyanoacrylate embolization and radiofrequency ablation for the treatment of varicose veins. *Phlebology.* 2019;34(4):278-83.

10. Carroll C, Hummel S, Leaviss J, Ren S, Stevens JW, Cantrell A, et al. Systematic review, network meta-analysis and exploratory cost-effectiveness model of randomized trials of minimally invasive techniques versus surgery for varicose veins. *Br J Surg.* 2014;101(9):1040-52.

11. Demirdaş E, Atılgan K, Çiçekçioğlu F, Erkoç MF. The Radiofrequency Ablation Therapy Results of our Newly-Established Bozok University Medicine Faculty Cardiovascular Surgery Centre Bozok Med J. 2017;7(3):67-72

12. Frullini A, Cavezzi A. Sclerosing foam in the treatment of varicose veins and telangiectases: history and analysis of safety and complications. *Dermatol Surg.* 2002;28(1):11-5.

13. Van den Bos R, Arends L, Kockaert M, Neumann M, Nijs ten T. Endovenous therapies of lower extremity varicosities: a meta-analysis. *J Vasc Surg.* 2009;49(1):230-9.

14. Bozkurt AK, Yılmaz MF. A prospective comparison of a new cyanoacrylate glue and laser ablation for the treatment of venous insufficiency. *Phlebology.* 2016;31(Suppl. 1) 106-13.

15. Gale SS, Lee JN, Walsh ME, Wojnarowski DL, Comerota AJ. A randomized, controlled trial of endovenous thermal ablation using the 810-nm wavelength laser and the ClosurePLUS radiofrequency ablation methods for superficial venous insufficiency of the great saphenous vein. *J Vasc Surg.* 2010;52(3): 645-50.

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