Radiofrequency ablation as effective method of treatment for varicose veins of lower extremities

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Abstract. Radiofrequency ablation (RFA) is the modern endovenous thermal method of treatment for varicose veins (VV) of the lower extremities which is characterized by high selective influence on pathologically changed vein. Intraoperative duplex sonography (DS) as an integral part of operation provides the precision of RFA treatment. The above-stated endovenous method is miniminvasive and is carried out under tumescent anesthesia. In comparison with phlebectomy complications are rare. 150 patients, both sexes, 60% (n=90) women, 40% (n=60) men were included in this research. In preoperative period all patients underwent DS. Visual analog scale (VAS), questionnaires of quality of life and sufficiency of treatment were used to assess the effectiveness of RFA and proved supreme results in treatment of VV of the lower extremities. RFA can be recommended as alternative to phlebectomy.

1. Introduction

More than quarter of the population of Russia and industrial countries suffers from varicose vein (VV) disease of the lower extremities which is characterized by primary varicose transformation of the superficial veins and is complicated by the development of chronic vein disease (CVD) that manifests in hypostases, skin changes, trophic ulcers of the lower extremities [1, 2]. New modern endovenous thermal techniques such as radiofrequency ablation (RFA) with VNUS ClosureFast device, endovenous laser ablation (EVLA) with short-wave and long-wave lasers have become an alternative to “traditional” surgery worldwide over the last years. The above-stated methods of treatment are miniminvasive, effective, provide early activation of patients in the postoperative period, surpass sclerotherapy (ST) and phlebectomy (FE) [3, 4]. The aim of this research is to improve the results of radiofrequency ablation (RFA) therapy for patients with varicose veins of lower limbs by assessment the pain syndrome and other complications, to show the effectiveness of endovenous methods of treatment on various stages of the disease.

The main objective of this study is to compare RFA and traditional phlebectomy, to assess the severity of the disease and the quality of patients life before and after the RFA endovascular treatment technique, to develop an algorithm for choosing the method of varicose vein treatment on different stages of the disease, to evaluate the safety of endovenous treatment method by the presence of complications.
2. Methods and materials
The study involved 150 people, both sexes, 90 women (60%) and 60 men (40%), the age of patients was from 22 to 83 years. All patients in the preoperative period underwent ultrasound examination of the veins of the lower extremities. The VV stage was determined by the international CEAP (Clinical, Etiology, Anatomy, Pathophysiology) classification (1994) (figure 1). The most important is the clinical component of the classification (C-component) that determines the stage of the disease. Patients with C1 stage were not included in the study since conservative therapy is more recommended (phlebotonic drugs, topical remedies, compression stockings) to them.

Figure 1. Patients distribution on CEAP classification (C-component) (%).

**RFA modified technique**
Under intraoperative ultrasound control ClosureFast radiofrequency catheter (VNUS Medical Technologies, San Jose, CA) introduces into the vein up to the level of the sapheno-femoral junction (SFJ), after replacing it from 10 to 20 mm distally to the confluence of v. epigastrica superficialis [5] tumescent anesthesia is applied to protect surrounding tissues from the thermal heat and to compress the target vein around the inserted catheter to increase the effectiveness of treatment. The operative temperature of the VNUS ClosureFast device (VNUS Medical Technologies, San Jose, California) is 120 C°. After each treatment cycle (20 seconds) the device gives a positive sound feedback signal that indicates the end of the cycle. According to the standard protocol of the operation two cycles are applied to the closest to the SFJ segment and one per each other 7- cm segment of the target vein. RFA treatment leads to the destruction of the endothelium, denaturation of collagen fibers, thinning of the vein wall [6]. Patients were examined in the early and late postoperative periods, all patients underwent ultrasound control at first (n=150, 100% of patients), seventh (n=75, 100% of all RFA patients) days after the operation, one month (n=53, 71% of all RFA patients), six months (n=17, 23% of all RFA patients), one year (n=16, 21% of all RFA patients), three years (n=5, 7% of all RFA patients) after the operation. 12 patients (16% of all RFA patients) with 8 mm diameter of the great saphenous vein (GSV) underwent modified RFA technique: three cycles to the proximal (closest to SFJ) segment, two cycles for each other segment and one cycle for the distal segment.

3. Results and discussion
Current advances in minimally invasive treatment show better results than open surgery (FE). Comparative analysis proved that in 2009 only 14% of vascular surgeons offered endovenous treatment, in 2012 open surgery was performed only in 44% [2]. One third of patients remained dissatisfied with open surgery in the long-term studies [1]. Our study showed that the success rate of both RFA and modified RFA technique as well as patients satisfactory after miniinvasive procedures are higher than in cases of FE (p<0,05).

The severity of venous disease on quality of patients' life decreased from 4 points to 2 points after RFA by VCSS (Venous Clinical Severity Score) (p<0,05).
The main complications of RFA were: allergic reactions (n=1), skin burn (n=1), paresthesia (n=2), superficial thrombophlebitis (ST) (n=3), hematomas (n=8). More common complications of FE were: paresthesia (n=15), ST (n=5), hematomas (n=26) (figure 2).

![Figure 2. Complications of surgical treatment (%) (p<0,05).](image)

In result, RFA treatment considerably surpasses FE in cases of paresthesias (7%) and hematomas (3.5%) and moderately in case of ST (1.8 %). The recurrent rate of the disease after RFA treatment is 5%, after FE it is 15%. At 9% of all RFA patients with GSV diameter from 8 mm up to 12 mm (n=12) who underwent modified technique that was 3-2-2-1 or 3-2-1 showed no reflux left after six months of treatment (figures 3, 4). Due to the absent of tumescent anesthesia and thermal heat FE showed non allergy and excluded skin burns correspondently. RFA is technically impossible if the target vein is tortuous or if its diameter exceeds 12 mm.

![Figure 3. RFA vein (1 day after treatment)](image) ![Figure 4. RFA vein (6 months after treatment)](image)

4. Conclusion
RFA both standard and modified surpassed FE by results of treatment. Local tumescent anesthesia that provides early activization of patients after RFA is preferable for patients with VV. Intraoperative DS-control during RFA helps to choose the algorithm for the need of multicycle procedure and provides precised intervention that reduces risk of the most severe complications.

In case of contraindications to RFA (technically unappropriate, tortuous target veins) one should conduct FE (figure 5).
Figure 5. Treatment success of surgery.

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