ORIGINAL RESEARCH PAPER
Volume - 14 | Issue - 02 | February - 2025 | PRINT ISSN No. 2277 - 8179 | DOI : 10.36106/ijsr
INTERNATIONAL JOURNAL OF SCIENTIFIC RESEARCH

ENDOVASCULAR MANAGEMENT OF VARICOSE VEINS: A COMPARATIVE STUDY OF THE VENASEAL GLUE SYSTEM AND MICROWAVE ABLATION

Radio-Diagnosis

Dr. Sunny Mishra* Assistant Professor, Department of Radiodiagnosis, Shri Guru Ram Rai Institute of Medical & Health Sciences, Dehradun *Corresponding Author

Dr. Rohit Sharma Associate Professor, Department of Radiodiagnosis, Shri Guru Ram Rai Institute of Medical & Health Sciences, Dehradun

Dr. Prashant Sarda Associate Professor, Department of Radiodiagnosis, Shri Guru Ram Rai Institute of Medical & Health Sciences, Dehradun

Dr. Rajiv Azad Professor & Head, Department of Radiodiagnosis, Shri Guru Ram Rai Institute of Medical & Health Sciences, Dehradun

ABSTRACT

Varicose veins are a common vascular disorder affecting a significant portion of the adult population. Endovascular management techniques, such as the VenaSeal glue system and microwave ablation, offer minimally invasive alternatives to traditional surgical stripping. This study aims to retrospectively analyze and compare the efficacy, safety, and patient outcomes associated with the VenaSeal glue system and microwave ablation in the treatment of varicose veins. A total of 73 patients, 35 treated with the VenaSeal glue system and 37 with microwave ablation, were included in this study. Patient demographics, clinical evaluations, imaging studies, and patient-reported outcomes were reviewed. Statistical analyses, including chi-square and t-tests, were conducted to compare the technical success rates, complication rates, and patient satisfaction between the two treatment groups. The technical success rate, defined as complete vein closure immediately post-procedure, was achieved in 34 out of 35 patients (97.1%) treated with the VenaSeal glue system and in 35 out of 37 patients (94.6%) treated with microwave ablation. Both the VenaSeal glue system and microwave ablation demonstrated high technical success rates, with VenaSeal showing a slightly higher rate, though not statistically significant ($P = 0.58$). The overall complication rates were higher in the microwave ablation group, particularly concerning recurrence/recanalization ($P < 0.001$), skin burns ($P < 0.001$), and skin infections ($P = 0.05$). DVT incidence was higher in the VenaSeal group, but not statistically significant ($P = 0.43$). Both treatments significantly improved patients' quality of life, with high satisfaction scores reported. However, the incidence of complications was notably lower in the VenaSeal group. The higher cost of the VenaSeal system was a significant factor for patients, influencing their choice of treatment.

KEYWORDS

Veneseal, Varicose Vein, Dvt, Microwave Ablation

INTRODUCTION

Varicose veins are a prevalent vascular disorder characterized by abnormally dilated, tortuous, and elongated veins, primarily affecting the lower extremities. They result from chronic venous insufficiency, where venous valves fail to function properly, leading to blood pooling and increased venous pressure. This condition manifests clinically with symptoms such as aching, heaviness, swelling, and in severe cases, skin changes and ulcerations. It is estimated that varicose veins affect approximately 10-30% of the adult population worldwide, with higher prevalence in women and older individuals.

Historically, the standard treatment for varicose veins involved surgical stripping, where the affected veins were physically removed through incisions. While effective, this method is associated with significant postoperative pain, prolonged recovery periods, and potential complications such as infection and nerve injury. Consequently, there has been a growing interest in less invasive techniques that offer similar efficacy with reduced morbidity. In recent years, endovascular management techniques have gained prominence as minimally invasive alternatives to surgical stripping. These techniques, including the VenaSeal glue system and microwave ablation, target the underlying venous insufficiency with the goal of achieving vein closure and symptom relief.

The VenaSeal glue system utilizes a proprietary cyanoacrylate adhesive to seal the affected vein. During the procedure, a catheter is inserted into the vein under ultrasound guidance, and the adhesive is delivered in a controlled manner, causing the vein to collapse and seal shut. The primary advantages of the VenaSeal system are its minimally invasive nature, the absence of the need for tumescent anesthesia, and a rapid return to normal activities. Microwave ablation, on the other hand, employs thermal energy generated by microwave radiation to induce vein closure. Microwave ablation offers the benefits of precise energy delivery, effective vein closure, and a similarly quick recovery period. Although both the VenaSeal glue system and microwave ablation have shown promise in clinical practice, there is a paucity of data directly comparing these two techniques in terms of efficacy, safety, and patient outcomes. Understanding these factors is crucial for guiding treatment decisions and optimizing patient care. This study aims to retrospectively analyze and compare the efficacy, safety, and patient outcomes associated with the VenaSeal glue system and microwave ablation in the treatment of varicose veins.

The primary objectives of this study are to evaluate the technical success rates of the VenaSeal glue system and microwave ablation, compare their complication rates and safety profiles, and assess patient satisfaction and quality of life post-treatment. By addressing these objectives, this study seeks to provide valuable insights into the relative merits of these endovascular techniques and inform clinical practice.

MATERIAL AND METHODS

Study Design

This retrospective study was conducted to compare the efficacy, safety, and patient outcomes of the VenaSeal glue system and microwave ablation in the treatment of varicose veins. The study design included a comprehensive review of patient medical records, clinical evaluations, imaging studies, and patient-reported outcomes.

Patient Selection

Inclusion Criteria:

- Patients diagnosed with varicose veins who were treated with either the VenaSeal glue system or microwave ablation.
- A minimum of 6 months of post-treatment follow-up data to ensure sufficient monitoring of outcomes and potential complications.

Exclusion Criteria

- Patients with a diagnosis of deep venous thrombosis (DVT), as this could confound the assessment of treatment efficacy and safety.
- Patients who had previously undergone vein stripping surgery, to avoid potential biases related to prior interventions.
- Patients with incomplete follow-up data, to ensure the integrity and reliability of the study results.

Data Collection

Medical records of all eligible patients were reviewed to extract relevant demographic information, clinical history, and details of the treatment procedures. This included data on patient age, gender,

comorbid conditions, and the severity of varicose veins (measured using the Clinical-Etiological-Anatomical-Pathophysiological (CEAP) classification). Clinical evaluations were conducted at baseline (pre-treatment), immediately post-treatment, and at follow-up visits at 1 month, 3 months, and 6 months post-treatment. These evaluations included physical examinations, assessment of symptoms, and documentation of any complications or adverse events. Duplex ultrasound imaging was performed pre-treatment and at follow-up visits to assess vein closure and monitor for any signs of recanalization or new venous insufficiency. The surveys included questions on pain levels, overall satisfaction with the procedure, and willingness to recommend the treatment to others. Responses were recorded using a 5-point Likert scale.

The VenaSeal procedure involved the following steps: Under ultrasound guidance, a catheter was inserted into the target vein. The VenaSeal adhesive was delivered through the catheter in a controlled manner, resulting in immediate vein closure. No tumescent anesthesia was required, and patients were encouraged to resume normal activities shortly after the procedure.

The microwave ablation procedure included: Insertion of a catheter equipped with a microwave antenna into the target vein under ultrasound guidance. Delivery of microwave energy to heat and collapse the vein wall, achieving vein closure. Tumescent anesthesia was administered to ensure patient comfort during the procedure.

Technical success was defined as the complete closure of the target vein immediately post-procedure, as confirmed by duplex ultrasound. Complications were categorized as minor (e.g., bruising, pain, superficial thrombophlebitis) and major (e.g., deep vein thrombosis, infection). The incidence of each type of complication was recorded for both treatment groups. Patient satisfaction was assessed using the post-treatment surveys, while quality of life was measured using the Venous Clinical Severity Score (VCSS) at baseline and follow-up visits.

Statistical Analysis

Statistical analysis was performed using SPSS or STATA software. Comparative statistics, including chi-square tests, were used to analyze categorical data, and t-tests were employed for continuous variables. A P value of 0.05 was considered statistically significant.

RESULTS

Patient Demographics

A total of 73 patients were included in this study, with 35 undergoing treatment with the VenaSeal glue system and 37 with microwave ablation. The patient cohort consisted of 49 males (67.1%) and 24 females (32.9%), with a mean age of 46 years (range: 24 to 68 years). The demographic distribution was well-matched between the two treatment groups. The age distribution within the study population showed no significant difference between the two groups (P = 0.84). The average age for the VenaSeal group was 46.2 years, while the microwave ablation group had an average age of 45.8 years. Patients' professions varied, including watchmen, teachers, defense personnel, surgeons, housewives, and cooks. This diversity reflects the widespread prevalence of varicose veins across different occupations.

Cost was a significant factor influencing the choice of treatment, as the VenaSeal glue system is notably more expensive compared to microwave ablation. This economic disparity highlights the need to consider cost-effectiveness in clinical decision-making. The technical success rate, defined as complete vein closure immediately post-procedure, was 97.1% (34/35) for the VenaSeal glue system and 94.6% (35/37) for microwave ablation. The difference in technical success rates was not statistically significant (P = 0.58).

Treatment Method	Technical Success Rate	P Value
VenaSeal Glue System	97.1%	0.58
Microwave Ablation	94.6%	0.58

Complications were categorized into minor (e.g., skin burns, infections) and major (e.g., deep vein thrombosis). The overall complication rates were significantly higher in the microwave ablation group compared to the VenaSeal group.

Deep Vein Thrombosis (DVT)

Treatment Method	Deep Vein Thrombosis	P Value
VenaSeal Glue System	17.1% (6/35)	0.43
Microwave Ablation	10.8% (4/37)	0.43

DVT was observed in 10 patients (13.7%) overall, with 6 cases (17.1%) in the VenaSeal group and 4 cases (10.8%) in the microwave ablation group. The difference in DVT incidence between the groups was not statistically significant (P = 0.43).Recurrence and Recanalization.

Recurrence and recanalization were significantly more common in the microwave ablation group, with 21 patients (56.8%) experiencing these complications compared to none in the VenaSeal group (P < 0.001).

Treatment Method	Recurrence/Recanalization	P Value
VenaSeal Glue System	0% (0/35)	<0.001
Microwave Ablation	56.8% (21/37)	<0.001

Skin burns were exclusively noted in the microwave ablation group, affecting 14 patients (37.8%), while no burns were observed in the VenaSeal group (P < 0.001).

Treatment Method	Skin Burns	P Value
VenaSeal Glue System	0% (0/35)	<0.001
Microwave Ablation	37.8% (14/37)	<0.001

Skin infections were reported in 24 patients overall, with 16 cases (43.2%) in the microwave ablation group and 8 cases (22.9%) in the VenaSeal group. The higher incidence of skin infections in the microwave ablation group was statistically significant (P = 0.05).

Treatment Method	Skin Infections	P Value
VenaSeal Glue System	22.9% (8/35)	0.05
Microwave Ablation	43.2% (16/37)	0.05

Patient satisfaction was assessed using post-treatment surveys, with responses recorded on a 5-point Likert scale. Both treatment groups reported high satisfaction scores, with mean scores of 4.5 for the VenaSeal group and 4.3 for the microwave ablation group. The difference in satisfaction scores was not statistically significant (P = 0.32).

Outcome Measure	VenaSeal Glue System	Microwave Ablation	P Value
Patient Satisfaction (mean)	4.5	4.3	0.32

Quality of life was measured using the Venous Clinical Severity Score (VCSS), with assessments conducted at baseline (pre-treatment) and follow-up visits at 1 month, 3 months, and 6 months post-treatment. Both treatment groups showed significant improvements in VCSS scores post-treatment. The mean improvement in VCSS was 4.8 points for the VenaSeal group and 4.6 points for the microwave ablation group. The difference in VCSS improvement between the groups was not statistically significant (P = 0.42).

Outcome Measure	VenaSeal Glue System	Microwave Ablation	P Value
VCSS Improvement (mean)	4.8 points	4.6 points	0.42

Cost Analysis

Cost was a major deciding factor for patients when choosing between the VenaSeal glue system and microwave ablation. The higher cost of the VenaSeal system was a significant consideration, influencing treatment decisions, particularly for patients from lower socioeconomic backgrounds.

Summary of Findings

Both the VenaSeal glue system and microwave ablation demonstrated high technical success rates, with VenaSeal showing a slightly higher rate, though not statistically significant. The overall complication rates were higher in the microwave ablation group, particularly concerning recurrence/recanalization, skin burns, and infections. incidence in VenaSeal group, but not statistically significant. Significantly higher in microwave ablation group (P < 0.001). Exclusive to microwave ablation group and statistically significant (P < 0.001). Higher in microwave ablation group and statistically significant (P = 0.05). Both treatments significantly improved patients' quality of life, with high satisfaction scores reported. However, the incidence of complications was notably lower in the VenaSeal group. The higher cost of the VenaSeal system was a significant factor for patients, influencing their choice of treatment.These results suggest that while both the VenaSeal glue system and microwave ablation are effective options for the endovascular management of varicose veins, the VenaSeal system may offer a more favorable safety profile despite its higher cost. The choice of treatment should consider both clinical outcomes and economic factors to optimize patient care.

CONCLUSION

This study provides a comparative analysis of the VenaSeal glue system and microwave ablation in the endovascular management of varicose veins. Both treatment methods demonstrated high technical success rates, indicating their efficacy in achieving immediate vein closure. However, there were notable differences in the safety profiles of the two techniques. The VenaSeal glue system exhibited a slightly higher technical success rate and was associated with fewer complications compared to microwave ablation. The microwave ablation group experienced significantly higher rates of recurrence and recanalization, as well as a greater incidence of skin burns and infections. Deep vein thrombosis was observed in both groups, with a higher but not statistically significant incidence in the VenaSeal group. Patient satisfaction and quality of life improvements were significant in both groups, with high mean satisfaction scores and notable improvements in the Venous Clinical Severity Score (VCSS) post-treatment. These findings highlight that both VenaSeal and microwave ablation effectively enhance patient outcomes, despite the higher complication rates observed in the microwave ablation group. Cost emerged as a significant factor in treatment decisions, with the VenaSeal glue system being more expensive than microwave ablation. This economic consideration is crucial for clinical decision-making, particularly in settings with budget constraints or for patients from lower socioeconomic backgrounds. In summary, while both the VenaSeal glue system and microwave ablation are effective in treating varicose veins, the VenaSeal system may offer a more favorable safety profile. Clinicians should weigh the benefits, potential risks, and economic factors when selecting the most appropriate treatment for patients with varicose veins. Further prospective studies with larger sample sizes and longer follow-up periods are recommended to validate these findings and optimize treatment protocols.

REFERENCES

[1]. Valentin LI, Walker TG. Bronchial artery embolization. InIR Playbook: A Comprehensive Introduction to Interventional Radiology 2024 May 3 (pp. 303-310). Cham: Springer International Publishing.

[2]. Xu HD, Yang L, Hu SB. Embosphere microspheres size for bronchial artery embolization in patients with hemoptysis caused by bronchiectasis: a retrospective comparative analysis of 500– 750 versus 700–900 μm microspheres. BMC Pulmonary Medicine. 2024 Apr 24;24(1):203.

[3]. Li H, Ding X, Zhai S, Gao K. A retrospective study on the management of massive hemoptysis by bronchial artery embolization: risk factors associated with recurrence of hemoptysis. BMC Pulmonary Medicine. 2023 Mar 16;23(1):87.

[4]. Park SJ, Lee S, Lee HN, Cho Y. Early versus delayed bronchial artery embolization for non- massive hemoptysis. European Radiology. 2023 Jan;33(1):116-24. Cheng L, Zhao X, Hu X, Huang J, Zhang X. Safety and Efficacy Comparison of Embospheres and Gelfoam Particles in Bronchial Artery Embolization for Massive Hemoptysis. Alternative Therapies in Health & Medicine. 2023 Jul 1;29(5).

[5]. Cheng L, Zhao X, Hu X, Huang J, Zhang X. Safety and Efficacy Comparison of Embospheres and Gelfoam Particles in Bronchial Artery Embolization for Massive Hemoptysis. Alternative Therapies in Health & Medicine. 2023 Jul 1;29(5).

[6]. Mazican M, Karluka I, Findikcioglu A, Andic C. Bronchial artery embolization in patients with life-threatening massive hemoptysis: comparison of the efficacy and safety of particulate embolizing agents and n-2-butyl-cyanoacrylate. European Review for Medical & Pharmacological Sciences. 2024 Jan 1;28(1).

[7]. Mohamed AM, El Shimy A, Abdelaziz NA, El-Din NM. Bronchial Artery Embolization Procedure for Treatment of Hemoptysis Caused by Cavitary Lung Lesions. The Egyptian Journal of Hospital Medicine. 2023 Jan 1;90(2):2701-8.

[8]. Cantu JA, Safdar Z. Hemoptysis requiring bronchial artery embolization in pulmonary arterial hypertension. South Med J. 2010;103:887–91.

[9]. Lu LS, Liu YM, Ma QY, Zhou ML, Gong QE, Jia SY, Ren YX. Bronchial artery embolization with polyvinyl alcohol foam and gelatinum sponge for serious hemoptysis. J South Med Univ. 2005;25:422–3.

[10]. Hahn S, Kim YJ, Kwon W, Cha SW, Lee WY. Comparison of the efectiveness of embolic agents for bronchial artery embolization: gelfoam versus polyvinyl alcohol. Korean J Radiol. 2010;11:542–6.

[11]. Ozkok A, Ucar AS, Akpinar TS, Okumus G, Kiyan E, Arseven O. Multiple systemic infarctions as a complication of bronchial artery embolization with polyvinyl alcohol: a case report. J Clin Med Res. 2011;3:275–7.

[12]. Kucukay F, Topcuoglu OM, Alpar A, Altay CM, Kucukay MB, Ozbulbul NI. Bronchial artery embolization with large sized (700–900 microm) tris-acryl microspheres (embosphere) for massive hemoptysis: long-term results (clinical research). Cardiovasc Intervent Radiol. 2018;41:225–30.

[13]. Panda A, Bhalla AS, Goyal A. Bronchial artery embolization in hemoptysis: a systematic review. Diagn Interv Radiol. 2017;23:307–17

[14]. Chen J, Chen LA, Liang ZX, Li CS, Tian Q, Yang Z, Jiang YW, She DY. Immediate and long-term results of bronchial artery embolization for hemoptysis due to benign versus malignant pulmonary diseases. Am J Med Sci. 2014;348:204–9.

[15]. Fruchter O, Schneer S, Rusanov V, Belenky A, Kramer MR. Bronchial artery embolization for massive hemoptysis: long-term follow-up. Asian Cardiovasc Thorac Ann. 2015;23:55–60.

[16]. Liu H, Zhang D, Zhang F, Yin J. nd long-term outcomes of endovascular treatment for massive hemoptysis. Int Angiol. 2016;35:469–76