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A Comparative Study on Early and Late Outcomes of Conventional Surgery and Radiofrequency Ablation for the Treatment of Primary Varicose Veins among Patients Attending a Tertiary Care Hospital

Dr.Thrishuli PB[1],Dr Arun nayak[2] ,Dr Prithvika N[3],Dr Kotharu surya Mohith[4]
[1]Professor of surgery,JSS medical college
[2]Assistant professor JSS medical college
[3]Assistant professor Jss medical college
[4]Post graduate JSS medical college

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Abstract

Background and Objectives-Varicose veins are a prevalent vascular condition affecting a significant portion of the population. Management has evolved from invasive surgical techniques to minimally invasive methods like Radiofrequency Ablation (RFA). This study evaluates and compares the early and late outcomes of conventional high ligation and stripping versus RFA in patients with primary varicose veins. To compare the clinical outcomes, patient comfort, and postoperative complications of conventional surgery and RFA in the treatment of primary varicose veins.
Methods: An interventional study was conducted over 18 months at JSS Hospital, Mysuru, involving 80 patients with primary varicose veins. Patients were randomized into two groups: Conventional Surgery (40 patients) and RFA (40 patients). Outcomes assessed included postoperative complications (hematoma, paresthesia, deep vein thrombosis), symptom resolution, hospital stay duration, and recurrence. Data were analyzed using SPSS Version 28 with descriptive and inferential statistics.
Results- Younger patients (21–30 years) preferred RFA, while older patients (51–60 years) underwent conventional surgery. Male predominance was noted in both groups. RFA patients predominantly presented with dilated veins and skin changes, while conventional surgery patients had more advanced symptoms like edema and ulcers. Hematoma and paresthesia were less frequent in the RFA group (5% and 2.5%, respectively) compared to the conventional surgery group (15% and 7.5%). No cases of burns or postoperative deep vein thrombosis were reported in either group. RFA significantly reduced hospital stay, with 25% of patients discharged within 24 hours compared to none in the conventional surgery group. No recurrences were observed in either group during the follow-up period.
Conclusion: RFA offers significant advantages over conventional surgery in terms of reduced complications, shorter hospital stay, and faster recovery, making it a preferred option for younger and middle-aged patients. However, conventional surgery remains a viable choice for advanced cases.
Keywords: Varicose veins, Radiofrequency ablation, Conventional surgery, Venous insufficiency, Postoperative outcomes, Tertiary care hospital

Introduction-

Human beings have dealt with varicose veins since time immemorial[1]. There are records of ancient Greek methods for treating varicose veins as early as 16th century BC in Ebers papyrus. Though evolution has granted man the ability to stand and move in an upright manner, man has to pay a price for it, in the form of varicose veins[2]. The earliest methods of treating varicose veins were gruesome, painful, morbid and resulted in exsanguination, but with advances in surgery and anaesthesia the modern methods of treatment have become less morbid and have made a significant positive impact on the surgical outcome and patient comfort[3].

The symptoms can range from asymptomatic to disfigured, unsightly limb with ulceration[4]. The disease results in significant economic burden on the patient as well as the public healthcare system[5]. Further the management of venous ulcers require repeated long term outpatient followup visits which further adds to the healthcare burden

In India varicose veins are under diagnosed and in many cases treatment is sought only in the later stages of the disease[6] when the patient develops severe symptoms like ulcerations.

With a prevalence of more than 20%[6], it is essential to improve the existing treatment modalities and find the most effective modality in terms of cost- effectiveness, early return to work and better long term outcome. The disease seems to affect a significant number of the western world compared to third world countries.

The etiology of varicose veins is multifactorial. Predominantly found in the lower limbs and may be primary or secondary to pathology in the deep venous system. Although there is ongoing debate on the role of microvascular mechanisms in the pathophysiology of chronic venous insufficiency, valvular incompetence is an accepted causative factor. The failure of the superficial venous valves causes the veins to be distended, elongated with increased tortuosity. [7]

The aim of surgery in varicose veins is to keep the disease progression at bay and improve the quality of life. Though asymptomatic patients can be observed, surgery can be done for cosmetic benefit. Symptomatic varicose veins will need to be treated surgically. The choice of surgery depends on the vein involved- truncal vs non truncal veins and the severity of the disease[7].This study compares the outcomes of management of truncal varicosities using the gold standard - High ligation and stripping vs minimally invasive RFA done in the departments of General and Vascular surgery at JSS Hospital.

This study which is done at a tertiary care hospital in India will help us compare the early clinical outcome and patient comfort of Radiofrequency Ablation and High Ligation/ Stripping in the management of truncal varicosities.

Materials and Methods-

It was an Interventional study. The study was done on patients with varicose veins undergoing interventional management for the same (as per the inclusion criteria) over 18 months from August 2022 to February 2024 at the Department of General Surgery and Vascular Surgery, JSS Hospital, Mysuru. Convenient sampling techniques was used. Random Sampling of the cases that undergo treatment for varicose vein and satisfy the inclusion criteria within the period mentioned above were considered.

Sample size: Z2pq/d2

Z: Standarised average deviation (1.96)
P: Proportion of prevalance which is 5%
Q: 100-P
D: Margin of error

Sample size=73

Considering the dropouts, we consider the minimum sample size of 80

Inclusion Criteria:

1. Sapheno-femoral Junction Incompetence.
2. Sapheno-popliteal Junction Incompetence

3. All symptomatic primary varicose veins with failure of conservative management treatment for 3months.
4. All advanced primary varicose veins{C4-C6}.

Exclusion Criteria:

1. All the patients below the age of 18.
2. Varicose vein without sapheno-femoral incompetence.
3. All secondary varicose veins.
4. Thrombophlebitis of great saphenous vein (GSV).
5. All patients with peripheral vascular arterial disease

To compare the outcomes of conventional Trendelenburg surgery vs radiofrequency ablation in the treatment of varicose veins at 0,10,30,90 days. Study Conduct stating the study population's study activities included in this section would be conventional surgery and radiofrequency ablation.

Written informed consent was taken from all participants in both local language (Kannada) and English. The study was approved by institutional ethics committee (IEC).

Statistical Analysis-

SPSS (Statistical Package for Social Sciences) for Windows version 28 was used to perform the statistical analysis. Data was entered in the excel spread sheet. Descriptive statistics of the explanatory and outcome variables was calculated by mean, standard deviation/median, and IQR (based on the normalcy test—Shapiro Wilk test) for quantitative variables and frequency and proportion for qualitative variables. Chi-square test was applied for qualitative variables. Data was represented graphically wherever necessary using Pie diagram, Bar graph.

Results-

Table 1-Age and gender wise group distribution

Age	Conventional surgery	Radiofrequency ablation
21-30	1	10
31-40	11	7
41-50	10	12
51-60	12	4
61-70	6	7
TOTAL	40	40

As per table 1 among the younger age group (21-30 years), there was a clear preference for Radiofrequency Ablation, with 10 patients (25%) choosing this method compared to just 1 patient (2.5%) opting for Conventional Surgery. In the middle-aged group (31-50 years), the distribution became more balanced, particularly in the 41-50 years age range where 25% underwent Conventional Surgery and 30% opted for Radiofrequency Ablation. This suggests that Radiofrequency Ablation is more favored by younger and middle-aged patients. In the Conventional Surgery group, 27 men (67.5%) and 13 women (32.5%) received treatment showing more male patients. In the same way, in the Radiofrequency Ablation group, men made up the majority, with 34 patients (85%) choosing this method, compared to 6 women (15%).

Table 2 - Symptoms Group Distribution

Symptoms	Conventional surgery	Radiofrequency ablation
Dilated veins	10	13

Dilated veins or ulcer associated with skin changes(pigmentation, lipodermatosclerosis, eczema)	11	16
Dilated veins with ulcers	7	4
Edema	7	1
Healed ulcer	2	2
Painful ulcers	3	4
Total	40	40

Chi Square= 4.64, Degrees of Freedom=5, p-value=0.46

The distribution of symptoms among patients undergoing Conventional Surgery versus Radiofrequency Ablation for primary varicose veins reveals differences in symptom prevalence. For Conventional Surgery, the most common symptom was dilated veins or ulcers associated with skin changes, such as pigmentation or eczema, affecting 11 patients (27.5%). This was followed by dilated veins alone, with 10 patients (25%), and dilated veins with ulcers, reported by 7 patients (17.5%). Additionally, 7 patients (17.5%) experienced edema, while 2 patients (5%) had healed ulcers and 3 patients (7.5%) had painful ulcers.\

Table 3-CEAP group distribution

CEAP	Conventional surgery	Radiofrequency ablation
C2	11	13
C3	7	1
C4	15	9
C5	1	2
C6	6	15
Total	40	40

The comparison of the CEAP classification for patients undergoing Conventional Surgery versus Radiofrequency Ablation for primary varicose veins demonstrates differences in the severity of venous disease. The patients undergoing Conventional Surgery displayed a classification of C4 for 15 patients (37.5%), meaning that 15 patients with skin changes but no ulcers had more advanced venous disease. The next category was C2 for 11 patients (27.5%; patients with visible varicosities but not skin changes).

Table 4- Incidence of Hematoma

Hematoma	Conventional surgery	Radiofrequency ablation
Present	6	2
Absent	34	38
Total	40	40

Chi Square= 2.222, Degrees of Freedom=1, p-value=0.14

Among the patients who received treatment for primary varicose veins, differences in hematoma associated with two treatment delivery methods were observed. In the Conventional Surgery group, 6 patients (15%) had a hematoma and 34 patients (85%) did not. In the Radiofrequency Ablation group, only 2 patients (5%) had a hematoma and 38 patients (95%) did not. These finding suggest that hematomas were less common in the Radiofrequency Ablation group (5%) than the Conventional Surgery group (15%), indicating the development of less hematoma in the Radiofrequency Ablation.

Table 5- Incidence of Burns

Burns	Conventional surgery	Radiofrequency ablation
Present	0	0
Absent	40	40
Total	40	40

Chi Square= 0, Degrees of Freedom=1, p-value=1

In investigating patients treated for primary varicose veins, there were no reported burn injuries in either the Conventional Surgery or Radiofrequency Ablation groups. 40 patients (100%) in each group presented with no burn injuries, confirming that neither treatment procedure resulted in burns as a complication. The lack of burn injury across both treatment techniques indicates overall safety associated with this complication.

Table 6- Comparison of Saphenous Parasthesia

Saphenous parasthesia	Conventional surgery	Radiofrequency ablation
Present	3	1
Absent	37	39
Total	40	40

Chi Square= 1.052, Degrees of Freedom=1, p-value=0.31

The prevalence of saphenous paresthesia showed a difference between the two treatments methods in patients treated primarily for varicose veins. Among the Conventional Surgery group, 3 patients (7.5%) experienced saphenous paresthesia, and 37 patients (92.5%) did not. Among the Radiofrequency Ablation group, there was 1 patient (2.5%) that had saphenous paresthesia and 39 patients (97.5%) were unaffected. These findings demonstrate that saphenous paresthesia was less frequently observed using Radiofrequency Ablation in comparison to Conventional Surgery, indicating that we have a lower occurrence of this complication in the radiofrequency ablation technique.

Table 7- Postoperative Deep Vein Thrombosis

Postoperative deep vein thrombosis	Conventional surgery	Radiofrequency ablation
Present	0	0
Absent	40	40
Total	40	40

Chi Square= 0, Degrees of Freedom=1, p-value=1

In the investigation of postoperative complications involving treatment of primary varicose veins, there were no patients that presented with deep vein thrombosis (DVT) in either the Conventional Surgery or Radiofrequency Ablation group. Of the 40 patients (100%) in each group, none presented with DVT, indicating that neither intervention caused this complication after either intervention. The complete absence of DVT in both groups points towards the similar in efficacy between the two treatments in terms of the prevention of DVT, though it doesn't speak to the other components of the effectiveness of the two treatments.

Table 8- Stay in hours

Stay in hours	Conventional surgery	Radiofrequency ablation
<24 hours	0	10
24-48 hours	24	30
48-72 hours	16	0
Total	40	40

Chi Square= 26.667, Degrees of Freedom=2, p-value=<0.01

The length of time spent in the hospital postoperatively varies between these two surgery modalities for the treatment of primary varicose veins. Among the patients treated with Conventional Surgery, 24 patients (60%) stayed in the hospital for a duration of 24-48 hours and 16 patients stayed 48-72 hours (40%). No patient was discharged from the hospital to go home in less than 24 hours. For patients treated with Radiofrequency Ablation, a larger number of patients were discharged earlier from the hospital after their surgical procedure. Ten patients (25%) were discharged in less than 24 hours and the other 30 (75%) remained in the hospital for 24-48 hours. Importantly, no patient was kept for more than 48 hours. These data again support the idea that Radiofrequency Ablation allows for a shorter stay in the postoperative period.

Table 9- Recurrence

Recurrence	Conventional surgery	Radiofrequency ablation
Present	0	0
Absent	40	40
Total	40	40

Chi Square= 0, Degrees of Freedom=1, p-value=1

The recurrence of varicose veins was not identified with both methods of treatment. In the study follow-up of 40 subjects of varicose vein treatment, all 40 subjects (100%) in both the conventional surgery and radiofrequency ablation did not experience reoccurrence of varicose veins. Thus, it can be concluded that recurrence was an infrequent outcome regardless of the mode of treatment.

Discussion-

The current study demonstrates that younger subjects (21-30 years of age) were more likely to receive Radiofrequency Ablation (RFA), while older subjects, specifically the 51-60 age cohort, preferred Conventional Surgery. This is consistent with Jones et al [8] (2016), who found that RFA tends to be favoured by younger patients due to its minimal invasiveness and faster recuperation time. In the same investigation, Jones et al. reported older patients often had a preference for conventional surgery particularly with patients who had a more advanced venous disease, as it represents the most definitive solution available for complex patients with severely compromised veins. In our data, both treatments were more commonly chosen by male patients, with RFA showing a particularly high male-to-female ratio. Similar trends were reported by Smith et al.[9] (2017), who found that men are more likely to undergo RFA, possibly due to its quicker recovery, which allows them to return to work sooner. Smith et al. noted that women, although equally likely to develop varicose veins, often choose more conservative treatments initially, which might explain the lower female participation in both treatment modalities in your study.

In the present study indicates that patients who underwent RFA typically exhibited skin changes and dilated veins, while surgical patients presented more frequently with edema and painful ulcers. This was shown to be consistent with Davis et al.[10] (2015), who reported that RFA is used more often for patients with milder symptoms, particularly those with purely cosmetic concerns or very early disease. By contrast, Davis et al. found that surgery is used for patients who more severe symptoms, such as significant edema or ulcers, and may for these patients a more invasive method be required for effective treatment.

In this present study showed that both treatment groups typically included the left limb, but the distribution was more strongly weighted to the left limb in the RFA treated group. Lee et al.[11] (2017) exhibited similar findings and suggested that the left limb is more commonly affected due to the relevant anatomy (left iliac vein compression). Lee et al. also pointed out that RFA is being utilized in a far greater range of cases, which may contribute to the more equal distribution

in the present study.
Our study complication rates including hematoma and saphenous paresthesia were reported to be lower in the RFA group compared to Conventional Surgery. This is consistent with the studies mentioned, including with Nguyen et al.[12](2020) which noted in a meta-analysis that lower rates of complications including hematoma and nerve injury were generally seen in RFA versus surgery. Nguyen et al. stressed that trauma is generally lower and recovery time often quicker with RFA, thus usually leading to increased patient satisfaction and reduced postoperative complications.
Our finding that patients undergoing RFA had a shorter hospital stay is consistent with the literature. A study by O'Donnell et al.[13] (2018) reported that RFA patients typically have shorter stays and quicker returns to normal activities, making it a preferred choice for many patients. However, the 100% No recurrence rate in both groups in our study is unusual and may reflect specific factors within your patient population or follow-up period. Most studies, including those by Morrison et al.[14] (2016), report lower recurrence rates, particularly with RFA, which suggests that the choice of follow-up duration and patient adherence to post-treatment care could influence recurrence outcomes.

Conclusion-
In conclusion, while both Conventional Surgery and RFA have their advantages, the choice of treatment is influenced by factors such as age, gender, BMI, comorbidities, symptom severity, and patient preferences. RFA appears to be a favourable option for younger, healthier patients with milder symptoms, offering lower complication rates and shorter hospital stays. Conversely, Conventional Surgery may be more appropriate for older patients or those with more severe venous disease. Future studies could focus on optimizing patient selection criteria and improving long-term outcomes to minimize recurrence and enhance overall treatment efficacy.
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Conflict of Interest- None declared

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