Evaluation of quality of life after Endo-Venous Radio-Frequency Ablation Procedure for the treatment of varicose vein

Ahmed Ali Al-Mashhadani[1], Saud Kadhim Abbas[2] , Husam Al-hraishawi[3*], Qais alkhalil[4]

[1]Surgery Department, College of Medicine, University of Al-Mustansiriyah, Iraq. dr.ahmedcts@yahoo.com,
ORCID: 0009-0001-5721-8049

[2]Department of Surgery, College of Medicine, University of Misan, Misan, Iraq: Email: Saud Kadhim Abbas
Email: saud.mcm@uomisan.edu.iq, ORCID: 0009-0003-7181-7130

[3*] Department of Physiology, College of Medical, University of Misan, Misan, Iraq; hra10@scarletmail.rutgers.edu.
ORCID: 0000-0003-4169-1824

[4]Surgery Department, College of Medicine, University of Al-Mustansiriyah, Iraq. Qaisradiologist@gmail.com ,
ORCID: 0009-0007-0149-631

Abstract

Backgrounds: Varicose veins are a common medical condition characterized by the dilation and tortuosity of the superficial venous system, primarily affecting the lower extremities. **Aim**: The study investigates the quality of life and the side effects experienced by patients undergoing varicose vein surgeries. **Methods**: a sample size of 130 patients. Data were collected during the first week post-surgery and after 30 days for some side effects and for one year for other side effects, employing statistical analysis through SPSS and Excel for visual representation. **Results:** The findings reveal significant changes in various health indicators over time, including paresthesia, occlusion, recurrence, redness, skin changes, thrombophlebitis, and ecchymosis. The study also found a decrease in patient satisfaction and quality of life over the study period. There were no differences in cellulitis over the study period. **Discussion:** The main outcomes of the Varicose Vein Surgery Study included changes in health status and the side effects of varicose vein patients over a one-year follow-up period. **Conclusion:** The study emphasizes the importance of continuous monitoring and improving nursing care to enhance the quality of life for patients post-surgery.

Keywords: Varicose, Ablation, Radio-Frequency.

Introduction

Varicose veins are a common medical condition characterized by the dilation and tortuosity of the superficial venous system, primarily affecting the lower extremities (1). These veins can lead to significant physical discomfort, cosmetic concerns, and, in severe cases, complications such as venous ulcers, thrombophlebitis, and chronic venous insufficiency (2). Surgical intervention, including procedures such as endovenous laser ablation (EVLA), radiofrequency ablation (RFA), and phlebectomy, has become a standard treatment option for symptomatic varicose veins (3-5)However, the primary goal of these interventions is not only to alleviate symptoms but also to improve the overall quality of life of patients (6-8).

Varicose veins are dilated branches of the great saphenous vein and small saphenous vein; the

incidence of varicose veins varies from 10% to 30%. Risk factors of varicose veins include family history, age, and pregnancy; a possible risk factor is standing for an extended period (9-12). High ligation and stripping is the traditional approach for varicose veins, yet a variety of alternative options have been used in recent decades, such as endovenous laser ablation (EVLA), endovenous radiofrequency ablation (RFA), and foam sclerotherapy (FS) (13).

Study objectives

The research aimed to study the changes in the health status of patients after undergoing Endo Venous Readio-Frequency Ablation procedure (EVRF) for varicose veins, such as Paresthesia, Occlusion rate, Recurrence rate, Cellulitis and Thrombophlebitis, in addition to studying the changes in the side effects of the procedure, such as quality of life, redness and skin changes, ecchymosis, and patient satisfaction, after a full year of patient follow-up. Data and information were collected in the first week, and the process of collecting data and information was completed after a full year. Appropriate statistical tests were used to test the differences in research variables during this period.

The Significance of the Study

The study gains its importance from the importance of its subject, which is achieving the highest levels of quality of healthy life by studying the side effects of varicose vein intervention procedures following up on the nursing care provided to patients, and improving the level of quality and working to control it in the field of providing health services by providing the latest technologies and through a professional medical staff.

2. MATERIALS AND METHODS
Methods

This study was conducted on a sample of varicose vein patients in the governorate of Maysan, where their number of patients reached 130. Data and information were collected from patients in the first week of varicose vein surgeries and after continuous and long follow-ups of patients. This data was compared after a full year based on the twenty-fifth version of the statistical program Statistical Package for the Social Sciences (SPSS). Excel was also used to obtain graphs and charts (13).

Materials and Study terms used:

The Quality of Life: The Centre for Disease Control (CDC) defines health-related quality of life as "the physical and mental well-being that an individual/group perceives over time."(14)

Paranesthesia is a technical term used to reflect a perception of abnormal sensation, including feelings of pins and needles, tingling, pricking, or a feeling as if ants are crawling over/under the skin (15).

Cellulitis is an acute inflammatory condition of the dermis and subcutaneous tissue usually found complicating a wound, ulcer, or dermatosis (16).

Thrombophlebitis is a blood clot in an artery or vein. When inflammation occurs due to a blood clot in a vein (17).

Patient satisfaction is the patient's perception of care compared with the care expected (18).

3. Results:

Distribution of patients according to gender:

The data set out in the above table regarding the distribution of the Patients based on gender indicates that the percentage of males represents 25.4%, while the female percentage represents 74.6% of the Patients participating in the study.

The repetitive distribution and percentage of Patients based on gender are shown in Figure 1.

Table 1: Repetitive distributions and percentage of the sample individuals according to gender.

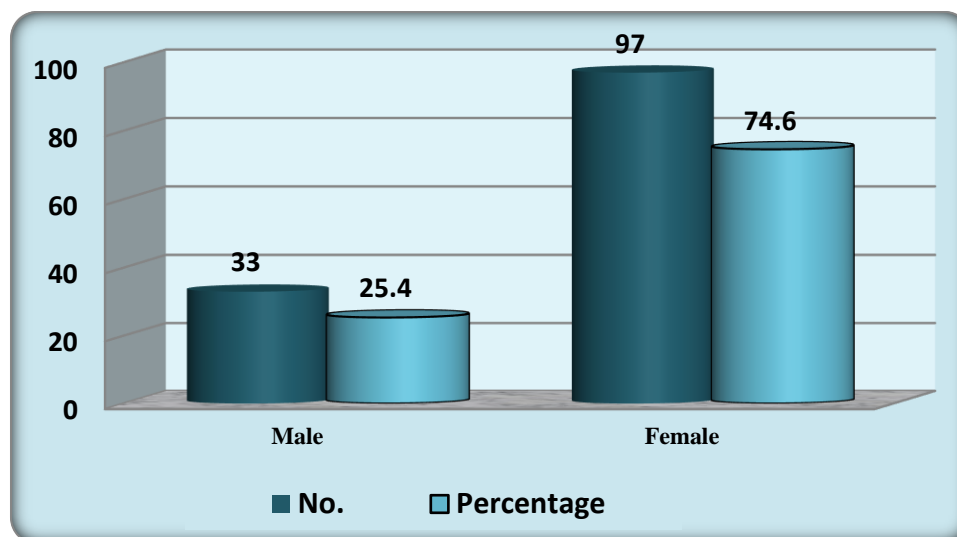| Gender	No.	Percentage
Male	33	25.4
Female	97	74.6
Total	130	100

Figure (1) The Repetitive Distribution and percentage of the Patients based on Gender

2. Distribution of Patients on an age basis:

The data set out in Table 2 regarding the distribution of the Patients based on age categories indicated that (18.5%) of the Patients were under 30 years of age., (38.5%) of the Patients were aged 30 to less than 40 years, and (246%) of the Patients were aged from 40 to less than 50 years, and (14.6%) of the Patients were aged from 50 to less than 60 years, and (3.8%) of the Patients were aged from 60 years. Moreover, the mean age of all participants was 38.92 ±1.072 years, with a range of 19 to 66 years.

Table (2): The Repetitive Distributions and Percentage of Patients according to age

Age category	No.	Percentage%
Less than 30 years	24	18.5
30 to less than 40 years	50	38.5
40 to less than 50 years	32	24.6
50 to less than 60 years	19	14.6
60 years and more	5	3.8
Total	130	100
Mean ± SD	38.92± 1.072	
Range	19 - 66	

However, the repetitive distribution and percentage of patients based on age are summarized in Figure 2.
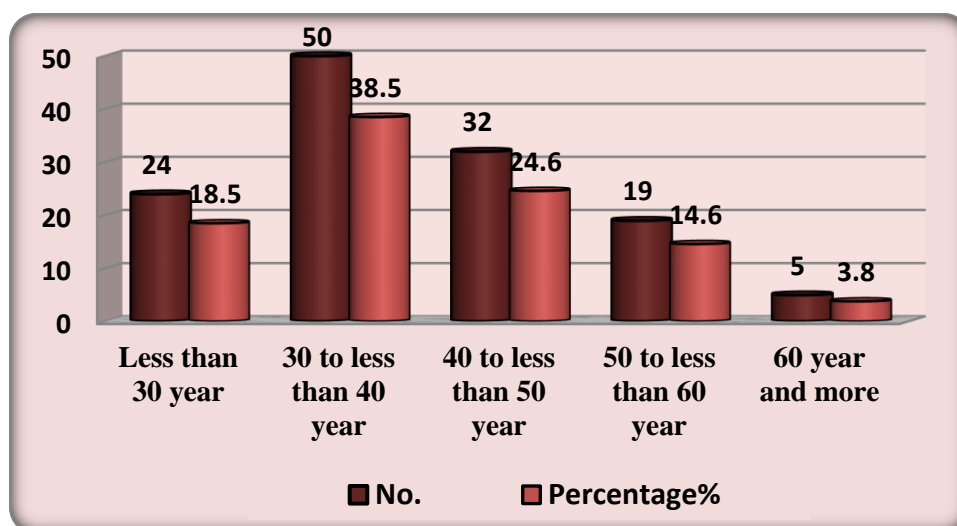

Figure (2) The Repetitive Distribution and percentage of the Patients based on age

Changes in the health status of patients after a varicose vein intervention procedure

1. Paresthesia

Table (3): T-test to determine differences in paresthesia between patients over the period from the 1st week to 30 days.

	Mean	N	Std. Deviation	The difference between the two means	P- value
Paresthesia (1st week)	1.3462	130	0.60632	.0277	0.000
Paresthesia (30 days)	1.0692	130	0.51622		

T-Test Calculated = 4.168   DF=129   T-Test Tabular = 1.984

From Table No. (3), it is clear that the average in paresthesia during the time 1st week was (1.3462) [*], while the average of paresthesia during 30 days was (1.0692), and the difference between the two Paresthesia averages was (0.277). To determine whether this difference is significant or not, the calculated t-value (4.168) was greater than its tabular value (1.984). Therefore, the difference in paresthesia during the period was statistically significant. This was confirmed by the statistical significance value of (0.000), which is less than (0.05).

---

[*] The average Patient satisfaction was calculated using a four-point scale, where one point was given for the answer "no", two points for the answer "mild", three points for the answer "moderate", and four points for the answer "Sever", i.e. the Patient satisfaction value ranged from (1 to 4).
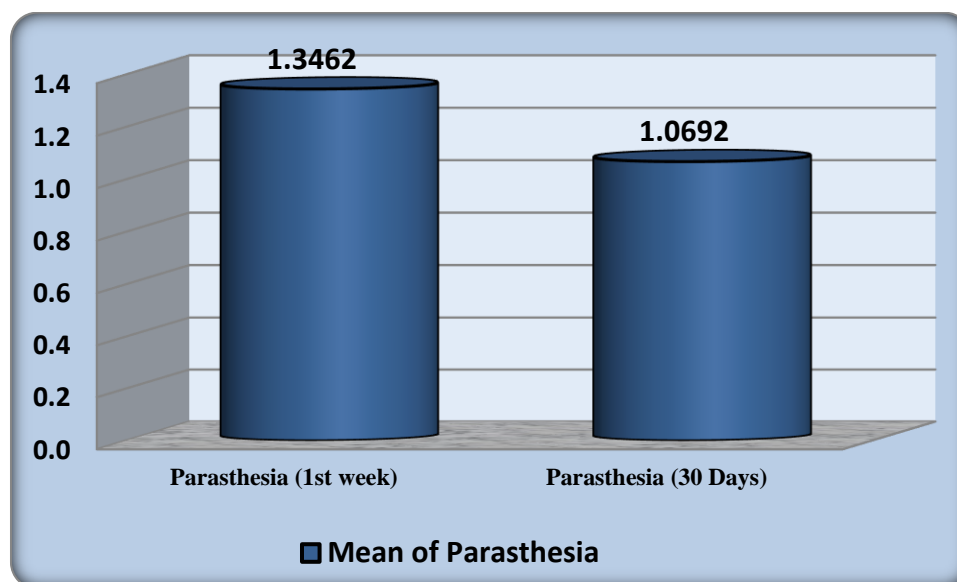
Figure (3): Mean of Paresthesia for the period from the 1st week to 30

2. Occlusion rate

Table (4): T-test to determine differences in Occlusion Rate between patients over the period from the 1st week to 1 year.

	Mean	N	Std. Deviation	The difference between the two means	P- value
Occlusion Rate (1st week)	2.8846	130	0.67783	0.9615	0.000
Occlusion Rate (1 year)	1.9231	130	1.59755		

T-Test Calculated = 6.765   df=129   T-Test Tabular = 1.984

From Table No. (4), it is clear that the average occlusion Rate during the time 1st week was (2.8846), while the average Occlusion Rate during 1 year was (1.9231), and the difference between the two occlusion Rate averages was (0.9615). To determine whether this difference is significant or not, the calculated t-value (6.765) was greater than its tabular value (1.984). Therefore, the difference in Occlusion Rate during the period was statistically significant, and this was reinforced by the statistical significance value, which is (0.000), which is less than 0.05.
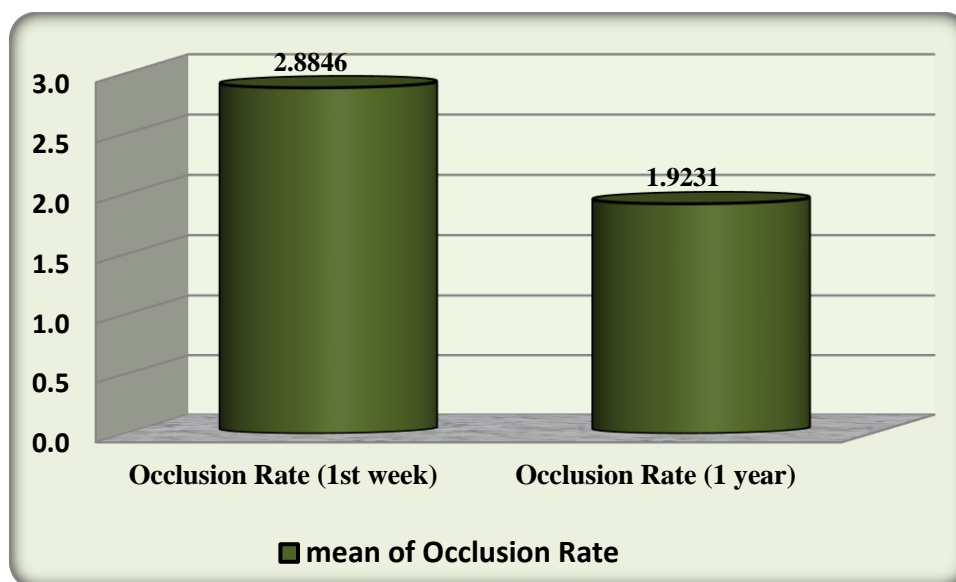
Figure (4): Mean of Occlusion Rate for the period from the 1st week to 1 year

3. Recurrence

Table (5): T-test to determine differences in Recurrence Rate between patients over the period from the 1st week to 1 year.

	Mean	N	Std. Deviation	The difference between the two means	P- value
Recurrence Rate (1st week)	0.9846	130	0.27799	0.3077	0.000
Recurrence Rate (1 year)	0.6769	130	0.59994		

T-Test Calculated = 5.652   DF=129   T-Test Tabular = 1.984

From Table No. (5), it is clear that the average recurrence Rate during the time 1st week was (0.9846), while the average Recurrence Rate during 1 year was (0.6769), and the difference between the two Recurrence averages was (0.3077). To determine whether this difference is significant or not, the calculated t-value (5.652) was greater than its tabular value (1.984). Therefore, the difference in the recurrence rate during the period was statistically significant, and this was reinforced by the statistical significance value (0.000), which is less than 0.05.
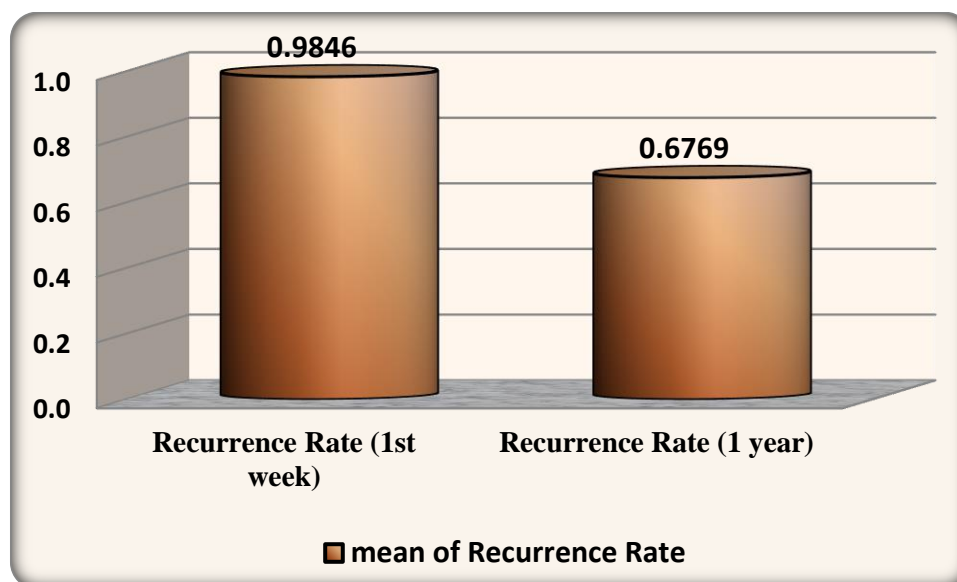
Figure (5): Mean of Recurrence Rate for the period from the 1st week to 1 year

4. Cellulitis

Table (6): T-test to determine differences in cellulitis between patients over the period from the 1st week to 30 days.

	Mean	N	Std. Deviation	The difference between the two means	P- value
Cellulitis (1st week)	0.9769	130	0.23179	.00615	0.074
Cellulitis (30 days)	0.9154	130	0.30588		

T-Test Calculated = 1.804   DF=129   T-Test Tabular = 1.984

From Table No. (6), it is clear that the average cellulitis during the time 1st week was (0.9769), while the average cellulitis during 30 days was (0.9154), and the difference between the two Cellulitis averages was (0.0615). To determine whether this difference is significant or not, the calculated t-value (1.804) was less than its tabular value (1.984). Therefore, the difference in cellulitis during the period was not statistically significant. This was confirmed by the statistical significance value of 0.074, which is greater than 0.05.
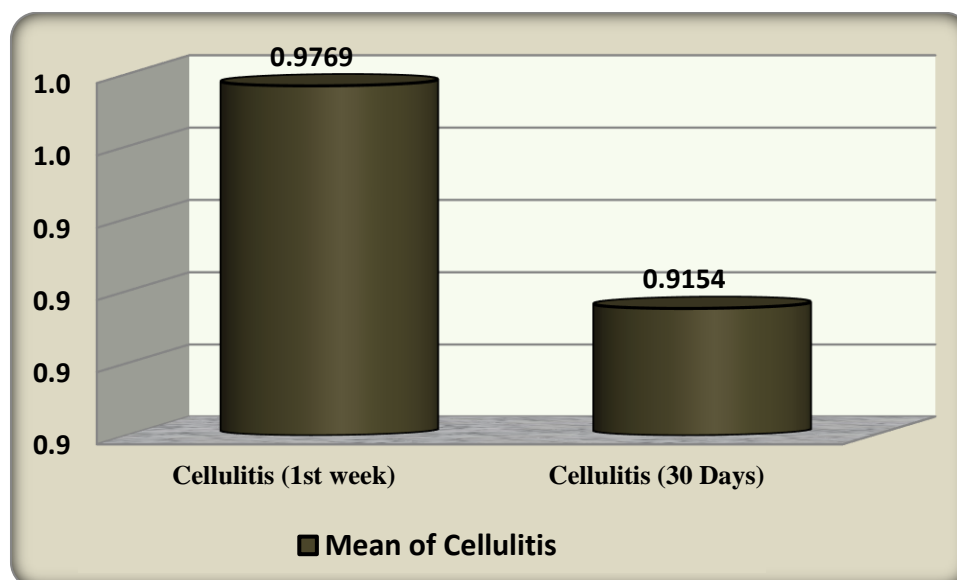
Figure (6): Mean of Cellulitis for the period from 1st week to 30 days

5. Thrombophlebitis

Table (7): T-test to determine differences in thrombophlebitis between patients over the period from the 1st week to 30 days.

	Mean	N	Std. Deviation	The difference between the two means	P- value
Thrombophlebitis (1st week)	1.1077	130	0.41756	.01308	0.001
Thrombophlebitis (30 days)	0.9769	130	0.40281		

T-Test Calculated = 3.273   DF=129   T-Test Tabular = 1.984

From Table No. (7), it is clear that the average thrombophlebitis during the time 1st week was (1.1077), while the average thrombophlebitis during 30 days was (0.9769), and the difference between the two thrombophlebitis averages was (0.1308). To determine whether this difference is significant or not, the calculated t-value (3.273) was more significant than its tabular value (1.984). Therefore, the difference in thrombophlebitis during the period was statistically significant. This was confirmed by the statistical significance value of 0.001, which is less than 0.05.
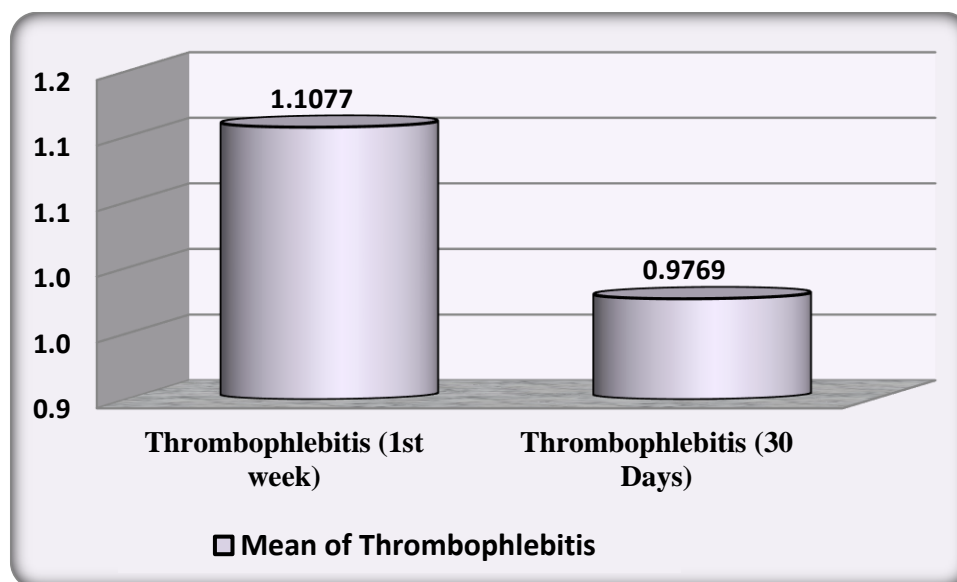
Figure (7): Mean of thrombophlebitis for the period from the 1st week to 30

6. The Quality of Life

Table (8): T-test to determine differences in quality of life between patients over the period from the 1st week to 1 year.

	Mean	N	Std. Deviation	The difference between the two means	P- value
Quality of life (1st week)	3.6154	130	0.85711	1.2	0.000
Quality of life (1 year)	2.4154	130	1.93212		

T-Test Calculated = 7.043   DF=129   T-Test Tabular = 1.984

From Table No. (8), it is clear that the average quality of life during the time 1st week was (3.6154), while the average quality of life during 1 year was (2.4154), and the difference between the two quality of life averages was (1.2). To determine whether this difference is significant or not, the calculated t-value (7.043) was greater than its tabular value (1.984). Therefore, the difference in quality of life during the period was statistically significant, and this was reinforced by the statistical significance value, which is (0.000), which is less than 0.05.
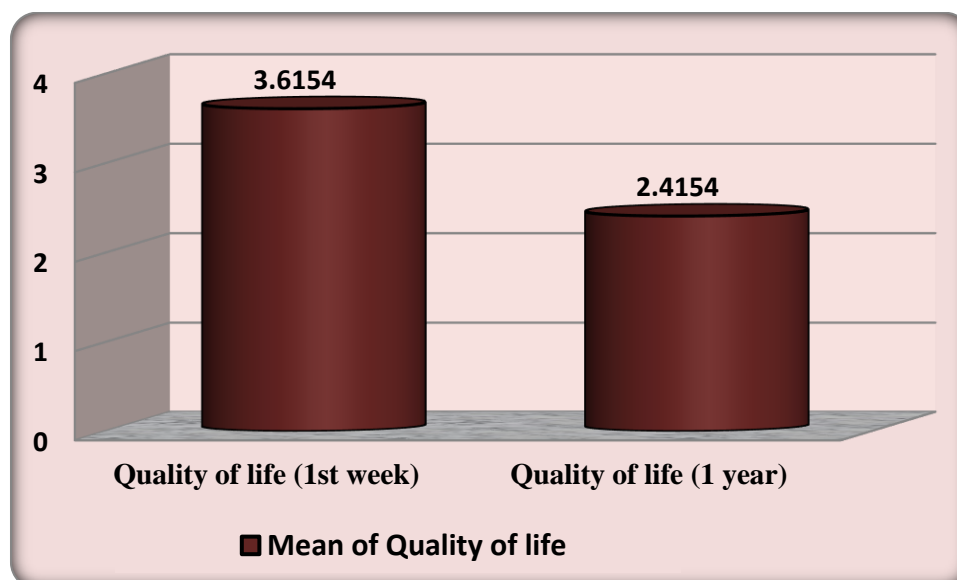
Figure (8): Mean of quality of life for the period from the 1st week to 1 year

7. Redness and skin changes

Table (9): T-test to determine differences in redness and skin changes between patients over the period from the 1st week to 30 days.

	Mean	N	Std. Deviation	The difference between the two means	P- value
Redness and skin changes (1st week)	1.2462	130	0.51432	.02693	0.000
Redness and skin changes (30 days)	0.9769	130	0.40281		

T-Test Calculated = 5.845   DF=129   T-Test Tabular = 1.984

From Table No. (9), it is clear that the average in redness and skin changes during the time 1st week was (1.2462), while the average of redness and skin changes during 30 days was (0.9769), and the difference between the two redness and skin changes averages was (0.2693). To determine whether this difference is significant or not, the calculated t-value (5.845) was more significant than its tabular value (1.984). Therefore, the difference in redness and skin changes during the period was statistically significant. This was confirmed by the statistical significance value of (0.000), which is less than (0.05).
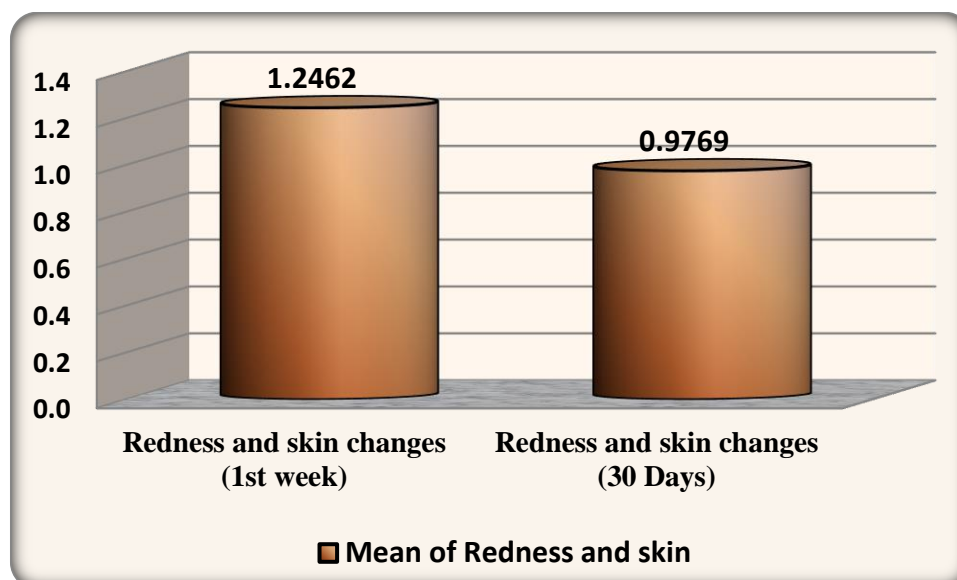
Figure (9): Mean of redness and skin changes for the period from the 1st week to 30 days

8. Ecchymosis

Table (10): T-test to determine differences in ecchymosis between patients over the period from the 1st week to 30 days.

	Mean	N	Std. Deviation	The difference between the two means	P- value
Ecchymosis (1st week)	1.1538	130	0.48961	.01769	0.000
Ecchymosis (30 days)	0.9769	130	0.42161		

T-Test Calculated = 3.993   DF=129   T-Test Tabular = 1.984

From Table No. (10), it is clear that the average for ecchymosis during the time 1st week was (1.1538), while the average of ecchymosis during 30 days was (0.9769), and the difference between the two Ecchymosis averages was (0.1769). To determine whether this difference is significant or not, the calculated t-value (3.993) was greater than its tabular value (1.984). Therefore, the difference in ecchymosis during the period was statistically significant, and this was reinforced by the statistical significance value, which is (0.000), which is less than 0.05.
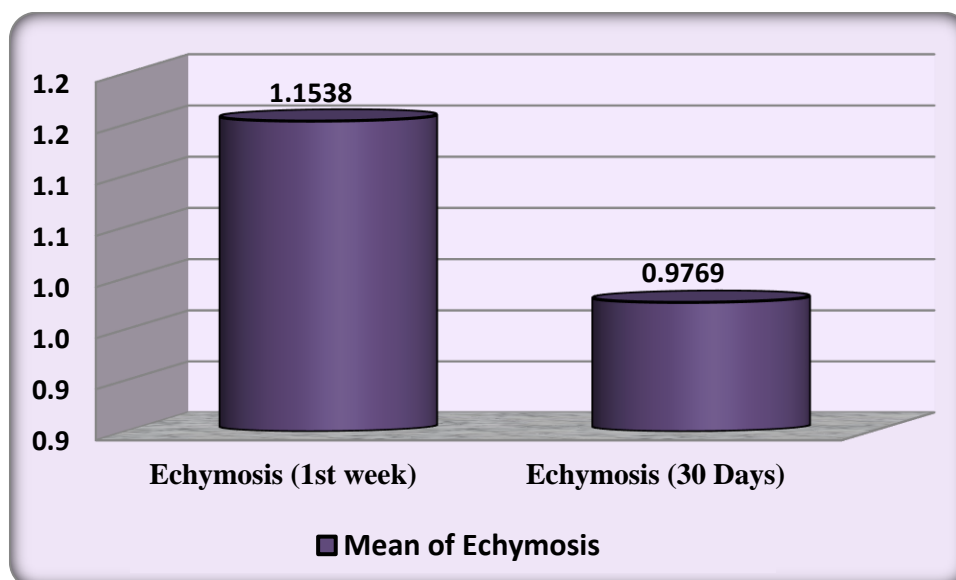
Figure (10): Mean of Ecchymosis for the period from 1st week to 30 days

9. Pt. Satisfaction

Table (11): T-test to determine differences in patient satisfaction between patients over the period from the 1st week to 1 year.

	Mean	N	Std. Deviation	The difference between the two means	P- value
Pt. Satisfaction (1st week)	2.8154	130	0.76538	.09616	0.000
Pt. Satisfaction (1 year)	1.8538	130	1.59024		

T-Test Calculated = 6.466   DF=129   T-Test Tabular = 1.984

From Table No. (11), the average patient satisfaction during the time 1st week was (2.8154), while the average patient satisfaction during 1 year was (1.8538), and the difference between the two Patient satisfaction averages was (0.9616). To determine whether this difference is significant or not, the calculated t-value (6.466) was greater than its tabular value (1.984). Therefore, the difference in patient satisfaction during the period was statistically significant, and this was reinforced by the statistical significance value, which is (0.000), which is less than 0.05.
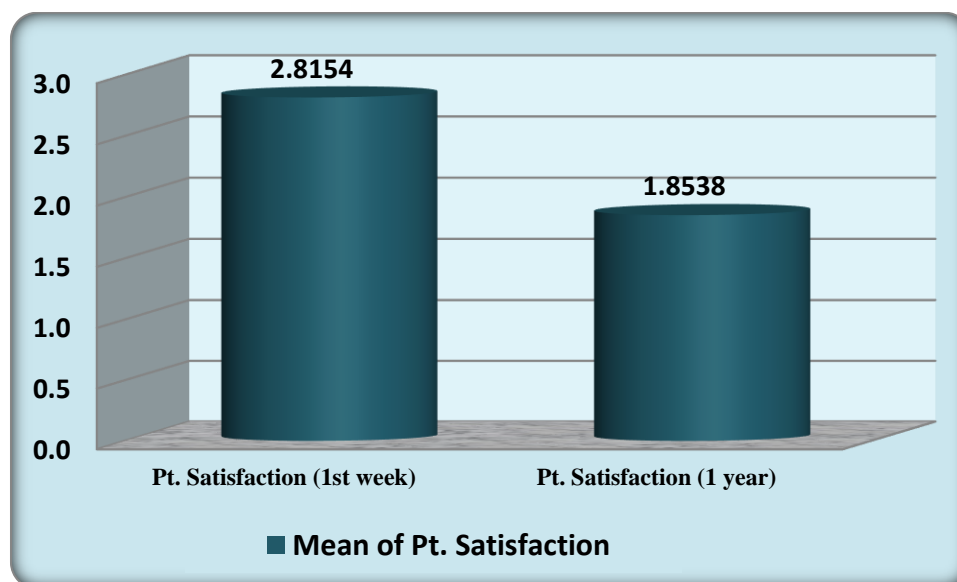
Figure (11): Mean of Patient satisfaction for the period from the 1st week to one year

Discussion:

The main outcomes of the Varicose Vein Surgery Study included changes in health status and the side effects of varicose vein patients over a one-year follow-up period (19). Specifically, the study found significant reductions in paresthesia, occlusion, recurrence, redness, skin changes, thrombophlebitis, and Ecchymosis (20-25). The study also found a decrease in patient satisfaction and quality of life over the study period. There were no differences in cellulitis over the study period. The results are detailed below:

1. The rate of paresthesia decreased from a mean of 1.1077 in 1st week to 0.9769 at 30 days, with a statistically significant difference (t-value 3.273, $p < 0.000$).

2. The rate of thrombophlebitis decreased from a mean of 1.3462 in 1st week to 1.0692 at 30 days, with a statistically significant difference (t-value 4.168, $p < 0.000$).

3. The rate of ecchymosis decreased from a mean of 1.1538 in 1st week to 0.9769 at 30 days, with a statistically significant difference (t-value 3.993, $p < 0.000$).

4. Patient satisfaction decreased from a mean of 2.8154 at week 1 to 1.8538 at 1 year, with a statistically significant difference (t-value 6.466, $p < 0.000$).

5. The quality of life decreased from 3.6154 at week 1 to 2.4154 at 1 year (t-value 7.043, $p < 0.000$

6. The study found a significant reduction in redness and skin changes, with a mean decrease from 1.2462 at week 1 to 0.9769 at 30 days (t-value 5.845, $p < 0.000$).

7. The recurrence rate also showed improvement, with a mean of 0.9846 at week 1 compared to 0.6769 at 1 year (t-value 5.652, $p < 0.000$).

8. For cellulitis, the mean remained relatively stable with no statistically significant difference (t-value 1.804, $p = 0.074$).

9. The occlusion rate decreased significantly from 2.8846 at week 1 to 1.9231 at 1 year (t-value 6.765, $p < 0.000$).

Conclusion:

Overall, the study highlighted the effectiveness of varicose vein surgery in improving patient outcomes over time, with a slight decrease in some adverse

events, such as the quality of life and patient satisfaction.

5. DECLARATIONS

5.1. Study Limitations

Study limitation: the number of patients needs to be larger and compared with other types of treatment.

5.2. Acknowledgements

5.3. Funding source

5.4. Competing Interests

Declare any potential conflict of interest that exists in this publication.

Author Contributions

The study was designed and performed by Husam Al-hraishawi and Ahmed Ali Al-Mashhadani. Additionally, all authors analyzed the data and wrote the manuscript.

Ethics

The study protocol was reviewed by the Human Ethics Committee of the College of Medicine, University of Misan, Iraq (No 1398 Deans office M4, dated 28/12/2023).

Acknowledgments:

Conflict of Interest:

There are no conflicts of interest.

References

1. Lin, F., Zhang, S., Sun, Y., Ren, S., & Liu, P. (2015). The management of varicose veins. *International Surgery*, *100*(1), 185-189. **doi.org/10.9738/INTSURG-D-14-00084.1**.

2. Haraldstad, K., Wahl, A., Andenæs, R., Andersen, J. R., Andersen, M. H., Beisland, E., ... & LIVSFORSK network. (2019). A systematic review of quality-of-life research in medicine and health sciences. Quality of Life Research, 28, 2641-2650. doi.org/10.1007/s11136-019-02214-9.

3. Kalteis, M., Berger, I., Messie-Werndl, S., Pistrich, R., Schimetta, W., Pölz, W., & Hieller, F. (2008). High ligation combined with stripping and endovenous laser ablation of the great saphenous vein: early results of a randomized controlled study. *Journal of Vascular Surgery*, *47*(4), 822-829. doi.org/10.1016/j.jvs.2007.10.060.

4. Darwood, R. J., Theivacumar, N., Dellagrammaticas, D., Mavor, A. I. D., & Gough, M. J. (2008). Randomized clinical trial comparing endovenous laser ablation with Surgery for the treatment of primary great saphenous varicose veins. *Journal of British Surgery*, *95*(3), 294-301. https://doi.org/10.1002/bjs.6101.

5. Rasmussen, L. H., Bjoern, L., Lawaetz, M., Blemings, A., Lawaetz, B., & Eklof, B. (2007). Randomized trial comparing endovenous laser ablation of the great saphenous vein with high ligation and stripping in patients with varicose veins: short-term results. *Journal of Vascular Surgery*, *46*(2), 308-315. https://doi.org/10.1016/j.jvs.2007.03.053.

6. Stötter, L., Schaaf, I., & Bockelbrink, A. (2006). Comparative outcomes of radiofrequency endoluminal ablation, invagination stripping, and cryostripping in the treatment of great saphenous vein insufficiency. *Phlebology*, *21*(2), 60-64. doi.org/10.1258/026835506777304692.

7. Hinchliffe, R. J., Ubhi, J., Beech, A., Ellison, J., & Braithwaite, B. D. (2006). A prospective randomised controlled trial of VNUS closure versus Surgery for the treatment of recurrent long saphenous varicose veins. *European*

journal of vascular and endovascular Surgery, *31*(2), 212-218. https://doi.org/10.1016/j.ejvs.2005.07.005.

8. Luebke, T., & Brunkwall, J. (2008). Systematic review and meta-analysis of endovenous radiofrequency obliteration, endovenous laser therapy, and foam sclerotherapy for primary varicosis. *Journal of Cardiovascular Surgery*, *49*(2), 213. doi.org/10.1016/j.jvs.2008.06.031.

9. Brar, R., Nordon, I. M., Hinchliffe, R. J., Loftus, I. M., & Thompson, M. M. (2010). Surgical management of varicose veins: meta-analysis. *Vascular*, *18*(4), 205-220. doi.org/10.2310/6670.2010.00.

10. Luebke, T., Gawenda, M., Heckenkamp, J., & Brunkwall, J. (2008). Meta-analysis of endovenous radiofrequency obliteration of the great saphenous vein in primary varicosis. *Journal of Endovascular Therapy*, *15*(2), 213-223. doi.org/10.1583/07-2287.

11. Carradice, D., Mekako, A. I., Mazari, F. A. K., Samuel, N., Hatfield, J., & Chetter, I. C. (2011). Randomized clinical trial of endovenous laser ablation compared with conventional Surgery for great saphenous varicose veins. *Journal of British Surgery*, *98*(4), 501-510.doi.org/10.1002/bjs.7394.

12. Pronk, P., Gauw, S. A., Mooij, M. C., Gaastra, M. T. W., Lawson, J. A., Van Goethem, A. R., & Van Vlijmen-van Keulen, C. J. (2010). Randomised controlled trial comparing sapheno-femoral ligation and stripping of the great saphenous vein with endovenous laser ablation (980 nm) using local tumescent anaesthesia: one year results. *European Journal of Vascular and Endovascular Surgery*, *40*(5), 649-656.doi.org/10.1016/j.ejvs.2010.08.007.

13. Christenson, J. T., Gueddi, S., Gemayel, G., & Bounameaux, H. (2010). Prospective randomized trial comparing endovenous laser ablation and Surgery for treatment of primary great saphenous varicose veins with a 2-year follow-up. *Journal of vascular Surgery*, *52*(5), 1234-1241. doi.org/10.1016/j.jvs.2010.06.104.

14. Rasmussen, L. H., Bjoern, L., Lawaetz, M., Lawaetz, B., Blemings, A., & Eklöf, B. (2010). Randomised clinical trial comparing endovenous laser ablation with stripping of the great saphenous vein: clinical outcome and recurrence after 2 years. *European journal of vascular and endovascular Surgery*, *39*(5), 630-635. doi.org/10.1016/j.ejvs.2009.11.040.

15. Helmy ElKaffas, K., ElKashef, O., & ElBaz, W. (2011). Great saphenous vein radiofrequency ablation versus standard stripping in the management of primary varicose veins-a randomized clinical trial. *Angiology*, *62*(1), 49-54. doi.org/10.1177/0003319710380680.

16. Subramonia, S., & Lees, T. (2010). Randomized clinical trial of radiofrequency ablation or conventional high ligation and stripping for great saphenous varicose veins. *Journal of British Surgery*, *97*(3), 328-336. https://doi.org/10.1002/bjs.6867.

17. Abela, R., Liamis, A., Prionidis, I., Mathai, J., Gorton, L., Browne, T., & Panayiotopoulos, Y. (2008). Reverse foam sclerotherapy of the great saphenous vein with sapheno-femoral ligation compared to standard and invagination stripping: a prospective clinical series. *European Journal of Vascular and Endovascular Surgery*, *36*(4), 485-490. doi.org/10.1016/j.ejvs.2008.06.029.

18. Gale, S. S., Lee, J. N., Walsh, M. E., Wojnarowski, D. L., & Comerota, A. J. (2010). 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. *Journal of Vascular Surgery*, *52*(3), 645-650. doi.org/10.1016/j.jvs.2010.04.030.

19. Shepherd, A. C., Gohel, M. S., Brown, L. C., Metcalfe, M. J., Hamish, M., & Davies, A. H. (2010). Randomized clinical trial of VNUS® ClosureFAST™ radiofrequency ablation versus laser for varicose veins. *Journal of British Surgery*, *97*(6), 810-818. doi.org/10.1002/bjs.7091.

20. Lewis, B. D. (2010). Re: Radiofrequency endovenous ClosureFAST versus laser ablation for the treatment of great saphenous reflux--a multicenter, single-blinded, randomized study (RECOVERY study). *Journal of Vascular and Interventional Radiology: JVIR*, *21*(2), 302-author. https://doi.org/10.1016/j.jvir.2009.09.029.

21. Hozo, S. P., Djulbegovic, B., & Hozo, I. (2005). Estimating the mean and variance from the median, range, and the size of a sample. *BMC medical research methodology*, *5*, 1-10. Doi.org/ 10.1186/1471-2288-5-13.

22. Liberati, A., Altman, D. G., Tetzlaff, J., Mulrow, C., Gøtzsche, P. C., Ioannidis, J. P., ... & Moher, D. (2009). The PRISMA statement for reporting systematic reviews and meta-analyses of studies that evaluate healthcare interventions: explanation and elaboration. *Bmj*, *339*. https://doi.org/10.1136/bmj.b2700.

23. Disselhoff, B. C. V. M., Der Kinderen, D. J., Kelder, J. C., & Moll, F. L. (2011). Five-year results of a randomized clinical trial comparing endovenous laser ablation with cryostripping for great saphenous varicose veins. *Journal of British Surgery*, *98*(8), 1107-1111. doi.org/10.1002/bjs.7542.

24. Disselhoff, B. C. V. M., Der Kinderen, D. J., Kelder, J. C., & Moll, F. L. (2008). Randomized clinical trial comparing endovenous laser with cryostripping for great saphenous varicose veins. *Journal of British Surgery*, *95*(10), 1232-1238. https://doi.org/10.1002/bjs.6351.

25. Carradice, D., Mekako, A. I., Mazari, F. A. K., Samuel, N., Hatfield, J., & Chetter, I. C. (2011). Clinical and technical outcomes from a randomized clinical trial of endovenous laser ablation compared with conventional Surgery for great saphenous varicose veins. *Journal of British Surgery*, *98*(8), 1117-1123. https://doi.org/10.1002/bjs.7615.