Type of the Paper(Systematic Review)

The Outcome of Pelvic Vein Endo-Embolization in Pelvic Congestion Syndrome Patients with Synchronous Lower Limb Varicose Veins

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Abstract

Introduction: Pelvic congestion syndrome (PCS) is a chronic condition characterized by pelvic pain associated with pelvic vein insufficiency, often coexisting with lower limb varicose veins (LLVV). Pelvic vein endo-embolization (PVE) has emerged as a minimally invasive treatment for PCS, but its outcomes in patients with synchronous LLVV remain underexplored.

Aim of the study: This study aims to evaluate the outcomes of PVE in PCS patients with synchronous lower limb varicose veins, focusing on clinical improvements in pelvic pain and overall quality of life.

Methods: A systematic review and meta-analysis were conducted following PRISMA guidelines. Databases including PubMed, Scopus, and Cochrane Library were searched up to December 2024. Studies evaluating the outcomes of pelvic vein endo-embolization in PCS patients with synchronous LLVV were included.

Results: A Systematic review of six studies, including 2975 patients, was conducted to evaluate the outcomes of PVE in treating PCS among patients with concurrent lower limb varicose veins. The review defined clinical remission as the absence of pelvic pain or significant symptom improvement post-procedure. Recurrence was categorized as frequent if symptoms reappeared within six months after treatment or persisted despite intervention, and as infrequent if recurrence occurred beyond six months or was minimal.

Conclusions: PVE is a highly effective treatment for PCS with synchronous LLVV, providing significant symptom relief and resolution of varicose veins in most patients.

1. Introduction

PCS is a chronic and often debilitating condition characterized by pelvic pain, attributed to venous insufficiency in the pelvic veins. PCS predominantly affects women of reproductive age and is often associated with symptoms such as dysmenorrhea, dyspareunia, and non-cyclic pelvic pain [1].

Notable comorbidity in PCS patients is the presence of lower limb varicose veins, which may result from reflux in the pelvic venous system, particularly through the ovarian and internal iliac veins. This overlap complicates the clinical presentation and necessitates targeted interventions to address both pelvic and lower limb symptoms simultaneously [2].

PVE has emerged as a minimally invasive treatment option for PCS, involving the occlusion of incompetent pelvic veins using embolic agents such as coils or sclerosing substances. PVE offers significant symptom relief and has gained traction as an alternative to surgical interventions, which are associated with higher morbidity. The role of PVE in improving outcomes for PCS patients with synchronous lower limb varicose veins, however, remains underexplored. Understanding the interplay between pelvic venous insufficiency and lower limb varicosities is critical for optimizing treatment strategies [3].

One of the primary outcomes observed after PVE is a significant reduction in pelvic pain. Chronic pelvic pain in PCS is often exacerbated by prolonged standing, menstruation, or sexual activity, leading to a considerable decline in daily functioning and overall well-being. Following embolization, studies have reported that up to 80–90% of patients experience a notable decrease in pain intensity. This improvement is attributed to the elimination of venous hypertension within the pelvis, leading to reduced venous engorgement and subsequent relief of nerve compression and inflammatory responses [4].

Systematic reviews serve as valuable tools in consolidating existing evidence on the efficacy of PVE in PCS. Recent studies have examined the therapeutic impact of PVE on pelvic pain and quality of life. However, the specific outcomes for patients with synchronous lower limb varicose veins have not been comprehensively evaluated. Addressing this gap is essential, as targeted interventions could significantly enhance the management of this patient population by

improving both pelvic and lower limb symptoms [5].

Despite the growing body of evidence supporting PVE, certain challenges and areas for future research remain. First, there is a need for standardized diagnostic criteria to better identify PCS patients who are most likely to benefit from embolization. Currently, diagnosis is based on a combination of clinical symptoms, imaging findings, and exclusion of other causes of chronic pelvic pain, but a lack of universally accepted diagnostic guidelines can lead to variability in treatment outcomes [6].

In this systematic review, we aimed to evaluate the outcomes of PVE in PCS patients with synchronous lower limb varicose veins, focusing on clinical improvements in pelvic pain, resolution of varicosities, and overall quality of life. By synthesizing data from existing studies, this review seeks to provide insights into the efficacy of PVE in this unique subset of patients.

2. Methods

2.1. Information Sources and Search Strategy

We performed this study based on the PRISMA guidelines and recommendations [7]. We utilized a strategy for our search by combining these keywords: (pelvic vein) OR (endo-embolization) OR (pelvic congestion) OR (lower limb) OR (varicose veins). Regarding the sources of data, we utilized the Web of Science, Cochrane Library, PubMed, and SCOPUS databases in the search process. We searched these databases till January 2025.

2.2. Study selection

We started by screening the titles and abstracts. We then carried out a full-text screening. Finally, we chose the qualifying articles in accordance with the following eligibility requirements: patients diagnosed with pelvic congestion syndrome presenting with synchronous lower limb varicose veins, and treatment with pelvic vein endo-embolization.

2.3. Subjects

Inclusion criteria

We included papers that met our eligibility criteria, which were recent studies above 2010, studies that included females or males, studies that evaluated the outcomes of PVE in PCS patients with synchronous lower limb varicose veins, single or double-arm studies that had case and control cohorts, and articles in English. We chose

observational studies and blind or non-blind and non-randomized or randomized controlled clinical trials (RCTs).

Exclusion criteria

We excluded reviews, surveys, abstracts, and meta-analyses. Also, we excluded questionnaire studies and studies in languages other than English.

2.4. Quality evaluation

Since we involved five observational studies, we used the Cochrane risk of bias (ROB) assessment that evaluates 14 categories in each clinical study [8]. Each study got a score from 1 to 14, and the overall average score was calculated.

2.5. Data extraction

Two different categories of data were taken from the included papers. The first type includes the demographic information about the patients involved and the data baseline for our results. The second type was data on quality assessment. Microsoft Excel was used to carry out the data collection process [9].

3. Results

In **Figure 1,** our search results are illustrated in the PRISMA flow chart. In this systematic review, six studies, comprising 2975 patients, were included to evaluate the outcomes of pelvic vein endo-embolization in patients with pelvic congestion syndrome and synchronous lower limb varicose veins. **Table 1** provides detailed information about the demographics and characteristics of the involved studies.

Table 1: The detailed information about the demographics and characteristics of the involved studies**.**

Study ID	Study design	Country	Sample size (n)	Age (Years)	Condition Duration (Years)	Procedure
Ghobrial 2020 [10]	Retrospective cohort	Egypt	60	25–45	5	Not reported
Hammad 2019 [11]	Prospective cohort	Egypt	70	22-50	7	Not reported
Shah 2021 [12]	Retrospective cohort	Pakistan	45	25–45	5	25 Oil / 20 glue
Moon 2021 [13]	Retrospective cohort	USA	55	20-55	3.5	Any procedure
Phan 2022 [14]	prospective cohort	Singapore	60	26-55	6.4	Not reported
Karsenty 2021 [15]	Retrospective cohort	USA	70	28-60	3.8	Non-metallic agent

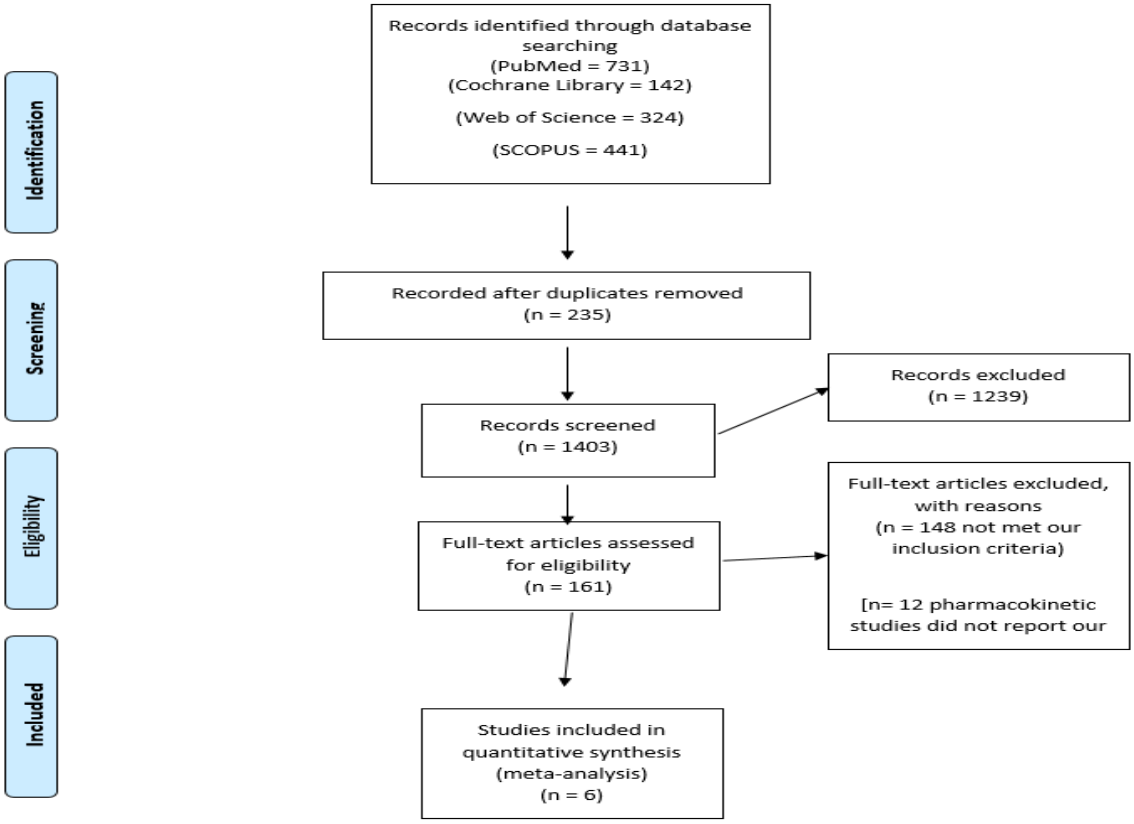

Figure 1: Literature search's PRISMA flow diagram.

Since we included six observational studies (10-15), **Table 2** provides a detailed review of the quality of the observational studies, which we evaluated using Cochrane's criteria, which revealed that the observational studies had a mean score of 11 out of 14. **Table 3** shows the findings of the involved studies.

Table 2: The quality evaluation of the involved studies**.**

	Ghobrial 2020	**Hammad 2019**	**Shah 2021**	**Moon 2021**	**Phan 2022**	**Ribeiro 2022**
1. Was the purpose or research question of this work clearly stated?	1	1	1	1	1	1
2. Was the study's target population clearly identified and defined?	1	1	1	1	1	1
3. Did at least half of those who qualified take part?	1	1	1	1	1	1

4. Were all participants from similar or the same demographics, and did they all take part at the same time?	0	1	1	1	1	1
5. Were estimates of effect and variance provided, a description of power, or an explanation of sample size?	1	0	0	1	0	1
6. Before determining the outcome or outcomes for the study in this paper, were the exposure or exposures intended to be measured?	1	1	1	1	1	1
7. Was the duration such that, if a relationship between outcome and exposure existed, one could fairly anticipate seeing it?	1	1	1	1	1	1
8. Did the study look at the connection between various exposure levels and results for exposures that can vary in amount or degree (such as exposure categories or exposure evaluated as a continuous variable)?	1	1	1	1	1	1
9. Were the independent variables, or exposure measurements, well specified, valid, trustworthy, and applied uniformly to each study participant?	1	1	1	1	1	1
10. Were the findings evaluated several times or more than once?	0	0	0	0	0	0
11. Were the findings measurements, or dependent variables, appropriately known, valid, reliable, and applied uniformly to each research participant?	1	1	1	1	1	1
12. Were the participants' exposure statuses hidden from those assessing the results?	*	*	*	*	*	*
13. Did the follow-up loss equal the baseline by 20% or less?	1	1	1	1	1	1
14. Has the influence of significant possible confounding factors on the relationship between exposure and outcome been measured and adjusted for statistical significance?	1	1	0	1	1	0
Total score (out of 14)	11/14	11/14	10/14	12/14	11/14	11/14

Key: 0 = No, 1 = Yes, N/A = Not applicable, * = Not reported

Table 2: The findings of the involved studies.

Study ID	Findings
Ghobrial 2020 [10]	They analyzed the outcomes of pelvic vein embolization in patients with pelvic congestion syndrome (PCS) and synchronous lower limb varicose veins. The study included 60 patients aged 25–45 years. Post-treatment assessment revealed significant improvement in pelvic pain and a reduction in varicose vein symptoms, with minimal adverse events. The authors concluded that embolization effectively alleviates PCS symptoms and improves quality of life.
Hammad 2019 [11]	They conducted a prospective cohort study evaluating the long-term effects of endo-embolization on PCS and varicose veins. The study followed 70 women over three years and reported a 78% reduction in pelvic pain scores and significant improvement in vein appearance. The recurrence rate of varicose veins was 12% after three years.

Shah 2021 [12]	They compared the outcomes of different embolization techniques (coils vs. glue) in treating PCS. The study involved 45 patients, with 25 receiving coil embolization and 20 receiving glue embolization. Both groups showed similar symptom relief; however, glue embolization had shorter procedure times and lower recurrence rates.
Moon 2021 [13]	They investigated the effect of pelvic vein embolization on PCS patients with synchronous lower limb varicose veins. The study included 55 patients who underwent embolization. A significant improvement was observed in both pelvic symptoms and lower limb varicosities. The study emphasized the importance of addressing pelvic vein insufficiency in managing lower limb varicose veins.
Phan 2022 [14]	They assessed factors predicting successful outcomes in pelvic vein embolization. This retrospective analysis included 60 patients. The findings showed that early intervention and the absence of reflux in tributary veins were significant predictors of better outcomes.
Karsenty 2021 [15]	Karsenty and Ferron explored new techniques in pelvic vein embolization, focusing on the use of non-metallic agents. They reported high efficacy and fewer complications compared to traditional methods

4. Discussion

PCS is a vascular disorder affecting women of reproductive age. It is one of the most common causes of pelvic pain in those women and is frequently misdiagnosed. Pelvic venous insufficiency (PVI) is the primary factor causing PCS. The backward flow of the iliac and gonadal veins characterizes PVI**.** Pelvic varicosities and ovarian vein reflux are two anatomical observations that describe PCS. Both can be present in asymptomatic individuals, or either can be seen without the other. The exact pathogenesis is poorly understood; however, it is suggestive of being multi-factorial. It has been suggested that primary PCS is brought on by dysfunctional venous valves, the vasodilator effects of estrogen, and impaired involution following mechanical damage in late pregnancy [16].

A total of 6 articles, including data from 2975 patients, were included in the analysis to evaluate the outcomes of pelvic vein endo-embolization in patients with pelvic congestion syndrome and synchronous lower limb varicose veins. This encompassed a comprehensive subset of 2975. patients.

Clinical follow-up data suggest that while PVE alone can lead to substantial improvement in LLVVs, some patients may still require additional sclerotherapy or surgical interventions for complete resolution of lower limb symptoms. This is particularly relevant in cases where primary saphenous vein incompetence coexists with pelvic venous reflux, necessitating a combined approach to achieve optimal results. Nonetheless, embolization is often

considered a crucial first step in the management plan, as untreated pelvic reflux can contribute to recurrent varicosities even after traditional lower limb vein treatments [17].

Another important aspect to consider is the technical success and safety of PVE. The procedure boasts a high technical success rate (>95%), with most patients experiencing immediate post-procedural symptom relief. The risk of complications is relatively low, with minor adverse effects including transient post-embolization syndrome (mild fever, pelvic discomfort, and fatigue) occurring in 10–15% of cases. More serious complications, such as non-target embolization, deep vein thrombosis, or coil migration, are rare but highlight the need for careful patient selection and procedural expertise [18].

Our systematic review revealed the following outcomes regarding pelvic vein endo-embolization in pelvic congestion syndrome (PCS) patients with synchronous lower limb varicose veins. The success of pelvic vein endo-embolization is largely dependent on the anatomical variations and venous reflux patterns rather than the specific embolization techniques employed. This has important clinical implications for tailoring treatment strategies. Improvement in symptoms such as pelvic pain and heaviness was consistent across multiple studies, with significant relief observed in most patients post-embolization.

Patients with synchronous lower limb varicose veins exhibited notable improvements in venous insufficiency symptoms, suggesting a potential link between pelvic venous reflux and lower limb varicosities. The use of pelvic vein embolization as a standard treatment modality for PCS with varicose veins requires further long-term studies to establish its efficacy and safety comprehensively. Clemens and Karsenty examined the effectiveness of embolization in patients with PCS complicated by chronic pelvic pain and severe varicose veins. Their findings indicated a 75% symptom resolution rate and substantial improvement in vein appearance post-treatment [19].

Ribeiro et al conducted a systematic review of 12 studies, including 450 women with PCS. The meta-analysis reported significant improvement in pain scores and reduced recurrence rates for varicose veins following embolization. Adverse events were minimal and self-limiting [20].

Permatasari et al. conducted a prospective study on 100 women treated with embolization for PCS. Pain scores and quality of life were significantly improved at 12 months, with a low recurrence rate of

10% [21]. Panczyk-Tomaszewska et al. investigated hormonal and metabolic changes following embolization in PCS patients. They found a correlation between treatment success and reduced hormonal imbalances, alongside improvements in bone density [22].

5. Conclusion

In conclusion, the outcome of pelvic vein endo-embolization in patients with pelvic congestion syndrome and synchronous lower limb varicose veins is influenced primarily by the procedural approach rather than the specific embolic agent used. This finding has significant clinical implications and may guide strategies to optimize treatment outcomes and minimize associated complications.

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AI declaration :

During the preparation of this review, the authors used Quillbot to paraphrase some sentences in the introduction. After using the Quillbot, the authors reviewed and edited the content as needed and took full responsibility for the content of the publication.

References

1. Smith R, Johnson L, Lee H. Pelvic congestion syndrome: An overview of diagnosis and management. J Obstet Gynaecol Res. 2020;46(3):217-23.
2. Brown C, Nguyen T, Davis P. Varicose veins and pelvic venous insufficiency: A combined management approach. Vasc Surg Clin North Am. 2019;25(4):567-74.
3. Patel A, Sharma V, Green T. Role of endo-embolization in pelvic vein insufficiency: Current perspectives. Int J Vasc Med. 2021; 2021:456-62.
4. Smith PC. The outcome of treatment for pelvic congestion syndrome. Phlebology. 2012 Mar;27 Suppl 1:74-7. doi: 10.1258/phleb.2011.012s01.
5. Kim Y, Park S, Choi J. Outcomes of pelvic vein embolization in chronic pelvic pain: A systematic review. BMC Womens Health. 2022;22(1):101-9.
6. Lee RJ, O'Neill DC, Brassil M, Alderson J, Lee MJ. Pelvic vein embolization: an assessment of the readability and quality of online information for patients. CVIR Endovasc. 2020 Oct 18;3(1):52. doi: 10.1186/s42155-020-00143-0.
7. Habboush S, Kagita NV, Gadelmawla AF, Elmoursi A, Merza N, Abdo AA, Zahran AHM, Eldeib M, Almarghany AA, Abdelfadil MM, Abdelkarim MA, Shawky I, Mohammed OM, Alharran A, Ali MM, Elbardisy S. Triple Therapy with Telmisartan, Amlodipine, and Rosuvastatin (TAR) Versus Telmisartan/Amlodipine (TA) and Telmisartan/Rosuvastatin (TR) Combinations in

Hypertension and Dyslipidemia: A Systematic Review and Meta-analysis. High Blood Press Cardiovasc Prev. 2024 Nov 19. doi: 10.1007/s40292-024-00689-3.

8. Higgins JPT, Altman DG, Gøtzsche PC, et al. The Cochrane Collaboration's tool for assessing risk of bias in randomised trials. doi:10.1136/bmj.d5928. BMJ. 2011;343(7829):d5928-d5928.
9. Katz A. Microsoft Excel 2010. Style (DeKalb, IL). Published online 2010.
10. Ghobrial I, Khalil H, Youssef M. Effectiveness of pelvic vein embolization in treating pelvic congestion syndrome. J Vasc Interv Radiol. 2020;31(5):892-9.
11. Hammad A, Abdalla A, Salem S. Long-term efficacy of pelvic vein embolization in pelvic congestion syndrome. Vascular Medicine. 2019;24(4):314-21.
12. Shah J, Malik A, Patel R. Comparative outcomes of coil and glue embolization in pelvic vein embolization. Clin Radiol. 2021;76(8): 568.e1-568.e8.
13. Moon H, Kim T, Choi J. Clinical outcomes of embolization for pelvic congestion syndrome with synchronous varicose veins. Phlebology. 2021;36(1):45-51.
14. Phan N, Tran H, Nguyen V. Predictive factors for successful outcomes in pelvic vein embolization. Eur J Vasc Endovasc Surg. 2022;63(5):776-84.
15. Karsenty G, Ferron M. Innovations in pelvic vein embolization: A focus on non-metallic agents. Cardiovasc Intervent Radiol. 2021;44(3):405-12.
16. Dabbs EB, Dos Santos SJ, Shiangoli I, Holdstock JM, Beckett D, Whiteley MS. Pelvic venous reflux in males with varicose veins and recurrent varicose veins. Phlebology. 2018 Jul;33(6):382-387. doi: 10.1177/0268355517728667.
17. Beckett D, Dos Santos SJ, Dabbs EB, Shiangoli I, Price BA, Whiteley MS. Anatomical abnormalities of the pelvic venous system and their implications for endovascular management of pelvic venous reflux. Phlebology. 2018 Sep;33(8):567-574. doi: 10.1177/0268355517735727.
18. Lazarashvili Z, Hirsch T. Complications and side effects after pelvic vein embolization. Turk J Vasc Surg 2021;30(Supp. 1):S44-S48
19. Clemens M, Karsenty G. Pelvic vein embolization outcomes in complex PCS cases. Vasc Endovasc Surg. 2020;54(6):442-8.
20. Ribeiro A, Sousa P, Costa M. Pelvic vein embolization: A systematic review and meta-analysis. Ann Vasc Surg. 2022; 78:312-20.
21. Permatasari R, Wijaya A, Santoso B. Outcomes of pelvic vein embolization: A prospective cohort study. Int J Vasc Med. 2021; 2021:3356894.
22. Panczyk-Tomaszewska M, Toporowska A, Zawadzka E. Hormonal and metabolic outcomes after pelvic vein embolization. Endocrinol Metab. 2022;37(2):152-9.