



Targeted Relief: how transcatheter coil embolization transforms treatment for pelvic congestion syndrome

Alivio específico: cómo la embolización transcatóter con espiral transforma el tratamiento del síndrome de congestión pélvica

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Received: 04/20/2022 Accepted: 07/19/2023 Published: 08/12/2024 DOI: <http://doi.org/10.5281/zenodo.13376284>

Abstract

Background: Pelvic congestion syndrome (PCS) is characterized by chronic pelvic pain, frequently linked with perineal or vulvar varices due to reflux or obstruction in the gonadal, gluteal, or periuterine veins. The aim of study is to evaluating the clinical characteristics and outcomes of patients with pelvic congestion syndrome (PCS) treated with coil embolization. **Method:** This retrospective descriptive analysis aims to evaluate the clinical characteristics and outcomes of patients with pelvic congestion syndrome (PCS) treated with coil embolization. The study seeks to analyze historical data to provide insights into patient demographics, procedure details, and outcomes. Additionally, it compares these findings with existing literature on the PCS coil embolization procedure. **Results:** A detailed review of patient records and cathlab database from 2021 to 2023 included 20 female patients with pelvic congestion syndrome treated with coil embolization. The mean age was 31.35 years, with 16 multiparous women. All experienced chronic pelvic pain for over 6 months, with additional symptoms including dysmenorrhea (40%), dyspareunia (30%), and psychological issues (10%). Trans-abdominal ultrasound was the primary diagnostic tool, with 50% also undergoing CT/MRV. The procedure was successful in all patients, with a mean of 2.3 coils used. Pain levels, measured by VAS, significantly decreased from 8.5 pre-intervention to 2.3 at 18 months' post-intervention. **Conclusion:** Endovascular coil embolization is a valuable therapeutic option for pelvic congestion syndrome, providing effective symptom relief with a favorable safety profile. While comparative studies show varying outcomes across different treatments, embolization remains a cornerstone in managing PCS. Continued investigation and refinement of this clinical practice are warranted.

Keywords: Pelvic congestion syndrome, Chronic pelvic pain, Endovascular coil embolization.

Resumen

Antecedentes: El síndrome de congestión pélvica (PCS) se caracteriza por dolor pélvico crónico, frecuentemente relacionado con varices perineales o vulvares debido a reflujo u obstrucción en las venas gonadales, glúteas o periuterinas. El objetivo del estudio es evaluar las características clínicas y los resultados de los pacientes con síndrome de congestión pélvica (PCS) tratados con embolización con coils. **Método:** Este análisis descriptivo retrospectivo tiene como objetivo evaluar las características clínicas y los resultados de los pacientes con síndrome de congestión pélvica (PCS) tratados con embolización con coils. El estudio busca analizar datos históricos para proporcionar información sobre la demografía de los pacientes, los detalles del procedimiento y los resultados. Además, compara estos hallazgos con la literatura existente sobre el procedimiento de embolización con coils PCS. **Resultados:** Una revisión detallada de los registros de pacientes y la base de datos del laboratorio de cateterismo de 2021 a 2023 incluyó a 20 pacientes femeninas con síndrome de congestión pélvica tratadas con embolización con coils. La edad media fue de 31,35 años, con 16 mujeres múltiples. Todos experimentaron dolor pélvico crónico durante más de 6 meses, con síntomas adicionales que incluían dismenorrea (40%), dispareunia (30%) y problemas psicológicos (10%). La ecografía transabdominal fue la herramienta diagnóstica principal, y el 50% también se sometió a TC/MRV. El procedimiento fue exitoso en todos los pacientes, con una media de 2,3 coils utilizados. Los niveles de dolor, medidos por VAS, disminuyeron significativamente de 8,5 antes de la intervención a 2,3 a los 18 meses posteriores a la intervención. **Conclusión:** La embolización endovascular con coils es una opción terapéutica valiosa para el síndrome de congestión pélvica, que proporciona un alivio eficaz de los síntomas con un perfil de seguridad favorable. Si bien los estudios comparativos muestran resultados variables entre los diferentes tratamientos,

la embolización sigue siendo una piedra angular en el manejo del PCS. Se justifica la investigación continua y el refinamiento de esta práctica clínica.

Palabras clave: Síndrome de congestión pélvica, Dolor pélvico crónico, Embolización endovascular con coil.

Introduction

Pelvic congestion syndrome (PCS) is defined as chronic pelvic pain associated with perineal or vulvar varices due to reflux or obstruction of the gonadal, gluteal, or periuterine veins. Chronic pelvic pain is described as lower abdominal or pelvic pain persisting for over six months, accounting for up to 30% of outpatient gynecologic visits in the United States and potentially affecting up to 40% of the female population during their lifetime¹. First described clinically by the French (Richet) in 1857, the association with pelvic varices was documented in 1949¹. Transcatheter venous embolization for PCS was introduced by Edwards et al. in 1993². The condition has garnered increasing interest among vascular surgeons due to its association with venous insufficiency of the lower limbs. Despite its prevalence, PCS is poorly diagnosed in both gynecology and angiology offices. Endovascular coil embolization has emerged as a minimally invasive and effective alternative to traditional surgical approaches for PCS treatment. This technique aims to occlude incompetent veins, control symptoms, preserve fertility, and offer an option for patients who cannot or reject conservative or surgical treatment. Recent studies report significant pain reduction and favorable long-term outcomes with few complications from embolization techniques. Various embolic agents, including coils, are used to induce vein occlusion. Coils offer the advantage of permanent occlusion by creating a physical barrier, reducing venous congestion, and ensuring precise targeting under imaging guidance. Coil embolization provides significant and sustained relief from chronic pelvic pain, improving the quality of life with minimal post-procedural pain and quick recovery. Ovarian vein embolization has a reported technical success rate of 100%, low complication rates, and long-term symptomatic relief in 86.6% of cases³. Patients present to various specialists, including general practitioners, gynecologists, vascular specialists, pain specialists, gastroenterologists, and psychiatrists. Pain varies in intensity, worsens in the premenstrual period, and is exacerbated by walking, standing, and fatigue. Common symptoms include post-coital ache, dysmenorrhea, dyspareunia, bladder irritability, and rectal discomfort. Underdiagnosis can lead to

anxiety and depression, necessitating a multidisciplinary approach for investigation and management. Noninvasive imaging (US, CT, MRI) is essential for diagnosis and exclusion of other conditions causing chronic pelvic pain, with transcatheter venography remaining the gold standard for definitive diagnosis and guiding ovarian vein embolization. PCS is associated with various etiologies, including constitutional, mechanical, inflammatory, hormonal, neural, psychosomatic, and vascular factors⁴. Anxiety and depression are common in this group, with debates on whether they are causes or effects⁵. PCS results from primary intrinsic venous abnormalities like absence of valves and venous incompetence, and secondary to mechanical factors like Nutcracker and May-Thurner syndromes. Diagnostic criteria for primary ovarian vein incompetence proposed by Beard include ovarian vein diameter ≥ 6 mm, contrast retention in the pelvic venous plexus >20 seconds, congestion of the pelvic venous plexus with or without opacification of ipsilateral (or contralateral) internal iliac veins, and filling of vulvovaginal and thigh varicosities, with scores >5 indicating PCS⁶. Contrast venogram has been largely replaced by noninvasive modalities for guiding intervention. Cross-sectional imaging with CT or MRV is commonly used to establish the etiology of pelvic vein disorders in symptomatic patients. Coakley proposed criteria for pelvic varices, including at least four ipsilateral tortuous parauterine veins, with at least one measuring >4 mm in diameter, or an ovarian vein diameter >8 mm. While CT requires radiation and lacks hemodynamic information, Doppler ultrasonography provides clear benefits⁷. The aim of study is to evaluating the clinical characteristics and outcomes of patients with pelvic congestion syndrome (PCS) treated with coil embolization.

Methods

This study was a descriptive, retrospective analysis. Patients included in the study had chronic pelvic pain persisting for more than six months, a documented diagnosis of PCS based on clinical and imaging findings, primary pelvic venous insufficiency, failure of conservative treatment measures, provided informed consent for the procedure, and were females of reproductive age. Exclusion criteria included contraindications for embolization (e.g., severe coagulopathy or infection), current pregnancy, secondary causes of pelvic pain (e.g., endometriosis, fibroids, Nutcracker syndrome, May-Thurner syndrome), and patient refusal to undergo the procedure. The diagnosis of PCS was confirmed using a combination of imaging modalities: transabdominal ultrasound (US) for initial evaluation of pelvic varicosities and venous reflux, transvaginal US for detailed assessment of ovarian and pelvic veins,

high-resolution CT imaging to map the pelvic venous anatomy and identify sites of reflux, and MR venography in selected cases for detailed visualization of pelvic venous insufficiency. The primary clinical features assessed were chronic pelvic pain, ovarian point tenderness, dyspareunia, dysmenorrhea, and recurrent varices or varicose veins in unusual anatomical distributions. The trans-catheter coil embolization procedure was standardized. Pre-procedural preparation included fasting for at least six hours, ensuring adequate hydration, continuing chronic medications except for blood thinners (which were stopped according to protocol), establishing intravenous access, and administering prophylactic antibiotics to prevent infection. Local anesthesia (2% lidocaine) was used at the access site, with sedation (midazolam) provided in some cases. A 6 French (Fg) sheath was introduced through the common femoral vein under Doppler US guidance. Catheters and coils were advanced under fluoroscopic guidance to target veins, primarily the ovarian veins, with occasional embolization of the internal iliac veins. MRye embolization coils, made of Inconel with spaced synthetic fibers, were used. Coils were deployed under fluoroscopic guidance to ensure precise placement and immediate, complete occlusion of the target veins. Post-procedure, patients were monitored for vital signs, analgesia administration, access site complications, and given discharge instructions with follow-up. The primary outcome was improvement in pelvic pain, measured using a visual analogue scale (VAS) from 0-10. Secondary outcomes included improvement in associated symptoms (e.g., dyspareunia, dysmenorrhea, vulval, vaginal, and lower limb varices). Re-intervention was defined as subsequent intervention due to symptoms, while recurrence was defined as radiological evidence of recurrence or recurrence of initial symptoms after treatment. Complications included pain, pyrexia, access site complications, and any required subsequent procedures. Data were collected from patient registries, medical records, the Cathlab database, and Cathlab storage devices for case-to-case review of images and fluoro loops. This study aimed to describe and analyze data from past records to provide insights into PCS coil embolization procedures, including patient demographics, procedure details, and outcomes within the scope of published literature.

Results

This detailed, retrospective study evaluated the clinical characteristics and outcomes of twenty female patients with pelvic congestion syndrome (PCS) treated with coil embolization from 2021 through 2023. The focus was on optimizing approach and growing experience in the center. All patients met the inclusion criteria and were referred by a gynecologist. The youngest patient was 18 years old, and the oldest was 45, with a mean age of 31.35 years (SD 7.96). Sixteen patients (80%) were multiparous, having given birth to 2-4 children (mean 2.68). All patients experienced chronic pelvic pain for more than six months, with durations ranging from six months to eight years. Additional symptoms included dysmenorrhea (8 patients, 40%), dyspareunia (6 patients, 30%), and psychological issues (2 patients, 10%). On examination, 2 patients (10%) had vulval and/or lower limb varicosities. Trans-abdominal ultrasound was the primary diagnostic tool used by referring doctors and was performed on all patients. Additionally, six patients underwent transvaginal ultrasound, which confirmed the diagnosis by revealing a dilated ovarian vein of more than 6 mm. CT/MRV was performed in 10 patients (50%) with unusual presentations, age extremes, or to exclude secondary causes and define anatomy. Diagnostic venography was not planned as a separate procedure since all patients were diagnosed with sufficient criteria without equivocal findings. Routine access was through the right common femoral vein in 19 patients. In one patient, access was achieved through the right internal jugular vein due to anatomical challenges. The number of coils needed for embolization ranged from 1 to 4 (mean 2.3, frequency: 2 coils 45%, 3 coils 35%). Technical success was achieved in all patients, with complete occlusion of diseased veins (left ovarian vein in 18 patients, bilateral in 1, right ovarian and internal iliac veins in 1). Reported complications and challenges included a contrast reaction in one patient, treated with antihistamines, steroids, intravenous fluids, and oxygen support. Two anxious patients required sedation with midazolam, and one patient with difficult engagement needed right internal jugular vein access. No access site-related complications or coil migration were reported. In the short term, two patients experienced lower abdominal pain localized near the procedure site, which was managed successfully with NSAIDs and Daflon. The mean duration of the coil embolization procedure was 50.65 ± 16.4 minutes. No long-term complications were observed during the follow-up period. Post-procedural follow-up included visits at a few days, six months, and eighteen months post-procedure. Outcomes and patient satisfaction were assessed using patient examinations, VAS, and trans-abdominal Doppler in selected cases. The mean VAS values pre-intervention, at six months' post-intervention,

and at eighteen months' post-intervention were 8.5, 3.5, and 2.3, respectively.

Figure 1

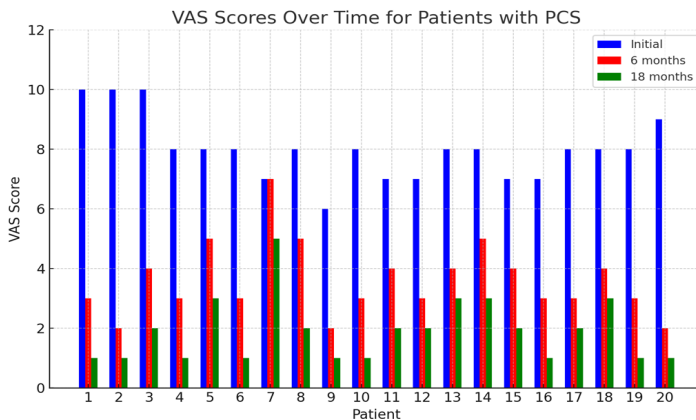


Fig 1: The figure below demonstrates the Visual Analogue Scale (VAS) scores for patients with Pelvic Congestion Syndrome (PCS) at different time intervals. The scores show the initial pain levels before treatment (blue), pain levels 6 months after treatment (red), and pain levels 18 months after treatment (green). Each patient's VAS scores are displayed, highlighting the significant reduction in pain over time following coil embolization treatment.

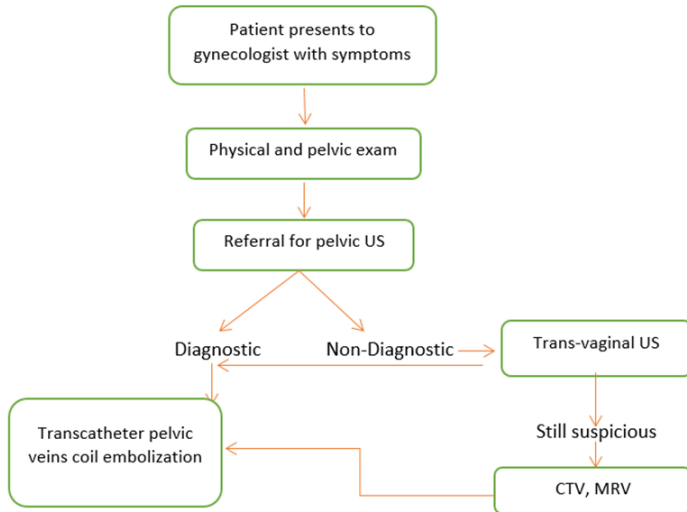
Discussion

Pelvic congestion syndrome (PCS) is characterized by reflux in the central pelvic veins, often associated with chronic pelvic pain or discomfort in the lower abdomen, typically affecting women of childbearing age and those with multiple pregnancies. The condition was first treated with endovascular embolization by Edwards et al. in 1993, who reported satisfactory long-term outcomes, marking a significant advancement in PCS management². The Society of Vascular Surgery and the American Venous Forum endorse endovascular treatment for PCS with a 2B recommendation in their practice guidelines for chronic venous disease treatment⁸. Despite its cost, endovascular treatment remains the mainstay for symptomatic PCS patients in the current era. This study does not aim to test a hypothesis or establish causality but to present data using summary characteristics. The goal is to describe and analyze data from past records, providing insights into PCS coil embolization procedures concerning patient demographics, procedure details, and outcomes within the scope of published literature. This contributes to the growing body of evidence supporting the efficacy and safety of coil embolization in managing PCS. Reviewing Mahmoud et al.'s article describing 20 published studies, our sample size of 20 patients is comparable to most studies, which typically enrolled around 50 patients. Our sample size allowed for

meaningful comparisons and conclusions. Our study's sample size aligns with studies which used the same type of coils for pelvic vein embolization^{3,9-13}. The mean age of our patients (31.35 years) was the lowest compared to published studies, with the youngest mean age being 32.3 in Kashef E et al.'s study¹⁴. This may be attributed to the younger age of marriage and pregnancy in our Middle Eastern community compared to Western countries. Regarding parity, the mean parity in our study was comparable to most studies, regardless of sample size, and identical to Laborda et al.¹⁵. Major presenting symptoms, such as chronic pelvic pain and dyspareunia, were comparable to those listed by Laborda et al. and Hanna J et al., highlighting the significant impact of these symptoms on both patients and their spouses^{15,16}. The diagnostic algorithm used to manage PCS in our study was the same as published by Gandini R et al.¹². This approach is logically plausible and comparable to studies by Kashef E et al., O'Brien MT et al., Szymgin M, et al., and Novaes LFC et al., where all diagnostic modalities were used, and high-sensitivity diagnostic tools were employed in selected cases^{14,17-19}. Our study reported a 100% technical success rate in embolization, aligning with findings from Liang et al. (2020) and Smith et al. (2023), who also demonstrated high technical success rates and a low incidence of major complications associated with coil embolization^{20,21}. Mahmoud et al. reported a 100% immediate technical success rate in 17 studies, with success rates of 94.7%, 95.8%, and 90.9% in three other studies³. There were no significant immediate complications in our study, reinforcing the high safety profile of the procedure when performed by experienced vascular surgeons. This highlights its feasibility as a first-line treatment option for PCS. All our patients completed their 18-month follow-up period, which is notable given the varying follow-up periods in reviewed studies (ranging from 2 months to 7 years)³. Initially, our VAS scores were high compared to published studies using the same scale but were comparable. Long-term outcomes were slightly better than those reported by other studies^{10,14,18,22}. The type of coil used may influence outcomes and patient satisfaction, suggesting the need for future comparative studies between different coil types. Our findings demonstrated a significant reduction in pelvic pain scores post-procedure, aligning with previous studies indicating symptomatic improvement after coil embolization, such as those by²³⁻²⁵. This supports the hypothesis that pelvic pain in PCS is largely attributable to venous reflux and congestion, which can be effectively addressed through embolization of incompetent pelvic veins. Comparative effectiveness studies show mixed results when comparing embolization with other interventions, such as surgical ligation or sclerotherapy. While some studies, like Gavrilov et al.²⁶, reported comparable symptomatic improvement and procedural outcomes between embolization and surgical intervention, others, like De Carvalho et al.²⁷, suggest the superiority of embolization in terms of shorter recovery and reduced procedural morbidity^{25,26}. These discrepancies may reflect variations

in patient selection criteria, procedural techniques, and outcome measures across different studies.

Figure 2: proposed model



Conclusions

Endovascular coil embolization is a valuable treatment option for pelvic venous syndrome, which can effectively relieve symptoms and has a more favorable safety profile compared with other surgical procedures. Although comparative studies have shown different treatment outcomes between different modalities, embolization remains the cornerstone of the treatment algorithm for iliac vein syndrome and deserves further study and improvement in clinical practice.

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