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RESEARCH ARTICLE

Evaluation of Pain and Quality of Life in Patients with Pelvic Congestion Syndrome Treated with Endovascular Plug Embolization

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ABSTRACT

Objective: Pelvic congestion syndrome (PCS) is usually encountered in female patients of reproductive age. Medical and endovascular interventions are used in the treatment. This study aimed to evaluate the effects of endovascular plug embolization on pain and quality of life in patients diagnosed with PCS.

Materials and Methods: In this retrospective study, 36 patients diagnosed with PCS and who underwent embolization of ovarian veins with the plug method between June 2023 and March 2024 were analyzed. All information such as age, BMI (body mass index), site and side of pain, medical treatments, comorbidities, time between onset of pain and endovascular intervention, accompanying symptoms, positions in which pain increased, and clinics consulted during the diagnostic process were recorded. NRS-11 (Numeric Rating Scale-11) and SF-12 (Short Form-12) scores were recorded before, and one and three months after, the endovascular procedure.

Results: The mean age of the patients was 39.5±8.2 years, and the mean duration of pain was 49.6±32.28 months. Compared to the pre-procedural baseline, the NRS score significantly decreased from 9.3 to 2.06, indicating substantial pain relief. The MCS-12 (Mental Component Summary-12) scores increased from 27.5 to 32.4, reflecting an improvement in patients' mental quality of life. Similarly, PCS-12 (Physical Component Summary-12) scores rose from 26.2 to 47.5, demonstrating enhanced physical quality of life. At the 3-month follow-up, statistical analysis of NRS and SF-12 scores confirmed a significant reduction in pain and an increase in quality of life ($p<0.001$).

Conclusion: Endovascular plug embolization is an effective and safe method in patients with PCS. Endovascular plug embolization in patients with PCS resulted in significant pain reduction and notable improvement in both mental and physical quality of life within three months post-procedure.

Keywords: Chronic pain, pelvic congestion syndrome, pelvic pain, plug embolization

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INTRODUCTION

Pelvic congestion syndrome (PCS) is predominantly observed in women of reproductive age and is characterized by abdominal and pelvic pain, accompanied by a sensation of fullness in the perineal and vulvar regions. Patients often report dysmenorrhea, dyspareunia, postcoital pain, urinary discomfort, and, less commonly, hematuria. Low back and hip pain may also be present. The pain typically worsens when standing and improves when lying down. PCS represents one of the causes of chronic pelvic pain (CPP), with symptoms persisting for more than six months and occurring independently of the menstrual cycle. Although the precise etiopathogenesis of PCS remains unclear, it is recognized that ovarian vein dilation is a hallmark of the condition. Disorders associated with abnormalities in the pelvic venous system, such as those observed in PCS, are currently classified under the broader category of "pelvic venous disorders."[1–3] There is currently no universally established diagnostic standard for PCS. Al-

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though clinical suspicion can guide initial assessment, catheter-based venography remains the definitive diagnostic modality. For situations in which non-invasive evaluation is preferred, a key ultrasonographic criterion is the presence of ovarian vein dilatation greater than 6 mm, detectable via either transvaginal or transabdominal ultrasonography. This finding is considered one of the most reliable indicators of PCS in imaging studies.[1,4,5]

Significant advancements have occurred in the management of PCS in recent years. Since the 1980s, therapeutic strategies have evolved widely, encompassing both pharmacological and surgical approaches. In the early 2000s, laparoscopic interventions became less favored due to potential complications, including nerve injury and hemorrhage. Currently, minimally invasive procedures are considered the standard of care. Endovascular techniques, such as sclerosing agents, foam sclerotherapy, and plug or coil embolization–either used individually or in combination—are commonly employed. Evidence indicates that these approaches are both highly effective and associated with low rates of adverse events.[6–8] Despite advancements in treatment, PCS patients frequently experience delayed diagnosis, often after multiple consultations in urology and gynecology clinics. This delay may result in unnecessary interventions, prolonged pain, and increased economic and productivity losses. Chronic pain associated with delayed recognition also contributes to both physical and psychological impairments. Endovascular plug embolization represents a minimally invasive intervention that allows same-day discharge, yet literature on its use remains limited compared to coil embolization.[9]

This study aimed to evaluate the effects of endovascular plug embolization on pain and quality of life in patients diagnosed with PCS.

MATERIALS and METHODS

The ethics committee approval from the University of Health Sciences, Kanuni Sultan Suleyman Training and Research Hospital (KAEK/2024.03.52, 27/03/2024) was obtained for the study. The study was conducted in accordance with the Declaration of Helsinki. The study was registered in clinicaltrials.gov with the number NCT06553014.

Our study is single-center and retrospective. We did not perform a formal sample size calculation prior to data collection. Our sample size (n=36) was determined by the number of cases within the defined time period and the service capacity of our institution. We presented our findings with p-values; we interpreted our analysis as exploratory/hypothesis-generating in nature. We included all consecutive patients who underwent endovascular "plug" embolization for PCS at our institution between June 2023 and March 2024 and who met the eligibility criteria.

Patients older than 18 years who presented with abdominopelvic pain with an numeric rating scale-11 (NRS-11) score of ≥5 lasting for more than six months and who had ovarian vein dilatation greater than 6 mm on transvaginal or transabdominal ultrasonography (USG) were included in the study.

Patients with leiomyoma, pelvic inflammatory disease, endometriosis, postoperative adhesions, a history of urologic or gynecologic surgery, end-stage renal disease, allergy to drugs used during the endovascular plug procedure, May-Thurner syndrome, Nutcracker syndrome, a history of abdominopelvic trauma or malignancy, a history of radiotherapy or chemotherapy, or known psychiatric illness were excluded. Additionally, patients who were pregnant or breastfeeding, or those diagnosed with fibromyalgia, lumbar disc herniation, scoliosis, facet syndrome, sacroiliac dysfunction, genitourinary, or gastrointestinal diseases were also excluded. Patients with missing data or those who refused to participate in the study were not included in the analysis.

The study included 36 patients who met the inclusion and exclusion criteria. The flow diagram of the patients included in the study is presented as Figure 1.

All ultrasonographies were performed by the same radiologist with at least 10 years of experience. A single ultrasound device (Esaote, Mylab X7, Genova, Italy) was used in this study.

Demographic and clinical information about the patients and the procedure was recorded in the database: Age, body

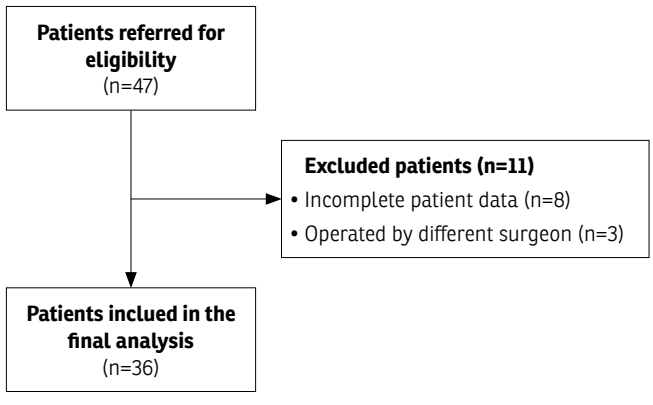

Figure 1. Flow chart of the patients

mass index (BMI), site of pain (perineum, vulva, labia majora/minor, hypogastrium, inguinal region, hip, lower back, leg) and side, past medical treatments, comorbidities, the time between the onset of pain and endovascular intervention, accompanying symptoms (feeling of heaviness in the perineum, swelling in the labia majora, dysuria, hematuria, dyspareunia, postcoital pain, dysmenorrhea, frequent urination), information on the position in which the pain increases (lying/standing/sitting), presence or absence of varicose veins in the lower extremity, need for a repeat procedure, vein entered during endovascular intervention, vein embolized, type of embolotherapy, duration of procedure (minutes), cumulative radiation exposure during the procedure (mGy-cm²). Complications (vessel perforation/hematoma/phlebitis/embolism/migration/dyspnea/panic attack/allergic reaction/infection) were recorded and evaluated according to the Society of Interventional Radiology (SIR) classification. In treatment planning for PCS, established guidelines and consensus statements from the Cardiovascular and Interventional Radiological Society of Europe (CIRSE) and the Society of Interventional Radiology (SIR) were carefully considered and incorporated.

The NRS-11 and short form-12 (SF-12) scores were used to assess pain and functionality before, 1, and 3 months after the endovascular procedure, and the results were recorded. The patients' NRS-11 and SF-12 scores, as documented during their 1st- and 3rd-month postprocedural follow-up examinations conducted by the same physician, were reviewed and recorded.

Intervention

All patients were taken to the procedure room and monitored with a 5-lead electrocardiogram (ECG), pulse oximetry, and blood pressure. Intravenous access was established in the forearm. The procedure was performed as an outpatient procedure with moderate sedation using midazolam 0.02–0.07 mg/kg (Zolamid ampul, 5 mg/ml, Vemilaç, Türkiye), fentanyl 1–2 µg/kg (Talinat ampul, 0.5 mg/10 ml, Vemilaç, Türkiye), and local anesthesia (5.0–10.0 mL of 0.5% lidocaine solution, Lidon ampul, 100 mg/5 ml, Onfarma, Türkiye). Venous access was obtained by ultrasound-guided right internal jugular or right femoral vein access with a 6F introducer sheath. First, the left renal vein was selectively catheterized with 5F macro-catheters advanced over a 0.035 hydrophilic wire. Venography was performed to evaluate ovarian vein reflux and to rule out hemodynamically significant renal vein compression. A venography image was obtained under the Valsalva maneuver. If left ovarian vein reflux was evident, the left ovarian vein was selectively catheterized, and venography was performed to visualize it from the renal vein separation to the most distal part (Fig. 2). Left ovarian embolization was performed after confirmation of valve regurgitation, filling of the pelvic venous reservoir, and elimination of contrast stagnation within the reservoir. The embolization material to be used was determined according to the diameter and width of the venous structure. Plugs ranging in size from 10 mm to 18 mm, selected according to the diameter of the vein, were delivered with a micro-delivery catheter, and the plugs placed into the lumen from the most distal to the proximal were allowed to open in the lumen (Fig. 3). Intermittent venography was performed to ensure adequate placement of plugs, and the absence of distal filling was clearly demonstrated. Subsequently, catheterization of the internal iliac veins and digital subtraction venography via a balloon occlusion catheter was performed. In this way, the remaining filling of the pelvic

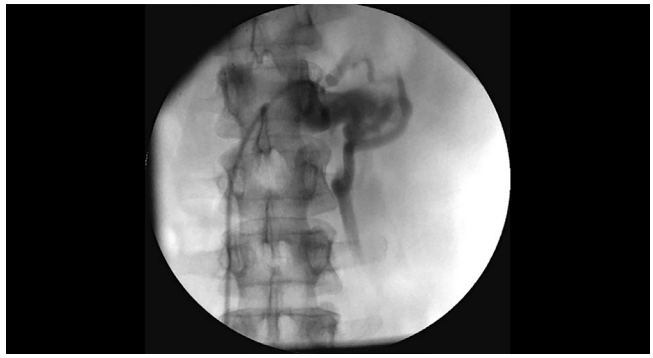

Figure 2. Contrast injection through the left renal vein following right femoral venous catheterization demonstrates distal reflux

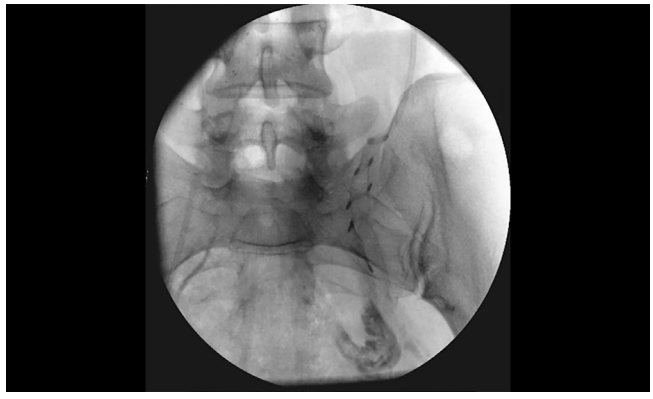

Figure 3. Plug embolization procedure performed in the left ovarian vein

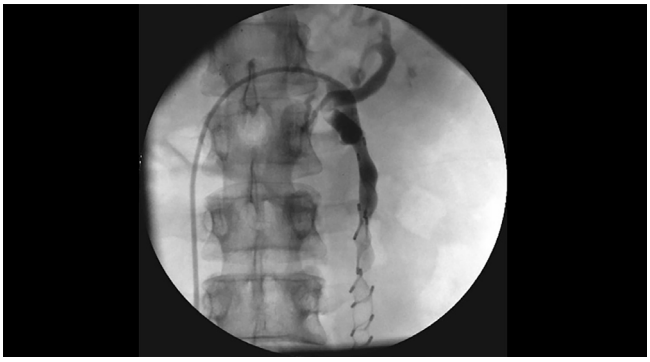

Figure 4. Following plug embolization, contrast injection demonstrates no distal reflux into the left ovarian vein

reservoir was evaluated, and the need for additional embolization was determined (Fig. 4). None of the patients included in our study underwent embolization to a vein other than the ovarian vein. After the procedure, patients were monitored for 2 hours. Patients who did not develop any complications were discharged from the hospital on the same day with the necessary recommendations.

Pain and Quality of Life Assessment

1. Numeric Rating Scale-11 (NRS-11): It is a numerical scale in which patients rate their pain between 0 (no pain at all) and 10 (the most severe pain they have ever felt in their life).[10]

2. Short Form-12 (SF-12): It is a scale by which patients' quality of life is evaluated. Short Form-12 is a shortened version of Short Form-36. In SF-12, the patient's general health status, physical and mental status, quality of life, and social activities are questioned. This scale has mental component summary (MCS-12) and physical component summary (PCS-12) components. It is scored between 0 and 100. A high score is associated with a good general health status.[11,12] (Table 1).

Statistical Analysis

All analyses were performed using IBM SPSS Statistics v22 (IBM Corp., Armonk, NY, USA). Categorical variables were summarized as counts (%). Continuous variables were examined for distribution characteristics using Q–Q plots and Shapiro–Wilk tests; findings were reported as mean ± SD and median (min–max). For NRS-11, PCS-12, MCS-12, and SF-12, the primary within-subject factor was time, consisting of three levels (pre-treatment, 1 month, 3 months). A one-way repeated-measures ANOVA was performed for each outcome; the sphericity assumption was assessed using the Mauchly test. Effect sizes were reported as partial η^2 for the omnibus time effect. In cases of sphericity violation, Greenhouse–Geisser ($\varepsilon \leq 0.75$) or Huynh–Feldt ($\varepsilon > 0.75$) corrections were applied to degrees of freedom. When normality or outlier checks showed significant deviation, results were confirmed using the nonparametric Friedman test. For pairwise comparisons between time points, the Bonferroni-corrected test was used under parametric conditions. All tests were two-tailed, and the statistical significance level was set at α=0.05. The internal consistency of the SF-12 is ideally assessed at the item level using Cronbach's alpha. In this retrospective dataset, the SF-12 was only archived as summary scores (PCS-12, MCS-12), so α could not be calculated at the item level. In this context, the alpha values reported in published validity-reliability studies for the SF-12 (Turkish validation)[11] were used as a reference, and this limitation of our study was noted.

RESULTS

The study included 36 patients. The mean and median ages of the patients were 39.5±8.2 and 38 years, while the mean and median BMI values were 25.27±2.78 and 24.9, respectively. The mean procedure time was 27 minutes, with an average cumulative radiation dose of 4567 mGy·cm² measured during fluoroscopy (Table 2).

Chronic diseases were present in 25% of the patients. A history of medical treatment was present in 22.2% of the patients (Table 2).

The distribution of pain, accompanying symptoms, positions exacerbating pain, and menstrual cycle disturbances–including dysmenorrhea–were found to vary significantly among patients. Furthermore, patients had a history of consultations across multiple medical specialties prior to undergoing the procedure (Table 2). Varicose veins in the lower extremities were present in 77.8% of the patients, and hemorrhoids were present in 2.8%. Complications developed in 22.2% of patients (Table 2).

Time-dependent within-subject effects were significant for all outcomes (ANOVA with repeated measures, GG-corrected), and large effect sizes were found for pain and overall quality of life, and moderate effect sizes for mental health: partial η^2=0.959 (NRS-11), 0.835 (PCS-12), 0.798 (SF-12 total), and 0.211 (MCS-12). Pairwise comparisons confirmed this pattern: the NRS-11 score was 9.36±0.83 before treatment, 2.51±1.87 at 1 month, and 2.06±1.51 at 3 months (pre vs 1 month $p<0.001$, pre vs 3 months $p<0.001$, 1 vs 3 months $p=0.04$). PCS-12 increased at 1 and 3 months compared to baseline and showed an additional increase between 1 and 3

Table 1. Short Form-12 parameters

Scales	Item no	Contents	Response categories
Physical Component Summary (PCS-12)	1	General health	Excellent/very good/good/fair/poor
	2	Moderate activities	Limited a lot/limited a little/not limited at all
	3	Climb several flights of stairs	Limited a lot/limited a little/not limited at all
	4	Accomplished less (physical)	All of the time/most of the time/some of the time/ a little of the time/none of the time
	5	Limited in kind of work	All of the time/most of the time/some of the time/ a little of the time/none of the time
	8	Pain—interference	Not at all/a little bit/moderately/quite a bit/ extremely
Mental Component Summary (MCS-12)	6	Accomplished less (emotional)	All of the time/most of the time/some of the time/ a little of the time/none of the time
	7	Did work less carefully	All of the time/most of the time/some of the time/ a little of the time/none of the time
	9	Calm and peaceful	All of the time/most of the time/some of the time/ a little of the time/none of the time
	10	Energy or vitality	All of the time/most of the time/some of the time/ a little of the time/none of the time
	11	Downhearted and blue	All of the time/most of the time/some of the time/ a little of the time/none of the time
	12	Social limitations	All of the time/most of the time/some of the time/ a little of the time/none of the time

months (all p<0.001, 1 vs. 3 months p=0.002). MCS-12 showed a delayed but significant improvement (omnibus p=0.002): pre vs. 1st month p=0.11, pre vs. 3rd month p=0.003, 1st vs. 3rd month p=0.001. The SF-12 total score showed a steady increase compared to baseline in both follow-ups and in the 1–3 month comparison, all p<0.001 (Table 3).

While the mean NRS score was 9.36 before the procedure, it was 2.5 at the end of the 1st month and 2.06 at the end of the 3rd month (Fig. 5).

While the mean MCS-12 score was 27.5 before the procedure, it was 30.33 at the end of the first month and 32.42 at the end of the third month (Fig. 6).

While the mean PCS-12 score was 26.22 before the procedure, it was 44.61 at the end of the 1st month and 47.56 at the end of the 3rd month (Fig. 7).

DISCUSSION

In our study, we examined the demographic characteristics of PCS patients, the type and anatomical localization of their pain, and the effects of plug embolization on pain levels and quality of life. The study demonstrated a significant reduction in pain intensity and a marked improvement in quality of life, as evidenced by decreased NRS and increased SF-12 (PCS and MCS) scores at the 1st and 3rd months after the procedure. The mean NRS score decreased from 9.36 pre-procedure to 2.06 at the 3rd month, while PCS-12 and MCS-12 scores improved substantially over the same period. The procedure was performed safely with a short mean duration (27 minutes) and a low complication rate (22.2%), indicating both clinical effectiveness and procedural safety.

PCS is an important cause of CPP in middle-aged premenopausal women. Although multiple pregnancies or changes in estrogen hormone levels have been thought to be involved in its etiopathogenesis, the cause has not been fully elucidated.[13] In our study, 86.1% of the patients were multiparous, and the mean age was 38 years. The relationship of PCS with menstruation has not been shown.[14] In our study, 63.9% of the patients had normal menstrual cycles. Patients with menorrhagia, metrorrhagia, or dysmenorrhea were in the minority.

Embolization was first performed in the treatment of PCS in 1993.[3,15] First, sclerotherapy was applied, and then coil embolization was performed. Sclerosing agents such as polidocanol and sodium tetradecyl sulfate are available.

Table 2. Sociodemographic data and clinical features of the patients (n=36)

Descriptive data	Mean±SD	Median (min-max)
Age (year)	39.5±8.2	38 (23–59)
BMI (kg/m^2)	25.27±2.78	24.9 (20–33.2)
Duration of pain (months)	49.6±32.28	36 (6–132)
Duration of fluoroscopy (minutes)	27.3±8.2	27 (10–44)
Radiation exposure (mGy-cm^2) (Cumulative)	4413.2±1441.5	4567 (1956–7660)

	n	%
Chronic diseases +	10	27.8
Type of chronic disease		
Anemia	3	8.3
Asthma	1	2.8
DM	1	2.8
FMF	1	2.8
Gastritis	1	2.8
HT	1	2.8
Hypothyroidism	2	5.6
Medical treatment +	8	22.2
Type of medical treatment		
Antihypertensive	1	2.8
Bronchodilator	1	2.8
Iron	2	5.6
Insulin	1	2.8
Colchicine	1	2.8
Levothyroxine	2	5.6
Site of pain		
Vagina	20	55.6
Groin	28	77.8
Hip	23	63.9
Back	15	41.7
Lower abdomen	16	44.4
Anus	9	25
Perineum	14	38.9

	n	%
Site of pain		
Lumbar region	17	47.2
Vulva	9	25
Position increasing pain		
Lying down	4	11.1
Standing	36	100
Sitting	11	30.6
Symptoms associated with pain		
Dyspareunia	28	80
Urgency	11	31.4
Postcoital pain	31	88.6
Dysuria	2	5.6
Clinic visited		
Gynecology	35	97.2
Urology	20	55.6
Cardiovascular	13	36.1
Gastroenterology	2	5.6
Varicose vein at the lower extremity	28	77.8
Menstruation		
Dysmenorrhea	2	5.6
Menometrorrhaga	2	5.6
Menorrhagia	4	11.1
Normal	23	63.9
Post-menauposal	5	13.9
Hemorrhoids+	19	52.8
Parity		
Multiparous	31	86.1
Uniparous	5	13.9
Complication during procedure+	8	22.2
Complications related with the procedure		
Dyspnea	2	5.6
Panic attack	5	13.9
Vasovagal reflex	1	2.8

SD: Standard deviation; BMI: Body mass index; DM: Diabetes mellitus; FMF: Familial mediterranean fever; HT: Hypertension

Polidocanol is available in foam and liquid forms, but the foam form is thought to be more effective. Ethanolamine is thought to create a large foam area in the vascular intima. Inflammation in the endothelium and the release of neuromediators result in fibrosis and occlusion in venous vessels.[14,16] Studies on the agents used have shown that most methods have similar efficacy and safety, high treatment success (>90%), and low complication rates.[17–19] In our study, only the plug embolization method was used, and the NRS scores of the patients decreased from 9.3 before the procedure to 2.03 at the end of the third month. With the plug method, 100% of the patients had a 50% or more reduction in NRS scores. This result shows that the procedure was successful.

Table 3. Comparison of the NRS-11 and SF-12 Scores at different time intervals

	Pre-procedure (pre) Mean±SD	1st month Mean±SD	3rd month Mean±SD	p†	p†† Pre vs 1st month, Pre vs 3rd month, 1st month vs 3rd month
NRS-11	9.36±0.83	2.5±1.87	2.06±1.51	**<0.001**	**<0.001 <0.001 0.04**
MCS-12	27.5±4.82	30.33±8.22	32.42±8.24	**0.002**	0.11 **0.003 0.001**
PCS-12	26.22±7.64	44.61±3.69	47.56±1.89	**<0.001**	**<0.001 <0.001 0.002**

†: Repeated ANOVA test; ††: Post Hoc-Bonferroni test. SF-12: Short form-12; SD: Standard deviation; NRS-11: Numeric rating scale-11; MCS-12: Mental component summary-12; PCS-12: Physical component summary-12

In the study by De Gregorio et al.,[20] the plug method was compared with the plug+polydocanol combination, and both treatment methods were found to be 100% effective. In the same study, it was observed that embolization with different methods provided significant improvement in pain scores determined by VAS (visual analog scale) at the 12-month follow-up in patients with PCS. Therefore, it was concluded that embolization was a highly effective treatment method. While the mean fluoroscopy time in this group was 25.4 minutes, it was found to be 34 minutes in patients who underwent plug+polidocanol foam sclerotherapy. In total, the mean fluoroscopy time was calculated as 27.3 minutes. The decrease in the duration of the procedure, the absence of major complications during the procedure, and the significant improvement in patient complaints in the follow-up of the patients reveal the effectiveness of plug embolization.

In a review by Hansrani et al.[21] evaluating 13 studies, the pain level in patients was evaluated with the VAS score, and it was concluded that the endovascular method was highly effective. In our study, SF-12 was used, and quality of life was evaluated in detail. To the best of our knowledge, our study is the first study in this patient group in which a detailed mental and physical evaluation was performed together with pain scores. In this study, the plug method was used

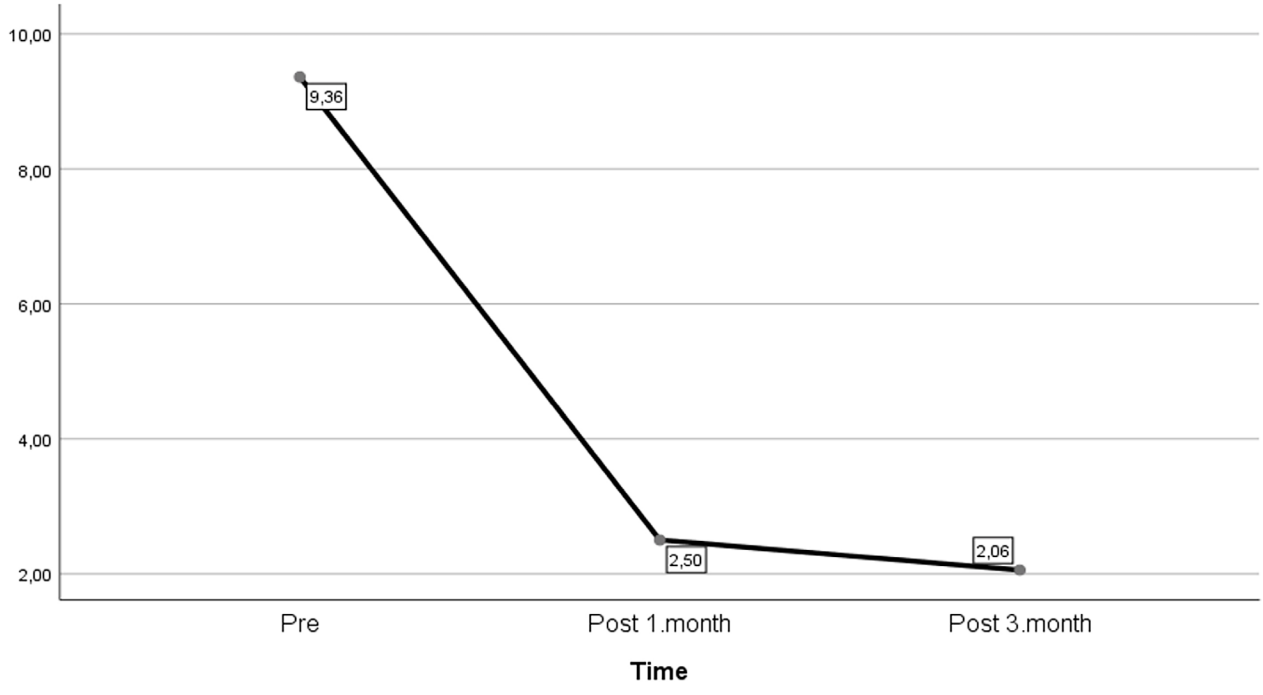

Figure 5. Graph demonstrating the change in the NRS-11 Scores at different time intervals

NRS-11: Numeric rating scale-11

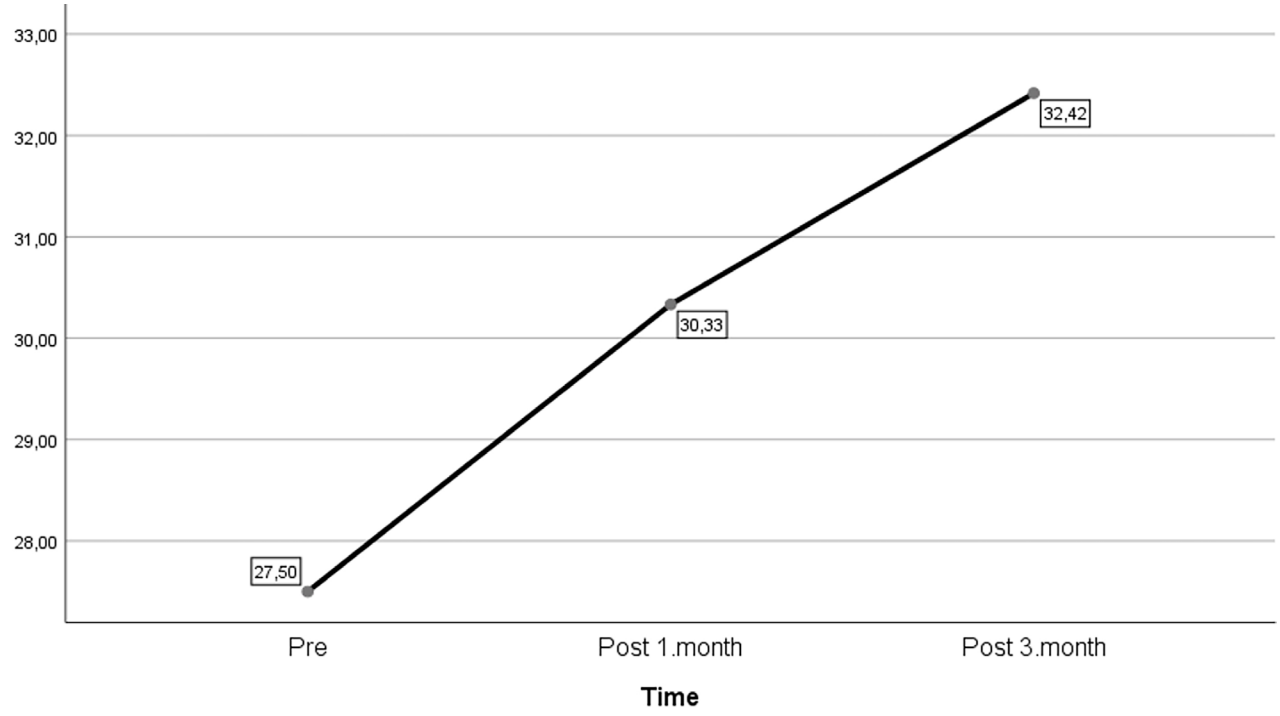

Figure 6. Graph demonstrating the change in the MCS-12 Scores at different time intervals

MCS-12: Mental component summary-12

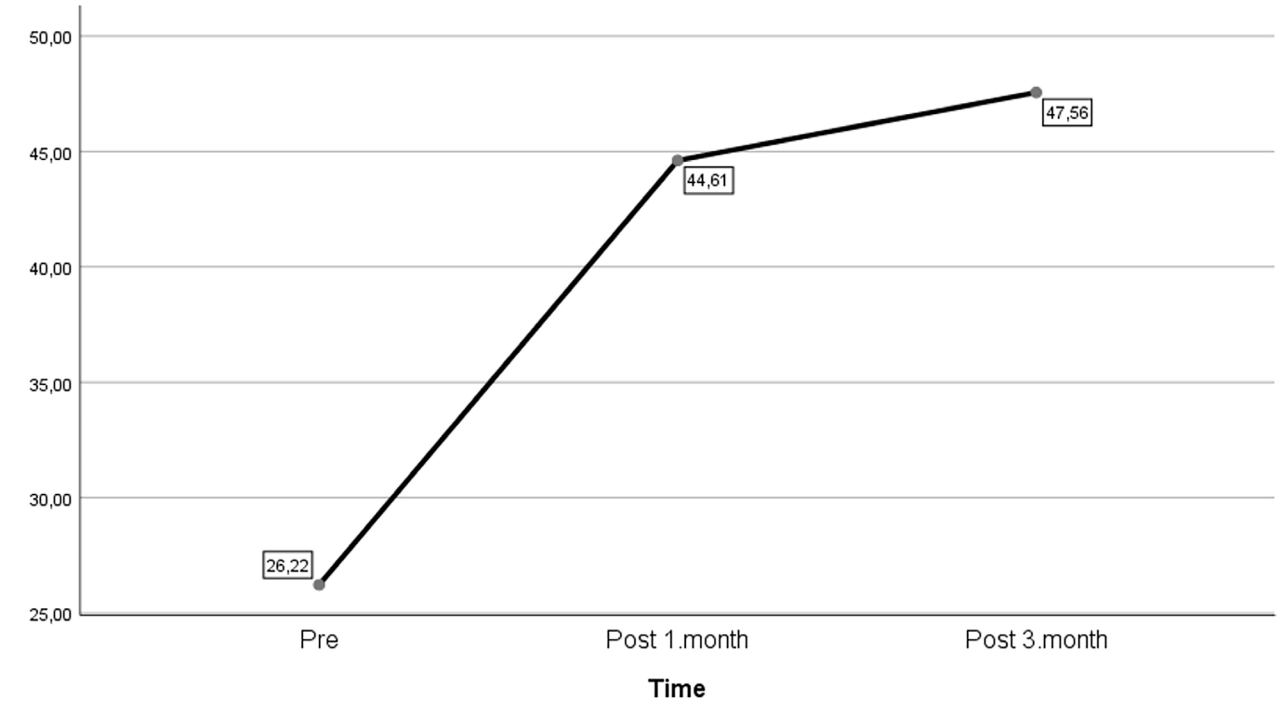

Figure 7. Graph demonstrating the change in the PCS-12 Scores at different time intervals

PCS-12: Physical component summary-12

in interventional treatment, and there was a significant improvement in NRS scores at 3 months after treatment.

In a review, Brown et al.[22] reported that diagnostic difficulties in PCS patients caused serious health problems and socioeconomic damage. In our study, the mean duration from the time the patients were diagnosed with PCS until interventional treatment was applied was 36 months. We believe that diagnostic difficulties prolong the management process.

In this study, complications encountered during the procedure were graded according to SIR classification.[9,23] During the procedure, panic attacks developed in 5 patients, short-term dyspnea in 2 patients, and vasovagal reflex in 1 patient. All complications were grade A, according to SIR. There were no complications related to the interventional technique and medications administered during and after the procedure. It is known that sedation reduces the risk of procedure-related complications in patients undergoing day-case procedures.[24,25] We suggest that this fact should be taken into consideration in terms of reducing complications.

In our study, only 1 patient had a rheumatologic disease. Comorbidities such as hypertension, asthma, and DM were also negligible. In the literature, there is insufficient data on the association of chronic diseases with PCS, which is a cause of CPP. Our data do not support the idea of an association. The presence of varicose veins in the lower extremities is thought to be a risk factor for PCS.[26] In our study, it was observed that 77.8% of the patients had varicose veins in the lower extremities.

In our study, all patients with PCS had pain that increased with standing. In addition, most of the patients had postcoital pain, dyspareunia, groin pain, and, less frequently, urgency and dysuria. Our patient group consisted of middle-aged women with a normal body mass index, most of whom were multiparous. There were no female patients who had never given birth. More than half of the patients had radiating pain in the hips and lower back. This finding is also noteworthy.

In a study by Laborda et al.,[27] patients with PCS were followed up for 60 months after coil embolization, and there was a significant regression in VAS scores. In our study, significant improvement was observed at the end of the third month in the MCS-12 and PCS-12 scores, which are subcomponents of the SF-12 evaluating the physical, mental, and social status and quality of life of the patients. The increase in SF-12 scores at 3 months compared to 1 month after the procedure suggests that the improvement continued over time.

Limitations

The main limitations of our study include its retrospective design, the relatively short duration of patient follow-up, the inability to perform direct comparisons with other interventional treatments for PCS, and the absence of objective post-procedural imaging to verify treatment efficacy. These limitations may affect the generalizability and robustness of our findings. Also, this study has a small sample size. Our limited sample size and failure to perform an a priori sample size calculation may increase the probability of Type II error, particularly in secondary endpoints and subgroup comparisons, and may limit the sensitivity of our estimates. Although including all eligible consecutive cases during the study period supports external validity, we are cautious about generalizability to different patient profiles and care settings. To validate our findings and refine our effect estimates, we recommend prospective, pre-planned, power-based studies with larger samples and longer follow-up periods, as well as comparisons with alternative embolization techniques.

CONCLUSION

Plug embolization appears to be a safe, effective, and durable treatment for pelvic congestion syndrome, providing significant relief from chronic pelvic pain and improving quality of life. Mean NRS scores in our cohort fell from 9.3 before the procedure to 2.03 at 3 months, with all patients achieving a ≥50% reduction in pain. Similarly, substantial improvement was shown in PCS-12 and MCS-12 scores, in keeping with improved physical and mental well-being. Such findings are in keeping with the literature regarding sclerotherapy and coil embolization but emphasize that plug embolization in isolation can achieve comparable or better results. Given the often very prolonged time to diagnosis in PCS, early recognition and timely intervention are important. Plug embolization therefore represents a reliable, minimally invasive approach to the management of PCS, bringing about considerable symptom benefit and improved quality of life in patients.

Disclosures

Ethics Committee Approval: The study was approved by the University of Health Sciences, Kanuni Sultan Suleyman Training and Research Hospital Ethics Committee (No: KAEK/2024.03.52, Date: 27/03/2024).

Informed Consent: Informed consent was obtained from all participants.

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REFERENCES

1. Kuo CH, Martingano DJ, Singh P. Pelvic congestion syndrome. In: StatPearls. Treasure Island (FL): StatPearls Publishing; 2025 Jan 19.
2. Alsannan B, Alzeeny A, Etrusco A, Laganà AS, D'Amato A, Tulandi T. Diagnosis and management of pelvic congestion syndrome: comprehensive review. Gynecol Obstet Invest 2024;89:437–44. [CrossRef]
3. Knuttinen MG, Xie K, Jani A, Palumbo A, Carrillo T, Mar W. Pelvic venous insufficiency: imaging diagnosis, treatment approaches, and therapeutic issues. AJR Am J Roentgenol 2015;204:448–58. [CrossRef]
4. Pitoulias AG, Andrioti Petropoulou N, Bontinis V, et al. Ultrasonography in the diagnosis of pelvic vein insufficiency: a systematic review and meta-analysis. Phlebologyv 2025;40:386–94. [CrossRef]
5. Rane N, Leyon JJ, Littlehales T, Ganeshan A, Crowe P, Uberoi R. Pelvic congestion syndrome. Curr Probl Diagn Radiol 2013;42:135–40. [CrossRef]
6. Cheong YC, Smotra G, Williams AC. Non-surgical interventions for the management of chronic pelvic pain. Cochrane Database Syst Rev 2014;2014:CD008797. [CrossRef]
7. Gavrilov SG, Karalkin AV, Moskalenko YP, Grishenkova AS. Efficacy of two micronized purified flavonoid fraction dosing regimens in pelvic venous pain relief. Int Angiol 2021;40:180–6. [CrossRef]
8. Gargiulo T, Mais V, Brokaj L, Cossu E, Melis GB. Bilateral laparoscopic transperitoneal ligation of ovarian veins for treatment of pelvic congestion syndrome. J Am Assoc Gynecol Laparosc 2003;10:501–4. [CrossRef]
9. Hanna J, Bruinsma J, Temperley HC, Fernando D, O'Sullivan N, Hanna M, et al. Efficacy of embolotherapy for the treatment of pelvic congestion syndrome: a systematic review. Ir J Med Sci 2024;193:1441–51. [CrossRef]
10. Altun G, Esin A, Ozsahin Y, Arslan S, Erkalp K, Salihoglu Z. Outcomes of rhomboid intercostal plane block on local anaesthesia in cardiac implantable electronic device implantation: a randomized controlled clinical trial. BMC Anesthesiol 2025;25:328. [CrossRef]
11. Soylu C, Kütük B. Reliability and validity of the Turkish version of the SF-12 health survey. Turk Psikiyatri Derg 2022;33:108–17. [English, Turkish] [CrossRef]
12. Soh SE, Morello R, Ayton D, Ahern S, Scarborough R, Zammit C, et al. Measurement properties of the 12-item short form health survey version 2 in Australians with lung cancer: A rasch analysis. Health Qual Life Outcomes 2021;19:157. [CrossRef]
13. Ganeshan A, Upponi S, Hon LQ, Uthappa MC, Warakaulle DR, Uberoi R. Chronic pelvic pain due to pelvic congestion syndrome: the role of diagnostic and interventional radiology. Cardiovasc Intervent Radiol 2007;30:1105–11. [CrossRef]
14. Vercellini P, Somigliana E, Viganò P, Abbiati A, Barbara G, Fedele L. Chronic pelvic pain in women: etiology, pathogenesis and diagnostic approach. Gynecol Endocrinol 2009;25:149–58. [CrossRef]
15. Bałabuszek K, Toborek M, Pietura R. Comprehensive overview of the venous disorder known as pelvic congestion syndrome. Ann Med 2022;54:22–36. [CrossRef]
16. Watanabe S, Okamura A, Iwamoto M, Nagai H, Sumiyoshi A, Tanaka K, et al. A randomized controlled trial to evaluate the safety and efficacy of transluminal injection of foam sclerotherapy compared with ultrasound-guided foam sclerotherapy during endovenous catheter ablation in patients with varicose veins. J Vasc Surg Venous Lymphat Disord 2022;10:75–81.e1. [CrossRef]
17. Sun Z, Liu Y, Chen A, Wang T, Liu S. Efficacy and safety of hyaluronic-polidocanol foam in sclerotherapy for head and neck venous malformations. Front Neurol 2024;15:1444896. [CrossRef]
18. Gava NM, Silva AS, Maciel GSB, Assis MP, Santos CAD. Analysis of the efficacy of endovascular treatment with foam sclerotherapy for pelvic congestion syndrome with ultrasound assessment. J Vasc Bras 2024;23:e20230178. [CrossRef]
19. Katz MD, Sugay SB, Walker DK, Palmer SL, Marx MV. Beyond hemostasis: spectrum of gynecologic and obstetric indications for transcatheter embolization. Radiographics 2012;32:1713–31. [CrossRef]
20. De Gregorio MÁ, Yamamoto-Ramos M, Fredes A, Serrano-Casorran C, Sierre S, Ciampi-Dopazo JJ, et al. A comparative study of patients with pelvic varicose veins treated with plugs alone or plugs and polidocanol. J Clin Med 2023;12:5408. [CrossRef]
21. Hansrani V, Abbas A, Bhandari S, Caress AL, Seif M, McCollum CN. Transvenous occlusion of incompetent pelvic veins for chronic pelvic pain in women: a systematic review. Eur J Obstet Gynecol Reprod Biol 2015;185:156–63. [CrossRef]
22. Brown CL, Rizer M, Alexander R, Sharpe EE 3rd, Rochon PJ. Pelvic congestion syndrome: systematic review of treatment success. Semin Intervent Radiol 2018;35:35–40. [CrossRef]
23. Khilnani NM, Xia JJ, Winokur RS, Meissner MH. Diagnosis and management of pelvic venous disorders in women. Cardiovasc Intervent Radiol 2024;47:1650–68. [CrossRef]
24. American Society of Anesthesiologists Committee. Practice guidelines for preoperative fasting and the use of pharmacologic agents to reduce the risk of pulmonary aspiration: application to healthy patients undergoing elective procedures: an updated report by the American Society of Anesthesiologists Committee on Standards and Practice Parameters. Anesthesiology 2011;114:495–511. [CrossRef]
25. Kaye AD, Rogers BN, Carrera CY, Urman RD, Azhar S, Shekoohi S. Sedation technique considerations for nonoperating room anesthesia: a narrative review and update. Curr Opin Anaesthesiol 2025;38:435–42. [CrossRef]
26. Basile A, Failla G, Gozzo C. Pelvic congestion syndrome. Semin Ultrasound CT MR 2021;42:3–12. [CrossRef]
27. Laborda A, Medrano J, de Blas I, Urtiaga I, Carnevale FC, de Gregorio MA. Endovascular treatment of pelvic congestion syndrome: visual analog scale long-term follow-up clinical evaluation in 202 patients. Cardiovasc Intervent Radiol 2013;36:1006–14. [CrossRef]