Effectiveness and safety of coils plus glue in slope embankment technology versus coils plus sclerosant in embolization therapy for reflux-type pelvic venous disorders

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ABSTRACT

Objective: This study aimed to evaluate the effectiveness and safety of coils plus glue (CPG) in slope embankment technology vs coils plus sclerosant (CPS) in treating reflux-type pelvic venous disorders.

Methods: The analysis included patients diagnosed with reflux-type pelvic venous disorders who were treated with CPG or CPS from 2019 to 2021. The inclusion criteria were noncyclic pain lasting more than 6 months, atypical varicose, and transvaginal Doppler ultrasound (TVDUS) and computed tomographic venography confirming the diagnosis and excluding compression factors and other diseases. Propensity score matching was performed at a 1:1.1 ratio based on the following covariates: age, pregnancy, body mass index, pretreatment visual analog scale (VAS), dysmenorrhea, dyspareunia, urinary urgency, tenesmus, low back pain, vulvar varicosities, vaginal varicosities, and lower limb varices. The pain was relieved by embolizing the target lesions with different embolic materials. The efficacy and safety of the different embolization materials were compared by VAS and TVDUS examinations at 1, 3, 6, 12, 24, and 36 months.

Results: From a total of 495 patients, 88 patients were selected from the CPG group and 77 patients from the CPS group by propensity score matching. The patients were followed up for 36 months. The preoperative VAS score of the CPG group was 8 (range, 6-8), and the CPS score was 8 (range, 7-8; $P = .64$). The postembolization VAS score of the CPG group was 2.05 ± 0.37, and the CPS score was 2.14 ± 0.35 ($P = .55$). A total of 28 cases (16.9%) showed complications, most of which were transient pain after embolization. No serious complications such as coil embolization to the lungs occurred. In addition, the CPG group used fewer coils than the CPS group by using the slope embankment technique. The mean coil length of the CPG group was 77.18 ± 33.82 cm, and the CPS group was 105.29 ± 71 cm ($P = .001$). The CPG group had an average operative time of 44.49 ± 5.72 minutes, whereas the CPS group took 43.45 ± 4.18 minutes on average ($P = .19$). The radiation dose in the CPG group was 398.40 ± 76.16 mGy, and the radiation dose in the CPS group was 388 ± 44.23 mGy ($P = .30$). The median recurrence-free survival in the CPG group was 34.23 months (95% confidence interval, 33.2-35.2), and the median recurrence-free survival in the CPS group was 30.39 months (95% confidence interval, 28.2-32.6; log rank $P = .018$).

Conclusions: Embolization therapy for refluxing PeVD was safe and effective, and proficient use of slope embankment technique with CPG increased efficacy and reduced complications. (J Vasc Surg Venous Lymphat Disord 2024;12:101945.)

Keywords: Pelvic venous disorders (PeVD); Venous; Pelvic congestion syndrome (PCS); Embolism

Pelvic venous disorders (PeVDs) have increasingly been recognized by physicians, but the unclear pathophysiology and confusing nomenclature (such as May-Thurner syndrome, pelvic congestion syndrome, Nutcracker syndrome) hinder the understanding of PeVDs. The incidence of PeVD in women aged from 18 to 50 years is between 15% and 30%. This pathology constitutes only 10% to 20% of all gynecological consultations; however, only 40% of women with PeVDs are referred to specialists for treatment.[1]

PeVD is a common disease characterized by pelvic venous hypertension caused by ovarian vein (OV) or internal iliac vein (IIV) reflux or renal vein or common iliac obstruction that leads to venous dilation.[2,3] Pelvic venous varicose and atypical varicose (posterior and lateral thigh varices, and varicose veins in nonsaphenous regions) are

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caused by pelvic venous hypertension.[4] This study mainly discusses the treatment of a series of symptoms caused by pelvic venous hypertension owing to OV and IIV reflux, as part of the larger group of patients with PeVDs. Moreover, multiple materials were used to treat PeVDs, including coils, glue, and sclerosing foam.[5-7] However, the optimal material remains controversial, and this study aimed to determine the material yielding the best results.

ARTICLE HIGHLIGHTS

- **Type of Research:** Single-center retrospective cohort study
- **Key Findings:** We treated 165 women with reflux-type pelvic venous disorders ($S_2V_2P_{BGV,R,NT}$) with coils plus glue (CPG) (88 patients) or coils plus sclerosant (77 patients). Both methods were safe and effective, but CPG had better outcomes in terms of pain relief, coil length, and recurrence free survival (log rank = 0.018).
- **Take Home Message:** CPG for reflux-type pelvic venous disorders ($S_2V_2P_{BGV,R,NT}$) has favorable perioperative outcomes compared with coils plus sclerosant in selected patients.

METHODS

Study population. This study was approved by the ethics committee of the First Affiliated Hospital of Fujian Medical University, and written informed consent was obtained from the patients: MRCTA, ECFAH of FMU [2021]169. Data for this study were collected retrospectively. The analysis included patients diagnosed with reflux-type PeVD who were treated with coils plus glue (CPG) or coils plus sclerosant (CPS) from 2019 to 2021. Propensity score matching was performed at a 1:1.1 ratio based on the following covariates: age, pregnancy, body mass index, pretreatment VAS, dysmenorrhea, dyspareunia, urinary urgency, tenesmus, low back pain, vulvar varicosities, vaginal varicosities, and lower limb varices (Fig 1). All data were saved onto a spreadsheet (Excel, Microsoft, Redmond, WA) that was controlled entirely by data managers.

All patients were admitted to the hospital after screening in the outpatient department. The personal history included body mass index and pregnancy history, and the physical examination generally revealed atypical varicosities. The visual analog scale (VAS) was assessed for each patient. All the patients were evaluated by a vascular ultrasound physician with 15 years of experience using transabdominal Doppler ultrasound (TACDS) and transvaginal Doppler ultrasound (TVDUS). All TACDS procedures were performed in the supine position, and TVDUS was performed in the lithotomy position. Moreover, lower limb venography and abdominal pelvic computed tomographic venography examinations were performed before interventions were undertaken.

Inclusion criteria. The inclusion criteria were patients >18 years old who signed an informed consent form and the presence of clinical PeVD symptoms, mainly noncyclic pain for >6 months.[8] TACDS + TVDUS revealed twisted uterine and varicose veins >6 mm, with at least one of the following TVDUS findings: varicose vein reflux, waveform change after Valsalva maneuvers, or bow-shaped dilated uterine veins communicating with pelvic varicose vein.[9,10] Digital subtraction angiography showed grade II or III (Hiromura classification) venous reflux, contrast agent retention of >20 seconds, pelvic venous plexus congestion and/or ipsilateral (or contralateral) IIV filling, and vulvar and thigh varicose vein filling.[9,11] According to the symptoms-varices-pathophysiology (SVP) classification,[12] all the patient types were $S_2V_2P_{BGV,R,NT}$. All were obtained through propensity score matching.

Exclusion criteria. The exclusion criteria were endometriosis, pelvic infection, urinary tract disease, intrauterine device, oral contraceptives, and vascular compression diseases (such as May-Thurner syndrome and Nutcracker syndrome). There were no patients who had stent placement in either the renal or iliac veins. The latter was excluded owing to potentially improved distal reflux lesions after treating proximal compression lesions.

Procedure. The patient was placed in a supine position, and no general anesthesia was required. Intravenous analgesia was recommended at the start of the surgery. For our team, the embolization treatment of pelvic venous diseases can be completed through the femoral vein with the corresponding catheter. The routine procedure in our center involves puncturing the left femoral vein, inserting a 5F vascular sheath (Cordis Corporation, Hialeah, FL; Terumo, Tokyo, Japan), and injecting contrast to confirm the shape of the iliac vein, the presence of the iliac internal vein, and lumbar ascending vein reflux. For a variety of reasons, intravenous ultrasound examination was not used to observe the internal condition of the iliac vein. A hydrophilic guidewire (Terumo) with a Cobra II, UAC (Merit Medical, South Jordan, UT) was used for femoral access. The catheter was used to hook into the left renal vein, passing the guide wire through the left OV to reach the pelvic floor. The position and presence of reflux were confirmed by catheter angiography. One exchange guide wire was used to reach the pelvic floor. A 6Fr 55- to 70-cm long guiding sheath introducer was used (Cook Medical, Bloomington, IN) to reach the proximal end of the left OV (Fig 2), providing a stronger supporting force. Subsequently, a microguidewire and microcatheter (Boston Scientific, Marlborough, MA) were

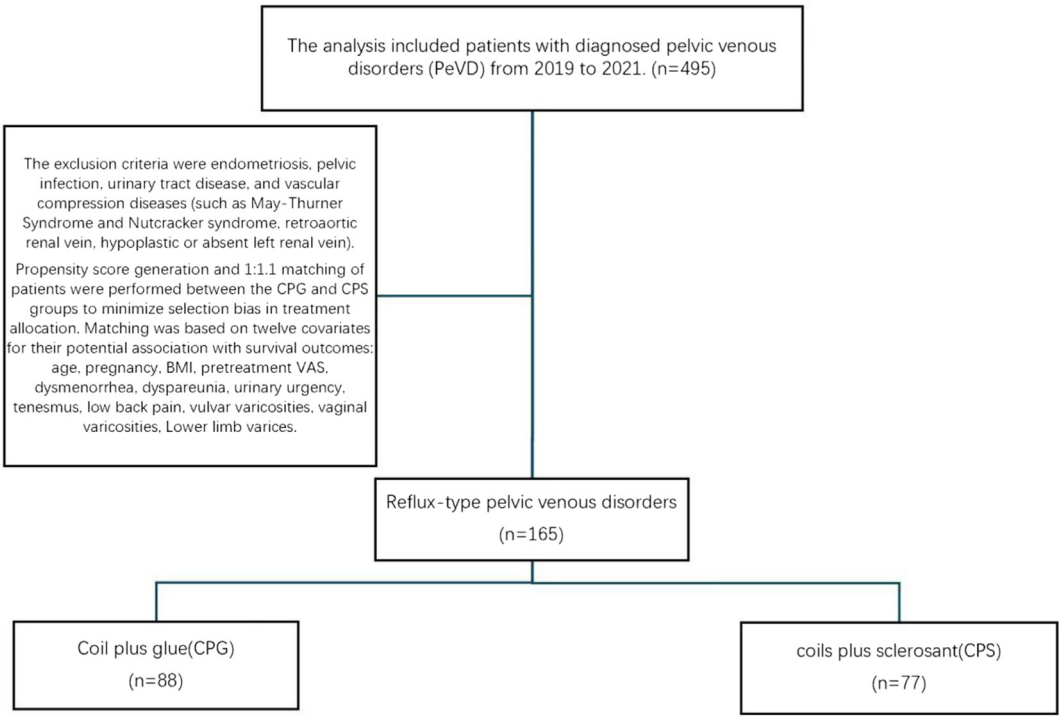

Fig 1. Patient cohort selection (including inclusion and exclusion criteria). *BMI,* body mass index; *CPG,* coils plus glue; *CPS,* coils plus sclerosant; *VAS,* visual analog scale.

used to pass through the left pelvic floor vein and reach the right side, confirming the correct location into the right OV by angiography. Venograms were performed under normal breathing, and superselective target vessels were performed under Valsalva maneuver. The results demonstrated that all patients had at least one enlarged OV (≥6 mm) with reflux (Hiromura grade II-III), retaining the contrast agent for ≥20 seconds, pelvic

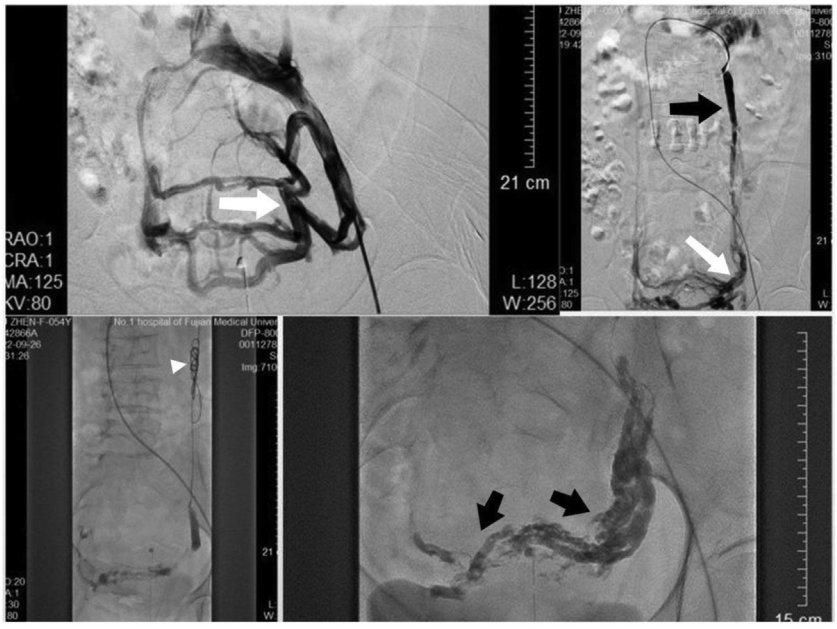

Fig 2. The main surgical process images of pelvic venography and embolization. The long white arrows show the reflux of the pelvic and internal iliac veins (IIVs). Short white triangles show coils that embolized the proximal end of the ovarian vein (OV) to prevent ectopic embolization of other sites with fluid embolic agents. The black arrow refers to the left OV, and the two black arrows show the imaging of pelvic vein embolization.

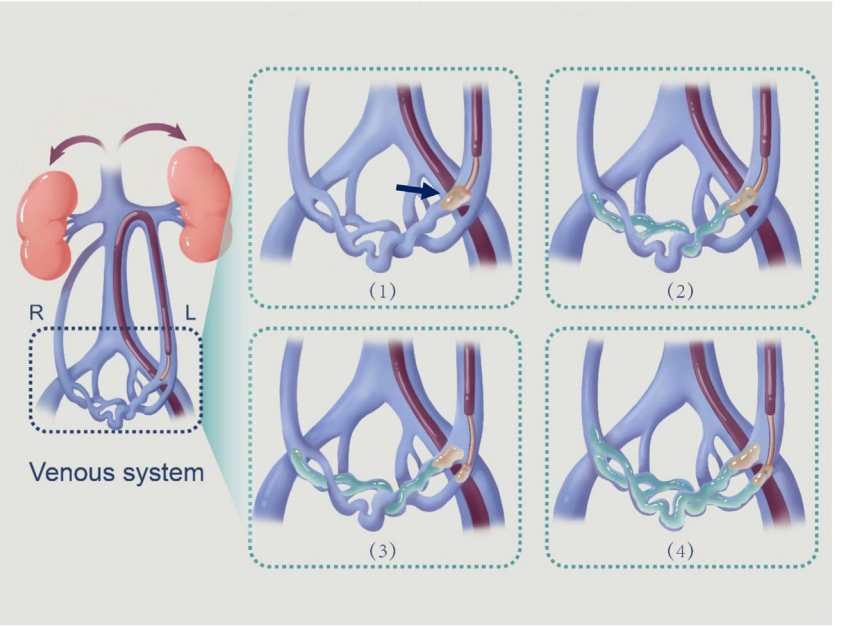

Fig 3. The details and effect of the slope embankment technique (SET) method. (1) Glue is injected into the catheter to form a slope embankment to prevent the glue from regressing (black arrow), (2-4) and then injected glue into the target vessel at the distal end for embolization.

venous plexus congestion, ipsilateral (or contralateral) IIV filling, and/or vulvar and thigh varicose vein filling.[9,13] The microcatheter and microguidewire were left at the pelvic floor for later use. Meanwhile, a mixture of cyanoacrylate glue with iodized oil (proportion 1:1) and sclerosant (3% polyvinyl alcohol) was prepared by an assistant, which

Table I. Demographics and clinical symptoms displayed by cohort

Characteristic	CPG	CPS	*P* value
Age, years	55.64 ± 12.25	58.69 ± 12.11	.11
Pregnancy	3 (2-5)	3 (0-6)	.104
BMI	25.23 ± 2.32	25.27 ± 2.11	.913
symptoms			
Pretreatment VAS	8 (6-8)	8 (7-8)	.64
Pain in standing position	84 (95.5)	72 (93.5)	.735
Pain in sitting position	13 (14.8)	13 (16.9)	.710
Pain in supine position	4 (4.5)	1 (1.3)	.373
Dysmenorrhea	54 (61.4)	47 (61)	.996
Dyspareunia	50 (56.8)	40 (51.9)	.531
Urinary urgency	14 (15.9)	16 (20.8)	.418
Tenesmus	7 (8.0)	13 (16.9)	.08
Low back pain	10 (11.4)	6 (7.8)	.439
Other symptoms	7 (8)	6 (7.8)	.969
History			
Ovarian cystic disease	38 (43.2)	35 (45.5)	.769
Vulvar varicosities	35 (39.8)	29 (37)	.781
Vaginal varicosities	20 (22.7)	16 (20.8)	.762
Lower limb varices	73 (83)	70 (90)	.134
Limb varices surgery	23 (26.1)	21 (27.3)	.869

BMI, Body mass index; *CPG*, coils plus glue; *CPS*, coils plus sclerosant; *VAS*, visual analog scale.
Values are mean ± standard deviation, median (range), or number (%).

Table II. Ultrasound findings displayed by cohort

	CPG	CPS	*P* value
TVDUS maximum parauterine venous diameter, caliber	7.2 (6.40-7.65)	7.3 (6.70-7.90)	.113
Parauterine venous reflux	64 (72.7)	51 (66.2)	.365
Waveform change in Valsalva maneuver	43 (48.9)	41 (53.2)	.574

CPG, Coils plus glue; *CPS*, coils plus sclerosant; *TVDUS*, transvaginal Doppler ultrasound.
Values are median (range) or number (%).

was emulsified by repeated boluses. In addition, 50% glucose water was prepared for flushing. First, the 50% glucose water was pushed through the microcatheter, and a 1-mL syringe was used to slowly inject the glue and iodized oil into the target vessel under fluoroscopy. As the glue was injected slowly, the catheter was withdrawn gradually, while observing for ectopic embolization. Moreover, the slope embankment technique (SET) was carried out. The SET requires slow glue injection. First, push approximately 0.5 mL glue at the near end of the catheter. Wait for about 2 seconds, fix the catheter with one hand, and push the glue with the other hand to slightly increase the force. Under fluoroscopy, you can observe the path of the glue. Glucose water was used to flush the microcatheter to prevent microcatheter blockage. When the target vessel needs to be replaced or pulled out of the body, the microcatheter can be withdrawn by pulling the 4F catheter and the microcatheter in the opposite direction (Fig 3). The glue was pushed to the distal target vessel as much as possible. All patients were embolized with four parauterine veins.

Embolization materials. The 2011 Society for Vascular Surgery guidelines for chronic venous disease recommend the use of composite materials for the embolization of pelvic venous disease.[13] To date, there is no hard evidence to support the superiority of one embolization material over another. Coils (Boston Scientific or Cook Medical) of different lengths and diameters (diameter, 8-20 mm; length, 20-40 cm; diameter, 8-20 mm; length, 14 cm) were used for embolization depending on the targeted vessel. All coils were oversized by approximately 20%. N-butyl cyanoacrylate glue was used in combination with iodine oil and 50% glucose water. The SET push injection method was used as described elsewhere in this article. The sclerosant consisted of 3% polyvinyl alcohol prepared by the Tessari method. Briefly, 1 mL polidocanol and 4 mL of air are pushed back and forth via a three-way valve, which causes foaming of the sclerosing agent for injection. However, foam sclerotherapy lacks visibility and distal escape may occur at the time of injection.

Follow-up. All patients were followed after discharge by the data manager. A total of eight patients were lost to follow-up (five patients changed their contact information, and three patients refused to return to the hospital for follow-up). The primary end point was the decrease in pain (including pelvic, limb, and menstrual pain, dyspareunia, and urinary urgency), as assessed by VAS. In addition, the patients underwent TACDS and TVDUS at 1, 3, 6, and 12 months, then annually for ≤3 years. The secondary end points were symptom recurrence, intervention time, radiation time, dose, and complication rate. Complications were evaluated according to the interventional radiology report grading and reporting standards[14] (Appendix). During follow-up, recurring symptoms related to PeVD were recorded. The definition of symptom recurrence was a higher VAS score than the previous score and the reappearance of preoperative symptoms. TACDS and TVDUS were used to determine whether the parauterine venous plexus was >6 mm.

Statistical analysis. SPSS 18.0 statistical software (SPSS, Chicago, IL) was used for analysis. Propensity score matching at a 1:1.1 ratio of patients who were performed between the CPG and CPS groups to minimize selection bias in treatment allocation. And continuous variables were expressed as the mean ± standard deviation, and qualitative variables were expressed as frequencies. The χ^2 test was used initially to compare qualitative variables, and the likelihood ratio or Fisher exact test was used in

Table III. Coils length and radiation doses and procedure time

Parameters	CPG	CPS	*P* value
Coils	77.18 ± 33.82	105.29 ± 71.22	.001
Total procedure time, minutes	44.49 ± 5.72	43.45 ± 4.18	.19
Fluoroscopy time, minutes	32.75 ± 5.52	31.56 ± 5.0	.15
Total air Kerma, mGy	398.40 ± 76.16	388 ± 44.23	.30

CPG, Coils plus glue; *CPS*, coils plus sclerosant.
Values are mean ± standard deviation.

Table IV. Main complications in both groups

Complications	CPG	CPS	*P* value
Access site hematoma	6 (6.8)	5 (6.5)	.93
Ovarian/pelvic vein extravasation	5 (5.7)	2 (2.6)	.45
Ectopic embolism to the lung artery	-	5 (6.5)	.02
Ectopic embolism to the renal vein	1 (1.1)	2 (2.6)	.56
Ectopic embolism to the iliac vein	1 (1.1)	1 (1.2)	.49

CPG, Coils plus glue; *CPS*, coils plus sclerosant.
Values are number (%).

cases where the χ^2 test was not appropriate. The *t* test was used to compare normally distributed data, and the rank-sum test was used to compare non-normally distributed data. Categorical information was expressed as percentages, and the χ^2 test was used for comparison between groups. A survival analysis was performed to evaluate the elapsed time from the treatment to complete improvement. Moreover, a Kaplan-Meier survival analysis was performed. A *P* value of $<.05$ was considered statistically significant.

RESULTS

Demographics. Table I presents the common clinical symptoms and proportions of PeVD in our study. The TACDS and TVDUS examinations were carried out to assess the diameter of the OV and periuterine venous in the pelvis. Table I presents the baseline data of the patients in the study, revealing no significant difference between the two groups. The inclusion criteria were established based on this examination (Table II).

As displayed in Table III, the average length of the coils used by the CPG group was significantly shorter than the CPS group (77.18 ± 33.82 cm vs 105.29 ± 71.22 cm; $P < .001$). The average operation time, the mean fluoroscopy time, and the mean accumulated air kerma were all shown in Table III. None of the differences measured were statistically significant.

Complications. From the data in Table IV, a total of 28 cases (16.9%) developed complications. All minor complications were recorded accurately. For example, hematoma at the puncture site was considered a complication at the puncture site, as evidenced by subcutaneous ecchymosis. In addition, local contrast agent retention owing to the partial passage of the guide wire through the vessel during endovascular therapy is a minor complication, but none of these complications require special intervention. No ectopic embolization to the pulmonary artery was found in the CPG group, whereas five cases were found in the CPS group ($P = .02$), with some foam sclerosant flowing into the right heart system. A small number of air bubbles were observed by angiography, and a small number of air bubbles were found in the right heart system by echocardiography during the treatment. No serious dysfunction was observed during the follow-up. Coil ectopic embolization of the left renal vein was found in one case in the CPG group and two cases in the CPS group. Coil ectopic embolization into the external iliac vein occurred in one case in the CPG group and one case in the CPS group.

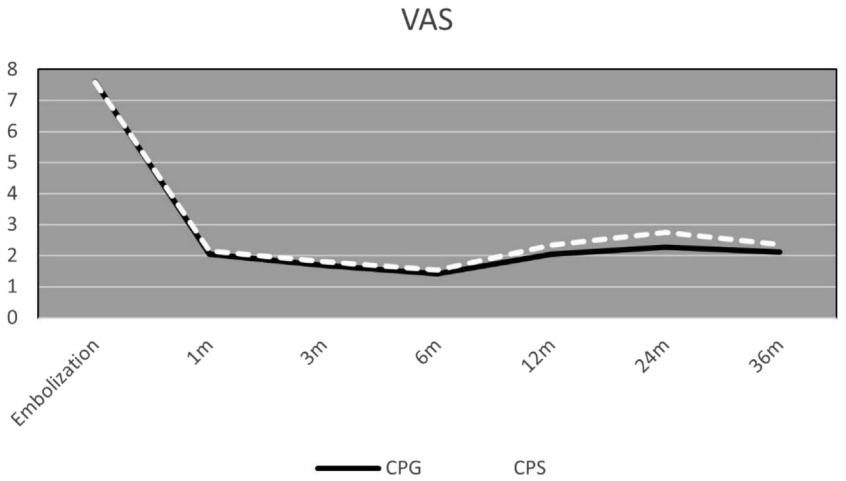

Fig 4. Curve of visual analog scale (*VAS*) changes in the two groups of patients. *CPG*, coils plus glue; *CPS*, coils plus sclerosant.

Table V. Recurrences and time of the appearance in the follow-up

Parameters	CPG	CPS	Total	*P* value
Recurrence	11 (12.5)	20 (26)	31 (18.8)	.03
Time, months	14.64 ± 2.90	12.67 ± 2.06	13.375 ± 3.50	.03
New embolization	7 (63.63)	11 (55)	18 (58.06)	.19
VAS, before	6.57 ± 0.79	6.23 ± 0.43	6.38 ± 0.65	.25
VAS, after	2.86 ± 0.690	2.64 ± 0.505	2.72 ± 0.57	.44

CPG, Coils plus glue; *CPS*, coils plus sclerosant; *VAS*, visual analog scale.
Values are mean ± standard deviation or number (%).

Among these cases, three were recovered by snaring and two cases used a balloon to push the coil into the OV. No glue embolus was found in other parts of the body. During embolization of the pelvic vein, attention should be paid to the communicating branches between the pelvic vein and the IIV. Hence, multiangle projection is needed to avoid ectopic embolization. In the subsequent 3-year follow-up, the patients showed no impact on the renal vein, the common iliac vein, or external iliac vein blood flow. The functional examinations of the corresponding parts, color Doppler ultrasound examination, creatinine, and lung function were also unaffected.

Follow-up. We used *t* tests and Kaplan-Meier tests to determine the connection between the CPG group and the CPS group. The follow-up time was 36 months, and a total of 165 patients (95.37%) completed the follow-up. The preoperative VAS of the CPG group was 8 (range, 6-8), and that of the CPS group was 8 (range, 7-8). VAS scores were assessed at each follow-up. VAS scores were evaluated typically during outpatient follow-up and were not evaluated at the same time as TACDS and TVDUS. The score trend is shown in Fig 4. The effects of the procedure on menstruation were not recorded in our study, but the patient's symptoms of dysmenorrhea improved after treatment. Most patients exhibited symptomatic relief in the short term. However, some patients had symptom recurrence or increased VAS scores during the follow-up period. This finding may be related to an incomplete embolization of the corresponding target blood vessels.

Among the 31 patients (18.8%) with recurrence, 11 patients (12.5%) were in the CPG group and 20 patients (26%) were in the CPS group ($P = .03$). The average

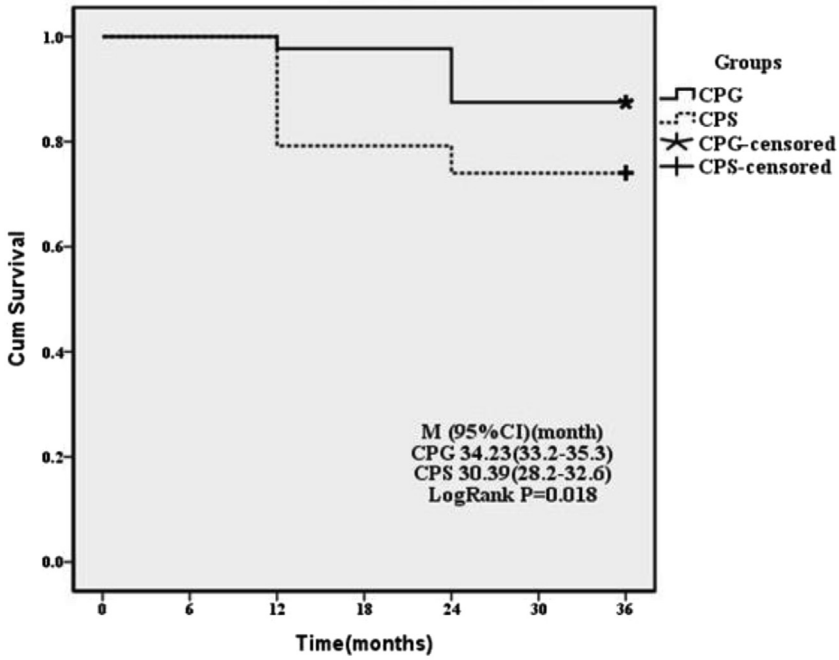

Fig 5. Kaplan-Meier analysis curves of the two groups of patients. *CI*, confidence interval; *CPG*, coils plus glue; *CPS*, coils plus sclerosant.

recurrence time of the CPG group was 14.64 ± 2.94 months, and that of the CPS group was 12.67 ± 2.06 months ($P = .03$). Seven patients (63.63%) in the CPG group underwent re-intervention, compared with 11 patients (55%) in the CPS group ($P = .19$). The VAS before reintervention in the CPG group was 6.57 ± 0.78 for CPG and 6.23 ± 0.42 in the CPS group ($P = .25$). The VAS after reintervention in the CPG group was 2.86 ± 0.69 and 2.64 ± 0.50 in the CPS group ($P = .44$) (Table V). Furthermore, the CPG group exhibited a median recurrence-free survival of 34.23 months (95% confidence interval, 33.2-35.2), and the CPS group exhibited a median recurrence-free survival of 30.39 months (95% confidence interval, 28.2-32.6) (Fig 5). The difference between the two groups was statistically significant (log rank $P = .018$).

DISCUSSION

The results further support the argument that endovenous gonadal vein (and IIV) embolization should be performed as a standard procedure for PeVD therapy, featuring high effectiveness and minimal complications. Technical effectiveness is estimated at 96% to 100%, with a recurrence rate of ≤18.8%; embolization-related complications were rare and nonfatal.[2,15] Therefore, embolization is recommended with a 2B level of evidence according to the Society for Vascular Surgery and American Venous Forum[13] and a IIB level of evidence according to the European Society of Vascular Surgery.[16] If there were multiple factors involved (concurrent May-Thurner syndrome, Nutcracker syndrome, and reflux), the principle of treatment followed the principle of "from top to bottom, outflow obstruction first and then reflux." Some patients exhibited reflux relief after treatment of the proximal lesions (May-Thurner syndrome, Nutcracker syndrome). An inappropriate treatment strategy may have serious consequences.[16]

In the literature review, little to no data showed any association showing the optimal embolization material. To date, no hard evidence has indicated the superiority of one technique over another.[4] It has been reported that some differences could exist in terms of cost, the difficulty of handling, pain as a complication, and radiographic artifacts.[17] The metal material minimizes the risk of liquid embolic agent migration and ectopic embolization, and the liquid embolic agent destroys the endothelial cells to achieve permanent embolization. The use of glue in iliac varicose veins and leak points was effective; however, precise control was required. More recently, Onyx, used alone or in combination with sclerosants, has been proven safe and effective.[18-20] Yet, this agent is difficult to use and involves a learning curve for practitioners, because polymerized fragments of glue can escape and microcatheter entrapment can occur.[19,21] In the past, the sandwich technique was used often to embolize the pelvic veins and OVs.[22] This study explores a SET, which uses fewer coils to achieve embolization (Fig 3).

The SET was a method using a microcatheter to deliver the glue to the target vein. A small amount of glucose injection was used to flush the microcatheter; saline was not used because the glue and saline injection would solidify immediately. After the glucose injection, a small amount of glue would be injected first, forming a slope embankment, thereby ensuring that glue flowed forward rather than backward when it was injected. When the microcatheter was blocked, a glucose injection was used to flush. Beginners should perform these maneuvers under fluoroscopy while rotating the C-arm machine to confirm the distance between the tip of the catheter and the target vein to avoid ectopic embolization. In cases where the microcatheter could not be pulled out directly, the cobra catheter and microcatheter were pulled continuously against each other to withdraw the microcatheter from the slope embankment. Of course, the entire procedure required a certain learning curve, but SET can be mastered proficiently, providing effective embolization (Fig 3). The current study demonstrated that, by using SET, the CPG group used fewer coils than the CPS group. The VAS is a 10-item scale that measures PEVD-specific symptoms. To date, a validated instrument to study the effects of treatment in patients with PeVD does not exist. Nevertheless, most studies focusing on CPP report significant decrease in pain scores after embolization.[2,23-25] The efficacy of treatment was evaluated by decreased levels of impairment, considering the symptoms and psychological impact. This last aspect plays a major role in PeVD; patients suffered mostly from diagnostic uncertainty over the course of many years.[26]

Our treatment concept is based on the CHIVA concept.[27] Vascular specialists who see multiparous women with (recurrent) leg or vulva varicosities should inquire about chronic pelvic pain and perform a routine duplex ultrasound examination to assess the morphology and function of gonadal and pelvic veins. The vast majority of patients presented with nutritional disorders of the lower limbs and were screened for varicose veins (posterior and lateral thigh varices and varicose veins in nonsaphenous regions). PeVD affects not only women of childbearing age, but also older women and some male patients.

CONCLUSIONS

This investigation aimed to assess the embolization efficacy of SET combined with glue, revealing a good embolization effect and few complications. However, no high-quality randomized controlled trial has been performed on the embolization of pelvic veins to treat PeVD. Randomized controlled trials on different regions and using different embolization materials and methods are expected to be published in the future.

AUTHOR CONTRIBUTIONS

Conception and design: ZZ, YD
Analysis and interpretation: PG, JZ, FC, XL
Data collection: MY, LL, YZ
Writing the article: ZZ, MY
Critical revision of the article: ZZ, PG, JZ, FC, XL, LL, YZ, YD
Final approval of the article: ZZ, MY, PG, JZ, FC, XL, LL, YZ, YD
Statistical analysis: Not applicable
Obtained funding: Not applicable
Overall responsibility: YD

DISCLOSURES

None.

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