Left ovarian vein embolization in pelvic congestion syndrome: technique and midterm results

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Background
Pelvic congestion syndrome is defined as intermittent or constant pain that persists for at least 3–6 months, is localized in the abdomen or pelvis, is not associated with pregnancy, is not limited to any period of menstrual cycle or intercourse, and is severe enough to cause functional disability or require treatment. This condition has been recognized as a potential cause of chronic pelvic pain (CPP) in women of childbearing age. The aim of this study was to detect the efficacy of embolization of ovarian veins by assessing the adequacy of closure of incompetent pelvic veins and abolishment of venous reflux in the addressed ovarian veins.

Patients and methods
A single-center prospective study was conducted on 14 women of childbearing age complaining of CPP associated with dysmenorrhea, dyspareunia, and\or vulvar varicosity, lower limb pain. All patients underwent lower limb venous duplex as well as pelvis duplex to assess the presence of dilated and refluxing ovarian vein more than 6 mm in diameter. Gynecological causes of pelvic pain were excluded; all patients underwent venography in an angiosuite to confirm the diagnosis of dilated ovarian vein and presence of parametrial varicosities. Embolization of ovarian vein and associated pelvic veins was done using foam sclerotherapy with polidocanol and coiling of the ovarian vein with coils ranging from 8 to 12 mm in diameter.

Results
In our study, there was a statistically significant improvement in symptoms in our patients after coiling during the follow-up compared with before coiling, including CPP (P=0.002), lower limb pain (P=0.003), dyspareunia (P=0.003), and dysmenorrhea (P=0.002).

Conclusion
The embolization of ovarian vein is feasible, safe, and effective with high rates of success and clinical improvement in the treatment of pelvic congestion syndrome.

Keywords:
chronic pelvic pain, coils, dyspareunia, embolization, ovarian vein, pelvic congestion syndrome

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Introduction

In 2009, pelvic congestion syndrome (PCS) was described in the VEIN-TERM transatlantic interdisciplinary consensus document as 'chronic symptoms, which may include pelvic pain, perineal heaviness, urgency of micturition and post coital pain, caused by ovarian and/or pelvic vein reflux and/or obstruction, and which may be associated with vulvar, perineal, and/or lower extremity varices' [1].

The presence of a vascular cause of pelvic pain was first noted in the late 19th century, but it was not until the half of the 20th century that a connection between chronic pelvic pain (CPP) and the presence of pelvic varicosities was proposed. Pelvic venous insufficiency, defined as incompetence of ovarian vein or internal iliac vein, or both, has been implicated as the cause of PCS. PCS typically affects women in the reproductive age, who have had at least one child. No cases have been reported in postmenopausal women [2].

It is difficult to establish the true incidence of PCS, given the lack of standard diagnostic criteria and even of clinical suspicion in women with gynecological and urological symptoms. Therefore, it is a frequently underdiagnosed pathology. According to the available literature, up to 10% of general population has ovarian varices, and 60% of them may develop PCS. PCS is to be considered in the differential diagnosis of CPP. CPP affects from 4 to 16% of

women, but only approximately one-third of them seek medical care. The prevalence of PCS is 10–30% in patients with CPP in whom no other obvious pathologies can be found [3].

Patients and methods

This was a single-center, prospective study that was conducted in the vascular surgery unit of Cairo University between September 2018 and March 2019 and included all women of childbearing age who presented with suspected symptoms of PCS, namely, CPP, deep seated pelvic heaviness, dyspareunia, dysmenorrhea, dysuria, unexplained vaginal discharge after full gynecological assessment, menorrhagia, vulvar varicosities, and even those having extra-axial lower limb atypical varicosities.

All cases underwent the following:

(1) Full vascular assessment to assess the certainty of the suspected diagnosis of PCS, that is, presence of extra-axial varicosities, and abdominal examination to exclude intra-abdominal swellings that may cause abdominal pain.
(2) Full gynecological assessment to assess the presence of vulvar varicosities and to exclude gynecological causes of abnormal vaginal discharge and menorrhagia.
(3) Full urological examination to exclude any other causes of dysuria.
(4) All cases had abdominal ultrasound after well colonic preparation as well ovarian veins assessment using Duplex ultrasound to detect possible reflux, that is, more than or equal to 2 s, and to assess its diameter, that is, more than or equal to 6 mm is indicative, as well as assessing the presence of parametrial and broad ligament varicosities.
(5) All cases underwent a detailed venous duplex for both lower limbs to assess the presence of lower limb varicosities, that is, axial and or extra-axial varicosities and to check for associated saphenofemoral junction incompetence.
(6) The demographic data for all patients were reviewed.
(7) Routine laboratory investigations, that is, CBC, INR, and creatinine, were done.
(8) For pain assessment before and after the intervention, visual analog pain scale ranging from 1–10 was used to assess the efficiency of the treatment and symptomatic pain relief (Table 1).

Table 1 Visual analog scale for pain [4]

Visual analog scale for pain			
0	1–2–3	4–5–6	7–8–9–10
No complain	Annoying	Uncomfortable	Horrible/agonizing
No pain	Mild pain	Moderate pain	Severe pain

Exclusion criteria were as follows:

(1) Age less than 18 years or over 50 years.
(2) Pregnant female.
(3) Symptoms less than 6 months.
(4) Pelvic masses.
(5) Gynecological causes of CPP, that is, endometriosis.
(6) Approval from the ethical committee of vascular surgery unit, General Surgery Department, Cairo University, was taken before the beginning of the study.

Technique

All patients signed an informed consent after briefing them about the nature of the assumed intervention and its possible complications. Drapping and sterile procedures were applied for all patients in our angiosuite in the routine supine position. The procedure was carried out under local anesthesia using 2 ml of lidocaine 2% injected as a local infiltration.

Either femoral vein approach or jugular vein approach was used according to the operating surgeon preference using an 18 G needle and a 0.035 inch, 260-cm-long hydrophilic guide wire. A vertebral catheter (5 Fr, 125 cm) was advanced, and then IVC cavography was done to locate the iliac veins and the renal and ovarian veins.

Different guiding catheters like sidewinder catheter or Sosomni (Cook Inc., Bloomington, Indianapolis, USA) were used to catheterize the left renal vein. After cannulation of the left renal vein, the left ovarian vein was cannulated using a 5-Fr catheter, and a renal venography with Valsalva technique was done to detect the left ovarian vein reflux more than or equal to 2 s as well as measurement of the diameter of left ovarian vein. The incompetent segments of pelvic and ovarian varicosities were also detected by opacification while the patient underwent Valsalva.

Findings that suggest pelvic venous incompetence are as follows:

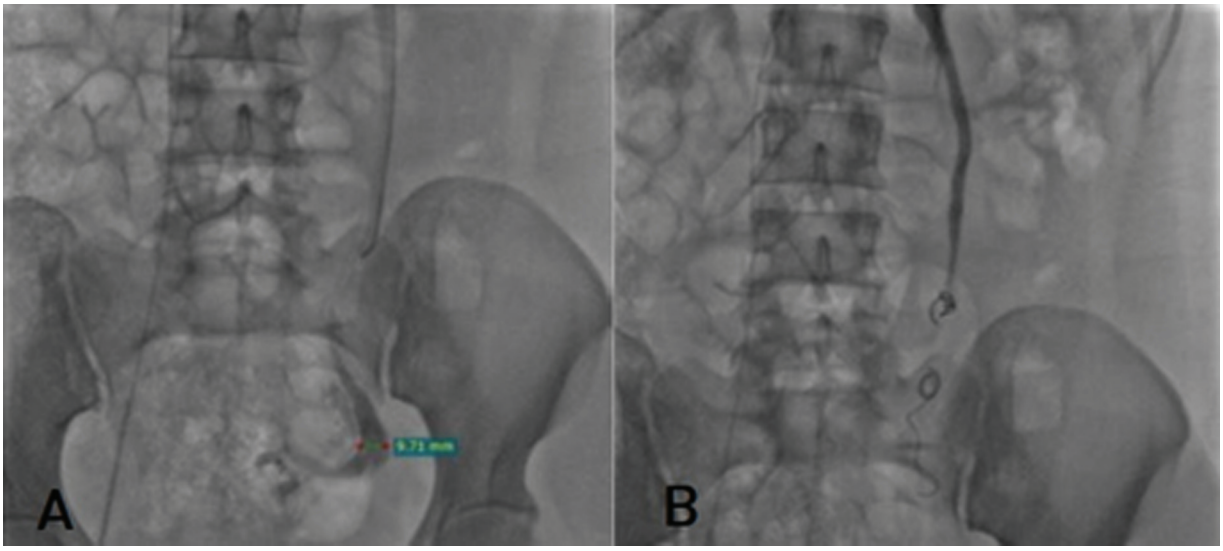
(1) Contrast reflow toward the ovarian and/or hypogastric veins

(2) Ovarian vein more than or equal to 6 mm in diameter (Fig. 1).
(3) Late clearance of contrast from pelvic veins.
(4) Opacification of pelvic veins crossing the midline (Fig. 2).
(5) Communicating veins with varicose veins in the obturator area [5].

The same procedure of cannulation and subsequent venography of the right ovarian vein was carried out, and assessment of the reflux was judged using the aforementioned criteria.

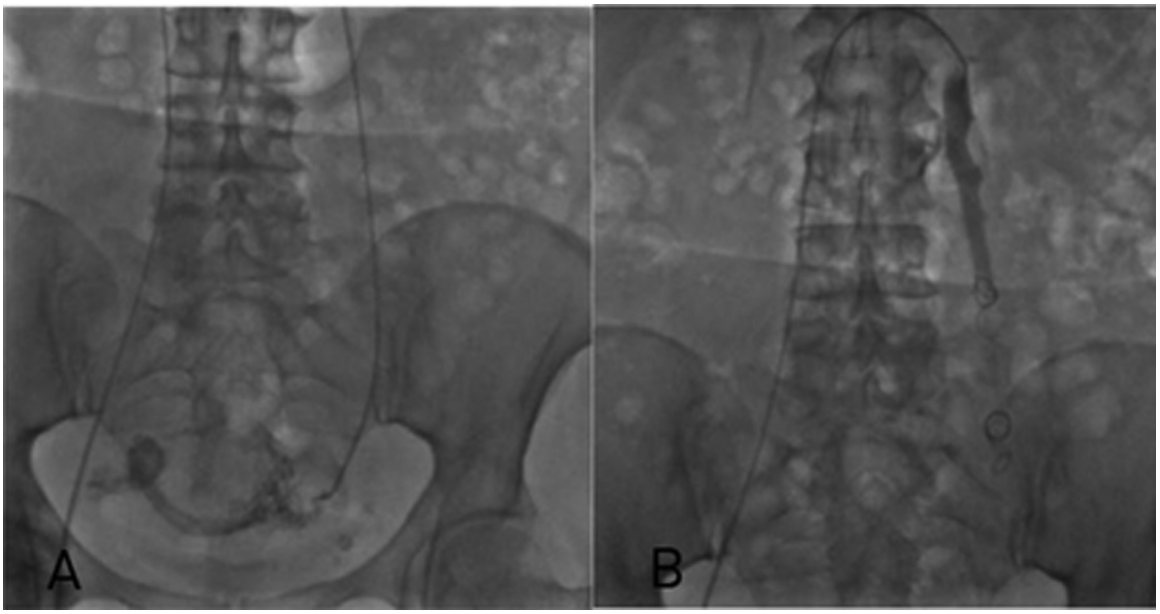
After confirmation of reflux, a microcatheter was used to advance as far as the incompetent pelvic venous segments. In all cases, we used foam sclerotherapy with a sclerosing agent, that is, polidocanol 3%, in a 4 : 1 mixture with air with a maximal volume of 10–12 ml foam to be injected in the Trendelenburg position. The use of sclerosing agent was mandatory in our cases to enhance the effectiveness of the embolization technique and to decrease the number of the coils needed to be inserted, thereby lowering the cost for the whole procedure.

Figure 1



Ovarian vein 9.7 mm in diameter (a) successful ablation after insertion of two coils (b).

Figure 2



Opacification of pelvic veins crossing the midline (a) that disappeared after coiling (b).

Foam injection was done under modest constant positive pressure to displace the contrast from the distal target veins ensuring complete vessel coverage and minimal reflux. Coils were then used to embolize the pelvic and ovarian varicose veins, that is, pushable platinum coils (Boston Scientific, Inc. or Cook Inc.) with diameter of 8–12 mm, to successfully occlude the targeted vessels. There was no need for tight packing of the coils to occlude the flow at the venous field unlike the arterial circulation owing to the status of the slow flow in the venous side, so leaving the coil of appropriate size along the entire course of the target vessel was all that was required for inevitable thrombosis. The whole length of the incompetent vessels including their larger truncal draining tributaries was embolized to prevent new collateralization.

Oversizing the coil diameter to the vessel size was done to ensure adequate closure. The number of the used coils varied according to its type and the morphology of the targeted vessels. Final venography was done to ensure adequate closure. After the procedure was finished, manual compression was applied to the site of access, the patient stayed for a couple of hours in the department, and then, he/she was discharged. Follow-up was done up to 9 months postoperatively by clinical assessment monthly and using the visual analog scale for pain assessment (Fig. 3).

In our study, the primary end point was to detect the efficacy of the procedure by assessing the adequacy of closure of incompetent pelvic veins and abolishment of venous reflux in the addressed ovarian veins.

However, the secondary end point was to detect the occurrence of minor and major complications.

Immediate complications were as follows:

(1) Contrast hypersensitivity to iodinated contrasts.
(2) Venous puncture related, for example, hematoma and pneumothorax (for venous catheterization via a neck vein).
(3) Coil misplacement.
(4) Coil migration.
(5) Extravasation and vessel perforation.

Delayed complications were as follows:

(1) Recurrence of symptoms.
(2) VTE.

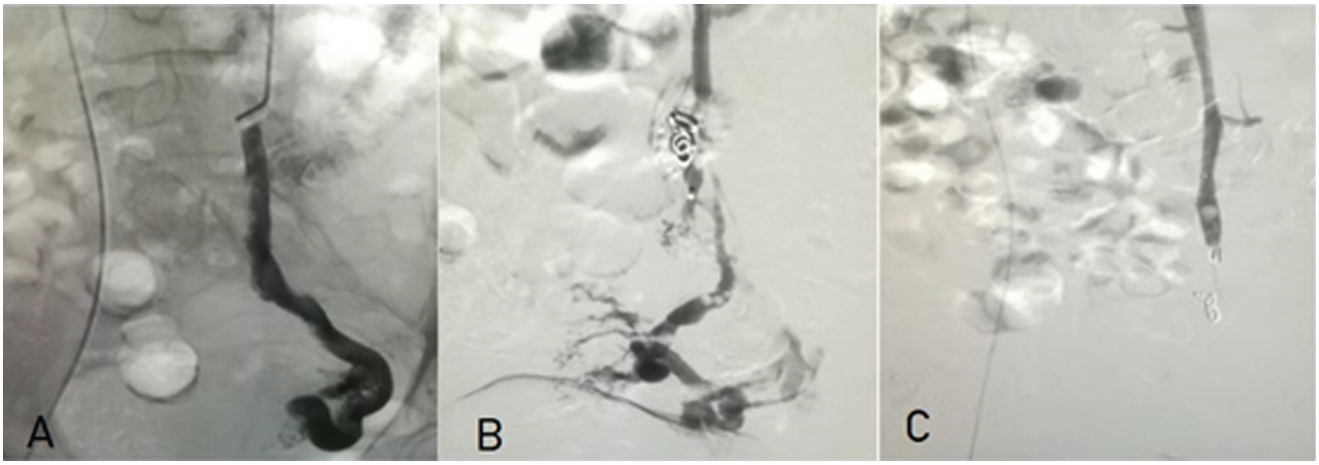
Statistical analysis

We analyzed data using the Statistical Package for the Social Sciences (SPSS Inc., Chicago, Illinois, USA), version 24 for Windows. Categorical data were described in terms of frequencies and percentages. Numerical data were described in mean and SD if normally distributed or median and interquartile range if not normally distributed. We used Wilcoxon signed-rank test to test the statistical difference between related variables. For dependent categorical variables, we used McNemar test to test the statistical association. *P* values less than 0.05 was considered statistically significant.

Results

This study was conducted in the vascular surgery unit of Cairo University between September 2018 and March 2019 and included all pregnant women who presented with suspected symptoms of PCS. The total number of recruited cases was 14 cases during the period of study. The age for all cases ranged from

Figure 3



Left ovarian vein more than 6 mm with late clearance of contrast from pelvic veins (a), partial improvement of reflux after insertion of first coil (b), and total disappearance of reflux after insertion of two coils (c).

24 to 41 years, with a mean±SD of 34.29±4.9 years. The mean±SD parity in the studied group was 3.7±1.8. The duration of symptoms ranged from 1 to 7 years, with a mean±SD of 3.57±1.65 years.

Regarding the presentation, most of the patient presented with pelvic pain, dyspareunia, dysmenorrhea associated with mild to moderated lower limb pain in around 86% of patients (Table 2).

Vulvar varicosities were present in nine (65%) patients, whereas lower limb varicose veins were presented in 12 (85.8%) patients (Table 3).

Regarding the procedure, femoral access was used in 85.8% of cases (12 cases), whereas jugular access was used in only two cases.

Intraoperative assessment of left ovarian vein diameter ranged from 6 to 11 mm, with a mean±SD of 8.18 ±1.6 mm.

The amount of foam injected was variable and raged from 1 to 15 ml, with mean±SD of 7.86±3.78 ml. At least two coils were used in most cases, but some cases needed up to seven coils to obtain satisfactory results.

Postoperative analysis of symptoms revealed significant improvement in pain score. Approximately 86% of patients were free of pelvic pain, dyspareunia, dysmenorrhea, and lower limb pain. Details are shown in Tables 4 and 5.

Although vulvar varicose veins were cured in 92% of patients, 49% of patients had persistent lower limb varicose; these cases required separate treatment for lower limb varicose veins (Table 6).

χ^2 tests showed significant results regarding improvement in vulvar varicosities; on the contrary, it was statistically nonsignificant for lower limb varicose veins (Table 7).

In our study, one case mandated a treatment for the right ovarian vein owing to severe reflux detected on venography.

No major complications occurred like VTE or coil migration on midterm follow-up period. Only a single case of vessel perforation and extravasation had occurred in one case and was managed conservatively with a quiescent follow-up course.

Table 2 Preoperative pain score

Pain score	Pelvic pain [*n* (%)]	Dyspareunia [*n* (%)]	Dysmenorrhea [*n* (%)]	Lower limb pain [*n* (%)]
No pain	2 (14.2)	2 (14.2)	1 (7.1)	2 (14.2)
Mild pain	0	0	0	1 (7.1)
Moderate pain	0	0	1 (7)	11 (79)
Sever pain	12 (85.8)	12 (85.8)	12 (85.8)	0

Table 3 Preoperative varicosities

Varicose veins	Vulvar varicose [*n* (%)]	Lower limb varicose [*n* (%)]
Present	9 (65)	12 (85.8)
Absent	5 (35)	2 (14.2)

Discussion

Lopez, stated that more than half of the world's population is female, and a significant number of women complain of CPP, mostly owing to pelvic venous incompetence that causes a status of PCS. Therefore, addressing the pelvic venous incompetence with minimally invasive treatment shall gain a high popularity [6].

Table 4 Postoperative pain score

Pain score	Pelvic pain [*n* (%)]	Dyspareunia [*n* (%)]	Dysmenorrhea [*n* (%)]	Lower limb pain [*n* (%)]
No pain	11 (78.6)	12 (85.8)	10 (71.4)	12 (85.8)
Mild pain	1 (7.1)	1 (7.1)	2 (14.2)	1 (7.1)
Moderate pain	2 (14.3)	0	1 (7.1)	1 (7.1)
Sever pain	0	1 (7.1)	1 (7.1)	0

Table 5 Pain assessment (precoiling and postcoiling) according to visual analog scale

	Precoiling symptoms				Postcoiling symptoms				*P* value
	Minimum	Maximum	Median	IQR	Minimum	Maximum	Median	IQR	
Pelvic pain	0	10	7	2	0	6	0	1	0.002
Dyspareunia	0	10	9	2	0	9	0	0	0.003
Dysmenorrhea	0	10	9	1	0	7	0	2	0.002
Lower limb pain	0	6	4	1	0	6	0	0	0.003

Table 6 Preoperative varicosities

Varicose veins	Vulvar varicose [*n* (%)]	Lower limb varicose [*n* (%)]
Persistent	1 (7.1)	6 (42.9)
Cured	13 (92.9)	8 (57.1)

Table 7 Results of χ^2 tests for varicosities

Type of varicosities	Value	McNemar test exact significance (two-sided)
Vulvar varicosities	14	0.004
Lower limb varicose veins	14	0.125

Over 20 years ago, PCS was addressed via pelvic vein embolization (PVE) and most commonly ovarian vein embolization. However, there is a lack of concrete evidence for its efficacy, as well as the assessment of its outcome [6].

On the contrary, Kwon *et al.* [5], showed that embolization of ovarian and pelvic veins has the best outcome and was recommended later with a grade 2B level of evidence according to the Society for Vascular Surgery and the American Venous Forum [7].

We assume two major problems concerning this intervention for relieving PCS, which may be an obstacle for this intervention to gain widespread popularity: the first of these is the subjective symptomatic relief after intervention, which is hardly to be assessed by objective methods, rather than using the well-known visual analog scale, and the second is that there are multiple variations in the per-se adopted technique, which differ from one institution to the another, as well from one treating physician to the another, that is some may use coils only for embolization, others can use an enhancement with embolizing sclerosing agents as polidocanol, others may try embolizing both ovarian veins, and so on [8].

Concerning the technical points of debate and argument facing the endovascular embolization intervention for treatment of PCS, it is obvious that it is not settled yet. Some authors were found to embolize both ovarian veins and the hypogastric veins to prevent recurrence [9].

Ganeshan and colleagues, found no statistically significant difference between treating a single left ovarian vein and treating both ovarian veins bilaterally. They attributed that treating both ovarian veins only adds more sophisticated steps and increases the dose of radiation and the time of the procedure [10]. In our study, we were settled to treat mainly the incompetent left ovarian vein, and only one case mandated a treatment for the right ovarian vein due to severe reflux detected on venography.

In our study, to ensure near-complete prevention of recurrence of symptoms, we adopted the policy of using concurrent embolizing platinum made coils and sclerosing agents, that is, polidocanol 3%, in the form of foam with mixing with air in a ratio of 4 : 1 and maximal volume of injection of 15 ml injected before coiling in the distal refluxing pelvic venous segments. This was specifically carried out to enhance the efficacy of coiling procedure and to lower the financial costs of the procedure especially after using seven coils to achieve complete occlusion in one of our early cases in the study.

Maleux *et al.* [11], pointed to an irritant nature of the injected sclerosing agents in the incompetent pelvic venous segments and the concurrent need for intravenous sedation during the procedure as well as postoperative need for NSAIDs to control pain. However, we found the use of sclerosing agents was well tolerated by all our patients during the procedure with slight intravenous sedation. Still there is a theoretical risk of incidental occlusion of the splanchnic veins due to communicant veins with the ovarian veins as stated by Maleux and colleagues.

In our study, we observed a statistically significant improvement in symptoms in our patients after coiling during our follow-up compared with before coiling, including CPP (P=0.002), lower limb pain (P=0.003), dyspareunia (P=0.003), and dysmenorrhea (P=0.002).

This was consistent with a study by Kwon *et al.* [5], where symptom improvement was seen in 82% of 67 patients. Maleux *et al.* [11], achieved a technical success of 98% in 41 patients, with total symptomatic relief in 59% of patients.

Venbrux *et al.* [9], achieved 100% technical success in 56 patients and recorded some degree of improvement (with a reduction of at least one point from baseline of the VAS score between baseline and follow-up).

Kim *et al.* [12], recorded an improvement in 83% of the cases recruited in their study over a relatively longer term follow-up compared with previous studies.

Therefore, it is obvious that the procedure is effective in eliminating CPP and lowering limb pain and other

symptoms like dysmenorrhea and dyspareunia, with an acceptable technical and clinical success rate.

Recurrent varices after surgery (REVAS) in lower limb varicosities is still a debatable issue. Although surgery is effective in eliminating lower limb varicose veins, REVAS ranges between 20 and 80% of patients after initial surgery [13].

Neovascularization is considered the commonest explanation for REVAS [14]; however, a more sophisticated explanation like development of collateral veins between the pelvis and lower limbs is gaining much acceptance recently. This was supported by the idea of adjunctive treatment by PVE in treating lower limb REVAS [15].

Selective venography remains the gold standard to detect pelvic incompetence and can show communicant veins with lower limb varicosities [16].

Malgor and Labropoulos [17] stated that pelvic-derived lower extremity varicose veins are found in up to 20% of women with varicose veins. The prevalence may be even higher in populations with persistent or REVAS.

Pelvic-derived lower extremity varicose veins are from pelvic venous hypertension that escapes to the legs via one of four common points. The commonest escape point is the perineal or P point, where the internal and external pudendal veins connect in the urogenital triangle. This will lead to inner thigh and posterior labial varicose veins [17].

The second common escape point is the inguinal or I point. At this location, pelvic venous plexus-derived reflux passes through the external inguinal ring via a recanalized vein of the round ligament, emerging in the groin medial to the common femoral vein. This can lead to groin and labial varicose veins [17].

Other less commonly discussed escape points include the gluteal points and varicose veins traveling along the sciatic nerve [17].

On revising our results, we found 50% reduction in lower limb varicosities after coiling through the period of follow-up; however, this was statistically insignificant (P=0.125).

Moreover, cases with vulvar varicosities all were treated efficiently after coiling except only one case out of nine cases with statistically significant P value of 0.004. Therefore, one can expect that PVE is going to be a new field player in the field of treating vulvar varicosities and REVAS; however, we see that this needs recruitment of a larger number of cases and more studies to precisely judge the efficacy of this intervention in such cases.

In our study, no major complications occurred like VTE and coil migration. Only vessel perforation and extravasation had occurred in 1 case and was managed conservatively with a quiescent follow-up course.

Tu *et al.* [18], described many complications in the literature from the procedure; the most common of which is vein perforation and extravasation, thrombophlebitis of the treated vein, and hematoma in the puncture site, and this occurs in about 4% of cases in the literature.

Migration of the coils is another complication, but it is rare as stated by Tu *et al.* [18]. Kim *et al.* [12] stated that proximal migration is dangerous, and it was mentioned to occur in 2% of patients treated with the procedure.

Conclusion

Pelvic vein embolization is considered a safe and effective measure to treat cases with PCS with minimal complications and good outcome.

One of the limitations of our study is the subjectivity of pain assessment after the intervention in all cases. Till now, there is no standardization of the applied technique concerning foam usage and the volume needed to embolize pelvic veins, as well as the suggested number of coils needed during the procedure, and if coiling alone without foam sclerotherapy is enough to prevent recurrence of symptoms or not.

It was obvious in our study that cases with vulvar varicosities and extra-axial lower limb varicose veins had a great benefit after coiling in improving these symptoms. This will need to be properly investigated on a larger number of patients in the future to have a concrete reply on whether this intervention is valuable for these patients or not as well as in cases of unexplained recurrence of varicosities in lower limbs after surgery.

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Conflicts of interest

There are no conflicts of interest.

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