Pelvic Varices Embolization

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Introduction

Pelvic venous incompetence (PVI) or pelvic congestion syndrome (PCS) is a disease entity that is characterized by a pain syndrome known as chronic pelvic pain (CPP) and is caused by varices. More broadly, CPP in women is defined as noncyclic pain originating in the lower abdomen or pelvis for more than 6 months in duration [1]. A potentially debilitating condition, CPP is estimated to affect as many as 39.1% of women at some point in their lives [2]. While the etiology of CPP is variable, pelvic venous incompetence (PVI) or pelvic congestion syndrome (PCS) has been recognized as a cause of CPP since 1949 [3]. PVI or PCS is defined as venous incompetence in ovarian, internal iliac, or parauterine veins, resulting in increased venous filling (i.e., congestion or engorgement) and subsequent development of ovarian and internal iliac (i.e., pelvic) varicosities. The term PVI is preferred over the older name, PCS, because it more accurately reflects the pathophysiology associated with the condition.

Pathophysiology

Ovarian varicosities were first described by Richet in 1857 [4]. However, it was not until the late 1920s when Cotte first linked ovarian varicosities in women with CPP, an association supported by Taylor in 1949 [3, 5]. The precise etiology of primary pelvic varices is unknown and likely multifactorial. Mechanical factors such as damaged or absent venous valves are significant in the development of retrograde flow and engorged veins [3].

Considering PVI (PCS) primarily affects young premenopausal women, ovarian activity and hormonal factors may also contribute to the development of varicosities [6]. The ovarian veins are exposed to a 100-fold high concentration of estradiol and estrone compared to the peripheral circulation. Resulting distension of the ovarian veins will worsen symptoms of PVI [7]. Reports of improvement in PVI symptoms when patients reach menopause or undergo hormonal suppression support this concept.

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A summary of causes of pelvic varices described in the literature, in addition to those listed above, include: (a) uterine malposition leading to pelvic vein kinking, (b) hydrostatic causes (e.g., pregnancy), (c) external vascular compression including the renal "Nutcracker" syndrome, (d) portal hypertension, (e) iliac compression syndrome (May-Thurner Syndrome), or (f) inferior vena cava syndrome [6–10].

Clinical Manifestations

PVI typically presents in young, multiparous women in their late 20s or early 30s [8, 11]. Commonly reported symptoms include a deep, dull pelvic ache, dyspareunia, and postcoital pain. Dull pain is usually present in the lower pelvis, the vulvar region, and the thighs. Sharp exacerbations occur after walking, prolonged standing, or activities that increase intra-abdominal pressure (lifting or bearing down). Patients often feel best in the morning. Pain is typically worse at the end of the day, during the premenstrual period, and/or during pregnancy [6, 7]. The condition may worsen after each subsequent pregnancy. On physical examination, the patient may have visible varicosities in the pudendal, vulvar, and labial regions.

Anatomy

Veins of the Pelvis

Anatomy of the pelvic venous outflow is variable. On the left, venous drainage from the pelvis is predominantly via the *left ovarian vein* and the *left internal iliac vein.* The left ovarian vein empties into the left renal vein (Fig. 2.1). The left internal iliac venous plexus drains into the deep pelvic central veins. In females, there is venous communication (blood flow) between the ovarian veins and the internal iliac veins. In addition, there is flow across the midline to the contralateral side as well as communication with veins in the upper thighs, pelvic floor, lower gastrointestinal tract, etc.

On the right side, venous drainage from the *right ovarian vein* empties into the central venous system generally at the junction of the inferior vena cava (IVC) and the right renal vein. The *right internal iliac vein* is similar to the left in its pattern of venous communications.

Anatomic variation in the pelvic venous anatomy is common and may include the finding of multiple dividing split parallel venous trunks comprising the left or right ovarian venous outflow (e.g., a single trunk at the level of the left renal vein with division into multiple trunks in the pelvis). Similarly, there may be duplications in the venous outflow of the internal iliac veins (e.g., two smaller internal trunks on one side of the pelvis rather than a single larger trunk, etc.).

On the left side of the pelvis, the left common iliac vein may be compressed by the crossing right common iliac artery anteriorly and the lumbosacral skeletal structures posteriorly. If significant, this may lead to left-sided pelvic venous outflow obstruction. This clinical entity is known as iliac compression syndrome (May-Thurner Syndrome) and may result in deep venous thrombosis (DVT) (i.e., recurrent left lower extremity DVTs, left leg swelling, and diversion of blood into the left internal iliac vein resulting in pelvic varices).

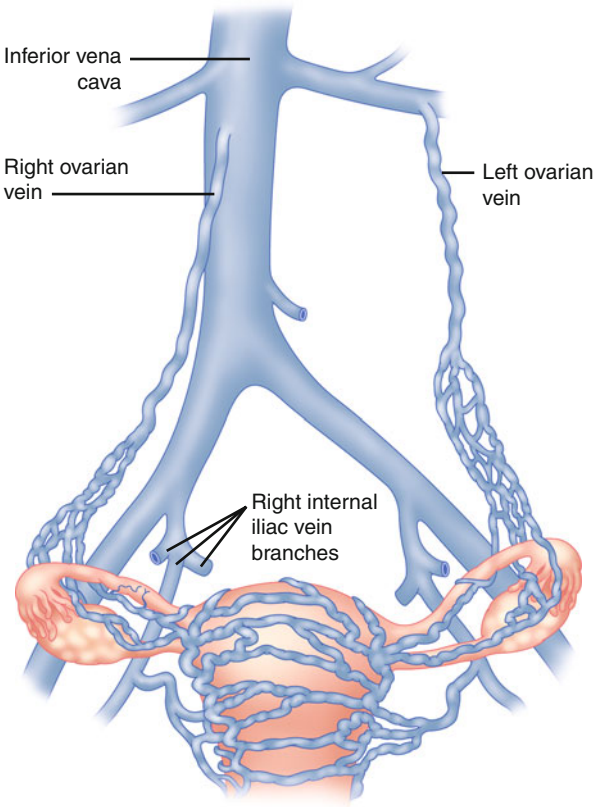


Fig. 2.1 Anatomy of ovarian and internal iliac varices

Infrequently, the left renal vein may be extrinsically compressed by vascular structures (e.g., retroaortic left renal vein). Compression of venous outflow from the left renal vein then causes elevated venous pressures in the hilum of the left kidney with reversal of blood flow in the left ovarian vein. This retrograde flow may result in large left ovarian veins with associated pelvic pain. This syndrome is called "Nutcracker Syndrome," as the compression of the renal vein between two "pinching" structures (i.e., the aorta anteriorly and the spine posteriorly) is analogous to the compression of a nutcracker.

Valves exist in the main trunks of ovarian veins but generally not in the internal iliac veins. Ovarian vein valvular incompetence may lead to reversal of venous flow in the ovarian vein with venous dilation of veins in the pelvis and development of ovarian and internal iliac varices. Hydrostatic pressure also plays a role, as women with PVI generally note increased pelvic pain with long periods of standing or sitting and report improved pain when supine.

Communications with multiple other venous tributaries in the pelvis may explain, in part, the development of (1) vulvar and vaginal varices (i.e., communication with the internal iliac veins) (Fig. 2.2) and (2) the worsening of varices in the upper thighs, buttocks, and groin areas (i.e., communication of the internal iliac veins with the saphenofemoral junction, etc.). Thus, knowledge of pelvic venous anatomy helps explain clinical conditions such as PVI and helps direct use of endovascular techniques for treatment.

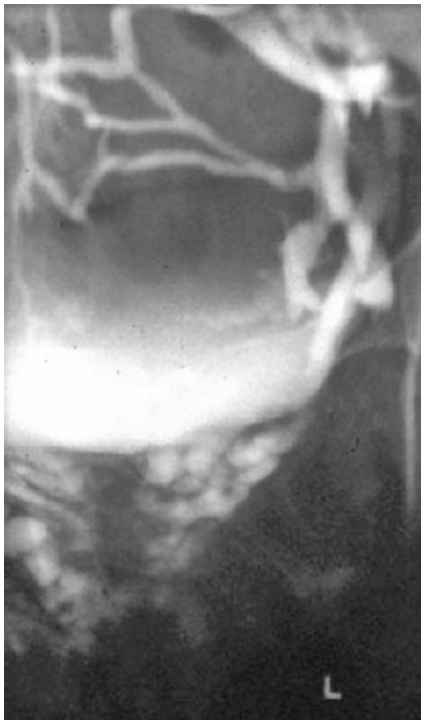


Fig. 2.2 Left internal iliac venogram. There are prominent midline pelvic varicosities with collateralization to perineal/vaginal and vulvar varices

Imaging

When a diagnosis of PVI is clinically considered, noninvasive imaging is the next step to confirm the presence of pelvic varicosities. Pelvic ultrasound (US) is a common first-line choice for investigation and can be conducted transabdominally or transvaginally [12] (Figs. 2.3a–c). Computed tomography (CT) (Fig. 2.4) and magnetic resonance (MR) imaging (Fig. 2.5) depict pelvic varices as tortuous and dilated, enhancing vascular structures in the pelvis. MR imaging is often the diagnostic modality of choice because of its multiplanar imaging capability and lack of ionizing radiation. However, because the patient is supine during CT and MR imaging and generally during US evaluation, pelvic varices may be less prominent. Additionally, ovarian and pelvic varices may not be addressed or diagnosed on supine MR, CT, or US scans because the consideration of this finding as "pathologic" may not be considered in the differential diagnosis of causes for chronic pelvic pain (i.e., a "lack of awareness"). MR and CT scans should be obtained and images depicted in the coronal, axial, and sagittal projections to better define anatomy and to avoid missed diagnoses. Recently, contrast-enhanced magnetic resonance venography (MRV) has gained popularity for diagnosis of PVI.

In the past, laparoscopy was commonly used in the diagnosis of PVI prior to the technologic advancements of noninvasive imaging modalities. Laparoscopic evaluation bears risk of a missed diagnosis of PVI in more than 80% of patients [13]. This is most likely

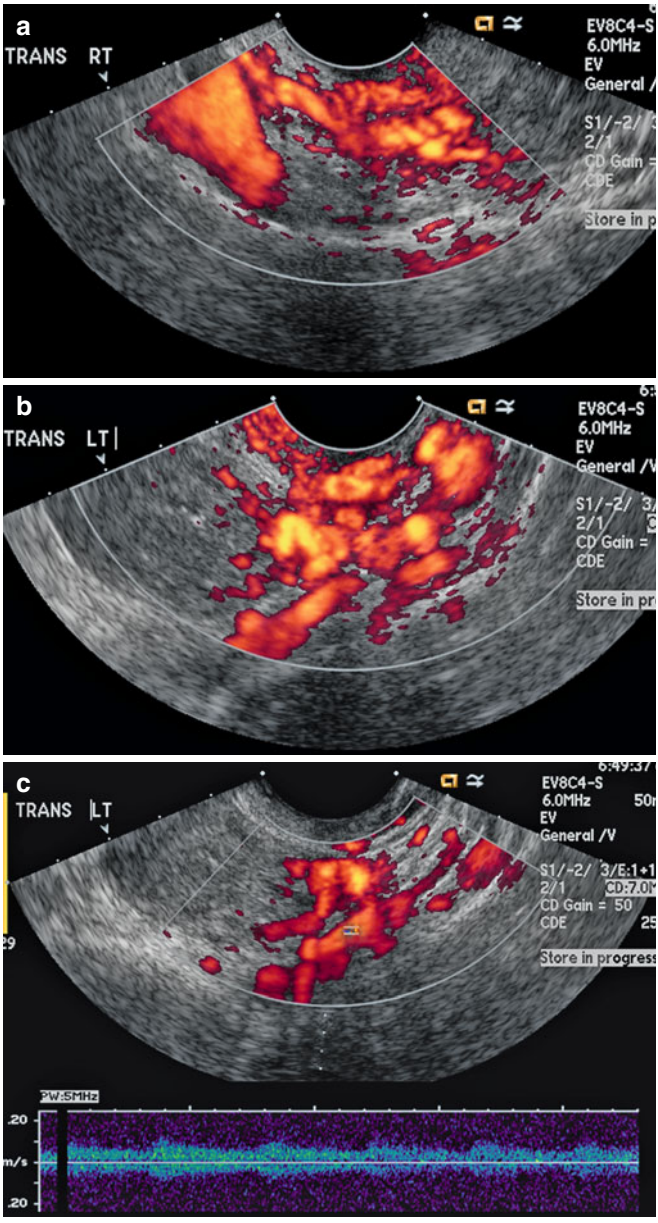


Fig. 2.3 (**a**–**c**) Pelvic ultrasound shows robust varices in the pelvis

due to patient positioning and instillation of carbon dioxide under pressure during the laparoscopic evaluation. Venography remains the "gold standard" for diagnosis of PVI. Venography offers the Interventional Radiologist a detailed depiction of venous anatomy, including identification of retrograde reflux, contralateral venous filling, internal iliac venous drainage, and any extension of venous collaterals into the central venous system [6].

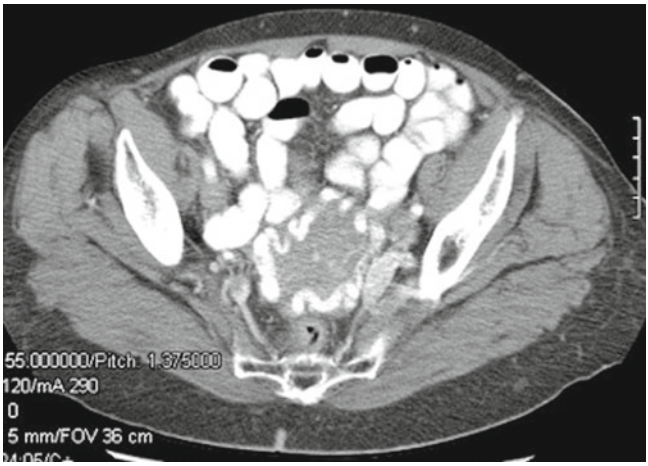


Fig. 2.4 CT scan pelvis. There are serpiginous varices posteriorly

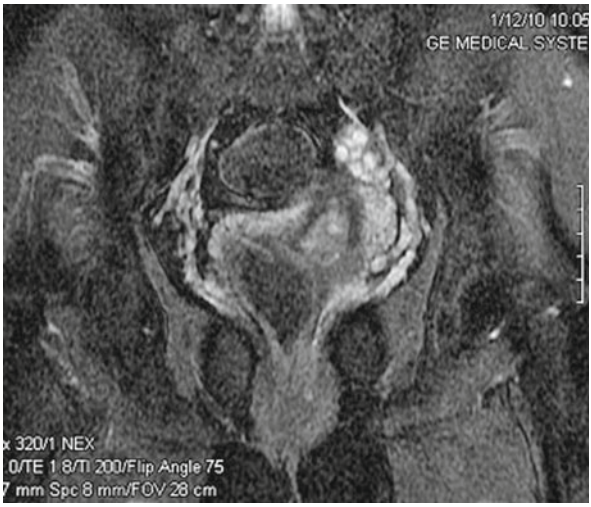


Fig. 2.5 Coronal contrast-enhanced pelvic MRI. Note the serpiginous varices surrounding the pelvic organs

Patient Encounter

Indications and Contraindications

Treatment for PVI in women depends on the severity of symptoms and clinical course of the patient. As reported in the literature, the range of medical therapeutic options is considerable [14]. First-line pharmacologic treatment is the use of analgesics. Other medical treatments of PVI include psychotherapy, progestins, danazol, phlebotonics, gonadotropin releasing hormone (GnRH) agonists with hormone replacement therapy (HRT), dihydroergotamine, and nonsteroidal anti-inflammatory drugs. Specifically, the literature supports use of medroxyprogesterone acetate (MPA) or the GnRH analogue goserelin in an effort to suppress ovarian function and/or increase venous contraction. MPA may be given orally

30 mg/day for 6 months. Goserelin acetate is dosed as an injection of 3.6 mg monthly over a 6 month period. As chemical ovarian "ligation" has numerous side effects, estrogen replacement or "add-back" therapy is frequently required as well [15].

If the patient has continued significant symptoms with minimal relief from pharmacotherapy, hysterectomy with or without bilateral salpingo-oophorectomy has been reported as last resort treatment. Treatment of PVI by hysterectomy, however, is not always curative. Studies show that among patients having undergone hysterectomy for PVI, 33% report residual pain and 20% experience recurrence of disease [16, 17].

In the authors' experience, hysterectomy is often not helpful and is associated with significant surgical risk. Additionally, many women are appropriately concerned with loss of fertility and the physical and clinical sequelae of a surgical hysterectomy/oophorectomy. Therefore, minimally invasive endovascular techniques remain an important treatment option.

Edwards et al. first introduced transcatheter embolotherapy (TCE) in 1993, a procedure, which has changed the management of women with PVI [18]. With refinement over the past decade, the technique of percutaneous embolization has been shown to improve clinical efficacy and reduce morbidity. Following clinical evaluation, screening imaging, studies, and venography, women with a suspected diagnosis of ovarian and internal iliac varices are potential candidates for transcatheter embolotherapy.

Indications for treatment include women with chronic noncyclic pelvic pain for 6 months or more that is not relieved by other medical therapies.

Contraindications for treatment of PVI using transcatheter techniques include active infection (e.g., bacteremia, pelvic inflammatory disease, etc.), allergy to contrast, and severe coagulopathy.

Consult, Consent, and Preparation

The patient should have an appropriate clinical history and imaging prior to the consultation visit. (See previous section in this chapter on Imaging) Appropriate imaging is a priority for pre-procedure planning whenever possible. Imaging is performed not only to document varices but to rule out other potential causes of pelvic pain (e.g., large ovarian cysts, uterine leiomyomata, etc.).

At some institutions, laparoscopy is performed, which again may be "negative" for reasons outlined previously in the Imaging section of this chapter. This is not a requirement at the authors' institution.

Given the complexity of PVI (PCS) and the nature of this image-guided procedure, a patient should first be seen in a clinic setting. This optimizes patient–physician rapport and allows for an appropriate discussion of risks, benefits, potential complications, outcomes, and specific details of the procedure.

In addition to risks associated with any minimally invasive procedure performed under conscious sedation (i.e., infection, bleeding, allergy to medications, damage to structures), one should include a frank discussion with the patient detailing the risks to ovarian function and fertility. Based on literature reviews, there are little data on the impact of ovarian/internal iliac varices embolization on ovarian function (i.e., impact on fertility). In limited published series, and in the authors' experience, there appears to be no negative impact on the menstrual cycle or fertility [10, 19].

The patient should have a negative pregnancy test. This is a medical–legal requirement at the authors' institution.

In general, a patient is informed that should she have significant discomfort after the embolization procedure, she may be admitted to the hospital for a "short stay" primarily for pain management. In the authors' experience, post-procedure pain is significant when using sclerosing agents in the ovarian varices (as opposed to use in the internal iliac veins). (See Technique section in this chapter.) This pain can typically be managed with a short-term course of an opiate analgesic medication.

Technique

Materials

Catheters and Wires

Operator choice dictates preference. The types of catheters will depend on whether the percutaneous venous access is femoral or jugular. The jugular approach generally utilizes a multipurpose or "hockey stick" (angled tip) configuration; whereas the femoral approach utilizes two basic shapes: a "Hopkins hook" (accentuated cobra catheter curve) for selection of the ostium of the left ovarian vein, and a reverse curve or "Simmons" shape for selection of the ostium of the right ovarian vein. The authors prefer the femoral approach with a 7 Fr sheath, a 7 Fr guiding catheter, and a 5 Fr hydrophilic catheter that may be coaxially directed.

Embolic Agents

At the authors' institution, sclerotherapy is performed as part of the embolization procedure. Although agents vary, operators may use 5% morrhuate of sodium (American Regent, Inc. Shirley, NY) plus Gelfoam® (Pharmacia & Upjohn Co, Division of Pfizer, Inc, New York, NY) (Figs. 2.6 and 2.7). Some operators use sodium tetradecyl sulfate (Bioniche Pharma USA, Lake Forest, IL) or a polymerizing glue, n-butyl-2-cyanoacrylate or butyl cyanoacrylate NBCA [11].

Coils

Depending on the size of the target vessel, coil diameter, length, shape and wire diameter (e.g., 0.035 in., 0.018 in.) vary. Operators generally use 0.035 in. diameter, 14 cm long Nester® coils (Cook Medical Inc, Bloomington, IN). The coils used for the ovarian vein trunks are generally 6, 8, 10, and 12 mm in diameter (Fig. 2.8). If the ovarian vein trunk is small in caliber, a microcatheter may be required. The authors prefer the Renegade® STC microcatheter (Boston Scientific Corp, Natick, MA) and Interlock™ coils (Boston Scientific Corp, Natick, MA).

Recent introduction of coils that create less MR imaging artifact may be more appropriate (MReye® coils, Cook Medical Inc, Bloomington, IN). The authors have limited experience with the MReye® coils.

Fig. 2.6 Photograph of Gelfoam® (Pharmacia and Upjohn Co., Pfizer Inc., New York, NY) sheet as it is being cut into small pieces. When this thick paste is used for embolization as a sclerosant, it will tend to remain in the varicosities rather than reflux into the central venous system

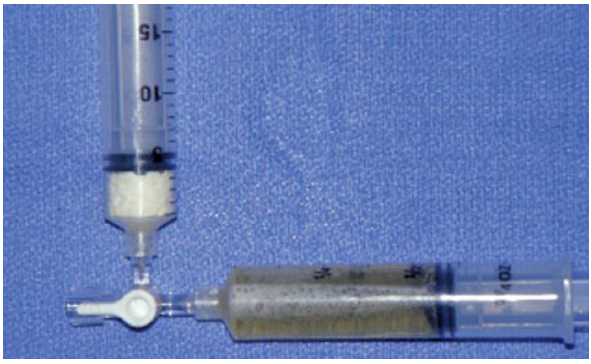


Fig. 2.7 Photograph of Gelfoam® (Pharmacia and Upjohn Co., Pfizer Inc., New York, NY) illustrating the technique of making the foam paste or "slurry." The cut pieces of Gelfoam® are placed in a 20 cm^3 syringe and compressed (*vertical syringe*). The sclerosant is placed in a second 20 cm^3 syringe (*horizontal syringe*)

Occlusion Balloons

Use of occlusion balloons for sclerotherapy in the internal iliac system is controversial. Not all investigators agree that internal iliac veins should be evaluated and treated. Results published in the literature do suggest improved outcomes if both the ovarian and internal iliac systems are treated [10, 19]. One may use a 9 Fr occlusion balloon catheter with a 11.5 mm balloon diameter (Boston Scientific Corp, Natick, MA) for work in the internal iliac veins.

Fig. 2.8 Platinum fibered Nester® coils (Cook Medical Inc., Bloomington, IN). These coils are thrombogenic and used to occlude the main trunk(s) of incompetent left and right ovarian veins (Courtesy of Cook Medical Inc. With permission)

Contrast Agents

For venography, standard iodinated contrast is used. There are little data in the literature describing alternative contrast agents (e.g., carbon dioxide, gadolinium, etc.).

Procedure Start

A single dose of an antibiotic administered intravenously on the day of the procedure is utilized in some centers. Patients usually are administered intravenous sedation with short acting agents such as fentanyl and midazolam for the procedure.

The patient is placed supine, and the groins as well as the neck may be prepped and draped in the usual sterile fashion.

Step by Step

The ovarian and internal iliac veins may be approached from a jugular or femoral approach. The authors prefer the latter because of room configuration (position of monitors, etc.).

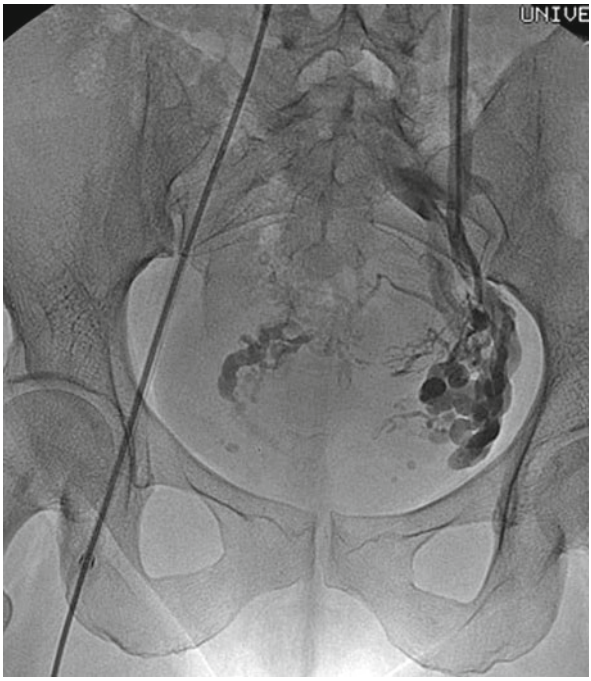


Fig. 2.9 Left ovarian venogram, same patient as in Fig. 2.5. Multiple varices are present in the left adnexal region, the pelvic floor, and adjacent to the uterus and bladder. There is also opacification of the left internal iliac venous tributaries

Vascular access is achieved using ultrasound guidance. A 9 Fr femoral sheath is placed. The larger 9 Fr sheath is used rather than 7 Fr to accommodate the balloon occlusion catheter used for treatment of internal iliac varices. (See earlier discussion.) A 7 Fr guiding catheter with a "Hopkins hook" shape (Cordis Johnson and Johnson, Miami Lakes, FL) is used to select the left renal vein. Once the guiding catheter tip is seated, a 5 Fr coaxially directed hydrophilic catheter is advanced over a guide wire into the ovarian vein and down into the pelvis. An ovarian venogram is performed (Fig. 2.9). After the baseline left ovarian venogram, one may mix a slurry of Gelfoam® (Pharmacia and Upjohn Co, Pfizer, Inc., New York, NY) and 5% sodium morrhuate (American Regent Laboratories, Inc., Shirley, NY).

To make this mixture, one cuts pieces of Gelfoam® (Pharmacia and Upjohn Co., Pfizer Inc., New York, NY) into small 3–4 mm pieces (Fig. 2.6). These are placed in a 20 ml syringe and compressed (Fig. 2.7). The sclerosant is placed in a second 20 ml syringe (horizontal syringe in the photograph). A three-way stopcock has been interposed between the two syringes. By pushing the syringe plungers alternately back and forth, the two materials mix together. The sclerosant soaked Gelfoam® is macerated as it passes through the hole in the barrel of the three-way stopcock. Eventually, the two mix together and become a thick paste. By partially closing the stopcock, the Gelfoam® is shredded further. This allows the paste to become more uniform in its consistency and thus easier to inject through the catheter during ovarian vein and internal iliac varices embolization.

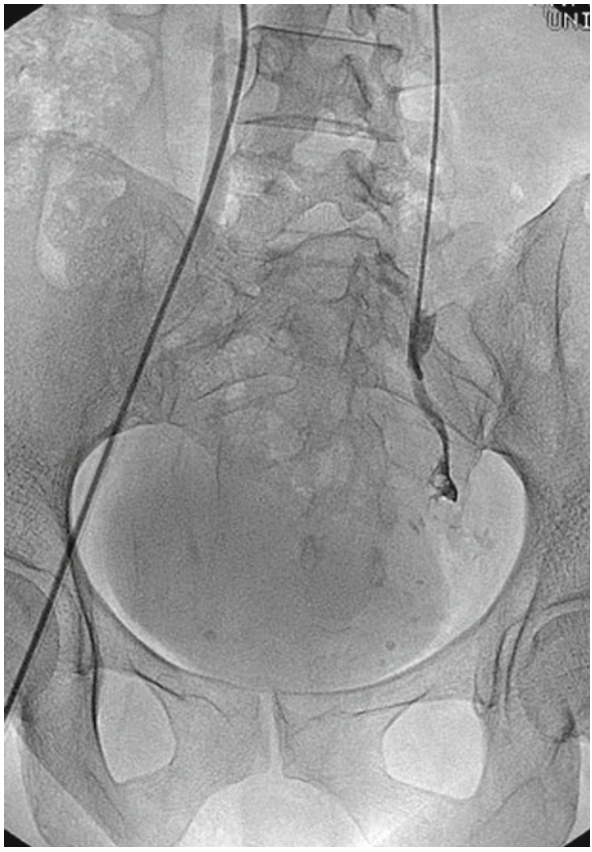


Fig. 2.10 Completion venogram after embolization with sclerosant/Gelfoam® (Pharmacia and Upjohn Co., Pfizer Inc., New York, NY) "slurry." The left pelvic varices no longer opacify. The main left ovarian vein trunk was then occluded with embolic coils (Fig. 2.11)

This sclerosant and Gelfoam® slurry is injected through the 5 Fr catheter. After an interval of 3–5 min (Fig. 2.10), the main left ovarian vein is occluded using coils (Figs. 2.8 and 2.11). As mentioned previously, other different sclerosing agents and glue have also been detailed in the literature.

From the inferior vena cava, the right ovarian vein is then selectively catheterized using a Simmons I or II shaped catheter (Fig. 2.12a). Some operators prefer a cobra catheter for this vein. A microcatheter is often helpful to advance access down the right ovarian vein. The microcatheter should be advanced coaxially into the right pelvic varices. After right ovarian venography, the embolization procedure is repeated using the gel foam and morrhuate slurry.

An alternative to the use of an expensive microcatheter and guidewire is the use of a Simmons-shaped 7 Fr guiding catheter and a coaxially advanced 4 or 5 Fr catheter (e.g., 5 Fr Bentson-Hanafee-Wilson 1(JB1) (Terumo Medical Corp, Somerset, NJ)). This shape is achieved by taking the Hopkins hook 7 Fr guiding catheter and heat shaping it into

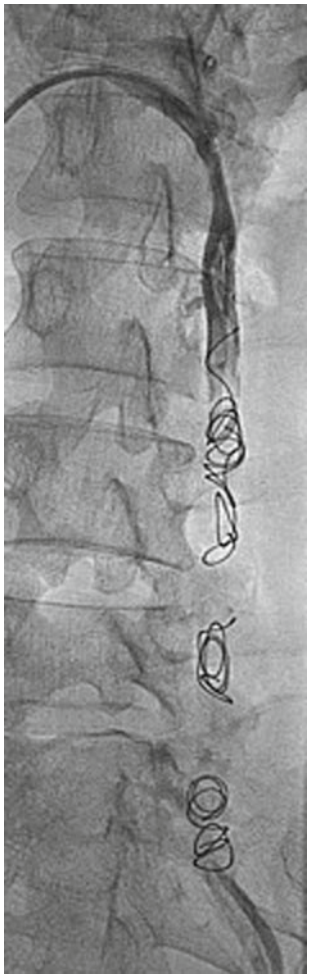


Fig. 2.11 Left ovarian vein embolization with coils

the reverse curve (i.e., Simmons) configuration. Again, after an interval of 3–5 min following slurry sclerotherapy, the main right ovarian vein is occluded using coils (Fig. 2.12b).

Given the common finding of venous communications that exist between ovarian veins and internal iliac veins, the authors feel that bilateral venography and embolization of both ovarian and internal iliac veins is required to reduce the chance of recurrence (Fig. 2.12c). It is helpful to use a balloon occlusion catheter. For this reason, a 9 Fr introducer sheath can be placed initially into the venous system. Recent introduction of occlusion balloons on a smaller diameter shaft may preclude the need for a large venous sheath size.

The authors use a 9-Fr occlusion balloon catheter with a 11.5 mm balloon diameter when inflated (Boston Scientific Corp, Natick, MA). The balloon is inflated at the anterior division

of the internal iliac vein. A venogram is performed (Fig. 2.13). The Gelfoam®-sodium morrhuate "slurry" is injected while the balloon is inflated. After a dwell time of 5–10 min, the occlusion balloon is deflated (Fig. 2.14). In the authors' experience, use of embolic coils should be avoided in the internal iliac veins because of the difficulty in delivering these devices in capacious veins and the inherent risk of coil embolization to the lungs.

A staged procedure may be performed by first embolizing the right and left ovarian varices. The patient is then allowed to recover for 3–6 weeks, and then returns later for embolization of the pelvic internal iliac varices. This sequential approach is dictated by practical factors such as patient personal time constraints and pain tolerance. In general, patients experience pain after the procedure, although this pain is usually less than that experienced by patients after arterial embolization [10, 14, 19].

If pain is severe, the patient may be admitted to the inpatient service with access to a patient-controlled analgesia (PCA) pump (i.e., for a "short stay"). Alternatively, if enough time is available, all four regions may be treated in one clinical setting (i.e., both ovarian and both internal iliac veins). The authors have recently switched to a single setting embolization procedure, largely based on patient preference (avoidance of a return trip, travel, time away from home and work, etc.).

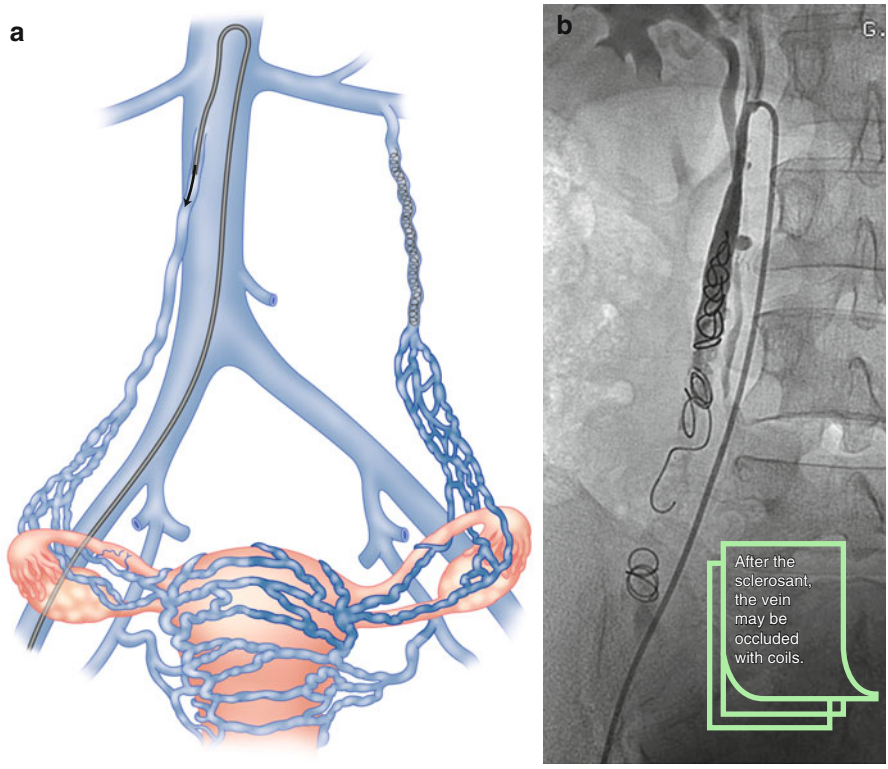
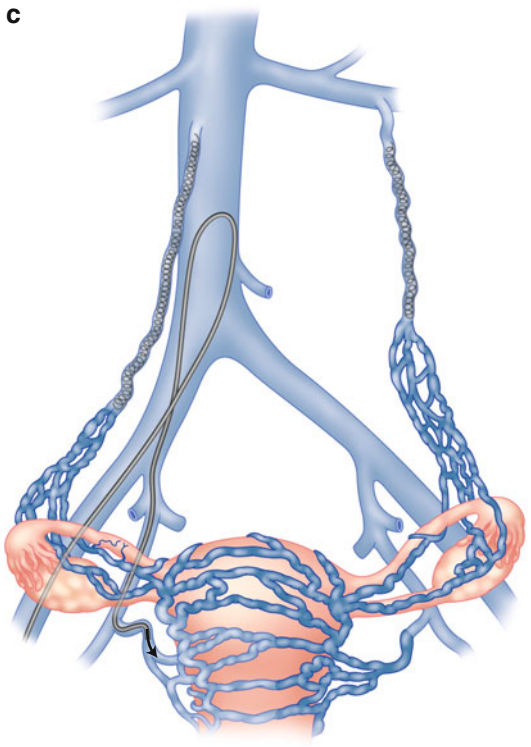


Fig. 2.12 (**a**) Catheter selection for the right ovarian vein. (**b**) Completion right ovarian venogram after embolization of varices. (**c**) Catheter selection for the internal iliac vein

Fig. 2.12 (continued)



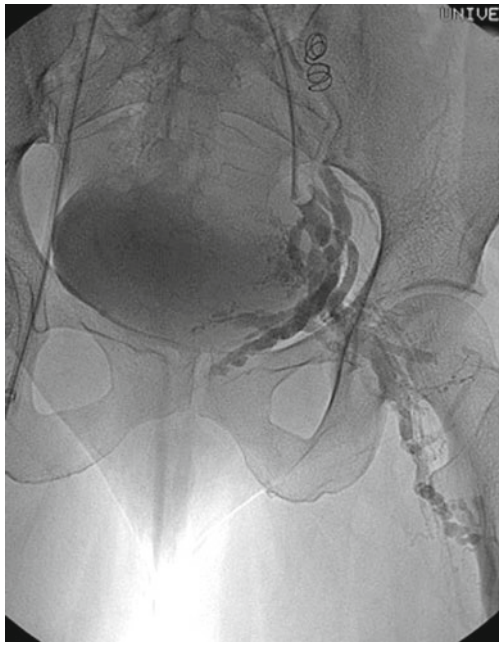


Fig. 2.13 Balloon occlusion of the internal iliac venogram from a contralateral approach. Residual varices are seen in the left pelvis. A "slurry" of sclerosant/Gelfoam® (Pharmacia and Upjohn Co., Pfizer Inc., New York, NY) was subsequently injected. The balloon was kept inflated for 10 min, then deflated

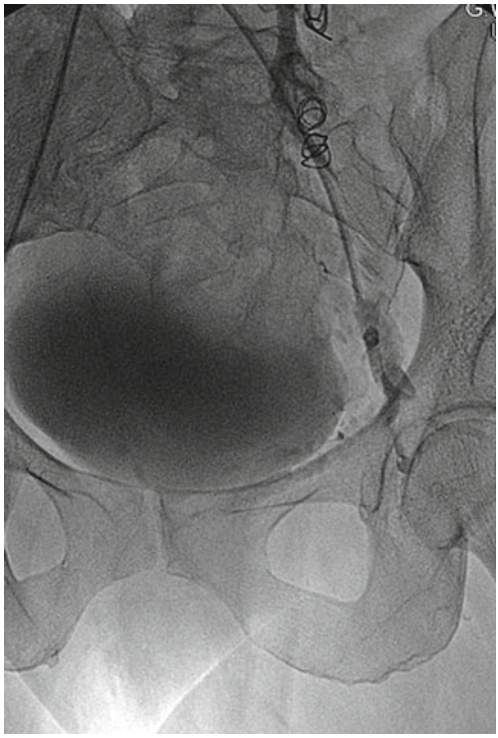


Fig. 2.14 Completed treatment of the left internal iliac varices. The varices no longer opacify

Fig. 2.15 (**a**–**d**) Fifty-year-old female with noncyclic chronic pelvic pain and rectal burning. She had a negative work up by her Gastroenterologist. She had a prior hysterectomy and bilateral salpingo-oophorectomy with no relief of symptoms. Significant past medical history included bilateral lower extremity deep venous thromboses after a motor vehicle accident 20 years ago. On physical exam, she has varices bilaterally in her thighs, buttocks, perineum, and vagina. (**a**) Fluoroscopic scout shows multiple calcified phleboliths in the low pelvis. (**b**) Left internal iliac venogram using balloon occlusion technique. Contrast refluxes from the left internal iliac vein into the left groin area and into the abnormal left lower extremity venous system. (**c**) Venogram performed during direct puncture of the right labia. The needle was slowly withdrawn until venous blood was aspirated. Contrast was then injected. Note the opacification of right perineal varices that were subsequently occluded with a dilute sclerosing agent (not shown). (**d**) Venogram of direct left labial puncture. Note reflux into the left internal iliac venous system. This communication between the left labial veins and the left internal iliac veins was occluded using the dilute sclerosing agent (not shown)

Occasionally, patients may have complex varices as a result of venous incompetence from multiple sources. Symptomatic perineal and vulvar/vaginal varices may require direct percutaneous puncture and sclerosis in addition to the transcatheter techniques described earlier (Fig. 2.15a–d).

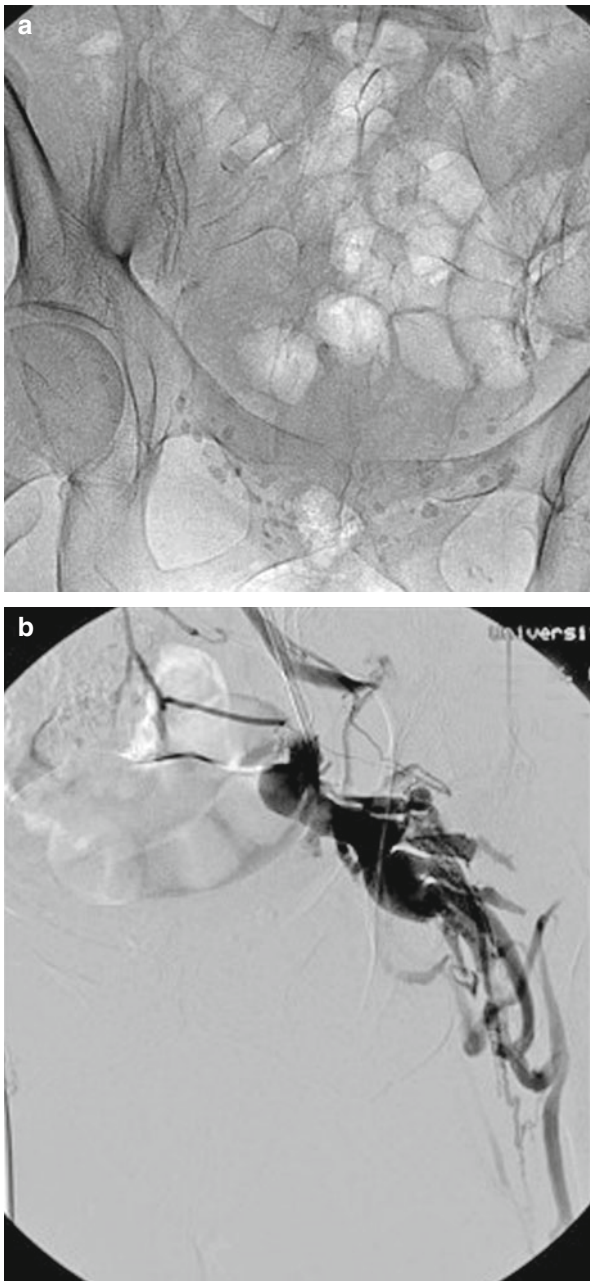
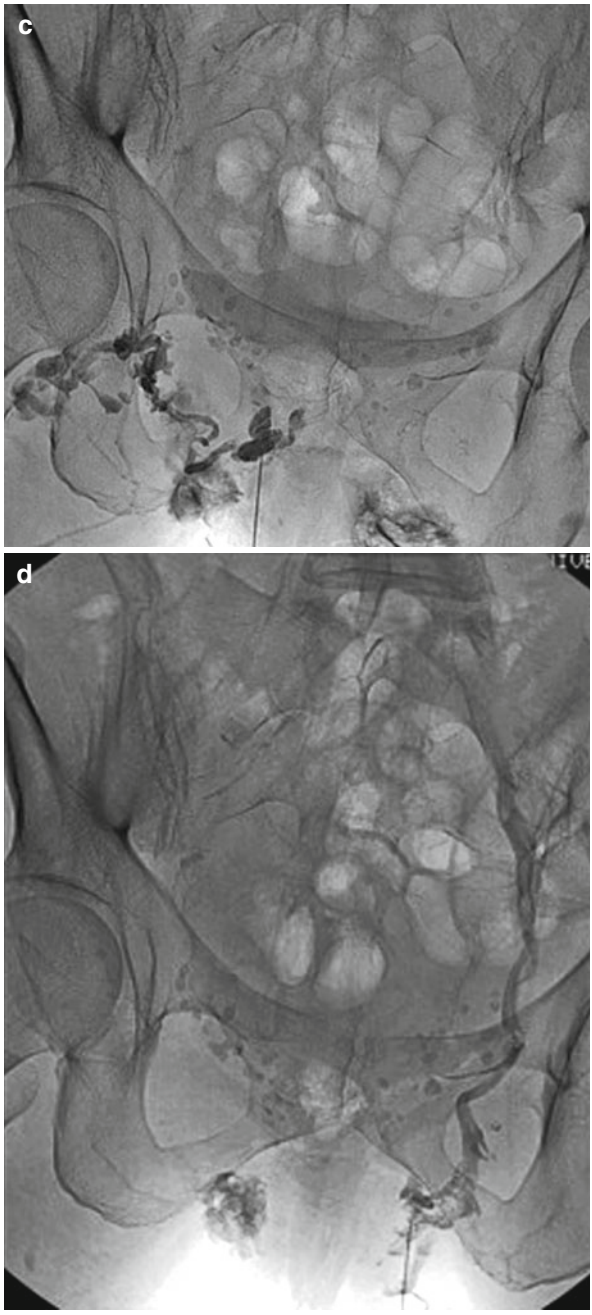


Fig. 2.15 (continued)



In the literature, procedural technical success rates for pelvic vein embolization have been shown to be as high as 99%.

Hints, Technical Pitfalls, and Pearls

When engaging the orifice of the ovarian vein, one may occasionally encounter vasospasm. Use of a pharmacologic vasodilator (e.g., nitroglycerine in 100 μg aliquots) injected in the ovarian vein may be useful. Alternatively, slow, direct, continuous infusion of saline into the ovarian vein orifice for several minutes may relieve venospasm. Waiting for several minutes without further wire or catheter manipulation may also result in relief of vasospasm.

If a valve in the ovarian vein prevents passage of a catheter, gentle manipulation (i.e., gentle probing with a 0.018 in. or 0.0014 in. in diameter guidewire) may prove useful. This maneuver may also be performed while the patient performs a Valsalva.

Given reports of coil embolization to the lungs during internal iliac varices embolization (early experience), the authors recommend that coils not be used in the main trunk of the internal iliac veins. Occasionally, an embolic coil may be used peripherally in the internal iliac system to close a "bridging vein" that would otherwise cause reflux of sclerosant to non-target sites (e.g., reflux of sclerosant from the internal iliac system to the saphenofemoral junction and veins of the upper thigh).

Post-Operative Care, Discharge Instructions, and Follow-up

After the procedure, access to oral, intramuscular, or intravenous pain medications may be required in the recovery room.

At discharge, patients will generally need a prescription for pain medication. At the authors' institution, the patient is also given a short course of oral antibiotics and an antiemetic. Discharge instructions and a physician contact number are also provided to the patient.

Most patients may return to normal activity within 3–5 days. Follow up in clinic in 3–6 weeks should be scheduled to assess the patient's pelvic pain and decide if further endovascular therapy is needed.

Outcomes

Previous studies have reported significant clinical improvement in 50–100% of patients undergoing embolization for PVI (PCS) [11, 14, 18–26]. In 2006, Kim et al. published the first major study of embolotherapy with both a large patient cohort ($n = 127$) and long-term follow-up (mean 45 months) [11]. From this study, 83% of patients ($n = 80$, out of 97 patients with long-term follow-up) exhibited significant clinical improvement, 13% reported no significant change, and 4% experienced worse symptoms [11]. Statistically significant improvement in overall pain was noted, as well as a reduction in the following:

pain while standing, pain while lying down, dyspareunia, urinary frequency, and the number of pain medications required ($P<0.0001$) [11].

In contrast, medical therapy has been shown to give patients relief, but the results may be short lived [27]. An extensive review of the literature for follow up of medical therapy revealed only one article with a follow-up term of 1 year – the longest documented [15]. Therefore, it is unclear if the benefits of contemporary chemical ligation for pelvic varices are truly sustained long term. Moreover, side effects of GnRH agonists and hormonal treatments – including weight gain, hot flashes, bone loss, and mood changes, which might be offset by estrogen "add-back" therapy – cannot be overlooked [27]. Further trials are needed to establish the efficacy of the GnRH/estrogen combination [27]. Even though relief from pain is not sustained in the long term with hormonal therapy, it may be most acceptable in those looking for a nonsurgical/noninterventional treatment.

Nonmedical therapy in the treatment of PCS has evolved dramatically since the 1980s. Previous studies had shown that hysterectomy with oophorectomy gave moderate relief to patients with PVI (PCS), but a recurrence rate or residual pain in 30% of patients at 1 year [17] (Fig. 2.16). Ten years ago, surgical ligation and embolization were also shown to be nearly equal in efficacy in reducing patient symptomatology for about 70% of PVI (PCS) patients treated. Experience continues to be quite limited for outcome with surgical/laparoscopic ligation of ovarian veins, with only small investigative cohorts involved [28, 29]. Moreover, surgical treatments, including hysterectomy with or without bilateral salpingo-oophorectomy and laparoscopic ligation of bilateral ovarian veins, present their own specific

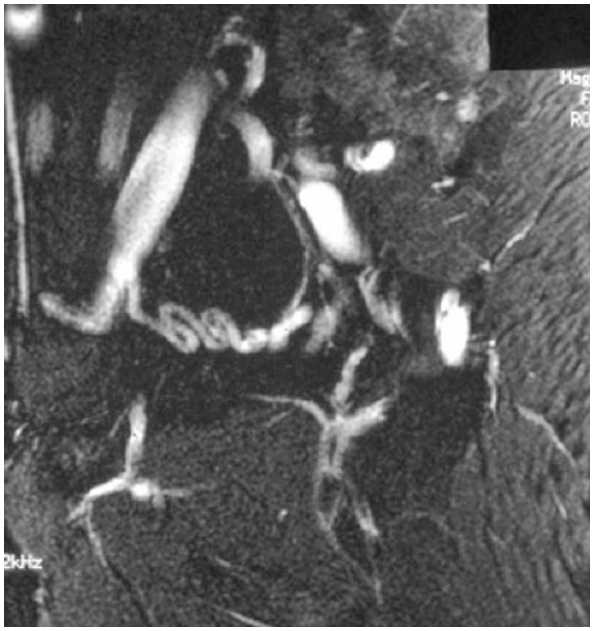


Fig. 2.16 Pelvic MRI from a woman with chronic pelvic pain who had undergone a hysterectomy. Despite this, the patient still had symptoms of pain. Pelvic varicosities arising from the iliac system are still visible

complications. Hysterectomy is associated with longer hospital stay and delayed restoration to normal daily life. Moreover, if performed with bilateral oophorectomy, it prematurely induces a menopausal state and ends the reproductive potential of a premenopausal woman. Even with laparoscopic procedures employed, 20% of the patients experience unsatisfactory results [17]. Small series of bilateral laparoscopic ligation boast absence of complications, but also acknowledge that the same may not hold in future studies with a larger sample size [30]. The procedure is also technically challenging. Multiple main trunks off the ovarian vein in as many as 40% of cases on the left and 25% of cases on the right may make laparoscopic procedures difficult, with a high potential of recurrence resulting from inadequate obliteration of all channels. In a series by Gargiulo et al. in 2003, complete remission of pain and absence of pelvic varicosities in patients who underwent surgical ligation lasted up to 12 months [28]. The authors were unsure in their conclusion whether transcatheter embolization was better, as this was not a randomized trial and patient numbers were small. Surgical management may also add the risk of abdominal and pelvic adhesion formation, ultimately increasing pain and significant patient morbidity.

Complications

Complications of embolotherapy for PVI are rare. As mentioned earlier, a few incidents of coil embolization to the pulmonary circulation during the procedure have been reported [10, 19]. This rare complication may be quickly corrected by snaring and removing the coils during the procedure.

Historically, one study reported complications of treatment of PVI to include vessel perforation, non-target embolization including embolization of coils to the pulmonary circulation, and cardiac arrhythmias in 8% of patients [31]. However, in the authors' experience, reports of complications of embolotherapy are rare (less than 2%). Other investigators have reported complications less than 4% to include ovarian vein thrombophlebitis, recurrence of varices, non-target embolization of embolic material, and radiation exposure to ovaries. It is important to note that limited long-term data have thus far demonstrated no negative effects on menstrual cycle or fertility from transcatheter embolotherapy [11, 14, 19]. Kim et al. have reported that patients with PVI who underwent ovarian and pelvic varices have a more durable result in terms of reduction of their pelvic pain [11].

Also in this reported series, patients who had venous embolotherapy showed no significant change in menses, fertility, or hormone levels. Finally, a subset of patients who had previously undergone hysterectomy before embolization still achieved significant improvement based on numeric pain perception scores. Long-term results published by Kim et al. reported no major complications and also did not find any significant changes in follicle stimulating hormone (FSH), leutinizing hormone (LH), or estradiol levels. One reported topic of concern is the impact of transcatheter embolotherapy of varices on the patient's future fertility. Kim et al. reported a 50% pregnancy rate in premenopausal women who would otherwise become infertile with other medical or surgical techniques [11, 14, 19].

Summary and Conclusions

Chronic pelvic pain caused by ovarian and internal iliac varices may be managed by transcatheter techniques. Embolotherapy to include use of sclerosing agents and embolic coils is associated with a high technical and clinical success. The greatest challenge to successful outcomes is careful patient selection [32]. Complications are fortunately infrequent. Noninvasive imaging in a woman with clinical symptoms of PVI (PCS) is indicated not only to confirm the diagnosis but also to rule out other abdominal/pelvic pathology. Imaging is not completely accurate as studies are generally performed supine. Laparoscopy also is limited for reasons outlined previously. Venography is utilized with the intent to treat.

Transcatheter techniques provide a reasonable therapeutic option in the management of women with chronic pelvic pain due to ovarian and internal iliac varices.

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