State of the Art in the Endovascular Management of Pelvic Congestion Syndrome

Estado del arte en el manejo endovascular del síndrome de congestión pélvica

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Pelvic pain
Dyspareunia

Palabras clave (DeCS)

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Summary

Chronic pelvic pain (CPP) is defined as pain in the pelvic area with a duration more than 6 months. It's an important cause of medical consultation, affecting approximately between 24 and 45% of women in the world. Pelvic congestion syndrome (PCS) is a notable and often under-diagnosed cause of chronic pelvic pain in patients, mostly premenopausal, that significantly affects quality of life. The main objective of this paper is to demonstrate the multiple diagnostic options and different therapeutic devices that are used for selective embolization, giving adequate management and resolution of pelvic congestion syndrome. In conclusion, PCS is a highly painful, disabling and important pathology to take into account due to its high prevalence and associated morbidity. Endovascular treatment has proven to be a highly reliable and safe option, with low complication rates, shorter recovery time, and briefer hospital stays compared to the surgical option. It's important to know the material and use it correctly which will help avoid complications.

Resumen

El dolor pélvico crónico (DPC) se define como un dolor de localización pélvica con una duración mayor a 6 meses. Es una causa importante de consulta médica, y afecta entre el 24 % y el 45 % de las mujeres en el mundo. El síndrome de congestión pélvica (SPC) es una fuente notable y muchas veces poco diagnosticada de dolor pélvico crónico en pacientes, en su mayoría premenopáusicas, que afecta de forma relevante la calidad de vida. El principal objetivo de este artículo es demostrar las múltiples opciones diagnósticas y diferentes dispositivos terapéuticos que se usan para la embolización selectiva, para dar un adecuado manejo y resolución al síndrome de congestión pélvica. En conclusión, el SPC es una entidad altamente dolorosa, incapacitante e importante para tener en cuenta por su alta prevalencia y morbilidad asociadas. El tratamiento endovascular ha demostrado ser una opción altamente confiable, segura, con bajas tasas de complicaciones, menor tiempo de recuperación y estancias hospitalarias más cortas, en comparación con la opción quirúrgica. Es importante conocer el material y utilizarlo correctamente, lo cual ayudará a evitar complicaciones.

Introduction

Chronic pelvic pain (CPP) is defined as pelvic pain lasting more than 6 months. It is a major cause of medical consultation, affecting between 24 and 45% of women worldwide (1, 2), and 15% of women between 18 and 50 years of age in the United States (2); it is responsible for 10 to 30% of gynecological medical care (3-5) and generates an annual cost of nearly 2 billion dollars in the United States (6) and 3.8 billion euros in Europe (7).

Pelvic congestion syndrome (PCS) is a notable - and often underdiagnosed (4, 8) - source of chronic pelvic pain in mostly premenopausal patients, who are significantly affected by it in terms of quality of life (1, 3, 9). Approximately 20-40% of visits for chronic pelvic pain are due to PCS (4, 8, 10).

PCS, as a cause of chronic pelvic pain, was first described in 1949 by Howard Taylor (11). The symptomatology is secondary to retrograde flow of incompetent gonadal veins, which generates pelvic venous dilatation and associated tissue congestion (12, 13). In addition, it should be noted that there are mechanical factors involved in its pathogenesis, such as the absence of ovarian venous leaflets in up to 15% of the left side and 6% of the right side, and valvular incompetence of at least one of the two sides in 50% of the patients (12, 14). The genetic component plays an important role in the development of the disease, as an association has been identified in

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up to 50% of patients. Likewise, hormonal influence is considered a determining factor in the pathogenesis, specifically in terms of estradiol, which induces selective dilatation of the ovarian and uterine veins, resulting in an increase in valvular stress (5, 8). Another pathophysiological mechanism involved is obstruction to ovarian venous flow, specifically, compression of the left renal vein by the superior mesenteric artery and the aorta, which triggers nutcracker syndrome (15).

The main risk factors associated with the disease are: multiparity, family history of venous insufficiency, age between 20 and 45 years (secondary to the hormonal influx mechanism), history of gluteal, vulvar and perineal varices, venous insufficiency, pelvic surgical procedures and retroverted uterus. In addition, there is an unclear relationship between PCS and polycystic ovaries, although it has been found in 40-50% of patients with pelvic venous insufficiency (4, 5, 8).

Typically, it is a pain that manifests as a "heaviness" at the pelvic level, predominantly in the evening, which worsens with standing, menstruation, exertion and pregnancy, and improves with supine position. The symptoms, which in most cases accompany the pain, are dyspareunia, dysuria, dysmenorrhea, increased urinary frequency, urinary urgency, nausea and symptomatic visible varicose veins in the vulvar and perineal region, as well as in the inner and posterior thighs (3-5, 9, 16). The association with venous insufficiency of the lower limbs is significant, close to 15% (17).

Diagnosis

On physical examination in the vaginal tract, sensitivity to cervical mobilization may be found, and on bimanual palpation uterine and ovarian tenderness may appear; in addition, vulvar and thigh varicose veins may be visualized. The combination of ovarian tenderness and pain after intercourse has a sensitivity of 94% and a specificity of 77% for PCS, when subsequently assessed with venography (venography), when subsequently evaluated with venography (10, 18, 19).

To establish the diagnosis it is important to take a complete clinical history, taking into account the risk factors mentioned, the characterization of pain and an adequate physical examination. In addition to this, imaging aids are essential since they allow definitive confirmation; the main tools that help establish the diagnosis are: transvaginal ultrasound (with Doppler application), transabdominal ultrasound, conventional venography, magnetic resonance imaging (MRI) and computed tomography (CT) (13, 20).

Imaging

Transvaginal ultrasound with Doppler is the ideal study for the diagnosis of PCS, due to its non-invasive nature, low cost, radiation-free and highly available; in addition, it can be performed in the semi-vertical position and evaluated with Valsalva maneuvers, which are mandatory. On the other hand, it has the advantage that added to transabdominal ultrasound, it allows excluding other diagnoses as causes of the symptomatology. The only limitation is that it is operator dependent. The diagnostic criteria with transvaginal ultrasound are: multiple dilated parauterine varices, diameter > 4 mm, slow flow <= 3 cm/sec, dilated arcuate vein in the myometrium crossing the midline and polycystic configuration of the ovaries. Transabdominal ultrasound is also an image to be considered for diagnosis; the criteria are: retrograde flow in the dilated right or left gonadal vein, dilated gonadal vein > 5 mm. The measurement of ovarian veins greater than 5 mm has a positive predictive value (PPV) of 71% and greater than 6 mm, a PPV of 83% for the diagnosis of PCS (5, 9, 20, 21). Figure 1 shows an ultrasound image with Doppler study.

Conventional venography with selective catheterization of the hypogastric and gonadal veins is the gold standard for the diagnosis of PCS (3-5, 9, 9, 20, 22) (Figures 2 and 3). Its main advantage lies in being able to perform concomitant endovascular management. Among its disadvantages are radiation and the fact that it is invasive. The diagnostic criteria are: dilated gonadal, uterine and utero-ovarian venous arcades, diameter > 5 mm, retrograde caudal flow in the gonadal vein (unilateral or bilateral), filling of the pelvic veins passing the midline through the utero-ovarian arcade, opacification of the vulvovaginal or thigh varices, remanent contrast medium in the pelvic veins (5).

It is important to point out that both hypogastric and gonadal veins must be catheterized, as well as to perform the study with Valsalva maneuvers and ideally on a tilt table. The approach can be via the basilic vein, jugular vein or femoral vein (9).

On the other hand, MR images are very useful in the diagnosis, mainly due to their absence of ionizing radiation and offer great detail of the anatomy and its functionality, to rule out other diagnoses. Its limitations are centered on its low availability, high cost and low specificity (9). Time-resolved magnetic resonance angiography (TR-MRA) is a variant with high performance demonstrated by several studies; particularly, in a trial published in 2012 in which 19 patients were evaluated by conventional venography and TR-MRA by 2 qualified observers, a sensitivity between 67 and 75 %, a specificity of 100 % and an accuracy between 79 and 84 % were obtained for the latter (23). Diagnostic criteria include: retrograde caudal flow of contrast medium on TR-MRA, dilated parauterine varices, evidence of slow flow (heterogeneous or hyperintense on T2), presence of arcuate vein crossing the midline, vulvar or thigh varices, polycystic configuration of the ovaries, absence of structural obstruction or obstructing mass and no evidence of endometriosis (5, 23, 24) (Figure 4).

Finally, CT venography has a minimal role in the diagnostic approach to PCS. It should be performed when any type of structural abnormality is suspected; it is useful in the anatomical characterization prior to procedures and in the exclusion of differential diagnoses. Incompetent pelvic veins are visualized as widened, dilated and tortuous tubular structures around the uterus and ovaries. Its disadvantages are related to radiation, its low specificity, the supine form in which it is performed and, like MRI, it does not allow determining the reflux of contrast medium within these veins (4, 5, 9). The proposed diagnostic criteria are: 4 ipsilateral parauterine veins tortuous and dilated (at least one greater than 4 mm), dilated gonadal vein with a diameter greater than 8 mm unilaterally or bilaterally, absence of structural compression by anatomical alteration or mass and no evidence of endometriosis (5, 24) (figure 5).

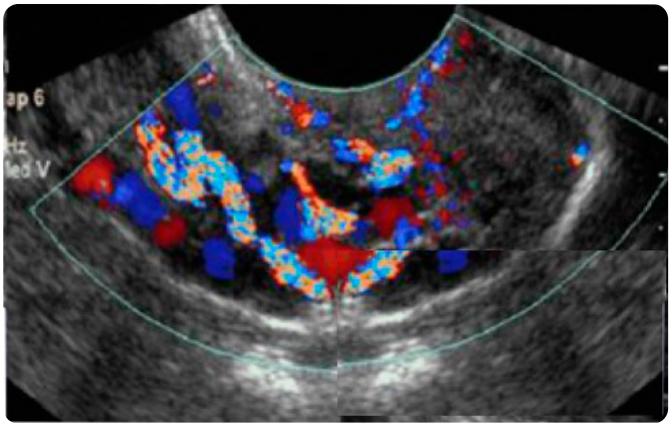

Figure 1. Vaginal ultrasonography with Doppler analysis. Dilatation of the parauterine venous plexus secondary to pelvic varices is observed.

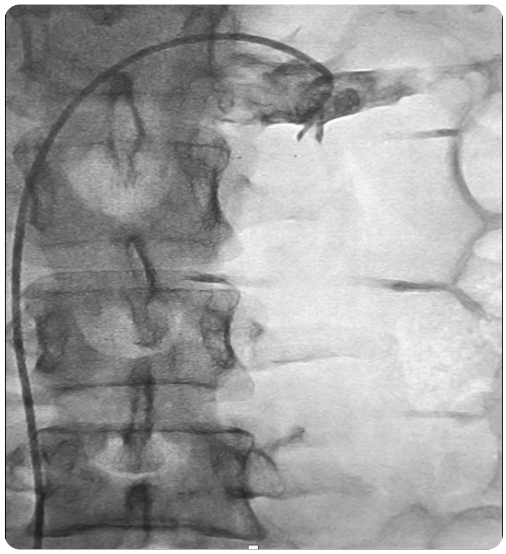

Figure 2. Selective venography in the left renal vein, showing competence of the left gonadal vein and its normal valve.

Figure 3. Selective venography showing insufficient left gonadal vein.

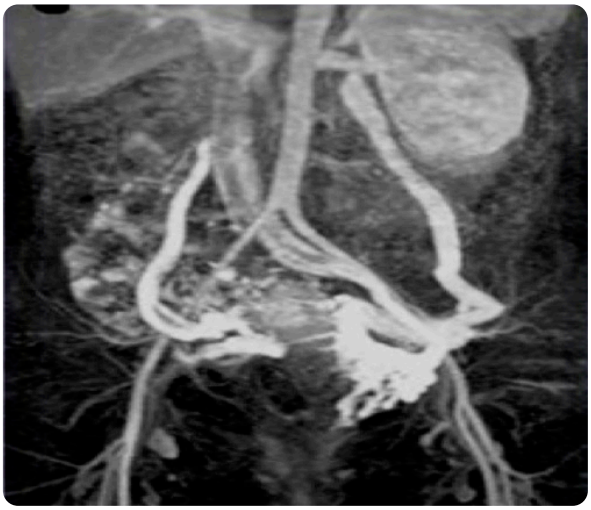

Figure 4. MR venography. Both gonadal veins are visualized with contrast medium in its interior with clear evidence of pelvic venous vascular insufficiency produced by dilatation of both gonadal veins and formation of pelvic varices.

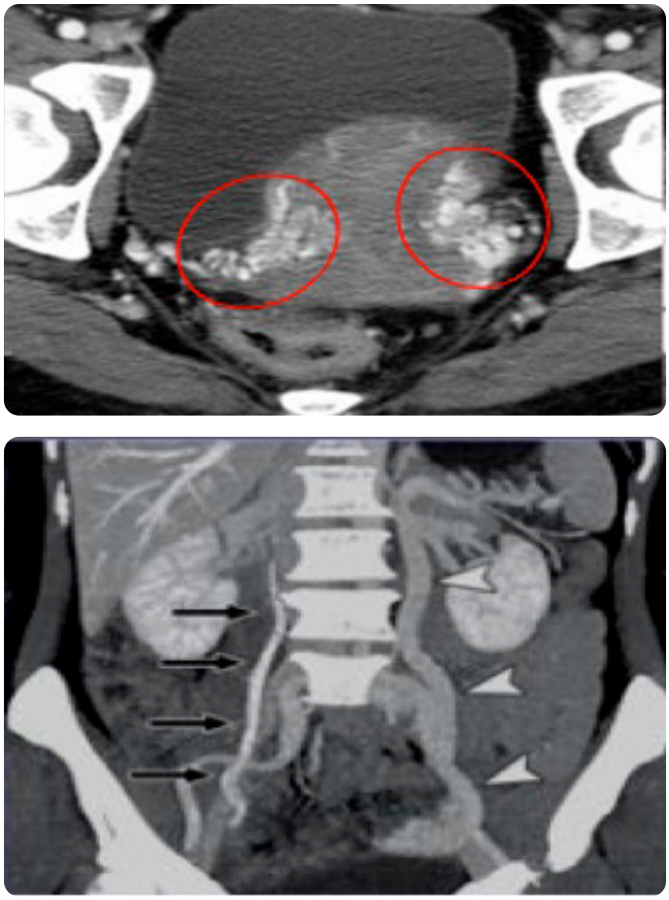

Figure 5. CT venography with contrast medium in axial and coronal sections: tortuous and dilated gonadal veins producing the syndrome of pelvic venous vascular congestion.
*Images 1, 4 and 5 are authors' own photographs. Images 2 and 3 were provided by the direct suppliers of the devices.

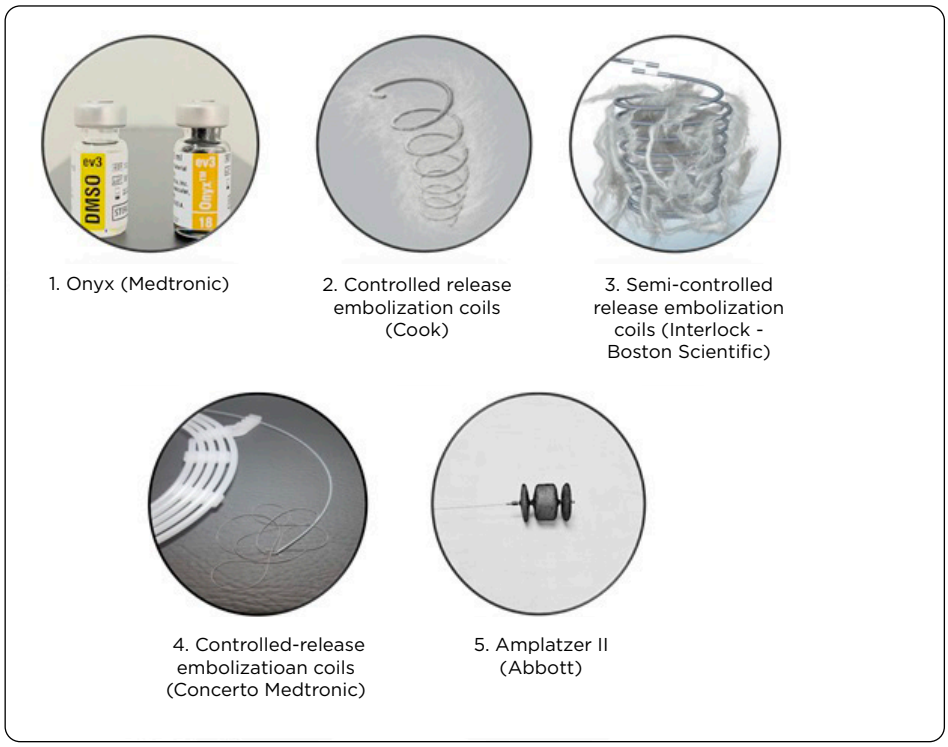

Figure 6. Different methods used for endovascular management of PBS.

Table 1 summarizes the diagnostic criteria for each imaging aid.

Table 1. Diagnostic criteria for imaging modalities in pelvic congestion syndrome

Imaging aid	Findings
Conventional venography	Dilated gonadal, uterine and utero-ovarian venous arcades. Diameter > 5 mm. Retrograde caudal flow in the gonadal vein (unilateral or bilateral). Filling of the pelvic veins past the midline through the utero-ovarian arcade. Opacification of vulvovaginal or thigh varices. Stagnation of contrast medium in the pelvic veins..
Transvaginal ultrasound	Multiple dilated parauterine varices. Diameter > 4 mm. Slow flow <= 3 cm/sec. Dilated arcuate vein in the myometrium crossing the midline. Polycystic configuration of the ovaries.
Transabdominal ultrasound	Retrograde flow in the dilated right or left gonadal vein. Dilated gonadal vein > 5 mm.
Magnetic resonance imaging	Retrograde caudal flow of contrast medium on TR-MRA. Dilated parauterine varices. Evidence of slow flow (heterogeneous or hyperintense on T2). Presence of arcuate vein crossing the midline, vulvar varices or thighs. Polycystic configuration of the ovaries. Absence of structural compression by anatomical alteration or obstructing mass. No evidence of endometriosis.
Computed tomography	Four ipsilateral parauterine veins tortuous and dilated (at least one greater than 4 mm). Dilated gonadal vein with a diameter greater than 8 mm unilateral or bilateral. Absence of structural compression by anatomic alteration or obstructing mass.

Source: Adapted from Bookwalter et al (5).

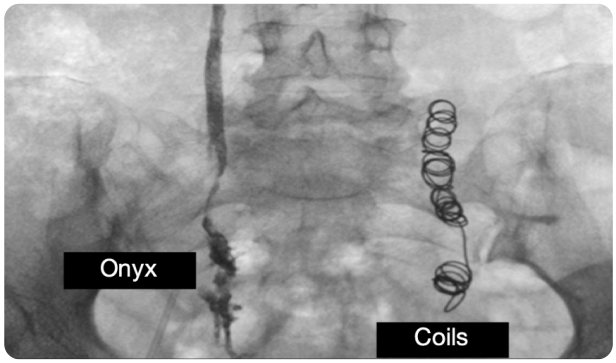

Figure 7. Venography in patient who was initially treated by PCS by means of embolization coils in the left gonadal vein and later with Onyx® (Medtronic) in the right gonadal vein.

Figure 8. a and b) Venography after selective embolization with Onyx® (Medtronic): adequate venous competence is shown after management. Embolization should start below the lower sacroiliac joint and conclude above the upper sacroiliac joint.

Treatment

For the treatment of PCS there are three management options: pharmacological, surgical and endovascular, with selective embolization. Among the alternatives in medical management are medroxyprogesterone acetate, GnRH analogues, phlebotonics and NSAIDs. The main associated adverse effects include weight gain, edema, night sweats and recurrence of pain on discontinuation of treatment. Surgical management includes two procedures: bilateral oophorectomy with or without hysterectomy, and transperitoneal ligation of the ovarian veins. The possible complications associated with these procedures are: deep vein thrombosis, retroperitoneal hematoma, paralytic ileus, mechanical ileus; in addition, it is associated with longer hospital stays and longer recovery time. Endovascular management with embolization has been shown to have higher success rates than pharmacological and surgical management (4, 5, 25).

Endovascular therapy by embolization was first described by Edwards et al. in 1993 (26) and since that time, through multiple investigations, has been established as the mainstay in the management of PCS due to its minimally invasive nature, low morbidity, short recovery, few days of hospitalization, improved pain, low rate of pain recurrence and complications (3, 13, 20, 27-31) (Figure 6).

The main complications associated with embolization are: migration of embolization coils to the pulmonary circulation, to the external iliac venous arch or to the renal vein, venous perforation, hematoma of the puncture site, and fever following embolization (4, 27). However, as mentioned, the complication rate is low (0-4%) (5, 18, 32).

Technically, the procedure can be performed using different materials such as sclerosing agents, embolization coils, Amplatzer® type plugs (Abbott) (33) or liquid embolic agents, such as Onyx® (Medtronic) (Figure 7).

A clinical trial published in 2013, in which 202 patients receiving embolization therapy for chronic pelvic pain secondary to PCS were followed for 5 years, documented 100% technical success and complete resolution of symptoms in 34%, as well as marked improvement in pain and quality of life. In addition, a low percentage (1.9 %) of major complications, due to migration of embolization coils, with no subsequent clinical significance (25).

On the other hand, in a retrospective study published in 2019, in which 17 patients were analyzed who underwent selective embolization using embolization coils embolization using embolization coils in the ovarian veins, pelvic veins, or both, and then resection of vulvar or thigh varicose bundles. A 100% technical success rate was obtained, with a median of one day of hospitalization, a median of 4 spiral hospitalization, a median of 4 embolization coils used in the procedure, marked improvement in pain and quality of life, and no recurrence of pain during 32 months of follow-up (3).

The main advantages of Onyx® (Medtronic) vs. embolization coils are: immediate occlusion, less time of rest for the patient after the procedure to be discharged, penetration to collateral vessels. Disadvantage: pain at the time of placement (Figure 8).

Advantages of embolization coils vs. Onyx® (Medtronic): No pain at the time of implantation and adequate occlusive effect in the vessel. Disadvantages: Risk of paradoxical embolization to the pulmonary circulation and the patient must rest more strictly than with the Onyx® (Medtronic).

The PCS embolization procedure can take anywhere from 15 to 90 minutes; it depends, of course, on the expertise and skill of the operator, the number of insufficient veins to be occluded, and the embolization materials used.

Patient recovery is usually 4 hours for those receiving embolization coils and Amplatzer® (Abbott), and one hour for those treated with Onyx® (Medtronic).

Post-embolization reinterventions are scarce and will depend on the patient being well embolized at the time of the procedure, taking into account the adequate assessment and identification of duplications of the gonadal veins and anatomical variants, for which a very good knowledge of the anatomy is required.

Regarding costs, the value of two embolization coils is equivalent to the cost of one Amplatzer® (Abbott) and one ampoule of Onyx® (Medtronic), clarifying that the variability in their value depends on the negotiation of each clinical institution with the industry.

Conclusions

In conclusion, PCS is a highly painful, disabling and important entity, and should be taken into account due to its high prevalence and associated morbidity. Correct diagnosis allows early intervention focused on symptom improvement and resolution. Endovascular treatment has proven to be a highly reliable, safe option, with low complication rates, shorter recovery time and shorter hospital stays compared to the surgical option; it is relevant to know the material and use it properly, which will help to avoid complication.

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