

Role of Trans-catheter Ovarian Vein Embolization in The Management of Symptomatic Chronic Pelvic Congestion in Females

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ABSTRACT

Background: Trans-catheter ovarian vein embolization has a role in the management of symptomatic chronic pelvic congestion in females.

Objective: To assess the technical success and short term clinical efficacy of trans-catheter ovarian vein embolization as a treatment for symptomatic pelvic congestion syndrome in women.

Methodology: Some of the cases are done at interventional radiology unit Ain Shams University and some of them are taken from literatures.

Conclusion: Ovarian vein embolization has a great role in the management of symptomatic pelvic congestion syndrome in women.

Keywords: Chronic pelvic pain (CPP), Pelvic congestion syndrome (PCS), Ovarian vein embolization (OVE).

INTRODUCTION

Chronic pelvic pain (CPP) is assumed to affect approximately 30% of all women in child bearing period and it accounts for almost 20% of outpatient gynecological appointments ⁽¹⁾.

Common causes of chronic pelvic pain are ovarian varicocele, endometriosis, pelvic adhesions, atypical menstrual pain, urologic disorders, irritable bowel syndrome, psychosocial issues ^(2,3) and pelvic and vulval varicosities, as well as many other causes. Despite the extensive diagnostic investigations and laparoscopic studies, the exact cause of CPP remains rather elusive. Pelvic congestion syndrome (PCS) takes place when varicosities develop around the ovaries in a presence of CPP. Like lower limb varicose veins pelvic varicosities are assumed to result from dysfunctional valves of the veins, refluxing blood flow, with venous engorgement. Congested pelvic veins may be very painful and account for approximately 30% of cases of CPP ⁽⁴⁾.

AIM OF THE WORK

The aim of this work is to assess the technical success and short term clinical efficacy of trans-catheter ovarian vein embolization as a treatment for symptomatic pelvic congestion syndrome in women.

The study was approved by the Ethics Board of Ain Shams University.

Anatomy of the pelvic venous drainage in females

The ovaries and uterus are drained by both the internal iliac and gonadal veins (**Fig 1**). The internal iliac vein passes slightly medial and

posterior to the internal iliac artery, joining the external iliac to form the common iliac vein. Its tributaries are divided into parietal and visceral. Parietal tributaries are the superior and inferior gluteal, sciatic, sacral, ascending lumbar, and obturator veins. Visceral tributaries are the uterine, gonadal, and vesicovaginal plexuses in women. In 27% of cases, the internal iliac vein drains by means of two separated trunks. Rarely, it can drain directly into the inferior vena cava (IVC). Valves are found infrequently on the internal iliac veins (10% of cases on the main trunk and 9% on its tributaries). Ovarian veins provide drainage of the parametrium, cervix, mesosalpinx, and pampiniform plexus, forming a rich anastomotic venous plexus with the paraovarian, uterine, vesical, rectal, and vulvar plexuses (**Fig 1**). Two or three trunks form a single ovarian vein at L4, with the left ovarian vein draining into the LRV and the right ovarian vein draining directly into the IVC in the majority of women. In up to 10% of women, the right ovarian vein may also drain into the right renal vein instead of the IVC ⁽⁵⁾.

Studies have shown that normal ovarian veins have an average diameter of less than 5 mm. Valves are present in these veins, mainly in the distal third. Ahlberg et al found no ovarian vein valves on the left side in 15% and none on the right side in 6%. In those in whom valves are present, they are incompetent in 40% on the left and in 35% on the right. Ovarian vein reflux has been reported in 10% of female renal transplant donors, up to 60% of whom develop PCS ⁽⁶⁾.

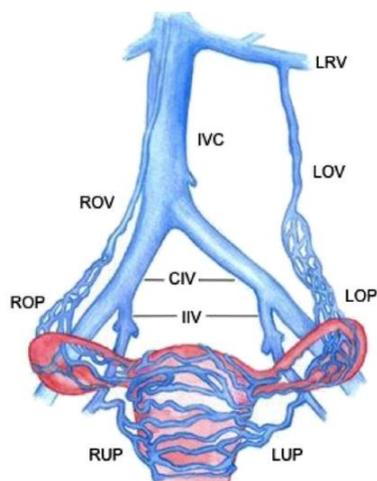


Figure (1): Pelvic venous anatomy. CIV, Common iliac veins; IIV, internal iliac veins; IVC, inferior vena cava; LOP, left ovarian plexus; LOV, left ovarian vein; LRV, left renal vein; LUP, left uterine plexus; ROP, right ovarian plexus; ROV, right ovarian vein; RUP, right uterine plexus. (Modified with permission. _ 2014 Intermountain Vein Center.) Quoted from Marlene *et al.*⁽⁵⁾ (2014).

Pathophysiology of Pelvic Congestion Syndrome

PCS accounts for up to 30% of patients presenting with chronic pelvic pain⁽¹⁾.

Risk factors for PCS

A combination of environmental, anatomic, and genetic risk factors contributes to the pelvic varicosities associated with PCS. Environmental factors include pregnancy, previous pelvic surgery, estrogen therapy, obesity, phlebitis, and engaging in careers that involve prolonged standing or heavy lifting⁽⁷⁾.

In PCS, the left ovarian vein is most commonly dilated, presumably because it joins the left renal vein at a right angle facilitating reflux. When the right ovarian vein is affected, its junction with the IVC is usually anomalous⁽⁸⁾.

Pathophysiology

Because of the paucity of functioning valves and the proximity of the pelvic veins to several structures, pelvic varicosities can develop by two mechanisms, reflux caused by incompetent valves and obstruction. The cause of valvular incompetence is unknown, although hormonal factors are thought to play a significant role. During pregnancy, estradiol inhibits vasoconstriction and induces uterine enlargement with selective dilation of the ovarian and uterine veins, placing more stress on the valves. Multiparous women are more likely to develop pelvic venous incompetence.

Conversely, vasoconstrictors have shown some efficacy in alleviating the symptoms of PCS by improving venous return through compression of the vein. In women diagnosed with PCS, the injection of dihydroergotamine produces a 35% reduction in diameter of the pelvic veins and a decrease in pain. Distal obstruction can lead to increased venous pressure and subsequent venodilation, valvular incompetence, and tortuosity of the ovarian vein, (**Fig. 2**) resulting in the development of an elevated pressure gradient between the LRV and the vena cava, a finding that is normally absent.

The presence of an elevated LRV-IVC pressure gradient may be suggestive of nutcracker syndrome, but not in isolation without symptoms or evidence of varicosities, as will be further discussed⁽⁵⁾.

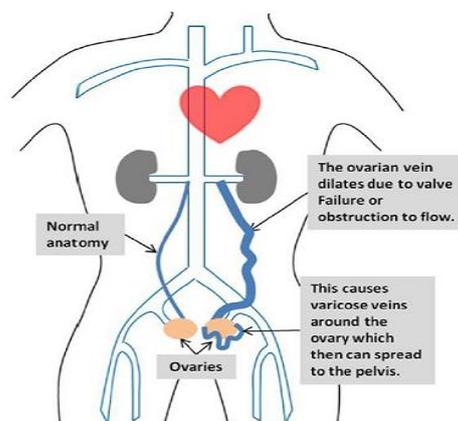


Figure (2) Dilated veins around ovary due to valve failure or obstruction to flow (C) spread of the varicose veins down the medial aspect of the inner thigh. Quoted from Saroj Das⁽⁹⁾ (2015).

PCS may also result from obstruction of ovarian vein outflow. The most common cause of obstruction is the compression of the LRV between the SMA and the aorta, also known as the nutcracker syndrome⁽¹⁰⁾.

Nutcracker syndrome refers to the compression of the left renal vein between the aorta and the superior mesenteric artery, which results in elevated left renal vein pressure and possible collateral vein development. Clinically, Nutcracker syndrome is characterized by intermittent hematuria with or without left flank or abdominal pain. The syndrome occurs in relatively thin patients and adolescents who often have an otherwise healthy medical history⁽¹¹⁾.

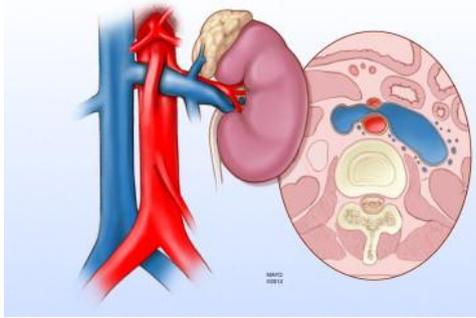


Figure (3) Nutcracker syndrome. Quoted from Sameh *et al.*⁽¹²⁾ (2013).

Diagnosis of Pelvic Congestion Syndrome
Clinical presentation of PCS:

Patients are most often multiparous, premenopausal females, ranging in age from 20 to 45 years. Symptoms include noncyclical, positional lower back, pelvic, and upper thigh pain. Pain is exacerbated before or during menses and may be associated with dyspareunia and prolonged postcoital discomfort. Symptoms are generally most severe at the end of the day, exacerbated by standing or heavy activity, and are diminished with supine positioning. Other complaints may include lumbosacral neuropathy, urinary frequency, and generalized lethargy⁽¹¹⁾.

Imaging Diagnosis of Pelvic Congestion Syndrome:

Pelvic ultrasound (US) and/or computed tomography (CT) scan are usually the first imaging modalities in the evaluation of patients with chronic pelvic pain. Both provide excellent resolution of the uterus. Although a CT scan has greater sensitivity for showing varicosities throughout the lower pelvis⁽¹³⁾. Transvaginal US provides detailed assessment of the pelvis and identification of varices and is aided by the ability to alter the position of the patient. Furthermore, the use of color duplex Doppler flow imaging increases the sensitivity of detecting varicosities (Fig. 4). The criteria for identifying PCS on US are dilation of pelvic veins to > 6 mm, reversal of the flow within ovarian veins, polycystic changes within the ovaries, and dilated veins in the myometrium⁽¹⁴⁾.

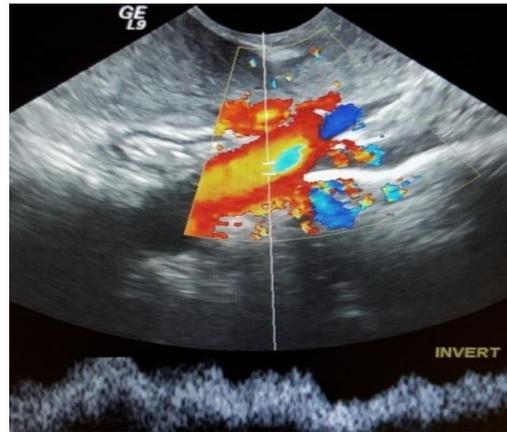


Figure (4) TVUS demonstrates dilated paraovarian veins. Done at interventional radiology unit Ain Shams University.

The advantage of computed tomography and magnetic resonance imaging over US is the ability to provide a more comprehensive assessment of the pelvic anatomy with multiplanar imaging and reconstruction, which is non operator dependent. Cross-sectional imaging also has a role in procedural planning. Varices are identified as serpiginous structures in the region of the adnexa (Fig. 5 & 6).



Figure (5) CT demonstrates varices as serpiginous structures in the region of the adnexa (arrowheads). Quoted from Neil Rane *et al.*⁽¹⁵⁾. (2013).

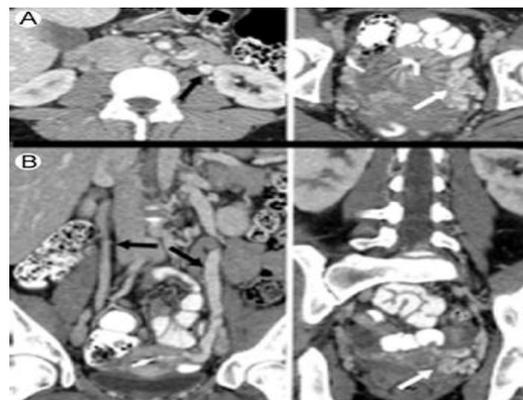


Figure (6): Axial (A) and coronal (B) CT images demonstrating the classic anatomical findings of pelvic congestion syndrome. Note the markedly dilated ovarian veins (black arrow) and numerous deep pelvic varicosities (white arrows). Quoted from Sonya Koo *et al.*⁽¹⁶⁾. (2014).

Conventional Catheter Venography still remains the 'gold standard', however it is rarely performed solely in a diagnostic context at our institution. It is performed immediately before embolization to confirm PCS and assess the venous anatomy for procedural planning.

Presence of one or more of these venographic findings suggests PCS

1. Dilation of the ovarian vein (diameter >6 mm)
2. Ovarian vein reflux
3. Uterine vein engorgement
4. Congestion of the ovarian venous plexus
5. Filling of pelvic veins across midline
6. Filling of vulvovaginal or thigh varicosities

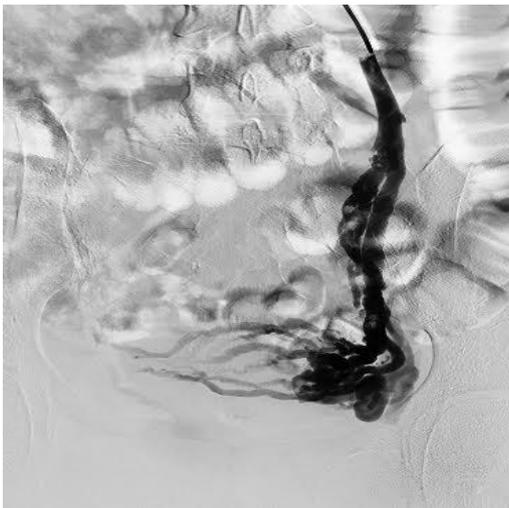


Figure (7): Left ovarian vein reflux. Done at interventional radiology unit Ain Shams University.

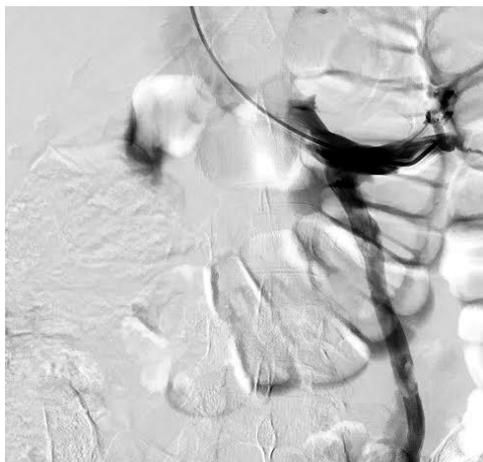


Figure (8): Ovarian vein diameter > 6mm. Done at interventional radiology unit Ain Shams University.

Technique of Ovarian Vein Embolization

The technique of trans-catheter embolotherapy for ovarian and pelvic varices is usually straight forward. The ovarian and internal iliac veins may be approached from a jugular,

antecubital or femoral approach; according to operator preference. A 7 French (7 F) vascular sheath is placed in the desired vein and a 5 F Cobra head in femoral or Vertebral in Jugular or arm vein is used to select the left renal vein. After an interval of 3 to 5 minutes, the main left ovarian vein is occluded using coils (**Fig. 9**)⁽¹³⁾.

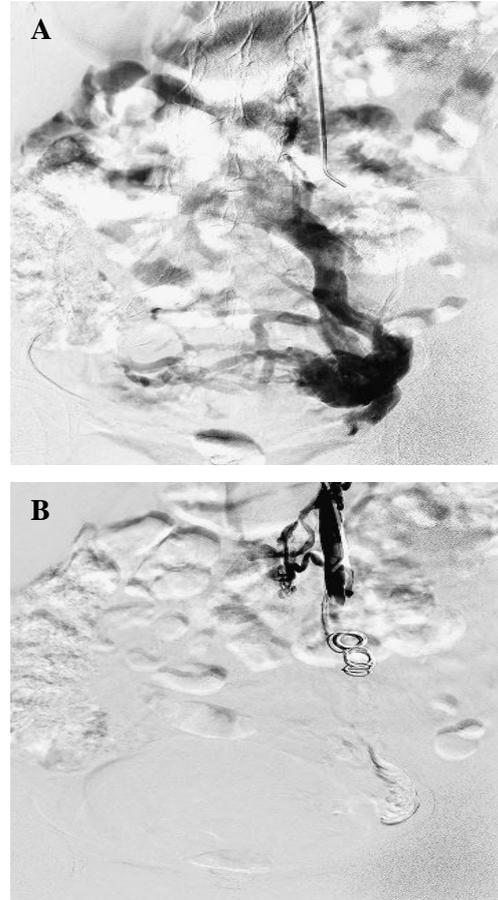


Figure (9):
(A) Left paraovarian varicosities.
(B) After coiling of the left ovarian vein. Done at interventional radiology unit Ain Shams University.

s University.

Other embolic agents including sclerosants and glue have also been detailed in the literature. From the inferior vena cava, the right ovarian vein is selectively catheterized using a Simmons I or II catheter. A second catheter is then advanced coaxially over a guide wire down into the right pelvic varices. The embolization procedure is then repeated. Given the communications that exist between ovarian veins and internal iliac veins, bilateral venography and embolization of both ovarian and internal iliac veins is required to reduce the theoretical chance of recurrence (**Fig. 10 and 11**)⁽¹³⁾.

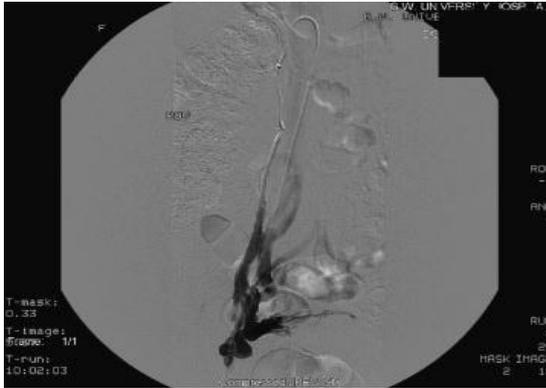


Figure (10): Right ovarian venogram. (Quoted from Elizabeth *et al.*⁽¹⁴⁾.(2008).



Figure (11): Right pelvic varices. Quoted from Elizabeth *et al.*⁽¹⁴⁾. (2008).

To evaluate the internal iliac veins, it may be helpful to advance a balloon catheter. The balloon is inflated at the proximal vein, and venogram performed through the end hole of the catheter. This allows for improved visualization of the vein's course and caliber.

Complications

Venous puncture related, e.g. haematoma, pneumothorax (for venous catheterization via a neck vein).

- Embolization of non-target vessels, i.e. coil misplacement, e.g. left ovarian vein involving left renal vein.
- Caution is advised with liquid embolic agents as communications have been shown to exist between the ovarian veins and paravertebral veins and between the left ovarian vein and splenic, ureteric and inferior mesenteric veins⁽¹⁵⁾.

CONCLUSION

- PCS remains an underdiagnosed cause of chronic pelvic pain because of the difficulty in identifying ovarian vein reflux in patients who are supine.
- Vascular surgeons in academic and community settings can improve the diagnosis of PCS by educating primary care physicians through in-service or continuing education seminars on the signs and symptoms of PCS.

- Because PCS is frequently a diagnosis of exclusion, an awareness of its prevalence within the primary care patient population can increase the referral of appropriate patients to vascular specialists for further workup. Once diagnosed, patients with PCS should be offered embolotherapy as a primary treatment option. Although conservative medical therapy with MPA or GnRH agonists has been reported, its effects are limited.

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