BOOK CHAPTER

Pelvic Venous Flow Disorder (/ui/service/content/url?eid=3-s2.0-B9781455709847002921)

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Pelvic venous flow disorder represents a group of venous maladies characterized by alterations in normal pelvic venous flow patterns. These maladies include pelvic congestion syndrome, nutcracker syndrome, and May–Thurner syndrome.

Pelvic venous flow disorder is a significant cause of chronic pelvic pain, defined as noncyclical pelvic pain of longer than 6 months' duration. An audit of primary care physicians in the United Kingdom found that the prevalence of chronic pelvic pain in women ages 15 to 73 years is similar to that of asthma and low back pain. Such chronic pelvic pain could affect more than 9 million women between 18 to 50 years of age in the United States and can cause lower general health, emotional well-being, and physical well-being scores and higher pain scores as documented by the SF-36 general health survey.

Pelvic venous flow disorder is often neglected in the differential diagnosis of chronic pelvic pain. The lack of a diagnosis among these patients often results in continued inappropriate diagnostic testing and ineffective treatments that could add nearly $1 billion dollars in expenditures to the health care system according to the Agency for Health Research and Quality.

In addition to chronic pelvic pain, pelvic venous flow disorder is also a cause of recurrent varicose veins of the lower extremities. Continued treatment of lower extremity varicose veins without the identification of pelvic reflux channels yields only temporary improvement. Reflux of venous blood from the pelvis to the leg can cause venous hypertension in either the superficial or deep systems, depending upon the pathways involved. Because pelvic venous flow disorder has an adverse impact upon such a large patient population, it is imperative that vascular specialists develop an understanding of the disorder, best diagnostic approaches, and effective therapies.

Venous Anatomy of the Pelvis

The venous drainage from the pelvis, as in the other areas of the body, is compartmentalized. There are the musculoskeletal compartment, consisting of the external iliac venous systems interconnected with the gluteal and pelvic floor muscles, and the visceral compartment, consisting mainly of the reproductive organs, the bladder, and the rectum.

Despite the general separation of these venous drainage pathways, there are areas of interconnections. The venous return from the perineum and vulva drains into both the greater saphenous vein in the area of the saphenofemoral junction and into the internal pudendal vein, which traverses the pelvic floor and merges with the inferior rectal vein carrying blood into the internal iliac vein. Reflux within this network can direct pelvic venous outflow into the greater saphenous vein.

The inferior gluteal vein is formed from the coalescence of small veins in the superior posterior thigh that are part of an anastomotic network with the lateral circumflex femoral vein, a tributary of the deep femoral vein. Thus, the inferior gluteal vein represents a connection between the deep femoral vein and the pelvic venous drainage system. This pathway may be a cause of recurrent varicose veins of the posterior lateral thigh.

The obturator vein collects blood from the superior, posterior, and medial thigh through connections with the medial circumflex femoral vein and carries it into the pelvis through the obturator foramen, establishing another communication between the pelvis and the lower extremity. There may also be a pubic vein, which represents a direct connection between the obturator vein and the external iliac vein. These pathways might also allow reflux of pelvic venous blood into the lower extremity.

The left ovarian vein is formed from the coalescence of veins of the pampiniform plexus within the mesosalpinx. This larger single vein travels superiorly out of the pelvis and joins the left renal vein. There is generally a single valve within the left ovarian vein located just proximal to its junction with the renal vein, which prevents reflux of blood from the left renal vein into the ovarian vein and the pelvis. The anatomy of the right ovarian vein is similar except that it directly enters the inferior vena cava below the level of the right renal vein.

The uterus, capable of dramatically increasing its blood flow during pregnancy, has two venous outflow pathways. The myometrium has numerous veins that form a broad plexus on the outer surface of the organ. These smaller veins coalesce to form bilateral uterine veins that travel through the broad ligaments to join the internal iliac veins. Superiorly, the venous plexus on the surface of the uterus also forms tributaries that merge with the ovarian venous plexus within the mesosalpinx. Valves are uncommonly found within these venous outflow tracts, allowing uterine blood to drain either through the uterine or ovarian veins.

The rectal venous plexus communicates directly with the internal iliac vein through the internal pudendal vein and with the uterine, vaginal, and bladder venous outflow tracts anteriorly through collaterals, unifying this visceral compartment.

These venous pathways provide not only direct flow patterns for venous drainage of the structures of the pelvis but also collateral pathways for drainage of the legs. Few valves are present within the major veins of the pelvis. Although the absence of valves within these major veins might allow some lateral movement of blood, general principles of venous drainage apply: The direction of venous outflow from the lower extremities and pelvis should be cephalad, blood should flow from smaller veins to larger veins, and venous drainage on each side of the pelvis should be equal and adequate and there should be little blood forced across the midline to drain through the contralateral venous system. The hallmarks of pelvic venous flow disorder are the movement of venous blood from larger veins into smaller veins, the presence of serpentine varicose veins within the pelvis, and venous flow crossing the midline and returning through the contralateral venous system. These abnormalities are often the cause of chronic pelvic pain, recurrent thigh varicose veins, or left leg edema.

Pathophysiology

Although there are likely many as yet undefined causes of pelvic venous flow disorder, there are two known etiologies: loss of ovarian vein valvular function and overload of the internal iliac venous system. Either of these causes can lead to abnormal pelvic venous flow patterns, pelvic varicose veins, or reflux into the lower extremity venous system and lower extremity varicose veins.

The presence of isolated retrograde flow in the ovarian vein is not sufficient for the diagnosis of pelvic venous flow disorder or pelvic congestion syndrome. Pelvic congestion syndrome is identified by reflux in the ovarian vein that flows into ipsilateral varicose veins and then continues to flow across the pelvis to drain through the contralateral pelvic venous system. Retrograde flow through the left ovarian vein can be caused by primary valvular incompetency, pregnancy, or nutcracker syndrome, which cause valvular dysfunction, venodilation, and retrograde flow into the pelvis. The driving pressures from the left renal vein enhance reflux through the ovarian vein, into the pampiniform plexus, and then into the presacral or uterine venous collaterals to drain via the contralateral internal iliac vein or into the superficial or deep systems of the lower extremity (Figure 1 (f0010)).

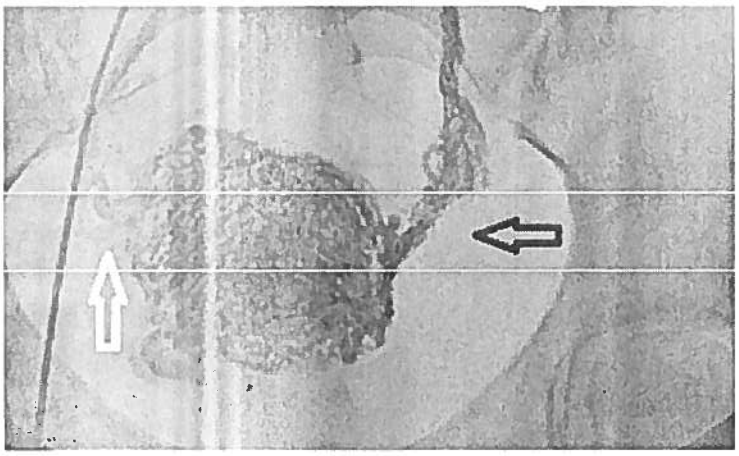

FIGURE 1

The most common form of pelvic venous flow disorder involves reflux through a dilated left ovarian vein *(horizontal white arrow)*, crossing the pelvis through the pampiniform plexus and small veins of the uterus *(black arrow)*, and flowing into the contralateral internal iliac vein through the uterine vein *(vertical white arrow)*.

Similarly, May–Thurner syndrome can force significant amounts of venous blood from the left lower extremity into the ipsilateral internal iliac vein, overloading this venous pathway. The result is that venous blood from the left lower extremity descends through the left internal iliac vein, crosses the pelvis through transpelvic collaterals, and exits through the right internal iliac vein (Figure 2 (f0015)). When these pathways are well developed, there is often minimal edema of the left leg but increasing episodes of pelvic discomfort. In a review of 50 computed tomography (CT) scans obtained in the emergency department to evaluate abdominal or pelvic pain without left leg pain, 66% were noted to have moderate or severe left common iliac vein compression.

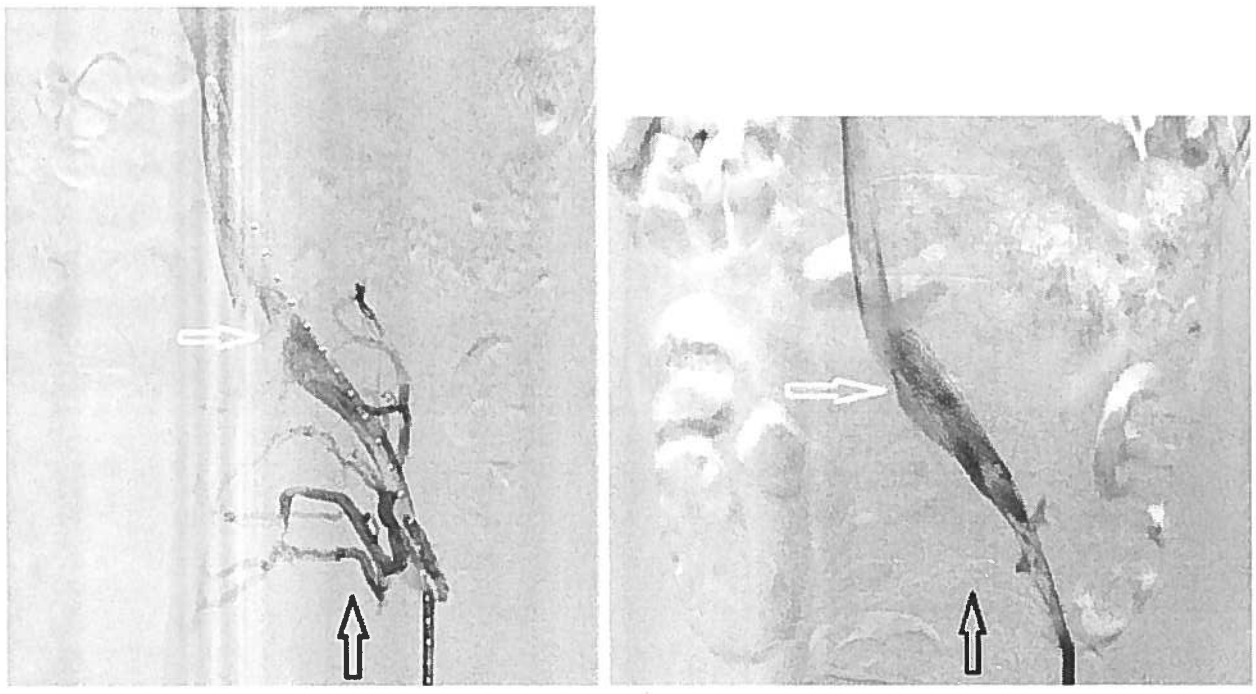

FIGURE 2

A, May–Thurner syndrome is caused by compression of the left common iliac vein by the right common iliac artery *(white arrow)*. This compression can force left lower extremity venous outflow through transpelvic collaterals *(black arrow)* into the right internal iliac vein, with drainage through the right common iliac vein. B, After stent placement into the left common iliac vein *(white arrow)*, the venous outflow of the left lower extremity has normalized, with no venous flow forced through pelvic collaterals *(black arrow)*.

Symptoms

The symptoms of pelvic venous flow disorder depend upon the patterns of abnormal venous flow, as noted in Table 1 (t0010) . Women who develop reflux in the left ovarian vein as a result of pregnancy-induced valvular dysfunction with flow through the small veins of the pampiniform plexus often have pain in the region of the left ovary. The same principles apply to the right ovarian vein. Patients with nutcracker syndrome most often experience left flank pain caused by left renal vein distention before developing left back and then pelvic pain. The chronology of symptoms relates to the site of abnormal venous engorgement, with back pain caused by distention of the left ovarian vein and pelvic pain resulting from the pampiniform plexus. Patients with May–Thurner syndrome often have pain with sitting or walking because of increased venous return from the leg flowing though the pelvis.

TABLE 1

Symptoms Associated with Various Causes of Pelvic Venous Flow Disorder

Symptoms	May–Thurner Syndrome	Nutcracker Syndrome	Gonadal Vein Reflux
Pain with standing	++	+++	+/–
Pain with sitting	+++	++	+/–
Pain with walking	+++	++	+/–
Dyspareunia	–	+/–	+++
Postcoital pain	–	–	+++
Hematuria	–	+++	–
Left flank pain	–	+++	–
Pain when supine	–	++	+

Diagnosis

Diagnostic studies are directed toward understanding the scope of the reflux problem. Although magnetic resonance venography and pelvic CT scanning can identify large pelvic varicose veins, routine use of these tests is unwarranted. These tests are costly, provide little information about flow patterns within the pelvic veins, and yield insufficient information to develop a complete treatment plan.

When the presenting symptoms include recurrent varicose veins of the thigh or perineum or intermittent left leg edema, venous duplex reflux studies are performed to determine the status of the superficial and deep venous systems of the leg and to note possible routes of pelvic flow into the thigh. Special attention is paid to the saphenofemoral junction and the deep femoral system.

Women who come to the hospital with symptoms of chronic pelvic pain of unknown etiology after a complete gynecologic evaluation are studied first with transvaginal ultrasound performed in 20 degrees of reverse Trendelenburg position to identify varicose veins within the pelvis. The veins of the perineum are also evaluated at this time to determine whether there is reflux through the external pudendal veins.

All patients are evaluated with abdominal and pelvic venography performed in 20 degrees of reverse Trendelenburg positioning to visualize the inferior vena cava; left renal vein; both ovarian veins; the common, external, and internal iliac veins; and the common femoral veins. Hand injection of contrast is used to avoid forcing the retrograde flow of contrast into the ovarian or pelvic veins. When nutcracker or May–Thurner syndromes are suspected, pressures are measured across the area of compression. A noncontrast CT scan of the abdomen can be a helpful confirmatory test to establish the diagnosis of the nutcracker syndrome.

Treatment

Once pelvic venous flow disorder has been identified, treatment is based upon the identification of causative factors. Hormone therapy, often used in women with chronic pelvic pain, is of little benefit. The goal of treatment is occlusion of the abnormal refluxing veins using occlusion coils, sclerotherapy, laparoscopically placed clips, or surgical ligation. Patients with chronic pelvic pain over the area of the left ovary from reflux in the left ovarian vein are most commonly treated simply with coil occlusion of the vein. Those who have multiple abnormal venous collaterals causing uterine venous congestion or recurrent thigh varicose veins may be treated with sclerotherapy of the collateral pathways prior to coil occlusion of the ovarian vein. Patients with the nutcracker syndrome undergo stenting or

reimplantation of the left renal vein and coil occlusion of the left ovarian vein, and those with May–Thurner syndrome have a left common iliac vein stent with sclerotherapy of abnormal cross-pelvic collaterals if venous outflow from the left leg has not normalized after stenting.

Results and Outcomes

The technical success for coil occlusion of the gonadal vein approaches 100% in almost all series. Closure of the ovarian vein and abnormal pelvic venous flow channels significantly reduces pelvic pain in more than 80% of those with chronic pelvic pain. Eradication of such abnormal refluxing pathways also can reduce the likelihood of recurrent thigh varicose veins when combined with sclerotherapy of the lower extremity varicose veins (Figure 3 (f0020)). Treatment of May–Thurner syndrome by stent placement into the left common iliac vein to reduce or eliminate compression is effective therapy, normalizing pelvic venous flow and providing complete relief in more than 80% (see Figure 2 (f0015)). Similar results can be expected with left renal vein stent placement for the nutcracker syndrome.

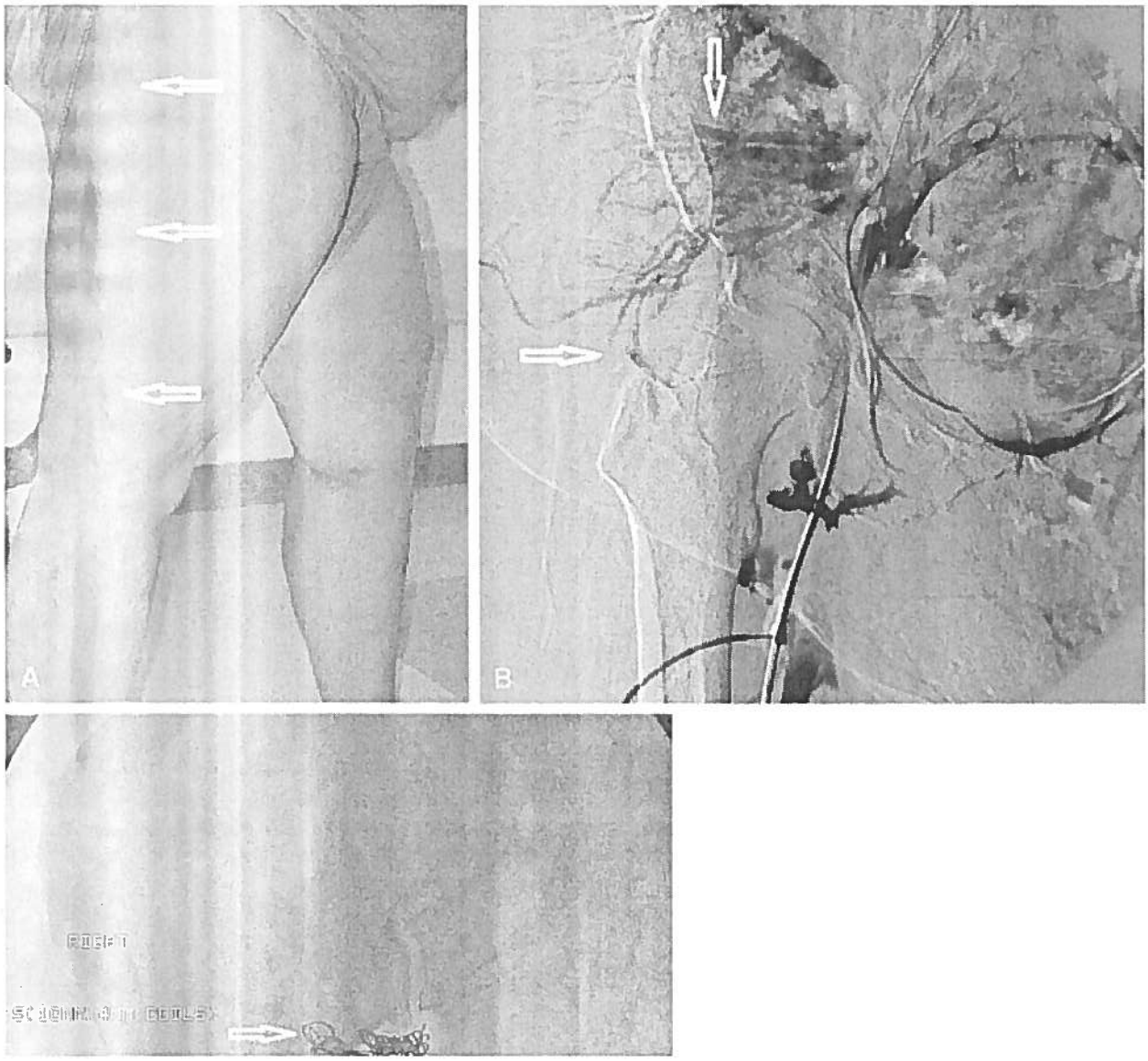

FIGURE 3

A, Patients with recurrent thigh varicose veins, especially along the posterolateral or the anteromedial areas of the thigh, have a high likelihood of having pelvic venous flow disorder with reflux into the leg. **B,** The pathways of reflux into the leg can be identified by tilt-table pelvic venography. *Arrows* point to the inferior gluteal veins, which form an anastomotic network with the lateral femoral circumflex vein to permit reflux into the superior posterolateral thigh. **C,** Coil occlusion of the refluxing pelvic collaterals before eradication of the lower extremity varicose veins significantly reduce the likelihood of lower extremity recurrence.

Complications of treatment of pelvic venous flow disorders are uncommon, occurring in less than 1%. The most common complication of treatment is dislodgment of coils that embolize to the lungs. Such embolization is generally not clinically significant. In the absence of symptoms, retrieval of dislodged coils from the lung is not necessary.

Recurrence of pelvic venous flow abnormalities is also uncommon. Less than 5% of patients undergoing comprehensive treatment of pelvic venous flow disorder have a recurrence within 4 years.

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