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## **A Systematic Review of Diagnostic Methods for Pelvic Venous Insufficiency**

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## **Abstract**

Pelvic venous insufficiency (PVI) is a recognized contributor to chronic pelvic pain (CPP). Diagnosing PVI can be challenging due to its often subtle and non-specific presentation. While both men and women can be affected, PVI is more prevalent in women, potentially due to hormonal fluctuations and the physiological effects of pregnancy. Transabdominal ultrasound (US) remains the first-line non-invasive imaging modality for PVI evaluation. However, magnetic resonance imaging (MRI) and magnetic resonance venography (MRV) play an increasingly important role in confirming the diagnosis, particularly in select patient populations where US findings are inconclusive. This article will delve into the various diagnostic techniques employed for PVI, analyzing their efficacy and limitations to guide optimal diagnostic approach.

**Key words:** pelvic venous insufficiency; chronic pelvic pain; pelvic congestion syndrome; pelvic varices

## **Introduction**

Pelvic venous insufficiency (PVI) is usually associated with pregnancy and postpartum discomfort. However, recent evidence suggests that PVI can manifest well before pregnancy and contribute to a variety of symptoms. A significant challenge in diagnosing PVI lies in the diverse presentation of symptoms, leading women to seek help from a wide range of specialists <sup>1</sup>.

## **Definition**

Chronic pelvic pain is a prevalent and under-recognized health concern. CPP is defined as persistent pain localized to the pelvis that lasts for at least six months. The condition significantly impacts quality of life and daily activities <sup>1</sup>. Pelvic congestion syndrome (PCS), first described by Louis Alfred Richet in 1857, is a potential cause of CPP <sup>2</sup>. It manifests as chronic pelvic pressure and dull ache, often without an identifiable explanation <sup>2</sup>. The condition is caused by the presence of abnormal, dilated ovarian veins and venous plexus. This leads to constricted blood drain and a blood retention within the pelvis. The definition of pelvic venous insufficiency (PVI) is connected to the pathophysiological background. This impaired venous return, often associated with incompetent pelvic veins, results in slower or even retrograde blood flow <sup>1,2</sup>.

## **Epidemiology**

Pelvic venous insufficiency (PVI) is often overlooked during differential diagnosis for chronic pelvic pain (CPP) <sup>1</sup>. While data on the overall prevalence of CPP is readily available, pinpointing the exact prevalence of PVI within the CPP population remains a challenge <sup>3</sup>. Studies suggest that CPP affects up to 39% of women at some point in their lives, with PVI contributing to an estimated 16-31% of these CPP cases <sup>1</sup>.

## **Etiology**

The etiology of pelvic venous insufficiency is multifaceted. Several factors may contribute, including primary vulvar insufficiency, familial history of varicose veins, hormonal imbalances, previous pelvic surgeries or pregnancies in the past <sup>2</sup>. Several venous compression syndromes, such as Nutcracker syndrome or May-Thurner syndrome, can also contribute to PVI symptoms <sup>4</sup>.

## **Symptoms**

Pelvic venous insufficiency symptoms are often non-specific and can overlap with those of other conditions:

- a prolonged and painful menstrual period

- pain may be localized to the lower pelvis, particularly around the urethra and vulva, and can worsen with prolonged sitting, standing, or in the evening <sup>1</sup>
- pricking, pruritus, burning sensation and discomfort in the pelvis minor <sup>5</sup>
- low back pain specially during first days of menstruation <sup>6</sup>
- left flank pain<sup>7</sup>, varicose vein of the abdomen
- dyspareunia, characterized by pain during sexual intercourse, is a frequently reported symptom associated with pelvic venous disorders <sup>8-10</sup>
- telangiectasias may be present on the posterior thigh and medial lower leg <sup>11</sup>
- vulvar and perineal varicosities <sup>12,13</sup>
- lower extremity and perineal heaviness <sup>14</sup>

### **Imaging Diagnosis**

Several diagnostic methods exist to identify pelvic venous insufficiency. The primary objective is to detect and localize affected venous regions. Imaging techniques play a crucial role in visualizing venous obstruction and reflux <sup>14</sup>.

### **Ultrasound**

Ultrasound is a widely used and non-invasive imaging modality for pelvic venous insufficiency diagnosis. A significant advantage is the absence of radiation exposure <sup>2</sup>. Doppler ultrasound offers a valuable advantage by providing hemodynamic information, including the ability to distinguish between retrograde and antegrade venous flow. During a pelvic ultrasound examination, both transabdominal and transvaginal probes can be utilize <sup>15</sup>. Transvaginal ultrasound can identify multiple dilated, tortuous veins surrounding the uterus and ovaries <sup>2</sup>.

Several established sonographic criteria can be used to diagnose pelvic varices:

- visualization of dilated ovarian veins with a diameter greater than 4mm
- slow blood flow (< 3 cm/s)
- dilated and tortuous arcuate veins within the myometrium communicating with pelvic varicose veins
- reversed or retrograde venous blood flow in the left ovarian vein

Studies suggest a correlation between pelvic vein diameter and the presence of ovarian reflux. Generally, vein dilatation exceeding 8 mm is associated with both symptoms and reflux, while diameters between 4-8 mm may be asymptomatic <sup>16</sup>. However, Dos Santos et al. reported no significant difference in diameter between ovarian veins with and without reflux <sup>17</sup>. This

finding suggests that vein diameter alone may not be a reliable indicator of ovarian venous reflux.

Pelvic vein collapse during supine positioning is a well-documented phenomenon. Therefore, several studies recommend examining patients in an upright stance during duplex ultrasound to improve visualization of pelvic veins<sup>18</sup>. Doppler waveforms in the dilated pelvic veins may reverse during an upright positioning or Valsalva maneuver. A comprehensive pelvic vein duplex examination should encompass the inferior vena cava, common iliac veins, and renal veins to rule out venous obstruction at these locations. Furthermore, for patients suspected of pelvic congestion syndrome, a lower extremity duplex scan is recommended, even in the absence of lower extremity symptoms<sup>19,20</sup>. This assessment helps identify potential reflux in the common femoral vein leading to the perineum, which may contribute to pelvic symptoms. Patients with pelvic venous insufficiency (PVI) may be more likely to have polycystic ovary syndrome (PCOS), a thicker endometrium, and uterine enlargement<sup>17</sup>.

Recent data highlight the limitations of duplex ultrasound in diagnosing dilated ovarian veins. While sensitivity for detecting a dilated left ovarian vein (LOV) was 100%, it was only 67% for the right ovarian vein (ROV)<sup>21</sup>. Specificity, indicating the ability to correctly identify normal veins, was also lower for LOV (57%) compared to ROV (90%)<sup>21</sup>. These findings emphasize the need for additional diagnostic tools alongside vein diameter measurements.

Ultrasound, while a valuable tool for PVI diagnosis, has limitations. Patient factors such as body habitus and bowel gas can impede image quality. Additionally, operator skill plays a significant role in accurate interpretation of ultrasound findings. While some experts suggest that highly skilled ultrasonographers may obviate the need for cross-sectional imaging<sup>22</sup> in certain cases, this approach should be undertaken with caution.

### **MRI/MRV**

Magnetic resonance imaging (MRI) offers high-quality images, enabling detailed visualization of pelvic anatomy and accurate organ depiction. However, a potential limitation of MRI for PVI diagnosis is the underestimation of pelvic venous plexus extent and gonadal vein dilatation in the recumbent position<sup>23</sup>. Studies report a wide range of sensitivity (88-100%) and specificity (38-75%) for MRI in PVI diagnosis<sup>23,24</sup>. An additional benefit of MRI is its ability to identify alternative causes of chronic pelvic pain, including gastrointestinal, urologic, myalgic, or uterine conditions. MRI can also reveal signs suggestive of endometriosis that may not be visible on ultrasound<sup>2</sup>.

Modern magnetic resonance imaging (MRI) techniques facilitate the visualization of pelvic varices, iliac vein reflux, and ovarian vein reflux. Static MRI sequences of the pelvis are valuable in excluding other non-vascular causes of pelvic pain. However, they cannot directly depict or quantify ovarian vein reflux.

MR venography (MRV) with T1-weighted coronal 3D gradient echo sequences and intravenous gadolinium contrast offers multi-phase assessment of both superficial and deep pelvic veins. Time-resolved angiography (TR-MRA) emerges as a particularly promising technique for PVI diagnosis. Compared to conventional venography, TR-MRA demonstrates superior capability in visualizing retrograde flow within ovarian veins. This technique can detect not only dilated, competent ovarian veins but also non-dilated, incompetent veins, enhancing diagnostic accuracy <sup>25</sup>.

TR-MRA utilizes various sequences, including TWIST (Time-Resolved Angiography with Interleaved Stochastic Technique), 4D-TRAK (Time-Resolved Angiography with central Key-hole Acquisition), and TRICKS (Time-Resolved Imaging of Contrast Kinetics), all of which facilitate visualization of pelvic varices and reflux <sup>22,26</sup>. Additionally, phase-contrast velocity mapping (PCVM) allows evaluation of both the direction and velocity of venous flow, providing valuable hemodynamic data <sup>22</sup>.

On T1-weighted images pelvic varices and ovarian veins are hypointense. Dilated pelvic and ovarian veins are hyperintense on T2-weighted images and have a lessened flow celerity <sup>27</sup>. During MR imaging, pelvic varices emerge as many dilated formations around uterus and ovaries. They are hyperintense on T2-weighted images and hypointense on T1-weighted images <sup>2</sup>. Dilated pelvic and ovarian varices are best visualized in the venous phase on T1-weighted gradient-echo MR images with contrast <sup>28</sup>. Retrograde filling of the ovarian veins from the renal veins may be demonstrated in the MRI late arterial phase. Pelvic varices can vary in number and size, and they may extend into the broad ligament <sup>2</sup>. Additionally, they may enlarge and connect with other nearby venous plexuses.

While conventional venography remains the gold standard for diagnosing pelvic venous insufficiency, it is an invasive procedure. The diagnostic criteria for PVI include <sup>1</sup>:

- retrograde flow in gonadal veins
- more than 5 mm dilatation of the ovarian and uterine veins
- opacification of thigh and vulvar varices
- stasis of contrast material in pelvic venous plexus

- through the utero-ovarian arcade to the opposite side flow of contrast material is retrograde <sup>29</sup>

Studies comparing the sensitivity, specificity, and accuracy of TR-MRA and conventional venography suggest that TR-MRA is a promising non-invasive alternative for diagnosing pelvic venous reflux in patients with suspected venous disorders <sup>30</sup>. Recent research supports the use of non-invasive imaging modalities for accurate PVI diagnosis. Demonstration of reflux in one or both gonadal veins is a key diagnostic feature for PVI.

### **Computer Tomography**

Computed tomography (CT) scans are less frequently employed for PVI diagnosis due to their use of ionizing radiation, which is generally avoided as a first-line option for women of reproductive age. While CT scans of the abdomen, pelvis, and thighs can explore pathology across various regions, they typically involve supine patient positioning, similar to MRI. Despite limitations in patient positioning, CT scans offer good sensitivity for imaging lower pelvic varices compared to Doppler ultrasound. However, magnetic resonance venography (MRV) demonstrates superior sensitivity for diagnosing pelvic venous disorders <sup>31</sup>. Undoubtedly, CT scans can be highly valuable in investigating other potential causes of pelvic pain. They may also be considered as a reasonable alternative for patients who cannot undergo MRI or when ultrasound examination proves inadequate.

### **Venography**

Catheter venography, although an invasive procedure, remains the gold standard for diagnosing pelvic venous insufficiency (PVI). This technique utilizes ionizing radiation and involves direct catheterization of a specific vein for contrast injection. Catheter venography facilitates a comprehensive evaluation, including:

- venous hemodynamics: measurement of venous pressure and performance of provocative maneuvers <sup>13</sup>
- venous patency: assessment of vein blockage or obstruction
- venous malformations: identification of abnormal vein development

Venography is typically reserved for situations where non-invasive imaging modalities (e.g., ultrasound, MRI) yield inconclusive or equivocal results.

Venography can confirm various features suggestive of PVI, including dilated ovarian veins (at least 5 mm in diameter), ovarian vein reflux with retrograde flow, uterine venous

engorgement, and vulvar and thigh varices <sup>31</sup>. However, the presence of all these findings is not mandatory for treatment consideration. Diameter measurement alone should not be the sole determinant for treatment planning. Clinical symptoms play a crucial role. A study demonstrated that nearly half (47%) of asymptomatic women had dilated ovarian veins and reflux on CT scans <sup>32</sup>. This finding highlights the limitations of relying solely on imaging for PVI diagnosis.

Beard et al. proposed a venographic scoring system to assess pelvic venous insufficiency severity <sup>33</sup>. This system evaluates three parameters: maximum diameter of the ovarian vein, degree of congestion and time when contrast material disappears. Each parameter is assigned a score of 1 to 3, with higher scores indicating greater severity. Ovarian vein diameter from 1 to 4 mm was found to be normal, from 5 to 8 mm was moderate, and more than 8 mm was severe. Degree of congestion was considered as small and straight for normal veins. Tortuous with different caliber were veins in moderate congestion. Very tortuous, wide and highly variable in caliber were veins in severe congestion. Time when the contrast disappeared after injection average was scored on the basis of a time of 0, 20 or 40 seconds <sup>2</sup>.

### **Differential diagnosis**

Pelvic venous insufficiency is a potential contributor to chronic pelvic pain. Numerous other gynecological conditions can also manifest with similar symptoms, including: endometriosis with adenomyosis, leiomyomas (uterine fibroids), pelvic adhesions, pelvic inflammatory disease (PID), ectopic pregnancy, ovarian remnant syndrome/Residual ovarian syndrome, malignant neoplasms, vulvodynia. Endometriosis is the most frequently encountered gynecological cause of chronic pelvic pain. Women with endometriosis are more likely to experience co-existing pain syndromes compared to the general population <sup>34</sup>. However, the severity of endometriosis does not always correlate directly with the intensity of pain symptoms. Conversely, research suggests that adenomyosis can be present in asymptomatic women without any apparent link to pelvic pain <sup>35</sup>. Given the multifaceted nature of chronic pelvic pain, a comprehensive and multi-systematic diagnostic approach is crucial. This should encompass evaluation for:

- gastrointestinal causes: inflammatory bowel disease, celiac disease, irritable bowel syndrome
- urinary tract dysfunction: recurrent urinary tract infections, urolithiasis (urinary stones), bladder pain syndrome
- musculoskeletal causes: myofascial pain syndrome, pelvic floor myalgia, fibromyalgia, abdominal wall muscle strain

- neurological causes: nerve injury, neuropathic pain, central sensitization
- psychological factors: depression, history of sexual abuse, somatization, opioid dependence

| <b>Gynecologic</b>          | <b>Bowel</b>                          | <b>Genitourinary</b>  | <b>Musculoskeletal</b>       | <b>Psychological</b>              |
|-----------------------------|---------------------------------------|-----------------------|------------------------------|-----------------------------------|
| Mittelschmerz               | Constipation                          | UTI                   | Hernia                       | Anxiety, depression               |
| Ovarian cysts               | IBS                                   | Interstitial cystitis | Myofascial pain              | Physical, emotional, sexual abuse |
| Pelvic inflammatory disease | IBD-Crohn disease, ulcerative colitis | Urolithiasis          | Neuropathic pain             | Secondary gain                    |
| Ectopic pregnancy           | Acute and chronic appendicitis        |                       | Nerve entrapment, injury     | Somatization                      |
| Outflow obstruction         | Adhesions from previous surgery       |                       | Pelvic floor myalgia         | Substance use                     |
| Mullerian anomaly           | Abdominal migraine/ and functional    |                       |                              |                                   |
| nonobstructive              | abdominal pain                        |                       | Fibromyalgia                 |                                   |
| Vulvodynia                  | Meckel's diverticulum                 |                       | Abdominal wall muscle strain |                                   |
| Hydrosalpinges              | Food intolerance                      |                       |                              |                                   |

*Table 1. Differential diagnosis for pelvic pain*<sup>6</sup>

Due to the diverse range of potential causes, a holistic approach to patient evaluation is essential to avoid overlooking important contributing factors.

### **Conclusion**

Patients with chronic, persistent pain, besides the medical treatment should undergo detailed investigation. This evaluation aims to rule out other non-vascular causes that can present with similar symptoms. Non-invasive imaging modalities such as Doppler ultrasound and magnetic

resonance venography (MRV), or even invasive conventional venography, should be used in conjunction with clinical evaluation to establish a proper diagnosis of pelvic venous insufficiency.

## **Disclosure**

### **Author's contribution**

Conceptualization: Justyna Dobrzańska and Magdalena Pach; Methodology: Agnieszka Nowak; Software: Mariola Dzedzic; Check: Aneta Michalczewska and Natalia Wierzejska; Formal analysis: Karolina Smykiewicz and Zuzanna Chmielowiec; Investigation: Agnieszka Fugas and Alicja Partyka; Resources: Justyna Dobrzańska; Data curation: Magdalena Pach; Writing – rough preparation: Mariola Dzedzic and Aneta Michalczewska; Writing – review and editing: Karolina Smykiewicz and Agnieszka Nowak; Visualization: Natalia Wierzejska; Supervision: Alicja Partyka; Project administration: Zuzanna Chmielowiec and Agnieszka Fugas;

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## **References:**

1. Szymanski J, Jakiel G, Slabuszewska-Jozwiak A. Pelvic venous insufficiency — an often-forgotten cause of chronic pelvic pain. *Ginekol Pol.* 2020;91(11):704-708. doi:10.5603/GP.a2020.0093
2. Knuttinen MG, Xie K, Jani A, Palumbo A, Carrillo T, Mar W. Pelvic Venous Insufficiency: Imaging Diagnosis, Treatment Approaches, and Therapeutic Issues. *American Journal of Roentgenology.* 2015;204(2):448-458. doi:10.2214/AJR.14.12709
3. Zondervan K, Barlow DH. Epidemiology of chronic pelvic pain. *Best Pract Res Clin Obstet Gynaecol.* 2000;14(3):403-414. doi:10.1053/beog.1999.0083

4. Butros SR, Liu R, Oliveira GR, Ganguli S, Kalva S. Venous compression syndromes: clinical features, imaging findings and management. *Br J Radiol.* 2013;86(1030):20130284. doi:10.1259/bjr.20130284
5. Meissner MH, Khilnani NM, Labropoulos N, et al. The Symptoms-Varices-Pathophysiology classification of pelvic venous disorders: A report of the American Vein & Lymphatic Society International Working Group on Pelvic Venous Disorders. *J Vasc Surg Venous Lymphat Disord.* 2021;9(3):568-584. doi:10.1016/j.jvsv.2020.12.084
6. Sachedin A, Todd N. Dysmenorrhea, Endometriosis and Chronic Pelvic Pain in Adolescents. *J Clin Res Pediatr Endocrinol.* 2020;12(1):7-17. doi:10.4274/jcrpe.galenos.2019.2019.S0217
7. Gulleroglu K. Nutcracker syndrome. *World J Nephrol.* 2014;3(4):277. doi:10.5527/wjn.v3.i4.277
8. Lakhanpal G, Kennedy R, Lakhanpal S, Sulakvelidze L, Pappas PJ. Pelvic venous insufficiency secondary to iliac vein stenosis and ovarian vein reflux treated with iliac vein stenting alone. *J Vasc Surg Venous Lymphat Disord.* 2021;9(5):1193-1198. doi:10.1016/j.jvsv.2021.03.006
9. Koo S, Fan CM. Pelvic Congestion Syndrome and Pelvic Varicosities. *Tech Vasc Interv Radiol.* 2014;17(2):90-95. doi:10.1053/j.tvir.2014.02.005
10. MacNeill C. Dyspareunia. *Obstet Gynecol Clin North Am.* 2006;33(4):565-577. doi:10.1016/j.ogc.2006.09.003
11. Kasperczak J, Ropacka-Lesiak M, Bręborowicz G. Definition, classification and diagnosis of chronic venous insufficiency – part II. *Polish Gynaecology.* 2013;84(1). doi:10.17772/gp/1540
12. Kim AS, Greyling LA, Davis LS. Vulvar Varicosities: A Review. *Dermatologic Surgery.* 2017;43(3):351-356. doi:10.1097/DSS.0000000000001008
13. Clark MR, Taylor AC. Pelvic Venous Disorders: An Update in Terminology, Diagnosis, and Treatment. *Semin Intervent Radiol.* 2023;40(04):362-371. doi:10.1055/s-0043-1771041
14. Marcelin C, Le Bras Y, Molina Andreo I, Jambon E, Grenier N. Diagnosis and Management of Pelvic Venous Disorders in Females. *Diagnostics.* 2022;12(10):2337. doi:10.3390/diagnostics12102337
15. Malgor RD, Labropoulos N. Diagnosis of venous disease with duplex ultrasound. *Phlebology: The Journal of Venous Disease.* 2013;28(1\_suppl):158-161. doi:10.1177/0268355513476653
16. Nascimento AB, Mitchell DG, Holland G. Ovarian veins: Magnetic resonance imaging findings in an asymptomatic population. *Journal of Magnetic Resonance Imaging.* 2002;15(5):551-556. doi:10.1002/jmri.10098
17. Adams J, Reginald PW, Franks S, Wadsworth J, Beard RW. Uterine size and endometrial thickness and the significance of cystic ovaries in women with pelvic pain due to congestion. *BJOG.* 1990;97(7):583-587. doi:10.1111/j.1471-0528.1990.tb02544.x
18. O'Brien MT, Gillespie DL. Diagnosis and treatment of the pelvic congestion syndrome. *J Vasc Surg Venous Lymphat Disord.* 2015;3(1):96-106. doi:10.1016/j.jvsv.2014.05.007
19. Meneses L, Fava M, Diaz P, et al. Embolization of Incompetent Pelvic Veins for the Treatment of Recurrent Varicose Veins in Lower Limbs and Pelvic Congestion Syndrome. *Cardiovasc Intervent Radiol.* 2013;36(1):128-132. doi:10.1007/s00270-012-0389-x

20. Creton D, Hennequin L, Kohler F, Allaert FA. Embolisation of Symptomatic Pelvic Veins in Women Presenting with Non-saphenous Varicose Veins of Pelvic Origin – Three-year Follow-up. *European Journal of Vascular and Endovascular Surgery*. 2007;34(1):112-117. doi:10.1016/j.ejvs.2007.01.005
21. Dos Santos SJ, Holdstock JM, Harrison CC, Lopez AJ, Whiteley MS. Ovarian Vein Diameter Cannot Be Used as an Indicator of Ovarian Venous Reflux. *European Journal of Vascular and Endovascular Surgery*. 2015;49(1):90-94. doi:10.1016/j.ejvs.2014.10.013
22. Topper SR, Winokur RS. Imaging of Pelvic Venous Disorders (PeVD); Should Every Patient Get an MRI? *Tech Vasc Interv Radiol*. 2021;24(1):100731. doi:10.1016/j.tvir.2021.100731
23. Bookwalter CA, VanBuren WM, Neisen MJ, Bjarnason H. Imaging Appearance and Nonsurgical Management of Pelvic Venous Congestion Syndrome. *RadioGraphics*. 2019;39(2):596-608. doi:10.1148/rg.2019180159
24. Riding DM, Hansrani V, McCollum C. Pelvic vein incompetence: clinical perspectives. *Vasc Health Risk Manag*. 2017;Volume 13:439-447. doi:10.2147/VHRM.S132827
25. Chennur VS, Nzekwu E V., Bhayana D, Raber EL, Wong JK. MR venography using time-resolved imaging in interventional management of pelvic venous insufficiency. *Abdominal Radiology*. 2019;44(6):2301-2307. doi:10.1007/s00261-019-01965-w
26. Kim CY, Miller MJ, Merkle EM. Time-Resolved MR Angiography as a Useful Sequence for Assessment of Ovarian Vein Reflux. *American Journal of Roentgenology*. 2009;193(5):W458-W463. doi:10.2214/AJR.09.2557
27. Coakley F V., Varghese SL, Hricak H. CT and MRI of Pelvic Varices in Women. *J Comput Assist Tomogr*. 1999;23(3):429-434. doi:10.1097/00004728-199905000-00018
28. Pagani JJ, Thomas JL, Bernardino ME. Computed tomographic manifestations of abdominal and pelvic venous collaterals. *Radiology*. 1982;142(2):415-419. doi:10.1148/radiology.142.2.6459608
29. Black CM, Thorpe K, Venrbux A, et al. Research Reporting Standards for Endovascular Treatment of Pelvic Venous Insufficiency. *Journal of Vascular and Interventional Radiology*. 2010;21(6):796-803. doi:10.1016/j.jvir.2010.02.017
30. Yang DM, Kim HC, Nam DH, Jahng GH, Huh CY, Lim JW. Time-resolved MR angiography for detecting and grading ovarian venous reflux: comparison with conventional venography. *Br J Radiol*. 2012;85(1014):e117-e122. doi:10.1259/bjr/79155839
31. Black CM, Thorpe K, Venrbux A, et al. Research Reporting Standards for Endovascular Treatment of Pelvic Venous Insufficiency. *Journal of Vascular and Interventional Radiology*. 2010;21(6):796-803. doi:10.1016/j.jvir.2010.02.017
32. Rozenblit AM, Ricci ZJ, Tuvia J, Amis ES. Incompetent and Dilated Ovarian Veins. *American Journal of Roentgenology*. 2001;176(1):119-122. doi:10.2214/ajr.176.1.1760119
33. Beard RW, Pearce S, Highman JH, Reginald PW. Diagnosis of pelvic varicosities in women with chronic pelvic pain. *The Lancet*. 1984;324(8409):946-949. doi:10.1016/S0140-6736(84)91165-6
34. Weiss G, Maseelall P, Schott LL, Brockwell SE, Schocken M, Johnston JM. Adenomyosis a variant, not a disease? Evidence from hysterectomized menopausal women in the Study of Women’s Health Across the Nation (SWAN). *Fertil Steril*. 2009;91(1):201-206. doi:10.1016/j.fertnstert.2007.11.025
35. Smorgick N, Marsh CA, As-Sanie S, Smith YR, Quint EH. Prevalence of Pain Syndromes, Mood Conditions, and Asthma in Adolescents and Young Women with

Endometriosis. *J Pediatr Adolesc Gynecol.* 2013;26(3):171-175.  
doi:10.1016/j.jpag.2012.12.006