From the American Venous Forum
2013 AVF Best Paper Award

Journal of
Vascular Surgery
Venous and Lymphatic Disorders™

The role of duplex ultrasound in the workup of pelvic congestion syndrome

Rafael D. Malgor, MD, Demetri Adrahtas, MD, Georgios Spentzouris, MD, Antonios P. Gasparis, MD, Apostolos K. Tassiopoulos, MD, and **Nicos Labropoulos, RVT, DIC, PhD,** *Stony Brook, NY*

Background: **Pelvic congestion syndrome (PCS) imaging workup algorithms are not well-defined. The purpose of our study is to gauge the impact and accuracy of duplex ultrasound (DU) to assist in the diagnosis of PCS.**
Methods: **We reviewed the records of 48 patients with PCS seen at a vein center from June 2010 to June 2012. All patients had DU plus either computed tomography venography (CTV) or conventional venography (CV). Measurements of the left (LOV) and right ovarian vein (ROV) diameter and the presence or absence of ovarian vein reflux were obtained using DU and compared with either CTV or CV to assess sensitivity and specificity. An ovarian vein diameter >6 mm was considered abnormal.**
Results: **All patients were female (29 Caucasians, 18 Hispanic, and 1 Asian). The mean number of pregnancies was 3 (range, 1-5). All patients had lower extremity varicose veins, and 14 (29%) had vulvar varicosities. Thirty-four (71%) patients reported pelvic pain, 22 (46%) dyspareunia, 2 (4%) dysuria, and 1 (2%) hematuria. The median diameter of the LOVs and ROVs measured using DU compared with either CTV/CV were similar (DU, 8.6 and 5.6; CTV/CV, 8.3 and 6). The sensitivity and specificity of DU to demonstrate a dilated LOV were 100% and 57%, and for the ROV were 67% and 90%. Pelvic varicosities were identified in all but one patient with good correlation between DU and CV.**
Conclusions: **DU has a high sensitivity to identify an abnormal LOV diameter that is greatly reduced when evaluating the ROV; however, the latter can be evaluated with another imaging modality such as CTV especially when DU results are equivocal or negative. A moderate specificity was found to determine both LOV and ROV abnormal diameters. All three imaging modalities are equally accurate to show the presence of pelvic varices. (J Vasc Surg: Venous and Lym Dis 2014;2:34-8.)**

The diagnosis and treatment strategies for pelvic congestion syndrome (PCS) have evolved over the years.[1-5] The clinical spectrum of PCS varies from mild symptoms such as pelvic fullness and discomfort to debilitating pelvic pain, dyspareunia, and voiding urgency that impairs quality of life.[6] Often, PCS afflicts female patients with two or more pregnancies.

Many patients have been treated worldwide for PCS based on many different workup tools with various degrees of reproducibility, reliability, and accuracy. Thus, it remains debatable, which is the most accurate and precise workup modality for PCS to define the candidates for intervention.

Duplex ultrasound (DU), transvaginal ultrasound (TVUS), computed tomography venography (CTV), and magnetic resonance venography (MRV) are noninvasive tests used for patients with chronic pelvic pain and PCS.[3,4,7] Conventional venography (CV) remains the gold standard to confirm and treat pelvic vein reflux (PVR).[8] However, CV is an invasive procedure that requires both radiation and contrast media. At the moment, workup algorithms have not been validated.[6] Further, the accuracy of DU in the PCS workup has not been assessed. The purpose of our study was to evaluate the accuracy of DU in the diagnosis of PCS.

METHODS

We reviewed data of 48 patients who were referred to our vein center for evaluation of chronic venous disease. Patients with previous venous interventions or acute venous disease in the lower extremities were excluded. In addition, patients who had an anatomic compression such as in renal or iliac veins were also excluded. All patients with symptoms of pelvic pain or heaviness, dyspareunia, dysuria with or without varicose veins in the region of the pubis, labia, perineum, or buttocks underwent a systematic DU protocol to seek PVR. Two blinded experienced observers (N.L., A.G.) evaluated all studies.

Briefly, our DU protocol begins imaging the inferior vena cava and left renal vein to assess for compression of the left renal vein by either the superior mesenteric artery (anterior Nutcracker phenomenon) or the aorta (posterior Nutcracker phenomenon). Measurements of the left (LOV) and right ovarian vein (ROV) diameter, and the presence or absence of ovarian vein reflux are then obtained. The pelvic veins are scanned to rule out iliac vein compression phenomena caused by either common or internal iliac artery or inguinal ligament. Uterine and ovarian venous plexus are also investigated to provide further information about PVR that is suggested when four or more tortuous

From the Division of Vascular Surgery, Department of Surgery, Stony Brook University Medical Center.
Author conflict of interest: none.
Awarded the best paper presented at the Twenty-fifth Annual Meeting of the American Venous Forum, Phoenix, Ariz, February 27-March 2, 2013.
Reprint requests: Rafael D. Malgor, MD, Division of Vascular Surgery, Department of Surgery, Stony Brook University Medical Center, HSC T19 Rm 90, Stony Brook, NY 11794-8191 (e-mail: rafael.malgor@stonybrook.edu).
The editors and reviewers of this article have no relevant financial relationships to disclose per the Journal policy that requires reviewers to decline review of any manuscript for which they may have a conflict of interest.
2213-333X/$36.00

http://dx.doi.org/10.1016/j.jvsv.2013.06.004

parauterine veins with >4 mm in diameter are present.[8] The examination is performed with patients in the supine position. If the test results are not clear and further clarification is required to rule out pelvic veins reflux particularly in the distal internal iliac veins, the patient is placed in a standing position. Valsalva maneuver is also elicited to evaluate phasicity and reflux. An ovarian vein diameter >6 mm is considered abnormal. There is no validated cutoff for ovarian or PVR based on duration or velocity. However, when reverse flow is present, it is always prolonged, and in our study, it was well over 2 seconds. As the number of ovarian veins may vary from one to seven, the largest diameter was recorded.

All patients had DU. Some patients had also either CTV or CV. Twenty-four (50%) patients had a CTV after DU screening, and 14 had CV that was done on an intention-to-treat basis. In the beginning of our experience, CTV was used as the second imaging modality to confirm DU findings prior to CV.

Statistical analysis. Continuous variables were reported as mean, median, and standard deviation, and continuous variables as mean ± standard deviation. Two-sample *t*-test and Fisher exact test were used to obtain the sensitivity and specificity of DU compared with CV/CTV. Pearson's coefficient was also calculated to determine the correlation between DU and CV/CTV when evaluating the diameter of the ovarian veins. A P value of $<.05$ was considered significant. All statistical analyses were performed by SPSS v 14 (IBM Corporation, Minneapolis, Minn).

RESULTS

Demographics and clinical presentation. Demographics and clinical presentation of the patients are displayed in Table I. All patients were female. The most common symptom was pelvic pain or heaviness reported by 34 (71%). Dysuria (n = 1) and gross hematuria (n = 2) were uncommon. The mean number of pregnancies was 3 (range, 1-5). The majority of patients had two or more pregnancies (n = 40; 83%). At the time of the first consult, four (8%) patients were on oral contraceptives. Leg edema was reported by 12 (25%) patients.

Anatomic findings using DU. A mean of two LOVs per patient were found ranging from 1 to 5. The median diameter of the LOV was 7.8 ± 2.8 mm varying from 2.6 to 15 mm. The ROV was considerably smaller in diameter than the LOV (5.6 ± 2.2 mm; $P < .0001$). Pelvic varicosities were present in all patients with LOV >6 mm on DU that was subsequently confirmed by CV. Fig 1 depicts dilated LOV with transmitted reflux to the pelvic varicosities and compensatory enlargement in the ROV.

Comparison among DU, CTV, and CV. A substantial interobserver agreement was noted (K = .8). On CTV, the median diameter of the LOV and ROV were 8.1 ± 2.9 mm and 6.1 ± 1.8 mm, respectively. All but one patient with pelvic varicosities was detected using CTV compared with DU. The diameter of LOV was similar when measured by DU, CTV, and CV (7.7 ± 1.5 vs 7.8 ± 2.8 vs 8.2 ± 3.8; P = NS). The median diameter of LOV with reflux demonstrated by DU, CTV, and CV was also similar (8.4 ± 2.3 vs 8.2 ± 3.8 vs 8.1 ± 2.9; P = NS).

Table I. Clinical presentation and demographics of 48 patients with pelvic congestion syndrome (PCS)

	Mean ± SD or No. (%)
Demographics	
Age, years	42 ± 10
Female	48 (100)
Caucasian	29 (60)
Hispanic	18 (38)
Asian	1 (2)
Clinical presentation	
Pelvic pain/fullness	34 (71)
Dyspareunia	22 (46)
Gross hematuria	1 (2)
Varicose veins	48 (100)
CEAP class 2	36 (75)
CEAP class 3	12 (25)

SD, Standard deviation.

A positive correlation of diameter measurements between DU and CTV was demonstrated as shown in Fig 2. The sensitivity and specificity of DU for detection of a dilated LOV compared with CTV/CV were 100% (18/18) and 57% (4/7) with a negative and positive predictive value of 100% (4/4) and 86% (18/21). Overall, the sensitivity, negative and positive predictive value of DU for a dilated ROV was lower than it was demonstrated for the LOV (67%, 89%, 69%); however, its specificity was 90% (9/10).

DISCUSSION

PCS is a debilitating condition with delayed diagnosis and laborious workup. The causes of primary PCS remain unclear, and the prevalence of symptomatic patients is underestimated. For that matter, little has been published about the diagnostic modalities and their accuracy. The majority of the available literature focuses on treatment strategies and their outcomes.[9,10] Recently, guidelines for the care of patients with varicose veins and associated chronic venous diseases recommending the use of noninvasive imaging studies in selected patients with PCS or symptomatic varices in the distribution of the pubis, labia, perineum, or buttocks have been published.[6] In our vein center, we typically found one patient with pelvic reflux for every 20 patients with lower extremity CVD. One in every 10 patients with CVD has nonsaphenous vein reflux. As outlined in the guideline, these patients have more often pelvic reflux particularly when vulvar and gluteal veins are present. However, if there are no symptoms of PCS, we do not perform treatment unless it is the cause of venous reflux recurrence in the lower limb. This is equivalent to an expert opinion because a validated algorithm leading to decision-making in PCS is not yet available.[6] The available guideline clearly reflects the lack of evidence due to poor methodologic quality of data published on the topic.[6]

We identified three noninvasive imagining modalities currently available for PCS workup, US (transabdominal