TJVS Turkish Journal of Vascular Surgery

Turk J Vasc Surg 2023;32(Supplement 1):1-5
DOI: 10.9739/tjvs.1970.01.215

Available online at www.turkishjournalofvascularsurgery.org

Invited Review

The role of duplex ultrasound in the diagnosis of pelvic venous disease

Irwin Toonder

Toonder Consulo, Berkel en Rodenrijs, Zilvergracht, The Netherlands

Received: 01 November, 2023 Accepted: 22 November, 2023 Published online: 30 November 2023

Abstract

Recently there is an increased awareness of the possibility of pelvic venous disorders in patients with phlebological disease. The pathophysiology involves venous reflux or obstruction or a combination of both. It has been recommended that valvular function should be determined by the duration of reflux with the patient in an upright position. However the term 'reflux' is being used avidly by those assessing magnetic resonance imaging and computer tomography where patients are in a supine position. Venous compression is a common finding when the patient is supine and does not necessarily mean pathology. Duplex ultrasound is probably the only diagnostic tool which allows for examination in both supine and upright positions.

Keywords: Pelvic venous disorder, duplex ultrasound

INTRODUCTION

Recently, practitioners involved in phlebology are increasingly aware of the less obvious patterns involved in venous pathology. The evaluation of latent causes of deep venous thrombosis (DVT) in the lower extremity as well as improved interventional therapies in the prevention and treatment of the post thrombotic syndrome (PTS), has inherently led to greater scrutiny of the so called pelvic congestion syndrome (PCS) [1]. PCS Is regarded by gynaecologists as subservient to chronic pelvic pain (CPP) [2]. However, a multidisciplinary desire has evolved to reach a consensus on the definition and quantification of PCS. As congestion may not be the only cause of symptoms, PCS has been better defined as being a pelvic venous disorder (PeVD) [3]. Not only has PeVD been better defined, the symptoms, varices, pathophysiology (SVP) classification of PeVD has been developed to ensure collection of standardised data potentially useful for evidence based reporting [4]. The clinical etiological anatomical pathophysiological (CEAP) has been instrumental in the scientific assessment of venous disease of the lower extremity [5]. Duplex ultrasound (DUS) has been indispensable for CEAP in the effort to score the anatomy and pathophysiology, identifying affected anatomical segments, with either reflux and/or obstruction [6]. Similarly, DUS is vital for the SVP classification in identifying the pathophysiology and identification of venous anatomical segments in the pelvic region. However, unlike the many consensus papers published for DUS assessment of the venous system of the lower extremity, till date there are no comparative standardised papers or consensus documents presented for the DUS examination of the pelvic venous system. This paper will attempt to evaluate the role of DUS and the used criteria in the diagnosis and treatment of PeVD.

Duplex ultrasonography protocols

Several useful DUS protocols for the evaluation of the pelvic veins have been published. However, it is fair to state that these protocols despite their common goals differ on essential aspects in the assessment of PeVD [7-9] (Table 1).

CITATION
Toonder I. The role of duplex ultrasound in the diagnosis of pelvic venous disease. Turk J Vasc Surg. 2023;32(Supplement 1):1-5.

Corresponding Author: Irwin Toonder, Toonder Consulo, Berkel en Rodenrijs, Zilvergracht, The Netherlands
Email: toonder@gmail.com

DOI: 10.9739/tjvs.1970.01.215

Table 1. DUS protocol PeVD

	Le Masle et al. [7]	Labropoulos et al. [8]	Villalba et al. [9]
Patient preparation	Not specified	Overnight fasting	12 hour fast, diabetes patients 4 hour fast
Patient position	Supine and/or upright	Supine with head elevation 30° upright for pelvic floor and lower extremity	45° reverse Trendelenburg optional lateral decubitis position
Transducer	Curved array <5MHz	Curved array 2-5Mhz (obese 1-5MHz)	Curved array low frequency (not specified)
Assessed segments	IVC, CIV, IIV, EIV, CFV, FV, DFV, gonadal vein left renal veins, ovarian plexi, uterine plexi superior gluteal, inferior gluteal, perineal, obturator, ingiunal, clitoral leak points	IVC, CIV, IIV, EIV, CFV, FV, DFV, gonadal vein both renal veins, ovarian plexi, perineum inferior gluteal	IVC, CIV, IIV, EIV, CFV, FV, DFV, gonadal vein left renal vein
Nutcracker syndrome	Velocity ratio 5:1	Narrow aorta-mesenteric angle not specified velocity ratio not specified, Ø not specified	Diameter not specified velocity ratio 5:1
May Thurner syndrome	Compression criteria not specified post thrombotic residual signs reversed flow internal iliac vein	Velocity ratio 2.5:1, assymmetric flow presence of collaterals reversed flow internal iliac vein	Wall thickening, intraluminal abnormality velocity ratio 2.5:1 unreliable presence of collaterals reversed flow internal iliac vein
Gonadal vein	Supine reflux during Valsalva permanent retrogade when upright diameter unreliable as criterium	Supine reflux during Valsalva diameter not specified diameter unreliable as criterium	Reflux possible not specified diameter not specified
Transabdominal approach	Yes	Yes	Yes
Transperineal approach	Yes, supine	No, but indirect via medial thigh upright	No
Flow augmentation	Valsalva	Valsalva	Not specified

IVC: Inferior Caval Vein, CIV: common iliac vein, IIV: internal iliac vein, EIV: external iliac vein, CFV: common femoral vein, FV: femoral vein, DFV: deep femoral vein

Venous compression

When the patient is examined in a supine position, venous compression is a common finding and non-pathological. See figures. The safety and apparent success of venous stenting has led to the focus on Nutcracker and May Thurner syndromes. Various publications have made suggestions for DUS criteria however most of the tests have been performed with patients in a supine position which may lead to a greater risk of false positives. DUS has demonstrated that when the patient is placed upright, compression becomes far less apparent. It is fair to state that seldom papers have been published with relevant DUS criteria where patients are examined in an upright position [10]. It can be postulated that when the patient is up right, and the compression persists this can be seen as a true positive (Figures 1-5).

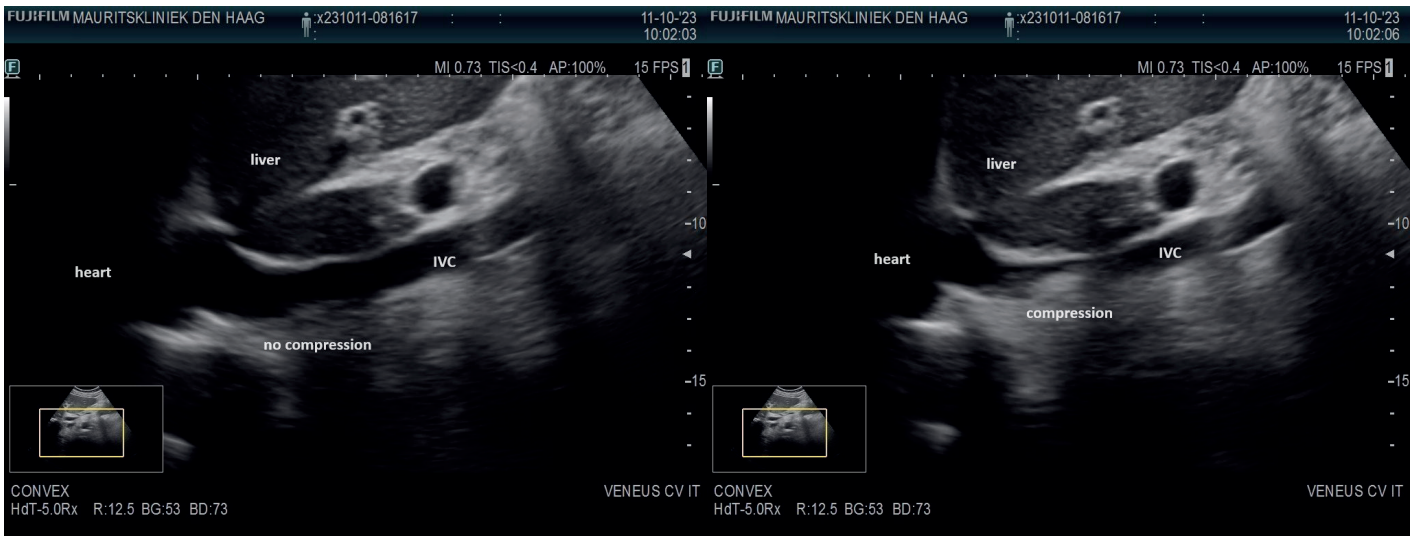

Figure 1. Longitudinal sagittal plane no Inferior Cava Vein (IVC) compression during exhalation and systole and complete IVC compression during inhalation and diastole

DOI: 10.9739/tjvs.1970.01.215

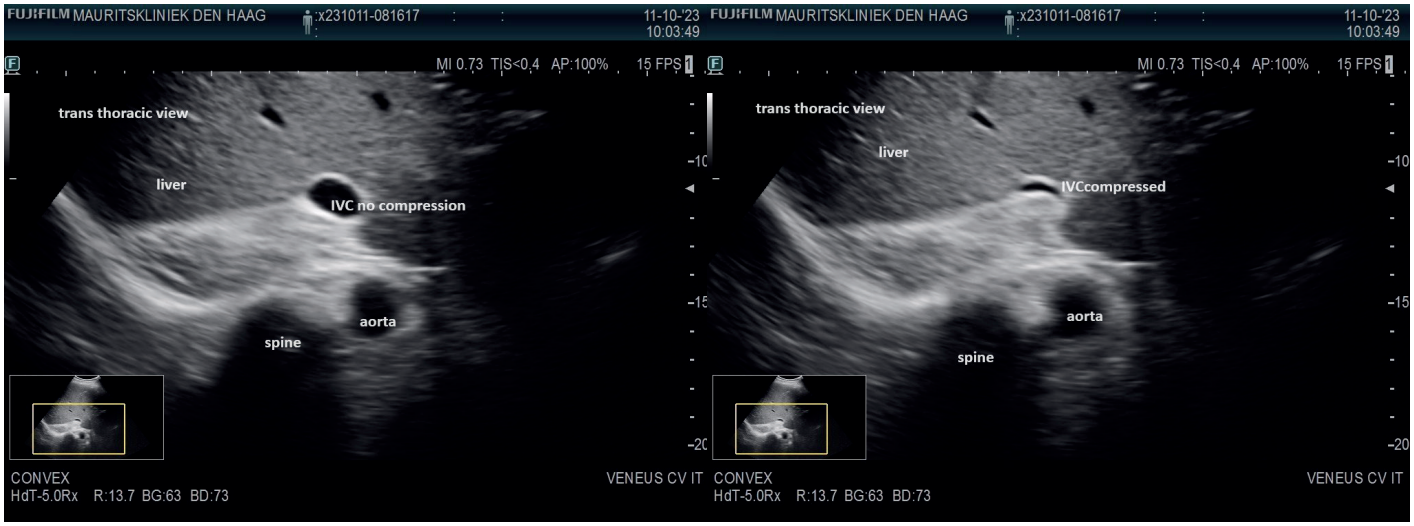

Figure 2. Trans thoracic view in transverse plane view no Inferior Cava Vein (IVC) compression during exhalation and systole and complete IVC compression during inhalation and diastole

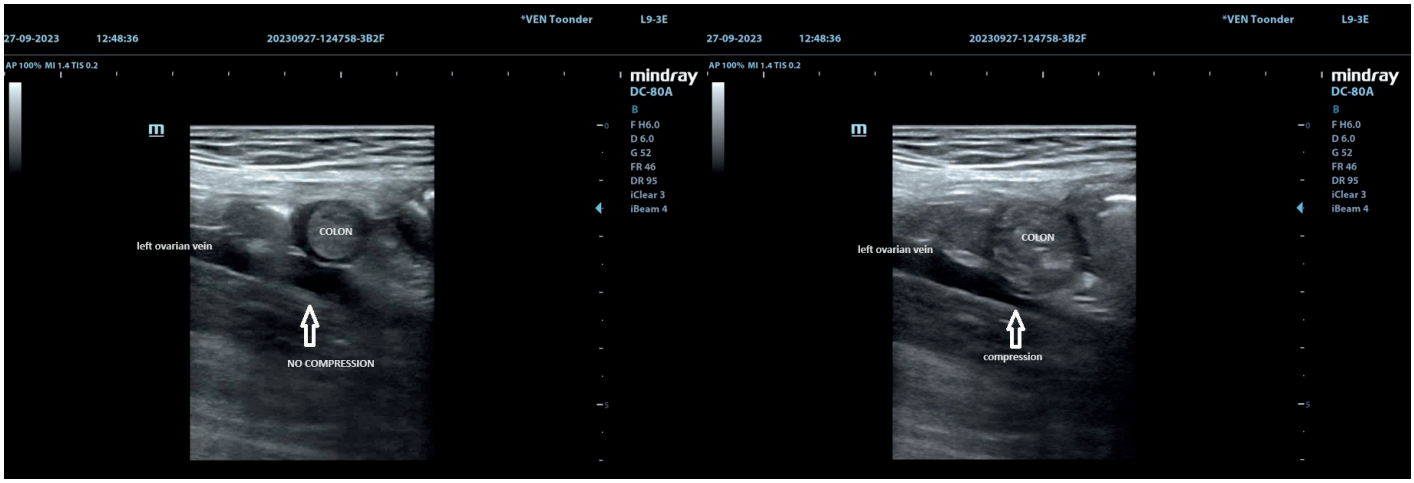

Figure 3. Colon peristalsis causing intermittent compression of the left ovarian vein. DUS mages were acquired with the patient in a supine position using a linear array 9-3Mhz transducer

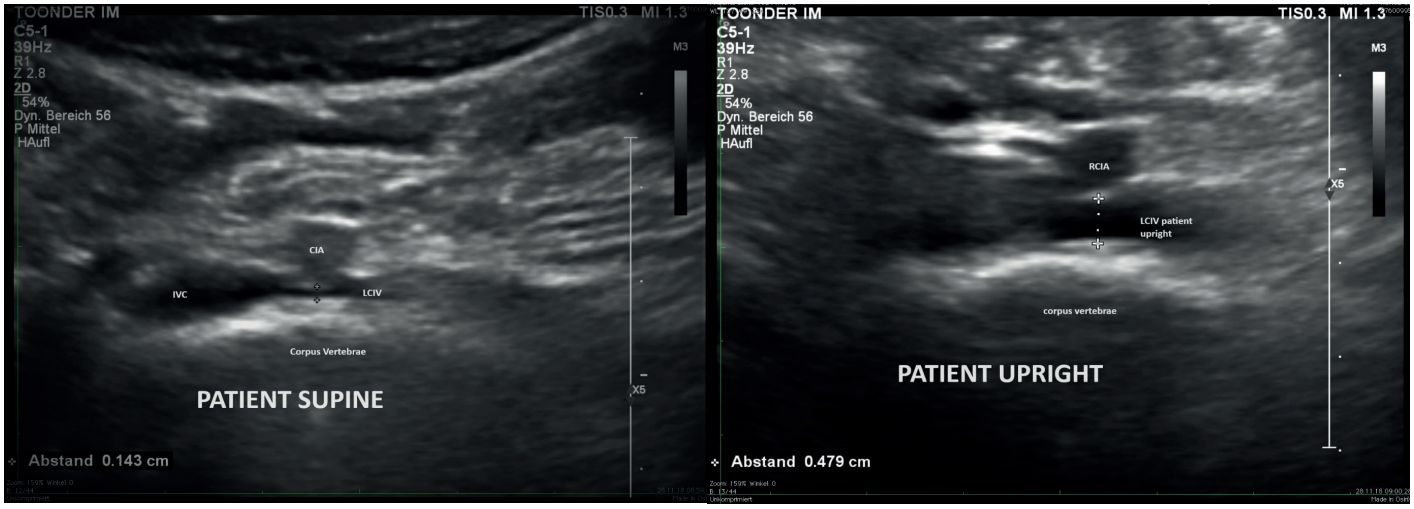

Figure 4. Right common artery compressing the left common iliac vein significantly less when the patient is upright in a May Thurner evaluation

 DOI: 10.9739/tjvs.1970.01.215

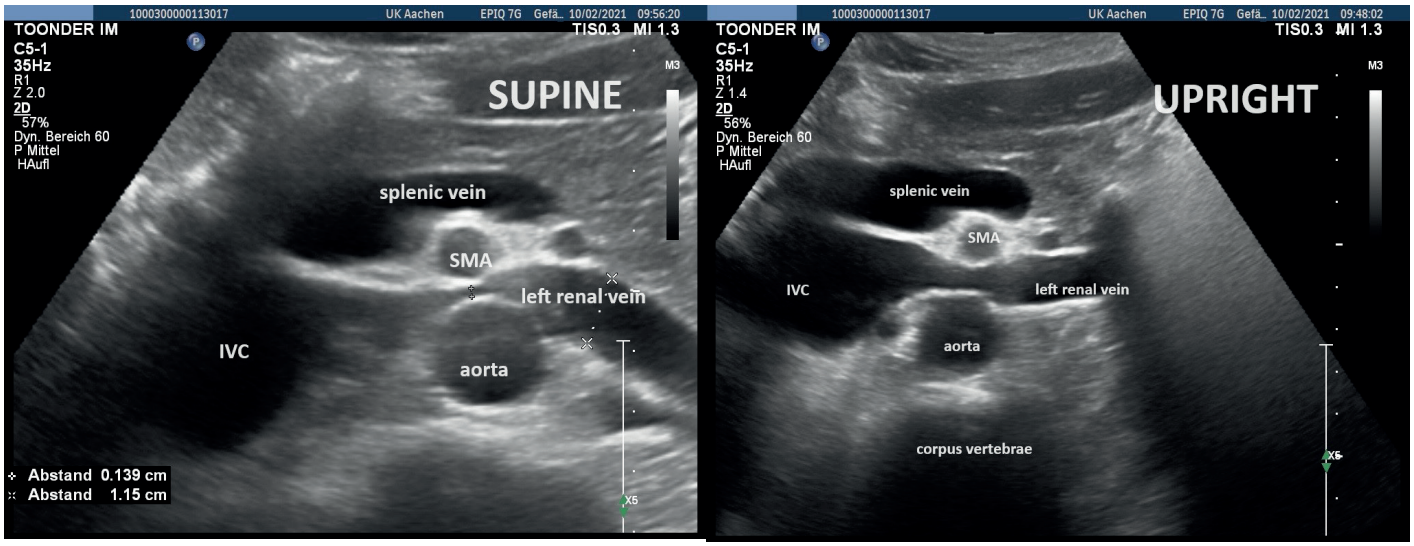

Figure 5. Supine versus upright where the Superior Mesenteric Artery (SMA) gives significantly less compression on the left renal vein when the patient is upright

Reflux

Reflux which is seen as retrograde flow in the venous system due to venous valve incompetency and is considered to be pathological when times exceed 0.5 seconds in the superficial venous system and 1 second for deep venous segments of the lower extremity, when the examination is performed with the patient in a near to upright position. In fact, it is stated that venous valve closure cannot be assessed reliably with the patient in a supine position [6]. Today no scientific studies have targeted specific reflux times for pelvic venous veins. Also, it can be stated that when diagnosing reflux in pelvic veins, this effectively means that the patient should be in an upright position. Oddly enough, the term reflux is used avidly when assessing computer tomographic venography (CTV) scans and magnetic resonance venography (MRV) imaging with the patients examined in a supine position. Many would argue that the dilated veins on images would support the concept of venous hypertension due to venous valvular failure. This underlines the necessity for DUS as a diagnostic tool which will not only be able to assess the anatomy but will allow to examine the patient in an upright position to accurately assess venous valvular function as well as understanding the hemodynamic patterns associated with PeVD. On the other hand, this may be an oversimplified approach to the consequences of venous hypertension in the pelvic region as some may refute the presence of valves in the first place. In fact, the evidence for the existence of valves in pelvic veins is weak [11]. With regards to venous incompetence, the DUS points of interest are the gonadal veins, internal iliac veins, the para-uterine and peri-vaginal plexi, the pelvic perforating veins the scrotal and vulvar veins as well as the perineal region itself [7-9].

Diameter

Venous diameter measurements are often used to determine pathology. Venous dilatation is often seen as an indicator for venous hypertension. However, it can be stated that there is no consensus on the location where diameters should be measured nor is there a clear cut off value. Another opinion is that diameter cannot be used as a diagnostic criterium [7-9,12].

CONCLUSION

Although it may be argued that the DUS examination should be performed in the same supine position as intravascular ultrasound (IVUS), MRV & CTV, in order to be able to compare the outcome of the various diagnostic tools, one should be aware of a greater risk of false positive findings. With the patient examined in a supine position, venous compression is a normal phenomenon. The definition of venous incompetence should be redefined specifically for the pelvic veins. The question should be asked is pelvic reflux the same as reflux in the lower limb? The presence and purpose of pelvic venous valves should be better understood if they exist at all. Furthermore, research should be performed to ascertain the value of aspect ratio, velocity ratios, flow direction, the true values of pelvic venous pressure, plexus asymmetry, the presence of collaterals etc to better understand pelvic venous disorders.

Data Sharing Statement: The data that support the findings of this study are available from the corresponding author upon reasonable request.

Author Contributions: All authors contributed equally to the article.

Conflict of Interest: The authors declared no conflicts of interest with respect to the authorship and/or publication of this article.

Funding: The authors received no financial support for the research and/or authorship of this article.

REFERENCES

1. Antignani PL, Lazarashvili Z, Monedero JL, Ezpeleta SZ, Whiteley MS, Khilnani NM, et al. Diagnosis and treatment of pelvic congestion syndrome: UIP consensus document. Int Angiol. 2019 Aug;38:265-83.
2. Jarrell JF, Vilos GA, Allaire C, Burgess S, Fortin C, Gerwin R, et al. No. 164-Consensus Guidelines for the management of chronic pelvic pain. J Obstet Gynaecol Can. 2018;40:e747-87.
3. Khilnani NM, Meissner MH, Learman LA, Gibson KD, Daniels JP, Winokur RS, et al. Research priorities in pelvic venous disorders in women: recommendations from a multidisciplinary research consensus panel. J Vasc Interv Radiol. 2019;30:781-9.
4. Meissner MH, Khilnani NM, Labropoulos N, Gasparis AP, Gibson K, Greiner M, 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;9:568-84.
5. Lurie F, Passman M, Meisner M, Dalsing M, Masuda E, Welch H, et al. The 2020 update of the CEAP classification system and reporting standards. J Vasc Surg Venous Lymphat Disord. 2020;8:342-52. Erratum in: J Vasc Surg Venous Lymphat Disord. 2021;9:288.
6. Coleridge-Smith P, Labropoulos N, Partsch H, Myers K, Nicolaides A, Cavezzi A. Duplex ultrasound investigation of the veins in chronic venous disease of the lower limbs--UIP consensus document. Part I. Basic principles. Eur J Vasc Endovasc Surg. 2006;31:83-92.
7. Lemasle P, Greiner M. Duplex ultrasound investigation in pelvic congestion syndrome: technique and results. Phlebolymphology. 2017;24:79-87.
8. Labropoulos N, Jasinski PT, Adrahtas D, Gasparis AP, Meissner MH. A standardized ultrasound approach to pelvic congestion syndrome. Phlebology. 2017;32:608-19.
9. Villalba LM, Grayndler V, Sharman P, Dwight L, Dwight K. Our protocol for transabdominal pelvic vein duplex ultrasound - a summary of south coast vascular laboratory's protocol for pelvic vein duplex ultrasonography, including equipment, patient positioning, ultrasound settings, and technique. Endovascular Today. 2018;17:7.
10. Nalcacioglu H, Ceyhan Bilgici M, Tekcan D, Genc G, Bostanci Y, Yakupoglu YK, et al. Nutcracker syndrome in children: role of doppler ultrasonographic indices in detecting the pattern of symptoms. J Clin Med. 2018;7:214.
11. Ahlberg NE, Bartley O, Chidekel N. Retrograde contrast filling of the left gonadal vein: a roentgenologic and anatomical study. Acta Radiologica Diagnosis. 1965;3:385-92.
12. Dos Santos SJ, Holdstock JM, Harrison CC, Lopez AJ, Whiteley MS. Ovarian vein diameter cannot be used as an indicator of ovarian venous reflux. Eur J Vasc Endovasc Surg. 2015;49:90-4.