

## THE RELATION BETWEEN PELVIC VARICOSE VEINS AND LOWER EXTREMITY VENOUS INSUFFICIENCY IN WOMEN WITH CHRONIC PELVIC PAIN

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**Purpose:** To determine the relation between pelvic varicose veins and lower extremity venous insufficiency in women with chronic pelvic pain.

**Methods and Materials:** This study was done in Yuzuncu Yil University Faculty of Medicine, Department of Radiology, with patients who were referred for abdominal and pelvic imaging between January 2007 and April 2008. A total of 1029 women with pelvic imaging study were included in the study. The presence of venous dilatations (diameter > 5 mm) in parauterine and paraovarian localizations were accepted as pelvic varicose veins. In all patients, endometrial thickness was measured and lower extremity venous system was examined with Doppler ultrasonography to assess possible associated venous insufficiency. All patients were undergone questionnaire for frequency of delivery, age, and chronic pelvic pain.

**Results:** Pelvic varicose veins were discovered with transabdominal ultrasound and computerized tomography in 56 of 1029 patients. Various degrees of associated lower extremity venous insufficiency were also discovered in 44 of 56 patients (78,6%) with pelvic venous dilatation. Of the 44 patients with lower extremity venous insufficiency, 21 were bilateral, 9 were right-sided, and 14 were left-sided. Endometrial thickness was significantly increased in patients with pelvic venous dilatation.

**Conclusion:** The presence of pelvic varicose veins is significantly associated with lower extremity venous insufficiency. Since the diagnosis of lower extremity venous insufficiency plays an important role in deciding the course of treatment, lower extremity Doppler ultrasonography examination would be useful to include in the evaluation of pelvic varicose veins.

**Key-word:** Veins, extremities.

Pelvic congestion syndrome (PCS), is defined as dilatation of veins of the broad ligament and the ovarian plexus. PCS is one of the important causes of chronic pelvic pain affecting women of reproductive age, especially multiparas (1, 2).

Pain in PCS is generally defined as tension, fullness and dullness. The duration and severity of the pain which is variable, can radiate to the hip and the thigh. Accompanying symptoms are irritable bladder, dyspareunia, and painful micturition (3). It is diagnosed by eliminating the other pelvic pathologies by several imaging techniques in suspected cases at the clinic, since there are many clinical situations that mimic the symptoms of PCS (4). Disorders to be eliminated in the differential diagnoses include pelvic inflammatory, endometriosis, pelvic tumors, interstitial cystitis and inflammatory bowel syndrome (5).

PCS is a clinical syndrome of chronic pelvic pain associated with typical radiological features of insufficient ovarian vein and dilated paraovarian veins. PCS is diagnosed by history, physical examination and

use of imaging techniques. In the imaging techniques, transabdominal and transvaginal ultrasonography (US) are the first preferred procedures because they are easy and non-invasive. Meanwhile, computed tomography (CT), magnetic resonance imaging (MRI) and venography are the other diagnostic tools (6, 7).

Normally, the diameter of the parauterine and paraovarian veins which are tubular structures, is smaller than 5 mm. The specific imaging finding of pelvic venous congestion is a dilated and tortuous structure of the ovarian and parauterine veins, the diameters of which are larger than 5 mm (8-10).

Pelvic varicose veins generally accompany vulvar, perineal and lower extremity varicose veins (11, 12). There is limited data in the literature regarding the level and the rate at which pelvis varicose veins accompany lower extremity venous insufficiency (11-13).

Our aim in this study is to evaluate whether there is a relation between pelvic varicose veins and lower extremity venous insufficiency in patients with chronic pelvic pain.

### Materials and methods

A total of 1029 female patients who had been referred to the Radiology Department of the Yüzüncü Yıl University School of Medicine between January 2007-October 2008 from several departments (Gynecology and Obstetrics, General Surgery, Internal Medicine, Urology) for abdomino-pelvic imaging (725 transabdominal US and 402 CT) were included in this prospective study. The study protocol was performed according to the Helsinki Committee requirements and Ethics Committee approval was obtained for the study. Also, informed consent was signed by the patients.

The clinical features were questioned and it was evaluated whether or not there was venous insufficiency in the main femoral vein in both lower extremities in patients whose ovarian and parauterine venous structures had been seen to be dilated during pelvic imaging.

On transabdominal ultrasonographic evaluation, a PHILIPS HD11 (Bothell, Washington, USA) with 3.5 MHz convex probe was used. The images were obtained in supine and semi-erectile position. Uterine and paraovarian pathologies were noted. In order to find the ovarian veins, the transducer was placed in the transverse plane through the left upper abdomen. The left renal and ovarian veins were viewed in this position.

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Then inferior vena cava was observed by placing the transducer in the middle of the abdomen. The transducer was then slid to the lateral in order to view the right ovarian vein.

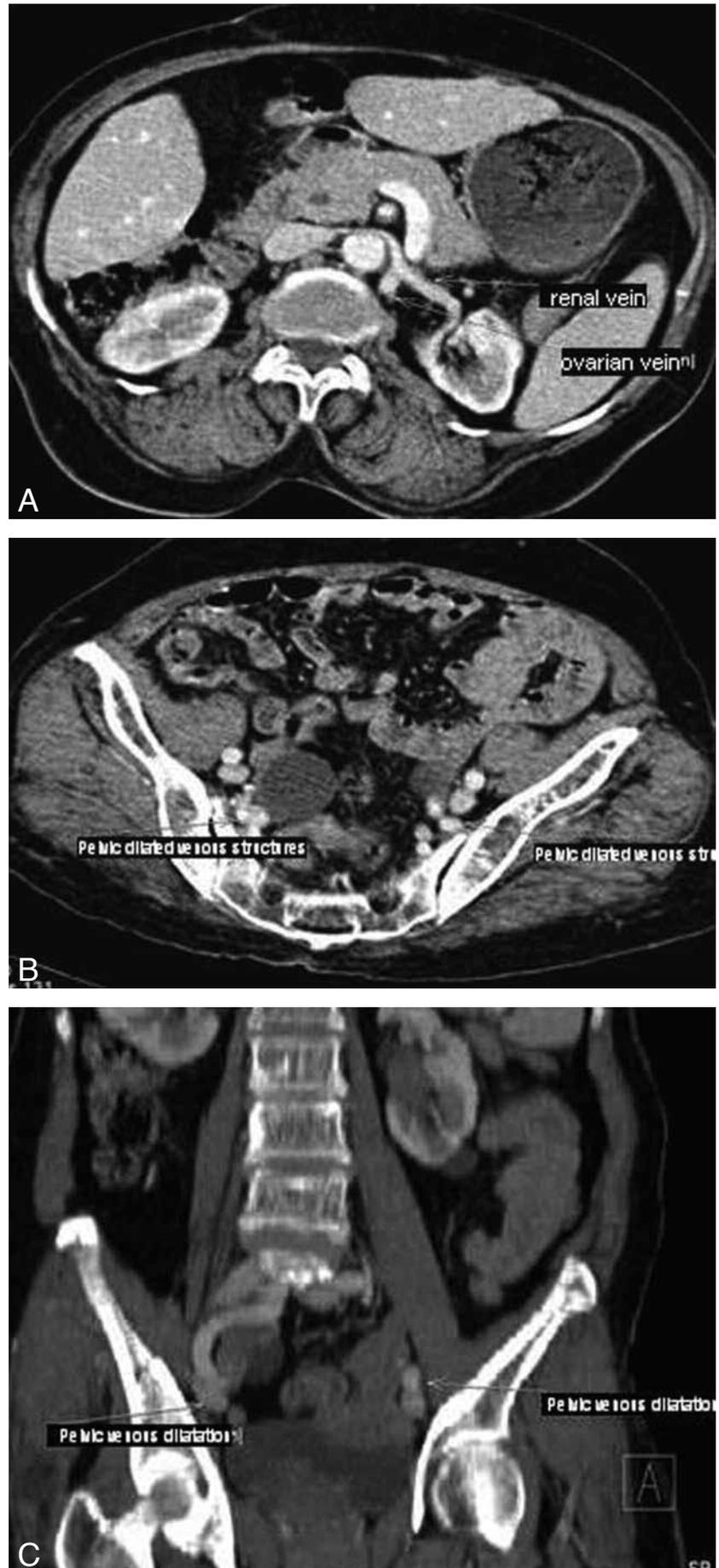
The intraluminal diameter of the ovarian veins were measured and recorded. The flow direction of blood in the ovarian veins were interpreted by Coloured Duplex Doppler US. Duplex wave changes were recorded during the Valsalva maneuver on the patients. The images of US were analysed by an experienced investigator. The endometrial thickness was also measured.

Circular or linear, non-pulsative, anechoic parauterine and paraovarian structures greater than 5 mm were accepted as pelvic varicosis.

CT imaging and scanning were performed by 4 channel MDCT scanner (SOMATOM Sensation 4; Siemens, Erlangen, Germany). The portal phase was used for evaluation of venous structures. Portal phase images were recorded 70 sec following the infusion of 100 ml ionic contrast agent at a rate of 2.5 ml/s. The abdomen was scanned from the superior part of the diaphragm to the pelvic floor with the patient holding his/her breath.

The scanning parameters were: collimation: 2.5 mm, pitch value: 1.25, kVp: 120, mA: 100. Data collecting and imaging recordings were performed at a study station where there was suitable software (Leonardo, Siemens Medical Systems). Images of each patient were evaluated by an investigator experienced in abdominal radiology. The diameter of ovarian and parauterine veins were measured in the axial plane. Nutcracker syndrome and the relation between ovarian vein and left renal vein were evaluated by coronal and sagittal multiplanar reformat images. The widest vein diameter which was greater than 5 mm at any plane was defined as dilated and accepted as pelvic varicosis (Fig. 1).

*Fig. 1.* — Abdominal tomography of a 40-year-old female patient who had abdominal pain. A. Dilatation was seen in the left ovarian vein at the point of drainage to the renal vein in the axial images. B. Bilaterally dilated venous structures, the diameters of which were greater than 5 mm in the axial pelvic images and a 4 cm cyst in the right ovary. C. Bilaterally dilated venous structures, the diameters of which were greater than 5 mm in the bilateral Multiplanar Reformat (MPR) coronal images.



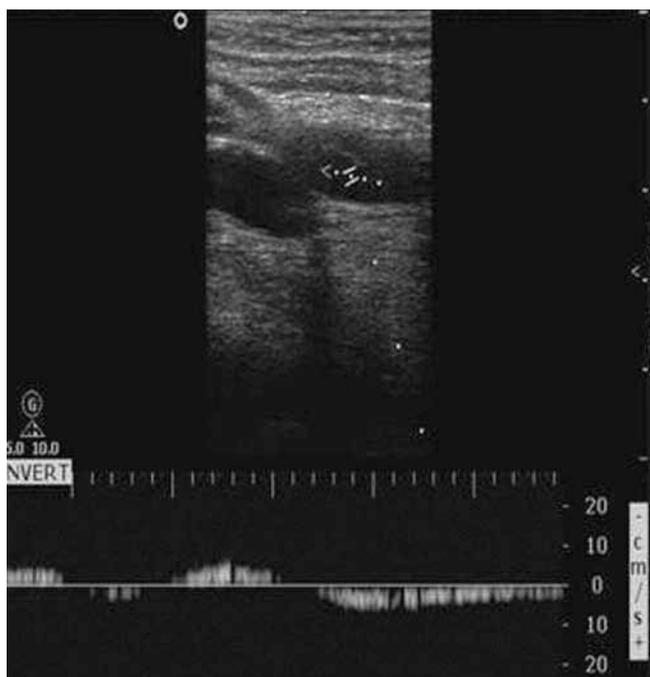


Fig. 2. — It was seen that the main femoral vein flow was not ceased during the valsalva and an opposite flow consistent with reflux was seen in the lower extremity Spectral Doppler evaluation. The actual appearance was in favor of venous insufficiency.

Lower extremity venous system was evaluated by high resolution 7.5 MHz linear probe of Philips HD11 (Bothell, Washington, USA) in the second step examination of patients who had dilated ovarian and parauterine veins on the trans-abdominal US and CT imagings. Vein wall texture, intraluminal echogeneity and compressibility of bilateral main femoral veins were investigated in the supine position.

The related venous structures were then evaluated according to their color and spectrum. As the reflux time changes according to the position of the patient, to the diameter of the lumen, and according to the numbers and locations of the valves, a definite limit has not been set for the venous reflux time in the literature, and a reflux time greater than 0.5-1 sec was accepted as pathological (14). We also accepted a reciprocal flow of over 0.7 sec during the valsalva and mechanical com-

pression as pathological in our study (Fig. 2).

**Statistical analysis**

All data were analyzed using the Statistical Package for the Social

Sciences for Windows 10.0 software (SPSS, Chicago, IL, USA). Data were presented as mean ± SD or percentage. Comparisons between groups were analyzed by Student's t-test and chi-square test. Statistical significance was defined as  $p < 0.05$ .

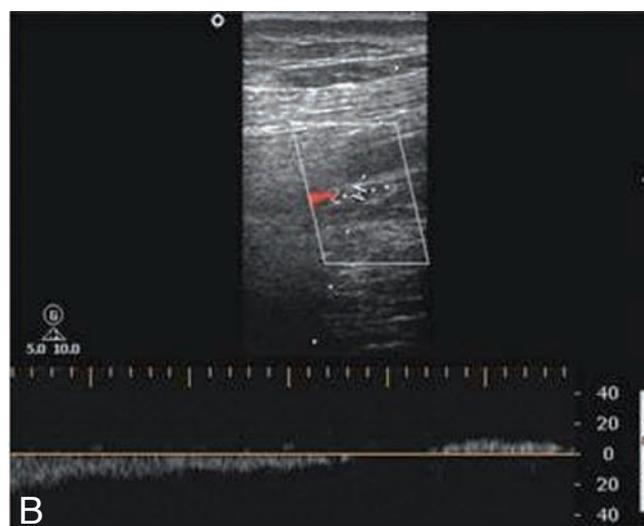
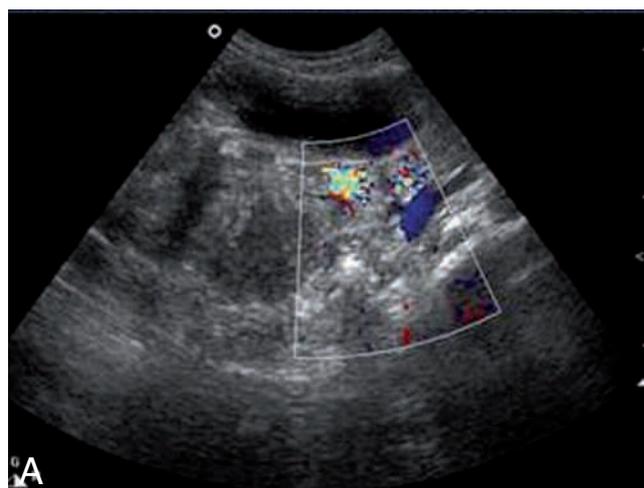


Fig. 3. — In the Doppler US investigation of a 28-year-old female patient with pelvic pain, A: wide venous structures, the diameters of which were greater than 5 mm in pelvic region. B. It was seen that the main femoral vein flow was not ceased during the valsalva and opposite flow consistent with reflux was seen in the Spectral Doppler evaluation. The actual appearance was in favor of venous insufficiency.

Table I. — Distribution of the patients according to the imaging methods.

	Ultrasonography	Computed Tomography	Total
Dilatation of pelvic veins (+)	21	35	56
Dilatation of pelvic veins (-)	704	367	973
Total	725	402	1029

Table II. — The clinical features of the patients.

	Dilatation of pelvic veins (+) (n = 56)	Dilatation of pelvic veins (-) (n = 973)	P value
Age (year)	36.9 ± 7.6	40.4 ± 9.2	0.44
Chronic pelvic pain, n (%)	51 (91%)	78 (8%)	< 0.001
PCS, n (%)	51 (91%)	0 (0%)	< 0.001
Endometrial thickness (mm)	9.9 ± 1.8	6.2 ± 2.1	0.048
Gravida (n)	4.8 ± 2.5	2.1 ± 1.7	< 0.001

PCS, pelvic congestion syndrome.

Table III. — Lower extremity venous insufficiency in women with pelvic venous dilatation.

	lower extremity venous insufficiency (+)	lower extremity venous insufficiency (-)	Total
Pelvic venous dilatation, n(%)	44 (78.6%)	12 (21.4%)	56 (100%)

## Results

Lower extremity venous system insufficiency was found in 44 of 56 patients who had pelvic venous dilatation. Lower extremity venous system insufficiency was found in 12 cases even though they had pelvic vein diameter of lower than 5mm. Pelvic veins whose diameters were greater than 5 mm, were seen bilaterally in 21 cases, on the right side in 9 cases, and on the left side in 14 cases (Fig. 3).

The mean number of births was  $4.8 \pm 2.5$  (0-10) in the study group which was composed of 4 nulliparous and 52 multiparous cases. In the statistical analysis, there was a positive relationship between the number of births and pelvic venous dilatation ( $p < 0.001$ ). Furthermore, as the number of births increased, the frequency of low extremity venous insufficiency increased. The number of births of cases which had pelvic venous dilatation and low extremity venous insufficiency were compared with the number of births of cases which had only pelvic venous dilatation. The mean number of births was higher in the lower extremity venous insufficiency group ( $5.1 \pm 2.5$  v.s  $3.7 \pm 2.4$ ,  $p = 0.084$ ).

The distribution of the patients according to the imaging methods has been displayed in Table I. The clinical features of the cases whose pelvic vein diameter was greater than 5 mm has been demonstrated in Table II. Table III reports the lower extremity venous insufficiency in women with pelvic venous dilatation.

Among the 56 patients with pelvic congestion, it was found that 2 had left renal vein progressing between the aorta and the superior mesenteric artery, and 3 were found to have the left renal vein progressing in the retro-aortic area. The frequency of nutcracker syndrome was 0.1% in the study group and 3.6% in patients with PCS.

The mean endometrial thickness was measured to be  $9.9 \pm 1.8$  mm in the group in which pelvic dilatation was seen, and was measured as  $6.2 \pm 2.1$  mm in the group in which pelvic varicosity was not found. Endometrial thickness was significantly higher in the patients who had pelvic dilatation in the parauterine and pelvic areas ( $p = 0.048$ ).

## Discussion

The results of the current study revealed that lower extremity venous insufficiency accompanies pelvic venous dilatation. Since the diagnosis of lower extremity venous insufficiency plays an important part in deciding the course of treatment, lower extremity Doppler US examination should be included in the evaluation of pelvic varicose veins.

Widening of the veins of the broad ligament and the ovarian plexus, and the presence of an incompetent ovarian vein are specific findings of PCS (15). It has been shown that PCS is found in 10% of the general population and in half of the women who have chronic pelvic pain (8, 16, 17). A hormonal component is thought to be present in the etiology of the PCS, because the symptoms disappear after menopause. In recent studies,

the relationship between polycystic ovarian syndrome and PCS has been demonstrated (18).

Estrogen is a potent vasodilator. The presence of estrogens receptors in human vascular cells is widely known. The vasodilatory effect of estrogen come out through different mechanisms. Excess estrogen leads to relaxation of smooth muscles by stimulation of nitric oxide synthetase and secretion of nitric oxide (19, 20). Nitric oxide not only dilates the uterine vessels, but also blocks the nitric oxide inhibitors and results in venous pain.

Although several imaging methods have been used to diagnose pelvic venous dilatation, transabdominal US is frequently used due to its non-invasiveness and easy applicability (5, 10). US can detect other pathologies related with PCS, such as polycystic ovary syndrome. In the light of this information, ultrasonography should be the first imaging technique for the diagnosis of PCS (13). Doppler US is used successfully in the evaluation of blood flow in venous structures. Retrograde flow in ovarian and parauterine veins suggests PCS in Doppler US (11).

Displaying dilated pelvic veins is not sufficient for the diagnosis of the syndrome, and decreased blood flow in the ovarian vein should also be present in order to make the diagnosis. Pelvic varicosity can be missed when ultrasonographic investigation is performed in the supine position as this position renders easier venous drainage. The sensitivity of US in the supine position is low for pelvic varicosity (20). In order to increase the sensitivity of US for the

diagnosis of PCS, the procedure should be performed in a semi-erectile position. It is important to view the retrograde flow in the pelvic vein during the Valsalva maneuver for the diagnosis (12).

Chronic pelvic pain was described in 129 of 1029 women who had undergone abdominal and pelvic evaluation. PCS was found in 52 (39.5%) of the patients who had described chronic pelvic pain. Our results were similar with the findings of Gultasli et al (13). Diseases which may be reasons for chronic pelvic pain, such as polycystic ovary syndrome, and myoma uteri were found in 72 (7%) of the patients in our study. The diameter of the pelvic veins were found to be greater than 5 mm in 3 of the patients.

Pelvic venous dilatation was investigated by US evaluation with the patients in supine position first and then in the semi-erectile position. Retrograde flow was probed in ovarian and parauterine veins during the Valsalva maneuver in patients with pelvic venous dilatation. Retrograde flow in the ovarian vein by Doppler US indicates PCS (11). Imaging of the widened pelvic veins is not sufficient for the diagnosis of the syndrome, but retrograde ovarian vein flow during Valsalva should also be demonstrated. Dynamic imaging tests are necessary for the correct diagnosis (12).

Pelvic venous dilatation and retrograde flow during the Valsalva were detected in 21 of 725 patients who had undergone pelvic US examination. The patients who showed pelvic dilatation by US examination were evaluated by CT.

CT is an important imaging tool for the diagnosis of PCS and detecting the pathologies related with PCS. Furthermore, contrast imaging has an important place in the diagnosis of venous insufficiency when there is venous contrast uptake during the arterial phase (6). The disadvantages of CT are radiation exposure, ineffective determination of venous changes in the supine and stable positions during the evaluation (7).

Pelvic venous dilatation was found in 35 of 402 patients who had undergone CT examination in our study. US evaluation was performed in the semi-erectile position in patients in whom pelvic dilatation was found on the CT examination. Retrograde flow was seen in the Doppler US examination of pelvic veins of 30 patients in whom pelvic venous dilatations were found by CT examination. Retrograde flow was

not seen in 5 patients. We thought that pelvic CT which had been performed in patients with chronic pelvic pain for different reasons had an important place in the diagnosis of PCS, contrary to the literature.

Although invasive techniques such as vulvar phlebography, transuterine venography, retrograde phlebography, and selective ovarian venography have been used in the past, these techniques are not utilized anymore, with the exception of selective ovarian venography. Selective ovarian venography is the gold standard for the diagnosis of PCS and should only be used for in patients who undergo the endovascular approach (7).

Selective ovarian venography can be performed under local anaesthesia. Following exclusion of pregnancy, the femoral vein is catheterized using the Seldinger technique. After selective catheterization of the left ovarian vein draining into the left renal vein under fluoroscopy, non-ionic contrast agent with low osmolality is injected and radiograms are obtained with the patient in the semi-erectile position (7).

The patients who had been found to have pelvic venous dilatation on the imaging techniques which had been requested by several departments, underwent evaluation by US, which would not pose additional risks and which would be non-invasive for pelvic vein examination and detection of insufficient flow in main femoral vein. There were no cases planned for endovascular treatment.

Pelvic congestion is generally diagnosed in multiparas. During pregnancy, the ovarian vein widens in order to compensate the increased blood flow, which is 60 times greater than normal. This is thought to be one of the most important reasons for the appearance of venous insufficiency (9).

A significant relationship was found between pelvic venous dilatation and the mean number of births in the statistical evaluation in our study group, in which the mean number of births was  $4.8 \pm 2.5$  (0-10) ( $p < 0,001$ ). The mean number of births in 56 patients who had pelvic venous dilatation and lower extremity venous insufficiency was  $5.1 \pm 2.5$ ; but the mean number of births who did not have lower extremity venous insufficiency was  $3.7 \pm 2.4$  ( $p = 0.084$ ).

In the autopsy series, it was found that there were no valves in the superior portion in 6% of the right and 15% of the left ovarian veins. It is

thought that the absence of valves is congenital, because pelvic varicosity is seen in nulliparous women, too (9). Four of the 56 patients with pelvic venous dilatation in our study were nulliparous. No other reason that could result in pelvic venous congestion was found in these patients.

Another cause of PCS is compression of the left renal vein between the superior mesenteric artery and the aorta. As a result of the compression of the left renal vein, venous hypertension occurs and collaterals are formed around the renal pelvis. This situation is defined as the Nutcracker syndrome. In the early phase, venous hypertension occurs when the left renal vein is compressed between the aorta and the superior mesenteric artery. Venous collaterals are also formed around the renal capsule. During the venous hypertension period in the Nutcracker syndrome, reflux is not observed, because the valves of the left ovarian vein are sufficient. The increase in the pressure of the left renal vein results in dilatation of the veins neighboring the calyx. Hematuria and flank pain are seen due to the dilated veins around the calyx (21, 22).

Nutcracker syndrome is diagnosed by symptoms like pelvic congestion, left flank pain, hematuria and observation of vulvar and pelvic varicosity on the US due to renal vein compression. MRI and CT examinations are also important for the diagnosis (23).

Among the 56 patients with pelvic congestion, it was found that 2 had a left renal vein progressing between the aorta and the superior mesenteric artery, and 3 (0.3%) were found to have a left renal vein progressing in the retroaortic area. The frequency of nutcracker syndrome was 0.1% in the study group and 3.6% in patients with PCS. Nutcracker syndrome is stated to be rare in the literature (23).

When the effect of estrogen is blocked by drugs like medroxyprogesterone acetate in the treatment of PCS, radiological and clinical improvements are achieved (24). It has been shown that high dose medroxyprogesterone acetate would improve the symptoms in 40% of the patients and decrease the congestion venographically (25). Although this effect would make one consider hormonal factors in the etiology, there has been no proof on the increased blood estrogen levels in women with pelvic congestion; however, there has been an indirect

effect of estrogen in pelvic organs (13).

It has been shown that endometrial thickness and uterine size are increased significantly in pelvic congestion (13). In our study, the mean endometrial thickness was  $9.9 \pm 1.8$  mm in patient who had pelvic varicosis and  $6.2 \pm 2.1$  mm in patients who did not have pelvic varicosis ( $p = 0.048$ ). This supports the idea that hormonal factors have an effect in pelvic congestion. This supports the findings of Gultasli et al. (13), who had shown that endometrial thickness of 30 patients with pelvic venous dilatation was greater than that of normal people (endometrial thickness was 9.2 mm in the pelvic dilatation group and 6.7 mm in normal people).

Pelvic varicosis is generally seen with vulvar, perineal and lower extremity varicosis (9, 10). Valvular insufficiency in other pelvic venous systems like the internal and external iliac veins have an important place in the pathophysiology of pelvic venous congestion (9). Despite the mention of lower extremity varicosis accompanying pelvic varicosis in the literature, there has been a limited number of studies that mention the rate. Gultasli et al. (13) found that 70% of the patients with pelvic venous dilatation had lower extremity insufficiency. Peripheral venous insufficiency was found in 21 (70%) of 30 patients whose pelvic vein diameter was greater than 5 mm. Peripheral venous insufficiency was mostly seen in main femoral vein (52%) and in other lower extremity venous structures at different rates.

In our study, in order to evaluate lower extremity venous insufficiency in cases with pelvic vein dilatation, main femoral vein was selected. The reason for this decision was due to the study of Gultasli et al. (13) who had mostly found main femoral vein insufficiency in patients with PCS. In the study group, it was found that main femoral vein insufficiency was seen in 44 of 56 patients whose pelvic vein diameter was greater than 5 mm and the relation between pelvic varicosis and lower extremity venous insufficiency was prominent. This finding is consistent with the results of Gultasli et al. (13).

PCS is treated by medical, interventional radiological techniques and surgical procedures. Current randomized controlled studies have given proofs about the supportive effect of medroxyprogesterone acetate or gosereline in the treat-

ment (26). Medical treatment is non-invasive, and progesterone, gosereline and daflon are useful for symptomatic treatment (24). In cases resistant to medical treatment, interventional radiology seems to be less invasive when compared with surgical treatment (6, 27). The greatest advantage of interventional radiology is the production of obstruction of ovarian veins with different embolizing agents in a single session and availability of the diagnostic procedure and treatment in the same session. The iliac veins can also be embolized. PCS to left renal vein stenosis or Nutcracker syndrome can be treated by stent installation. The results of endovascular treatment are more favorable than medical treatment and at least as successful as surgery (6, 27). Although complications are rare, metallic coils may extend through the main iliac vein and lead to pelvic pain (28).

In the study performed by Kim et al. (29) it was seen that the symptoms of 127 patients in whom bilateral ovarian vein embolization and iliac vein embolization had been assessed with regard to effectiveness, had improved in 83%, not changed in 13%, and worsened in 4% of the cases. These results supported the fact that internal iliac vein embolization would improve the symptoms significantly and the success of embolization would be high. In this study, the right ovarian vein was embolized when there was prominent reflux in the left and the right ovarian vein. Internal iliac vein embolization was performed when the symptoms did not improve 6 weeks after the embolization of the ovarian vein (29). Surgery should be attempted if the interventional radiological techniques have failed. Laparoscopic or open ovarian vein or internal iliac vein ligation are among the surgical alternatives.

As a result, PCS has an important place amongst the causes of chronic pelvic pain, which is frequently seen in women. In our study, we found that lower extremity venous insufficiency in great part accompanies pelvic venous dilatation. It would be beneficial to evaluate the lower extremity venous system by Doppler US when pelvic varicosis is detected by different imaging procedures.

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