

## DISTRIBUTIONS OF LOWER EXTREMITY VARICOSE VEINS IN FEMALE PATIENTS WITH PELVIC CONGESTION SYNDROME

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### ABSTRACT

#### Purpose

To demonstrate lower extremity varicose veins distributions in patients with Pelvic Congestion Syndrome.

#### Material and Methods

During a period of January 2015 to December 2018, 913 consecutive patients (1552 limbs) referred to Interventional Radiology Department due to lower extremity varicosities were retrospectively evaluated. Clinical evaluation was made in concordance with CEAP (clinical, etiological, anatomical and pathological elements) classification and included pain scores according to Visual Analogue Scale and Pelvic Venous Insufficiency questionnaire. Duplex ultrasound examinations were performed in patients' standing position. Computed Tomography Angiography was performed all suspected patients and obtained images were evaluated on workstation.

#### Results

Totally of 93 patients (all females) were adopted as PCS according to clinical, duplex ultrasound and CTA findings. The mean age was 44 (range 24-72 years). Median PVI VAS score was 39 (range 20-82). All patients were multiparous (median delivery number 3.7, range 2-7). Of 93 patients with PCS, purely non-saphenous varicosities (vulvar, groin or buttock) were demonstrated in 32 (34.4%) patients in 55 limbs and the combination of non-saphenous and saphenous varicosities were demonstrated in 55 (59.1%) patients. On the other hand, only six (6.5%) patients were involved in saphenous venous insufficiency alone. Saphenous-femoral (SF) and saphenous-popliteal (SP) junctions were competent in the majority of the saphenous insufficiencies (51 of 61, 83.6%). Distribution of saphenous vein insufficiency was as follows: great saphenous vein (70.5%), small saphenous vein (22.9%) and combination of great and small saphenous vein (6.6%). Total number of patients with non-saphenous varicosities was 87. We detected the combination of genital, thigh and calf regions varicosities in 52 (59.8%) patients. Thirty (34.5%) of them had genital and thigh varicosities and the remaining five (5.7%) patients were involved with genital region alone.

#### Conclusion

Varicose veins of the lower limbs with atypical distributions should prompt consideration of PCS especially in multiparous fertile women. A knowledge about variant distributions of lower extremity varicose veins could save patients suffering from recurrent interventions owing to the lower limb varicosities.

### INTRODUCTION

Pelvic Congestion Syndrome (PCS) or Pelvic Venous Insufficiency (PVI) is a clinical entity found commonly in relatively young, multiparous women and characterized by chronic pelvic pain lasting over 6 months, dyspareunia, dysmenorrhea, and urinary urgency feeling in the setting of pelvic

varicosities (1). PCS occurs due to ovarian vein or internal iliac vein insufficiency. All other pelvic pathologies causing these symptoms need to be excluded before PCS could be diagnosed.

Lower extremity chronic venous insufficiency is a disease with high prevalence worldwide. This pathology is characterized by signs and symptoms of venous stasis and hypertension, like prominence, dilation and varicosity of superficial veins, aching, heaviness, tiredness and swelling of the lower extremities and skin changes ranging from pigmentation to ulceration (2).

The venous circulation relationship between the lower limbs and the pelvic veins was first established by Massel et al. (3) and Hobbs et al. (4). Lower extremity varicosities which results from pelvic varicosities are primarily located on the medial side of the thigh and mostly, genital region especially vulva is also effected because of these connections. Therefore understanding this connection system is the key factor at the time of diagnosis of lower extremity varicosities with unusual location. This provides accurate treatment and prevents patients from redundant interventions.

In our clinic, we have special interest in the treatment of the combination of lower extremity varicose veins owing to PCS and pelvic venous insufficiency.

The purpose of this study is to demonstrate lower extremity varicose veins distributions in PCS patients. To the best of our knowledge, there are no studies investigating these patterns in patients those have already diagnosed with PCS.

## MATERIAL AND METHODS

### Participants

This clinical study was planned and performed as retrospective investigation in accordance with Helsinki Declaration. Informed consent forms were obtained from all participants. During a period of January 2015 to December 2018, 913 consecutive patients (1552 limbs) referred to Interventional Radiology Department due to lower extremity varicosities were retrospectively evaluated. All patients were evaluated clinically and with duplex ultrasound imaging. As a result, 610 (66.8%) female and 215 (35.2%) female patients were suspected for PCS according to clinical and duplex ultrasound findings.

### Clinical Evaluation

Clinical evaluation for lower extremities was made in concordance with CEAP (clinical, etiological, anatomical and pathological elements) classification (5). Additionally, pain scores were noted according to Visual Analogue Scale (VAS) graduated from zero to ten for each extremity. Furthermore, PVI questionnaire which is suggested by Society of Interventional Radiology (SIR) and questioning pelvic pain (overall, when lying down and in standing), limb pain (when lying down and in standing), dyspareunia, urinary urgency, and menstrual pain was accomplished according to VAS as well (5). Total PVI VAS score was calculated for each participant.

### Duplex Ultrasound Imaging

Duplex ultrasound examination with 4.5-11 MHz transducer (Logiq P5; General Electric Healthcare, Milwaukee, USA) was performed by one of two vascular ultrasound dedicated radiologist in patients' standing position. Superficial and deep venous system reflux patterns of the lower extremities were evaluated after manual compression of unilateral calf and during Valsalva maneuver. Reflux was defined if reverse flow exceeded 0.5 second for superficial and 1 second for deep veins (2). Non-saphenous varicosities were also determined. Insufficiency types (saphenous,

non-saphenous or both) and non-saphenous varicosities locations with their extensions were noted and mapped on a schematic diagram. We divided non-saphenous varicosities into 3 groups: genital region (including vulva, perine, groin and buttock), thigh region, and calf region.

Transvaginal ultrasound was not carried because all patients suspected for PCS were underwent detailed evaluation with contrast-enhanced computed tomography angiography (CTA). Additionally, CTA was preferred as diagnosis and treatment of PCS necessitate accurate description of pelvic venous anatomy that cannot be achieved by transvaginal ultrasound (6-9).

### **Computed Tomography Angiography**

In our institution, CTA is the chosen standard modality for patients suspected of PCS in order to exclude potential coexisting abdominal and pelvic disorders, which can also cause chronic pelvic pain, and to demonstrate ovarian vein dilatation with pelvic varicosities. Determining the right and left ovarian vein junction levels and connection variations to vena cava inferior and renal veins are the advantages for CTA as well, that can guide interventional radiologists for proper endovascular embolization. We carried out CTA (Siemens Artis Zee, Siemens AG, Muenchen, Germany) for all PCS suspected patients with an injection of 100 mL iodinated contrast agent using a rate of 3mL/s through power injector. Arterial and venous phases obtained with 5mm slice thickness were evaluated on workstation (Syngo X Workplace, Siemens AG, Muenchen, Germany).

### **Patient Selection**

Patients with lower extremity varicosities, regardless of saphenous or non-saphenous, who were diagnosed as PCS according to PVI questionnaire score and results obtained from CTA were included in the study. Totally of 111 patients were adopted as PCS on CTA if at least one ovarian vein diameter was over 8 mm together with pelvic varicosities over 4 mm of diameter (7, 8). Presence of contrast in ovarian vein on arterial phase was also accepted as sign of PVI (9, 10). Nine patients with PVI score below 20 were excluded although there is no published data determining cut-off values for PVI score in PCS. As a result, 93 patients were included in the study. These patients were also underwent digital subtraction venography and treated by mechanical and/or chemical embolization for PVI.

Patients who were detected with intra abdominal or pelvic mass and who has other causes of chronic pelvic pain, diagnosed by gynecology department, were excluded. Patients with nutcracker syndrome, retro aortic left renal vein, inferior vena cava syndrome, portal hypertension were excluded as well. Other exclusion criteria were as follows: known vascular malformation in the abdomen or at the lower limb, actual pregnancy, history of lower limb varicose vein operation, lower limb great or lesser saphenous vein thrombophlebitis and deep vein thrombosis.

### **Statistical analysis**

Descriptive analysis was performed with SPSS v.20 (New York, New York, USA). Categorical variables were presented as median with range, and percentage.

## **RESULTS**

Totally of 93 patients (all females) were adopted as PCS according to clinical, duplex ultrasound and CTA findings. The mean age was 44 (range 24-72 years). Median PVI VAS score was 39 (range 20-82). All patients were multiparous (median delivery number 3.7, range 2-7).

### Patterns of varicosities in lower extremities

Of 93 patients with PCS, purely non-saphenous varicosities (vulvar, groin or buttock) were demonstrated in 32 (34.4%) patients in 55 limbs and the combination of non-saphenous and saphenous varicosities were demonstrated in 55 (59.1%) patients. On the other hand, only six (6.5%) patients were involved in saphenous venous insufficiency alone. Saphenous-femoral (SF) and saphenous-popliteal (SP) junctions were competent in the majority of the saphenous insufficiencies (51 of 61, 83.6%). Distribution of saphenous vein insufficiency was as follows: great saphenous vein (70.5%), small saphenous vein (22.9%) and combination of great and small saphenous vein (6.6%). We did not find deep venous system insufficiency alone among all patients. Only a few patients with reflux in main femoral or popliteal vein were having incompetent SF or SP junction as well that we adopted them as so called 'siphon effect'. Most of the patients (87.4%) were C2 according to CEAP classification while remain patients were in class C3 (12.6%).

### Non-saphenous varicosities distribution

Total number of patients with non-saphenous varicosities was 87. We detected the combination of genital, thigh and calf regions varicosities in 52 (59.8%) patients. Thirty (34.5%) of them had genital and thigh varicosities and the remaining five (5.7%) patients were involved with genital region alone. Genital region varicosities were mostly vulvar and groin located. Almost all genital varicosities were extending to thigh and/or calf, and particularly to medial part in thigh and posteromedial part in calf.

## DISCUSSION

Although there are several published studies on PCS and its relationship between lower limbs varicosities, to the best of our knowledge this is the first study focused on lower limb varicosity types in patients those have already diagnosed with PCS according to CTA and clinical findings.

Chronic pelvic pain in women is a common condition, which may be caused by PCS, endometriosis, pelvic adhesions, atypical menstrual pain, urological problems, spastic colon syndrome, and psychosomatic disorders. Pelvic varicosities are found in about half of women having chronic pelvic pain.<sup>6</sup>

The key scenario in PCS is incompetence of the ovarian veins and venous reflux which is mostly diagnosed in multiparous women, consequence of enormous dilatation of the ovarian veins during pregnancy. In our study, mean number of delivery was 3.7 (range, 2-7) among 93 women.

The absence of valves in the ovarian veins, the compression of the left renal vein between the aorta and the superior mesenteric artery (nutcracker syndrome), and left renal vein variations may also cause PCS (7,8).

Several imaging diagnostic criteria have been reported for PCS with duplex ultrasound, CTA, magnetic resonance angiography (MRA), and digital subtraction angiography. In our institution CTA is the selected non-interventional modality combining with clinical evaluation according to PVI VAS score in order to diagnose PCS. The adopted CTA criteria for PCS are as follows: the presence of pelvic varicosities that measure more than 4 mm in diameter adjacent to the adnexa, dilated ovarian veins measuring more than 8 mm in diameter, and the presence of contrast in ovarian vein on arterial phase (9, 10). CTA is a modality that not only confirms the diagnosis, and also provides detailed anatomical information essential for endovascular gonadal vein embolization and excludes other potential intra-pelvic and intra-abdominal abnormalities. MRA could be more appropriate because of lack of radiation issues but the MRA technology is not cost-effective and

expensive. Currently, there is no VAS based questionnaire that has been specifically validated for the pain characteristics typically described in PVI and generated against the control population. In these circumstances, we consider that the questionnaire recommended by SIR to be the most appropriate because of its exhaustive content.

Pelvic varicosities are frequently associated with genital region (vulva, perine, buttock) and lower extremity varicose veins. Because hemodynamics in the sub-diaphragmatic venous system is a single functional unit connected with multiple and variable pathways (11). Internal iliac vein tributaries such as inferior gluteal and obturator vein have direct connection to the both the superficial and deep veins of the lower extremities (12). Therefore, pelvic region varicosities most likely could be the source of lower extremity varicosities via these connections.

Lower extremity chronic venous insufficiency is characterized with dilatation and varicosities of superficial veins causing heaviness, tiredness, aching, swelling and skin changes (13). Venous reflux is most often found in the saphenous vein trunks and in their tributaries. Non-saphenous venous reflux is defined as retrograde flow in superficial veins other than those that originate from the saphenous trunks and its frequency is about 10% in all lower extremity varicosities (13). Vulva, buttock, thigh, popliteal fossa, knee and along the sciatic nerve are the frequently seen locations of non-saphenous varicosities. Non-saphenous varicosities are more common in women. In a study of 835 limbs, this type of reflux was found in 67 female and in 17 male patients (14). The hormonal changes especially during and after pregnancy seem to be the most likely adequate theory.

Non-saphenous varicosities may also extend to the saphenous veins or their tributaries (14). Non-saphenous varicosities were determined as a usual suspect of PCS in several studies. We also found non-saphenous varicosities in 87% of our PCS patients. However, the percentage of saphenous insufficiency was 65.5% in which 6.5% of them was not accompanied by non-saphenous varicosities and in most of the saphenous vein insufficiencies SF and SP junctions were competent (83.6%). The majority of the saphenous insufficiencies were GSV (70.5%) and when we consider its close location to the pelvic region, this is predictable. In PCS, the involved lower extremity truncal veins distal to a competent SF or SP junction receives reflux from deep system via a perforator or from superficial flow continuity and these sources could be oversight during the duplex evaluation. Therefore, it is important to keep in mind that female patients with detected lower extremity truncal venous insufficiency could also be evaluated for PCS by briefly asking a couple of questions regarding well known symptoms especially in fertile multiparous women.

Genital region, especially vulva and buttock, is the favorite location and distribution point of pelvic varicosities those extending to the lower extremity. However, usually it is difficult to diagnose varicosities at this stage particularly in some communities such as in our country due to the social issues. Therefore, we thought that the frequency of PCS or pelvic varicosities are actually underestimated and this could be covered by being awake and having skills regarding anatomical and clinical details of PCS.

## CONCLUSION

Varicose veins of the lower limbs with atypical distributions should prompt consideration of PCS especially in multiparous fertile women. A knowledge about variant distributions of lower extremity varicose veins could save patients suffering from recurrent interventions owing to the lower limb varicosities.

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