ISSN: 0975-1556

Available online on www.ijpcr.com

International Journal of Pharmaceutical and Clinical Research 2022; 14(1);320-325
Original Research Article

To Evaluate the Role of Ultrasonography in Pelvic Congestion Syndrome

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Received: 06-11-2021 / Revised: 19-12-2021 / Accepted: 28-12-2021
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Conflict of interest: Nil

Abstract

Background: Pelvic congestion syndrome (PCS) is defined as chronic pelvic pain (CPP) due to either dilated or refluxing pelvic veins.

Aims and objectives: 1) To evaluate the role of ultrasonography with doppler in diagnosing PCS. 2) To compare the findings with healthy volunteers. Materials & Methods: This observational cross-sectional study was carried out at Obstetrics and Gynaecology department IGIMS, Patna including 100 multiparous premenopausal women, 50 with chronic pelvic pain and 50 healthy women, over a period of 1 year (2019-2020), after clearance from institutional ethics committee. Inclusion criteria: CPP, Multiparous premenopausal women. Exclusion Criteria: Pregnancy, Fibroid, Endometriosis, PID, Prolapse uterus. Informed consents were taken. All underwent transvaginal and transabdominal sonography to assess the pelvic vein diameter, the ovarian veins diameter, flow direction, presence of pelvic varicocele, volume of uterus and presence of polycystic ovaries. The findings were statistically analysed. Statistical Analysis: SPSS v23 (IBM Corp.) was used for data analysis. Statistical significance was kept at $p < 0.05$.

Results: The mean ± SD diameter of the right Ovarian Vein Diameter, left ovarian vein diameter, right pelvic vein diameter and left pelvic vein diameter in the PCS group were significantly different when compared with control group. ($p = <0.001$). Reversed caudal flow in the ovarian veins were present in all of the patients with PCS group and in six patients of the control group. Pelvic varicoceles were present in all patients with PCS group and in five patients of the control group. Polycystic ovaries were present in 26 patients with PCS group (52%) and eight patients of the control group (16%). Mean uterine volume was 113.632±0.537 cm^3 in the PCS group and 111.437±0.754 cm^3 in the control group ($p>0.05$).

Conclusion: Sonography was found to be potentially useful non-invasive tool for diagnosing patients with CPP.

Keywords: Pelvic congestion syndrome, Chronic pelvic pain, Pelvic varicocele, Polycystic ovaries, Doppler study.

Introduction

In women of reproductive age group, chronic pelvic pain (CPP) is a common yet underestimated condition, with a prevalence of 5.7–26.6% [1–7]. The International Association for the Study of Pain has defined chronic pelvic pain as pain, either continuous or recurrent, perceived in structures related to the pelvis, for at least 6 months. Differential diagnosis of chronic pelvic pain is pelvic inflammatory disease, pelvic adhesions, endometriosis, ovarian pathology and the under-diagnosed pelvic congestion syndrome (PCS) [1–5,8]. Pelvic congestion syndrome was first described in 1857, showing chronic pelvic pain associated with varicose veins [9]. Among patients with CPP, the prevalence of pelvic congestion syndrome is found to be 12–33% [1–5,10]. Premenopausal, multiparous women are most commonly affected by pelvic congestion syndrome and have complaints like dysmenorrhea and exacerbating pain during and after intercourse or prolonged standing [11–13]. Veins arising from the ovarian venous plexus, communicate with the uterine plexus in the broad ligament. Incompetence of these veins, either due to congenital absence of valves or pregnancy, leads to retrograde venous flow, and thus, progressive development of pelvic varicosities [14,15]. During pregnancy, the vascular capacity of ovarian veins increases by up to 60 times of their normal capacity [16]. This increased capacity causes mechanical pressure, contributing to persistent venous reflux; thus, explaining occurrence of pelvic congestion syndrome in multiparous women mainly [17]. Presently, venography is the gold standard, but invasive, test for the diagnosis of pelvic venous disorders [18,19]. Also, venography is a time-consuming process and exposes the pelvis of women to radiation [18,19]. Venography could be replaced as diagnostic test if noninvasive diagnostic tools were found to be accurate. In this study, we aimed to evaluate the role of pelvic ultrasonography with Doppler studies in diagnosing pelvic congestion syndrome in women with chronic pelvic pain.

Materials and Methods:

This observational cross-sectional study was performed at the obstetrics and Gynaecology department, from 2019-2020, in IGIMS, Patna, Bihar, India, after clearance from institutional ethics committee, including 100 premenopausal multiparous women; divided into two groups, 50 healthy volunteers (control group) and 50 patients with suspected pelvic congestion syndrome (excluding the other causes of chronic pelvic pain) i.e study group. Informed written consent were taken from all. With transabdominal and transvaginal sonography, we examined all the patients of study group and control group. In the study group, all the patients had a history of chronic pelvic pain for more than 6 months and ovarian point tenderness on pelvic examination. On ultrasonography, pelvic varicocele was seen and other pelvic diseases including endometriosis, uterine myoma, and uterine adenomyosis were excluded. Sonography was performed with the subjects in the supine position using an HDI 3000 scanner with 4-2–MHz convex and 9-5–MHz intracavitary transducers (Philips, Bothell, WA). Healthy control subjects and patients of study group were matched according to age. The age range were 26–45 years and 27–45 years of the study group and the control group respectively. On transabdominal sonography, we measured the internal diameter of the ovarian vein with handheld calipers and also evaluated the direction of flow in the ovarian vein with colour and duplex Doppler sonography. With transvaginal sonography we evaluated maximum diameter of the pelvic venous plexus, presence of pelvic varicocele, volume of the uterus, and polycystic changes of the ovary. The diagnostic standard used for the diagnosis of pelvic varicoceles were tortuous and

dilated veins, greater than 5 mm in diameter around the ovary and uterus [3]. All the parameters were evaluated in the patients with pelvic congestion syndrome and in control subjects. Each parameter used in patients with pelvic congestion syndrome and control subjects was statistically analyzed.

Statistical Analysis

Data were coded and recorded in MS Excel spreadsheet program. SPSS v23 (IBM Corp.) was used for data analysis. Descriptive statistics were elaborated in the form of means/standard deviations and medians/IQRs for continuous variables, and frequencies and percentages for categorical variables. Data were presented in a graphical manner wherever appropriate for data visualization. Group comparisons for continuously distributed data were made using independent sample 't' test when comparing two groups. If data were found to be non-normally distributed, appropriate non-parametric tests in the form of Wilcoxon Test were used. Chi-squared test was used for group comparisons for categorical data. In case the expected frequency in the contingency tables was found to be <5 for >25% of the cells, Fisher's Exact test was used instead. Linear correlation between two continuous variables was explored using Pearson's correlation (if the data were normally distributed) and Spearman's correlation (for non-normally distributed data). Statistical significance was kept at $p < 0.05$.

Results

On transabdominal sonography, right ovarian and left ovarian veins were located in both the study group (PCS group) and the control group. The mean ± SD diameter of the right Ovarian Vein in the pelvic congestion syndrome group was 8.50 ±1.89 mm and in the control, group was 4.91 ±1.20 mm (p=<0.001). Left ovarian vein mean± SD diameter was 8.47 ± 1.81 mm in the pelvic congestion syndrome group and 4.95 ± 1.16 mm in the control group (p = <0.001).Reversed caudal flow in the ovarian veins were present in all of the patients with pelvic congestion syndrome (100%) and in six patients of the control group (12%). On transvaginal sonography, pelvic varicoceles were present in all patients with pelvic congestion syndrome (100%) and in five patients of the control group (10%). The mean diameter of the right pelvic vein was 7.92 ±1.46mm in the pelvic congestion syndrome group and 3.80 ± 0.35 mm in the control group (p = <0.001); the mean diameter of the left pelvic vein was 7.79 ± 1.63 mm in the pelvic congestion syndrome group and 3.79 ±0.32 mm in the control group (p=<0.001) . Polycystic ovaries were present in 26 patients with pelvic congestion syndrome group (52%) and eight patients of the control group (16%). Mean uterine volume was 113.632±0.537 cm^3 in the pelvic congestion syndrome group and 111.437±0.754 cm^3 in the control group (p>0.05).

Table 1 is showing sensitivity, specificity, positive predictive value, negative predictive value, and diagnostic accuracy of various parameters i.e primary diagnostic parameters. Table-2 is showing association between pelvic congestion syndrome and parameters.

Table 1: Primary Diagnostic Parameters

Variable	Sensitivity	Specificity	PPV	NPV	Diagnostic Accuracy
Right Ovarian Vein Diameter (Cutoff: 5.6 by ROC)	100.0% (93-100)	76.0% (62-87)	80.6% (69-90)	100.0% (91-100)	88.0% (80-94)
Right Ovarian Vein Diameter (Cutoff: >5)	100.0% (93-100)	60.0% (45-74)	71.4% (59-82)	100.0% (88-100)	80.0% (71-87)

Variable	Sensitivity	Specificity	PPV	NPV	Diagnostic Accuracy
Left Ovarian Vein Diameter (Cutoff: 5.7 by ROC)	100.0% (93-100)	76.0% (62-87)	80.6% (69-90)	100.0% (91-100)	88.0% (80-94)
Left Ovarian Vein Diameter (Cutoff: >5)	100.0% (93-100)	58.0% (43-72)	70.4% (58-81)	100.0% (88-100)	79.0% (70-87)
Mean Ovarian Vein Diameter (Cutoff: 5.75 by ROC)	100.0% (93-100)	86.0% (73-94)	87.7% (76-95)	100.0% (92-100)	93.0% (86-97)
Mean Ovarian Vein Diameter (Cutoff: >5)	100.0% (93-100)	58.0% (43-72)	70.4% (58-81)	100.0% (88-100)	79.0% (70-87)
Maximum Ovarian Vein Diameter (Cutoff: 7.1 by ROC)	88.0% (76-95)	86.0% (73-94)	86.3% (74-94)	87.8% (75-95)	87.0% (79-93)
Maximum Ovarian Vein Diameter (Cutoff: >5)	100.0% (93-100)	38.0% (25-53)	61.7% (50-72)	100.0% (82-100)	69.0% (59-78)
Right Pelvic Vein Diameter (Cutoff: 5.1 by ROC)	100.0% (93-100)	98.0% (89-100)	98.0% (90-100)	100.0% (93-100)	99.0% (95-100)
Right Pelvic Vein Diameter (Cutoff: >4)	100.0% (93-100)	94.0% (83-99)	94.3% (84-99)	100.0% (92-100)	97.0% (91-99)
Left Pelvic Vein Diameter (Cutoff: 5.6 by ROC)	100.0% (93-100)	100.0% (93-100)	100.0% (93-100)	100.0% (93-100)	100.0% (96-100)
Left Pelvic Vein Diameter (Cutoff: >4)	100.0% (93-100)	92.0% (81-98)	92.6% (82-98)	100.0% (92-100)	96.0% (90-99)
Mean Pelvic Vein Diameter (Cutoff: 5.7 by ROC)	98.0% (89-100)	100.0% (93-100)	100.0% (93-100)	98.0% (90-100)	99.0% (95-100)
Mean Pelvic Vein Diameter (Cutoff: >4)	100.0% (93-100)	88.0% (76-95)	89.3% (78-96)	100.0% (92-100)	94.0% (87-98)
Maximum Pelvic Vein Diameter (Cutoff: 5.8 by ROC)	100.0% (93-100)	100.0% (93-100)	100.0% (93-100)	100.0% (93-100)	100.0% (96-100)
Maximum Pelvic Vein Diameter (Cutoff: >4)	100.0% (93-100)	86.0% (73-94)	87.7% (76-95)	100.0% (92-100)	93.0% (86-97)

Table 2: Association between PCS and Parameters

Parameters	PCS		p value
	Present (n = 50)	Absent (n = 50)	
Right Ovarian Vein Diameter* **	8.50 ± 1.89	4.91 ± 1.20	<0.001[1]
Left Ovarian Vein Diameter* **	8.47 ± 1.81	4.95 ± 1.16	<0.001[1]
Mean Ovarian Vein Diameter* **	8.49 ± 1.58	4.93 ± 0.81	<0.001[2]
Maximum Ovarian Vein Diameter* **	9.24 ± 1.85	5.57 ± 1.16	<0.001[2]
Right Pelvic Vein Diameter* **	7.92 ± 1.46	3.80 ± 0.35	<0.001[1]
Left Pelvic Vein Diameter* **	7.79 ± 1.63	3.79 ± 0.32	<0.001[1]
Mean Pelvic Vein Diameter* **	7.85 ± 1.14	3.79 ± 0.21	<0.001[1]
Maximum Pelvic Vein Diameter* **	8.73 ± 1.38	3.95 ± 0.40	<0.001[1]

****Significant at p<0.05, 1: Mann-Whitney U Test, 2: t-test*

Discussion

In this observational cross-sectional study, we aimed to identify the role of ultrasonography, a non-invasive diagnostic

tool, in the work-up of suspected patients of PCS while comparing with healthy premenopausal multiparos women. Although the ultrasound congestion score is based on vein diameter, and a subjective assessment of congestion; it is non-invasive too, so may be the ideal first step in the diagnosis of PCS. Park et al. found a high specificity (91%) when a vein > 5 mm was crossing the uterine body [11]. Transvaginal ultrasound found to have a high sensitivity (100%), for pelvic varicoceles, thus, assuming a good ability to rule out PCS when pelvic varicoceles are not found [11,20]. In the present study also, we found the sensitivity of transvaginal ultrasound to be 100% for pelvic varicocele. The role of transabdominal ultrasonography was also studied by Park et al. and he found that an ovarian vein diameter of > 6 mm had a positive predictive value of 83.3% [11]. In our study, we found the mean ovarian diameter (Cutoff: 5.75 by ROC) accounted for a sensitivity 100%, specificity 86%, positive predictive value of 87.7%, negative predictive value of 100% and diagnostic accuracy of 93%.

With ultrasound Doppler technique, reversed caudal flow in the ovarian vein was found to be highly sensitive (100%) for diagnosing PCS [11]. In the present study also, we found the same. In congested adnexal veins, the flow is typically low; power Doppler assigns different colour tones and brightness to the total energy of the Doppler signal; thus, it becomes more sensitive to motion [21]. Labropoulos et al. had also proposed a protocol for examination of patients suspected of PCS with ultrasonography, including the patient's position and head elevation of 30 degrees [22]. The only requirement of the technique is overnight fasting. Yet, some of studies found that power Doppler assessment of adnexal veins, were unable to differentiate healthy women from women with PCS [23,24]. . Thus, a good diagnostic work-up must be readily available for patients suspected of CPP.

Conclusion

With this review, we have tried to add important data on the accuracy of ultrasonography in the work-up of patients with CPP. Pelvic veins > 5 mm, communicating with both ovarian plexus and reversed caudal flow have been found to be the most indicative for PCS. Till now, a validated non-invasive diagnostic tool is not available. Ultrasonography and MRI are the most investigated modalities. MRI is very costly. Future studies should be done to investigate the role of different positions of the patients, such as reverse Trendelenburg and the Valsalva's maneuver in transvaginal ultrasonography to correlate these with the findings of venography, the current reference standard for diagnosis. Thus, there is an urgent need for several studies in patients of suspected PCS to draw a proper outline in management.

Funding

This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

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