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Effect of type & size of fibroid on Uterine Artery Doppler Indices

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ABSTRACT

Background and Objectives: Fibroids are a common occurrence in women of reproductive age, with significant prevalence in the population studied. These benign tumors can impact various aspects of reproductive health, including fertility and blood flow to the uterus. Uterine artery Doppler indices are a reliable measure of blood flow and can provide valuable information for the management of fibroids. By investigating the effect of size and type of fibroids on uterine artery Doppler indices, this study expands the existing knowledge and contributes to improved care for women with fibroids.

METHODOLOGY: A descriptive study was conducted in Gilani ultrasound center for the duration of 7 months to find the effect of type and size of fibroid on uterine artery Doppler indices. With Toshiba Xario Prime with convex probe frequency of 3.5MHz.A sample of 68 patients with different types and size of fibroid on uterine artery. The statistical programed for social sciences (SPSS) version 25.0 was used to analyze the data.

RESULTS: 68 patients were enrolled for this study Mean age of women was 37.39. Out of a total of 68 patients, 24 (35.3%) had intramural fibroid, +24 (35.3%) had submucosal fibroid and twenty patients had sub serosal fibroid 20 (29.4%) of them. The relationship between Fibroid size and Right uterine artery with a significance level (P) 0.64 indicates a non-significant association. The relationship between Fibroid size and left uterine artery with significance level (P) 0.549 indicates a non-significant association. Relationship between Fibroid type and right uterine artery with a significance level (P) 0.47 indicates a non-significant association. Relationship between Fibroid type and left uterine artery with a significance level (P) 0.667 indicates a non-significance association.

CONCLUSION: Study concluded that no association found between the size and type of fibroid.

KEYWORDS: Uterine fibroid, Ultrasound, Myoma, pregnancy rate

INTRODUCTION

One of the most important public health issues on the planet is myomas.1 Fibroid tumors or myomas, also known as endometrial leiomyomas, are rather frequent.2 An essential reproductive organ is the uterus. The embryo is put into this hollow, pear-shaped structure, which has muscular boundaries, and it develops there until the infant is born. Myomas are the most prevalent benign genital tumors throughout the reproductive period, despite being a key organ in human reproduction. Uterine myomas, frequently referred to as "fibroids" as well as "leiomyomas," are endometrial tumors made up of cells of smooth muscle and fibroblasts that are rich in extracellular matrix. These neoplasms have the ability to significantly impair its function, causing it to stop reproducing. As women get older and more regularly use assisted reproductive technologies, myomas in pregnancy are becoming more prevalent. Myomas are documented to affect 10.7% of pregnant women during the first trimester. 3

On how quickly they develop, progesterone, growth hormone, and oestrogen all have an effect. Uterine fibroid tumors appear during the reproductive years, grow throughout pregnancy, and then go away after menopause while having no recognized aetiology. Oestrogen agonist use has been associated with a higher risk of fibroid tumours.4Fertility may suffer as a result of fibroids. These detrimental effects include

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lowered fertility and an increased risk of problems in the first trimester.5 Fibroids can induce premature labour and birth, placenta previa, intrauterine growth retardation, an increase in caesarean delivery, and postpartum hemorrhage.6 The most common benign gynecological lesion in females, fibroid tumors, may have a variable impact on infertility and reproductive health. 7

The most common symptoms that a uterine myoma will present with are bleeding, secondary anemia brought on by menometrorrhagia, metrorrhagia, or irregular menstrual hemorrhage, discomfort, mass indications, sexual dysfunction, and infertility. Approximately 62% of affected women experience multiple symptoms. Unusual signs may also develop. Complications of myomas include intra-abdominal blood loss, excessive vaginal discharge, uterine inversion as well as flexure, hydroureters and/or fluid accumulation, urinary incontinence, kidney problems, deep vein thrombosis, necrosis as well as disease, mesenteric vein thrombus formation, intestinal sepsis, and malignant alteration. 8

Depending on where they are found, fibroids might be submucosal, intramuscular, or subserosal.9 Submucosal fibroids denature the uterine cavity, although they can be divided into three types: type I, which are unicellular myomas with less than 50% intramural outgrowth, type II, which are motile myomas with more than 50% intramural extension. 10Intramural fibroids have little effect on the endometrium and grow into the uterine submucosa with approximately half their greatest width. 11 However, more than half of sub-serosal tumors spread outside the uterine serosal surface, and unlike intramural fibroids, they do not cause uterine injury. It is possible to have unicellular or pedunculated sub serosal fibroids. 12 This category includes any fibroid greater than 4 cm in diameter that does not harm the endometrium and is found all across the thickness of the myometrium. 13

The physical exam is important because it might reveal the position, size, and movement of the fibroids and uterus. There are several scanning methods available, each with its own set of advantages and disadvantages. Ultrasound imaging is the mainstay of diagnosis. There are two types of ultrasound imaging procedures: transvaginal and abdominal. Other ultrasound versions include two-dimensional (2D) and three-dimensional (3D) ultrasound, saline-infused sonography (SIS), and sonohysterograms (HSN). The relative benefits of ultrasonography are its broad availability, simplicity of use, and low cost. Because ultrasound is based on sound, the wave's closeness to its target is critical. The transvaginal operation has a significant benefit over the abdominal method because of its close proximity to the tumor site. It increases the resolution and characterization of the pelvic organs.14The two most used techniques for assessing the impact of fibroid on the uterine cavity are hysterosalpingograms and color Doppler ultrasonography. Hysterosalpingograms may only be 50% and 20% sensitive and specific for detecting intrauterine lesions, respectively. 15 The color transvaginally flowing the investigation of uterine fluxes and fibroid vascular supplies was done using the Doppler method. 16

Doppler studies of arteries may not show genuine blood circulation to the endometrium since the inner layer is the central aspect of the womb and there is branch flow between the uterus and ovarian veins. As a result, using 3D ultrasound with a power Doppler to accurately quantify endometrial blood flow makes more sense. 17

Women of reproductive age frequently experience fibroids, which can result in a number of problems. In order to create an effective treatment strategy for fibroid patients, this study compares the uterine artery velocity of fibroid patients and healthy individuals.

METHODOLOGY

It was a descriptive study performed to find out the effect of type and size of fibroid on uterine artery Doppler indices. Sample size was 68 patients. The duration of study was 7 months and data were collected from Gilani ultrasound center Lahore Pakistan. The inclusion criteria were women with uterine fibroid. The exclusion criteria were patients who had any history of previous uterine surgery and women who were any anomaly other than fibroid. Toshiba Xario Prime with convex probe frequency of 3.5MHz was used. The statistical programed for social sciences (SPSS) version 25.0 was used to analyze the data.

RESULTS

Of the 68 patients aged 28 to 50 aged were sent to the ultrasound department, 24 (35.3%) had intramural fibroid, 24 (35.3%) had submucosal fibroid and twenty of the sub serosal 20 (29.4%) fibroids were found.

Table 1: Correlation shows that the relationship between fibroid size and left uterine artery peak systolic velocity (PSV), with a P value of 0.54 indicating a non-significant association.

Variable Y	Velocity_PSV_cm_sec_L _Velocity_PSV_cm_sec_L
Variable X	size
Sample size	68
Correlation coefficient r	0.2608
Significance level	P=0.549
95% Confidence interval for r	0.02387 to 0.4700

Table 2: Correlation shows that the relationship between fibroid size and right uterine artery peak systolic velocity (PSV) is shown in this table, with a P value of 0.64 suggesting a non-significant association.

Variable Y	Velocity_PSV_cm_sec_R _Velocity_PSV_cm_sec_R
Variable X	Size
Sample size	68
Correlation coefficient r	0.05765
Significance level	P=0.6405
95% Confidence interval for r	-0.1833 to 0.2921

Table 3: Kruskal-Wallis test shows that the relationship between fibroid type and the right uterine artery pulsatility index (PI), with a P value of 0.47 indicating a non-significant association.

Data	Pulsatility_index_PI_R Pulsatility index (PI) R
Factor codes	Types
Sample size	68

Descriptive statistics

Factor	n	Minimum	25th percentile	Median	75th percentile	Maximum
Intramural	24	0.3000	0.835	1.120	1.995	10.070
Submucosal	24	0.4200	0.785	1.455	2.305	99.000
Sub serosal	20	0.4800	1.015	1.760	2.390	5.100

Kruskal-Wallis test

Test statistics	1.4836	
Corrected for ties HT	1.4843	
Degrees of Freedom (DF)	2	
Significance level	P = 0.476097	
Factor	n	Average rank
(1) Intramural	24	31.21
(2) Submucosal	24	34.46
(3) Sub serosal	20	38.50

Descriptive study show intramural fibroid average rank was 31.21 and median rank was 1.120, submucosal fibroid average rank was 34.46 and median rank was 1.455, sub serosal fibroid average rank was 38.50 and median rank was 1.760. And the significance level (P) was 0.47.

Table 4: Kruskal-Wallis test shows that the relationship between fibroid types and left uterine artery peak systolic velocity (PSV), with a P value of 0.66 indicating a non-significant association.

Data	Pulsatility_index_PI_L Pulsatility index (PI) L
Factor codes	Types
Sample size	68

Descriptive statistics

Factor	n	Minimum	25th percentile	Median	75th percentile	Maximum
Intramural	24	-15.4000	20.915	28.585	37.225	93.300
Submucosal	24	7.1000	21.935	30.750	47.750	93.300
Sub serosal	20	6.1800	24.220	30.930	51.270	80.300

Kruskal-Wallis test

Test statistics	0.8073
Corrected for ties HT	0.8075
Degrees of Freedom (DF)	2
Significance level	P = 0.667821

Factor	n	Average rank
(1) Intramural	24	32.19
(2) Submucosal	24	34.27
(3) Sub serosal	20	37.55

Descriptive study show intramural fibroid average rank was 32,19 and median rank was 28.585, submucosal fibroid average rank was 34.27 and median rank was 30.750, sub serosal fibroid average rank was 37.55 and median rank was 30.930. And the significance level (P) was 0.667.

DISCUSSION

The "Effect of fibroid type and size on the uterine artery Doppler index" was the subject of a brief study. This study's main goal was to use ultrasound imaging to find extra menstrual irregularities, pain, and uterine fibroids, all of which are detrimental to fertility and pregnancy. Although ultrasound results were nearly identical at the time, ultrasonography has now surpassed speed and emerged as the most effective way to find uterine fibroids and associated illnesses. The aim of this study is to collect information on the effect of fibroid type and size on the Doppler index of the uterine artery. They want to make a believable connection between the sizes and varieties of fibroid tumors using ultrasound imaging. Despite its importance, most of these research focus on different imaging techniques, even if ultrasonography is better for fibroid imaging. By employing ultrasonic imaging, they hope to establish a fair association between the sizes and varieties of fibroid tumors. Despite its significance, ultrasonography has received the most attention among the other imaging modalities since it is more effective at detecting fibroids.

According to our records, 68 people between the ages of 28 and 50 were referred to the ultrasonography department. The size of fibroids and the PI of both the left and right uterine arteries were found to be related in our study, with a P value of 0.51 for the left uterine artery and a P value of 0.45 for the right uterine artery. The link between fibroid size and PI of both the right and left uterine arteries is non-significant.

Uterine artery blood circulation in myomatous uteri was the subject of a research study published in 2012 by Fatmeh Ghaterh Samani et al. PSV and uterine volume do not significantly correlate in the control group ($p = 0.5$). PSV and uterine volume have a significant relationship in the case group ($R = 0.36$, $P = 0.01$). The relationship between PI and womb volume in the control group is very weak and non-significant ($P > 0.05$, $R > 0.033$). In the case group, PI and uterine volume have a substantial inverse relationship ($P = 0.01$; $R = -0.461$). Uterine volume and the prevalence of myomas was not

significantly correlated in the control group (P > 0.05, R = 0.106). Only 14 cases (32% of the total) of visible arteries of myomas were found when the color Doppler of the fibroids was analyzed, and the mean RI in the fibroid artery was 0.570 and 18.18

According to our statistics, 68 individuals ages 28 to 50 went to the ultrasound department. We discovered a link between the size of fibroids and the resistive indices of a left uterine artery in our study, with a P-value of 0.93 for left uterine arteries and a P-value of 0.82 for right uterine arteries. The link between fibroid size and the resistance index of the right and left uterine arteries is non-significant.

Szabo et al. reported their study in 2002 on the use of color Doppler ultrasound to distinguish uterine leiomyomas from problems of the connective tissue of the uterus. The intra-tumoral peaked systolic velocity (PSV) was much higher in patients with sarcomas than in those with womb myomas, despite the fact that the mean tumoral resistive index (RI) and pulsatility index (PI) were significantly lower in those with sarcomas. There was a substantial decrease in RI and PI and an increase in PSV in 14 of the leiomyoma cases with large size and/or neoplastic, degenerative, and inflammatory changes. The detection performance for uterine cancer was 67% when a RI split value of 0.5 was utilised, with an untrue rate of 11.8%. 19

According to our statistics, 68 people ages 28 to 50 went to the radiology department. In our studies, the PSV of a left uterus artery shows a significant correlation, whereas the PSV of a right uterus artery indicates a non-significant connection.

A article titled " effect of subserosal, intramural, and submucosal fibroids on the outcome of assisted reproductive technology (ART) treatment" was published in 1998 by Talia Eldar-Geva et al. Findings on transvaginal uterine ultrasonography performed before the initiation of treatment

and pregnancy and implantation rates. he pregnancy rates per transfer were 34.1%, 16.4%, 10%, and 30.1% in the patients with subserosal fibroids,intramural fibroids, submucosal fibroids and no fibroids, respectively. The implantation rates were 15.1%, 6.4%, 4.3%, and 15.7%, respectively. Both rates were significantly lower in patients with intramural fibroids than in those with subserosal fibroids or no fibroids Pregnancy and implantation rates were significantly lower in the groups of patients with intramural and submucosal fibroids, even when there was no deformation of the uterine cavity. Pregnancy and implantation rates were not influenced by the presence of subserosal fibroids. Surgical or medical treatment should be considered in infertile patients who have intramural and/or submucosal fibroids before resorting to ART treatment.20

According to our statistics, 68 individuals, ranging in age from 28 to 50, were referred to the radiology department. We discovered a link between the types of fibroid and the pulsatility indices of the left and right uterus arteries in our studies, with 0.18 P-values for the left endometrial artery and 0.47 P-values for the right artery. This correlation between fibroids' types and the PI of left and right endometrial arteries is non-significant.

Asim Kurjak and colleagues published "The Assessment of benign uterine tumor vascularization by transvaginal color doppler"in 1992 year.Transvaginai color flow Doppler was used to study uterine flow and fibroid arterial supply. These studies were carried out in 101 patients with palpable uterine fibroids and 60 women attending the clinic for annual checkups. Blood flow impedance expressed as resistance index (RI), pulsatility index (PI), and blood velocity are calculated from the 5th to the 8th day of the menstrual calendar. Increased blood velocity and decreased RI and PI in both uterine arteries occurred in patients with uterine fibroids. The same technique was also used to study blood flow in the main arteries supplying identifiable fibroid. Diastolic flow in these arteries was always present and increased in comparison with uterine artery blood flow. The difference in uterine artery blood flow between patients with fibroids and healthy volunteers is statistically significant and may have predictable value in growth rate evaluation of the benign uterine mass.21

Our records show that 68 people between the ages of 28 and 50 visited the ultrasonography department. With a 0.66 P value for the left uterine artery and a 0.95 P value for the right uterine artery, we were able to link the different fibroid types to the peak systolic velocities of the left and right endometrial arteries in our study. There is no statistically significant correlation between different fibroid types and the PSV of the left and right uterine arteries.

Povilas Sladkeviciu wrote a paper entitled"Transvaginal Doppler Examination of Uteri with Myomas"in 1996.The uterine arteries and arteries in the wall and core of myomas were examined with transvaginal color and spectral Doppler ultrasound in 28 premenopausal and 17 postmenopausal women with uterine myomas. Eighteen premenopausal women and 100 postmenopausal women without myomas served as the controls for uterine artery Doppler measurements. The respective median time-averaged maximum velocity and pulsatility index (PI) values for the left uterine artery were 36.1 cds anci 1.36 in premenopausal women with

myomas vs. 17.6 cds and 2.58 in controls; p = 0.0001. The corresponding values in postmenopausal women were 13.9 cm/s and 1.93 vs. 11.0 cm/s and 2.33; p < 0.05. PI values < 1.0 were recorded from 92% (24/26) of the myomas in premenopausal women and from 69% (11/16) of those in postmenopausal women. We conclude that uterine myomas substantially affect blood flow velocity in the uterine arteries, and that PI values < 1.0 are common in uterine myomas and do not indicate malignancy.22

CONCLUSION

Study concludes that, there was no association found between size and type of fibroid with Doppler indices.

Fig-1 In above image the sub mucosal fibroid was present. Along with effect of fibroid on left and right uterine artery stated below.

Fig-2 Effect of sub mucosal fibroid on left uterine artery. Left uterine artery shows pulsatility index (2.57), Resistive index (0.87) and peak systolic velocity (77.4 cm/s).

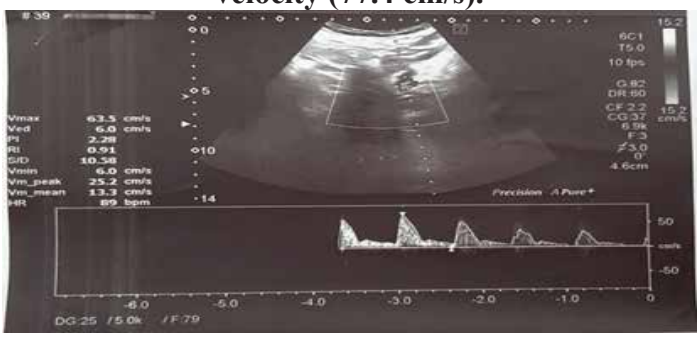

Fig-3 Effect of sub mucosal fibroid on right uterine artery.

Right uterine artery shows pulsatility index (2.28), Resistive index (0.91) and peak systolic velocity (63.5 cm/s).

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