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Research Article

Sonographic Evaluation of Fibroid Vascularity as a Predictor of Symptom Severity

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ABSTRACT

Background: Fibroids of the uterus are a frequent source of gynecological morbidity, but the manifestation of the symptoms may differ broadly in women with this condition. Although the size and location of fibroid have been the focus traditionally, they do not necessarily explain clinical manifestation. The initial concern has hence been on the increased focus on fibroid vascularity as a possible determinant of severity of symptoms.

Methodology: This is an observational research that was done in one year i.e. January 2024 - December 2024 at department of Obstetrics and Gynaecology, POF Hospital, Wah Cantt. Seventy two women with uterine fibroid diagnosis on ultrasound were recruited one after another. The clinical symptoms were recorded and were classified on the basis of severity. Fibroid characteristics and vascularity were evaluated with the help of gray-scale ultrasound and color Doppler imaging. Doppler indices like resistive index, pulsatility index and peak systolic velocity were recorded. General statistical procedures were carried out to assess relationships between vascular parameters and the severity of symptoms.

Results: Fibroid vascularity that was moderate to significant was found in over 50 per cent of the participants. Vascularity grade patients had a significant probability of having moderate to severe symptoms as opposed to patients showing minimal or no flow. Doppler analysis indicated would show reduced resistive and pulsatility indexes and increased peak systolic velocities of patients with more significant symptom load. These correlations were also found to be statistically significant, and with less strength fibroid size alone showed a relationship with symptom severity.

Conclusion: Clinical symptom severity has a close relationship with fibroid vascularity measured by Doppler ultrasound. Doppler assessment is extra-information to regular gray-scale examination and can potentially be helpful in predicting the symptoms burden and management approach.

Keywords: Uterine fibroids; Doppler ultrasound; Vascularity; Symptom severity; Color Doppler

INTRODUCTION

One of the most common benign tumors in women of reproductive age is uterine fibroids, and this issue poses an important source of gynecological referral all over the world. Even though a significant number of fibroids do not cause any symptoms, a significant percentage of the victims have been experiencing symptoms like heavy menstrual bleedings, pains in the pelvic regions, pressure related effects and poor living situations. The difference in clinical presentation usually creates difficulties during evaluation and treatment [1-3].

Historically, the patterns of symptoms were explained by the size, number, and location of fibroid in the organism. There is, however, clinical experience and emerging research that indicates that the structural factors are not necessarily well-correlated with the severity of symptoms. Minute fibroids face the risk of causing extraordinary symptoms in certain patients and huge lesions can be comparatively silent in others. This discord is a pointer that more biological elements come to play in fiberoid behavior [4-6].

The vascular supply is of main importance in fibroid development, hormonal sensitivity, and tissue functioning. The new technology in ultrasonography especially color and spectral Doppler imaging has enabled one to test fibroid vascularity without the need of very delicate

procedures like surgeries or catheterization. Doppler parameters, like resistive index and pulsatility index provide an indirect understanding of blood flow parameters and tissue perfusion [7-10].

In spite of the increasing interest, the clinical value of fibroid vascularity according to the severity of the symptoms is yet to be explored comprehensively, particularly in the clinical practice environment as a matter of routine. Knowledge of this relationship could positively affect who to stratify patients, predict the symptom burden, and individualized management choices. This research study was thus aimed at measuring fibroid vascularity through doppler ultrasound as well as testing its correlation with the intensity of clinical symptoms.

METHODOLOGY

This type of observational study was conducted during 1 year of period of observation from January 2024 - December 2024 at department of Obstetrics and Gynaecology, POF Hospital, Wah Cantt. Women who came with symptoms acquired to be indicative of uterine fibroids and were referred to have a pelvic ultrasound examination were considered in the study. The research was meant to investigate the correlation between the fibroid vascularity measured using Doppler ultrasound and the intensity of clinical symptoms experienced by the patients.

Seventy two individuals were enrolled in a study of a sample size of seventy-two patients through non-probability consecutive method. Adult women who had uterine fibroids in the ultrasound test were also eligible assuming they have never undergone surgical or interventional procedure to treat fibroids. Pregnancy and postmenopausal patients, patients with previously known pelvic malignancy/inflammatory pelvic disease were excluded to prevent confounded clinical and imaging results.

Direct interviews with the patients and review of the medical records at the presentation provided clinical information. Such data as age, parity, duration of symptoms and the character of presenting complaints were reported. A structured clinical assessment on the symptoms level was used to measure the severity of symptoms with special consideration given to menstrual abnormalities, pelvic pain, pressure related symptoms and related urinary or bowel symptoms. Patients were classified into mild, moderate, or severe groups of symptoms based on the symptom burden on a general scale.

Transabdominal and transvaginal probe was used to conduct ultrasound examination based on clinical indication and the comfort of the patient. The application of gray scale imaging was initially applied to measure the uterine morphology, fibroid number and size, location and echotexture. They were recorded as the largest fibroid and measurements were taken in three perpendicular planes to make them consistent.

Color Doppler assessment was then done to determine the fibroid vascularity. Finding the optimal Doppler settings, such as gain and pulse repetition frequency, were also realized to prevent the over- and underestimation of the blood flow. The vascularity was classified according to the flow pattern based on the observed pattern as absent, minimal, moderate or marked vascularity. Besides that, spectral Doppler captured the resistive index, pulsatility index, and peak systolic velocity of the most prominent feeding vessel when recognizable.

An expert radiologist conducted all the ultrasound tests to reduce inter-observer variations. In order to increase the consistency, measurements were taken on a standardized protocol and equivocal measurements were re-taken in the same examination session. The digital data of images and Doppler waveforms were saved to be viewed when there was a need.

The statistical software was used to enter and analyze the data. Continuous variables were indicated using the mean with standard deviation and the and categorical variables in the form of frequencies and percentages. The statistical significance used to determine the relationships between fibroid vascularity and the severity of the symptoms was done using the appropriate statistical tests depending on the data distribution, and statistical significance was set to the p-value of below 0.05.

RESULTS

These were seventy-two women who were assessed with symptomatic uterine fibroids. The majority of the participants were in their reproductive age with multiparity being observed more than the nulliparity. In most cases, the symptoms had existed over a long period, which implies the chronicity of fibroid-related complaints.

Table 1. Baseline demographic characteristics of participants (n = 72)

Variable	**Mean ± SD / n (%)**
Age (years)	36.8 ± 6.4

Body mass index (kg/m²)	27.1 ± 3.8
Parity	
• Nulliparous	18 (25.0%)
• Multiparous	54 (75.0%)
Duration of symptoms (months)	14.6 ± 7.9

The symptoms most commonly reported were menstrual abnormalities especially the heavy menstrual bleeding. Over half of the participants had suffered pain related complaints such as pelvic complaints and dysmenorrhea. Mass effect symptoms were less frequent but still had clinical significance including urinary and bowel problems.

Table 2. Distribution of clinical symptoms among patients (n = 72)

Symptom	n (%)
Menorrhagia	49 (68.1%)
Pelvic pain	41 (56.9%)
Dysmenorrhea	38 (52.8%)
Pelvic pressure	29 (40.3%)
Urinary symptoms	21 (29.2%)
Constipation	16 (22.2%)

It was observed under ultrasound that fibroids were slightly more numerous than solitary lesions. Most prevailing fibroids were found to be of five centimeters and above at the period of evaluation. The most typical were intramural fibroids that were then followed by submucosal and subserosal.

Table 3. Gray-scale ultrasound characteristics of fibroids (n = 72)

Ultrasound feature	n (%)
Number of fibroids	
• Single	31 (43.1%)
• Multiple	41 (56.9%)
Largest fibroid size	
• < 5 cm	27 (37.5%)
• ≥ 5 cm	45 (62.5%)
Location	
• Submucosal	19 (26.4%)
• Intramural	37 (51.4%)
• Subserosal	16 (22.2%)

Color Doppler studies revealed different levels of vascularity of fibroids. A significant percentage of cases showed moderate to great vascularity, which meant the active circulation of blood. The difference in doppler indices between the low- and high-flow groups had statistically significant differences in their changes across the vascularity grades.

Table 4. Doppler vascularity grading and associated flow indices

Vascularity grade	n (%)	RI (Mean ± SD)	PI (Mean ± SD)	PSV (cm/s) Mean ± SD
Grade 0–1	27 (37.5%)	0.68 ± 0.06	1.42 ± 0.31	21.4 ± 4.8
Grade 2	26 (36.1%)	0.61 ± 0.05	1.19 ± 0.27	27.6 ± 5.2
Grade 3	19 (26.4%)	0.54 ± 0.04	0.98 ± 0.22	33.9 ± 6.1
p-value	—	**< 0.001**	**0.002**	**< 0.001**

It was demonstrated that fibroid vascularity was significantly implicated with overall symptom severity. Patients who had a higher grade of vascularity had greater chances of having moderate to severe symptoms. This correlation was statistically important, and it proven the predictive value of Doppler vascular assessment.

Table 5. Association between fibroid vascularity and symptom severity (n = 72)

Symptom severity	Low vascularity (Grade 0–1) n (%)	High vascularity (Grade 2–3) n (%)	p-value
Mild	15 (55.6%)	8 (17.8%)	
Moderate	9 (33.3%)	19 (42.2%)	
Severe	3 (11.1%)	18 (40.0%)	**0.001**

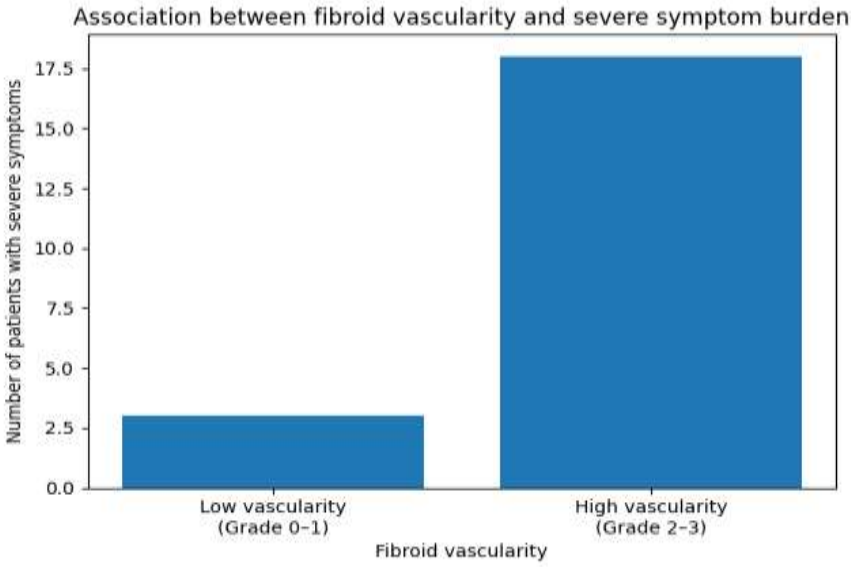

Figure 1. Association between fibroid vascularity and severe symptom burden.

The bar chart demonstrates a markedly higher number of patients reporting severe symptoms among those with high fibroid vascularity (Grade 2–3) compared to low vascularity (Grade 0–1).

DISCUSSION

The current study proves that there is a significant correlation between fibroid vascularity with Doppler ultrasound and the intensity of clinical symptoms. patients of higher grades of vascularity more tended to report moderate to severe symptoms, especially heavy menstrual bleeding and complaints of pain. This observation corroborates the idea that fibroid biology and not size is an important factor in symptom burden [11-13].

It has already been demonstrated that more extensive vascular supply of fibroids is linked to greater metabolic activity and proximity to local hormonal reactivity in previous research. Active perfusion of fibroids is suspected to cause abnormal bleeding of the uterus because it leads to more endometrial perturbation and distortion of uterine contractility. These results are consistent with the observations since patients with pronounced vascularity had more severe menstrual symptoms than those with insignificant menstrual flow or no flow [14-16].

This association is further reinforced by the inverse relationship present between the indices of resistive and pulsatility and symptom severity. Reduced values of Doppler resistance imply precipitated blood flow which has been observed in previous studies to be associated with fibroid development and symptom escalation. The latter can be compared to similar trends observed in investigations assessing the fibroid response to medical treatment and uterine artery embolization because highly vascular lesions presented micro-characterized clinical behavior [17, 18].

Excidingly, the size of fibroid alone did not always correlate with the intensity of the symptoms in this group of followers. Although size fibroids were widespread, the intensity of symptoms was observed to be more closely correlated with vascular features than absolute size. The note this observation is in accord with the reports that small highly vascular fibroids can lead to out of proportionate symptoms especially when they are intramurally or submucosally based [19].

The results of the present research report the usefulness of the concept of integrating Doppler

evaluation with regular ultrasound analysis of uterine fibroids. In addition to diagnostic validation, vascularity grading can be useful in prediction of the severity of symptoms, as well as in management decision-making. Closely followed or early intervention may be beneficial in patients with highly vascular fibroids and less invasive in those that have low-flow lesions [20].

Although this research has its strong points, it has some weaknesses. The sample size was relatively small and measure of the symptom severity was clinically determined instead of being a validated quality-of-life measure. Moreover, it is a single-central research, and thus the findings cannot be entirely generalized. However, these regular associations observed indicate that the results are clinically applicable and require further research in bigger, inter-center studies.

CONCLUSION

The evidence that fibroid vascularity assessed with Doppler ultrasound is correlated to symptom severity is apparent. The correlation between higher vascular grades and lower Doppler resistance indices with higher clinical burden, especially menstrual and pain-related symptoms can be made. Making vascular examination as a component of standard ultrasound examination can enhance the clinical decision-making and individual patient care.

REFERENCES

1. Keizer, A., et al., *Fibroid vascularisation assessed with 3D Power Doppler as predictor for fibroid related symptoms and quality of life; a pilot study.* 2021. 13(4): p. 387.
2. Akpinar, E., et al., *Role of machine learning algorithms in predicting the treatment outcome of uterine fibroids using high-intensity focused ultrasound ablation with an immediate nonperfused volume ratio of at least 90%.* 2022. 26(22).
3. Zhou, Y., et al., *Ultrasound-guided high-intensity focused ultrasound for devascularization of uterine fibroid: a feasibility study.* 2021. 47(9): p. 2622-2635.
4. Ascher, S.M., et al., *ACR appropriateness Criteria® fibroids.* 2022. 19(11): p. S319-S328.
5. Sainio, T., et al., *Feasibility of apparent diffusion coefficient in predicting the technical outcome of MR-guided high-intensity focused ultrasound treatment of uterine fibroids–a comparison with the Funaki classification.* 2021. 38(1): p. 85-94.
6. Santalla-Hernández, Á., et al., *Efficacy, complications, and factors predictive of response to treatment with transvaginal radiofrequency ablation for symptomatic uterine myomas.* 2022. 29(6): p. 743-752.
7. Frijlingh, M., et al., *Differences in fibroid vascularity after three months of pre-treatment with leuprolide acetate or ulipristal acetate: A pilot study.* 2020. 245: p. 186-192.
8. Gao, J., et al., *Evaluating the Curative Effect of Ultrasound-guided Sclerotherapy with Foam Lauromacrogol for Uterine Fibroids.* 2021. 5(1): p. 32-38.
9. Li, C., et al., *Magnetic resonance-guided high-intensity focused ultrasound of uterine fibroids: whole-tumor quantitative perfusion for prediction of immediate ablation response.* 2020. 61(8): p. 1125-1133.
10. Beermann, M., et al., *Long term follow-up of uterine fibroids treated with microwave ablation: an up to 3-year observational study of volume, regrowth, and symptoms.* 2022. 39(1): p. 1158-1163.
11. Amin, T., et al., *The effect of pelvic pathology on uterine vein diameters.* 2021. 13(1): p. 7.
12. Badawy, A., et al., *The Use of Green Tea in the Treatment of Symptomatic Uterine Fibroids.* (I): p. 3116-3135.
13. Kurban, L.A.S., et al., *Uterine artery embolization of uterine leiomyomas: predictive MRI features of volumetric response.* 2021. 216(4): p. 967-974.
14. Ciarmela, P., et al., *Uterine fibroid vascularization: from morphological evidence to clinical implications.* 2022. 44(2): p. 281-294.
15. Vyas, S., et al., *Ultrasound features help identify patients who can undergo noninvasive management for suspected retained products of conception: a single institutional experience.* 2021. 46(6): p. 2729-2739.
16. Daga, S.R., S.V.J.J.o.E.o.M. Phatak, and D. Sciences, *Ultrasound Evaluation of Uterine Leiomyoma in Perimenopausal Females with Histopathological Correlation.* 2020. 9(8): p. 562-566.
17. Torkzaban, M., et al., *Contrast-enhanced ultrasound for monitoring non-surgical treatments of uterine fibroids: a systematic review.* 2021. 47(1): p. 3-18.
18. Marinova, M., et al., *Efficacy of ultrasound-guided high-intensity focused ultrasound (USgHIFU) for uterine fibroids: an observational single-center study.* 2021. 38(2): p. 30-38.
19. Harmsen, M.J., et al., *Consensus on revised definitions of Morphological Uterus Sonographic Assessment (MUSA) features of*

adenomyosis: results of modified Delphi procedure. 2022. 60(1): p. 118-131.
20. Madzia-Madzou, D., *Dynamic Contrast Enhanced Magnetic Resonance Imaging Applications in High Intensity Focused Ultrasound Treatment for Uterine Fibroids*. 2022.