

## Evaluation of uterine fibroids as a cause of AUB by pelvic ultrasound

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### Abstract

The present prospective diagnostic cross sectional study was carried out in the Department of Radio-diagnosis from October 2013 to July 2015. A total of 158 patients were included as per the predefined study criteria. Transabdominal and transvaginal sonography was done on all patients and the diagnosis was correlated with final histopathological diagnosis. Clinically, most common pathology diagnosed was fibroid uterus (53.80%). Similarly on transabdominal and transvaginal sonography, majority (37.80% and 41.78 %) of patients were diagnosed with uterine fibroids. The sensitivity, specificity, positive predictive value and negative predictive value of transvaginal sonography for detection of uterine fibroids is 82.26%, 85.90 %, 82.26% and 85.90 % respectively. While sensitivity, specificity, positive predictive value and negative predictive value of transabdominal sonography is 59.68%, 74.36 %, 64.91% and 69.88% respectively. Transvaginal scans were found to be more accurate for the diagnosis of small fibroids while large myomas were best imaged with a combination of transabdominal and transvaginal sonography. Majority of the fibroids were intramural (TAS-59.46%; TVS-54.90%) in location and hypoechoic (72.55%) in appearance.

**Keywords:** Ultrasound, Fibroids, Myomas.

### 1. Introduction

Uterine fibroids, also known as leiomyomas or myomas, are the commonest uterine neoplasms. They are benign tumors of smooth muscle origin, with varying amounts of fibrous connective tissue.[1] Uterine fibroids are the cause for some of the most common gynecological problems among women presenting to gynecology emergency and outpatient departments. They are often asymptomatic but they can cause a multitude of symptoms such as abnormal uterine bleeding, a feeling of pelvic pressure, urinary incontinence or retention, or pain. They may also be associated with reproductive problems such as infertility and miscarriage. Management strategies are usually individualized based on the severity of the symptoms, the size and location of the fibroid, the patient's age and their chronological proximity to menopause, and the patient's desire for future fertility. It is important to determine the localization, measurement, and characterization of uterine fibroids for research into and for evaluating therapeutic responses to investigational agents. The accurate assessment of the size, number, and position of myomas enables the optimal selection of patients for medical therapy, noninvasive procedures, or surgery. Imaging techniques available for confirming the diagnosis of myomas include sonography,

saline-infusion sonography, and MRI.[2] The study was undertaken to evaluate the diagnostic accuracy of transabdominal and transvaginal ultrasound in the diagnosis of uterine fibroid in women with abnormal uterine bleeding.

### 2. Materials and methods

A prospective diagnostic study was carried out from 1<sup>st</sup> October 2013 to 30<sup>th</sup> July 2015 in the Department of Radiodiagnosis of a tertiary care rural hospital. The study population constituted of women presenting with abnormal uterine bleeding. Total 158 patients with abnormal uterine bleeding were studied. Ultrasound examination was then performed, firstly the patient was subjected to abdominal ultrasound and then subsequently transvaginal ultrasonography was also performed on the same patient.

Fibroid was defined as a well-defined, solid mass (isoechoic / hypoechoic / hyperechoic) with a whorled appearance, showing some degree of posterior acoustic shadowing causing the uterus to appear bulky or causing an alteration of the normal uterine contour [3].

The patients were followed up and intraoperative and histopathological findings were obtained. Histopathological diagnosis was considered as Gold standard for evaluating the diagnostic ability of transabdominal and transvaginal sonography.

### 3. Results

Out of a total of 158 patients, 85 (53.80%) were clinically diagnosed as fibroids while in transabdominal and transvaginal sonography number of patients with fibroid were 60 (37.80 %) and 66 (41.78%) respectively. Out of the 60 patients with fibroids detected on transabdominal sonography 57 were operated, out of which 37 cases were confirmed on histopathology. On transvaginal sonography, total number of

patients with fibroids was 66, 62 of these were operated and out of which 51 cases were confirmed on histopathology. Thus, the sensitivity, specificity, positive predictive value and negative predictive value of transvaginal sonography for detection of uterine fibroids is 82.26%, 85.90 %, 82.26% and 85.90 % respectively while that of transabdominal sonography is 59.68%, 74.36 %, 64.91% and 69.88% respectively (Table 1).

**Table 1: Transvaginal sonography and transabdominal sonography for detection of uterine fibroids**

		Positive on H/P	Negative on H/P	Sn	Sp	PPV	NPV
TVS	+	51	11	82.26%	85.90 %	82.26%	85.90 %
	-	11	67	(70.47% to 90.80%)*	(76.17% to 92.74%)*	(70.47% to 90.80%)*	(76.17% to 92.74%)*
TAS	+	37	20	59.68%	74.36%	64.91%	69.88%
	-	25	58	(46.45% to 71.95%)*	(63.21% to 83.58%)*	(51.13% to 77.09%)*	(58.82% to 79.47%)*

A total Of 60 and 66 fibroids were diagnosed on transabdominal and transvaginal ultrasonography out of which 37 and 51 were confirmed on histopathology respectively. Majority were intramural in location (TAS-59.46%; TVS-54.90%); followed by in submucosal region

(TAS-24.32%; TVS-29.41%), in subserosal location (TAS-10.81%; TVS-11.77%) and pedunculated fibroids (TAS-5.41%; TVS-3.92%). Table 2 shows the distribution of location of fibroids on transabdominal and transvaginal ultrasound.

**Table 2: shows the distribution of location of fibroids on transabdominal and transvaginal ultrasound.**

Location	Number of confirmed fibroids (TAS)	Percentage	Number of confirmed fibroids (TVS)	Percentage
Intramural	22	59.46%	28	54.90%
Submucosal	9	24.32%	15	29.41%
Subserosal	4	10.81%	6	11.77%
Pedunculated	2	5.41%	2	3.92%
Total	37	100%	51	100%

Majority (37, 72.55 %) of fibroids appeared hypoechoic on sonography, 9 (17.65%) showed mixed echogenicity followed by 4 fibroids (7.84%) which appeared isoechoic to surrounding myometrium on transvaginal

sonography. Only 1(1.96%) case showed a hyperechoic fibroid. Table 3 shows sonographic (TVS) characteristics of confirmed fibroids.

**Table 3: Shows sonographic (TVS) characteristics of confirmed fibroids**

Echogenicity	Number of confirmed fibroids	Percentage
Hypoechoic	37	72.55%
Mixed echogenicity	9	17.65%
Isoechoic	4	7.84%
Hyperechoic	1	1.96%
Total	51	100%

Table 4 shows the accuracy of detection for fibroids of size less than 2 cm is 88.71% on TVS and 72.58% on TAS, for fibroids of size 2-5 cm is 82.26% on TAS and

88.71% on TVS and for fibroids of size > 5 cm is 93.55% on TAS and 95.16% on TVS.

**Table 4: Shows the accuracy of detection for fibroids**

Size of confirmed fibroids (cm)	TAS	TVS	Histopathology	Accuracy of TAS	Accuracy of TVS
< 2	6	18	21	72.58%	88.71%
2- 5	16	20	25	82.26%	88.71%
> 5	15	13	16	93.55%	95.16%
Total	37	51	62		

### 4. Discussion

In the present study, on transabdominal sonography, in 60 patients fibroids was attributed to be the cause of abnormal uterine bleeding while on transvaginal sonography, 66 patients were diagnosed with fibroids.

#### Comparison of transabdominal sonography and transvaginal sonography as a diagnostic modality for fibroid:

In our study, out of 66 cases of fibroids detected on transvaginal sonography, 62 underwent histopathological examination, out of which 51 were proven to be fibroids. Thus, sensitivity, specificity, positive predictive value and

negative predictive value of transvaginal sonography for detection of uterine fibroids is 82.26%, 85.90 %, 82.26% and 85.90 % respectively.

Out of 60 cases of fibroids detected on transabdominal sonography, 57 underwent histopathological examination, out of which 37 were proven to be fibroids. Thus, sensitivity, specificity, positive predictive value and negative predictive value of transabdominal sonography are 59.68%, 74.36 %, 64.91% and 69.88% respectively.

Takreem *et al* [4] in their study, found the sensitivity of TVS for detection of uterine fibroids to be 69%.

Dasgupta *et al* [5] evaluated the diagnostic options and accuracy of abnormal uterine bleeding in perimenopausal women found the sensitivity and specificity of TVS for fibroids is 65.7%% and 95.4% respectively.

Dipi *et al* [6] studied the comparison of transabdominal and transvaginal sonography in the evaluation of uterine mass. The sensitivity of TAS and TVS to diagnose leiomyoma was 88.9% and 94.9%, specificity 88.6% and 91.4%, positive predictive value 80.0% and 85.0%, negative predictive value 93.9% and 97.0%, and accuracy 88.7% and 92.5% respectively.

In the study done by Pascual *et al* [7] the sensitivity of TVS for myoma was 85.7%, where hysteroscopy was taken as gold standard. Dueholm [8] conducted a study to compare the accuracy of magnetic resonance imaging and transvaginal ultrasonography in myoma reported the sensitivity of TVS was 99% and the specificity 91%.

Wilde and Scott-Barrett [3] found that for diagnosis of submucous fibroids and small fibroids <5 mm TVS is more sensitive but they recommend that TAS and TVS should be performed in conjunction because when the uterus is bulky or retroverted the uterine fundus may lie outside of the field of view.

### **Sonographic characteristics**

In the present study, a total of 60 and 66 fibroids were diagnosed on transabdominal and transvaginal ultrasonography out of which 37 and 51 were confirmed on histopathology respectively. Majority of the fibroids were intramural in location followed by submucosal, subserosal and pedunculated in that order.

Wilde and Scott-Barrett [3] also found out that intramural fibroids are the most common type. They concluded submucosal fibroids are the most likely to be symptomatic since they project into the endometrial cavity. Submucosal fibroids can occasionally become pedunculated and prolapse into the cervical canal or vagina.

In the study by Kathuria and Bhatnagar [9], 38% patients were diagnosed with fibroid uterus, of various types - submucous in 18% patients, intramural in 16% patients and 2% each with subserosal and pedunculated fibroid.

Haemila *et al*[10] in their study on ultrasound evaluation of abnormal uterine bleeding detected 14 myomas

(20%), and was able to differentiate these myomas as 10 interstitial (14.29%) and 4 submucous in location.

Zagoria *et al* [11] highlighted that by transabdominal sonography; it may be possible to distinguish submucosal and intramural fibroids at all times. Distortion of the endometrial echo complex by submucosal fibroid is usually easier to identify on transvaginal sonography as compared to transabdominal sonography.

Dueholm *et al* [8] concluded that sonography might be inadequate for determining the precise number and position of myomas, although transvaginal sonography is reasonably reliable for uteri <375 mL in total volume or containing four myomas or fewer.

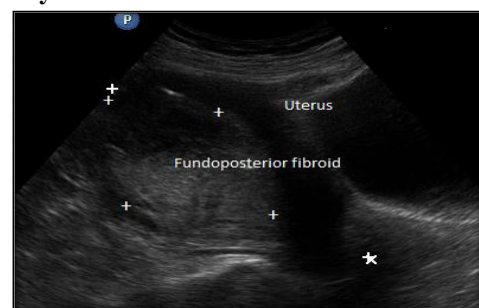
Farrer- Brown *et al* [12] studied the venous changes in the endometrium of myomatous uteri and etiology of uterine leiomyomas. Their theories for the possible cause of menorrhagia included venous ectasia resulting from mechanical compression of veins by myomas, or altered function, expression or storage of vasoactive growth factors produced by myomas. A variety of myoma-related growth factors increase proliferation or vascular caliber or promote angiogenesis.

Majority (37, 72.55 %) of fibroids appeared hypoechoic on sonography, 9 (17.65%) showed mixed echogenicity followed by 4 fibroids (7.84%) which appeared isoechoic to surrounding myometrium on transvaginal sonography. Only 1(1.96%) case showed a hyperechoic fibroid.

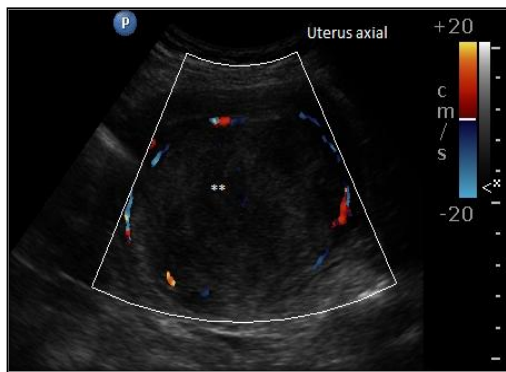
In a study done by Tamura-sadamori *et al* [13] on sonohysteroscopic evaluation of uterine fibroids also found out of 47 fibroids, 25 (53.2%) were hypoechoic, whereas the remaining 21 (44.7%) were isoechoic and only 1 was hyperechoic. 17 fibroids were located anteriorly and posteriorly each and 13 were fundal in location. This was similar to findings in our study.

In the study done by Fried *et al* [14] on sonographic spectrum of benign pelvic masses, they concluded that poor through transmission of ultrasound helps to distinguish fibroids from cysts. Also, since the fibroids are responsive to estrogen, leiomyomas tend to enlarge become more hypoechoic under estrogen stimulation and occasionally undergo necrosis. Menopausal transition stage is a hyper-hormonal stage, with a marked increase of estrogen with progesterone being absent (hyper estrogenia).

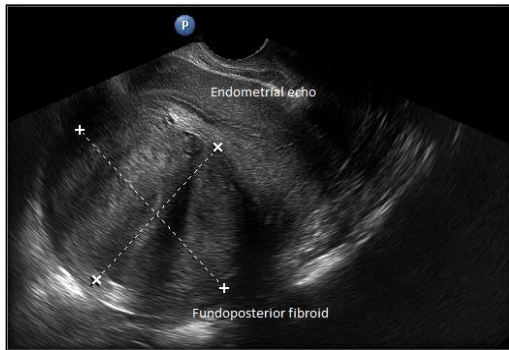
### **Case 1: 45 year old with abnormal uterine bleeding**



**Fig.1a**



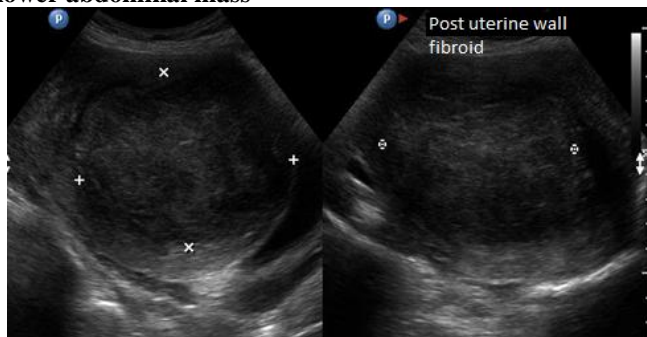
**Fig. 1b**



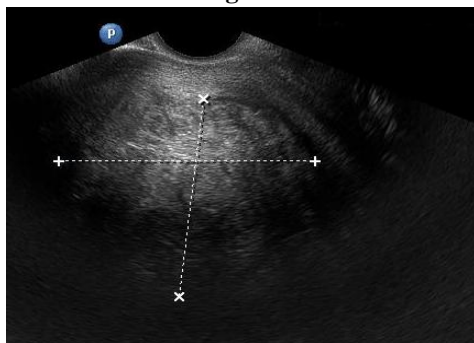
**Fig. 1c**

Fig. 1a, 1b (transabdominal) and 1c (transvaginal) scan shows large (7.3 x 6.1 cm) intramural fundoposterior fibroid (\*\*) with peripheral vascularity.

**Case 2: 40 year old with abnormal uterine bleeding and lower abdominal mass**



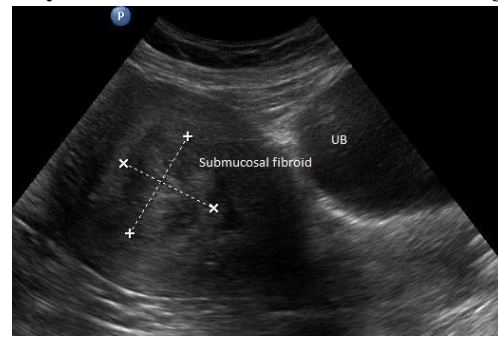
**Fig. 2a**



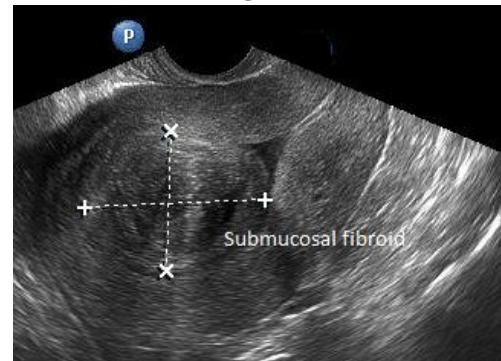
**Fig. 2b**

Fig. 2a (transabdominal) and 2b (transvaginal) scan reveals large (8.7 x 7.1 cm) posterior wall intramural fibroid, better visualised on TAS as the fundus is obscured on TVS.

**Case 3: 38 year old with abnormal uterine bleeding**



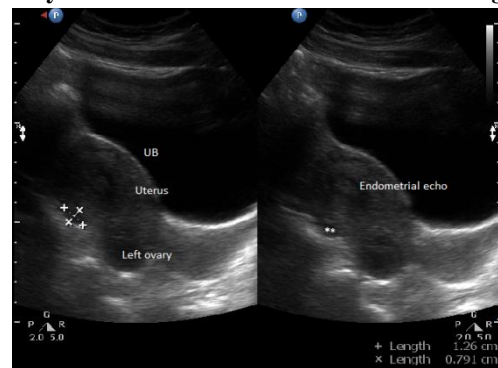
**Fig. 3a**



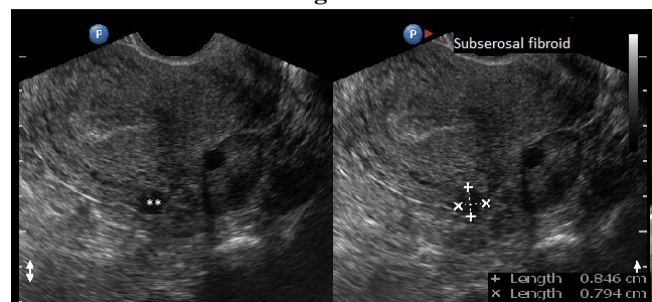
**Fig. 3b**

Fig. 3a (transabdominal) and 3b (transvaginal) shows a moderately large submucosal fibroid (4.5 x 3.5 cm) with typical whorled appearance.

**Case 4: 45 year old with abnormal uterine bleeding**



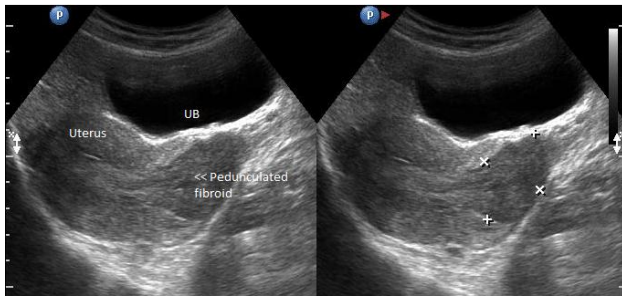
**Fig. 4a**



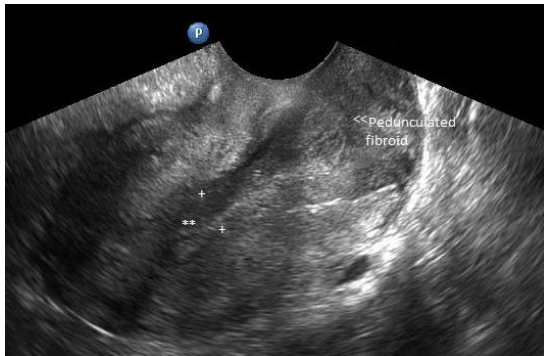
**Fig. 4b**

Fig. 4a (transabdominal) and 4b (transvaginal) shows a hypoechoic subserosal fibroid (\*\*) seen along fundo-posterior wall of uterine fundus.

**Case 5: 44 year old with abnormal uterine bleeding**



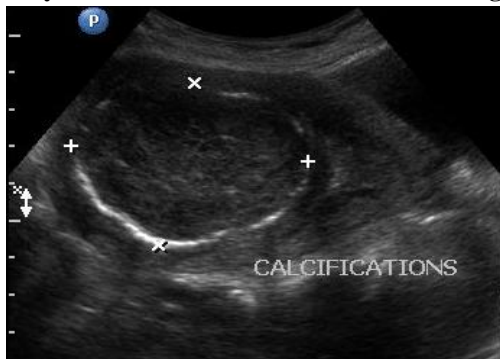
**Fig. 5a**



**Fig. 5b**

Fig. 5a (transabdominal) and 5b (transvaginal) shows a pedunculated fibroid (3.7 x 2.6 cm) connected to the fundus with a pedicle (\*\*).

**Case 6: 47 year old with abnormal uterine bleeding**



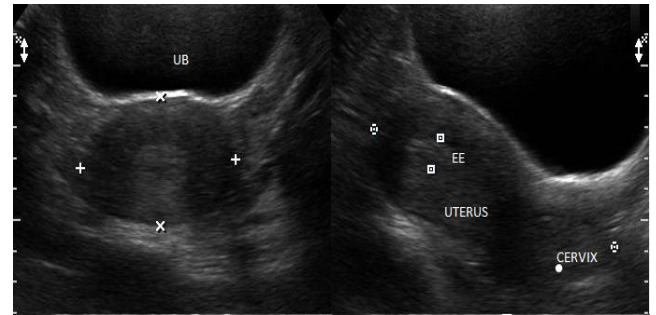
**Fig. 6a**



**Fig. 6b**

Fig. 6a (transabdominal) and 6b (transvaginal) shows a moderately large submucosal fibroid (5.7 x 4.2 cm) with peripheral calcifications and posterior acoustic shadowing.

**Case 7: 40 year old with abnormal uterine bleeding**



**Fig. 7a**



**Fig. 7b**

Fig. 7a transabdominal scan reveals normal uterus, cervix and endometrial echo. Fig. 7b transvaginal scan shows a small intramural fibroid (0.8 x 0.4 cm) in the anterior uterine wall.

Larger fibroids show degenerative changes. Degeneration results in areas of heterogenous echogenicity and subsequently calcification in the form of shadowing. This correlated well with our study where larger fibroids showed more degenerative changes.

Our study showed that the accuracy of detection for fibroids of size less than 2 cm and between 2-5 cm is more on TVS as compared to TAS while for fibroids of size > 5 cm the diagnostic accuracy of TAS and TVS is comparable (TAS- 93.55%; TVS-95.16%).

In the study conducted by Parker [15] it was found out, transvaginal sonography is the most readily available and least costly technique and may be helpful for differentiating myomas from other pelvic conditions. Large myomas may be best imaged with a combination of transabdominal and transvaginal sonography, a finding which was also corroborated by our study.

Khan *et al* [2] also concluded that transvaginal scans are more sensitive for the diagnosis of small fibroids. However, when the uterus is bulky or retroverted, the uterine fundus may lie outside of the field of view. Transabdominal views are often of limited value if the patient is obese.

**5. Conclusion**

Transvaginal sonography is a cheap, easily available and reliable method for diagnosing pathology in cases of perimenopausal bleeding. Uterine fibroids were the most common cause of abnormal uterine bleeding followed by dysfunctional uterine bleeding. TVS has excellent diagnostic accuracy in detection of uterine fibroids as compared to TAS.

However, TAS should be performed in conjunction with TVS. The two techniques are complementary as TAS offers a wider field of view, increased depth of penetration, and an ability to evaluate adjacent organs.

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