



Indian FERTILITY Society

SONO-NAVIGATOR SERIES

ROLE OF ULTRASOUND IN DIAGNOSING FIBROIDS

INTRODUCTION

Leiomyomas (fibroids or myomas) are benign smooth muscle neoplasms with varying amounts of fibrous tissue and are the most common uterine neoplasm, reported in 20% to 30% of women over 30 years of age.¹ These are usually multiple, causing enlargement of the uterus with a lobular serosal contour and may present with a palpable pelvic mass, uterine enlargement, pelvic pain, anemia, and dysfunctional uterine bleeding depending upon their location and size.

ROLE OF ULTRASOUND

Pelvic ultrasound is the **imaging study of choice** for uterine leiomyomas.

Transabdominal scan	Transvaginal scan	3D ultrasound
Low sensitivity, limited use in obese patients. Often used to supplement the transvaginal examination when uterus is enlarged or location of the leiomyoma prevents adequate sound penetration and visualization as in a retroverted uterus . (fig. 1)	High sensitivity (95 to 100 percent) for detecting myomas in uteri less than 10 gestational weeks' size. ² Can detect fibroids as small as 5mm. (fig. 2)	Exact localization and precise estimate of the relationship between sub-mucus /intramural fibroid and endometrial cavity. 3D coronal view is more useful. Also good for volume measurement of uterine leiomyomas and vascularity assessment by using vascularity index or vascularity volume display. (fig. 3)

- ▶ **3D power Doppler ultrasound indices** have been found to be statistically significantly associated with density, ischemic necrosis, and histologic cellular activity of fibroids.
- ▶ **Saline infusion sonography** is more accurate. If there is an intra-cavitary leiomyoma (submucosal or intramural that protrudes into the uterine cavity), and the percent of the fibroid that is within the endometrial cavity is not clearly ascertained (and could alter care). **Also to differentiate endometrial polyps from sub mucous fibroids.**³ (fig 4)

TYPICAL DIAGNOSTIC FEATURES ON ULTRASOUND

- ▶ Heterogeneously enlarged uterus with **lobular contour**.
- ▶ Typically focal, well-defined, round, **sharply margined, hypoechoic** lesion within the myometrium or attached to it, often showing shadows at the edge of the lesion and/or internal fan-shaped shadowing.
- ▶ Hypoechoic, isoechoic, or echogenic relative to the myometrium. **Majority are hypoechoic**. Small leiomyomas are typically homogeneous whereas those larger than 3 cm in diameter are often heterogeneous.
- ▶ Surrounding myometrium can become compressed and form a **pseudocapsule**. (fig. 2)
- ▶ Occasionally compressed lymphatics and vessels create a **thin hypoechoic rim** around intramural leiomyomas. (fig. 2)
- ▶ **Edge refraction** at the interface of the leiomyoma with the normal surrounding myometrium may help to identify an isoechoic leiomyoma.
- ▶ The **Venetian blind artifact (shadows)** - a sonographic finding typically associated with adenomyosis can also occur in uterine fibroids. **The posterior shadowing** may be dense or striated (**comb-like**). This is believed to be caused by the transitional zone between apposed tissues of different acoustic properties such as fibrous tissue and smooth muscle, as well as refraction from the edges of whorls and bundles of smooth muscle. Very helpful in differentiating an exophytic leiomyoma from an adnexal or ovarian mass. (fig. 2)
- ▶ **Peripheral blood flow** on color or power doppler images. Fibroids which are necrotic or have undergone torsion will show absence of flow. (fig. 5, 8)
- ▶ Increased blood velocity and **decreased RI and PI** in both uterine arteries occur in patients with uterine leiomyomas compared to healthy volunteers. This feature may have predictable value in growth rate evaluation of a benign uterine mass.
- ▶ **Degeneration** may result in edema with cystic spaces, echogenic hemorrhagic areas, and dystrophic calcification. The calcifications can be curvilinear and peripheral or clump-like and will demonstrate dense posterior shadowing. (fig. 6)

TYPES OF FIBROIDS - FIGO CLASSIFICATION (fig. 7)

SM - Submucosal	0	Pedunculated intracavitary
	1	<50 percent intramural
	2	≥50 percent intramural
O - Other	3	Contacts endometrium; 100 percent intramural
	4	Intramural
	5	Subserosal ≥50 percent intramural
	6	Subserosal <50 percent intramural
	7	Subserosal pedunculated
	8	Other (specify, eg, cervical, parasitic)
Hybrid Leiomyomas (impact both endometrium and serosa)	Two numbers are listed separated by a hyphen. by convention, the first refers to the relationship with the endometrium while the second refers to the relationship to the serosa. One example is below	
	2-5	Submucosal and Subserosal each with less than half the diameter in the endometrial and peritoneal cavities, respectively

DIFFERENTIAL DIAGNOSIS

Condition	Ultrasound Features
Adenomyosis	Smooth external contour, myometrial cysts , thickened and ill defined junctional zone . Asymmetric globularity, ill defined margins, central vascularity on color doppler. (fig. 8, 9)
Leiomyosarcoma	Rapid change in size, indistinct or infiltrative margin, unusually complex echo pattern, and internal vascularity , especially if the distribution of the vessels is irregular. (fig. 10)
Endometrial polyp	Single feeding vessel compared to multiple feeding vessels on color doppler in case of sub mucous fibroid. SSG increases the diagnostic accuracy. (fig. 4)
Adnexal/ ovarian mass (eg. Brenner's tumour, fibrothecoma)	A bridging vascular pedical between the uterus and pedunculate fibroid is seen on colour doppler and normal ipsilateral ovary in case of fibroid . Not seen in adnexal mass. (fig. 11)
Transient uterine contractions	The masses are not consistent and will usually have disappeared on subsequent sequences.



Fig. 1: Transabdominal sagittal sonogram shows a heterogeneous but predominately hypoechoic posterior uterine fibroid.



Fig. 2: Transvaginal image of a large myoma showing Peripheral hypoechoic zone, compressed pseudo capsule and venetian band.

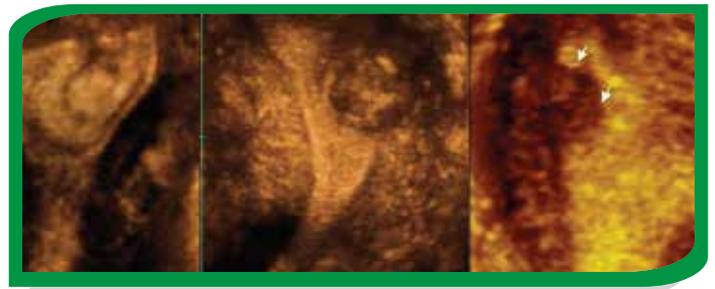


Fig. 3: 3D transvaginal ultrasound showing submucosal fibroids indenting cavity

- T0 - whole in endometrial cavity
- T1 - >50% in endometrial cavity
- T2- < 50% in endometrial cavity.

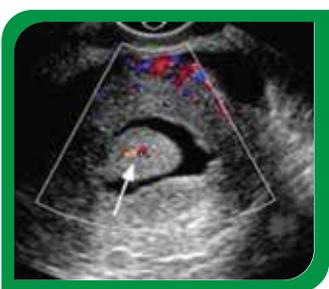


Fig. 4: Endometrial polyp on SSG showing a single feeding vessel.



Fig. 5: circumferential vascularity in a fibroid.

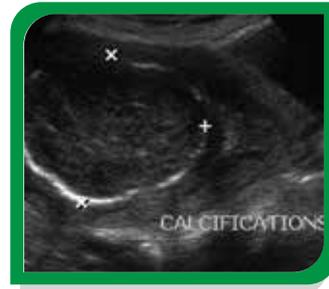


Fig. 6: Peripheral calcifications in a fibroid



Fig. 7: Subserosal broad ligament fibroid



Fig. 8: Power Doppler studies reveal central vascularity with a spoke wheel radial pattern in a fibroid.



Fig. 9: Power dopler showing diffuse vascularity in adenomyosis.

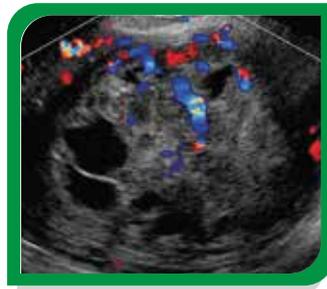


Fig. 10: Transvaginal scan of a leiomyosarcoma, showing degenerative changes and increased internal vascularity on colour doppler.



Fig. 11: A pedunculate fibroid mimicking an adnexal mass.

When can MRI make a difference in diagnosing fibroid?

MRI should not be used as a first line modality. But can be an effective problem solver in specific case scenarios like:

- ▶ ultrasound findings are inconclusive or non specific.
- ▶ uterus is too large for ultrasonography.
- ▶ for better demonstration of uterine zonal anatomy.
- ▶ for assessing size, location, number (**fibroid mapping**) and type of degeneration of fibroid to determine choice of therapy- myomectomy, HIFU, UAE and hysterectomy.
- ▶ To differentiate between fibroids and adenomyosis - high intensity glands are seen within the myometrium on T2 weighted images in case of adenomyoma.

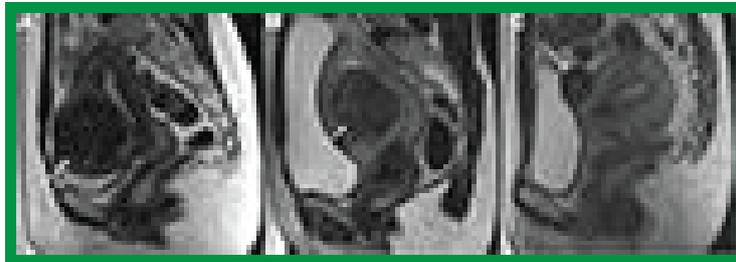


Fig. 12: Sagittal T2-weighted MRIs of fibroids
a. Intramural
b. Submucosal
c. Subserosal

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2. Abuhamad A.(2014). *Ultrasound in obstetrics and gynaecology: A practical approach.*

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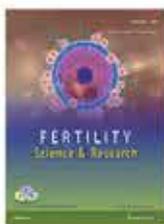
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Who can apply for IFS Membership : All Professionals with postgraduate qualification such as Obstetricians & Gynaecologists, Clinical embryologists, andrologists, ultrasonologists, counsellors, geneticists and other involved in the care of infertility patients.

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