**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. 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.

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

**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. (fig 4)
Heterogeneously enlarged uterus with lobular contour.
Typically focal, well-defined, round, sharply marginated, 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)

**TYPICAL DIAGNOSTIC FEATURES ON ULTRASOUND**

**TYPES OF FIBROIDS - FIGO CLASSIFICATION (fig. 7)**

<table>
<thead>
<tr>
<th>SM - Submucosal</th>
<th>0</th>
<th>Pedunculated intracavitary</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1</td>
<td>&lt;50 percent intramural</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>≥50 percent intramural</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>Contacts endometrium; 100 percent intramural</td>
</tr>
<tr>
<td></td>
<td>4</td>
<td>Intramural</td>
</tr>
<tr>
<td></td>
<td>5</td>
<td>Subserosal ≥50 percent intramural</td>
</tr>
<tr>
<td></td>
<td>6</td>
<td>Subserosal &lt;50 percent intramural</td>
</tr>
<tr>
<td></td>
<td>7</td>
<td>Subserosal pedunculated</td>
</tr>
<tr>
<td></td>
<td>8</td>
<td>Other (specify, eg, cervical, parasitic)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>O - Other</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Hybrid Leiomyomas</td>
<td>2-5</td>
<td>Submucosal and Subserosal each with less than half the diameter in the endometrial and peritoneal cavities, respectively</td>
</tr>
</tbody>
</table>

(impact both endometrium and serosa)
## Differential Diagnosis

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

---

**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
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

References


Book References

WHY TO JOIN IFS
IFS is a Multi-disciplinary Society that values the input and participation of professionals in the scope of Reproductive Medicine.

IFS MEMBERSHIP
Benefits At A Glance

Pan India Society

Collaboration with ESHRE & IFFS

2414 Members & 26 Chapters

National Conference Fertivision every year with reduced registration fees

Special Interest Group (13) for IFS Members to show cast their talent

Research Wing of IFS has its own ethical committee for Research Project approval

Publication Wing - Fertility Science & Research Journal

IFS Fellowship Program in Clinical ART & Embryology in collaboration with Amity University

ESHRE Certified Embryologist Examination in India, conducted by IFS every year

IFS Outreach activities all over India

IFS Master Courses

Free access to IFS E-Pathshala contents and Official Journal

IFS E-Pathshala - IFS Conversation, Nexus, ARText, Fertility News, CATALYST
INDIAN FERTILITY SOCIETY

IFS is a Multi-Disciplinary Society that values the input and participation of professionals in the scope of Reproductive Medicine.

2350+ Members  25 State Chapters

How To Join IFS

IFS Life Membership Fees
Clinicians:--
Rs. 5932/- + (18% GST - 1068) = Rs. 7000/-
Non Clinicians:--
Rs. 4237/- + (18% GST - 763) = Rs. 5000/-

Online Procedure

It is the easiest way to Register yourself as the lifetime member of our family. while following the procedure, fill the online membership form and pay the membership fee.

Your registration number would be generated and you will get your membership certificate and also access to member portal on our website where you can manage your profile and get all important notification.

Offline Procedure

You can pay by cash or card at the registration counter provided.
or you can easily download our offline membership form or use the offline form attached with this document, fill all required information attach the membership fee DD or Cheque and send on our secretariat address.

Account Details:
Account No: 50562010067180 | IFSC Code: ORBC0100179
Bank Name: Oriental Bank of Commerce
Branch: Connaught Place, New Delhi-110001

Dr. M. Gouri Devi
President

Dr. Pankaj Talwar
Secretary General

IFS Secretariat
Flat No. 302, 3rd Floor,
Kailash Building,
26, Kasturba Gandhi Marg,
C.P. New Delhi – 110001

+91 9667742015
+91-9899308083
91-1140018184

Indianfertilitysocietydelhi@gmail.com
info@indianfertilitysociety.org
IndianfertilitysocietyIFS
Ifsdelhi
Indianfertilitysociety
**Indian Fertility Society**

**Offline Registration Form**

Download the form and send to the secretariat with recent pic and cheque/draft

<table>
<thead>
<tr>
<th>Name</th>
<th>Qualification</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Date of Birth</th>
<th>Designation</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Workplace Phone No</th>
<th>Residence Phone No</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Mobile</th>
<th>E-mail</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Workplace Address</th>
<th>Residence Address</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>State</th>
<th>IFS Chapter</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Address to be used for correspondence**

- Workplace ○
- Residence ○

**Account Details:**

Account No: 50562010067180 | IFSC Code: ORBC0100179
Bank Name: Oriental Bank of Commerce
Branch: Connaught Place, New Delhi-110001

**Payment Details:**

- Amount: ..............................................................
- Cash / Cheque / Demand Draft No: ......................... Dated: .........................
- Bank: ..............................................................
- Signature: .................................. Name: ................. Date: .........................

**IFS Life Membership Fees**

- Clinicians: Rs. 5932/- + (18% GST -1068) = Rs. 7000/-
- Non Clinicians: Rs. 4237/- + (18% GST -763) = Rs. 5000/-

* Please make Cheque / Draft in favour of “INDIAN FERTILITY SOCIETY” payable at New Delhi.
* Please attach two recent passport size photographs.

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.