Volume 23, June 2023, Issue 2

AOGD BULLETIN

Holistic Approach to Women's Health

AOGD 2023

Issue Theme : Imaging in Obstetrics & Gynaecology

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From the AOGD Office


Dr Amita Suneja


Dr Abha Sharma


Dr A G Radhika

Dear Friends

Now that we are in our second month as AOGD, so much has happened. Active AOGD members have dedicated their time and effort to bringing diverse women's health issues to the table and we applaud them for doing so. Throughout the month, AOGD members organized CMEs and workshops on important clinical topics. A very informative online program focused on violence against women was offered by Dheera AOGD, UNICEF, and FOGSI on 5th May.

We are happy to share that to make things easier, we have uploaded the AOGD member list with their AOGD and FOGSI membership numbers on the website.

Thanks for reading the May issue on fetal health and adolescent dilemmas. The feedback from AOGD members was extremely positive, and this issue on 'Imaging in Obstetrics and Gynecology' promises not to disappoint.

Please also save your dates for the 45th Annual Conference of AOGD to be held 19th - 20th August 2023 at Leela Ambience, Gurugram and Preconference workshops on 18th August. We are strategizing for the conference, and the first announcement of highlights has already been made. We look forward to interacting with all of you throughout the year!

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Dear Seniors and friends

We are overwhelmed and extremely thankful to our readers for appreciation we received for the May issue. Continuing with the trend of including both Obstetrics and Gynaecology topics, we chose 'Imaging in Obstetrics and Gynaecology' as the theme for current issue. The advancement in imaging techniques has revolutionised clinical care and given a whole new dimension in patient diagnosis and management. This has also led to better integration with our radiological colleagues. A heartfelt thanks to all our learned contributors in this issue.

We have included an update on the role of MRI in Obstetrics for both maternal and fetal conditions, prenatal fetal cardiac screening by echo-cardiography, utility of ultrasound in infertility and pelvic floor disorders and much more. There is an algorithm on the role of imaging in adnexal masses which is important for gynaecologists to make a preoperative diagnosis of probable malignant masses and deal with them accordingly. A coverage of legalities in maternal fetal imaging would be interesting to read! For snap shot section there is an interesting fetal procedure with a link to the video. The research hub has touched on 'how to design a clinical trial'. Concurrent with the AOGD theme of holistic health, the section health harmony and happiness focusses on Yoga in pregnancy this time.

'Dil Se' section has heart felt confession of our gynaecology resident's husband. Needless to say that we gynaecologists owe our success to the sacrifices that our families make for us!

Hope you enjoy reading this issue and any feedback/ suggestions for the bulletin are welcome.

Warm Regards

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MRI In Obstetrics: An Update

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INTRODUCTION

Ultrasound imaging is the first-line imaging modality owing to its lower cost, wide availability, safety, convenience and real-time display. However, antenatal ultrasound has inherent limitations including beam attenuation by maternal adipose tissue and fetal bone, limited field of view, and relatively limited soft-tissue contrast. Ultrasound also relies on fetal positioning and presence of sufficient amniotic fluid to provide an adequate acoustic window. MRI can overcome many of these limitations because of development of ultrafast sequences, better contrast resolution and the ability to obtain images in multiple planes, regardless of fetal position. It is free from ionising radiation, provides large field of view, and is not limited by maternal obesity and fetal bone. Therefore, MRI has now become a complementary investigation to ultrasound in the evaluation of the fetus and other obstetric conditions by confirming/ excluding suspected abnormalities and recognizing additional information beyond that is available with ultrasound. An additional impetus to MRI in obstetrics has been the emergence of fetal medicine as the recognised speciality with advances in management including fetal surgeries. As per the recent American College of Radiology (ACR) and Society of Pediatric Radiology (SPR) safety guidelines in pregnant patients, no detrimental effects on the developing fetus or mother have been conclusively documented on exposure of 3T or weaker magnetic fields in the routine clinical MRI process[1]. Due to concerns about the safety of gadolinium-based contrast media in pregnancy, there are no documented fetal indications for the use of MR contrast agents.

TIMING OF MRI IN OBSTETRICS

Guidelines suggest fetal imaging after 18 weeks of gestation as MRI acquired before 18 weeks gives limited diagnostic information due to fetal movement and small size of the fetus [1,2]. Non-fetal obstetric pathologies can be assessed at any time in pregnancy depending upon the indication of obstetric examination.

INDICATIONS

FETAL INDICATIONS

The standard fetal MR examination typically includes the ultrafast T2 weighted sequences. T1 weighted images are also acquired, which are helpful in the assessment of possible hemorrhage, thyroid gland, meconium containing bowel and evaluation of liver position particularly in cases of congenital diaphragmatic hernia. According to the ACR-SPR practice parameters[1], the primary indications for fetal MRI include the following (Table-1):

Table 1: Fetal indications of MRI

System	Indications	
Brain	• Congenital anomalies	• Ventriculomegaly • Agenesis of the corpus callosum • Abnormalities of the cavum septum pellucidum • Holoprosencephaly • Posterior fossa anomalies • Cerebral cortical malformations or migrational anomalies • Solid or cystic masses • Cephalocele
	• Screening fetuses with a family risk for brain abnormalities (such as tuberous sclerosis, corpus callosal dysgenesis, or lissencephaly).	
	• Vascular abnormalities	Vascular anomalies; Hydranencephaly; Infarction; Hemorrhage; Monochorionic twin pregnancy complications
Spine	Congenital anomalies	Neural tube defects; Sacrococcygeal teratomas; Caudal regression/sacral agenesis; Sirenomelia; Vertebral anomalies
Skull, Face and Neck	1.Masses	Vascular or lymphatic anomalies; Goitre; Teratomas; Facial clefts; Congenital cysts and cystic masses
	2. Assessing airway obstruction	
Thorax	1.Thoracic pathology	• Congenital airway and lung malformation (CHAOS, CPAM, bronchogenic cyst, sequestration and CLO) • Congenital diaphragmatic hernia • Effusions • Mediastinal masses • Suspected esophageal atresia • Lymphangiectasia
	2. Volumetric assessment of fetal lung parenchyma	
Abdomen and pelvis	1.Masses	
	2. Abdominal-pelvic cyst	
	3. Complex genitourinary anomalies or complex lower urinary tract obstruction	
	4. Renal anomalies in cases of severe oligohydramnios	
	5. Complex bowel anomalies	
	6. Complex abdominal wall defect	
Musculoskeletal	1.Extremity masses (such as lymphatic malformations and Klippel-Trenaunay-Weber)	
	2. Skeletal dysplasias - assessment of associated anomalies	
	3. Confirmation of suspected limb anomalies	
Complications of Multiple Gestation Pregnancies	1.Monochorionic twins	• Vascular anatomy prior to laser treatment • Morbidity after death of a monochorionic co-twin
	2. Conjoined twin- further delineation of anatomy	
Fetal Interventions Assessment	Confirming the diagnosis and planning potential interventional options, assessing the fetal brain both before and after surgical interventions	

A. Fetal Brain

Ventriculomegaly (Fig.1): Fetal MRI provides better morphological and precise measurements of 3rd ventricle, aqueduct of Sylvius as well as 4th ventricle in addition to the lateral ventricles. Fetal MRI is highly sensitive for Corpus callosal dysgenesis (Fig.2) due to multiplanar imaging capabilities and relatively higher soft tissue resolution.

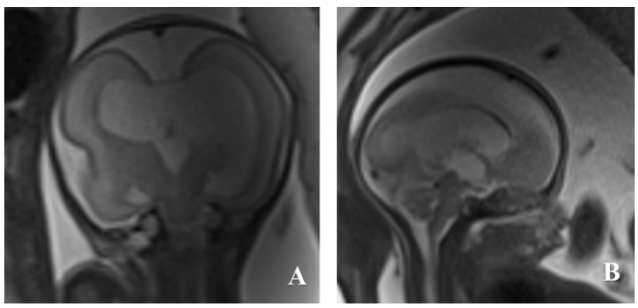

Figure 1. VENTRICULOMEGALY – AQUEDUCTAL STENOSIS: Coronal T2WI (A) of the fetal head at 25 weeks' gestation shows dilated bilateral lateral and third ventricles, thinning of overlying cerebral parenchyma and grossly thinned out corpus callosum. Sagittal T2WI (B) of the fetal head shows narrowing of aqueduct and normal fourth ventricle.

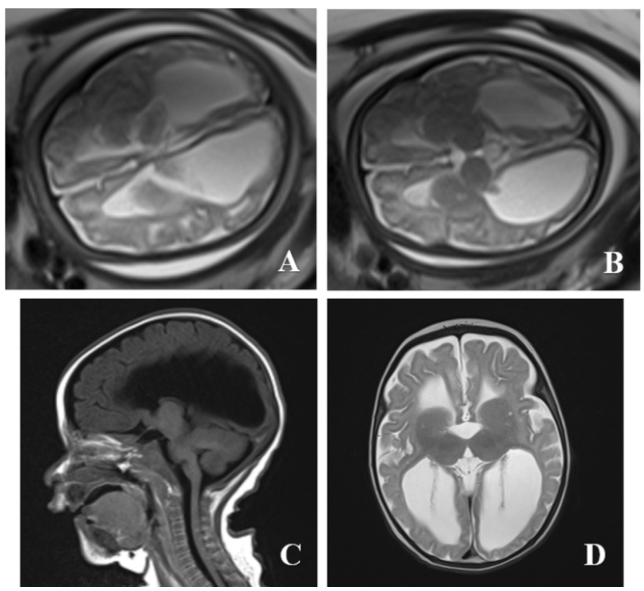

Figure 2: CORPUS CALLOSUM AGENESIS: Axial T2WI (A and B) of the fetal head at 40 weeks' gestation absence of interconnecting fibres of corpus callosum between cerebral hemispheres and colpocephaly. Postnatal MRI with sagittal T1WI (C) and axial T2WI (D) confirms the prenatal diagnosis of corpus callosum agenesis with colpocephaly.

Different types of holoprosencephaly (alobar, semilobar and lobar) and associated abnormalities of corpus callosum, facial abnormalities and other extra-craniofacial congenital anomalies are easy to recognize on MRI. It is usually not indicated in the cases of alobar holoprosencephaly which can be diagnosed on the ultrasound alone, but is useful in differentiating semilobar type from lobar variety which may be difficult to differentiate on ultrasonography. Semilobar holoprosencephaly is characterized by fusion of the cerebrum anteriorly with absent septum pellucidum and poor development of frontal horns. There is partial fusion of the thalami with visualization of posterior falx and splenium of corpus callosum. Lobar variety of holoprosencephaly shows fusion of frontal lobes with unfused thalami/basal ganglia and visualization of the 3rd ventricle. Part of the frontal horns may be seen with formation of posterior body/splenium of corpus callosum. Fusion of fornices is delineated better on MRI as compared to ultrasound.

Posterior fossa anomalies (cystic posterior fossa malformation, rhombencephalosynapsis, Joubert, pontocerebellar hypoplasia) can be seen better on MRI as it allows detailed multiplanar assessment and accurate biometric evaluation of the posterior fossa structures enabling precise characterization. Fetal MRI is a valuable imaging tool in diagnosing disorders of cortical development including hemimegalencephaly, cortical dysplasia, lissencephaly, heterotopias, polymicrogyria and schizencephaly, not apparent on ultrasound. It allows better delineation of the site, extension and morphology of the intracranial masses as compared to ultrasound. Haemorrhage is better visualised on MRI as hyperintense signal on T1 weighted images and can be seen in PNET and glioblastoma. Diffusion weighted imaging also has a role in the characterisation of fetal tumors with PNET often showing restricted diffusion. MRI may be useful as a screening tool in familial cases of tuberous sclerosis, corpus callosum dysgenesis, and

malformations of cerebral cortical development, even if ultrasound shows normal results. MRI is also indicated in the assessment of vascular malformations, hydranencephaly, infarctions and in the evaluation of complications of monochorionic twin pregnancy (due to vascular events), when ultrasonographic examination is inconclusive/incomplete.

B. Fetal Spine

These include neural tube defects (NTDs) (Fig. 3), sacrococcygeal teratoma (SCT), sacral agenesis and vertebral anomalies. Echoplanar MR imaging/"black bone" imaging has been suggested for the evaluation of these abnormalities. MRI can differentiate between open and closed spinal dysraphism based on thickness of the tissue layer over the herniated sac. Fat can be identified using T1 weighted sequences leading to better depiction of subtype of spinal dysraphism[3]. MRI is useful in correctly identifying the type of SCT, assessing intrapelvic/intraspinal extension of the lesion and discerning the mass effect on the pelvic organs. The correct level of vertebral involvement can be identified by fetal MRI in sacral agenesis and vertebral segmentation-formation anomalies.

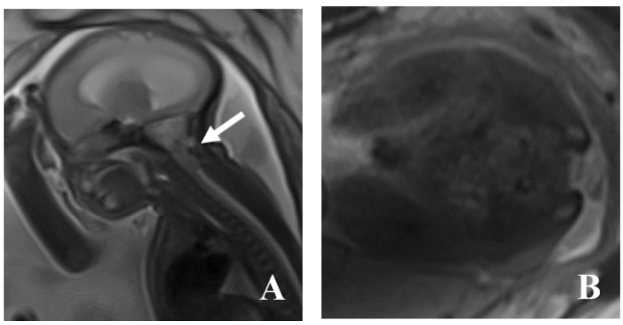

Figure 3: OPEN SPINAL DYSRAPHISM – ARNOLD CHIARI MALFORMATION: Sagittal T2WI (A) of the fetal head, neck and chest at 23 weeks' gestation shows small posterior fossa with herniation of hindbrain structures through the foramen magnum into upper cervical spinal canal with obliteration of the cisterna magna and fourth ventricle (white arrow) and upstream dilatation of the ventricular system. Axial T2WI (B) of the fetal lower abdomino-pelvic region shows lumbosacral meningomyelocele.

C. Fetal skull, face and neck

Fetal MRI allows superior visualisation of the involved site delineating the complete extent, mass effect on surrounding structures especially airway and better characterisation of the masses including vascular or lymphatic anomalies, goitre, teratomas, and other congenital cysts. Accompanying or isolated clefts involving the secondary palate is achievable only with fetal MRI.

D. Fetal Thorax

1. Airway anomalies

It provides accurate level of airway obstruction in addition to other typical imaging findings of Congenital high airway obstructive syndrome (CHAOS) including increased lung signal, increased lung volumes with flattened and inverted hemi diaphragms, dilated airway below the level of obstruction, centrally positioned compressed heart and features of hydrops[4].

Fetal MRI helps in the better delineation of blind ending esophageal pouch allowing the diagnosis of esophageal atresia, which is difficult to detect on prenatal ultrasound. It also helps in the detection of additional associated anomalies not precisely detected on ultrasound like anal atresia[4].

2. Lung lesions

Congenital pulmonary airway malformations (Fig. 4), sequestration and congenital lobar emphysema- Fetal MRI helps in the better characterisation of the lesion and determining the exact size and extent of lung hypoplasia.

Congenital diaphragmatic hernia (Fig. 5)- Fetal MRI easily differentiates between lungs,

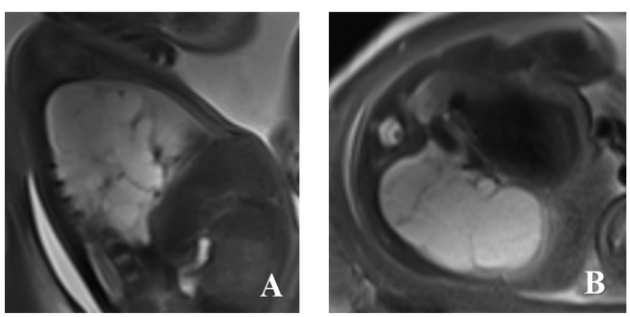

Figure 4: CONGENITAL PULMONARY AIRWAY MALFORMTION: Sagittal T2WI (A) and axial T2WI (B) of the fetal thorax at 34 weeks' gestation show multi-cystic hyperintense lesion involving upper lobe of the left lung causing shift of the heart towards right side.

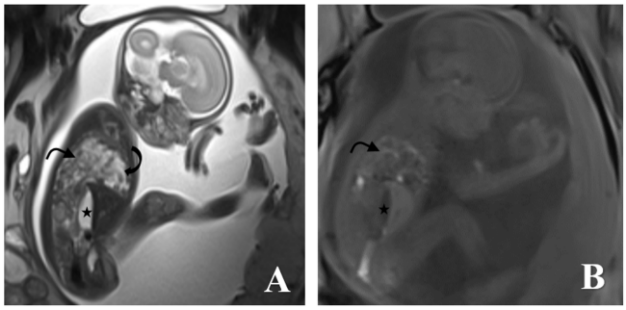

Figure 5: CONGENITAL DIAPHRAGMATIC HERNIA (CDH): Sagittal T2WI (A) and sagittal T1WI (B) of the fetus at 24 weeks' gestation show left CDH containing small bowel (curved arrow) and large bowel (bent arrow) loops with intra-abdominal stomach (star).

herniated intra-abdominal organs and mediastinal structures. This provides precise information involving contents of the herniation especially solid organs and better evaluation of both lungs.

Fetal MRI also provide better assessment of lung parenchyma and measurements of lung volume owing to the greater spatial resolution and increased contrast between the lungs and the adjacent structures.

E. Fetal abdomen and pelvis

MRI is indicated in the evaluation of ultrasonographically equivocal cases of abdomino-pelvic masses (such as hemangiomas, neuroblastomas, sacrococcygeal teratomas and suprarenal or renal masses) (Fig. 6), cysts, complex genitourinary and bowel anomalies (bladder exstrophy, cloacal malformation, anorectal malformations and complex bowel obstruction), complex lower urinary tract obstruction (Prune Belly Syndrome) or complex abdominal wall defects (like limb body wall complex/body stalk deformity). For bowel related pathology, presence of meconium within the lumen appears hyperintense on T1 images, allowing better depiction of the anatomy and therefore the bowel related pathology. Renal anomalies (Fig. 7) in cases of severe oligohydramnios/anhydramnios and/or obscured renal fossae due to overlying bony shadow are better visualised on MRI.

F. Fetal musculoskeletal system

It is indicated in the evaluation of extremity masses (such as lymphatic malformations) accurately delineating its extension and further characterising the lesion. It is also helpful in the assessment of the associated anomalies in cases of skeletal dysplasias and to confirm the ultrasonographically suspected limb anomalies.

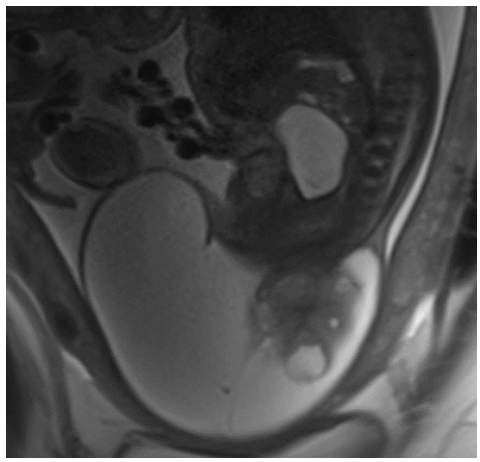

Figure 6: SACROCOCCYGEAL TERATOMA (TYPE 1): Sagittal T2WI of fetal pelvis at 36 weeks' gestation shows a large externally protruding predominantly cystic mass lesion showing small solid component within seen arising from the coccyx with no intrapelvic component.

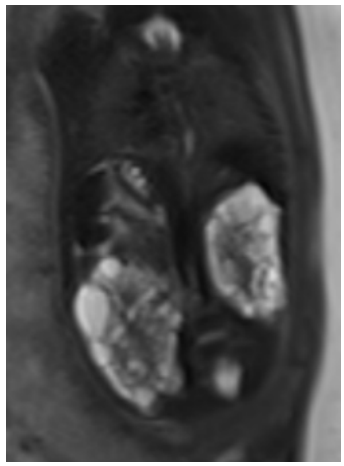

Figure 7: BILATERAL MULTICYSTIC DYSPLASTIC KIDNEY: Coronal T2WI of fetus at 28 weeks' gestation shows bilaterally enlarged kidneys replaced by cysts of variable sizes with hypoplastic low signal intensity lungs and anhydramnios.

G. Complications of multiple gestation

MRI has a role in the delineation of vascular anatomy before laser treatment of monochorionic twins. In conjoined twins, MRI shows better fetal anatomy with accurate depiction of shared organs and diagnosis of additional abnormalities in the fetuses.

H. Fetal surgery assessment

With development in fetal imaging and interventions, now fetal surgeries have become a practical choice to improve quality of life in less severe fetal abnormalities like neural tube defects, sacrococcygeal teratoma, abnormalities causing airway compromise e.g., CHAOS and neck masses, chest masses, congenital diaphragmatic hernia and lower urinary tract obstruction. MRI helps in confirming the ultrasonographic diagnosis and in planning possible fetal surgical interventions.

ADVANCES RELATED TO USE OF MRI IN FETAL IMAGING

Use of advanced MR sequences- Spectroscopy, diffusion-weighted imaging (DWI), diffusion-tensor imaging (DTI) and functional imaging are the advanced MR sequences that are providing access to fetal micro- and macro-structures, metabolism, function and behaviour especially in neuroimaging. The use of proton MR spectroscopy in fetal brain using single voxel technique has enabled quantification of various metabolites. It has been found that lactate may serve as an indicator of early fetal compromise[5]. The changes in fetal brain microstructure can be quantitatively assessed using DWI and DTI, with DWI providing relevant information in cases of acute brain ischemia and haemorrhage. The recent studies demonstrate that the functional MRI which enables quantification of local blood oxygenation levels, will likely help in understanding the role of early insults on later disturbances in neural functional connectivity[5]. The recent development of Doppler ultrasound gated cine fetal MR imaging has been found technically satisfactory and accurate for fetal heart evaluation and it may serve as a promising adjunct to fetal echocardiography.

NON-FETAL OBSTETRIC INDICATIONS

(Table-2)

A. Placenta accreta spectrum (PAS) disorders (Fig. 8)

MRI acts as an auxiliary imaging modality in the assessment of PAS disorders with ambiguous sonographic findings guiding further management and ensuring better outcomes for the patients. MRI provides precise information on the depth and extension of placental invasion with additional advantages in patients with posterior placenta as compared to ultrasound. Seven MRI features for diagnosis of PAS disorders include placental/uterine bulge, focal exophytic mass, intraplacental T2-dark bands, loss of T2-hypointense retroplacental line, abnormal vascularity of placental bed, myometrial thinning and bladder wall interruption[6]. DWI is a complementary advanced MR sequence in the evaluation of PAS disorders enabling better depiction of myometrial-placental interface.

Table 2: Non-fetal obstetric indications of MRI

Indications	
1. Ectopic pregnancy	• Rare or complicated forms
2.Placental complications	• Placenta accreta spectrum disorders • Placental abruption • Gestational trophoblastic disease
3.Uterine complications	• Acute fibroid degeneration • Uterine rupture and prediction of scar dehiscence
4.Cervical incompetence and prediction of preterm labour	
5.Ovarian torsion	

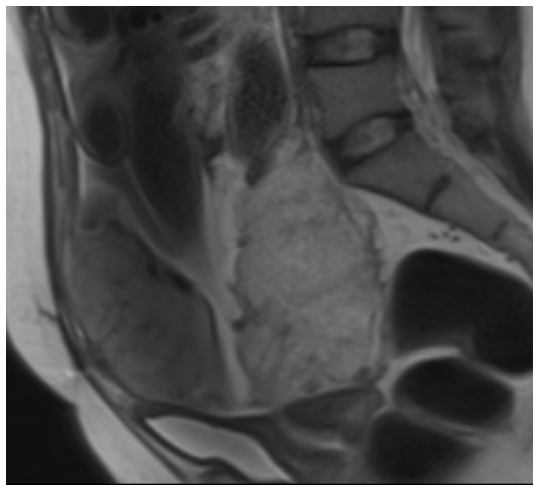

Figure 8: PLACENTA PREVIA WITH PLACENTA ACCRETA SPECTRUM DISORDER: Sagittal T2WI of female pelvis shows low lying placenta located in the lower uterine segment showing heterogenous intermediate signal intensity and focal posterior-inferior uterine bulge with focal thinning and loss of retroplacental hypointense myometrial outline without any obvious invasion or breech of serosa.

B. Ectopic pregnancy

MRI is indicated in the evaluation of rare and complicated cases of ectopic pregnancy like abdominal pregnancy, interstitial pregnancy,

angular pregnancy and cervical pregnancy with inconclusive or insufficient diagnosis on ultrasound.

C. Placental abruption

It is indicated in the evaluation of placental abruption when there is high clinical suspicion of the condition but ultrasound shows negative results. MRI provides excellent characterization of the hematoma structure predicting its age based on signal intensity on T1 and T2 weighted images, classifying the hematomas as hyperacute, acute, early subacute, late subacute and chronic.

D. Gestational trophoblastic disease (GTD)

MRI is not usually indicated in the routine evaluation of GTDs. It can help in diagnosing the hydatiform moles at ectopic locations e.g. cesarean scar hydatiform mole. MRI also aids the evaluation of equivocal and complicated malignant cases by assessing myometrial invasion and extension into the parametrium.

E. Uterine complications

The imaging findings on MRI in red degeneration (Fig. 9) includes diffuse/peripheral hyperintensity on T1 weighted images with variable signal intensity on T2 weighted images with or without presence of T2 hypointense rim. MRI is reserved for the equivocal cases of uterine rupture and prediction of scar dehiscence following ultrasound evaluation in stable patients and shows full thickness tear in the uterine wall with rupture/protrusion of the part of amniotic sac, intraperitoneal fetal parts and hemoperitoneum (Fig. 10).

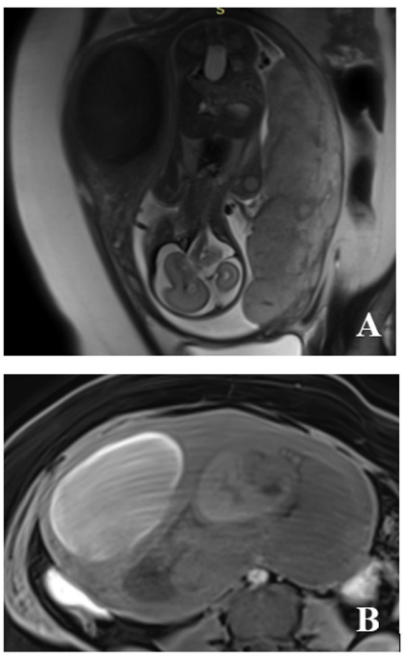

Figure 9: RED DEGENERATION OF FIBROID: Sagittal T2WI (A) and axial T1WI (B) of maternal abdomino-pelvic region show gravid uterus with intramural fibroid involving its right lateral wall showing diffuse T2 hypointensity and peripheral T1 hyperintense rim.

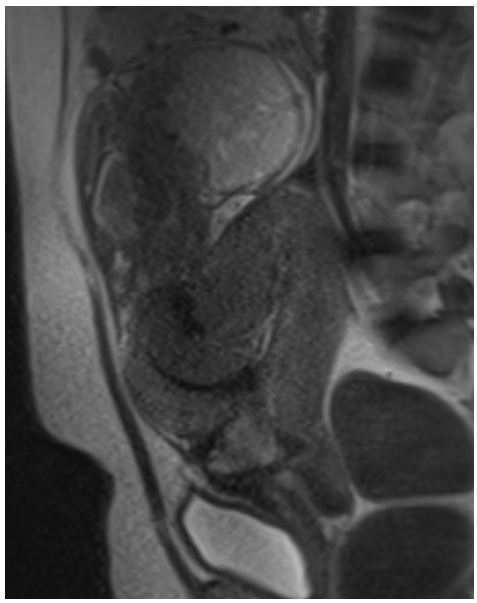

Figure10: UTERINE RUPTURE: Sagittal T2WI of maternal abdomino-pelvic region shows bulky uterus with a large complete thickness defect involving the anterior myometrium of the lower uterine segment. Placenta is seen to protrude out through the defect into the lower abdominal cavity with visualisation of amniotic sac containing a single fetus in the peritoneal cavity above the level of the placenta and the myometrial defect.

F. Cervical incompetence and prediction of preterm labor

The MRI signs (apart from measurement of cervical length) that may be helpful in the prediction of cervical insufficiency include presence of hypo-signal at the internal orifice of cervix, loss of definition of peri-endocervical stromal zone and presence of hypointense contents in the amniotic sac. It has been found that high ADC values in the subglandular area of the cervix are significantly associated with the occurrence of delivery within 7 days, however requires further confirmation in the subsequent studies.

G. Adnexal lesions/ Ovarian torsion

MRI is indicated in the equivocal cases after ultrasound assessment. The imaging features include midline position of the involved ovary with displacement of the uterus towards involved side, ovarian enlargement, edema and hemorrhage, peripherally displaced follicles, twisted vascular pedicle and free fluid in the pelvis.

CONCLUSION

MRI has been now increasingly used as a problem-solving tool in the assessment of both fetal and non-fetal obstetric indications. It is a rapidly and continuously evolving imaging modality, which provides a powerful adjunct to ultrasound for the evaluation of challenging obstetrical conditions. The modality has led to unprecedented understanding of various obstetric pathologies with promising future full of new possibilities. With appropriate use, MRI in obstetrics can be used to further advance the maternal and fetal care.

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AOGD Risk Management Support [ARMS] Group

One of the ways to ensure stress-free work environment and optimal patient care is mutual support among professional colleagues. An advisory group was set up last year so that they can be contacted if any of us is caught in a complex clinical dilemma / dealing with aggressive clients or is apprehensive about how to document or effectively troubleshoot a potential problem. The same group will continue to provide timely advice and is led by

Convener- Dr. Vijay Zutshi- 9818319110

Co convener- Dr. Aruna Nigam- 9868656051

We invite suggestions from all members regarding functioning of this cell which will guide us forming the SOPs. Pl mail to **aogd.ucmsgtbh2023@gmail.com**

Cardiac Screening And Fetal Echocardiography: Extending The Boundaries

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Introduction

Congenital heart disease (CHD) have been reported in 8 to 9 per 1000 live births in large population studies. The frequency of chromosomal abnormalities in fetuses with congenital heart defects varies from 5%-15%[2-4] and majority of fetuses with cardiac defects and chromosomal abnormalities have other associated extracardiac abnormalities in the order of 50% to 70%.

An accurate prenatal diagnosis of congenital heart defects (CHD) is critical in determining the requirement for immediate postnatal treatment, predicting the course of (surgical) treatment and assessing the prognosis of the defect, including long-term outcome. This information is also necessary for determining the location and timing of delivery. It will also prevent mental trauma to the parents by providing them adequate time to understand the pathophysiology of the disease and giving them an opportunity to take a sound decision regarding the outcome of the pregnancy including termination.

The 'basic' and 'extended basic' cardiac ultrasound examinations including outflow tract views as well as the four-chamber view are designed to maximize the detection of heart anomalies during a second-trimester scan. This approach helps to identify fetuses at risk for genetic syndromes and provides useful information for patient counseling, obstetric management and multidisciplinary care. The cardiac screening examination is performed optimally between 18 and 22 weeks' menstrual age. However, if there is a family history of loss of a previous child or where the nuchal translucency measurement is $\geq$ 3.5 mm, a scan may be offered at or before 14 weeks' gestation, with a follow-up scan at 20–22 weeks. If a fetus is suspected of having CHD at any scan, it should be seen as soon as possible, regardless of menstrual age.

Suspected heart anomalies will require more comprehensive evaluation using fetal echocardiography. Fetal echocardiography is broadly defined as a detailed ultrasound evaluation that is used to identify and characterize heart anomalies before delivery. This specialized diagnostic procedure is an extension of fetal cardiac screening parameters that have been previously described for the 4-chamber view and outflow tracts.

Technical factors

Cross-sectional gray-scale imaging is the basis of a reliable fetal cardiac scan. Higher-frequency probes will improve the likelihood of detecting subtle defects. System settings should have a high frame rate, increased contrast and high resolution. Low persistence, a single acoustic focal zone and a relatively narrow image field should also be used. Images should be magnified until the heart fills at least one third to one half of the screen. The cine-loop feature should be used to assist the real-time evaluation of normal cardiac structures,

Technical limitations (eg. maternal obesity, fetal position, oligohydramnios, abdominal scars and early or advanced gestation) may impede a detailed evaluation of cardiac anatomy due to poor penetration and posterior acoustic shadowing, especially during the third

trimester. Optimizing transducer placement on the maternal abdomen, applying adequate transducer pressure and changing the maternal position are techniques that may improve fetal positioning and image quality. In some cases, it may be necessary to reexamine the patient at a different time during gestation if the heart is poorly visualized due to technical factors.

Cardiac examination

The evaluation should include the following anatomic regions, including the upper abdomen for situs, cardiac chambers, valves, vessels, and pericardium:

- Four-chamber view, including pulmonary veins
- Left ventricular outflow tract
- Right ventricular outflow tract
- Branch pulmonary artery bifurcation
- Three-vessel view (including a view with pulmonary artery bifurcation and a more superior view with the ductal arch)
- Short-axis views ("low" for ventricles and "high" for outflow tracts)
- Long-axis view (if clinically relevant)
- Aortic arch
- Ductal arch
- Superior and inferior venae cavae

Four-chamber view

This analysis begins with an initial assessment of the fetal right/left orientation, i.e, visceral /abdominal situs by starting the scan from upper abdomen and looking for the position of the stomach, portal vein, descending aorta, and inferior vena cava in the axial view of the abdomen. Stomach and heart are on the left side while inferior vena cava is on the right side. Parameters to be noted in four chamber view are shown in Table-1.

A normal heart is usually no larger than one third of the area of the chest. The heart is mainly situated on the left side of the chest and its long axis normally points to the left by about 45 ± 20æ% (2 SD). Situs abnormalities should be suspected when the fetal heart and/or stomach are not found on the left side. Abnormal axis

Table 1: Checklist for assessment of fetal situs/laterality and the four-chamber view

Situs and general aspects
Fetal laterality (identify right and left sides of fetus)
Stomach and heart on left
Heart occupies a third of thoracic area
Majority of heart in left chest
Cardiac axis (apex) points to left by 45? ± 20?
Four chambers present
Regular cardiac rhythm
No pericardial effusion
Atrial chambers
Two atria, approximately equal in size
Foramen ovale flap in left atrium
Atrial septum primum present (near to crux)
Pulmonary veins entering left atrium
Ventricular chambers
Two ventricles, approximately equal in size
No ventricular wall hypertrophy
Moderator band at right ventricular apex
Ventricular septum intact (apex to crux)
Atrioventricular junction and valves
Intact cardiac crux
Two atrioventricular valves open and move freely
Differential offsetting: tricuspid valve leaflet inserts on ventricular septum closer to cardiac apex than does mitral valve

increases the risk of a cardiac malformation, especially involving the outflow tracts. Abnormal displacement of the heart from its normal anterior left position can be caused by a diaphragmatic hernia or space-occupying lesion, such as cystic adenomatoid malformation of the lung. Position abnormalities can also be secondary to fetal lung hypoplasia or agenesis. A shift of the axis to the left may also occur with fetal gastroschisis and omphalocele.

Both atrial chambers normally appear similar in size and the foramen ovale flap should open into the left atrium. The lower rim of atrial septal tissue, called the septum primum, should be present. This forms part of the cardiac 'crux', the point where the lower part of the atrial septum meets the upper part of the ventricular septum and where the atrioventricular valves insert. Pulmonary veins can often be seen entering the left atrium and, when technically feasible, visualization of at least two of these veins is recommended. The moderator band, a distinct muscle bundle that crosses the right ventricular

cavity, is seen near the apex and helps to identify the morphological right ventricle. The left ventricular apex appears smooth and forms the apex of the heart. Both ventricles should appear similar in size and have no evidence of thickened walls. The ventricular septum should be examined carefully for cardiac wall defects, from the apex to the crux. The septum is best seen when the angle of insonation is perpendicular to it.

Two distinct atrioventricular valves (right-sided, tricuspid; left-sided, mitral) should be seen to open separately and freely. The septal leaflet of the tricuspid valve is inserted into the septum closer to the apex when compared with that of the mitral valve (i.e. normal offset). Abnormal alignment of the atrioventricular valves can be a key sonographic finding for cardiac anomalies such as atrioventricular septal defect.

Normal heart rate and regular rhythm should be confirmed. The normal rate ranges from 120 to 160 beats per minute.

Four chamber view is shown in figure -1.

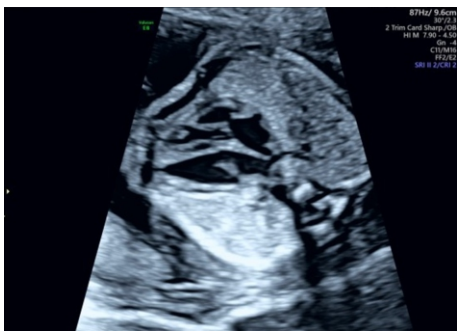

Figure 1: Four Chamber View

Outflow tract views

Views of the left and right ventricular outflow tracts (LVOT and RVOT) are an integral part of the fetal cardiac screening examination. It is important to ascertain normality of the two vessels, including their connection to the appropriate ventricles, their relative size and position and adequate opening of the arterial valves. It is recommended that in cases when this cannot be confirmed, further evaluation be carried out. The examination of the outflow tracts requires that the great vessels are approximately equal in size and cross each other at right angles from their origins as they exit from the respective ventricles. Additional cross-sectional views show different aspects of the great vessels and surrounding structures, but are part of a continuous sweep starting from the RVOT and include the three-vessel (3V) view and the three vessels and trachea (3VT) view. The evaluation of outflow tracts increases the detection rates for major cardiac malformations above those achievable by the four-chamber view alone and is more likely to identify conotruncal anomalies such as tetralogy of Fallot, transposition of the great arteries, double outlet right ventricle and truncus arteriosus.

Sonographic technique

Performing a transverse sweep (sweep technique) with cephalad movement of the transducer from the fetal abdomen (at the level of the standard abdominal circumference) through the four-chamber view and towards the upper mediastinum offers a systematic way of assessing the fetal heart and provides the various views through which normality of the outflow tracts views can be ascertained: LVOT, RVOT, 3V and 3VT views.

Left ventricular outflow tract (LVOT) view

The LVOT view (figure 2) confirms the presence of a great vessel originating from the morphological left ventricle. Continuity should be documented between the ventricular septum and the anterior wall of this vessel, the aorta. The aortic valve moves freely and should not be thickened. It is possible to trace the aorta into its arch, from which three arteries originate into the neck. However, identification of these aortic arch vessels is not considered as a routine part of the cardiac examination. The LVOT view helps to identify outlet ventricular septal defects and cono-truncal abnormalities that are not

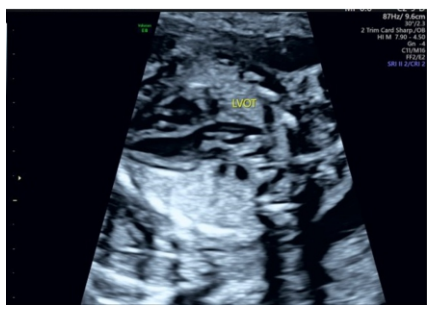

Figure 2: Left Ventricular outflow tract

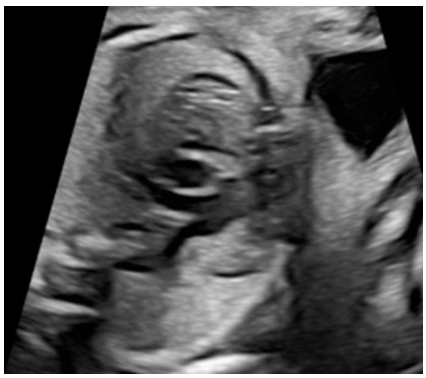

Figure 3: Right Ventricular outflow tract

seen during examination of the four-chamber view alone.

Right ventricular outflow tract (RVOT) view

The RVOT view (figure 3) confirms the presence of a great vessel originating from the morphological right ventricle, the pulmonary artery normally arises from this ventricle and courses towards the left of the more posterior ascending aorta. It is usually slightly larger than the aortic root during fetal life and crosses the ascending aorta at almost a right angle just above its origin. At this level, as seen in, the superior vena cava is often seen to the right of the aorta. This view is similar to the three vessel (3V) view. The pulmonary valve moves freely and should not be thickened. The vessel originating from the RVOT can be confirmed as the pulmonary artery only if it branches after a short course. The take-off of the right branch of the pulmonary artery comes first and the left branch subsequently. The normal pulmonary artery continues distally towards the left side and into the ductus arteriosus that connects to the descending aorta.

Three-vessel (3V) view and three vessels and tracheal (3VT) view

Visualization of the 3V view (figure 4) and 3VT (figure 5) view is desirable and should be attempted as part of the routine cardiac screening examination.

These two standard ultrasound planes define three vascular structures, and their relationships with each other and with the airways (trachea). Briefly, an assessment of vessel (pulmonary artery, ascending aorta and superior vena cava) number, size, alignment and arrangement needs to be made. From left to right, the vessels are the pulmonary artery, the aorta and the superior vena cava. The pulmonary artery is the most anterior vessel and the superior vena cava is the most posterior. Their relative diameters decrease from left to right, with the pulmonary artery being larger than the aorta, and the aorta larger than the superior vena cava. Typically, certain abnormalities associated with a normal four-chamber view, such as complete transposition of the great arteries, tetralogy of Fallot and pulmonary atresia with a ventricular septal defect, are likely to have an abnormal 3V view. The 3VT view, which is a more cephalad image, in which the transverse aortic arch is better visualized ('aortic arch view') and its relationship with the trachea emphasized. The trachea is usually identified a hyperechogenic ring surrounding a small fluid-filled space. Both the ductal and aortic arches are positioned to the left of the trachea and form a 'V' shape as they both join the descending aorta. The 3VT view is likely to enable detection of lesions such as coarctation of the aorta, right aortic arch, double

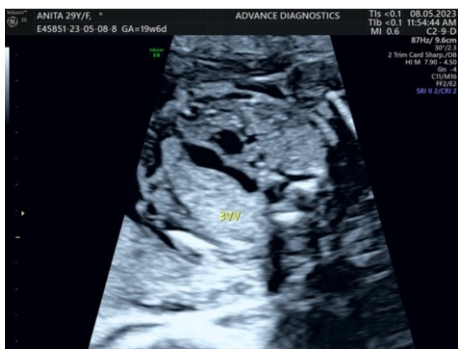

Figure 4: Three Vessel View

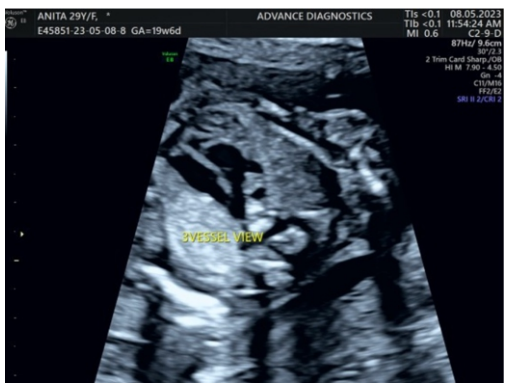

Figure 5: Three Vessel - Tracheal View

aortic arch and vascular rings.

Complementing the four-chamber view with the outflow tract views in the cardiac screening examination is therefore an important step to improve detection of CHD.

Color flow Doppler

Use of color flow Doppler is not mandatory and is actually an integral part of fetal echocardiography. Color flow mapping may facilitate imaging of the various cardiac structures as well as highlighting abnormal blood flow patterns. It may also constitute a valuable tool in the evaluation of cardiac anatomy in obese patients and may further improve detection rates of major CHD in low-risk pregnancies.

Fetal Echocardiogram

A fetal echocardiogram should be performed if CHD is suspected, if the normal four-chamber and outflow tract views described above cannot be obtained at the time of screening or if recognized risk factors indicate increased risk for CHD (Table -2).

Conclusion

As most of the CHDs occurs in low risk pregnancies without maternal or fetal risk factors, therefore most referrals for fetal echocardiography and subsequent prenatal diagnosis of CHD rely solely on detection of a cardiac anomaly on screening obstetric ultrasound. Therefore, fetal heart should be assessed in all pregnancies during the standard obstetric anatomic ultrasound, typically performed between 18–22 weeks gestation, with adequate visualization of the four-chamber and ventricular outflow tract views including three vessel view and three vessel tracheal view. Any fetus with abnormal cardiac views or increased maternal or fetal risk of CHD should undergo detailed fetal echocardiography.

Suggested reading

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Table 2: Indications of fetal echocardiography

Fetal factors	**Maternal Factors**
• Suspected cardiac structural anomaly • Suspected abnormality in cardiac function • Hydrops fetalis • Persistent fetal tachycardia (heart rate > 180 beats per minute) • Persistent fetal bradycardia (heart rate < 120 beats per minute) or a suspected heart block • Frequent episodes or a persistently irregular cardiac rhythm • Major fetal extracardiac anomaly • Nuchal translucency of 3.5 mm or greater or at or above the 99th percentile for gestational age • Chromosomal abnormality by invasive genetic testing or with cell-free fetal DNA screening • Monochorionic twin	• Pregestational diabetes regardless of the hemoglobin A1C level • Gestational diabetes diagnosed in the first or early second trimester • In vitro fertilization, including intracytoplasmic sperm injection • Phenylketonuria (unknown status or a periconceptional phenylalanine level > 10 mg/dL) • Autoimmune disease with anti-Sjogren syndrome related antigen A antibodies and with a prior affected fetus • First-degree relative of a fetus with CHD (parents, siblings, or prior pregnancy) • First- or second-degree relative with disease of Mendelian inheritance and a history of childhood cardiac manifestations • Retinoid exposure • First-trimester rubella infection
<u>May be considered in certain fetal conditions like:</u> • Systemic venous anomaly (eg. a persistent right umbilical vein, left superior vena cava, or absent ductus venosus) • Greater-than-normal nuchal translucency measurement between 3.0 and 3.4 mm	<u>May be considered in certain maternal conditions like:</u> • Selected teratogen exposure (eg. paroxetine, carbamazepine, or lithium) • Antihypertensive medication: angiotensin converting enzyme inhibitors • Autoimmune disease with Sjogren syndrome–related antigen A positivity and without a prior affected fetus • Second-degree relative of a fetus with CHD

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Improving pregnancy outcomes in a fetus with Monochorionic diamniotic multiple pregnancies with a TRAP Sequence: A video article

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Twin reversed arterial perfusion (TRAP) sequence is an anomaly that is unique to monochorionic twin pregnancies. At an early embryonic period, there is demise of one twin. In dichorionic diamniotic pregnancy, this leads to a vanishing twin but in a monochorionic pregnancy, there is a reversal in the blood flow due to the vascular anastomoses between the twins. There is reversed perfusion by the surviving twin through a large artery to- artery anastomosis. This is then known as the pump twin, and the demised twin is known as the acardiac twin.[1]

They can present in various forms depending on the blood supply to the acardiac twin, but as this is hypoxemic arterial blood, there is inevitably poor development of structures of the acardiac twin. The most common is 'acephalus' in which there is still a reasonable development of the lower limbs but the head is absent and the upper limbs are only partially developed. The 'amorphus' type is the least differentiated form presenting as a shapeless mass of tissue. [2] This type of pregnancy is known as Twin Reversed Arterial Sequence (TRAP)

The parasitic acardiac twin leads to the risk of high-output heart failure and polyhydramnios in the pump twin.[3] This is due to the blood supplied to the parasitic twin and also because the returning blood has bypassed the placenta (as is the usual situation) the healthy twin gets further compromised and hypoxemic.[4] This may potentially lead to long term poor neurodevelopmental outcomes in the surviving twin, especially if intervention is delayed to beyond 23 weeks.[5]

Due to high-output cardiac failure and polyhydramnios-related very preterm birth, the risk of perinatal death for the pump twin about 35–55%. The birth is on average, around 30 weeks when diagnosed in the second trimester. However when diagnosed in the first trimester, one out of three pump twin dies between first trimester scan and 16 weeks.[6]

Diagnosis

The pathognomonic diagnosis is by demonstrating the reverse flow into the acardiac twin cord using ultrasound doppler. This is seen well in the second trimester but even in the first trimester it can be detected. It is a good practice point to switch on colour flow, in what appears to be a demised fetal pole.

Management

Parents must be counseled about the options of conservative management including in utero intervention to arrest the reversed blood flow. The last option should be termination of the entire pregnancy. The technique used depends on the case MCDA or monoamniotic, ablative procedures preferred and accessibility of the acardiac sac.

The most common technique used is intrafetal coagulation of the blood supply using Radiofrequency Ablation [7]. The video attached demonstrates this technique.

Survival after in utero surgery

The survival of the pump twin is about 80% with an average gestation at birth of 36 weeks but there is still a very high preterm birth rate of 10–20%.

Please click on this link to access the video:

https://1drv.ms/f/s!ArCBk5PFWvt9lw_q_FNd50IdIwMQ?e=nkpSIs

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Yoga In Pregnancy

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Introduction

Yoga is widely recognized as a form of mind body medicine that creates a balance among emotional, mental, physical and spiritual dimensions. It is a comprehensive system that uses physical postures (asanas), breathing exercises (pranayama), concentration (dharana), meditation (dhyana) and contemplative practice.

Pregnancy is a state of physiological stress which necessitates physical, mental and social adaptation. Research shows that prenatal maternal stress increases the risk of spontaneous abortion, preterm labour, fetal malformations and growth restriction. Yoga asanas improves physical strength and enhance flexibility in pregnancy. Yoga training has shown to decrease sympathetic response (systolic pressure, diastolic pressure, heart rate). The vagus nerve regulates heart rate, blood pressure, gastric acid secretion and functioning of many other organs. Yoga down-regulates the HPA axis and sympathetic nervous system, both of which have been shown to prevent the release of the stress hormones such as cortisol and catecholamines. There is decreased firing from the Locus Coeruleus, which is the principal site in the brain for synthesis of nor epinephrine in response to stress and panic. This decreased nor epinephrine output helps the body to relax and quieten down with reduced respiratory rate and heart rate and promotes the feeling of well being. The decreased sympathetic output decreases the release of corticotrophin releasing factor, with resultant decrease in cortisol output and thereby reducing stress.

Om Chanting has an effect on parasympathetic system and reduces stress. Pranayama, increases oxygen supply to the fetus thus increasing coordinated relaxation and contraction of uterus facilitating easier delivery. Dhyana or Meditation in conjunction with asanas and breathing awareness reduces excessive thinking. Yoga in pregnancy has a big role in enhancing safe vaginal delivery, shorten labour duration, ensures better endurance of pain and reduces post partum depression. ACOG recommends that women with low risk pregnancy should participate in moderate intensity physical activity for 30 minutes or more on most, if not all, days of the week [1].

Yoga poses for antenatal women

Regimen for yogasana are divided into three categories according to trimester.

First trimester (Table 1)

- Avoid inversion, back bends (compresses the uterus or over stretches it)
- Poses to be done with basic modifications
- Encourage long relaxation phase after exercise

Second trimester (Table 2)

- Avoid supine poses
- The center of gravity shifts to the right so standing poses to be done against the wall for support

Table1: Yoga poses in first trimester

Asanas	Benefits
Utthitatrikasan (extended triangle pose)	Strengthens pelvic floor muscles Increases flexibility of spine
Virbhadrasan (warrior pose)	Tones lower body Relieves backache
Vrikshasan (tree pose)	Stretches legs n back Improves concentration
Tadasana (palm tree pose)	Helps in stretching and relaxing back muscles
Uthita parsvakonasan (extended side angle pose)	Strengthens legs muscles

Table 2: Yoga poses in second trimester

Asanas	Benefits
Vajrasan (thunderbolt pose) (only pose which can be done after meals)	Increases energy uptake and blood flow to pelvic organs Relieves hyperacidity
Matsyakridasan (flapping fish pose)	Relieves constipation Ideal for relaxed sleep
Marjariasan (cat stretch pose)	Essential for bearing down efforts during labour
Tadasan (palm tree pose)	Strengthens rectus abdominis
Bhadrasan (gracious pose)	Helps in toning muscles of pelvis Relieves mental stress
Kati chakrasan (rotation pose)	Tones muscles of waist and back

Table 3: Yoga poses in third trimester

Asanas	Benefits
Ardhatitaliasan (half butterfly)	Loosening of hip joints Enables fast and easy delivery
Pornatitaliasan (full butterfly)	Increases stretching ability of perineum Tones up the pelvic girdle
Chakkichalasan (churning mill pose)	Tones nerves n muscles of pelvis for easy delivery
Utthanasan (squat n rise pose)	Strengthens muscles of back n uterus enabling easy delivery
Baddhakonasana (cobbler pose)	Loosens the hip joint and increases blood flow

Table 4: Pranayama during pregnancy

Pranayama	Benefits
Anuloma vilom	Helps in holding breath which may aid in pushing the baby
Bhramari	Increases oxygen supply thus helps in baby's growth
Nadi shuddhi	Maintains body temperature

Table 5: Mudras in pregnancy

Yog mudra	Benefits
Apana mudra	Helps in coping with pain and facilitates contractions
Gyan mudra	Purification of mind
Aakash mudra	Helps stay positive and healthy
Pushan mudra	Effective for nausea, flatulence and feeling of fullness

Third trimester (Table 3)

- Avoid laying on back

Pranayama and mudras can be done in any trimester (Table 4, 5)

Yoga poses to be avoided in pregnancy include Naukasana, Chakrasana, Bhujangasana, Halasana, Viparita shalabhasana, Ardha matsyendrasana and Kumbhaka

Evidence in literature

Evidence suggests that yoga during pregnancy is safe, feasible and acceptable to pregnant women and may be more beneficial than walking and other standard prenatal exercises for mental and physical health. In a systematic review Corrigan et al 2022 concluded that yoga in pregnancy reduces anxiety ($p=0.002$), depression ($p=0.03$) and perceived stress ($p<0.001$)[2]. Yoga interventions also reduced duration of labour ($p<0.001$) and normal vaginal birth ($p<0.001$) and tolerance for pain. Shujuan Hu et al [3]demonstrated that yoga intervention reduces depression ($p<0.001$), anxiety ($p=0.003$), labour pain ($p=0.001$), back pain and percentage of caesarean section ($p=0.002$). The study showed significant improvement in psychological well being($p<0.5$), immune function and intrauterine fetal growth ($p<0.5$).

But despite having a proven beneficial role very few antenatal women practice yoga in our country. There are very few studies which seek to learn why is there a big gap in knowledge attitude and practice (KAP)of yoga in pregnancy. Thus KAP studies on yoga in pregnancy should be conducted so that further steps can be taken to incorporate yoga among all our antenatal women.

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ALGORITHM

Imaging in Adnexal Masses

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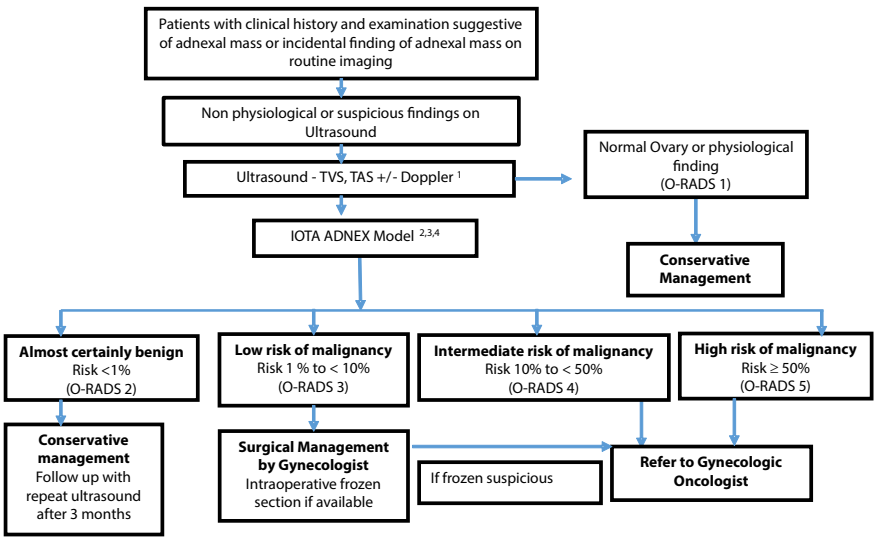

Figure 1: Initial imaging algorithm using ultrasound and IOTA ADNEX Model 1 (ESGO/ISUOG/IOTA/ESGE Consensus Statement on pre-operative diagnosis of ovarian tumors, reproduced with permission).

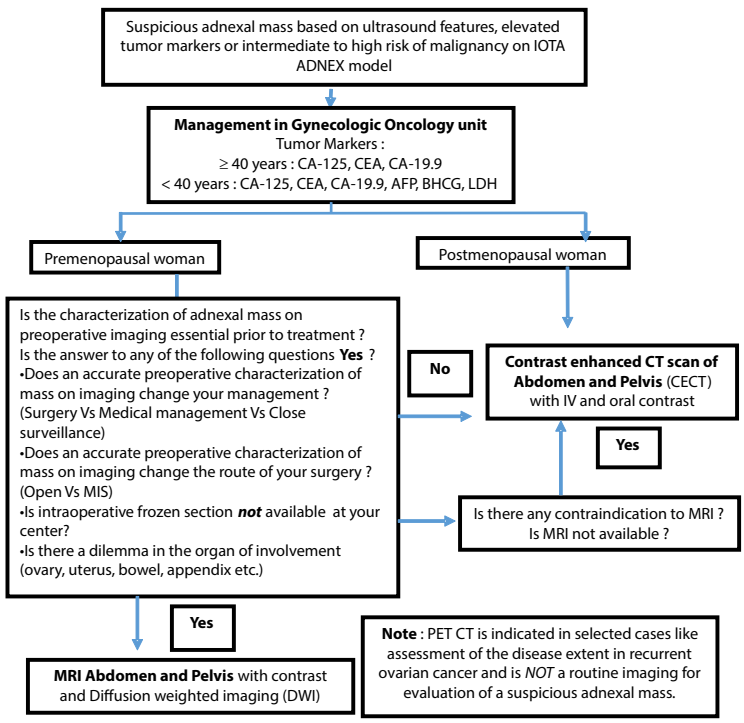

Figure 2 : Imaging algorithm for suspicious adnexal mass in Gynecological Oncology (author's proposed flowchart)

Abbreviations:
IOTA: International Ovarian Tumor Analysis
ADNEX: Assessment of Different NEoplasias in the adnexa
O-RADS: Ovarian-Adnexal Reporting and Data System

Assessment of Different Neoplasias in the Adnexa (ADNEX) Model

- *Clinical predictors*
- Age (years)
- Serum CA-125 (IU/ml)
- Type of centre to which the patient has been referred for ultrasound examination
- *Ultrasound predictors*
- Maximum diameter of lesions (mm)
- Proportion of solid tissue (%)
- Number of papillary projection (0, 1, 2, 3, >3)
- Presence of >10 cyst locules (yes/no)
- Acoustic shadows (yes/no)
- Presence of ascites (yes/no)

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Forthcoming Events

1. **AOGD - FOGSICON 2023:45th AOGD Annual Conference & FOGSI PG Conference, on 18 -20 August 2023 at Leela Ambience Hotel, Gurugram**

2. **IVF Unit, Deptt of Obgy, VMMC and Safdarjung Hospital, Delhi and AOGD infertility committee will be organising a CME on ,"Tackling Uterine Factors in Infertility " from 1 to 4pm on 22 June 2023 at old LT,Safdarjung hospital, New Delhi.**
   Convener: Dr Bindu Bajaj
   Co conveners: Dr Garima Kapoor,Dr Divya Pandey

3. **AOGD and Delhi PG Forum will be organising a Case discussion on "Vulval Malignancy" on 19.6.23 at 7:00 -8:30 pm by Post Graduates of Maulana Azad Medical College, Delhi.**

4. **Next online AOGD Monthly Clinical Meeting will be held on 30th June, 2023 at 4-5pm and will be conducted by Apollo Hospital, Sarita Vihar.**

Ultrasound in Infertility: Diagnostic and Therapeutic roles

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Senior Director and Head- IVF & Reproductive Medicine

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Infertility is present in 8-10% of couples in reproductive age group in India. Infertility could be due to either male and female causes or both could be responsible. It requires a thorough evaluation of both partners. Evaluation includes hormonal assays for physiological and metabolic evaluation and imaging like ultrasound for anatomical evaluation.

Ultrasound is a safe, noninvasive and cost effective method to evaluate female and male anatomy. It can be a 2D, 3D or saline infusion sonography depending on indications. In an infertile male where semen parameters are impacted a scrotal ultrasound should be done to rule out causes like varicocele and other pathologies. Ultrasound also plays a role in guiding therapeutic procedures like oocyte retrieval and embryo transfers.

Ultrasound in evaluation of female Infertility

Ultrasound forms one of the cornerstones in diagnostic as well as therapeutic modalities in infertility. Ultrasound could be through various routes and methods and is mainly used for a baseline ultrasound before ovarian stimulation, follicular monitoring to track the follicular growth, saline infusion sonography for intrauterine and tubal lesions and abdominal ultrasound in case large fibroid or adenomyosis or ovaries high in pelvis not visualized by TVS.

Assessment of Pelvic pathology

Transvaginal ultrasound forms a good modality to assess pelvic pathology in women. The uterus, ovaries and adnexa are evaluated.

Ovarian Pathology

a) Diagnosis of simple cyst, endometriotic cysts or a dermoid can be made according to the sonographic characteristics of the cyst. Simple cysts are seen as clear hypoechoic unilocular lesions while dermoid cysts are identified by solid hyperechoic areas with calcification in the cyst. Endometriotic cyst have low levels echoes with a typical ground glass appearance.

b) PCOS: Diagnosis of PCOS is dependent on an ultrasound finding of more than 12 antral follicles in each ovary as per Rotterdam criterion and more than 20 follicles per ovary as per International Evidence based guideline for the assessment and management of polycystic ovary syndrome (2018). Ovarian volume of more than 10 cc is characteristic of PCOS

Uterine Pathology

a) Fibroids: Fibroid mapping can be done with 3D ultrasound to find out if it is indenting the endometrium and thus impacting implantation. Mapping is also essential in planning surgery. Submucous fibroids and intramural fibroids distorting the cavity decrease pregnancy rates and require removal in the infertile woman.

b) Adenomyosis: Globular enlargement of uterus with lakes in myometrium and asymmetric enlargement of anterior or posterior wall can be found on ultrasound in cases with adenomyosis. The endomyometrial junction is obscure with thickening of transitional zone. Adenomyosis has an impact on endometrial receptivity and decreases implantation rate in both natural and assisted reproduction.

c) Polyps: Endometrial polyps are seen on ultrasound as hyperechoic lesions in cavity with a feeding vessel. They are best seen in midcycle when endometrium is expanded and thick.[1] It is recommended that these polyps be removed as they may impair implantation

d) Intrauterine adhesions: Disruption of endometrial- myometrial junction with skip lesions may indicate intrauterine adhesions and require adhesiolysis. Hyperechoic bands across the cavity with fluid filled pockets interspersed with areas of normal endometrium may be seen.

e) Congenital malformations: With ultrasound congenital malformations like septum, uterus didelphus, bicornuate and unicornuate uterus can be identified. 3D ultrasound allows assessment of internal and external contours thus enabling a differentiation of various congenital malformation from each other.

f) Fluid in endometrial cavity: This can often be seen when there are adhesions, hydrosalpinx or chronic endometritis. This affects implantation and embryo transfer is to be postponed till cause is treated.

Tubal Pathology

Hydrosalpinx: Tubal Pathology like hydrosalpinx can be diagnosed on ultrasound as a retort shaped cystic lesions around the ovary and can impact the results of fertility treatment like IVF. Hydrosalpinx should be removed or the tube should be clipped at proximal end to disconnect it from uterus[2]

Saline Infusion sonography

Saline is infused into the uterus transcervically to enhance visualization of the cavity and enable detection and assessment of intrauterine lesions like polyps, fibroids and adhesions. Tubal patency can also be assessed but with less accuracy than an HSG or laparoscopy because it is based on the detection of movement of passage of saline through the tubes. The tubes themselves are not delineated.

Follicle Monitoring

Follicle monitoring is an important imaging technique in ovarian stimulation for IUI or IVF. It helps in assessing ovarian response and timing the procedures

Basal scan

Monitoring an ovulation induction cycle starts on second day of menstrual cycle i.e. before the start of ovulation induction. The following can be assessed on basal scan

Table 1: Antral follicle count as a predictor of ovarian reserve

AFC	OVARIAN RESERVE
< 4	Poor – Response poor
4-6	Low count
6-8.	Acceptable
8-12	Normal
12-15	Higher side
>15	High chance of hyperstimulation

a) Antral follicle count (AFC) and ovarian volume directly relate to the ovarian reserve (Table-1). Antral follicles are anechoic round structures seen on second day of period. They range from 2-10 mm and should be measured when ovary occupies at least more than 50% screen. Dose of ovarian stimulation drugs is decided based on antral follicle count and other ovarian reserve parameters like AMH and FSH as they predict response to treatment.

b) Ovarian cyst or early dominant follicle - On a basal scan any cyst more than 10 mm is relevant. If cyst is functional it will secrete estrogen or progesterone and interfere in stimulation. Hence, it is better to wait for next cycle.

c) Checking mobility of ovaries to ensure normal tubo-ovarian relationship and the accessibility of ovary for transvaginal oocyte retrieval. In case it is inaccessible vaginally an abdominal oocyte pickup has to be planned.

d) Curvature of cervical canal to plan embryo transfer or IUI

e) Basal endometrial thickness: If endometrial thickness is not less than 5 mm a polyp should be ruled out. If a hormone secreting cyst is present causing endometrium to be thick it is better to wait for next cycle and for cyst to resolve.

Monitoring a stimulated cycle

a) Measurement of follicle : The two largest follicular diameter perpendicular to each other are measured and averaged. Measurement of ovarian follicles can be

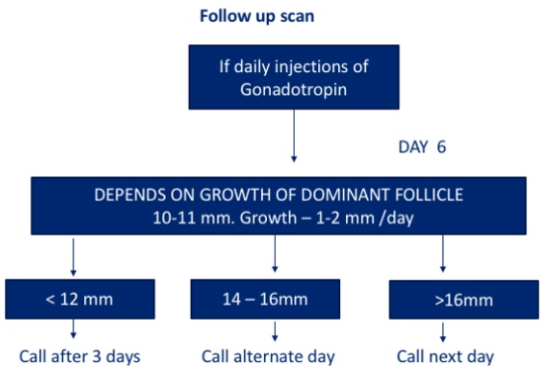

Figure 1: Time interval between scans

achieved by two and three dimensional ultrasound. Sonographic Automated Follicular Volume Calculation (Sono AVC) using 3D ultrasound software is useful in superovulation, when the goal is obtaining multiple large follicles, and routine measurement can be tedious and inaccurate. The mean follicular growth rate is different in natural and stimulated cycle at 1.4 mm/day and 1.7 mm /day respectively. The dominant follicle at time of rupture varies in size from 14 mm to 22 mm in the diameter in the same patient in consecutive cycles. Follow up intervals are scheduled according to follicular size, growth rate of follicle (normal being 1-2 mm/day) and blood hormone concentrations of estradiol if measured (Figure-1).

b) Oocyte maturity: With clomiphene induction the follicle reaches maturity at 20 – 22 mm but with gonadotropins it occurs earlier by 17-18 mm. Another sonographic sign of mature follicles is the presence of low level intrafollicular echoes. The oocyte retrieval or IUI is planned at 34-36 hours after the ovulation trigger.

c) Perifollicular Blood Flow: The perifollicular flow which is seen on Doppler reflects the health of the follicle. The follicle with more than 75% perifollicular flow (Figure 2a) is considered to have better oocytes yielding, morphologically good embryos and a higher pregnancy rate than one with a lesser flow (Figure 2b).

d) Signs of ovulation on ultrasonography

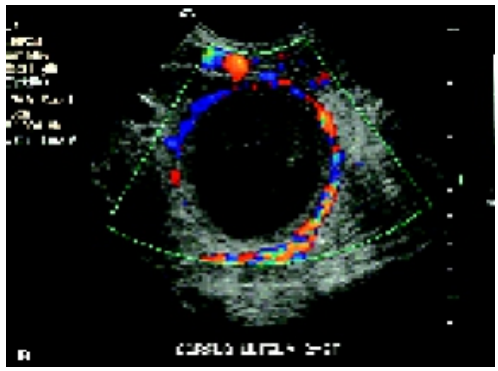

Figure 2a: More than 75% blood flow around follicle as seen by Doppler

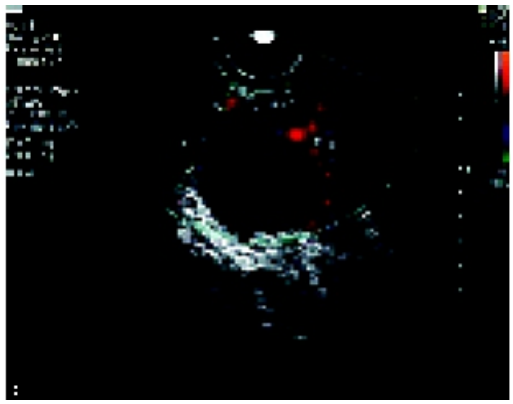

Figure 2b: Less than 25% blood flow around follicle as seen by Doppler

include indistinct margins, increase in density of internal echoes in follicle, irregularity of follicle, abrupt decrease in size of follicle and fluid in cul-de-sac. Various aberrations like staggered growth of follicle at mid follicular stage, premature rupture of follicle, luteinized unruptured follicle and follicular endometrial asynchrony can be diagnosed on ultrasonography.

e) Assessment of Luteal Phase: The corpus luteum formed after rupture of the follicle can be assessed sonographically or by measuring serum progesterone on day 21. The fresh corpus luteum is hypoechoic structure with an irregular internal wall and margins. It may contain some internal free-floating or fixed echoes that correspond to hemorrhage. Its wall is thickened due to the process of luteinization with peripheral vascularity, the "ring of fire" (Figure 3). Assessing the Corpus luteum for aberrant luteolysis is important to identify a deficient

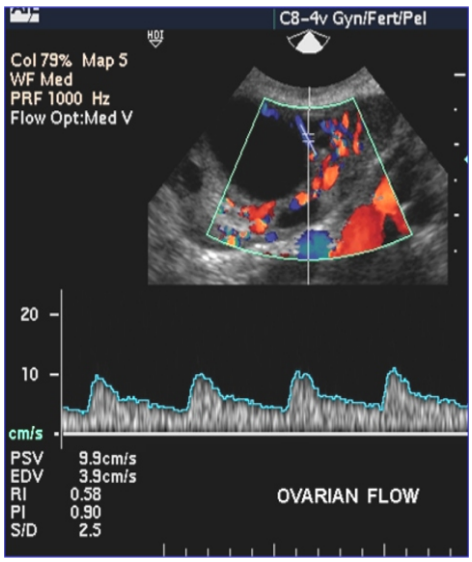

Figure 3 : Corpus Luteum with blood flow

luteal phase. The criteria for aberrant luteolysis includes poorly formed follicle, luteinized unruptured follicle, lutein cyst formation, absence of corpus luteum and lack of endometrial echogenicity on 7th post ovulation day.

Endometrial Monitoring

Parameters seen while assessing the endometrium include endometrial thickness, endometrial morphology, endometrial vascularity, endomyometrial junctional zone and wave pattern and uterine artery PI. Endometrial volume on 3D USG and endometrial power doppler area are not routinely done.

a) Endometrial thickness: Endometrial thickness is measured in the mid sagittal plane, from the outer edge of the endometrial-myometrial interface to the opposite outer edge at the widest part of the endometrium.

b) Endometrial Morphology: The endometrial / periendometrial areas have four zones because of endometrial layering (Fig 4)

Zone 1: 2 mm thick area surrounding the hyperechoic outer layer

Zone 2: The hyperechoic outer layer of the endometrium

Zone 3: The hypoechoic inner layer of the endometrium

Zone 4: The endometrial cavity

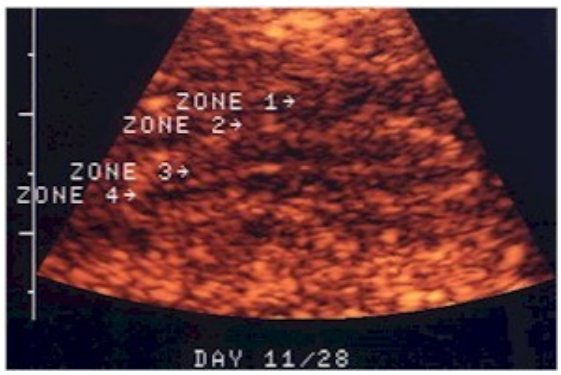

Figure 4: The endometrium with its 4 zones

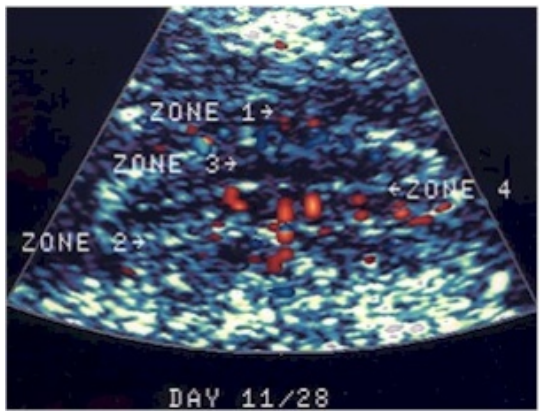

Figure 5: Vascular penetration on Power Doppler to Zone 4

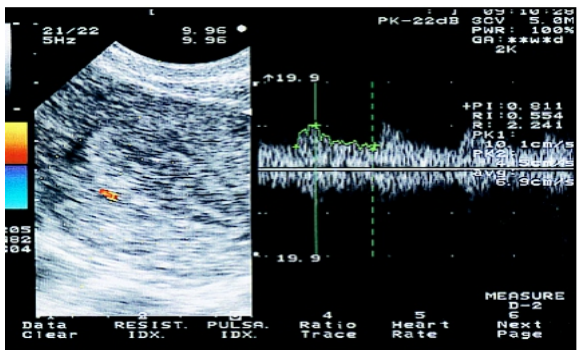

Figure 6: Blood Flow – Doppler of endometrium

c) Endometrial blood flow: The blood flow is assessed in endometrium according to the zones by doppler (figure 5 &6)

d) Endomyometrial junctional zone: Measurement of junctional zone thickness using 3D ultrasound is predictive for success of implantation. The thicker the junctional zone the lower the pregnancy rate.

e) Myometrial contractions: Myometrial contractions also can be visualized and more than 3 contractions is a good sign

The various parameters of endometrium and its

Table 2: The Uterine Scoring System[3]

Parameter	0	1	2	3	4
Uterine artery doppler PI	<2.5 – 2.99 > 3	< 2.2 - 2.49	< 2.19		
Endometrial thickness	<7	>14	7-9	10-14	
Endometrial layering	No	Hazy 3 line		Distinct 3 line	
Myometrial echogenicity		Coarse/ inhomogenous	Homogenous		
Myometrial blood flow (internal to arcuate vessels)	Absent		Present		
Endometrial zone 3 blood flow	Absent		Sparse		Multifocal
Myometrial contractions wave like in 2 min	<3			>3	

blood flow have been scored (Table 2)[3]. Score of 20 and more is associated with conception in all cases while score of 17-19 was associated with conception in 77% cases. Score of less than 14 was associated with no conception.

Doppler Indices for uterine receptivity

Uterine artery Doppler flow indices are also gaining importance. Some of them are vascularization index (VI), flow index (FI) and vascularization flow index (VFI)) of endometrial and sub-endometrial regions. Low pulsatility index (PI) in uterine and intra-ovarian arteries around the time of ovulation was exhibited by women who conceived, as opposed to those who did not. A uterine PI of more than 3 is a predictor of poor pregnancy outcome in assisted reproductive techniques. Some of the favorable parameters are enlisted in table 3.

Table 3: Ultrasound parameters predicting higher pregnancy rates

1. Endometrium—Triple layer appearance and 8- 12 mm thickness
2. Vascularity in zone ¾
3. Endometrial Power Doppler Area > 5 mm^2
4. Myometrium appears homogenous
5. Uterine Artery PI < 3
6. Uterine Artery End diastolic flow – Present
7. Perifollicular Circumferential Vascularity > 75%
8. Ovarian Stromal Arteries—PSV > 10 cm/sec.
9. Volume on 3D USG (2-7 mm^3)

Ultrasound in Evaluation of Male Infertility

A scrotal ultrasound is indicated in case of severe oligoasthenoteratospermia (OATS) or azoospermia. It would help to find a local cause or differentiate between obstructive and nonobstructive azoospermia.

Scrotal ultrasound

Scrotal ultrasound helps in assessing size of the testis and identifying any pathology like varicocele, tumours, cysts, hydrocele. It also helps in assessing the size and texture of the testis The testis is $3 \times 3 \times 4$ cm in dimension with a volume of 12-19 cc.

Non obstructive Azoospermia: Testis may be small (less than 12cc) or absent. There may be altered echotexture and reduced blood flow on doppler assessment in atrophic testis. A high resistivity index may show an abnormal hemodynamics which could impact the spermatogenesis leading to OATS. Undescended testis may be located by ultrasound.

Obstructive Azoospermia: Cyst and calcification in the testis suggest obstruction. In absence of vas these signs would be present. In addition, an abrupt termination of epididymis into an echogenic cord is seen.

Varicoceles: They are dilated veins in the testis and are best seen on colour doppler. It helps to identify and classify a varicocele. A venous diameter of more than 3mm on Valsalva shows a relevant varicocele which can impact semen parameters.

Hydrocele: This is a fluid collection between layers of tunica vaginalis and indicates pathology in the testis which may impact sperm production

Trans-rectal ultrasound (TRUS)

It helps to visualize the ejaculatory ducts, prostate, seminal vesicles and vas deferens. A seminal vesicle diameter of more than 15 mm, and ejaculatory duct of more than 2.5 mm suggest a blockage of the ejaculatory duct. Vas deferens diameter of more than 5 mm is also suggestive of obstruction. Prostate can be visualized with TRUS in case there is a suggestion of prostatic pathology. Prostatic cyst or abscess can sometimes cause ejaculatory duct obstruction[4].

Therapeutic role of ultrasound in infertility

There are some infertility therapies which cannot be done without ultrasound guidance like oocyte retrieval for IVF. There are others where results are better if ultrasound guidance is used like intrauterine insemination (IUI) and embryo transfer.

IUI done under ultrasound guidance helps in negotiating the catheter in a curved canal and prevents unnecessary trauma. It ensures accurate placement of semen and reduces the frequency of difficult IUI. Pregnancy rates were increased from 13.9% to 23.4%.[5] However, no significant difference was seen between the live birth rate and miscarriage rate between the two groups

Oocyte retrieval is always ultrasound guided. The transvaginal probe with a needle guide is introduced into the vagina. Once follicles are visualized on ultrasound a needle connected to a suction pump is passed through the guide. The needle is introduced from the central part of the ovary to prevent ovary from moving. Each follicle is pierced and fluid suctioned into a test-tube. The echogenic needle tip is in vision constantly.

Ultrasound Guided Embryo Transfer: The patient is asked to come with a full bladder to enable visualization of uterus by a transabdominal ultrasound. The outer catheter is passed till internal os under ultrasound guidance. The inner catheter loaded with the embryo is passed through the outer catheter to about 1 cm below fundus where the embryo is released.

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Calendar of Virtual Monthly Clinical Meetings 2023-24

Date	Name of Institution
30th June, 2023	Apollo Hospital
28th July, 2023	Army Hospital (Research & Referral)
18th -20th August, 2023	AOGD FOGSICON 2023
25th August, 2023	Deen Dayal Upadhyay Hospital
29th September, 2023	All India Institute of Medical Sciences
27th October, 2023	ESI hospital, Basaidharapur
24th November, 2023	MAMC& LNJP Hospital
29th December, 2023	Sir Ganga Ram Hospital
30th January(Tuesday) , 2024	Dr RML Hospital
23th February,2024	VMMC & Safdarjung Hospital
28th March ,2024	UCMS & Guru Teg Bahadur Hospital
19th April, 2024	LHMC & Smt. Sucheta Kriplani Hospital
31st May ,2024	B L Kapoor Hospital

Imaging In Gynecological Cancers- An Update

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Introduction

The last few decades have witnessed significant innovations in the imaging modalities as well as addition of evidences on their role in staging and surveillance of patients with gynecological cancers. One such paramount change has been seen with new FIGO (International Federation of Obstetrics and Gynecologic) staging of carcinoma cervix that was traditionally based on only clinical assessment. In the current era of evidence based medicine; the literature could highlight role of various imaging modalities like ultrasound (USG), computed tomography (CT), magnetic resonance imaging (MRI) and their performance in accurate tumor staging with impact on patient management and prognosis. This article thus aims to document and illustrate the advantages and limitations of these imaging techniques for work up and follow up of patients with gynecologic malignancies.

Ultrasound (USG)

USG is often the first imaging modality used for evaluation of any female presenting with complaints of genitourinary tract because of non-specific nature of the clinical presentations like abdominal pain, burning micturition, irregular menstrual cycles; etc. The female undergoes trans-abdominal USG (TAS) using curvilinear probe on full-bladder to visualize uterus and ovaries especially in young patients owing to its wider availability, lack of radiation exposure, cheaper and less time consuming as compared to other cross- sectional imaging. In sexually active females; this is usually followed by transvaginal (TVS) sonography for detailed evaluation of the uterine cavity and adnexa, using high frequency dedicated transvaginal/ trans-rectal transducer. TVS enables better visualization of endometrial irregularities, polyps, follicular or ovarian internal characteristics as well as relation to the surrounding structures. However, it is limited by its small field of view and need for expertise to perform. Transrectal ultrasound (TRUS) serves as an option for local disease evaluation in young females particularly in whom MRI is contraindicated.

Endometrial Cancer

Dynamic contrast enhanced MRI (DCE-MRI) is the imaging modality of choice for assessment of any endometrial pathology with the aim to rule out underlying malignancy. It is accompanied with unenhanced T2 and diffusion weighted imaging sequences for appropriate staging and estimation of myometrial invasion. The sensitivity and specificity of MRI in determining the myometrial infiltration and cervical invasion ranges from 70 to 95%. Due to its limited availability especially in resource constrained settings; TVS has been evaluated as an alternate option with literature documenting 71–85% sensitivity, 72–90% specificity and 72-84% accuracy for detecting myometrial invasion and sensitivity of 29-93% and specificity of 92-94% for the detection of cervical invasion. To further improve the diagnostic accuracy, and to improve the overall image quality contrast enhanced USG is evolving. This involves intravenous injection of microbubble contrast agent, which delineates the tumour neovascularity (as it has the capability of detection of vessels with diameters less than 0.1 mm which are beyond the scale of colour Doppler and power Doppler ultrasound), thus combining visualization of both the tumour morphology and vascularity. CE-TVUS is very useful in detection of deep myometrial invasion and cervical stromal involvement and hence, has a potential for more precise pre operative

staging assessment.

Cervical Cancer

Ultrasound has been utilized for assessment of tumour size, parametrial invasion and nodal involvement. When compared with MRI, the accuracy of parametrial infiltration detection by TRUS was comparable with MRI [98.9% and 94.7%, respectively (P <0.219)]. The accuracy for detecting tumor was 93.7% vs 83.2% for TRUS and MRI (P <0.006) respectively. In small tumors (< 1 cm3), the accuracy of tumour detection by TRUS was 90.5% and 81.1% by MRI (P < 0.049). TVS also performs equally well , however there remains a risk of bleeding with bulky tumours. TAS enables detection of hydronephrosis which may represent ureteric infiltration by the mass and it can also detect enlarged retroperitoneal nodes; however since the modality is highly operator dependent and needs a definite learning curve; its role is being explored further for clinical utility. Ultrasound has a limited role in determination of metastatic lymphadenopathy.

Ovarian Cancer

USG (TAS + TVS) is the modality for detection, diagnosis and characterization of any adnexal pathology. Since the clinical symptoms may be non-specific or overlapping, with tendency of incidental detection of the adnexal lesions; various tools and scoring systems have been designed to approach the USG features. The most commonly used reporting systems include IOTA simple rules, IOTA Adnex model, GIRADS and recently introduced O-RADS. The primary role of these systems is to characterize the lesions according to their morphological appearance; for example cystic vs solid, presence of septations, solid mural nodule, vascularity, etc; and with background of menopausal status and hormonal profile; these systems provide risk stratification category to guide further step in management algorithm. Malignancy rates were comparable to recommended rates by previous literature in O-RADS and IOTA, but higher in GI-RADS. O-RADS had significantly higher sensitivity for malignancy than GI-RADS and IOTA (p = 0.003 and 0.0007, respectively), but non-significant slightly lower specificity (p > 0.05). O-RADS, GI-RADS, and IOTA showed similar overall inter reviewer agreement (κ = 0.77, 0.69, and 0.63, respectively) with a tendency toward higher inter reviewer agreement with O-RADS than with GI-RADS and IOTA.

Magnetic resonance Imaging (MRI)

Contrast enhanced MRI (CEMRI) pelvis is the gold standard for local staging of various gynaecological cancers, as it provides soft tissue contrast and resolution that enables precise delineation of local tumour extension. MRI does not involve exposure to ionizing radiation. This imaging techniques provides not only anatomical information of the organs but also evaluates the functional characteristics of the disease. The latter can be achieved by two principles- first is based on the principle of restricted diffusion of water molecules within tumor as compared to the surrounding structures; and second demonstrates the vascularity within the mass after intravenous injection of gadolinium based contrast material. These sequences also enables appropriate evaluation in post treatment setting in order to differentiate between post treatment changes from early recurrences. However, the technique has major limitation in terms of restricted availability especially in low & middle-income countries, cost, long acquisition time, need of patient compliance, expertise for acquisition and interpretation; and administration of nephrotoxic contrast.

Endometrial cancer

MRI can accurately assess depth of myometrial invasion, cervical involvement, and presence of metastatic lymph nodes. The mass usually shows restricted diffusion evidenced by high signal intensity on DWI and low ADC value in contrast with other benign endometrial conditions that typically have higher ADC values. The presence of intact low T2 junctional zone mostly excludes the myometrial invasion. T2W images may be used to differentiate endometrial cancer from sub mucus leiomyoma. DCE-MRI is considered as the modality for accurate disease extent estimation as it has been

observed that the malignancy enhances earlier than the surrounding myometrium and thus, the interpretation should be comprehensive with combination of T2, DWI and DCE images; followed by delayed sequence for demonstration of cervical invasion, if any. The sequences have to be acquired in sagittal planes, along the axis of uterus/ endometrial signal in order to illustrate degree of myometrial invasion; the latter being an important factor for deciding surgical approach and prognosis. On DCE imaging, small tumours may show early enhancement compared to the normal endometrium.

Cervical Cancer

MRI considered gold standard imaging for evaluation of tumour size and locoregional disease spread. Typically, cervical tumours elicit intermediate to high signal on T2 WI compared to myometrium, and show restricted diffusion. On DCE, signal on T2 WI compared to myometrium, and show restricted diffusion. On DCE, the tumor usually shows early avid enhancement compared to unaffected cervical tissue. Enhancement is frequently heterogeneous in large tumors secondary to necrosis, while smaller tumors elicit more uniform enhancement. Careful evaluation of the integrity of the cervical stromal rim which is usually >3mm in thickness and normally appears as homogenous hypointense T2 WI rim, is needed to exclude parametrial involvement. Parametrial involvement might appear as soft tissue speculations and nodularity. MRI can reliably differentiate between local recurrence and post radiotherapy changes. Local recurrence typically appears as mass of intermediate to high signal on T2WI, showing early contrast enhancement on DCE and diffusion restriction, while post radiation changes/fibrosis typically shows no diffusion restriction and show either no or late enhancement on DCE.

Ovarian tumours

MRI is commonly used to assess indeterminate adnexal masses seen on ultrasound. MRI features suggestive of malignancy include large solid component, early mass enhancement on DCE, mural or septal thickness of >3 mm, internal mural nodularities, presence of necrosis within the mass, extension to other pelvic organs, mesentery, omentum, lymph nodes and presence of ascites. MRI with the superior contrast and soft tissue resolution can differentiate benign from malignant adnexal masses. A dermoid will have a high signal on the T1 and T2 FSE weighted images and will show decreased signal in the fat suppressed sequences. A relatively novel application of MRI in ovarian tumors is the Ovarian-Adnexal Reporting and Data System (O-RADS) MRI risk score that implies a codified scoring system to assess the malignant potential of ovarian and adnexal lesions based on MRI imaging characters (lesion composition, signal characters and enhancement pattern). The signal intensity is described as homogeneous/heterogeneous and hypointense/ intermediate/hyperintense on T2-weighted images (in relation to iliopsoas muscle and urine or cerebrospinal fluid) and T1-weighted images (in relation to the iliopsoas muscle and fat). At high b-value diffusion-weighted imaging (DWI), the signal intensity is described as low or high (in relation to urine or cerebrospinal fluid).

PET-MRI

The diagnostic performance of PET-MRI appear promising, but is limited by cost and availability. PET-MRI is superior to FDG PET CT in the assessment of local disease spread. PET-MRI has a potential role in planning for radiotherapy and assessment of treatment response. The main benefit of this modality is lower radiation exposure.

CT and PET CT

One of the more readily available cross-sectional imaging modality is contrast enhanced CT scan (CECT) that enables acquisition of entire chest and abdomen within seconds, in contrast to time consuming MRI. Hence, more often than other radiological investigations, patients undergo CECT for evaluation of abdominal complaints. CECT involves administration of

positive oral contrast i.e. diluted contrast to delineate the bowel loops; followed by intravenous administration of iodinated contrast of 1.5ml/kg body weight. The evaluation of distant metastases, nodal involvement, relationship with surrounding structures especially in clinically advanced tumors, can be rapidly performed with CECT. Thus, it is often performed in patients with cervical cancers which appear to be advanced on clinical examination or USG circumventing MRI; and similarly in ovarian malignancies which are highly suspicious for malignancy on USG and appear upfront operable. Disadvantages of CT include exposure of patients to ionizing radiation, possible adverse reactions to the contrast agents and iodinated contrast-limitations or contraindications in patients with renal insufficiency.

However, its role is limited in post treatment setting where post radiation or chemotherapy changes have overlapping features and may mimic recurrence/ residual disease. In these scenarios, CT is accompanied by PET imaging which is a functional modality based on the principle of increased uptake of glucose by tumor sites or metabolically active sites. PET-CT has been shown to be superior for early detection of nodal metastases or local site recurrences; however it is primarily indicated in post treatment follow up of carcinoma cervix and endometrium patients.

Ovarian Cancer

Studies have explored the utility of PET/CT to differentiate:-

a) Malignant ovarian tumours from benign ovarian tumours: Malignant ovarian tumours have been shown to have an average SUV max of 7.6 which is unrelated to the grade or histology. Clear cell ovarian tumours and mucinous ovarian tumours have a lower FDG uptake compared to serous or endometrioid histologies

b) Borderline ovarian tumours (BOT) from malignant ovarian tumours: A study has shown SUV max cut off of 3.7 to distinguish BOT from stage I ovarian cancer with a sensitivity of 83.3%, specificity of 85.7% and AUC 0.893.

PET/CT is an effective imaging modality for staging EOC, with a sensitivity of 75.5–83.3%, specificity of 68.4–99.4%, positive predictive value of 87.5–95.3%, and negative predictive value of 96.5–98.6%. Preoperative staging by PET/CT shows 70-80% concordance with surgical staging but should be interpreted with caution as possibility of false negative and false positive findings should be borne in mind. It is highly specific in detecting lymph node metastasis and extra abdominal spread of disease leading to upstaging in 30-40% cases and can detect unsuspected synchronous malignancies.

PET may also be utilized in ovarian cancer treatment planning. Studies comparing CT, PET and PET/CT with intraoperative findings have found the respective sensitivity of 46-63%, 80-84% & 85-89% and specificity of 89-95%, 77-88% & 85-90%. The detection of mediastinal nodes on PET/CT has been found to be associated with a higher chance of suboptimal cytoreduction thereby indicate the aggressive tumour biology. PET/CT features predictive of suboptimal cytoreduction include: extra-abdominal spread (including mediastinal nodes), diaphragmatic deposits, ascites, pleural exudates, peritoneal carcinomatosis, large bowel mesenteric implants, small bowel mesenteric implants, hepatic hilar infiltration, root of mesentery involvement.

Patients whose PET scans convert from positive to negative after treatment, more commonly have complete pathologic responses and typically better disease-free survival and overall survival than patients whose scans remain positive. PET/CT has been studied as a tool to predict the histopathological response among patients with advanced EOC undergoing NACT by comparing the SUV parameters in the Pre NACT and Post NACT PET/CT imaging. After chemotherapy, waiting a minimum of 10 days before performing 18F-FDG PET is advised. An arbitrary SUV max cut off of 3.8 after treatment be utilized for differentiating between

responders and non-responder. 40% cut-off for the decrease in SUV max is reported as a predictor of histopathological response at the time of interval cytoreductive surgery with sensitivity, specificity, and accuracy of 81.8%, 72.4%, and 72.4%, respectively. NCCN guidelines recommend that PET/CT to be done for initial workup of patients with epithelial ovarian cancer for indeterminate lesions only if the results alter management. PET/CT can be considered during surveillance of patients with epithelial ovarian cancer as clinically indicated to detect early recurrences with high specificity.

There are several limitations of PET/CT imaging:

1. Physiologically increased FDG uptake be seen by ovaries during ovulation and endometrium during menstruation. Other benign lesions like fibroids and endometriomas may also show false positive findings.
2. Urine has increased FDG uptake: Focal ureteric activity or focal bladder activity and vesicovaginal fistula can also limit disease evaluation
3. Potential false negative : Mucinous, clear cell, low grade serous and those with large necrotic areas are potentially false negative on PET imaging. Similarly the small volume peritoneal disease (<5mm) and small lymph nodes may also be false negative. Physiological bowel activity may mask peritoneal disease, serosal disease and small lymph nodes. Peri vesical disease masked by urine with high uptake in bladder.

Endometrial cancer FDG PET CT has well established role in detection of extrauterine spread before salvage radiotherapy or surgery. However, there is no role for FDG PET CT in the detection, local staging or in the preoperative nodal staging of endometrial cancer

Cervical cancer: PET CT is the imaging of choice for staging of locally advanced cervical cancer with better detection of distant and nodal metastasis.

Artificial Intelligence (AI), Deep Learning, Radiomics and Radiogenomics

It aims to create intelligent machines with functions and reactions similar to human beings (i.e., develop theories, identification, reasoning and interpretation) with acuteness and influence typically pertaining to human body. Deep learning is a form of machine learning with more than 90% supervised learning. Deep learning presents an analytical method which utilizes neural networks that employ mathematical models to imitate neuronal cells of the human brain. Radiomics is a novel approach, that is based on analysis of extracted images from radiologic imaging. Radiogenomics is the extension of radiomics through the combination of genetic and radiomic data. AI is a promising tool to improve diagnostic efficiency, treatment response. There are certain difficulties regarding generalizability, reproducibility, human engagement, privacy protection and legal issues.

Suggested reading

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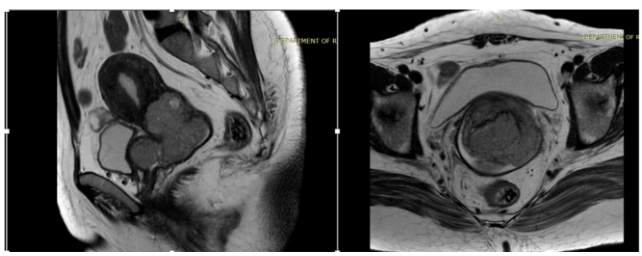

Figure 1: MRI in Carcinoma cervix- Sagittal T2 weighted (left) image shows lobulated hyperintense mass involving cervix with extension into lower uterine segment, upper third of vagina, bilateral fornices. Axial T2 image (right) shows loss of stromal hypointensity of cervix on left side with irregularity along the parametrium suggesting parametrial invasion

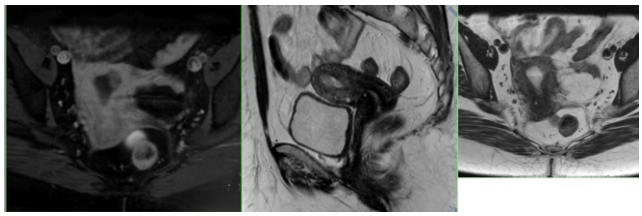

Figure 2: MRI in carcinoma endometrium: Focal hypo enhancing intrauterine lesion is seen along the left cornual surface on post contrast image (left) which shows intermediate signal on T2 weighted sagittal (center) and axial (right) image

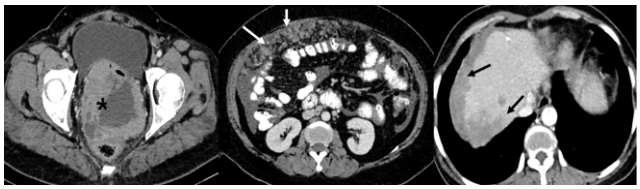

Figure 3: CECT abdomen for Carcinoma ovary: Axial CT scan of pelvis shows conglomerate heterogeneous mass (asterisk) replacing ovaries and uterus and infiltrating the rectum posteriorly. The mass has associated omental caking (white arrows) and diffuse diaphragmatic deposits (black arrows)

Resident's Corner "Dil se"

From Scrubs to Scripts: A Take on Marriage to Medical Marvel

Ajit Kumar, Annu Kumari, Adrija

Oh, my dear wife, the doctor so great,
I love you dearly, but let's get this straight.
I'm not a medical man, that's clear,
But living with you, it's becoming more clear.

The world of medicine is vast and unknown,
But I try to understand, with patience and a groan.
Your jargon, acronyms, and terms so foreign,
Make my head spin like a top in a whirlwind.

You deliver babies, and save lives every day,
While I sit at my desk, and type away.
But when you come home, tired and worn,
I'll be here waiting, with love and popcorn.

So here's to us, the non-medical spouse,
We may not know medicine, but we're the ones who douse
The flames of stress and burnout, with humour and love,
Making life together, a gift from above

Role Of Ultrasound In Pelvic Floor Disorders

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Introduction

Female pelvic floor disorders encompass a number of prevalent conditions which include pelvic organ prolapse, urinary and fecal incontinence, obstructed defecation, and sexual dysfunction. Pelvic floor ultrasound (PFUS) is an inexpensive, non-invasive and a readily available diagnostic modality that provides unique visualization of deep pelvic support structures which include pelvic muscles (levator ani complex), urogenital hiatus and minimal levator hiatus which is the shortest distance between the pubic symphysis and the levator plate. PFUS is useful in women with pelvic organ prolapse, urinary and fecal incontinence and clinical complaints due to injuries occurring during vaginal deliveries. Clinical assessment alone is insufficient to assess the pelvic floor function and anatomy as it describes surface anatomy rather than true structural abnormalities. Correlation of the PFUS findings with the clinical presentation of the patients can aid in understanding the underlying anatomical problem and effectively plan the treatment to be given to alleviate the symptoms and of the patients

Pelvic Floor Disorders

Levator ani complex, which includes the puborectalis, pubococcygeus and iliococcygeus along with the fascia surrounding the pelvic organs forms the pelvic floor also known as the pelvic diaphragm. Levator ani muscle fibres from either sides converge behind the rectum to form the levator plate. The underlying tone of the levator ani muscles keep the minimal levator hiatus closed by compressing the urethra, rectum and the vagina. On contraction of the levator ani muscles, the levator plate elevates and supports the pelvic organs. Weakening, any tear or defect or the separation of the levator muscles from their origin leads to pelvic floor dysfunction. Clinical applications of PFUS is shown in Table 1.

Table 1: Clinical applications of PFUS

Evaluation of urinary symptoms • Urinary incontinence • Recurrent UTI • Persistent dysuria • Symptoms of voiding dysfunction
Symptoms of Pelvic Organ Prolapse
Evaluation of bowel symptoms • Anal incontinence • Obstructed defecation
Symptoms of pelvic floor surgery • Vaginal discharge or bleeding • Pelvic or vaginal pain
Dyspareunia
Evaluation of cyst or mass in the vagina or perineum
Evaluation of implants • Urinary incontinence slings • Synthetic mesh for pelvic organ prolapse • Bulking agents
Evaluation of symptoms related to childbirth • Levator ani muscle assessment • Obstetric perineal injury • Obstetric anal sphincter injury (OASIS)

Available Modes In Pelvic Floor Ultrasound

The choice of the ultrasound probe and the technique to be used is based on the operator's expertise. Sonographic settings that warrant lowest possible ultrasonic exposure and highest diagnostic information are preferred in PFUS.

- **Two-dimensional ultrasound (2D)-** Two-dimensional imaging is helpful for dynamic quantification of pelvic organ prolapse, assessment of pelvic floor function in physical therapy, visualization of bladder neck mobility in stress urinary incontinence and initial screening for vaginal cysts and mesh. The images are in real time and greyscale. The most basic requirement for PFUS is a B-mode capable 2D ultrasound system, a 3.5-6MHz curved array transducer and a video printer

which is readily available and inexpensive.

- **Three and four- dimensional ultrasound (3D and 4D)-** Both 3D and 4D ultrasound help to evaluate the deep pelvic structures including the levator ani muscles and the pelvic floor hiatus. Three-dimensional sonography refers to a 2D static display of 3D data that are generated by computer stacking of 2D images. Four-dimensional sonography refers to 3D images that can be viewed in real time.

Patient Preparation and Approaches In PFUS

- **Preparation and patient positioning-** The steps and the procedure of the PFUS should be explained to the patient in detail and an informed consent should be taken before starting the sonography. The examination is usually performed in dorsal lithotomy or modified lithotomy position i.e a cushion placed under the buttocks and lower limbs in frog-legged position. PFUS can also be performed in the standing position if necessary such as when patient is not capable of performing dynamic maneuvers such as Valsalva or pelvic floor contraction in supine position.

  PFUS should be performed after voiding or catheterisation as full bladder and sometimes full bowel can prevent full development of prolapse.

- **Probe placement**- The anatomical location of the probe placement depends on the pelvic structures to be visualised and the approach is decided based on the patient's symptoms and clinical findings. The surface probe can be placed firmly on the perineum and symphysis pubis without causing any discomfort except in cases of vulvitis and marked atrophy.

  The endo-cavitary probe should be inserted with care to avoid discomfort to patients. Regardless of the modality opted for evaluation,

- **Approaches-** Various approaches in PFUS evaluation are perineal, introital, endo-vaginal and endoanal (Table 2). Regardless of approach PFUS starts with a 2D perineal/ introital dynamic scanning followed by 3D/4D evaluation of pelvic floor structures.

Table 2: Various approaches in PFUS

APPROACH	Perineal (pPFUS)	Introital (iPFUS)	Endo-vaginal (EVUS)	Endoanal (EAUS)
Probe type	2D: End-fire curved-array probe 3D or 4D: End-fire curved-array probe	2D: End-fire endovaginal sector probe 3D or 4D: End-fire endovaginal sector probe	2D: Side-fire linear probe 3D: Side-fire linear probe	2D: Side-fire linear probe 3D: Side-fire linear probe
Landmark	Pubic symphysis and the levator plate	Pubic symphysis and the levator plate	Vesicourethral junction	Puborectalis sling
Probe position	Perineum and/or vulva	Vaginal introitus	Vaginal canal (<6cm into vaginal canal)	Endoanal canal
Clinical applications	• 2D-pelvic organ prolapse and sling and mesh movement • 3D-levator ani avulsion, midurethral slings and implants • 4D-levator ani muscle ballooning	• 2D-pelvic organ prolapse and sling and mesh movement • 3D-levator ani avulsion, midurethral slings and implants • 4D-levator ani muscle ballooning	Visualisation of urethra, bladder neck and bladder, levator ani muscles, anal canal and anal sphincters	• Visualisation of external and internal anal sphincters • Indicated when anal sphincter irregularity is noted on other sonographic modalities and in women with accidental bowel leakage • Provide insight into pathophysiology of anal incontinence
Limitations	• May not be able to see the higher structures in the vagina • May be painful in patient with vulvar lesions or pathology	• May not be able to see the higher structures beyond the vagina • May not be tolerated by patients with introital pathology	Vaginal insertion of the probe may not be acceptable to some patients	Endoanal application can be uncomfortable and painful in case of deep infiltrating endometriosis of rectum, internal hemorrhoids, fissures and colitis

PFUS In Specific Pelvic Floor Disorders

Levator ani detachment

Levator ani injury is common after vaginal delivery with women presenting with continuous pain, urinary retention and/or vaginal bulge which worsen on prolonged standing and is demonstrated on postpartum ultrasound. The definition of levator ani detachment is an ultrasound definition and a diagnosis is made if at least the reference slice and 2 slices cranial to the reference slice show a defect. Ultrasound can confirm levator ani detachment by wide separation of the levator plate from the pubic symphysis and minimal or no anterior and upward movement of the levator plate with voluntary pelvic floor contractions.

In a study EVUS at rest and during voluntary contraction in a 2D mid-sagittal posterior view was performed.[1] The distance between the

levator plate and probe on EVUS and distance between levator plate and pubic arch on transperineal ultrasound was measured. The levator plate/rest ratio (lift/rest*100) was calculated by the position at the kegel lift divided by the levator plate position at rest. All patients with lift of 30 precent or greater were considered to have high muscle strength.

Another study on women with pelvic floor dysfunction, levator ani muscle deficiency was evaluated by EVUS and digital pelvic muscle strength assessment by Modified Oxford Score.[2] Levator ani deficiency and muscle strength scales were moderately negatively correlated. Among patients with normal morphology or the most severe muscle deficiency, levator ani deficiency scores could identify the majority of patients with functional or non-functional muscle strength scores, respectively.

Pelvic organ prolapse

POP-Quantification (POP-Q) system aids in the diagnosis of pelvic organ prolapse, but this method can be subjective, depending on the examiner and patient's ability to perform the maximal Valsalva manuever. In addition, it is difficult to clinically differentiate between posterior vaginal wall laxity, true rectocoele and enterocoele by POP-Q classification.

Recently, a retrospective study compared the POP-Q examination with Translabial ultrasound (TLUS) quantification of pelvic organ prolapse using a new method of angle measurement. TLUS was done both at rest and during Valsalva manuever (Figure1). They observed that the clinical staging and angle measurement were correlated with the POP-Q and TLUS findings. Weak but significant correlations were observed between the POP-Q stage and the angle measurements for the Ap parameter. This study concluded that the staging of POP with the use of an adjunctive diagnostic TLUS using the levator plate as a reference line correlated more precisely with the results of a physical examination using the POP-Q system and this angle measurement method could be used as an adjunctive parameter in TLUS imaging to correlate with the findings of the clinical POP-Q system.[3]

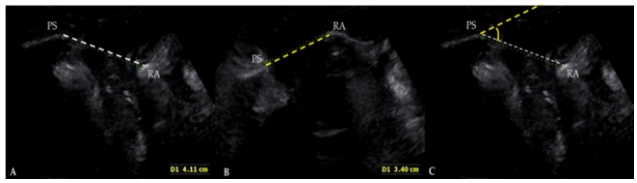
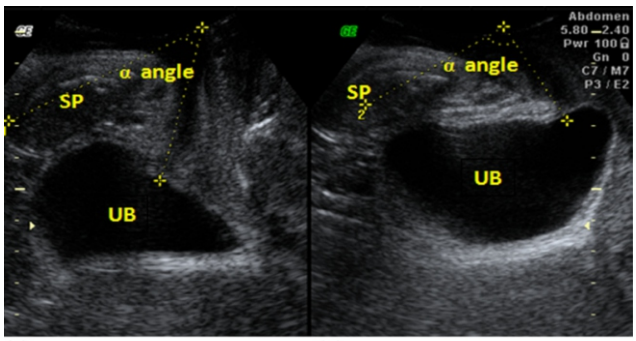


Figure 1: Translabial ultrasonography in patients with pelvic organ prolapse (POP) at rest (A), and in the maximal Valsalva phase (B). PS: pubis symphysis; RA: rectal ampulla. Angle measured between a reference line through the inferior margin of the symphysis pubis and the levator plate connected to the rectal ampulla, at rest (white dotted line) and during the Valsalva maneuver (yellow dotted line) (C).

Urinary Incontinence

Stress urinary incontinence is one of the crucial pelvic floor disorders with an incidence ranging from 10-30% worldwide. An important factor for the incidence of SUI is old age, associated with weakness or malposition of pelvic floor muscles and laxity of the urethral musculature, especially of the external sphincter. The pathological basis of SUI is probably due to defective anatomical support of the bladder neck and proximal urethra, with resultant hypermobility and descent beyond the intra-abdominal transmission zone.

Transperineal ultrasound helps in assessing pelvic floor muscle contraction and urethral hypermobility by generating a panoramic view of the pelvic organs without modifying the anatomical relationship between structures and facilitates probe stability during a cough or a Valsalva maneuver. Bladder neck mobility has been related to the functional integrity of the structures surrounding the proximal urethra. On TPUS, abnormal movement of the bladder neck with a cough or Valsalva manoeuvre can be visualised. The extent of this movement can be assessed by measuring the angles of inclination between the proximal urethra and some other fixed axis. In this respect, the anterior urethral angle (α angle; drawn between the axis of the proximal urethra and the central axis of the symphysis pubis) and the posterior urethrovesical angle (β angle; formed between a line drawn at a tangent to the proximal half of the urethra and a line at a tangent to the lowermost back aspect of the bladder base), are the frequently used parameters to diagnose SUI on ultrasound. (Figure 2,3)



(a) (b)

Figure 2: TPUS for the assessment of α angle at rest (a) and straining (b).
SP, symphysis pubis; UB, urinary bladder.

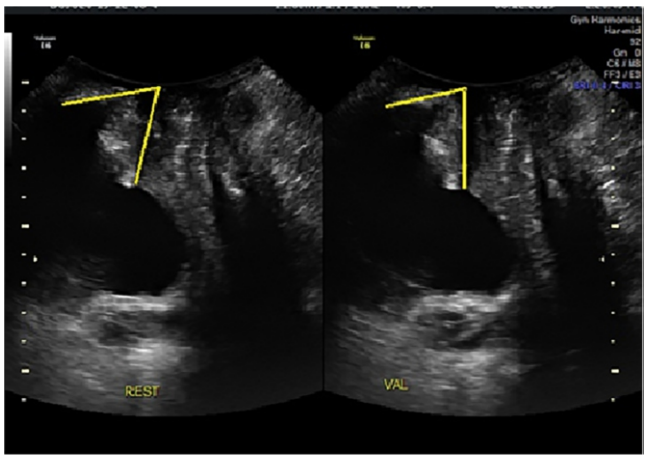


Figure 3: Measurement of β angle on TPUS

Keshavarz et al conducted a study to predict the stress urinary incontinence by measuring the retrovesical angle (β angle) by transperineal ultrasound.[4] (Figure 2) Bladder neck descent (BND) and maximal cystocele descent were defined during the maximal Valsalva manoeuvre relative to the infero-posterior margin of the symphysis pubis. They inferred that new cut off for β angle, more than 127 with Valsalva manuever could very well predict the SUI response. Comparison of TPUS parameters showed significantly higher values for BND and the β angle with and without the Valsalva maneuver, which were consistent with the diagnosis of SUI in the case group. Thus, β angle and BND could be considered critical ultrasound indicators for the diagnosis of SUI.

Other uses of PFUS include postsurgical assessment of patients with SUI and is also an appropriate tool to guide injection of bulking agents for the treatment of stress urinary incontinence. EVUS is used to image the urethra before and after injection of urethral bulking agents and to assess agent placement. The normal placement of a urethral bulking agent is at three and nine o'clock relative to the urethra.

A small study that assessed placement of urethral bulking agents with 3D EVUS imaging reported that, although the bulking agent was most often found at 3- and 9-o'clock positions as intended, the distance from the urethrovesical junction was highly variable after an uncomplicated, office-based transurethral injection.5 Hence, it is advised to perform EVUS after injection of a urethral bulking agent and reinject the agent, as needed, to fill any gaps in coverage.

Vaginal Synthetic Mesh Complications

PFUS can be particularly useful in evaluating complications related to the highly echogenic polypropylene mesh used in midurethral slings and pelvic organ prolapse repair. In women with prior mesh placement, postsurgical symptoms may relate to incorrect initial mesh placement and/or changes in mesh since implantation. Ultrasound can visualize the current mesh position and shape as well as assess for mesh contraction (i.e, shrinkage) and migration. PFUS can be used to evaluate post-mesh insertion symptoms including abnormal postsurgical pain, persistent urinary incontinence, and new onset urinary retention. Accurate localization of vaginal mesh is important before planning mesh removal or revision as both procedures can result in significant morbidity.

Obstetric anal sphincter injuries (OASIS)

PFUS can be used in the diagnosis of OASIS and levator ani injury, which typically cause anal incontinence and pelvic pain with prolapse, respectively.

Accidental bowel leakage

For women with accidental bowel leakage (also referred to as fecal incontinence), endoanal ultrasound (EAUS) is well established in identifying normal anatomy, anal sphincter tear, and perianal fistula. Another approach is to initially evaluate these women with PFUS using a transperineal approach, which may be better tolerated by some women and has good

negative predictive value if normal anatomy is visualized, and then proceed with EAUS imaging only if the first study is abnormal.

Future Prospects

Sonographic imaging of pelvic floor functional anatomy is becoming increasingly useful in the hands of physicians, surgeons and researchers investigating pelvic floor disorders due to low cost and universal availability and allowing the observation of manuevers such as Valsalva and pelvic floor contraction in real time. The near universal availability of 4D ultrasound systems and new software options will likely lead to the acceptance of this method as an integral part of pelvic floor medicine. Further researches are warranted to evaluate the prognostic and diagnostic value of ultrasound so that it can be used in tandem with clinical assessment in managing pelvic floor disorders.

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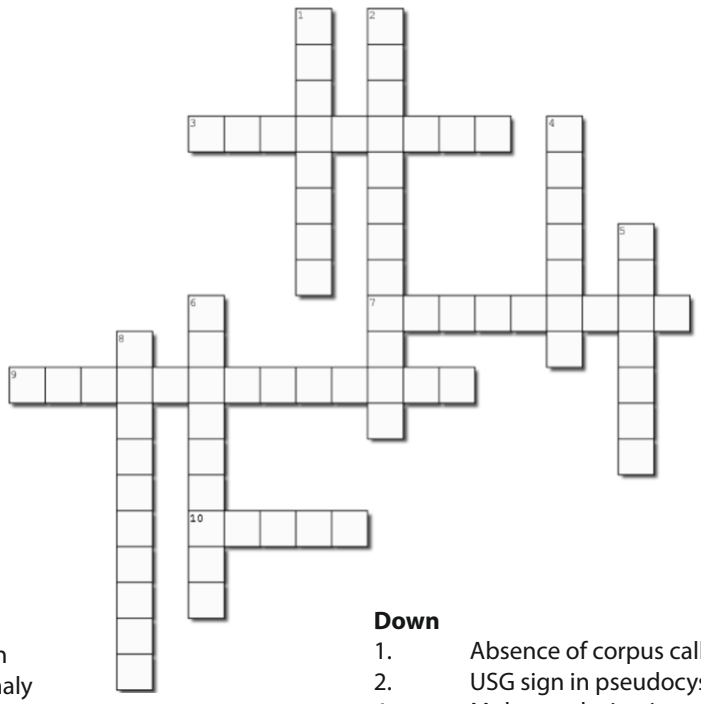
CROSSWORD PUZZLE

Bhanupriya



Across

3. Sign of ovarian torsion
7. USG sign of anencephaly
9. USG apperance of adenomyosis
10. The principal followed in ultrasound for lowest possible dose

Down

1. Absence of corpus callosum sign
2. USG sign in pseudocysts
4. Molar tooth sign is seen in which syndrome
5. Placental grading on ultrasound
6. Normal spine appearance
7. Typical vascularity seen in metastatic tumors

WORD BANK: shower cap, lead vessel, rail track, flapping sign, grannum, Joubert, venetian blind, alara, whirlpool, tear drop

Legal Issues in Fetal Imaging

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Introduction

Fetal imaging has revolutionized the practice of obstetrics. It continues to be one of the most rapidly evolving subspecialties with an increasing understanding of fetal anatomy and better resolution of ultrasound machines. Fetal imaging is no longer an assessment of gross abnormalities but has become more sophisticated with more and more targeted examinations of individual organs, e.g., the fetal echocardiogram and neurosonogram. However, with great success comes greater responsibility and fetal imaging is fraught with legal implications.[1] In our country doctors performing fetal imaging must abide by the Pre-conception and Pre-natal Diagnostic Techniques Act (PCPNDT).[2] This article briefly outlines the challenges and key points regarding legal issues in fetal imaging.

PCPNDT Act and daily practice

The Prenatal Diagnostic Techniques (Regulation and Prevention of Misuse) PNDT Act, 1994 was introduced to curb prenatal sex determination and female infanticide. It was amended and renamed Pre-conception and Pre-natal Diagnostic Techniques (PCPNDT) Act in 2003 to include pre-conception techniques that could potentially be used for sex determination. The act was made stricter and more rigorous in 2012. The act covers all fetal imaging centers, including ultrasound and fetal MRI. It also regulates genetic counseling centers, genetic labs, and genetic clinics. Details of the act can be accessed from the government website; however, the essential points detailed in the Act are as follows:

1. The imaging center should be registered at least 30 days in advance with the PNDT office. All ultrasound machines available at that center and the doctor performing the scan should be registered on the certificate. No doctor other than those registered in a particular center is allowed to use the machine.
2. Written consent should be obtained from the pregnant mother and the sonologist performing the scan regarding non-communication of the sex of the fetus under section 5 of the act.
3. A board declaring that sex determination is not performed at the center in both English and the local language should be displayed prominently.
4. A copy of the PC-PNDT registration certificate should be displayed in the reception area as well as in the scan room.
5. Form F provided in the act should be filled out accurately. A hard copy with the patient's signature has to be preserved at the clinic when form 'F' is submitted online.
6. All records should be submitted to the PNDT office within the stipulated time which is by the 5th of each month.
7. All records must be preserved by the imaging center for at least 2 years.
8. The USG machine should not be shifted from one centre to another or to any undesignated place within the same center.
9. Registration of a sonologist is restricted to a maximum of two clinics within a district.
10. The certificate of registration should be renewed every five years.

Noncompliance with the act is punishable with imprisonment up to 3 years with a fine up to ten thousand rupees at the first conviction. Subsequent conviction may be punishable by imprisonment up to 5 years and a fine of fifty thousand rupees. The name of the offending doctor is submitted to the state medical council for initiation of appropriate action that may

include suspension of registration. If convicted, the name of the doctor can be removed from the council for a period of 5 years for the first offense and permanently for a subsequent conviction.

A study by the Public Health Foundation of India (PHFI) found that non-registration of the ultrasound centre accounted for the maximum number of offenses under the act followed by non-maintenance of records, communication of gender and advertisement for sex selection.[3]

Protocol for fetal imaging

Litigations in fetal imaging can also arise from failure to detect an anomaly. Fetal imaging is a highly operator-dependent modality; however, even the most experienced and highly trained specialists performing scans using the best equipment can miss some anomalies. Several guidelines are available that define the standard of care for performing an ultrasound. The Society of Fetal Medicine (SFM) practice guideline for performing a second-trimester anomaly scan is an Indian guideline that outlines the minimum standards for the scan in Indian settings. It outlines the scope and limitations of an anomaly scan. The document specifies the gestation at which an anomaly scan should be performed and provides a checklist of the anomalies to be checked. It also provides guidance regarding documentation including images. Adherence to these guidelines while performing a systematic examination of the fetus is instrumental in minimizing diagnostic errors.[5]

Several factors such as the gestation at which the scan is performed, maternal BMI, patient-specific issues like an abdominal scar from previous surgery, fibroids, multiple pregnancies, and fetal position also affect detection rates. Thus, documentation of 'limited views' due to these must be included in the report. Whenever an examination is limited by any of these factors, a follow-up scan should be scheduled, or the patient may be referred to another center with more appropriate expertise and equipment.

The medical practitioner should counsel the pregnant woman and her family regarding the scope and limitations of the scan. A disclaimer should be signed and included in all reports.

To conclude, fetal imaging is an indispensable part of obstetrics in the current age. It is bound by the legalities of the PCPNDT Act, and like any other imaging modality, it is also liable for litigation when anomalies get missed. Thus, strict adherence to the PNDT Act provisions, performing the scan per stipulated guidelines, and patient counseling regarding its limitations are essential for a safe practice.

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How to design a Clinical Trial?

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Introduction

Of the various types of study designs, clinical trial is the gold standard to investigate the effect of an intervention. A clinical trial is defined as "any research/study that prospectively assigns human participants or groups of humans to one or more health-related intervention(s) to evaluate the effects on health outcomes."[1] Vaccines, public health interventions, surgical procedures, drugs, devices can be the various forms of intervention being examined in the trial.[1]

There are various types of trials such as Randomized controlled trials (RCT), Cluster-randomized trial, Crossover trials, Single-arm trials, and Quasi-experimental studies, to name a few. In this article we will focus on the essential prerequisites to designing the most common type of trial, i.e., an RCT. A well-designed clinical trial is essential to obtain valid and reliable results.

Formulate a research question

The first step is to formulate a research question. This must be done using the 'FINER' criteria and must carry the 'PICO' elements within itself. The FINER criteria stand for Feasibility, Interesting, Novel, Ethical and Relevant. The researcher must assess whether an RCT is the suitable study design to answer the research question. The PICO elements are the Population under study, Intervention, Comparator group, and Outcome. For example, what is the difference in reduction of maternal anemia during delivery among anemic pregnant women with S. Hb <10g/dl with single dose 1g IV low-molecular weight iron dextran administration as compared to oral iron supplementation during 24-34 weeks of gestation?h The population (P) is pregnant women with anemia (Hb<10g/dl), intervention (I) is 1g IV low-molecular weight iron dextran administration, comparator (C) is oral iron supplementation, and the outcome (O) is reduction of maternal anemia at delivery.

A trial should be conducted only if there is genuine indecision about the efficacy of the intervention. In the randomized clinical trial design, counterpart of the intervention arm may either involve the use of a placebo or an active control. The assignment of placebo to a diseased individual while a known treatment is available raises ethical concerns. The available databases like Cochrane- Systematic review/meta-analysis, PubMed must be explored for existing literature on clinical trials held to answer the research question. The researchers may choose some other topic to conduct a trial if it has already been conducted. Clinical trials including pregnant women may subject the mother or fetus to possible harms that may be caused by an intervention. However, the exclusion of pregnant women from research also excludes them from the potential benefits of participation in terms of providing better care by generating evidence.

Formulation of a core research team

The next step is to form a core research team. This should consist of a principal investigator (PI) and co-investigators, if needed for designing and executing the trial. Statistical experts who are acquainted with bio-medical research should be included to strengthen the methodology by choosing appropriate outcome measure, sample size, etc. If the trial is multi-centric, a research coordinator must be appointed at each site. For providing the intervention in the trial arms competent clinicians/therapists/experts must be involved. The trial must have designated member(s) for

data management and analysis. The team should also consist of staff to screen participants for eligibility criteria, receiving consent, recruitment.

Formulate objectives and outcomes

Based on the research question formulated, the primary objective which must be achieved in the RCT has to be framed. The 'SMART' criteria must be satisfied to formulate appropriate primary objective of the study. The objective should be (S) specific, (M) measurable, (A) achievable, (R) Relevant and (T) Time-bound. It is highly important that the objective is clearly specified and is measurable. These primary and secondary objectives must be translated into primary and secondary outcome measures. The primary outcome measures can be of different types such as measurement of difference in means, difference in proportion, Odds Ratio etc. The outcome measure must specify the numerical parameter used for achieving the objective. It is advised that an RCT must have only one primary objective. It can, however, have multiple secondary objectives to evaluate other relevant aspects of the intervention.

Example: An RCT was conducted to study the role of low-dose Aspirin in prevention of pre-eclampsia[3]. The corresponding objective was 'to evaluate the effect of 100 mg of aspirin in preventing preeclampsia among high-risk pregnant women screened with maternal risk factors and the primary outcome measure was 'the incidence of preeclampsia' where preeclampsia was defined as SBP >140 mm Hg or DBP >90 mm Hg on at least 2 occasions 4 hours apart, developing after 20 weeks of gestation with previously normal blood pressure and accompanied by proteinuria.

Randomization techniques

Planning well about the randomization technique lies at the heart of an RCT design as it eliminates the conscious and unconscious biases that may arise during the selection process. It also establishes similar baseline characteristics as it distributes the known and unknown factors affecting the outcome evenly across the two arms. Randomization techniques can be simple randomization, block randomization or stratified randomization. Simple randomization can be done by using random number tables available in statistics textbooks or it can be computer-generated random number tables. However, simple randomization does not ensure equal distribution of study subjects across the two arms. Block randomization technique can be used for achieving 1:1 allocation of subjects among both the groups. In this technique, a block size is determined (2, 4, 6 ...etc.) and a simple random technique is applied to assign them to control or intervention arm in equal number. There is a scope of predictability of recruitment of the last subject in a block, and therefore blocks with variable sizes are preferred.[4]

The assignment of the study subject if revealed to the investigator can also introduce 'selection bias'. Consciously or subconsciously the investigator may influence the enrolment of the subject into a particular group. To avoid this, allocation concealment can be done using sequentially numbered opaque sealed envelopes (SNOSE) where the assignment i.e., group A or B is written and placed into a sealed envelope which is numbered according to randomization. During the recruitment, the study subjects are handed over to the assigned consecutively as they enroll in the study. In blinding, the information whether a participant is receiving a treatment, or a placebo is kept confidential. It can be done at three levels. Single-blinding can be either blinding of the study subject (participant-blind) or the assessor (assessor-blind). When both the study subject and the assessor are unaware about the treatment given, it is called double blinding. If blinding is also done at the level of analysis of the data, where analysts are unaware about the treatment group that the data set belongs to, it is known as triple-blinding.

Calculating sample size

The sample size for the trial should be calculated based on the primary outcome measure. For

estimation of the sample size certain parameters must be specified. These parameters are the effect size, i.e., the expected difference between the two groups. This difference must be clinically meaningful, and the sample size calculation will give a sample size sufficient to be able to detect this difference. Both type I error and the power of the study must be defined. For most studies, it is 5% and 80% respectively. Power is the probability that the sample size is sufficient to be able to detect the difference considered while doing the sample size computation.

Data analysis

The next step is to decide the data analysis technique for the RCT. There are two approaches for data analysis in RCT, a) Intention to treat (ITT) and b) Per protocol (PP). During the trial there may be unplanned crossovers between the two treatment arms. Some subjects who were assigned surgical intervention may refuse to undergo the surgery and will be given medical treatment and vice versa. ITT dictates that the data should be analyzed considering the subjects to be in the groups to which they were initially assigned to irrespective of the switch made. However, PP approach mandates that only those subjects who completed the treatment as per the protocol should be analyzed. Any participant who switches from one treatment arm to another in between or who is lost to follow up is excluded from the analysis.[5]

Ethics

Lastly, an important component of any RCT is ethical consideration. Approval from the respective Institutional Ethics Committee must be obtained before commencement of the trial. It is mandatory for the committee approving the trials to be registered with the central licensing authority with timely renewal of registration. All the clinical trials involving humans, or study of interventions such as drugs, surgical procedures, preventive measures, devices, lifestyle modifications, educational or behavioral treatment, rehabilitation strategies conducted in India must be registered under Clinical Trial Registry - India (CTRI) before the enrollment of participants in the trial. If the trial is multicentric, the registration can be done by the lead Principal Investigator. In case where multiple countries are involved in a trial the Indian Principal Investigator of the team must register the trial under CTRI.

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JOURNAL SCAN

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Uterine and placental blood flow indexes and antinuclear autoantibodies in unexplained recurrent pregnancy loss: should they be investigated in pregnancy as correlated potential factors? A retrospective study.

Bruno V, Ticconi C, Martelli F, Nuccetelli M, Capogna MV, Sorge R, Piccione E, Pietropolli A.

BMC Pregnancy Childbirth. 2020 Jan 20;20(1):44

BACKGROUND

The potential role of antinuclear antibodies (ANA) in recurrent pregnancy loss (RPL) pathogenesis is still debated, although some evidence suggest that they could affect pregnancy outcome, leading to a higher miscarriage rate in these patients. A hypothesized mechanism is through changes in uterine flow in pre-conceptional stage, by modifying endometrial receptivity in RPL. However, scant data are available, in pregnancy, about their role in RPL placental perfusion, also in relation to its potential treatments, such as low molecular weight heparin (LMWH). The aim of this study is to retrospectively further investigate the correlation between two-dimensional (2D) and three-dimensional (3D) uterine and placental flow indexes and the presence or the absence of ANA in women with unexplained RPL (uRPL), treated or not treated with LMWH.

METHODS

2D Doppler measurement of pulsatility index (PI) of the uterine arteries and 3D ultrasonography determination of vascularization index (VI), flow index (FI) and vascularization flow index (VFI) was carried out with the aid of the virtual organ computer-aided analysis (VOCAL) technique in LMWH treated (n 24) and not treated-uRPL patients (n 20) and in the relative control group (n 27), each group divided in ANA+ and ANA- subgroups. Serum assay for the presence of ANA was performed in all women.

RESULTS:

No differences were found in PI, VFI and VI values, by comparing the different groups. A difference in VI values was found for ANA- patients between RPL women not treated with LMWH and the treated ones (p=0.01), which have lower VI values and similar to controls. By considering only ANA- treated and not treated RPL patients, the ROC curve shows an area of 0,80 and at the VI cut-off of 11,08 a sensitivity of 85% and a specificity of 67%.

CONCLUSIONS

LMWH could exert a potential beneficial effect in restoring the physiological blood flow supply in terms of VI in uRPL ANA- status, suggesting to include ANA and VI investigations in the RPL diagnostic algorithm in a research context, since further studies are needed to clarify this challenging hypothesis in order to try to ameliorate ANA and abnormal placental vascularization negative influence on RPL pregnancy outcome.

AUTHOR COMMENTS COMMENTS

PI of the uterine artery has been shown to have significantly increased values in women with RPL and it is even higher in RPL ANA+ patients compared to ANA- patients. Another study carried out by the same authors indicated that in pregnant women affected by RPL the PI of the uterine arteries, detected at 4–5 weeks of gestation, could be an ANA independent-RPL index. The omnigenous VI values in case of ANA+ in all the three groups showed that the behaviour in the VI parameter does not change,

independently of RPL status. It could be hypothesized that ANA+ status does not induce a more severe condition in RPL when compared to controls in terms of VI and, therefore in placental vascularization. At the best of knowledge this is the first study showing an effect of LMWH on placental VI index in relation to RPL and/or ANA status, even though the study population is low and further investigations should be considered in a larger cohort of patients. LMWH could exert a potential beneficial effect in restoring the physiological blood flow supply in terms of VI in uRPL ANA-status, which could related to a condition of impairment in placental blood flow supply, suggesting to include ANA and VI investigations in the RPL diagnostic algorithm in a research context.

Three-dimensional transvaginal ultrasound vs magnetic resonance imaging for preoperative staging of deep myometrial and cervical invasion in patients with endometrial cancer: systematic review and meta-analysis.

Spagnol G, Noventa M, Bonaldo G, Marchetti M, Vitagliano A, Laganà AS, Cavallin F, Scioscia M, Saccardi C, Tozzi R.

Ultrasound Obstet Gynecol. 2022 Nov;60(5):604-611

OBJECTIVES

To evaluate and compare the diagnostic test accuracy (DTA) of three-dimensional transvaginal ultrasound (3D-TVS) and magnetic resonance imaging (MRI) for deep myometrial infiltration (DMI) and cervical invasion for preoperative staging and surgery planning in patients with endometrial cancer (EC).

METHODS

This systematic review and meta-analysis investigated the DTA of MRI and 3D-TVS for DMI and cervical invasion in patients with EC. A literature search was performed using MEDLINE, Scopus, EMBASE, ScienceDirect, The Cochrane library, ClinicalTrials.gov, Cochrane Central Register of Controlled Trials, EU Clinical Trials Register and World Health Organization International Clinical Trials Registry Platform to identify relevant studies published between January 2000 and December 2021. Study quality was assessed using the Quality Assessment of Diagnostic Accuracy Studies-2 (QUADAS-2) tool.

RESULTS

Five studies, including a total of 450 patients, were included in the systematic review. All five studies compared the DTA of 3D-TVS vs MRI for DMI, and three studies compared the DTA of 3D-TVS vs MRI for cervical invasion. Pooled sensitivity, positive likelihood ratio and negative likelihood ratio for detecting DMI using 3D-TVS were 77% (95% CI, 66-85%), 4.57 and 0.31, respectively. The respective values for detecting DMI on MRI were 80% (95% CI, 73-86%), 4.22 and 0.24. Bivariate metaregression indicated a similar DTA of 3D-TVS and MRI (P = 0.80) for the correct identification of DMI. Pooled ln diagnostic odds ratio for detecting cervical invasion was 3.11 (95% CI, 2.09-4.14) for 3D-TVS and 2.36 (95% CI, 0.90-3.83) for MRI. The risk of bias was low for most of the four domains assessed in QUADAS-2.

CONCLUSION

3D-TVS demonstrated good diagnostic accuracy in terms of sensitivity and specificity for the evaluation of DMI and cervical invasion, with results comparable with those of MRI. Thus, we confirmed the potential role of 3D-TVS in the preoperative staging and surgery planning in patients with EC.

AUTHOR COMMENTS

Endometrial cancer (EC) is one of the common gynecological malignancies, and it represents the sixth most frequent cancer in women worldwide. Office hysteroscopy-guided endometrial sampling is the preferred tool for the histological diagnosis of EC. To determine the correct surgical management, it is fundamental to assess the following risk factors: (1) tumor grade and molecular classification; (2) lymphovascular space invasion; (3) non-endometrioid histology; (4) cervical invasion; (5) deep myometrial invasion (DMI); (6) lymph-node involvement and distant metastasis. The first three risk factors can be identified only on

histology. Other factors can be identified using cross-sectional imaging modalities, including computed tomography (CT) or positron emission tomography to assess for lymph node involvement and distant metastasis, magnetic resonance imaging (MRI) to assess for DMI, cervical invasion and lymph node metastasis and transvaginal sonography (TVS) to assess for DMI and cervical invasion. MRI has demonstrated high specificity for the preoperative assessment of DMI, cervical invasion and lymph-node metastasis owing to its good performance in soft tissue evaluation. In recent years, the potential of three-dimensional TVS (3D-TVS) to replace MRI has been studied. Studies comparing 3D-TVS and MRI have shown similar DTA in assessing DMI and cervical invasion. According to author this is the first meta-analysis to compare 3D-TVS with MRI for the diagnosis of DMI and cervical invasion in patients with EC. They found that 3D-TVS and MRI had comparable DTA for the diagnosis of DMI with low between-study heterogeneity. In addition, compared with MRI, 3D-TVS is a less expensive technology, widely available in most settings and without contraindications for its application. It could be performed during the first oncological visit, reducing costs, time of preoperative diagnostic work-up and patients' anxiety. The main limitation of this meta-analysis is the small number of studies and patients included. The bivariate approach, which is the recommended procedure for DTA meta-analysis, was applicable only for DMI (five or more studies included). The bivariate approach was not appropriate for the meta-analysis of studies evaluating cervical invasion (only three studies included), for which only the univariate approach with DOR was used.

Can sonographic imaging of the fetal pancreas predict perinatal outcomes in gestational diabetes mellitus?

Golbasi H, Bayraktar B, Golbasi C, Omeroglu I, Adiyaman D, Sever B, Ekin A.

J Perinat Med. 2022 May 25;50(9):1189-1197

OBJECTIVES

To evaluate whether fetal pancreatic echogenicity and its measurements are associated with gestational diabetes mellitus (GDM) and perinatal outcomes.

METHODS

A prospective cohort study was conducted with 150 pregnant women with a singleton pregnancy. The study included pregnant women between 30 and 41 weeks with or without GDM. Fetal pancreatic circumference was measured using the free-hand tracking function. The echogenicity of the fetal pancreas was compared with the echogenicity of the liver and bone (ribs, spine) and classified as Grades 1, 2 and 3. The relationship between maternal characteristics and perinatal outcomes with fetal pancreas measurements and echogenicity was evaluated.

RESULTS

Pregnant women with 75 GDM and 75 without GDM were included in the study. Mean fetal pancreas circumference measurements were significantly higher in pregnant women with GDM than in those without GDM ($p=0.001$). Hyperechogenic (Grade 3) fetal pancreas was significantly higher in pregnant women with GDM than in pregnant women without GDM, and there was a positive correlation between pancreatic echogenicity and HbA1c levels in pregnant women with GDM ($r=0.631$, $p<0.01$). There was a significant relationship between pancreatic echogenicity, measurements and adverse neonatal outcomes in pregnant women with GDM, and pancreas measurements were significantly higher in pregnant women with caesarean delivery.

CONCLUSIONS

Fetal pancreatic echogenicity and measurements in pregnant women with GDM can give an idea about glucose regulation and adverse perinatal outcomes.

AUTHOR COMMENTS:

Hyperechogenic pancreas can be useful biomarker to help predicting GDM in pregnant women who refuse or cannot complete OGTT. The best gestational age to visualize the fetal pancreas is between 14-20 weeks. . Maternal

obesity and fetal back-up position is the main limited factor for satisfactory visualization.

Women with a fetal hyperechogenic pancreas are having almost 30-fold increase risk in development GDM. Echogenicity was the only measurement predicting GDM. Hyperechogenic pancreas view provided 84 % predicting of GDM. Since pregnant women have increased insulin resistance with higher amount of blood glucose that passes through the placenta into the fetal circulation, extra glucose in the fetus is stored as body fat (especially in shoulders and subcutaneous abdominal tissue) which can lead to macrosomia . Increased pancreatic echogenicity may be caused by this fat deposition. In a recent review, ultrasound detected pancreas adiposis (hyperechogenic lobes of the pancreas) was associated with higher insulin resistance, increased composition of visceral fat, metabolic syndrome and even damage of pancreatic tissue. In some cases fatty hyperechogenic pancreas was not a banal, regular lesion. Thus, the echogenicity of fetal pancreas during a routine scan should not be a banal, acceptable marker. Therefore, ultrasound is the simplest and best routinely method for fetal pancreatic echogenicity.. Fetal pancreas echogenicity during a routine scan between 24 and 28 weeks should be a promising non-invasive tool or marker for GDM diagnosis. Hyperechogenic fetal pancreas may be used as a complementary biomarker for the detection of pregnant women suspected with GDM.

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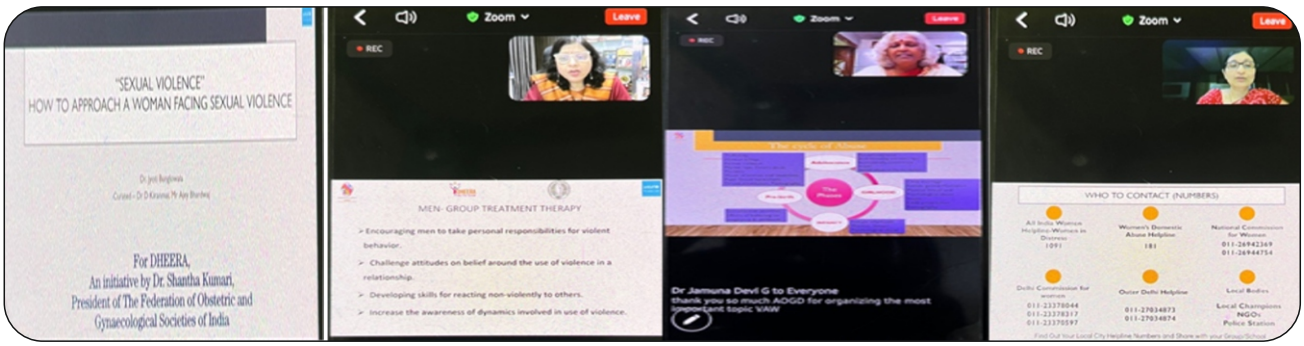
EVENTS HELD IN MAY 2023

1. Dheera (Say No To Violence Against Women) was conducted online by FOGSI-UNICEF-AOGD on 2/5/2023. There were in total 8 lectures on the various aspects related to the subject and the CME was very well appreciated.



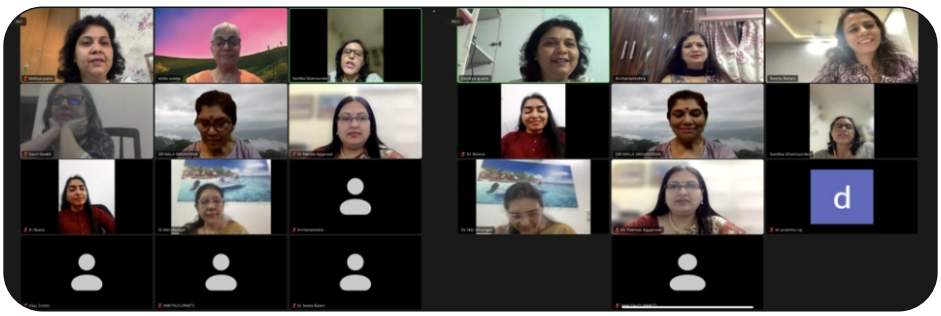
2. A CME on Cervical Cancer Mukt Bharat organised by AOGD breast cervical cancer prevention sub-committee with DGFSW was held on 29 April 23, 2..30 to 5.30 pm.
Convener: Dr Mrinalini Mani
There were 4 lectures and workstations on colposcopy, cryotherapy and LEEP

3 AOGD and Delhi PG Forum organised a Case discussion on "Vulval diseases" on 15.5.23 by Post Graduates of Maulana Azad Medical College, Delhi.
Coordinator Delhi PG Forum: Dr. Sunita Malik, Dr Shivani Agarwal
Chairperson:
Dr. Sarita Shamsunder, Sr. Specialist (OBG), VMCC and Safdarjung Hospital, Delhi
Moderators:
Dr. Archana Mishra, Prof. (OBG), VMCC and Safdarjung Hospital, Delhi
Dr. Niharika Dhiman, Prof. (OBG), Maulana Azad Medical College, Delhi
PG Residents OBG, MAMC, Delhi: Dr. Shivani Ashok Mane & Dr. Ashika Happy

4. AOGD Endoscopy & Endometriosis committee organized a CME cum hands-on workshop for postgraduate students on 20th May 2023 at Lady Hardinge Medical College New Delhi. More than 80 students across Delhi & NCR attended the event. There were station based discussions by mentors who were members of the committees.The event was greatly appreciated by all participants.

5. A webinar public forum on 'Understanding Menopause 'was organised on 22.5.23 by Community Health and public awareness committee, AOGD Delhi in collaboration with IMA East Delhi Branch & IMS Delhi Chapter.

6. Infertility committee AOGD and Delhi Gynecologist Forum South organized a CME on 25th May 2023, 1.30-4.00 pm at Hotel Eros, Nehru Place
7. AOGD in association with Indian Fertility Society and SPECTRA organised a Symposium on 'Recurrent pregnancy loss and Preterm labour' on 30th May 2023, 2:30 - 4:30pm at Hotel Le Meridian, New Delhi.
8. A Webinar on Vulva was organised by Sir Ganga Ram Hospital on 31st May 2023
   Chief guest : *Dr Amita Suneja* (President of AOGD).
   Guest of Honor : *Dr Sarita Shamsunder* :(Chairperson, Oncology Committee, AOGD)
   Dr K Gujral: (Chairperson, Institute of Obstetrics and Gynaecology, Sir Ganga Ram Hospital)
   Dr Mala Srivastava: Head of Gynae Oncology unit, Institute of Obstetrics and Gynaecology, Sir Ganga Ram Hospital)



PROCEEDINGS OF CLINICAL MEETING

AOGD monthly clinical meeting held at
Sitaram Bhartia Institute of Science & Research on 26th may 2023

Challenges and dilemmas in IHCP

Dr Priti Arora Dhamija

Sr Consultant, Obstetrics and Gynaecology

Intrahepatic Cholestasis of pregnancy is the most common liver disorder specific to pregnancy. It commonly presents in the late second or early third trimester and is characterised by itching of normal appearing skin, deranged liver function tests and elevated bile acid levels > 19 micro mol/L.

Nowadays most guidelines are suggesting assessment of bile acids alone as diagnostic criteria however lab values tend to differ depending on type of assay, fasting status of patient and treatment received. For every 1 micromol/L rise in bile acid, there is 1-2% increased risk of adverse perinatal outcome such as prematurity, stillbirth, presence of meconium, neonatal respiratory distress syndrome. However there is not much correlation among liver enzymes and bile acids; biochemical values and clinical outcome as illustrated by certain cases that were highlighted. Case 1 presented with term IUFD, she had normal bile acids but high liver enzymes which continued to rise despite UDCA treatment. Later she developed gall stones. Case 2 had normal liver enzymes but extremely high bile acids, response to treatment was good. She was induced at 38 weeks , LSCS done for failed induction but good perinatal outcome and no evidence of any meconium. Case 3 had high bilirubin, liver enzymes and bile acids and no symptomatic response to UDCA. Work up revealed gall stone disease, lab values improved with treatment and she had spontaneous delivery at term. All cases were managed in consultation with gastroenterologist and delivery planned according to bile acid levels. Adequate counselling, proper follow up and continuous EFM during labour are advocated.

How old is too old to deliver

Dr Kusum

Consultant, Obstetrics and Gynaecology

Background- Maternal age has been on a startling rise due to entry of women in the work force, availability of effective and safe contraception and abortion services and professional liabilities. So it is imperative to look at the outcome of pregnancies occurring in midlife.

Objective- To study the maternal and neonatal outcome of pregnancies occurring in women at 40 yrs or above.

Materials and Method- A retrospective analysis of 100 women who delivered at the age of 40 year or above from 2012 to June 2022 in was done. Maternal characteristics, mode of delivery and neonatal details were noted.

Results: Out of 100 women, majority were 40 years old and maximum age was 46 yr(2%). Majority of women(81%) conceived spontaneously, 4% had OVI and 15% of women underwent IVF. The incidence of hypothyroidism was 27 % while type 2 diabetes and gestational hypertension was seen in 8% and 15% respectively while 18% developed gestational diabetes mellitus, 5% had preclampsia. More than half(53%) delivered vaginally, 23% underwent elective LSCS. None of the baby had any congenital abnormality and mean birth weight was 2557±415gms.

Conclusion : Maternal age is in rising trend due to various social reasons but still it is worth considering because overall maternal and neonatal outcome is promising. Prenatal assessment should be done carefully as pre existing medical illnesses may come to surface in pregnancy and a multidisciplinary approach is required.

Hepatic problems in Obstetrics and Gynaecology: GILBERT SYNDROME

Dr Panchampreet Kaur

Consultant, Obstetrics and Gynaecology

Background: Gilbert (pronounced as zheel-BAYR) syndrome which is also known as meulengracht disease is an autosomal dominant disorder with incomplete penetrance. It results in unconjugated hyperbilirubinemia in the absence of

hepatocellular disease or hemolysis.

Case Reports: Case 1 : 47 year old female, P1L1 with previous 1 LSCS presented with heavy menstrual bleeding and was diagnosed to have Large multiple fibroid uterus corresponding to 20 weeks size uterus. After preoperative workup and anaesthesia clearance, she was taken up for surgery. There were dense adhesions with endometriotic spots, multiple fibroids (9 cm, 4 cm, 5 cm) including a cervical fibroid (4 cm) which was stuck in POD. Total abdominal hysterectomy with bilateral salpingooophorectomy was done. Patient had 1.5 litres of blood loss and was transfused blood and blood products. She developed icterus and dark coloured urine on 1st operative day. Lab tests showed only hyperbilirubinemia [Bilirubin:9.7 mg/dl (Indirect/Direct:6.2/3.5)] with liver enzymes being normal. It was initially thought as hemolysis but on further investigations including peripheral smear there was no evidence of hemolysis and LDH, Indirect coombs test, HPLC was normal. Bilirubin rose to 12 mg/dl on second day and thereafter started reducing. Enzymes remained normal throughout. Patient was clinically fine and urine colour gradually improved and was discharged on post operative day 3. Case 2: 29 year old female G2P1L1 with previous normal delivery was a known case of Gilbert syndrome diagnosed 10 years back. She came to us in third trimester and had received steroids elsewhere for fetal lung maturity as preterm labour had been expected due to gilbert syndrome. Her growth scans were normal. Bilirubin levels were 2.23 mg/dl with indirect hyperbilirubinemia and normal liver enzymes. She was reassured and pregnancy was managed as any other normal pregnancy. She went into spontaneous labour at 40 weeks+ and had an uneventful vaginal delivery. Her both children did not have any signs of jaundice at birth and are having normal development.

Discussion: Gilbert syndrome is a diagnosis of exclusion which has a benign course. Uridine diphosphate–glucuronyl transferase activity is reduced to 30% of the normal due to gene defect. It does not need any active intervention. Clinical awareness is the key. Usually bilirubin levels do not rise >6 mg/dl but it might get precipitated by stress, dehydration, fasting status.

Unveiling the Uncommon - A rare clinical scenario

Dr Namrita Sandhu

Consultant, Obstetrics and Gynecology

Background: Vulval lesions remain an enigma and can confound even the most astute clinicians. A picture of a rare vulval lesion was put up for spot diagnosis and it was a diagnostic challenge for all

Case scenario: 46 year old P3L3 lady presented with c/o Vulval lesions – Gradually increasing in size & number since the last two years. The lesions although localised to the vulva, were associated with itching. On examination, multiple, small, whitish pale papules were noted on the left labia majora and posterior half of right labia majora. The lesions were non tender, non pruritic, ranged in size from 2-10 mm. There was no punctum, no induration, redness or discharge. There were no palpable inguinal lymph nodes. No other cutaneous abnormalities were present. A simple excision of the vulval lesions was performed and sent for HPE, which confirmed the diagnosis of steatocystoma multiplex

Discussion: It is a rare genetic skin disorder characterised by the presence of multiple noncancerous cysts beneath the skin, which are typically associated with sebaceous glands. It commonly affects specific areas of the body where sebaceous glands are present. Main stay of diagnosis is taking a biopsy of the cyst for histopathological examination. There is no definitive cure, even though we have a number of treatment options available. There is no reason apart from cosmetic to treat these lesions. The disease has a good prognosis but recurrence is common. We need more studies to further understand the disease condition and to develop new treatment approaches, including targeted therapies.

Association of Obstetricians & Gynaecologists of Delhi

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