20 – 22 weeks scan

(TIFFA)

Dr Jayprakash Shah  MD; FICOG
Chairman – Imaging science committee FOGSI
Fetal Medicine expert
Rajni Hospital, Ahmedabad,
Ex sonologist Sheth V S Gen Hospital & Smt NHL Municipal Medical Colloege Ahd
CIMS Hospital Ahmedabad
Akar IVF Center Anand

Dr Parth Shah  MD; DGO; FIGE
Laprosocist & Fetal medicine expert
Rajni Hospital, Ahmedabad
Sonography is a third eye for obstetrician to visualize the unseen patient-fetus. Sonography is not only useful to identify the normal anatomy of the unborn fetus but at the same time we can diagnose the fetal malformations & even the soft markers which are suspicious of the fetal anomaly. In India at present the termination is legally allowed up to 20 weeks of pregnancy, so this malformations scan shall be carried out between 18-20 weeks. But we expect this termination limit to increase up to 24 weeks, in that case ideal time for this scan shall be 22-24 weeks so that we can not only pick up the malformations but at the same time can utilize uterine artery screening for probabilities of PIH & IUGR.

When we want to screen the fetus for malformation we require to follow certain guidelines for systemic screening so that nothing can be missed.

Following step must be adopted for adequate fetal scan.

1. **Screening of whole uterus for no of fetus, presentation, cardiac activity & gross malformations.**
2. **Head**
   a. Transthalamic view
   b. Transventricular view
   c. Transcerebellar view
   d. Additions views
      i. Coronal
      ii. Sagital & para sagital
3. **Face**
   a. Tangential
   b. Profile
   c. Transverse
      i. At Eye balls
      ii. At Hard palate
      iii. At Tongue
      iv. At Mandible
4. **Spine**
   a. Transverse
   b. Longitudinal Sagital
   c. Longitudinal coronal
5. **Chest**
   a. Heart
      i. 4 chamber view
         1. PASS
      ii. Outflow tracts
         1. LVOT
         2. RVOT
      iii. 3 vessel view
         1. Ductal arch level
         2. Aortic arch level
   b. Lungs
6. **Abdomen**
   a. AC level
   b. Kidneys level
   c. Bladder lever

7. **Limbs**
   a. 3 segments of each limb
   b. 3 x 4 long bones

8. **Environment**
   a. Placenta
      i. Position
      ii. Grade
      iii. Penetration
   b. Cord
      i. Length & coiling
      ii. Mass lesion & knot
      iii. No of vessel
   c. Amniotic fluid

9. **Cervix**

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**Standard Views**

**Head:** in the head three standard scan planes to be seen. In all this plane CSP is visible at junction of 1/3rd from frontal end to 2/3rd from occipital end, Falx in the center, preferably to be horizontal, bilateral symmetry, intact calvarium, anechoich shadow from the edge of skull. Look for the intactness of the skull.

**Transthalamic view:** A view passing through the thalamus with falx in center lying preferable horizontal with bilateral symmetry & sylvian sulcus visible. You will notice cerebral peduncles towards occiput behind the thalamus & third ventricle slit between two thalamus. This creates a well known arrow sign.

How to Get: One can get this view easily by locating the spine in longitudinal with head, then keeping the head in the view, rotate the transducer by 90° with little tilting & rotation as required.

Biometry: In this place curser from outer border of calvarium to inner border of calvarium at the level of center of falx one can measure BPD. OFD can be measured by placing the curser from outer to inner or inner to outer or from center of calvarium to center of calvarium
**Transventricular View**: This is a plane passing through the lateral ventricle with falx in center horizontal is preferable, thalamus on both side of falx & CSP pallucidum visible with bilateral symmetry of skull. One shall visualize the medial border of lateral ventricle, lateral border of lateral ventricle with choroid plexus touching both the wall. One can measure lateral ventricle from medial border to lateral border at the level of glomus of choroid, internal diameter, only anechoic area to be measured.

How to Get: One can get this view by tilting the transducer cephalic from transthalamic view.

**Transcerebellar View**: This is the plane passing through CSP with falx in center & horizontal, bilateral symmetry, rounded cerebellum on both side of echogenic vermis. Cerebellum is with echogenic periphery & hypo echoic center. CM is a cavity between posterior border of vermis & inner border of calvarium. NF can be measured in the same plane from posterior border of calvarium to outer border of skin.
How to Get: One can get this view by rotating the transducer caudal on occipital side keeping the frontal end of transducer fixed.

Biometry:

Cerebellar measurement from outer border of cerebellum to outer border of cerebellum
Cisterna megna From posterior border of vermis to inner border of calvarium. Upto 6 mm it is normal, between 6 mm to 10 mm in is grey zone. More than 10 mm is abnormal.
Nuchal Fold From outer border of skull to outer border of skin. Nuchal fold at 17 weeks is less than 5 mm & at 18 weeks onwards it is less than 6 mm. It is a strong soft marker in second trimester pregnancy.

Face:

Profile face: Sagital section of head gives you profile view. Here you identify forehead which is neither slopping, nor having bossing with this skin over the frontal bone, nasal bone, nose, upper lip, lower lip & the chin. If you draw a line from forehead, chin will be projecting in front of line.
**Tangential view:** View having coronal sections through face showing nose, nostril, lips, eye, eye lens, hard palate.
**Transverse view** When the probe is slide down from tranthalamic view towards mandible we can have following view
1. Through Orbit
2. Through hard palate
3. Through tongue
4. Through Mandible

Photo with section slice, sono photo

Usually cranial lesions are hardly unilateral so this three standard planes are sufficient. But if one has doubt regarding some unilateral lesion or wants to confirm the findings more precisely one can have additional scan plane in form of coronal sections, parasagittal sections. Power doppler can be used to identify pericallosal vessel in parasagittal section.

A section at the base of the skull will be useful to identify circle of willis & can be nicely seen with power doppler on. One can measure MCA flow at this level.

**Spine:**

**Longitudinal Sagital:** This plane show vertebral bodies anteriorly, lateral ossifications centers of one side posterior to it & skin intactness covering the lateral ossification center. Ossification centers of other side can be confirmed by tilting the transducer to opposite side. In this view confirm the intact soft tissue behind the spine & continuous visualization of all vertebrae of cervical, thoracic, lumber & sacral region. One can count the vertebra, if any spinal lesion see the extent of lesion & involvement of no of vertebrae & level of involvement.
Transverse section: In this section vertebral body center is identified anteriorly, two lateral ossification centers are identified posteriorly with skin covering it. Spinous processes from lateral ossification complete the spinal canal in which spinal cord is housed. In coronal section one can identify even small lesion involving one vertebra also like meningocele, diastomatomyelia.

Longitudinal coronal section: In this view two lateral ossifications are seen running parallel like rail road, but spine is seen in part due to curvature, so we need to manipulate probe direction to examine the whole spine in installments. Small lesions & extent of vertebral involvement can be seen nicely.

Chest:

Heart:

Confirmation of situs solitus: Visualise the Upper abdomen at the level of AC & confirm the presence of stomach on the left side. Now slide the transducer cephalic & confirm that heart is tilted to left side.
Four chamber view:

**Right ventricle**

1. Very close to anterior chest wall
2. Moderator band is at the apex
3. Tricuspid valve is inserted towards the apex
4. Dirty looking cavity due to corde & moderator band

**Left atrium**

1. Very close to spine
2. Flap of foramen ovale open in it
3. Pulmonary veins enter in it
4. Mitral valve is towards base of heart

When two of four cavities of heart are defined, rest two cavities can be assigned easily

Confirm following finding to define

**Normal 4 chamber**

1. Position: central one third of the chest
2. Axis: 45' ± 20'
3. Interventricular septum is intact
4. Interatrial septum is visible
5. Crux of heart is off set
6. Both ventricles are equal in size & contract & relax simultaneously
7. Both atrium are equal in size & contract & relax simultaneously
8. Foramen ovale visible & flap of foramen ovale beat in left atrium
9. Moderator band visible in right ventricle.
10. Only one vessel – descending aorta visible, behind the heart & anterior to spine, in cross section

**Left out flow tract:** Sliding the transducer from four chamber view cephalic, one can visualize large vessel having exit from left ventricle. Anterior wall of aorta is in continuation of IVS & posterior wall with anterior flap of mitral valve. Aortic valve at origin is visible when there is ventricular diastole – valve is closed. Initially ascending aorta is directed cephalic & to right & then it turns posterior & to left as arch from which cranial vessel arise, & then descend downward.
Right out flow tract: Sliding the transducer from LVOT view cephalic, one can visualize large vessel having exit from right ventricle. After origine if bifurcate in two vessel – Right pulmonary which is running postero right & behind the ascending aorta, left pilmonaty which runs cranially so not easily visible, but it’s continuation directly posterior as ductus arteriosus is visible in this view. At the origine RVOT crosses LVOT.

3 Vessel view: Sliding the transducer from RVOT cephalic, one can visualize line, dot, dot view. Line is more to left is main pulmonary artery running posteriorly & to left towards spine as DA & joing descending aorta. It is the largest vessel in this view. Middle dot is Ascending aorta left to MPA & little smaller than it. Last dot to left is SVC. This is also called 3 vessel view at ductal arch level. If you slide transducer just cephalic to this you will see 3 vessel with ascending aorta connected to descending aorta & MPA not connected at this atage – this is termed as 3 vessel view at aortic arch level.
Chest at 4 chamber view:

Heart is situated in central one third area with tilt to left having axis of 45° ± 20°. On both side homogenously echogenic lungs are visible. Aorta just anterior & to left of spine. Spine exactly in cross section with skin covering it. Part of cut sections of ribs visible on both sode. Lung fields are homogenously echogenic.

Abdomen:

AC level: It is cross section of upper abdomen at the level of stomach visible on the left, portal vessel entering in from anterior wall & directed posteriorly & turning to right, on both the side part of ribs visible, Descending aorta anterior & to left of spine, IVC anterior & to right of spine & descending aorta. Gall bladder visible right to portal vessel. In this plane one has to be careful that part of kidney, lungs, heart, cord entry is not visible which signify that section is not right.

Kidney level: In this one can identify kidneys with renal pelvis cut transversly, on both the spine of spine, Small bowel – echogenic mass with small puctations in the center on abdomen, anterior to spine, posterior to cord entry. Large bowel visible at periphery & posteriorly as tubular structure with little echoes in the cavity, haustration may not be visible at this stage. Cord entering from anterior wall with intact anterior wall of abdomen.

Bladder level: Anechoich cystic structure behind the anterior anodemenal wall flushed to it with two vessel running on both the side more easily visible with color – two umbilical arteries; Signoid colon posterior to bladder, sacral spine posteriorly & iliac wings visible by the side of sacral spine with angulation of less than 90°.

Upper Limb:

How to Get: By sliding the transducer laterally from coronal or sagital longitudinal spine, one will see the scapula, continue to move laterally till either long end or cut end of long bone is visible – that is humerus. You have to rotate & tilt the transducer to get whole humerus metaphysic with hypoechoich epiphysis visible at both the end. One has to measure the metaphysic of long bone only for biometry. Now concentrating over lower end of humerus slide the transducer to get either cut section or length of forearm – ulna radium. From here continue downwards till hypoechoich carpel bones are visible & then metacarpels & fingers.
Lower Limb: Identify spine in long sagittal, slide to tip of sacrum, keeping the end of transducer over the tip of sacrum fixed, rotate other end towards fetal abdomen, long bone one visualize will be femur. Follow the same technique as of upper limb to identify whole lower limb.

Biometry of long bones: identify whole long bone, metaphysis with hypo echoic epiphysis visible at both the end. One has to measure the metaphysis of long bone for biometry. One is suppose to identify all the three segments of each limb & all 12 long bones to be seen but need to measure only femur. Minor degree of curvature of medial surface of long bone is usually normal & to be ignored. Limb movements are to be evaluated at all the major joints. If fetus is continuously not moving at major joint for more than 15 minutes of hypokinetik, it’s abnormal finding. In case of abnormal findings lie, absence of any bone, curved bone, fractured bone, short long bone other long bones to be measures along with the foot. Femur is always to be compared with tibia & humerus with ulna. Femur / foot length ≥ 90.

Environment:

Placenta: Placenta is to be identify for it’s postion, relation with internal os, grade of placenta, penetration in myometrium, thickness & consistancy of placenta, cord insertion & it’s relation to placenta.

Position: normally placenta is implanted in upper segment of uterus. When it is 3 cm or less near to internal os then is it low lying placenta, when covering internal os it is placenta, previa.

Grade 0: No echogenicity

Grade I: occational echogenic spots over maternal or fetal surface of placenta.

Grade II: materal & fetal surface with frequent echoes with partly visible septa extending from maternal surce to fetal surface & vice versa.

Grade III: maternal & fetal surface with frequent echoes with fully extending septa from maternal surface to fetal surface.

Thickness: Normally placenta thickness is equal to mm of the no weeks of pregnancy after 10 weeks of pregnancy.
Normally cord is inserted at the center of placenta. If it is to the edge or running underneath the membrane before emerging out, it’s abnormal finding suggestive of velamenous insertion of the cord.

Penetration: On scan a black line underneath the echogenic substance is visible separating it from relative hypoechoic myometrium. When this demarcation is lost & further invasion id noticed of placenta into myometrium – it is suggestive of placenta acreta, increta or percreta.

**Amniotic fluid:**

Amniotic fluid is clear in II trimester. It gives a impression of little more during early second trimester. It can be assessed by three method:

1. Largest Pocket: Largest pocket is between 3 to 7 cm suggest normal amniotic fluid
2. AFI: Divide the gravid uterus in four quadrant & measure the largest vertical pocket in each quadrant. Sum it up to get the AFI. Normal AFI is between 5 to 20 cm
3. Goldstein’s criteria: Visually amniotic fluid is normal with largest pocket between 3 – 7 cm
   - Oligoamnios: AFI less visually overcrowding & largest pocket less than 3 cm
   - Polyamnios: AFI more than 20 cm; Visually more fluid & largest pocket more than 7 cm

**Assessment of Cervix:**

It can be done by abdominal route with maternal bladder filled partly. Full bladder may elongate the cervix giving the false sense of security.

![Ultrasound image of normal cervix and incompetent os](image)

**Normal Cervix**  **Incompetent Os**

Best assessment of cervix can be done by TV route

Cervix to be measured from internal os to external os taking care to avoid any membrane being included. Normally it is more than 25 cm at 18 weeks of pregnancy. Both os will be closed.

Cervical stress test: While examining by TV route asses the length of cervix first. Then give abdominal pressure by other hand or ask assistant to do it & evaluate the internal os. If internal os give way to pressure by opening up & with shortening of cervical length it suggest incompetent os, irrespective of the length of cervix.
Guideline for II Trimester scan

Dr Jayprakash Shah  MD; FICOG
Chairman – Imaging science committee FOGSI
Fetal Medicine expert
Rajni Hospital, Ahmedabad,
Ex sonologist Sheth V S Gen Hospital & Smt NHL
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Fetal Biometry & growth

1. Measurement of BPD & HC at Transthalamic view (CSP, Thalami, Bilateral symmetry)
2. AC at AC view (Trans section with spine stomach, UV turning to right, part of ribs visible with exclusion of Lungs & kidneys)
3. FL (Only diaphysis to be measured with both epiphysis in view
4. EFW (calculated from biometry)
5. AF assessment (AFI / Deepest pocket / Visual criteria)
6. Fetal movement

Multifetal pregnancy

1. Defining chorionicity & amnioncity
   a. Lambda sign / “T” sign
   b. No of placenta
   c. Thickness of membrane
   d. Sex of Child (As per PC PNDT not to be seen / disclose)
2. Estimation & comparison of growth
Fetal Anatomy Survey

1. Head (Transthalamic view, Trans ventricular view, Trans cerebellar view)
   a. CSP
   b. Lateral ventricle & choroid plexus
   c. Midline Intact falx
   d. Posterior fossa (CM, Cerebellum, NF
   e. Intact cranium

2. Face
   a. Upper Lip
   b. Orbits
   c. Nostrils
   d. Face profile (Chin projecting forward, NB visible & 11% of BPD)

3. Neck – No mass

4. Chest
   a. 4 Chamber heart
   b. Lungs
   c. Outflow tract of heart
   d. No mass lesion in chest
   e. Visual estimation of heart / cheat circumference & size

5. Abdomen – 3 level
   a. AC level
   b. Kidneys & cord level
   c. Bladder level

   Structures
   1. Stomach
   2. Portal turning to right
   3. Both kidneys
   4. Bladder
   5. Cord insertion
      2 Vessel on side of bladder

6. Spine

7. Transverse & sagittal view

8. Limbs
   a. 3 segments of all 4 limbs
   b. 12 long bones – Size, shape, mineralisation
   c. One femur to be measured
   d. If suspicious – rest bone to be measured

9. Fetal environment
   a. Placenta
      i. Position in relation to internal os
ii. Echogenicity
iii. Mass
iv. Accessary lobe

b. Umbilical cord
i. 3 vessel
ii. Mass
iii. Length & coiling

c. Amniotic fluid

10. Cx measurement from internal od to external
11. Genitalia (In India as per PC PNDT act not to be seen / Declared