ICRI GUIDELINES 2022

THE 11 WEEKS TO 13 WEEKS 6 DAYS SCAN

SEPTEMBER 2022

ICRI SUBSPECIALITY GROUP ON FETAL RADIOLOGY

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Need for these scans

Aneuploidies and other chromosomal abnormalities cannot be detected directly by ultrasound. However, many studies have shown that there are some findings in the fetus increase the risk for chromosomal abnormalities. These findings are also present in the normal fetus and hence, their presence is not diagnostic of chromosomal abnormalities. These are called markers and their presence should not be considered as abnormalities or anomalies. They indicate the need for further testing and have no other significance.

Moreover, there is evidence in literature that it is also possible, sometimes, to detect gross structural abnormalities /anomalies at this stage of gestation if the scan is done according to protocols. This requires expertise, good equipment and more time. The detection rate is not 100% during screening and the attempt is for an early diagnosis so that the patient can be offered an early termination pregnancy if the abnormality is gross. Most of the studies reporting 100% detection rates, for some of the abnormalities, are those that are done in tertiary care centres, most of them referral units.

Where can it be done

In any centre approved by PCPNDT with trained personnel and appropriate equipment.

When should it be done?

This is a scan that is done between 11 and 13 weeks 6 days of gestation, that is, when the CRL of the fetus is between 45 and 84 mm.

TYPES OF SCANS:

India is a vast country with a large population and limited number of equipment as well as trained personnel. Equipment available in many places are basic with limited capabilities which would limit the ability of the operator to do a detailed study. Hence, there is a need to have different types of scans.

The types of scans recommended for this stage of gestation -

1. First trimester screening / level 1 scan

2. First trimester anomaly scan / level 2 scan

First trimester screening (level 1 scan) is a basic study and does not include screening for structural abnormalities. It includes the following - measurement of crown rump length (CRL), measurement of nuchal translucency (NT), assessment of nasal bone (NB) and uterine artery Doppler as a screening test for preeclampsia. Use of Samrakshan software is encouraged but not mandatory as this data is from Indian population.

First trimester anomaly scan (level 2 scan) is a more detailed study which includes the following - measurement of CRL, measurement of NT, assessment of NB, ductus venosus Doppler (DV), tricuspid regurgitation assessment (TR), assessment for structural abnormalities and uterine artery (UA) Doppler as a screening test for preeclampsia. Use of Samrakshan software is encouraged but not mandatory as this data is from Indian population.

MEASURING CRL:

1. Midline sagittal section of the entire fetus
2. Magnification such that the fetus occupies more than 2/3 of the screen
3. The crown and rump must be clearly visible

4. Fetus must be in neutral position - neither flexed nor extended
5. Amniotic fluid visible between the chin and the chest with the neck in neutral position
6. Fetus should be near horizontal to the ultrasound beam (as near as 90° as is practically possible)
7. Calipers are to be placed exactly at the junction of skin with amniotic fluid both at the crown and the rump.
8. The maximum straight line measurement from the crown to the rump is to be used.

Measuring CRL is crucial for dating and also for risk assessment as NT and NB measurements vary with gestational age.

If dating has not been done by an earlier scan and the ultrasound dating differs by more than 7 days from LMP dating, the EDD should be corrected to correspond with the ultrasound dating (cEDD). In case of IVF pregnancies, ultrasound EDD (cEDD) should not be used since the conception date is already known. Instead, the IVF date should be used as mentioned in the early pregnancy guidelines.

MEASURING NT:

1. A mid sagittal section of the fetus should be obtained.
2. Magnification should be such that only the fetal head and upper thorax is included in the image.
3. The fetus should be in neutral position.
4. The widest part of the translucency should be measured.
5. Measurement should be done on to on.

A correct midsagittal section will demonstrate the hypoechoic diencephalon in the centre, rectangular shape of the hard palate, echogenic tip of the nose and nuchal membrane posteriorly.

The magnification should be such that the minimum movement of the calipers produces only as 0.1 mm change in the measurement.

Neutral position means that the head should be in line with the spine. There should be amniotic fluid between the fetal chest and the chin and the neck should not be extended.

The widest part of the translucency should be measured. More than one measurement can be done and the largest measurement meeting all the criteria should be used.

The margins of the nuchal translucency should be clear and not fuzzy. A high contrast setting and low gain setting may be used to achieve this.

On to on means the measurements should be taken with the inner border of the horizontal line of both the callipers should be placed ON the line that defines the nuchal translucency. The crossbar of the calliper should be such that it is hardly visible as it merges with the white line of the border, not in the nuchal fluid.

NASAL BONE ASSESSMENT:

1. A mid sagittal section of the fetus should be obtained.
2. Magnification should be such that only the fetal head and upper thorax is included in the image.
3. The ultrasound transducer should be parallel to the nose.
4. The echogenicity of the nasal bone should be greater that the skin overlying it.

A correct view of the nasal bone should show three lines: the first two lines are horizontal and parallel to each other ("= sign"). The top line is the skin and bottom one (more echogenic than the overlying skin) is the nasal bone. A third line, at a higher level, is the tip of the nose. If the nasal bone is less echogenic than the skin, it should be concluded as absent nasal bone.

Nasal bone nomograms for Indian population in first trimester are not available, hence short nasal bone should be diagnosed with caution. This is important keeping in view the fact that nasal bone of Indian population in 2^{nd} trimester is significantly shorter than that of the western population.

It is not sufficient to just image the nasal bone and measure the nuchal translucency. Since the normal ranges of these measurements vary with gestational age, a risk factor based on maternal age and nuchal translucency should be arrived at using a calculator – online calculators, like for example, the fetal medicine foundation calculator, may be used for this purpose. This risk for aneuplodies should be mentioned in the report.

UTERINE ARTERY DOPPLER:

Uterine artery Doppler is routinely done transabdominally with 3.5 MHz transducer.

In a sagittal section of the uterus, the cervical canal and internal cervical os should be identified. Then, with colour Doppler mapping, the transducer is gently tilted from side to side to identify the uterine arteries at the level of the internal os.

Pulsed wave Doppler should be used with the sampling gate set at 2 mm is placed within the uterine artery at the level of the internal os. The angle of insonation should be less than 30º. When three similar consecutive waveforms are obtained the PI must be measured and the mean PI of the left and right arteries should be calculated.

Reason –

Pre-eclampsia (PE) is a leading cause of perinatal mortality and morbidity in India.

Recently, various studies have shown that a combination of mean uterine artery pulsatility index (PI) combined with medical, obstetric history, mean arterial pressure can identify a higher proportion of patients at risk for PE then uterine artery Doppler alone. Moreover, adding other markers like placental growth factor (PlGF) can increase the detection rate, however, this would increase the cost of screening and hence may not be feasible as a screening procedure, at present, in our country.

This is the basis for or the program called Samrakshan by IRIA. Though not mandatory, it is encouraged to use Samrakshan in screening for PE, both in first and second trimesters and for follow up of high-risk cases in third trimester.

The nomogram for transvaginal uterine artery Doppler is different. Hence, transabdominal uterine artery Doppler charts should not be used if the study is done trans vaginally. A transvaginal nomogram should be used in such cases.

ADDITIONAL SECTIONS TO BE DONE IN CASE OF FIRST TRIMESTER ANOMALY SCANS:-

DUCTUS VENOSUS DOPPLER:

Ductus venosus Doppler should not be done during fetal movements.

The magnification should be such that only the fetal thorax and abdomen occupy the whole image.

Right ventral midsagittal view of the fetal trunk should be acquired with color Doppler demonstrating the umbilical vein, ductus venosus and the fetal heart. The ductus venosus will show typical aliasing.

A small (0.5 - 1.0 mm) pulsed Doppler sample should be placed at the site of aliasing with an insonation angle of less than 30 degrees and high sweep speed. The high sweep speed spreads out the Doppler waveforms allowing better assessment of the a-wave.

TRICUSPID VALVE DOPPLER:

Tricuspid Doppler should not be done during fetal movements.

An apical 4 chamber view of the fetal heart should be obtained with magnification such that the fetal thorax occupies most of the image.

A pulsed-wave Doppler sample volume of 2.0 to 3.0 mm should be positioned across the tricuspid valve so that the angle to the direction of flow is less than 30 degrees from the direction of the inter-ventricular septum.

The sweep speed should be high (2-3 cm/s) so that the waveforms are widely spread for better assessment.

Tricuspid regurgitation is diagnosed if it is found during at least half of the systole and with a velocity of over 60 cm/s, since aortic or pulmonary arterial blood flow at this gestation can produce a maximum velocity of 50 cm/s.

The tricuspid Doppler should be repeated at least 3 times as the tricuspid valve could be insufficient in one or more of its three cusps.

ASSESSMENT OF STRUCTURAL ABNORMALITIES:

Many gross abnormalities can be detected in this scan. However, the detection rate is not 100% for the vast majority of them during population screening. Some studies show possibility of 100% detection for some abnormalities in expert hands with good equipment in referral centres. This cannot be extrapolated for population screening, especially in our country where there are limitations in equipment, availability of trained personnel, etc.

Even in advanced countries with better equipment, more doctors and better doctor: population ratios, detection rates are not 100% in routine clinical practice.

The structural evaluation in the first trimester anomaly scan is an attempt to diagnose early gross structural abnormalities so that an option of first trimester termination can be offered to the patient. However, this may not always be possible. This scan does not replace a 2nd trimester anomaly scan / TIFFA. The detection rates during the 2nd trimester will be higher than during 1st trimester as many organs would not have completed development or may be too small for detailed evaluation in the first trimester.

Organs to be evaluated –

Head – Transventricular plane, transthalamic plane.

Face – mid sagittal (NT / NB, mandible position, size), orbits, retro-nasal triangle.

Heart – situs, presence of 2 equally sized inflow tracts (ventricles), presence of 2 outflow tracts forming a V on the left side.

Abdomen – Stomach, Urinary bladder, cord insertion, structural continuity of the abdominal wall.

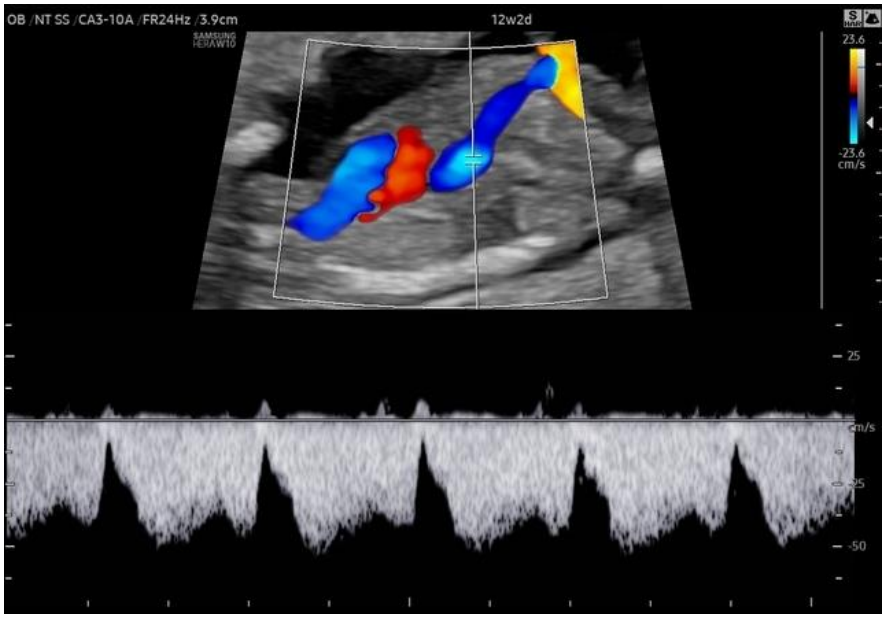
Extremities – Presence of all 4 limbs and 3 segments in each limb.

Other sections / organs may be studied optionally (Eg. kidneys, diaphragms, 3 vessel cord, spine, etc).

MEASURING CRL:

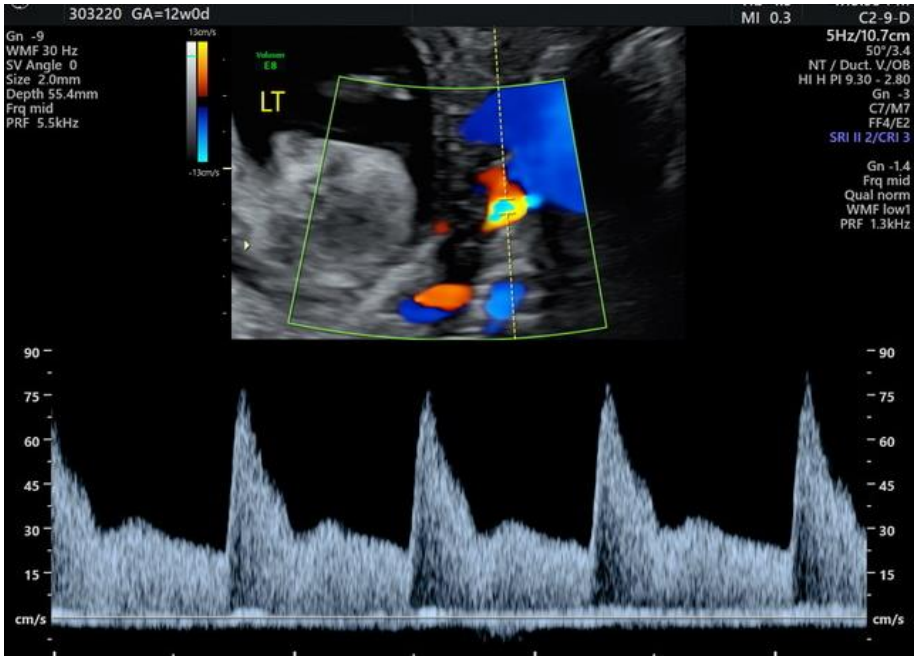
NUCHAL TRANSLUCENCY, NASAL BONE:

DUCTUS VENOSUS:



<u>TRICUSPID FLOW</u>:

<u>UTERINE ARTERY</u>:



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