

## Fetal Echocardiography, Somethingburger for Radiologists in Nepal

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Fetal Echocardiography (echo) has been a hot topic in our part of the world. There has been a debate all over the country about the issue about who should be performing fetal echocardiography. However, with time we radiologists should be aware and prepared for detection of every anomaly within the fetus during the pregnancy; congenital heart disease is should not be an exception. Having been performing targeted fetal anomalies during 20-22 weeks period of gestation since the commencement of the radiology services in Nepal, every radiologists should perform standard fetal echocardiography in present scenario. Under the umbrella of the targeted imaging for fetal anomalies (TIFA), we are already been looking the chest anomalies in certain views, namely cardiac situs, heart rate, 4 chamber view, 3 vessel view and outflow tracts, heart chambers of the heart, aorta, pulmonary arteries and its relationship including diaphragm and lungs. Fetal echo is an extension of the same. With continuous practice and dedication, it will be a lot easier with time. It is high time that fetal Echocardiography should be included within the curriculum of the MD Radiodiagnosis, FCPS and other radiology subspecialty training in Nepal.

Over the past 5 years, several professional groups, including the American Society of Echocardiography 2023, the International Society of Ultrasound in Obstetrics and Gynecology, 2023 and the American Institute of Ultrasound in Medicine (AIUM), 2020 have published updated guidelines and standards documents on fetal cardiac evaluation.<sup>1,2,3</sup> Following these guidelines, the cardiac screening examination is performed optimally between 18 and 22 weeks gestation. Screening at 20-22 weeks is less likely to require an additional scan for completion of this evaluation when compared with screening at 18-20 weeks, although many patients would prefer to know about major defects as early as possible in the pregnancy. A focused fetal ultrasound to detect a congenital anomaly is offered to a population of healthy individuals with a low probability of disease. However, there is tremendous regional variability in the performance of the fetal echo as a screening tool to detect CHD. Thus, decisions about indications for referral for fetal echocardiography are challenging at the population and health policy levels.

### Indications for fetal Echocardiography

#### A. Fetal factors

- Suspected cardiac structural anomaly
- Fetal extra-cardiac anomaly known to be associated with CHD
- (For example, exomphalos, congenital diaphragmatic hernia, suspected esophageal atresia/gastrointestinal obstruction)
- Suspected abnormality of cardiac function or cardiomegaly
- Hydrops fetalis
- Persistent fetal tachycardia (heart rate  $\geq$  180 bpm)
- Suspected heart block or persistent fetal bradycardia (heart rate  $\leq$  110 bpm)
- Frequent episodes or persistently irregular cardiac rhythm
- Nuchal translucency  $\geq$  3.5 mm
- Confirmed or suspected genetic abnormality
- Monozygotic twinning

#### B. Patient or familial disease or environmental exposure

- First-degree relative of fetus with CHD (parents, siblings, half-siblings)
- First- or second-degree relative with disease of Mendelian inheritance and history of childhood cardiac manifestations

- Pregestational diabetes, regardless of HbA1c level
- Anti-Ro/SSA antibodies
- Phenylketonuria (unknown status or periconceptional phenylalanine level > 10 mg/dL)
- Retinoid exposure Confirmed fetal infection (TORCH- and parvovirus-B19-positive)

### Other indications when fetal echo may be considered

- Second-degree relative of fetus with CHD
- Gestational diabetes diagnosed in first or early second trimester
- Nuchal translucency between 3.0 and 3.4 mm
- Selected teratogen exposure (e.g. paroxetine, carbamazepine, lithium, sodium valproate)
- Conception by IVF, including ICSI
- Use of ACE inhibitors (antihypertensive medication)

**Other considerations though** historical reports may suggest otherwise, there is insufficient evidence to show that risk of CHD is significantly over baseline for certain patient and fetal factors, including patient obesity (BMI  $\geq 35$  kg/m<sup>2</sup>), SSRI antidepressant exposure other than paroxetine, non-cardiac ‘soft marker’ for aneuploidy, abnormal serum analytes (e.g.  $\alpha$ -fetoprotein level), isolated SUA, gestational diabetes diagnosed after second trimester, warfarin exposure, alcohol exposure, echogenic intra-cardiac focus, prenatal fever or viral infection with sero-conversion only, isolated CHD in a relative further removed than second-degree to fetus.

For example, exomphalos, congenital diaphragmatic hernia, and suspected esophageal atresia/gastrointestinal obstruction<sup>124</sup>. †If resources allow (twins are also seen by fetal medicine specialists). ACE (angiotensin-converting enzyme); anti-Ro/SSA, (anti-Sjogren’s- syndrome-related antigen-A); BMI (body mass index); CHD (congenital heart disease); HbA1c (Hemoglobin A1c); ICSI (intracytoplasmic sperm injection); IVF (in-vitro fertilization); SSRI (selective serotonin reuptake inhibitor); SUA (single umbilical artery).

In summary, the above-mentioned three international consensus guidelines states standard planes as follows:

#### 1. American Society of Echocardiography

- Upper abdomen axial view for the abdominal situs
- Four chamber view
- LV outflow
- RV outflow
- 3VV, 3VT views
- Bicaval Views
- Long axis views of the aortic arch and ductal arch
- Short axis views
- Doppler ultrasound (PW Doppler should be used routinely to assess, at a minimum, flow patterns in ventricular inflows, outflows, arches, pulmonary veins, the ductus venosus, and umbilical vessels)

#### 2. International Society of Ultrasound in Obstetrics and Gynecology

- Four chamber view
- LV outflow
- RV outflow
- 3 VV, 3VT views
- Although the use of color flow Doppler ultrasonography is not considered mandatory in these Guidelines, becoming familiar with its use and adding it to routine screening is encouraged. Color flow mapping is an integral part of a fetal echocardiogram and its role in the diagnosis of CHD cannot be

underestimated.

### 3. American Institute of Ultrasound in Medicine

- 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 venacava
- Color and Pulsed Doppler (Required) for Systemic veins (including superior and inferior venacava and ductus venosus), Pulmonary veins (at least two: one right vein and one left vein), Atrial septum and foramen ovale, Atrio-ventricular valves, Ventricular septum, Semilunar valves, Ductal arch and Aortic arch.

In current scenario in Nepal, the detection rates for congenital anomalies continue to increase; the demand for fetal echocardiography has grown. If detected early, it can provide the involving clinicians an ample of opportunities for prognosticating the disease, counseling the family, proper transition between the pre and post natal states with focused care at birth. The general population must be made aware regarding the importance of prenatal diagnosis and timely management of cardiac anomalies for improved outcome. We should develop the consensus and guidelines for fetal echocardiography in Nepal.

### REFERENCES

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