Introduction Indication timing

Fetal echocardiography

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Fetal echo 1980

- Ultrasound equipment for real-time fetal imaging became available in obstetrics towards the end of the 1970s.
- 1980 Ultrasound evaluation of the heart was introduced into pediatric cardiology, and became an important diagnostic tool. By Allan LD, Kleinman CS.

* Fetal echocardiography

* Timing for the examination (18-20 weeks)

Scanning in first trimester
Scanning later at 20 weeks

Fetal Nuchal Translucency (N.T.)
FETAL ECHOCARDIOGRAPHY

Who?

Technique

The accurate prenatal diagnosis of CHD

- Detection of CHD in the fetal heart (incidence 5-11/1000)
- Parents counseling
- Management options
  - T.O.P. (Chromosomal anomaly, major defects)
  - Management during pregnancy (Medical)
  - Time, Mode, place of delivery
  - Appropriate management (Intervention, surgery) immediately after birth.
- Normal fetal heart (high risk pregnancy) → good news
Fetal Circulatory Dynamics

- Parallel arrangement of the two circulation.
- Mixing of the venous returns
- High impedance and low flow of pulmonary circulation.
- Low impedance and high flow of placental circulation.
- Presence of shunts.

In fetal heart:

- Patent foramen ovale:
- Patent ductus arteriosus:
- Patent ductus venosus:
## Indications for Fetal Echocardiography

### Maternal Risk Factors
- a. Maternal metabolic disorder e.g. diabetes mellitus
- b. Anti Ra, La antibody S.L.E.
- c. Maternal teratogens
- d. Advanced maternal age

### Familial Risk Factors
- a. Family history of CHD
- b. Mendalin syndromes

### Fetal Risk Factors
- a. Increased N.T.
- b. Extracardiac abnormality
- c. Hydrops fetals
- d. Chromosomal abnormality
- e. Cardiac abnormality on ultrasound scanning
- f. Fetal arrhythmia

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**Indications for fetal echocardiography**

### Maternal Risk Factors

**a. Diabetes mellitus**

Cardiac malformations

CHD reported to be five times higher in the infant of diabetic mother (4-7%)

TGA, DORV VSD, Truncus, Coarctation
Indications for fetal Echocardiography

**Maternal risk factors**

a. Diabetes mellitus

- HBA1C, above 8% predicts a higher risk of CHD as high as 22%.
- HBA1C, below 6.5% predicts a low risk of CHD

Diabetic cardiomyopathy,
L.V.H, B.V.H. >5 mm
(?Regressive)

Gestational diabetes

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Indications for fetal Echocardiography

**Maternal risk factors**

b. Connective tissue disorder (S.L.E.)

- Maternal auto-antibodies, particularly anti-Ro and anti La.
- Approximately 60% of mothers who deliver a child with heart block have anti-Ro and anti La.

* 2nd heart block
Indications for fetal Echocardiography

Maternal risk factors

c. Maternal teratogens

<table>
<thead>
<tr>
<th>Tratogen</th>
<th>CHD %</th>
<th>Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maternal PKU</td>
<td>15-20</td>
<td>VSD, ASD, PDA, COA</td>
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<tr>
<td>Alcohol</td>
<td>35</td>
<td>VSD, ASD, TOF</td>
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<tr>
<td>Rubella</td>
<td>50</td>
<td>PDA, PPS</td>
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<tr>
<td>Thalidomide</td>
<td>10-15</td>
<td>TA, TOF</td>
</tr>
<tr>
<td>Retinoic acid</td>
<td>25</td>
<td>TGA, TOF, DORV</td>
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<tr>
<td>Valproate</td>
<td>25</td>
<td>VSD</td>
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<tr>
<td>Lithium</td>
<td>9</td>
<td>TA, ASD</td>
</tr>
</tbody>
</table>

D. Advanced maternal age ?? T_{21}

Indications for fetal Echocardiography

Familial and genetic risk factors

A- Familial factors

- A previous child or fetus has CHD the risk is increased in a subsequent pregnancy to 2%, with two previously affected pregnancies the risk reaches 10%.
- When a parent has CHD, the risk of recurrence between 5% and 10%, it is higher when the mother is affected than the father.
Indications for fetal Echocardiography

Familial and genetic risk factors

The risk of familial recurrence for CHD in different CHD

| AVSD | 7.8% |
| Conotruncal anomalies | 5.1% |
| F4 | 3.1% |
| LV. Obstruction | 3.6% |
| Ao. Corct. | 6.7% |

• B- Genetic factors
• 40% of CHD in the fetal heart have chromosomal abnormalities
• Only 5% in liveborns have CHD

<table>
<thead>
<tr>
<th>Chromosomal anomaly</th>
<th>Risk of CHD</th>
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<tbody>
<tr>
<td>Trisomy 13</td>
<td>80%</td>
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<tr>
<td>Trisomy 18</td>
<td>100%</td>
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<tr>
<td>Trisomy 21</td>
<td>40-50%</td>
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<tr>
<td>Turner’s syndrome</td>
<td>20-40%</td>
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</tbody>
</table>
Indications for fetal Echocardiography

**Fetal risk factors**

a. Increased first-trimester nuchal translucency (N.T.)

![Fetal Nuchal Translucency (N.T.)](image)

**Measurement of N.T.**

![Ultrasound scan of a fetus](image)
• An abnormal NT test indicates an increased risk for aneuploidy and structural abnormality. Depending on the extent of the NT, associated biochemical marker results, and maternal age.
• Genetic counseling and chorionic villous sampling (CVS) or amniocentesis.
• Chromosomal study (FISH)

Indications for fetal Echocardiography

Fetal risk factors
Extracardiac abnormalities

* Omphalocele
  CHD 30%
  F4, VSD
Indications for fetal Echocardiography

Fetal risk factors

Extracardiac abnormalities

* Diaphragmatic hernia
  10-20%
  HLH, Coarct, VSD

Indications for fetal Echocardiography

Fetal risk factors

Extracardiac abnormalities

Hydrops fetalis
Indications for fetal Echocardiography

Fetal risk factors

Extracardiac abnormalities

Fetal arrhythmia

• Abnormal 4. Ch. 60%
• G. V. not seen.
• RV / LV disproportion.
• Fetal dysrrhythmia.
• Echogenic focus. 3-8%
Prenatal diagnosis remains an important goal. Screening for familial, maternal, and fetal factors known to increase the risk of CHD can help identify cases.

Routine screening of the fetal heart's four chambers and outflow tract in low-risk pregnancy remains important for the detection of CHD. Extended scanning of (4 chamber + grade vessels) can detect 75% of CHD.

- Educational programs for ultrasonographers and obstetricians for encouraging examination during routine obstetric scanning is mandatory for better detection of CHD.
- Scanning in trimester if confined to high-risk patient, increased nuchal translucency