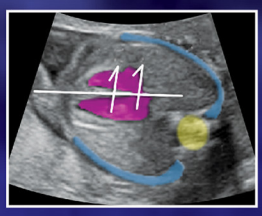
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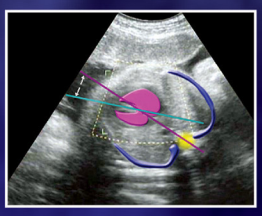
JAYPEE

Includes DVD-ROM

Atlas of Fetal Echocardiography







SECOND EDITION

Manish R Pandya

Foreword
S Suresh

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2

Indications

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INDICATIONS OF THE FETAL ECHO

Congenital heart disease (CHD) is a leading cause of infant mortality with an estimated incidence of about 4–13 per 1,000 livebirths. Between 1950 and 1994, 42% of infant deaths reported to the World Health Organization (WHO) were attributed to be due to cardiac defects. Structural cardiac anomalies were also among the abnormalities, most frequently missed by prenatal ultrasonologists. Prenatal detection of fetal cardiac anomalies helps in improving the outcome of pregnancies as nearly half of the cases of CHD are minor and may be easily corrected by surgery.

Nearly, 46% cases of CHDs are diagnosed by first week of life; 88% by first year and 98% by the age of 4 years. Incidence is typically increased after inclusion of bicuspid aortic valve disease as its incidence is estimated to be approximately 10 in 1,000 livebirths. In premature babies, cardiac defects such as patent ductus arteriosus (PDA) and ventricular septal defect (VSD) may be commonly encountered.

ETIOLOGY OF CARDIAC MALFORMATION

- Multifactorial mode of inheritance is a common cause of CVS anomalies. It could be associated with:
- Single gene disorders, such as autosomal recessive syndrome, e.g. hypoplastic left heart syndrome, Noonan syndrome and pulmonary stenosis.
- Chromosomal anomalies, e.g. Trisomy 21: (Atrial or ventricular septal defects); Trisomy 18 and 13: (ventricular septal defects)

During 1980 to 1990, it became a common practice to perform fetal echocardiography primarily in women who were considered to be at an increased risk of children having CHD. Some of these high-risk groups were as follows:

- Abnormal findings in the fetus on the routine obstetric study
- A family history or maternal disease associated with CHD

- Maternal indication:
  - Pre-existing metabolic diseases, such as diabetes, phenylketonuria, collagen vascular disease, etc.
  - Alcohol abuse
  - *Family history:* First degree relative of proband
  - *Maternal infections:* Parvovirus B19, rubella, coxsackie
  - *Cardiac teratogen exposure:* Retinoid, phenytoin, carbamazepine, lithium carbonate, valproic acid, etc.
  - *Maternal antibodies:* Anti-Ro (SSA), Anti-La (SSB)
- Fetal indication:
  - Nonimmune hydrops
  - Suspected fetal heart anomalies
  - Abnormal fetal karyotype
  - IUGR
  - Polyhydramnios
  - Increased nuchal translucency
  - Absent nasal bone
  - Fetal cardiac rate or rhythm disturbances, persistent bradycardia, persistent tachycardia, persistent irregular heart rhythm, etc.
- Familial risk factors:
  - Siblings history of cardiac defects
  - Cardiac defect in parents
  - Family history of cardiac defects.

There is always possibility of some type of cardiac anomalies in low-risk group of patients, especially where we see an abnormal four chamber view.

We prefer use of four chamber view as screening tool which helps in diagnosing at least one-third cases of CHDs. Prenatal detection of CHD depends on the following factors:

- Examiner's experience
- Maternal obesity
- Transducer frequency
- Abdominal scars
- Gestational age
- Amniotic fluid volume
- Fetal position.

The "basic" and "extended basic" cardiac ultrasound examinations are designed to maximize the detection of heart anomalies during second trimester scan and help in the visualization of the outflow tracts and great vessels.

We prefer to perform the initial transabdominal study of fetal heart between 16 and 20 weeks as at this gestational age, the valves are well developed, the size of heart is adequate for study and fetal size and position usually allow best access to fetal heart.

In some high-risk cases, early detection can be possible by 10–14 weeks with the help of TVS approach.

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There are specific risk factors involved for CHD. Some of the fetal factors are enlisted here:

- Chromosomal abnormalities
- Extracardiac anatomical abnormalities
- Nonimmune hydrops fetalis
- Fetal cardiac arrhythmias
- Abnormal, cardiac scan on routine ultrasound examination

So many times, maternal history of congenital heart diseases and metabolic disorders, or exposure to some teratogenic agent may also lead to CHD.

On routine scan, if we see some anomaly per se such as nonimmune hydrops, we must always search for another anomaly and most of the times we may land up, detecting a CHD.

So, we must follow a rule that whenever we find some anomaly, we much definitely search for another one and usually it will be there.

In presence of fetal cardiac arrhythmias, we must think about some structural cardiac anomaly. If we look into statistics, we would find that more than 1% cases of CHD are associated with isolated extrasystole.

On fetal cardiac scan, if we see complete heart block, there are 50% chances of having cardiac anomalies.

Now, we have to observe every heart with suspicion and every pregnancy should be scanned because high level of suspicion will always pay in diagnosis of heart abnormalities. The incidence of maternal diabetes is now on a rise and more and more mothers having gestational diabetes are being encountered in clinical practice. Only, if we maintain a high level of suspicion at the time of routine ultrasound examinations, we would be able to pick-up fetal heart abnormalities. The incidence of CHD among diabetic mothers are five times higher in comparison to normal pregnant women; VSD and transposition of great vessels are very common and can be easily detected on targeted scanning.

In first trimester, high levels of glycosylated hemoglobin (HbA_{1C}) may sometimes result in the development of structural cardiac anomalies. So we must keep a strict watch for detecting the presence of cardiac anomalies in heart of the fetus of pregnant lady with high HBA_{1C} levels. This would enable us to give her best output in terms of normal fetal heart.

NUTSHELL

1. Congenital heart disease is a leading cause of infant mortality, structural anomaly were the most common and frequently missed by parental ultrasound.
2. Prenatal detection of fetal cardiac anomaly helps a lot because most of CHD are minor and may be corrected easily by surgery with very good outcome.
3. Multifactorial mode of inheritance is common cause of CVS anomaly. There will be indication for fetal cardiac evaluation on single gene or chromosomal anomaly, maternal and fetal indication as well as familial risk factors.
4. Examination of fetal heart will be dependent upon fetus as well as examiner's experience, maternal obesity, transducer frequency, abdominal scars, amniotic

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fluid and most important is fetal position because if spine is anterior it will be very difficult to see fetal heart so cardiac conducive spine posterior fetus will be fine position.

5. Fetal cardiac examination is divided between two part basic and extended basic by International Society of Ultrasound in Obstetrics and Gynecology (ISUOG).
6. We can make sure after cardiac examination that this baby will require more comprehensive fetal echocardiography with detail examination of right ventricular outflow tract (RVOT), left ventricular outflow tract (LVOT), and tripple vessel and tracheal views.

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Atlas of Fetal Echocardiography

Salient Features

- Fetal echocardiography is a detailed scan of fetal heart and its all connecting blood vessels and valves enabling to look for congenital heart defects
- It is simple and easy-to-read book with all basic and extended fetal echocardiography
- Guides to differentiate normal from abnormal with plenty of normal and abnormal heart images with tomographic ultrasound imaging (TUI), three-dimensional rotation and labeled images
- Includes step-by-step approach of examining fetal heart with PASSS… Position, Axis, Size, Symmetry and Squeeze…
- Contains Nutshell in every chapter for easy point remembering
- Every effort has been made to provide complete information with color photographs to enhance diagnostic confidence and skill in readers to evaluate fetal heart in detail with braveheart sonography.



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To his credit, he has developed View Compact Disc of endoscopic surgery with running commentary in two parts which can run on simple VCD player. He has authored the following books published by M/s Jaypee Brothers Medical Publishers, New Delhi, India: Co-Author of *Step by Step Infertility Practice, Step by Step Gynecological Endoscopy Surgery, Step by Step Active Management of Labor*; Author of *Step by Step Male Infertility Management*; and *The Techniques of IVF Made Easy*. He has written three books which are recommended by Royal College of Obstetricians & Gynaecologists, UK, as reading material in MRCOG. He has written three chapters in postgraduate series by Dr Daftary and one chapter in *Etiopathology in Dysfunctional Uterine Bleeding* (DUB). He has published 3 papers in International *Journal of Pharmacological and Clinical Research*. He is an Editor-in-Chief of *Indian Journal of Obstetric and Gynecological Research*. Recently, he has been awarded with The Dynamic Indian of the Millennium by KG Foundation, Coimbatore, Tamil Nadu, India. He has given 260 presentations as faculty across the world.

He is having the Federation of Obstetric and Gynaecological Societies of India (FOGSI)-recognized ultrasonography training center, Gujarat, India, for basic advance color Doppler and 3D/4D ultrasonography with small parts. He is having National Association for Reproductive and Child Health of India (NARCHI), Karnataka State Open University (KSOU)-recognized center for DFW/DRCH/DGO (Diploma in Obstetrics and Gynecology) and College of Physicians and Surgeons (CPS) of Mumbai (DGO) recognized by Gujarat Medical Council (GMC). He is giving ART training in Manish IVF Center—one stop solution for parenthood at Surendranagar, Gujarat, India. *www.manishivf.com; www.drmanishpandya.com*.

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