Major Forms of Congenital Heart Disease: Impact of Prenatal Detection and Diagnosis

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Identification of congenital cardiac malformations by echocardiography in midtrimester fetus

LINDSEY D ALLAN, MICHAEL TYNAN, STUART CAMPBELL, ROBERT H ANDERSON

From Guy's Hospital; King's College Hospital; and Cardiothoracic Institute, Brompton Hospital, London

Br Heart J 1981; 46: 358–62
Impact of Prenatal Diagnosis for Management Strategies

Simpson JM. 2006
Krapp M, Heart 2003
Impact of Prenatal Diagnosis for Management Strategies

- **Intrauterine evolution of CHD**

One of the major advances of fetal echocardiography: understanding the morphology and the pathophysiology of CHD before birth.

Enrico Chiappa, Journal of Cardiovascular Medicine 2007
Intrauterine evolution of congenital heart disease

Hornberger LK. Left heart obstructive lesions and left ventricular growth in the midtrimester fetus. Circulation 1995
Impact of Prenatal Diagnosis for Management Strategies

Intrauterine Transcatheter Valvuloplasty

Courtesy of DR ZIELINSKY
Impact of Prenatal Diagnosis for Management Strategies

- Improvement in detection of CHD.
- Understanding the morphology and the pathophysiology of CHD
- Accurate Diagnosis of CHD
- Early Family Counseling
- Prenatal treatments
- Planned delivery (In utero transportation and competition among centers)
- Immediate appropriate postnatal treatments
Impact of Prenatal Diagnosis for Management Strategies

Fetal Dx vs Postnatal DX:
- Optimal Medical Care
- Fetal Diagnosis
- Postnatal Diagnosis
Prenatal Diagnosis of CHD

Does it make a difference to survival??
Impact of Fetal Diagnosis on Survival

No difference in Survival or even a worse mortality observed in comparison with cases with only postnatal diagnosis

- I D Sullivan, Heart 2002
- Enrico Chiappa, Journal of Cardiovascular Medicine 2007
- Kumar RK, Hornberg LK, Am J Cardiol 1999
- Daubeney PE, Circulation 1998
Survival advantage reported in the literature in selected types of CHD

- Better preoperative clinical status
- Better survival in some of the duct dependent cardiac lesion (d-TGA, COA)
Improved Surgical Outcome After Fetal Diagnosis of Hypoplastic Left Heart Syndrome
Wayne Tworetzky, Doff B. McElhinney, V. Mohan Reddy, Michael M. Brook, Frank L. Hanley and Norman H. Silverman
*Circulation* 2001;103;1269-1273
Improved Surgical Outcome After Fetal Diagnosis of Hypoplastic Left Heart Syndrome
Wayne Tworetzky, Doff B. McElhinney, V. Mohan Reddy, Michael M. Brook, Frank L. Hanley and Norman H. Silverman
*Circulation* 2001;103;1269-1273

Lower incidence of preoperative acidosis

Less need for preoperative inotropic medications
Detection of Transposition of the Great Arteries in Fetuses Reduces Neonatal Morbidity and Mortality
Damien Bonnet, Anna Coltri, Gianfranco Butera, Laurent Fermont, Jérôme Le Bidois, Jean Kachaner and Daniel Sidi
*Circulation* 1999;99:916-918

### Comparison of Characteristics of Patients in the Prenatal and Postnatal Groups

<table>
<thead>
<tr>
<th></th>
<th>Postnatal Group</th>
<th>Prenatal Group</th>
<th>( P )</th>
</tr>
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<tbody>
<tr>
<td>Isolated TGA</td>
<td>204</td>
<td>57</td>
<td>NS</td>
</tr>
<tr>
<td>Associated defects</td>
<td>46</td>
<td>11</td>
<td>NS</td>
</tr>
<tr>
<td>VSD</td>
<td>31</td>
<td>8</td>
<td>NS</td>
</tr>
<tr>
<td>VSD + CoA</td>
<td>14</td>
<td>3</td>
<td>NS</td>
</tr>
<tr>
<td>CoA</td>
<td>1</td>
<td>1</td>
<td>NS</td>
</tr>
<tr>
<td>Age at admission, h</td>
<td>72±910</td>
<td>2.2±2.8</td>
<td>&lt;0.01</td>
</tr>
<tr>
<td>Mechanical ventilation</td>
<td>95 (38)</td>
<td>12 (17.6)</td>
<td>&lt;0.01</td>
</tr>
<tr>
<td>Metabolic acidosis=MOF</td>
<td>56</td>
<td>8</td>
<td>&lt;0.05</td>
</tr>
<tr>
<td>PGE1 infusion</td>
<td>95</td>
<td>32</td>
<td>NS</td>
</tr>
<tr>
<td>BAS</td>
<td>168</td>
<td>54</td>
<td>NS</td>
</tr>
<tr>
<td>Preoperative mortality</td>
<td>15</td>
<td>0</td>
<td>&lt;0.05</td>
</tr>
<tr>
<td>Coronary artery pattern</td>
<td>233 ASO</td>
<td>68 ASO</td>
<td></td>
</tr>
<tr>
<td>Normal</td>
<td>168</td>
<td>47</td>
<td>NS</td>
</tr>
<tr>
<td>Abnormal</td>
<td>65</td>
<td>21</td>
<td>NS</td>
</tr>
<tr>
<td>Postoperative mortality</td>
<td>20</td>
<td>0</td>
<td>&lt;0.01</td>
</tr>
<tr>
<td>Hospital stay, d</td>
<td>30±17</td>
<td>24±11</td>
<td>&lt;0.01</td>
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</tbody>
</table>
Coarctation of the aorta

- Common duct dependent cardiac defect missed at routine physical screening of the neonate.

- An estimated 60% of newborns with isolated coarctation are sent home as “healthy” babies

Results: Both collapse and death were more common in the postnatally diagnosed group (p < 0.05). Femoral pulses were more likely to be palpable and there was echocardiographic evidence of duct patency in the antenatally diagnosed infants (p < 0.001 and p < 0.05, respectively). An increased respiratory rate was associated with postnatal presentation (p < 0.05). Infants with haemodynamic instability preoperatively were more likely to have been diagnosed postnatally (p < 0.01).

Conclusions: Antenatal diagnosis of coarctation of the aorta is associated with improved survival and preoperative clinical condition.
Prenatal diagnosis of pulmonary atresia: impact on clinical presentation and early outcome

Aphrodite Tzifa, Claire Barker, Shane M Tibby, et al.

Arch Dis Child Fetal Neonatal Ed 2007;92: 1
Prenatal diagnosis of TA did not appear to have a significant impact on short-term survival

83% vs 81%

Conclusions—Prenatal diagnosis did not affect overall survival despite facilitated care. The prognosis of RAI was worse compared with LAI because of more complex associated cardiac defects and the inability to perform successful surgical procedures.
Spectrum of CHD in fetal is different from that in postnatal.

Lesions detected antenatally most commonly underwent termination of pregnancy or had a relatively poor prenatal (Ebstein’s anomaly) and postnatal (SV) outcome.
Spectrum of CHD in fetal is different from that in postnatal

1- Prenatal detection rates for many major cardiac abnormalities.

2- Method of selecting cases for fetal echocardiography

3- The tendency to a lower gestational age at birth in prenatal diagnosis series

4- Antenatal assessments of the fetal hearts with 4 chamber view

Comparative analysis of pattern, management and outcome of pre- versus postnatally diagnosed major congenital heart disease: a population-based study

E. T. JAEGGI, G. F. SHOLLER, O. D. H. JONES* and S. G. COOPER

Ultrasound Obstet Gynecol 2001; 17: 380–385
Comparative analysis of pattern, management and outcome of pre- versus postnatally diagnosed major congenital heart disease: a population-based study

E. T. JAEGGI, G. F. SHOLLER, O. D. H. JONES and S. G. COOPER

Anomalies detectable by abnormal ventricular outflow 6.7%

Anomalies detectable by four-chamber view 30%
Twenty-year trends in diagnosis of life-threatening neonatal cardiovascular malformations

C Wren, Z Reinhardt, K Khawaja

- 25% in living infants diagnosed to have CHD after discharge home
Conclusions: One in three infants with a potentially life-threatening cardiovascular malformation left hospital undiagnosed. Better early diagnosis is likely to be achieved by further improvements in antenatal diagnosis.
- Continuous Training program for obstetric sonographers
- Constant feedback
FETAL CARDIAC PROGRAM

KING ABDULAZIZ CARDIAC CENTER

IMPROVEMENTS IN THE ANTENATAL DETECTION AND DIAGNOSIS OF CHD
Mark Your Calendar  29-31 March

10th Echocardiography Workshop on Congenital Heart Disease

TEE Imaging from Knowledge to Clinical Practice
“First Hands-on TEE Workshop”

National Guard Health Affairs
King Saud Bin Abdulaziz University for Health Sciences
and the Postgraduate Training Center - Riyadh

29th – 31st March 2011
24th–26th Rabi’I 1432 H

International Guest Speaker:
Dr. Richard Humes, MD, FAAP, FACC
Chief, Cardiology - The Children’s Hospital of Michigan
Detroit Medical Center (DMC)

target audience
This course is designed for pediatric and adult cardiologists,
anesthesiologists, E.R. Physicians, fellows in training, and
Cardiac Sonographers. Participants should have a good
working knowledge of echocardiography.

venue
Cardiac Sciences Auditorium, King Abdullah Cardio Center
King Abdullah Medical City for National Guard Health Affairs
Riyadh, Saudi Arabia

Early Registration: 01 March 2011

Your are Invited
About 40% of congenital heart defects can be discovered with just the four-chamber view in a low risk population, and additional examination of the outflow tracts and the two great arteries increases this rate to 70% 80% and encompasses all critical cardiac defects. [17-20,33,34,36,37]

Gardiner HM. Fetal echocardiography: 20 years of progress. Heart 2001
the detection rate is 85%-95% at tertiary perinatal centers

- Raupach K, False diagnosis in prenatal sonography Ultraschall Med 2004
- Huhta J, Curr Opin Pediatr 2004
Possible risk factors in 10%-30% of fetuses with cardiac lesions

Sonographic "abnormalities" on obstetric ultrasound screening during prenatal care depend on the expertise available in pre- and perinatal centers

- Friedman AH, where we've been, where we are. Prenat Diagn 2002.
- Hornberger LK, In utero pulmonary artery and aortic growth and potential for outflow obstruction in TOF, Am Coll Cardiol 1995