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Fetal Echocardiography I

By Gurur Biliciler-Denktaş, MD, FACC, FAAP

This is the first in a series of two articles. The second article, "Fetal Echocardiography II" is written by Monesha Gupta-Malhotra, MBBS of the University of Texas Houston Medical School & Children's Memorial Hermann Hospital, Houston, Texas, and will be published in the March issue of Congenital Cardiology Today.

Prenatal diagnosis of congenital heart disease is a very important subject for both the obstetrician and neonatal specialists for optimal care to be given to the mother, fetus and the newborn baby. With advances in ultrasound technology, fetal echocardiogram has proved to be a very important diagnostic imaging test to evaluate the structural or functional abnormalities of the fetal heart. In addition, fetal cardiac intervention is becoming a field of interest for some specific lesions like semilunar valve stenosis. In taking care of a fetus with congenital or functional heart disease, obstetricians, pediatric cardiologists and neonatologists work together for optimal outcome for the mother, fetus and the newborn baby.

Congenital heart disease affects 6-8 per 1000 live births, at least half of which should be detectable before birth. If the fetuses are screened for cardiac malformations according to the traditional high-risk groups, only about 20% of babies with heart disease would be identified.² In today's advanced era of imaging, the fetal heart must be examined on all obstetric ultrasounds. The imaging of a four-chamber

heart, outflow tracts with great vessel crossing, and arches, along with cardiac function and rhythm, should be routinely done during an OB ultrasound. Even the smallest suspicion should direct the patient to a center with pediatric cardiologists specialized in fetal cardiac scanning and diagnosis.

Indications

Fetal and maternal factors and OB ultrasound findings are used to define high-risk populations for referring a fetus for detailed cardiac scanning.³⁻⁴

1. **Fetal factors:** Chromosomal abnormalities, extracardiac defects (e.g. Omphalocele, diaphragmatic hernia, duodoneal atresia, tracheoesophageal fistula, abnormal visceral situs, 2 vessel cord, hydrocephalus, microcephalus, hydronephrosis, hydrops), multiple fetal pregnancy, fetal cardiac arrhythmia.
2. **u:** Family or maternal history of CHD, familial inherited disorders (Marfan, Noonan's etc) diabetes mellitus, autoimmune disease (SLE, Sjogren's) phenylketonuria; decline of invasive prenatal diagnosis in advanced maternal age, abnormal triple screen.
3. **Exposure to Teratogens:** Drugs (warfarin, retinoic acid, lithium, anticonvulsants, alcohol, prostaglandin synthetase inhibitors); infections (rubella, parvovirus, coxsackie virus); high doses of ionizing radiation.
4. **Ultrasound findings:** Increased nuchal fold, suspicious OB scan, echogenic foci.



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1. Hoffman et al, Anesthesiology 2008; 109 A7 2. Dent et al, J Thorac Cardiovasc Surg. 2006 Jan;131(1):190-7
3. Andropoulos et al, Anesthesiology 2007; 107: A209

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The likelihood of detecting a fetal cardiac defect is closely related to the experience of the ultrasonographer, the timing of the examination and the equipment used.³

Timing of Examination

Though fetal heart images can be obtained as early as 15 weeks by transabdominal scanning, the optimal timing for a fetal cardiac evaluation is between 18-22 weeks gestation.⁴

Equipment

Fetal ultrasound transducers must be in the range of 5-3 MHz transmitted frequency and may be sector or linear array.¹ With wider near-field view, curvilinear probes may be more helpful.⁴ In addition to detailed two-dimensional imaging, M-Mode, Doppler, color-flow Doppler and image enlarging should be used during fetal cardiac scanning.¹

Examination

An uncomplicated, complete fetal cardiac exam can be performed in 30-60 minutes. The scan should include but not be limited to the examination of:¹

- Biparietal diameter for estimation of gestational age
- fetal lie and position
- fetal visceral situs
- cardiac position
- four-chamber anatomy
- great vessels and their relationships
- atrioventricular and semilunar valves
- aortic and ductal arches
- shunting at foramen ovale and ductus
- systemic and pulmonary veins
- cardiac chamber dimensions /cardio-thoracic index
- wall thicknesses
- valve/vessel dimensions
- fetal heart rate and rhythm
- umbilical cord
- pericardial and extracardiac spaces for fluid accumulation

In addition to 2D images from four chamber view, five chamber view, long axis views (from LV and RV outflow tracts), short axis view/sweep (3 vessel view), caval long axis view, ductal arch and aortic arch views along with systematic Doppler examination of atrioventricular and semilunar valves, systemic and pulmonary veins, ductus venosus, foramen ovale, ductus arteriosus, aortic arch, and umbilical vessels should be a part of a routine fetal cardiac examination.⁴

Although it is often not very easy to follow a sequence of scanning secondary to fetal (e.g. fetal lie) and maternal (e.g. obesity, previous intraabdominal surgery) factors, every effort should be made to evaluate the fetal heart according to the above recommendations in which order they may be best obtained.

In an OB fetal ultrasound at least a four chamber heart along with five chamber view, outflow tracts with crossing over of the great vessels, and aortic and ductal arches should be visualized. The three-vessel view will also be an added asset in determination of fetal cardiac abnormalities. In this way, most of the cardiac abnormalities will be seen or suspected to have the patient evaluated in detail by a fetal echocardiographer.

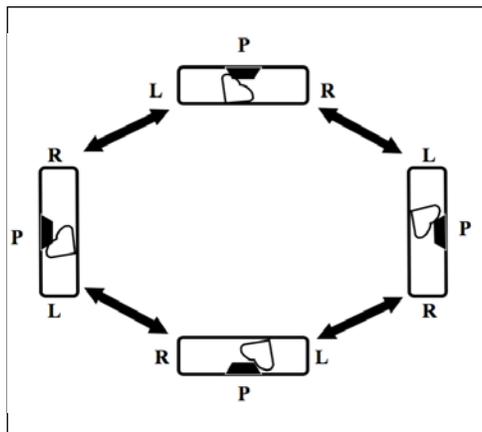


Figure 1. P: Posterior; L: Left; R: Right.

A fetal cardiac scan should start with the number of fetuses and how they are positioned in the uterus. Cardiac position and visceral situs (PIC 1) should be determined before beginning a detailed scanning. Differentiating the fetal right side from the left may be challenging in some cases, especially for non-ob scanners. Cordes et al have proposed a simple way of determination of fetal right and left sides.⁵ During initial orientation, the fetal head is placed to the right side of the screen. From this sagittal plane, the transducer is rotated 90 degrees clockwise to get the fetus in transverse image. In this image, the fetus will always be visualized from caudal to cranial. Depending on the fetal lie (face up/down, left side/right side down), the fetal side can then be determined with a simple technique. If the left hand is assumed as the letter L with the tips of fingers pointing towards the sternum and the palm is placed on

the spine, wherever the thumb is directed will be the left side (letter L) of the fetus. Once the cardiac position and visceral situs is



PIC 1: Stomach and aorta seen on the same side of the spine.



PIC 2: Four-chamber view. PFO flap bowing towards LA.



PIC 3a: Four chamber- crossing of great arteries- aorta.



PIC 3b: Four chamber- crossing of great arteries- PA.

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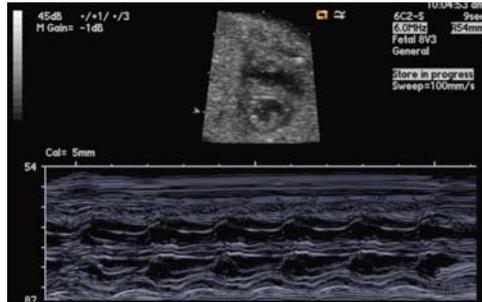
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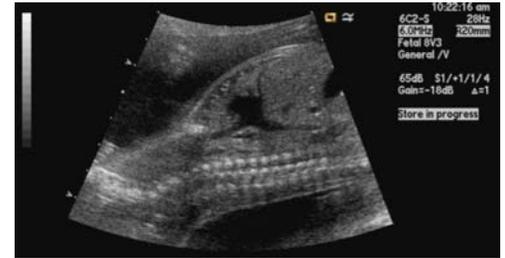
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PIC 4: Pulmonary veins- color Doppler.



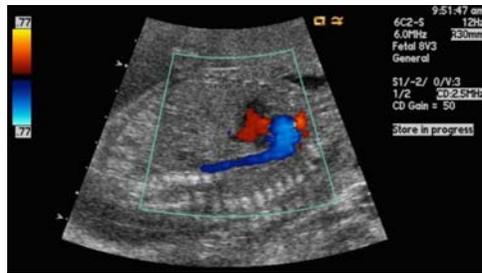
PIC 9: M-Mode of RV/LV to measure wall thickness.



PIC 13a: SVC-IVC.



PIC 5: RUPV color Doppler.



PIC 10: Aortic arch and branches with color Doppler.



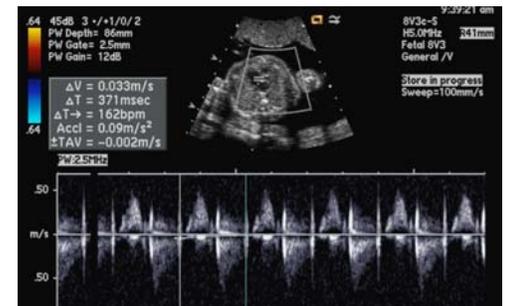
PIC 13b: SVC-IVC and foraminal flap.



PIC 6: Short axis of Ao and PA- PA branches.



PIC 11: Aortic arch Doppler.



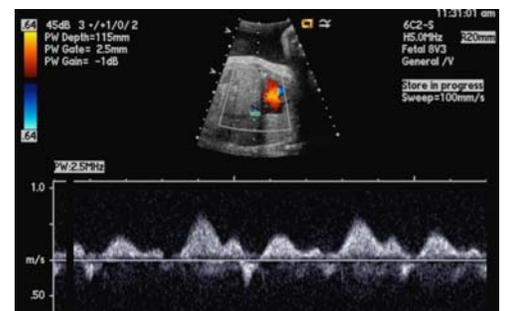
PIC 14: LVOT Doppler.



PIC 7: Aorta, PA Branches, SVC.



PIC 12: Ductal arch color Doppler.



PIC 15: IVC Doppler.



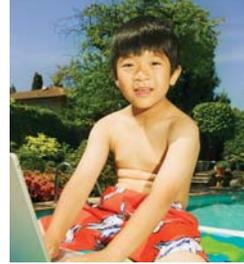
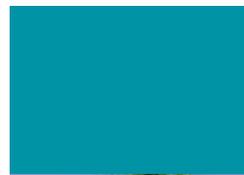
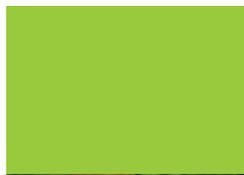
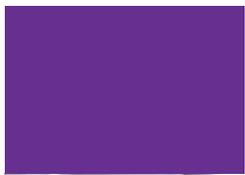
PIC 8: Short axis of RV/LV.

view, with minimal movement of the transducer, the heart should be scanned from posterior to anterior to see the coronary sinus and pulmonary veins posteriorly (PIC 4-5), and the aorta anteriorly (PIC 3). Moderator band and lower insertion of the TV leaflets to the crux of the heart compared to the insertion of mitral valve leaflets are hints for determination of the right ventricle.

The long axis view of the fetal heart will show the aortic mitral continuity and the ascending aorta. With further sweeping at this level,

determined, then one can move to further delineation of anatomy (Figure 1).

Four-chamber view (PIC 2) of the heart is the most widely recognized view by the non-fetal echocardiographer. It is usually easy to get and gives the operator an idea about the chambers (atria and ventricles) with respect to their size and function, atrial and ventricular septums and atrioventricular valves. From this



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This physician will join a team of 13 boarded Pediatric Cardiologists, 4 Nurse Practitioners, and 2 Exercise Physiologists. Our section, with support from nursing, social work, nutrition and exercise physiology, offers the region's most comprehensive care for newborns to young adults with congenital or acquired heart disease. Treatments emphasize preventive care. In addition, through our Ward Family Center for Congenital Heart Disease, we collaborate with cardiac surgeons and other specialists to offer enhanced treatment and research opportunities for children and adults with congenital heart disease. As a training site for University of Missouri-Kansas City, Children's Mercy physicians integrate education and teaching into all aspects of patient care. This training is to residents, fellows, medical and nursing students. Research is encouraged and supported in an environment rich with opportunities. EOE/AAP

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pulmonary arterial and aortic connections as well as ductus arteriosus will be seen.

When scanned perpendicularly from the long axis view, fetal cardiac short axis (PIC 6-8) view can be obtained. Cranial and inferior sweeps of fetal cardiac short axis will help with delineation of pulmonary veins, short axis of both ventricles, relationship of great arteries relative to their respective ventricles, pulmonary artery and its branches, inferior and superior vena cava and the 3-vessel view (SVC, AO, PA), ductus arteriosus and aortic arch with its branches.

The ductal and aortic arches (PIC 10-12) can be visualized from the ductal/aortic arch view. In this view, the RVOT, MPA and the branch PAs can easily be seen. Aortic arch with its head and neck vessels, ascending/transverse and descending aorta as well as the entrance of ductus at isthmus with its flow normally directed towards the isthmus/aorta (right to left flow) are findings that are observed sweeping from anterior right side of fetus to posterior left side.

The best view of the PFO/atrial septum is from caval long-axis view where long axis of SVC and IVC (PIC 13) and their continuity is also seen.

During visualization of the above mentioned cardiac structures, chamber, vessel, semilunar and atrioventricular valve annulus sizes should be measured and incorporated into the report. In addition to 2D measurements, Doppler interrogation of valves, systemic and pulmonary veins, aorta and ductus arteriosus, PFO, and umbilical vein and artery (PIC 11, 14-17) should be performed.

Cardiothoracic ratio should be measured from an optimal four-chamber view (PIC 18).

Different techniques have been studied to evaluate heart rate and rhythm. M mode, pulsed Doppler, pulsed tissue Doppler and recently tissue velocity imaging (TVI) are most commonly used modalities.⁶ In a normally conducting rhythm, calculation of baseline rate can be easily done from Doppler interrogation of the outflow tracts. (PIC 19).

For additional information, during M mode evaluation, simultaneous recordings of atrial and ventricular wall motion are done. Pulsed wave Doppler of ventricular outflow tract, along with the ventricular inflow where the

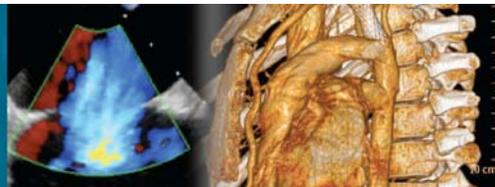
"A" wave of atrial contraction can be differentiated, gives information about the type of arrhythmia (premature beats, etc). Extrasystoles, especially premature atrial contractions (PAC) (conducted or blocked) are the most common arrhythmias encountered in a fetus. Though 1-3% of PACs may result in intermittent supraventricular tachycardias, usually PACs are benign findings that resolve by the time the patient seeks the attention of a fetal echocardiographer.⁶ Premature ventricular contractions (PVC) are rarely seen in fetuses, and may be benign findings though myocardial disease, cardiac tumors and decreased cardiac function should be ruled out. PVCs may require further postnatal evaluation.

Fetal tachyarrhythmias are usually SVTs that have a rate over 180 bpm. These arrhythmias warrant immediate attention, since as a result of this, cardiac compromise and hydrops can develop. Usually these arrhythmias are controlled by medical management but in rare instances may require early delivery.⁶ Ventricular tachyarrhythmias are very rare and, as mentioned before, may be the consequence of myocardial compromise or cardiac tumors and need immediate attention for treatment. Any fetus with tachyarrhythmias, even though hemodynamically stable, requires frequent follow-up imaging to evaluate the cardiac function and fetal hydrops.

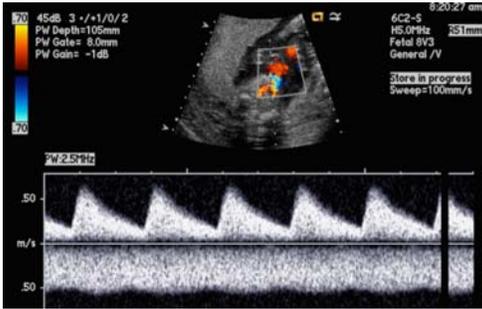
Bradyarrhythmias (HR less than 110 bpm) are usually encountered during episodes of vagal stimulation, fetal distress or systemic disease. During cardiac ultrasound examination, short periods of self-recovering bradycardia are commonly encountered. Nonconducted PACs are also a reason for bradycardia though these are not deemed hemodynamically significant. Maternal autoimmune diseases (SLE or Jorgen Syndrome) are the main reasons for fetal bradycardia, usually fetal atrioventricular block. Any AV block in the fetus warrants maternal investigation since maternal autoimmune disease may not be symptomatic at the time of fetal bradyarrhythmia diagnosis. Certain medical treatments (maternal plasmapheresis, dexamethasone, B sympathomimetic treatment) are being tried in mothers of fetuses with AV block. Where there is evidence of cardiac dysfunction or fetal distress, early delivery should be thought as an option.



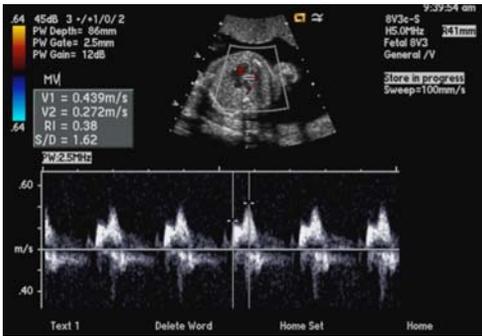
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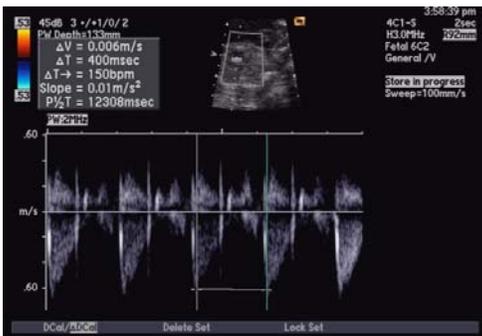
PIC 16: Umbilical artery and vein Doppler.



PIC 17: MV inflow Doppler.



PIC 18: Cardiothoracic ratio.



PIC 19: Heart rate calculation.

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5th Charleston Symposium on Pediatric Electrophysiology: Focus on Clinical Management

December 13-15th, Charleston, SC; Directors, J. Philip Saul and Thomas Paul

By J. Philip Saul, MD

Our 5th Charleston Pediatric EP Symposium took place in mid-December at the historic Francis Marion Hotel in Charleston, South Carolina, and like the prior symposia was a resounding success.

This year's symposium, however, had a distinctly different flavor. Based on feedback from prior years and an interest in keeping the course changing over time, the program focused primarily on "how to make decisions on care," rather than the technical aspects of delivering care. To that end, most of the talks were preceded by a case report which demonstrated the complexity of decision making in the relevant topic and posed a set of questions for the speaker. Apparently, our brochure "sold" this concept well because of the 100 or so attendees, over half were a mix of non-electrophysiologists, including pediatric cardiologists, adult electrophysiologists, adult cardiologists and nurse practitioners. Further, attendees came from all over the United States, 5 countries in Europe, and Japan.

The program began on Sunday at 1:00 p.m. with a session entitled, *Management of Selected Clinical Arrhythmias with Ablation as an Option: Decision Making*. After Dr. Walsh led the conference off by presenting the sad case of an 8-year-old girl who died suddenly after being followed for asymptomatic WPW since infancy, I delivered the first lecture on management of the asymptomatic child with WPW. My review of the topic covered a surprising amount of recent literature supporting the notion that it is, in fact, the asymptomatic child with WPW who is at the highest risk, indicating that some sort of risk assessment should be performed in children between the ages of 5 and 10 years. After another case report, Dr. Walsh reviewed contemporary management of paroxysmal SVT in the child, focusing on when to ablate, when to use other therapies and what type of ablation is most appropriate. We were then fortunate to have Dr. Marcus Wharton, an adult cardiologist from MUSC who specializes in atrial fibrillation ablation, provide an overview of who can benefit from AF ablation, what congenital heart patients might be candidates, and what are the most current techniques. By demonstrating that even patients with high left atrial pressures and CHF can improve dramatically after AF ablation, he proposed

the intriguing idea that some of our most complex congenital heart patients with AF might not only be candidates for ablation, but could improve their systemic ventricular function as well. Dr. Paul, my co-director, finished up the session with a talk on idiopathic ventricular tachycardia.

A conference dinner and reception followed the Sunday afternoon session at the Francis Marion Hotel and was enjoyed by all who attended.

"Based on feedback from prior years and an interest in keeping the course changing over time, the program focused primarily on "how to make decisions on care" rather than the technical aspects of delivering care."

All day Monday was devoted to electrical cardiomyopathies and those that can cause sudden death, with the morning session focused on diagnosis and the afternoon on risk assessment and therapy. We were indeed fortunate to have Dr. Michael Ackerman of the Mayo Clinic for these sessions, who gave five lectures through the course of the day. The day began with me providing an overview of syncope and how to differentiate malignant from benign presentations. Then Mike Ackerman provided an outstanding summary of the state-of-the-art for genetic testing, how to interpret the tests and what is the relevance of polymorphisms. He introduced the case of a family with hypertrophic cardiomyopathy (HCM) with two phenotypically and genetically affected children who died suddenly and a third child with genetically confirmed disease but normal phenotype. This case was re-discussed throughout the day in terms of appropriate management of the third child and the parents. John Reed from MUSC then covered ECG documentation methodologies and interpretation. The session turned to management of specific channelopathies including LQTS and the less common Brugada, short QT and



Dr. Thomas Paul, Course Co-Director.



Dr. John Triedman.



Dr. Michael Ackerman, LQTS and genetics expert. He gave 5 talks in one day!



The faculty. From the left -to-right: Mitchell Cohen, Barbara Deal, Ed Walsh, Marty LaPage, Phil Saul, Jan Janousek., Thomas Kriebel, Heike Schneider, Thomas Paul, Mike Ackerman, John Reed.

CPVT. John Triedman of Children's in Boston introduced the topic with a great case of a child with genetically-confirmed Brugada and Mike Ackerman followed with a 40-minute lecture covering a wide range of clinical issues. The final talks of the morning were on ARVD: delivered by Mitchell Cohen from Phoenix Children's and followed by Mike Ackerman for a talk on how to risk stratify in patients with HCM. Mitchell provided a terrific overview of ARVD focusing on how to diagnose it, and which patients are best managed with medication, ablation and ICD placement. Then Mike made a compelling argument that with few exceptions the specific genetic defect in HCM is not a good risk-stratifier; but having more than one risk factor including family history, syncope, VT, massive LVH, BP drop with exercise and LVOTO is a pretty good predictor for who might benefit from an ICD. Mike was also able to provide extensive data from his own large patient population of both HCM and LQTS patients.

Monday afternoon led off with a dramatic case presentation by our MUSC EP fellow, Marty LaPage, of a three-year-old with LQTS who has had over 100 ICD shocks after a left stellate ganglionectomy at Mayo Clinic, and a wide variety of maximal drug therapies. Mike Ackerman then discussed the latest treatment strategies for LQTS, including stellectomy. He presented convincing evidence that most LQTS patients can be managed with medication. Of the 15% of his cohort who have received an ICD, only 21% have received an appropriate shock and none of those had LQT3. Stellectomy seems to be very effective for ICD patients who continue to be appropriately shocked despite adequate medical therapy, or patients who cannot or don't want to take beta-blockade. After another case presented by Thomas Kriebel of Gottingen, Germany, John Triedman reviewed the indications for and technical choices for the pediatric patient who needs an ICD. A variety of non-transvenous approaches were discussed. There was such interest in Mike Ackerman's presentations that he agreed to stay through the afternoon break to answer questions. After the break, he gave his final presentation on the 2005 published Bethesda Guidelines for sports participation with the conditions discussed during the day, the role an ICD plays in those guidelines, and the relative lack of evidence to support the guidelines. His conclusion was that the Bethesda Guidelines are very conservative, and his recommendations were that these decisions could be more individualized, potentially allowing select



Dr. Marcus Wharton, Adult Electrophysiologists, speaking on atrial fibrillation ablation.



Dr. J. Philip Saul, Course Co-Director.

patients with well-informed families to participate in more sports. The day finished up with a panel discussion on sports participation in channelopathy and genetic cardiomyopathy patients which attracted a lot of questions and attention from the audience. Unfortunately, we had to bid Mike Ackerman goodbye to catch an evening plane just before the panel.

Tuesday was a full day with a morning session on cardiac resynchronization (CRT) in the pediatric patient with and without congenital heart disease (CHD), and an afternoon session on atrial and ventricular tachycardias in the postoperative patient with CHD. The CRT session began with another case from Marty LaPage, who presented a patient with an arterial switch for d-TGA, surgical



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Working Together to Develop a Better Tomorrow



Sports Participation panel. From left-to-right: Drs. Triedman, Janousek, Deal, Cohen and Saul.

heart block, dysynchrony and late ventricular dysfunction who was upgraded to a CRT device, but had minimal to no systemic ventricular function improvement. He posed the questions: Who should have such devices? How do we put them in patients with abnormal anatomy? and How do we decide if they are working? These were the critical questions for management and all were addressed by the speakers that followed. First, Hamilton Baker from MUSC reviewed the echocardiographic assessment of synchrony, followed by Mitchell Cohen reviewing the role of CRT in the patient without congenital heart disease who has either a primary cardiomyopathy or one secondary to pacing for complete heart block (CHB). John Triedman then presented cases of a young child with d-TGA and surgical CHB, and a 60+ year old man with corrected TGA who both improved



From left-to-right, Debbie Bryant and Martha Baldwin, course coordinators.

dramatically after CRT. Following these cases, Jan Janousek from the University of Leipzig in Germany provided an excellent review and meta-analysis of the available published data series on patients with CHD who have undergone CRT. He ended that presentation with a pair of slides proposing the concept that patients with pacing induced dyssynchrony are very likely to have a virtual cure by CRT, while patients with primary pump failure and dyssynchrony may have some improvement with CRT, but it is likely to be transient due to the progressive nature of the underlying myopathy. After the break, Mitchell Cohen presented another illustrative case on a single ventricle patient who underwent successful CRT pacing, followed by Barbara Deal from Children's Memorial in Chicago presenting an excellent overview of how to evaluate the need for ICD backup in some pediatric patients with CRT. Finally, after Ed Walsh presented a case on the complications that can be encountered in pacing a child with CCHB from infancy through adulthood, Jan Janousek provided an excellent review of transvenous versus epicardial pacing in the child and made the convincing case that almost all children <30 kg should have their first device placed epicardially, and the lead placed as close to the LV apex as possible to optimize synchrony. The audience seemed to be mostly in agreement when surveyed informally.

The final afternoon session had a nice mix of a few "experts" providing a brief 10-15 minute how-to on their management

"Review of the evaluations revealed that our focus on management hit the 'sweet spot' for a wide variety of practitioner types including pediatric and adult subspecialties."

techniques of a variety of arrhythmia categories: Ed Walsh on atrial tachycardia in the patient with two ventricles, Jan Janousek on atrial tachycardia in the atrial switch patient, me on atrial tachycardia in the Fontan patient, and Mitchell Cohen on ventricular tachycardia in the patient with congenital heart disease. The session ended with updates on the techniques and outcomes for catheter ablation of atrial tachycardias by John Triedman, substrate mapping of ventricular tachycardias by Thomas Paul, and surgical management of arrhythmias by Barbara Deal.

Review of the evaluations revealed that our focus on management hit the "sweet spot" for a wide variety of practitioner types including pediatric and adult subspecialties. From the feedback, it is clear the attendees felt the information was very valuable for their practices. Our day on Channelopathies and Cardiomyopathies appeared to be a big hit. I know I learned a lot as well. We look forward to using the feedback to design an even better course for the future!

Best Regards for the New Year!

CCT

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Medical News, Products and Information

Heart Transplant Patients Appear to Have Elevated Risk for Multiple Skin Cancers

Many heart transplant patients develop multiple skin cancers, with increased risk for some skin cancers among patients with other cancers and with increasing age, according to a report in the December issue of *Archives of Dermatology*, one of the JAMA/Archives journals.

"Solid organ transplant recipients are at increased risk for skin cancers," the authors write as background information in the article. "Incidence, tumor burden and risk factors for skin cancer are well documented in renal transplant recipients. However, these characteristics are documented to a lesser extent in heart transplant patients, who are at least twice as likely to have skin cancer compared with renal transplant recipients." Reasons for this could include the greater use of immunosuppressive medications and an older average age at the time of transplant.

Jerry D. Brewer, MD, of Mayo Clinic, Rochester, MN, and colleagues reviewed the records of 312 patients who had received heart transplants between 1988 and 2006. Patients had an average age of

47.4 years at the time of their transplant and information was extracted from their charts regarding overall characteristics, cancers, risk factors and death.

The patients developed a total of 1,395 skin cancers; overall, 46.4% of the patients had developed skin cancer during the 19 years of follow-up. This included 1,236 squamous cell carcinomas and 151 basal cell carcinomas (the non-melanoma skin cancers), five malignant melanomas and three other types.

When evaluating the tumor burden of the 312 patients, 76 (24.4%) had at least one squamous cell carcinoma, 24 (7.7%) had only one squamous cell carcinoma and 19 (6.1%) had 10 or more; in addition, 54 (17.3%) had at least one basal cell carcinoma, 23 (7.4%) had only one and two (0.6%) had 10 or more.

Patients were more likely to develop squamous cell carcinoma if they had other types of cancer after their transplant, were older or had a known cause for their heart failure. Infection with the herpes simplex virus, being older and using a medication known as mycophenolate to suppress the immune system were associated with an increased risk of basal cell carcinoma.

"Although a considerable tumor burden was found in this study, the rate of death due to skin cancer was surprisingly low. Only one patient died of skin cancer, of a melanoma," the authors write. "Health care providers and patients at our center have been educated for more than 10 years about the risk, early detection and treatment of skin cancer, which is apparent from the low mortality rate seen in the patients of this study."

"Vigilant sun protection practices, skin cancer education, regular skin examinations and daily vitamin D supplementation are appropriate interventions in these high-risk heart transplant patients," they conclude.

For more information, www.jamamedia.org.

Genetic Link to Heart Failure

A team of researchers, at Washington University School of Medicine, St Louis, has identified a group of 12 genetic variants in the HSPB7 gene that are associated with heart failure in humans.

The team, led by Gerald Dorn, used an approach they have recently developed that allows ultra-high-throughput targeted DNA sequencing to identify genetic variation in

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For more information please contact:

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Deadline for contact is February 28, 2010.

four genes with biological relevance to heart failure. They identified in a large group of Caucasian individuals with heart failure, 129 separate genetic variants in the four genes, including 23 that seemed to be novel. Further analysis of 1117 Caucasian individuals with heart failure and 625 nonaffected Caucasians indicated that a block of 12 genetic variants in the HSPB7 gene was associated with heart failure. Confirmation of this association was provided by analysis of an independent group of individuals.

The authors hope to use the same approach to identify further genetic variants associated with heart failure, a disease that is influenced by multiple genetic factors.

Read the complete article, "Cardiac signaling genes exhibit unexpected sequence diversity in sporadic cardiomyopathy, revealing HSPB7 polymorphisms associated with disease" in *Journal of Clinical Investigation* at: <http://www.jci.org/articles/view/39085?key=QR23mwtlf19slud3dWA9>

Study Finds Mixed Results Comparing 2 Surgical Strategies for Infant Heart Defect

Infants born with a severely underdeveloped heart are more likely to survive to their first birthday when treated with a new shunt procedure — yet it may not be the safest surgery long term, according to research presented at the American Heart Association's Scientific Sessions 2009.

Babies born with a critically underdeveloped left side of their hearts require three surgeries to correct the problem. A portion of the first operation, the Norwood Procedure, includes a connection to deliver blood from the heart to the pulmonary arteries feeding the lungs so that blood can pick up oxygen. There are currently two ways it can be done:

The new modification of the Norwood utilizes a right ventricle to pulmonary artery (RV-to-PA) shunt to connect the functioning right ventricle to the pulmonary artery.

The traditional version uses a modified Blalock-Taussig shunt (MBTS), which connects the aorta (the major blood vessel delivering blood from the heart to the body) to the pulmonary artery.

In a 15-center trial by the Pediatric Heart Network, 555 infants (61% male, 73% Caucasian) were randomized to receive either the RV-to-PA shunt or MBTS procedure.

In the first results from the study, the researchers reported:

- At 12 months, significantly more babies survived without requiring a heart transplant with the RV-to-PA shunt (74%) compared to the MBTS (64%, $p=0.01$).
- The RV-to-PA shunt had more complications, necessitating 240 interventions (87.6 for every 100 babies), for example, to make adjustments to the shunt, or to use balloons or stents to keep it open. Far fewer cardiovascular interventions were needed (183, or 66.5 for every 100 babies) in the MBTS group ($p=.006$).
- At an average of two years, the transplant-free survival advantage of RV-to-PA (68%) over MBTS (62%) had diminished and was no longer significant ($p=0.14$).

"Early results seem to favor the RV-PA shunt, but by two years there is no longer any survival advantage," said Richard G. Ohye, MD, lead author of the study and Associate Professor of Surgery at the University of Michigan Medical School in Ann Arbor. "It is still unknown which will turn out to be better over the long term."

For example, the children still must undergo other stages of surgical repair to increase the amount of oxygen in their blood. Good pulmonary artery growth is important in the success of this procedure. In the results so far, overall pulmonary artery growth was significantly greater after the MBTS.

"Ongoing surveillance as these children grow and undergo the final surgical procedure will be very important to determine the proper roles of the shunts," Ohye said.

Although rare, having a single working ventricle is the most common severe congenital heart defect.

"Just 25 to 30 years ago, this defect was uniformly fatal," Ohye said. "Now babies are treated with a series of three surgeries, but many still die, even when treated at experienced centers."

Each shunt procedure has theoretical advantages, but researchers previously didn't have hard evidence about which option to choose. The downside of the MBTS is that it takes blood away from the arteries feeding the heart muscle. The RV-to-PA shunt doesn't do this; but requires an incision into the baby's only working ventricle, creating scarring that might interfere with its later function.

"Roughly 50% of surgeons use each type, but we truly don't know which is better because there has never been a study," Ohye said. "In fact, there has never been a multi-center, randomized clinical trial performed in congenital heart surgery. This trial sets a new standard for using evidence-based medicine to evaluate new procedures in congenital heart surgery."

Co-authors are Sarah Tabbutt, MD, PhD; Lynn A. Sleeper, ScD; Gail D. Pearson, MD, ScD; Lynn Mahony, MD; Jane W. Newburger, MD, MPH; Minmin Lu, PhD; Peter C. Laussen, MBBS; Caren S. Goldberg, MD, MS; Nancy W. Ghanayem, MD; Peter C. Frommelt, MD; Andrew M. Atz, MD; Steven Colan, MD; Jeffrey P. Jacobs, MD.; James Jagers, MD; Kirk R. Kanter, MD; Catherine Dent Krawczeski, MD; Alan B. Lewis, MD; Brian W. McCrindle, MD, MPH; L. LuAnn Minick, MD; Seema Mital, M.D.; Christian Pizarro, MD; Chitra Ravishankar, MD; Ismee A. Williams, MD; and J. William Gaynor, MD.

The National Heart, Lung, and Blood Institute funded the study.

What Parents of Fetuses With Congenital Defects Want From Their Doctors

Newsweek — Before and after delivery, the mothers of unborn babies prenatally diagnosed with severe birth defects want doctors to walk a fine line between giving them realistic information—no matter how grim the prognosis—and giving them hope for the best possible outcome.

Results of a small study by neonatologists at Johns Hopkins Children's Center also show that mothers want to be prepared for all possible scenarios.

The study, described in October's *Pediatrics*, is believed to be the first one to examine the parent-neonatologist relationship during this highly emotional—and traumatic — period following the diagnosis of such congenital anomalies such as Tetralogy of Fallot, a severe heart malformation that's sometimes known as "Blue Baby" Syndrome, or bladder exstrophy, a condition in which the bladder forms abnormally outside the abdomen.

Because neonatologists are the first physicians to take care of these critically ill newborns, they work most closely with parents after what is often a shattering diagnosis with uncertain outcomes.

"With better screening in recent years and improved diagnostic tools, the number of congenital anomalies detected before birth has increased, and so has the burden on physicians to communicate the implications of such devastating news to expectant parents and to tell them what can be, and perhaps more importantly, what cannot



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be done,” says Pamela Donohue, ScD, senior investigator on the study and Director of Clinical Research for Neonatology at Hopkins Children’s.

The Hopkins study of 22 mothers, interviewed before and after delivery, found that what mothers valued most during prenatal consultation was preparation for all possible

outcomes and a tour of the Neonatal Intensive Care Unit (NICU), an intensely technological and alien environment to most parents.

In addition, the mothers said they wanted a knowledgeable, sensitive and caring physician, who is realistic, yet optimistic. As one parent put it, “...I think you can create realistic expectations, put all the possibilities out on the line, and still be able to comfort someone in saying, ‘You know we’re here and we’re going to manage this case with the expectation of the best possible outcome.’”

“After delivery,” says Francesca Miquel-Verges, MD, a neonatology fellow at Hopkins at the time of the study and one of its authors, “neonatologists: should review all the case notes before meeting with the parents, schedule time to sit down with the family, use easy to understand language, show sympathy and explain realistically what can be done.”

“A lot of these may seem like no-brainers, but in the hustle and bustle of a busy NICU, following through with such care is easier said than done,” continues Miquel-Verges, now at the University of Arkansas for Medical Sciences.

Mothers reported that having a sympathetic and compassionate physician was just as, or more important, than having one with all the facts. Indeed, textbook knowledge was of little value if the physician came across as cold or lacked empathy, the investigators found.

Another critical element was consistent and coordinated communication about the diagnosis among all healthcare providers, including neonatologists, obstetricians and specialists. Receiving inconsistent or conflicting information damaged parental trust and added to already high anxiety, researchers say.

Co-investigators in the study include S. Lee Woods, MD, PhD; Susan W. Aucott, MD; Renee D. Boss, MD; and Leslie J. Sulpar, RN MSN.

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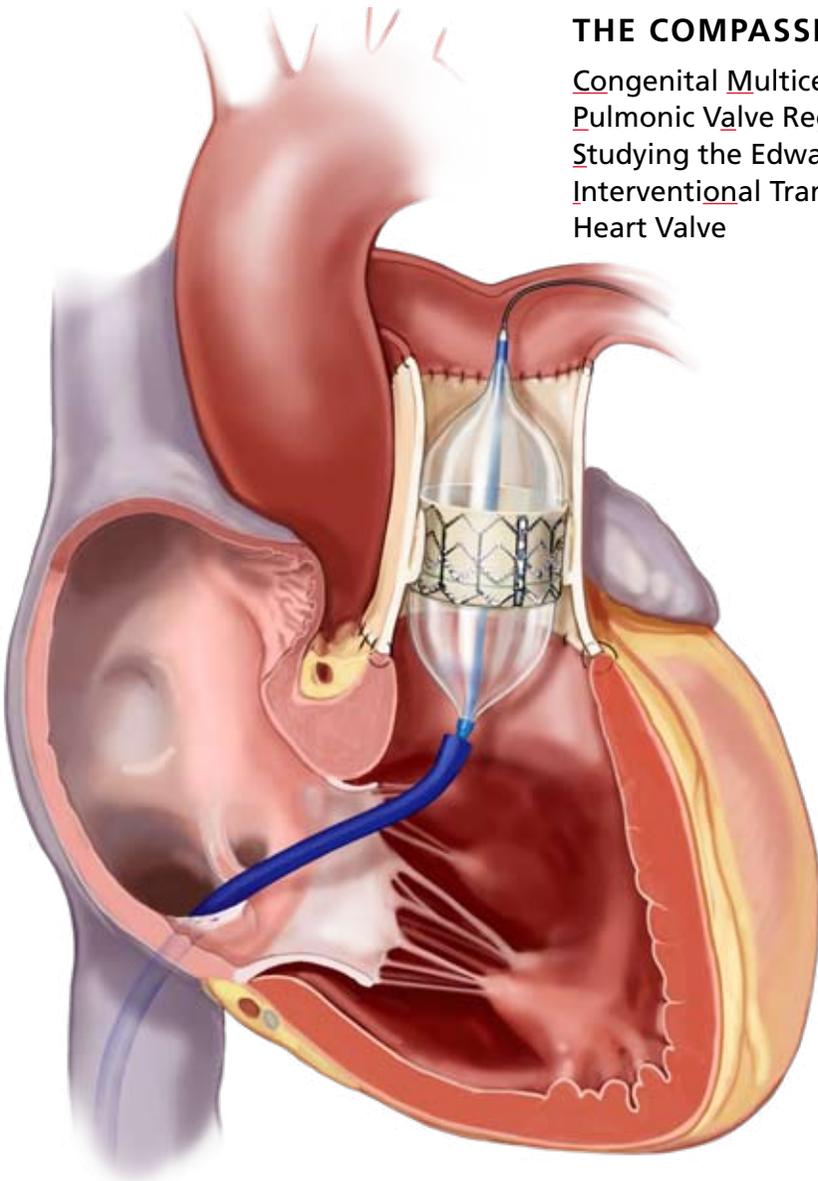
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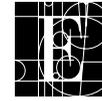
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