Review of the Congenital Cardiac Anesthesia Society program at Pediatric Anesthesiology 2008

Morning session submitted by Dr. Zulfiqar Ahmed
Children's Hospital of Michigan

Dr. Dean Andropoulus (Texas Children's), president of CCAS, opened the meeting with his welcome address, followed by meeting chair, Dr. James DiNardo (Boston's Children's) who outlined the day.

First part of the morning session was the "Cardiac Anesthesia Update" and the moderator was Dr. Steven Tosone (Emory Health Care). The first speaker was Dr. Mark Galantowicz (Columbus Children's) who has developed the hybrid procedure. He started with a historical perspective on the surgical repair of the HLHS (hypoplastic left heart syndrome). His current data of hybrid procedures included results of 43 patients. Mortality in these patients is currently zero after the hybrid procedure, with no intraoperative transfusion, no need for ECMO, CPB or inotropes. Dr. Ravi Thiagarajan (Children's Hospital Boston) later discussed the mechanical circulatory support of post cardiotomy myocardial failure. Multiple studies have shown that 3-4% post cardiotomy patients need mechanical ventricular support. These options include ECMO, IABP and VAD. Currently the survival with the bio pump is 41%. The use of ECMO for CPR has survival of 52% in neonates, 51% in pediatric patients but only 12% in adult population. The cost of ECMO was a significant factor (mean $205,146). ECMO performed in OR has better outcome then when performed in Cardiac ICU.

The second part of the morning session was "In my Opinion" with Dr. Emad Mossad (Texas Children's) as the moderator. Participants were Drs. Christopher Tirotta (Miami Children's), Glyn D. Williams (Stanford), David Vener (Cleveland Clinic) and James DiNardo (Boston Children's). The following questions were addressed:

1) The best inotrope for terminating CPB: A useful mnemonic was suggested- "Don't Eat My Chocolate, Please". D=dopamine, dobutamine. E=epinephrine. M=milrinone. C=calcium and P=phenylephrine and phentolamine.

2) Tight Control of Glucose on CPB: An audience vote for their threshold to treat high blood glucose showed that most of them would give insulin above 200-300 mg/dl.

3) Serum Lactate as prognostic indicator: The panel in this case was of unanimous opinion that a change in the lactate levels is more important then one isolated high level in the absence of cause.

The last part of the morning session, moderated by Dr. David Rosen (West Virginia University), was "The Failing Fontan". The first speaker was Dr. Scott Walker (Indiana University). He started with an evolutionary comparison of the circulation between cold-blooded animals and mammals. The fish circulation was described as being the closest to the Fontan physiology. An ideal Fontan patient should be in normal sinus rhythm, with 94-95% oxygen saturation on room air, no A-V regurgitation, no hepatomegaly, no renal dysfunction and a normal LV function. Concerns should arise when the patient exhibits worsening fatigue, weight gain, palpitations, syncope and lowering saturations, arrhythmias, heart failure, and exercise intolerance.

Drs. Karen Thomson (Children's National Medical Center) and Suanne Daves (University of Chicago) jointly presented the next session on "Evaluation of Fontan Patient". The 'perfect' Fontan circulation is the one that permits adequate passive pulmonary blood flow, systemic ventricular filling, and adequate cardiac output without the need for right-to-left shunting from a fenestration or acquired/congenital shunting via veno-atrial or veno-veno collateral vessels. An MRI could give more information in this regards than a cardiac ECHO. Other organ systems that may be affected by a failing Fontan circulation include GI system with hepatic dysfunction due to systemic venous hypertension, protein losing enteropathy, coagulation abnormalities and neurodevelopment issues.

Afternoon session submitted by Dr. Cathy Bachman
University of Chicago

The afternoon started with a "How I Manage It" panel moderated by Dr. Victor Baum (University of Virginia Medical Center). The 3 panel members were Drs. Gail Boltz (Stanford Medical Center), James Spaeth (Cincinnati Children's), and Dean Andropoulos (Texas Children's). Four clinical scenarios were discussed, the first being a 3 month old s/p Stage 1 palliation for a brain MRI. A variety of sedation techniques are used, ranging from standard propofol or general anesthesia with an inhaled agent, to dexmedetomidine using a high dose (load 1-2 mcg/kg and infusions of 1-2 mcg/kg/hour), to "older" drugs including chloral hydrate 75 mg/kg orally and pentobarbital 5 mg/kg orally or 3 mg/kg IV + 2 mg/kg as needed. A study of MRI's in 21 day old HLHS patients comparing pentobarbital IV vs. low dose inhaled agent +/- fentanyl showed no difference in patient outcomes between the techniques.

The second clinical scenario was an 8 month old trisomy 21 s/p TOF/CAVC repair for DL/bronchoscopy. Again, a variety of anesthetic techniques were discussed. Endocarditis (SBE) prophylaxis guidelines were discussed, and everyone was encouraged to review the recently updated guidelines.

The third scenario, 3 day old s/p Stage I palliation with uncontrolled post-CPB bleeding, brought up the issue of aprotinin and activated Factor VIIa. Some centers still use aprotinin for a few select cases, including Norwood repairs, and uncontrolled bleeding (if not surgical) may be treated with protamine, platelets, then cryoprecipitate, and rarely Factor VIIa. Aprotinin is used for select patients at other centers, and the few (and small) published studies available for pediatric patients do not appear to demonstrate a difference in postoperative problems as yet. However, use has been reduced significantly since the NEJM article (adults) was published. Factor VIIa is also used very sparingly, and the literature suggests that the incidence of thrombotic complications in pediatric patients may be rare but potentially severe.

The last scenario, 10 year old HLHS s/p OHT, severe CAV, developmentally delayed, needle phobic for myocardial biopsy/coronary angiography, was considered a very high risk patient by the panel members. Mortalilty in this group may be up to 16%, from either coronary artery disease or graft failure. CAD may not elicit angina symptoms (denervated heart). Points of discussion included preop sedation choices, intubation vs. LMA, and agents used for maintenance, with a wide variety used.

The workshops later in the afternoon were well attended. Wanda Miller-Hance (Texas Children's) gave the workshop entitled Transesophageal Echocardiograpy in Children: an Interactive Session. She walked us through the basics of TEE in pediatric patients, discussing indications, probe choices, contraindications, and complications. She talked about the use of the ICE probe for very small infants. Its main advantage is that it is smaller than the regular TEE probe, but can image in one plane only, is very stiff and may cause morbidity, and has no temperature control with the worry that it may get too hot. She demonstrated the various views, and the images throughout her presentation were excellent. The other workshop, Mechanical Ventilation: Nuts and Bolts, was given by Stephen Stayer (Texas Children's). The new and improved anesthesia machines have ventilators which are more accurate for neonates in particular, with the resultant decreased need to bring ICU ventilators to the OR. Features such as decoupling FGF from tidal volumes allow for more constant tidal volumes regardless of FGF. The newer ventilators also can better compensate for changes in compliance. Pros and cons of volume vs. pressure modes for neonates were discussed. Lastly, the newer machines take longer to clear of trace amounts of vapor for use in malignant hyperthermia susceptible patients – they must be flushed for over 65 minutes.