PULMONARY HYPERTENSION & A HISTORY OF GRAVES' DISEASE AND CARDIAC ARREST UNDER ANESTHESIA

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Case Report

- 20yo G2P1 presenting at 34wk 4d gestation
- Pulmonary hypertension, Takotsubo cardiomyopathy, anemia, and Graves' disease
- Multiple episodes of cardiac arrest during thyroidectomy
  - Global hypokinesis with areas of akinesis, LVEF <20%, impaired relaxation, severe RV dilatation, required IABP following surgery
  - LVEF recovered to 50% in months following, but moderate PA pressures and RV dilatation remained, and functional status limited by DOE
- Lost to follow-up for >1yr

Third Trimester Management

- Multidisciplinary decision-making regarding labor and delivery
  - Remarkably unremarkable pregnancy, NYHA II on presentation
- Methimazole commenced due to elevated free T4 and undetectable TSH
- Anticoagulation (LMWH) initiated at therapeutic dosing, consider sildenafil if symptoms worsen
  - Plan to hold 48hrs prior to scheduled induction
- Plan for vaginal delivery— induction of labor at 37wks 5 days
  - PA Catheter and epidural prior to induction
  - Forceps-assisted second stage of labor
- Plan for 3 day MICU stay post delivery

Course of Delivery

- Patient admitted day prior to induction for evaluation and monitoring placement, lovenox ceased day prior
- Central line and PA catheter placed
  - Controversial decision, differing opinions within team
- Epidural placed and induction commenced
- Digoxin loaded during active labor for episodes of SVT
- Brought to OR for assisted delivery
- Infant born with Apgars 9/9 at 1 and 5 minutes

Pulmonary Hemodynamics

	Baseline (one year pre-pregnancy)	Pre-delivery (35w3d)	Immediately prior to IOL (37w5d)	Immediately Postpartum	20hrs Postpartum	5 days postpartum
Systemic blood pressure, mm Hg	101/68	95/53	105/70	134/83	109/71	122/70
Heart rate, beats/min	68	108	125	105	108	59
CVP, mmHg	unknown	unknown	5	7	10	unknown
Pulm. artery pressure, mm Hg*	**>56-61/X**	**>60/20**	**62/34**	**56/38**	**47/40**	**unknown**
Cardiac output, l/min	unknown	4.4	5.7	unknown	unknown	unknown

**Pulmonary artery pressures from immediate pre-delivery until postpartum are via Swan-Ganz, all others from TTE*

Anesthetic Concerns

- Risk assessment

Risk Stratification

- The *REVEAL risk calculator* has been validated to predict 1yr survival in a general patient pool with PAH
- No good estimation of risk for pregnancy
- No safe cutoff for patients with pulmonary hypertension, although higher risk with NYHA III/IV

Regitz-Zagrosek, V. *et al.* ESC Guidelines on the management of cardiovascular diseases during pregnancy. *Eur. Heart J.* 2011

Benza, R. L. *et al.* The REVEAL Registry risk score calculator in patients newly diagnosed with pulmonary arterial hypertension. *Chest*. 2012.

Anesthetic Concerns

- Risk assessment
- Safety of neuraxial anesthesia, including anticoagulation issues

Neuraxial Anesthetic Considerations

- Epidural anesthesia is indeed safe if titrated gently to avoid dramatic changes in preload and SVR
  - Combined spinal-epidural is an option for elective Cesarean section

Anticoagulant	Time from last dose to placement	Time from removal to next dose	Comments
Low molecular weight heparin (LMWH)			
Therapeutic Dosing	>24hrs	> 4hrs, delay 24hrs if traumatic placement	Do not administer LMWH with catheter in place. Anti-Xa level does not correlate with risk of bleeding, contraindicated if used in conjunction with oral anticoagulation and/or antiplatelet medications
Prophylactic Dosing	10-12 hours	> 4hrs, delay 24hrs if traumatic placement	
Unfractionated heparin			
Therapeutic Dosing (IV)	2-4hrs, check for normal aPTT	1hr	If heparin administered for >4 days, check platelet levels and consider HIT HIT
Prophyllactic Dosing (Subcutaneous)	No delay needed if <10,000u/day and BID or daily dosing	1hr	

Horlocker TT et al. Regional anesthesia in the patient receiving antithrombotic or thrombolytic therapy: American Society of Regional Anesthesia and Pain Medicine Evidence-Based Guidelines (Third Edition). 2010.

Anesthetic Concerns

- Risk assessment
- Safety of neuraxial, including anticoagulation issues
- Preparing for a general anesthetic

Planning for a General Anesthetic

- Pacemaker/AICD – last interrogation and results
  - Response to magnet
- Airway considerations given pregnancy
  - Decreased FRC and concerns for hypoxemia and vasoconstriction
- Increased risk of postpartum hemorrhage with all Cesarean sections
  - Nitrous oxide contraindicated
  - Volatile halogenated anesthetics (sevoflurane, isoflurane) cause uterine relaxation and can mitigate the effect of oxytocin