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Disclosure

- Nothing to disclose
Objectives

- Describe the epidemiology, pathophysiology, obstetrical and anesthetic management for:
  - Thrombocytopenia during pregnancy
  - Hypercoaguable disorders of pregnancy
  - Acute Fatty Liver of Pregnancy (AFLP)
  - Peripartum Cardiomyopathy (PPCM)

Gestational Thrombocytopenia

- A G1P0 at 40 weeks 4 cm dilation requests epidural
  - PMH- morbid obesity (BMI 40)
  - PSH- none
  - Pregnancy hx- gestational thrombocytopenia

- Labs
  - Pre-pregnancy- Hbg- 12, HCT- 35, platelets- 175K
  - 28 weeks- Hbg-9, Hct-29, platelets-90K
  - Current labs-Hbg-9, Hct-29, platelets-74K, LFTs-wnl

- Airway- MP 4, 3 FB, LROM – potential difficult airway

Questions?

- What is the epidemiology and pathophysiology of gestational thrombocytopenia & immune thrombocytopenia (ITP)?
- What are the treatments for gestational thrombocytopenia & ITP?
- What is the lowest platelet count one case safely perform a neuraxial anesthetic in a pregnant patient?
- What are the signs and symptoms of an epidural or spinal hematoma?
### Normal Labs

<table>
<thead>
<tr>
<th></th>
<th>Nonpregnant</th>
<th>1st Trimester</th>
<th>3rd Trimester</th>
<th>% Change Term</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hbg (g/dL)</td>
<td>12-15.8</td>
<td>11.6-13.9</td>
<td>9.5-15</td>
<td>-15%</td>
</tr>
<tr>
<td>Hct (%)</td>
<td>35.4-44.4</td>
<td>31-41</td>
<td>28-40</td>
<td>-15%</td>
</tr>
<tr>
<td>Platelets (x10^9/L)</td>
<td>165-415</td>
<td>174-394</td>
<td>146-429</td>
<td>Unchanged or decreased</td>
</tr>
<tr>
<td>PT (sec)</td>
<td>12.7-15.4</td>
<td>9.7-13.5</td>
<td>9.6-12.9</td>
<td>-20%</td>
</tr>
<tr>
<td>PTT (sec)</td>
<td>26.3-39.4</td>
<td>23-38</td>
<td>22.6-35</td>
<td>-20%</td>
</tr>
<tr>
<td>Fibrinogen (mg/dL)</td>
<td>233-496</td>
<td>244-510</td>
<td>301-696</td>
<td>increased</td>
</tr>
</tbody>
</table>

Most coagulation factors increase → hypercoaguable state of pregnancy

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### Thrombocytopenia Epidemiology

- Decrease of 10% in platelet count common
- 10% of pregnancies experience thrombocytopenia
- Timing and onset vary
- Some disorders associated with increased maternal and neonatal morbidity and mortality
  - Hemorrhage
  - Neonatal intracranial hemorrhage
Isolated Thrombocytopenia

- Gestational
- Immune thrombocytopenia (ITP)
- Heparin induced thrombocytopenia (HIT)
- Type Iib Von Willebrand disorder

Thrombocytopenia associated with systemic disorders

- Preeclampsia
- HELLP syndrome
- Hemolytic uremic syndrome (HUS)
- Thrombotic thrombocytopenic purpura (TTP)
- Acute fatty liver of pregnancy
- Viral infections (i.e., HBV)
- Hypersplenism
- Nutritional
- Bone marrow dysfunction
- Systemic lupus erythematosus

Pregnancy-Associated Thrombocytopenia

<table>
<thead>
<tr>
<th>Pregnancy-Associated Thrombocytopenia</th>
<th>Peak time to Onset</th>
</tr>
</thead>
<tbody>
<tr>
<td>ITP</td>
<td>1st-2nd trimester</td>
</tr>
<tr>
<td>Gestational thrombocytopenia</td>
<td>2nd-3rd trimester</td>
</tr>
<tr>
<td>Preeclampsia</td>
<td>3rd trimester</td>
</tr>
<tr>
<td>HELLP</td>
<td>3rd trimester</td>
</tr>
<tr>
<td>AFLP</td>
<td>3rd trimester</td>
</tr>
<tr>
<td>HUS</td>
<td>3rd trimester</td>
</tr>
<tr>
<td>TTP</td>
<td>2nd trimester</td>
</tr>
<tr>
<td>SLE</td>
<td>Anytime</td>
</tr>
</tbody>
</table>

ITP, immune thrombocytopenia; HELLP, hemolytic; elevated liver enzymes, low platelet count; AFLP, acute fatty liver of pregnancy; HUS, hemolytic uremic syndrome; TTP, thrombotic thrombocytopenic purpura; SLE, systemic lupus erythematosus.

Gestational Thrombocytopenia

- Affects 5%-8% of all pregnancies
- 75% of all thrombocytopenias
- Platelet count < 130,000 to 150,000,
  - typically >70,000

- Develops late 2nd-3rd trimester
- No autoimmune dx or prior hx
Gestational Thrombocytopenia
Pathophysiology

- Accelerated platelet activation
- Accelerated consumption of platelets
- Reduced lifespan of platelets during pregnancy

Gestational Thrombocytopenia - Diagnostic Criteria

- Mild or asymptomatic thrombocytopenia
- No PMH or hx thrombocytopenia
- Occurs in late gestation
- No association with fetal thrombocytopenia
- Spontaneous resolution after delivery

Gestational Thrombocytopenia
Management

- Platelet counts >50,000 vaginal and cesarean delivery safe
- Routine obstetric care
- Neuraxial anesthesia dependent on platelet count
Immune Thrombocytopenia (ITP)

- Prevalence = 8 per 1000 pregnancies
- 5% of all cases of pregnancy-associated thrombocytopenia
- Onset is 1st or 2nd trimester
- Increased risk of neonatal intracranial hemorrhage

ITP Pathophysiology

- Accelerated clearance of platelets
  - coated by IgG anti-platelet autoantibodies
- Coated platelets removed via spleen
- Other causes-diminished production, alteration in T cell subsets

ITP is Diagnosis of Exclusion

- r/o incidental, preeclampsia, HELLP, etc
- May have prior hx thrombocytopenia
- Underlying autoimmune disorder
- Hx severe thrombocytopenia (<50,000)
  - Significant thrombocytopenia in 1st or 2nd trimester
    - declining platelet count toward gestation
OB Management

- Frequent platelet count monitoring
- Corticosteroids for platelet counts 30,000-50,000
- Intravenous immune globulin (IVIg) considered 1st line by some
  - Temporary effect-increase platelets
- Spleenectomy possible during 2nd trimester
- Platelet transfusion?

Anesthetic Management

- Thorough preoperative assessment
  - Labs-CBC, coags, LFTs
  - Consider coagulation studies if platelets < 100,000
  - R/O other causes, i.e., preeclampsia, AFLP

  - Evaluate for:
    - Clinical evidence of bleeding
    - Trend in platelet count and platelet function
    - Adequacy of coagulation factors
    - Risks/benefits of neuraxial anesthesia
      - Risk of failed intubation?

ITP & Epidural Placement

- Choi & Brull Systematic Review (2009)

  - No reports of epidural or spinal hematoma in N = 326
    - 87% lumbar epidurals
    - n = 9 platelets <50,000, n = 19 platelets 50,000-75,000

  - Thrombocytopenia not treated in majority of patients
    - <50,000 prompted tx w/ steroids, IVIg, or platelets prior to neuraxial anesthesia

  - No complications reported
What is a safe platelet count?

- Minimum “safe” platelet count undefined
- Platelet count between 75,000-80,000 adequate
- Consensus: <50,000 avoid neuraxial anesthesia
- 50,000 to 80,000 weigh risks vs. benefits
- Incidence of spinal hematoma extremely rare in OB
  - <1:200,000

Suggestions

- Thorough preoperative neurological evaluation
- Most skilled provider perform procedure
- Spinal safer than epidural
- Use flexible wire-embedded epidural catheter
- Check platelet count before removal of epidural catheter
- Monitor postop for epidural or spinal hematoma
  - Neurological consult and MRI

Epidural and Spinal Hematoma

- Prolonged or excessive blockade
- Return or worsening of blockade
- Bowel or bladder dysfunction
- Back pain radiating to legs
- Delayed recognition and treatment (>6-12 hrs) associated with worse outcome
Case Discussion

- Consult with OB-GYN-pt high risk for C/S
- You confirm platelet count is 74,000 and place CLE
- 2 hours later repetitive late decelerations → C/S
- No surgical or anesthesia complications
- Q2 hour neuro checks done postop
- No signs of epidural hematoma
- Pt discharged on POD #3

Clinical Vignette

- A 32 y/o G1P0 presents to the preop clinic at 32 weeks
- PMH-Protein S deficiency with hx of DVT
- PSH-none
- Meds-lovenox 40 mg SQ QD
- Airway- MPI, 3FB, FROM
Questions

- When should the patient stop here LMWH?
- Is it safe to place an epidural if the patient is on SQ heparin?
- How soon can you place an epidural after her last dose of LMWH? SQ Heparin?
- When can I remove the epidural after LMWH?
- When can the patient resume dosing of LMWH?

Thrombophillias

- Pregnancy & Hemostasis
  - increased clotting potential, decreased anticoagulant activity, and decreased fibrinolysis
- Thromboembolism occurs in 1 in 1600 births
- Inherited thrombophillias increase risk of thromboembolism
- Pulmonary embolism one of most common causes of maternal death

<table>
<thead>
<tr>
<th>Thrombophillias &amp; Autoimmune Disorders</th>
<th>VTE in pregnancy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Factor 5 Leiden mutation</td>
<td>40%</td>
</tr>
<tr>
<td>Prothrombin gene mutations</td>
<td>17%</td>
</tr>
<tr>
<td>Protein C deficiency</td>
<td>14%</td>
</tr>
<tr>
<td>Protein S deficiency</td>
<td>3%</td>
</tr>
<tr>
<td>Antithrombin III deficiency</td>
<td>1%</td>
</tr>
<tr>
<td>Antiphospholipid syndrome*</td>
<td>24%**</td>
</tr>
</tbody>
</table>

*high-risk for DVT, PE, MI, CVA, recurrent pregnancy loss.
**24% of events occur during pregnancy.
OB Management

- Thrombophillias & anticoagulants
  - tx dependent on history
  - LMWH

- Antiphospholipid syndrome
  - LMWH + low-dose ASA

Anticoagulation during Pregnancy

- Prophylactic-
  - Enoxaparin 40 mg SQ QD

- Therapeutic-
  - Enoxaparin 1 mg/kg BID

- 36 weeks
  - SQ heparin 5000 u SQ BID

- Stop at onset of labor

When can I place an epidural or spinal?

ASRA Guidelines

- Aspirin- no contraindication

- SQ heparin
  - <10,000/day no contraindication
  - Tx >4 days check platelet count (risk of HIT)
  - CLE removal 2-4 h after last dose

- LMWH
  - Prophylactic (single day dosing) = delay 12 h
  - Therapeutic (twice day dosing) = delay 24 h

- Remove catheter 12 h after last dose

- LMWH dosing 2 h after CLE removal

- Check record for other meds & risk factors
Case Discussion

- Patient admitted at 35 weeks in preterm labor 6 cm dilated
- Last dose of lovenox 8 hours prior to admission
- Obstetrician plans vaginal delivery
- Patient requests an epidural

What do you do?

Case Discussion

- Analgesia options
  - Wait 4 h until placing epidural (12 h after last dose)
  - Consider IV opioids → remifentanil PCA
- Remifentanil PCA at 40 mcg Q2 minutes initiated
- CLE placed 4 hours later
- SVD 2 hours later
- No complications
Clinical Vignette

- 25 yo, 38-week G2P0 admitted at 1 cm at NH Guam
- PMH- negative, PSH- none, OB-uncomplicated
- Labs- Hbg 13, Hct 41%, platelets 259,000
- Given morphine 5 mg IV + 5 mg IM
- 5 hrs later CSE- ropivacaine 0.2% 10 mL/hr
- 13 hrs after admission SVD
  - uterine atony→pitocin 40U, methergine 0.2 mg IM, EBL-500 mL
  - CLE removed per protocol by RN

13 hrs after admission patient become obtunded

- 112/79, HR- 107, RR-88, 99%, patent airway, weakly squeeze hands to command
- CT head (-), transferred to ICU
- Glucose- 47 mg/dL→50% dextrose. No response
- Narcan 0.2 mg → responds
  - Describes general malaise and fatigue sx
- Labs-
  - liver failure, renal insufficiency, metabolic acidosis, hypoglycemia, coagulopathy (INR = 4.3)

AFLP diagnosis
AFLP Pathophysiology

- Potentially fatal metabolic disorder of liver
- Incidence 1:1000 to 1:20,000, mortality <10%
- Exact cause unknown
  - Genetic role?
  - mitochondrial trifunctional protein dysfunction
  - deficiency of LCHAD
  - free fatty acid accumulation → liver failure

AFLP Pathophysiology

- Develops commonly during 3rd trimester
- Malaise, N/V, headache, epigastric pain, jaundice
- Rapid development of liver failure + encephalopathy
- Hypoglycemia & hyperbilirubinemia characteristic
- Renal dysfunction common
Obstetrical Management

- Treatment is prompt and supportive care
- Consultation with experts
- Delivery of fetus
- Consider transfer to tertiary care facility

Anesthetic Implications

- Optimize patient prior to delivery
  - Correct hypoglycemia, coagulopathy, thrombocytopenia, anemia
- Prepare/treat hemorrhage
- Avoid medications with high hepatic metabolism
  - i.e., morphine and active metabolite
- CLE ➔ Monitor for signs of epidural hematoma
  - Timing of CLE catheter removal

Case Discussion

- Coagulopathy, thrombocytopenia and anemia treated with blood product transfusions
- Hourly neurological checks performed
- Medically evacuated to Hawaii 48 h after admission
- Discharged POD #7
- Labs normalized POD# 13
Clinical Vignette

- 26 G1P0, 69 kg, 35 w EGA presents with 3 day hx of SOB and inability to lie flat, blurred vision, & lower extremity edema
  - 157/100, HR-140, RR-22, T-36.6, SPO2- 92%, FHT-140
  - PMH- none, PSH- none, Prenatal- uncomplicated
  - Labs- tox labs WNL, K = 2.6 meq/L
  - CXR- pulmonary edema
  - Presumptive diagnosis = severe preeclampsia
  - Labetalol 10 mg IV + furosemide 10 mg

Clinical Vignette

- 2 hrs after admission acute decompensation
  - SPO2 81% 100% NRB, 157/112, late decels
  - 10 mg furosemide
  - Emergency cesarean delivery
    - RSI → pink frothy secretions
    - SPO2- 75%–85%, ETCO2- 35 mm Hg, 120/70-130/80’s, HR-110
    - ABG end of case-7.37/58/42/24/85%/-1
  - 3 hrs after admission: transferred to ICU
Clinical Vignette
- ICU- 125/53, HR- 97, SPO2- 75% → SIMV
- Improving respiratory function
- Tx- magnesium gt, diuresis, afterload reduction
- CT- neg for PE
- POD#2- worsening pulmonary edema
  - BNP – 1600 pg/mL, ECHO- EF 20%
- Diagnosed with PPCM

PPCM vs. Severe Preeclampsia
- Overlap in PPCM and severe preeclampsia
  - make diagnosis difficult
- Oxidative stress contributes to PPCM and preeclampsia
- Severe preeclampsia develops after 20 weeks' EGA
- PPCM can develop in the last month of pregnancy or within 5 months after delivery
  - lacks an identifiable cause
Treatment of PPCM

- Similar to treatment of heart failure (HF)
  - Diuresis
  - Afterload reduction
- VIP differentiate compensated vs. uncompensated HF
  - Beta-blockers contraindicated in uncompensated HF
    - Could labetalol worsened this patients HF?
  - Hydralazine better for BP & afterload reduction
- ACI contraindicated during pregnancy
- Prophylactic anticoagulation

Prognosis of PPCM

- EF slow to improve

- Case series- 75% did not fully recover at 5 yrs

- Increased morbidity & mortality with subsequent pregnancies
  - Multidisciplinary management
Anesthetic Management

- Dependent on severity of PPCM
- Management similar to HF → consider cardiology consult
- Consider patient status, urgency of situation/need for delivery
- Invasive monitoring and vasoactive agents may be indicated
- Hemodynamically stable
  - SVD - epidural analgesia ok; check anticoagulation status
  - C/S - CLE, CSE (low-dose spinal), GETA
  - Minimize rapid onset of sympathetomy

Case Discussion

- Pt extubated on POD#4
- Discharged home POD#9
  - lisinopril & carvedilol & oxygen therapy
  - Counseled on risks of subsequent pregnancy
- 9 months after delivery
  - EF 40-50%
  - Still needed oxygen for exercise-induced hypoxemia

Conclusion

- PPCM rare disease of pregnancy
- Have high index of suspicion with subtle signs HF
- Manage like HF patient
- Multidisciplinary team management VIP
Questions?

References

5. Chestnut’s Obstetric Anesthesia 4th Ed.