I DIDN’T KNOW WHAT I DIDN’T KNOW

Mark Goodwin, MD
Advocate Medical Group
Disclosure

Speaker name: Mark Goodwin, MD

I have the following potential conflicts of interest to report:

☑ Consulting
☐ Employment in industry
☐ Stockholder of a healthcare company
☐ Owner of a healthcare company
☐ Other(s)

☐ I do not have any potential conflict of interest
• 32 y/o Female, 23 weeks pregnant presents to ER with left leg pain and mild swelling. Just returned from business trip to San Antonio. During trip had episode of lightheadedness which she thought was hypoglycemia.

• DVT Ultrasound – Negative

• What would you do?

• How would you treat???
Venous thromboembolism in pregnancy

- 1.1 deaths per 100,000
- 10% maternal deaths
- 33% pregnancy related DVT and 50% PE occur after delivery
- 4-5 fold increased risk of VTE – 20% increase risk in puerperium
- 80%DVT and 20% Pulmonary Embolism
- Majority proximal, massive and left leg
She presents to ER with increased pain & swelling left leg. Some SOB possibly from to pregnancy. Left leg more swollen. Right leg some fatigue. Erythema. Temp 100.2. HR 90-100. FHR163. US extensive DVT. IV heparin. At 3a.m. had question syncope in bed from mild drop in BP from uterus compressing IVC. Patient feels good.

• What would you do next? Anything?
• How would you have treated her?
Anticoagulation and Pregnancy

• Increase of maternal blood volume 40-50% and volume of distribution
• Increase in GFR with pregnancy
• Shorter half live for unfractionated heparin and LMWH may require higher doses and more frequent administration
You Don’t Know – What You Don’t Know
Ionizing Radiation Outcomes

- Intrauterine fetal death
- Malformation
- Growth and Developmental Disturbances
- Mutagenic and Carcinogenic Effects
Imaging and Pregnancy

- Background exposure fetus for 9 months is 1000 microGy
- Limited CT pulm angio is 130 microGy-1/7th times less than natural radiation exposure for pregnancy over 9 months
- Terminate pregnancy if > 100,000 microGy
- 100 cGy increase risk of breast CA by 40% (similar to never being pregnant)
- Breast exposure CT 20-50 microGy
Bottom Line

• Although the radiation risk to the fetus cannot be ignored, the risk is very low.

• The risk of fetal death is much, much greater if the mother has an untreated pulmonary embolism.
Hospital course

- CTA shows moderate PE
- Leg very swollen 2–3 times right leg
- Echo RV not dilated
- Troponin negative
- Heart rate 105. Dyspnic with conversation
- She is an athlete
- What would you do now???
It’s Never Easy

• Brought to lab for IVC filter as felt hemodynamically could not tolerate further embolism
• Phillips Clarity X-Ray allows 25% of normal radiation
• Vena Cavagram IVC occluded
• Now What????
You Don’t Know – What You Don’t Know
TEAM

- Cardiology
- Obstetrics
- High Risk OB
- Maternal/Fetal Medicine
- Radiology

- CV surgery
- Hospitalist
- Nursing – Critical Care, Telemetry, CVOR, L&D, Cath Lab
- Outside resources
Fetus Prognosis 25 Weeks

- 700-800 gms
- 85% chance of survival
- 74% survival without profound neurodevelopmental impairment
- 60% survival without moderate to severe neurodevelopmental impairment
- 10-15% ICB during delivery
TPA

- Large molecule does not cross placenta
- Two compartment clearance – hepatic and plasma
- Half life – 4 minutes
- No increase risk to fetus or teratogenic
- No increase risk bleeding to mother unless during delivery
Lovenox

• Not Teratogenic – Animal studies given 15 times the normal dose
• Does not cross the placenta
• 604 women – 72 hemorrhagic events in 63 women. 14 Neonatal hemorrhage
• Dose 1mg/kg q12 hour
• Factor Xa level - .7 – 1.0
• Test Factor Xa level 4 hours after dose
Intervention

- IVC filter placed
- Trellis device left leg to IVC
- Angiojet with pulse spray of TPA
- Ekos catheter bilateral iliacs
- IVUS left iliac
- TPA 0.75 mg/hr left leg and .5 mg/hr right
- Heparin 200 units/hour
Next day

- IVC thrombus nearly resolved
- Left common iliac significantly better but still thrombus
- Angiojet with thrombectomy
- PTA of left common iliac with 12 mm balloon
- No stent – will need in future
- Ekos/TPA for 12-24 more hours
Never easy

- Had some flushing with Angiojet thrombectomy
- Developed some back pain – Hemoglobin, fibrinogen and platelet all stable
- Followed by L&D nurses – now having contractions
- Procardia started. Already received steroid
- TPA stopped – concern about delivery
All Worth It

• Heparin 2900 units/hour
• Contractions resolved
• Leg dramatically improved. HR 68
• “This is the best I have felt in weeks. I feel great!”
• Mom and baby home on Lovenox
• Follow Xa levels intermittently
• Delivered healthy baby at 38 week. IVC filter removed and May-Thurner stented
Conclusion

- CT radiation risk exposure to fetus is 130 milliGy which is \( \frac{1}{7} \) of 9 month of background radiation exposure
- Phillips Clarity allow dramatically lower amounts of radiation – 75% reduction
- Possible \( \frac{1}{300,000} \) increased risk of death from cancer risk to fetus
- Check for hypothyroid in first week
Conclusion

• Clinical signs of PE misleading
• Ultrasound for DVT not 100% accurate particularly for iliac veins which are rarely evaluated
• Know what you don’t know
• Lovenox does not cross placenta
• Monitor Xa levels with pregnancy and Lovenox in all cases of DVT/PE because of increases in GFR and blood volume
Conclusion

• Significant mortality, developmental and ICB risks with delivery of 25 week fetus
• TPA has ½ life of 4 minutes
• TPA does not cross placenta
• Use catheter directed TPA to minimize dose and deliver to thrombus
• Low dose heparin during TPA
• Avoid Angiojet thrombectomy???
• Risk of radiation exposure to fetus is far, far less than risk of untreated PE
I DIDN’T KNOW WHAT I DIDN’T KNOW

Mark Goodwin, MD
Advocate Medical Group
DVT Ultrasound

• Excellent screening test
• Very operator dependent
• Does not examine iliac veins!!!!!!!
• Does not replace your clinical judgment
• Severe left leg swelling in female is May - Thurner until proved otherwise
May – Thurner Syndrome

- Iliac DVT from right common iliac artery compressing left common iliac vein
- Anatomy exists in 20% of population
- Women 3 times more likely than males
- Needs IVUS for diagnosis
- Treat with lysis and stent
- NIVL – Non thrombotic Iliac Vein Lesions may affect either right
Deterministic Effect

- Deterministic effect – exposure affects severity of outcome
- Deterministic effect are dose related affecting large number of cells. If injury occurs during organogenesis (first 12 weeks of fetal development) impairment, agenesis or malformation of organ may occur
Stochastic Effects

- Stochastic Effects – Exposure Affects Probability of Outcome
- These are monoclonal resulting in a change to genome and altered differentiation of a cell. Probability but not severity increases with radiation dose
- Increase risk of thyroid cancer with in utero exposure to radiation. Chernobyl is an example of a stochastic effect
Imaging and Pregnancy

• Limited CT may be lower than V/Q but much higher sensitivity and specificity
• V/Q scan place foley to decrease fetal exposure
• May have increase risk of hypothyroid in newborn from iodinated contrast
Imaging and Pregnancy

- Fetus 100 microGy may result in 1/300,000 increase risk of death from cancer before age 15
- Half pack a day smoker 1/200 relative risk
- Pregnancy 1/170,000 relative risk
The two-compartment clearance model showing the microconstants used in the circulatory simulation.

• 1. TPA increases risk of bleeding in fetus
• 2. CTA has minimal radiation risk for fetus
• 3. May Thurner is only on left leg
• 4. Lovenox crosses the placenta
• 5. TPA does not cross the placenta
• 6. Ultrasound accurate for iliac DVT
• 7. Factor Xa levels sometimes should be monitored with Lovenox and pregnancy
Quiz – True False

1. TPA increases risk of bleeding in fetus - False
2. CTA has minimal radiation risk for fetus- True
3. May Thurner is only on left leg - False
4. Lovenox crosses the placenta - False
5. TPA does not cross the placenta - True
6. Ultrasound accurate for iliac DVT - False
7. Factor Xa levels sometime should be monitored with Lovenox and pregnancy - False