



Peripartum Amniotic Fluid Embolism

Key Articles

1. Shamshirsaz AA, Clark SL. Amniotic Fluid Embolism. *Obstet Gynecol Clin North Am.* 2016;43(4):779-790.
2. Society for Maternal-Fetal Medicine (SMFM) with the assistance of Pacheco LD, Saade G, et al. Amniotic fluid embolism: diagnosis and management. *Am J Obstet Gynecol* 2016;215:B16-24.

Introduction

- Amniotic fluid embolism (AFE) is a catastrophic syndrome that can occur during or closely after delivery.
- Although uncommon, of women who die or develop unexpected cardiovascular collapse, AFE is statistically the most likely diagnosis.
- True incidence is unknown but estimated to occur once in every 10-50k deliveries.
- Unfortunately, there is no gold standard test for the diagnosis of AFE, and diagnosis is often made by clinical presentation.
- Unfortunately, many of the signs and symptoms of AFE overlap with other more common obstetric complications such as hemorrhagic shock due to postpartum hemorrhage, anaphylaxis, or placental abruption.

Recognition and diagnosis

- When first described, the syndrome described as an AFE was thought to be the result of a large bolus of fetal material (amniotic fluid) into the maternal circulation.
- New research suggests that this condition is not embolic, but more likely an inappropriate host response to fetal antigens, that causes a massive inflammatory response leading multisystem organ failure.
- Acute pulmonary hypertension is more likely to develop from diffuse endothelial exposure to amniotic fluid.
- In the unstable patient presenting with precipitous delivery, a rapid differential diagnosis should include:
 - Unrecognized hemorrhage
 - Placenta abruption
 - Uterine rupture
 - Eclampsia
 - Anaphylaxis (IgE mediated?)
 - Endotoxin mediated septic shock
 - PE
 - Peripartum cardiomyopathy
 - AMI
- **Classic Triad:** Hypoxia (ARDS/Pulmonary hypertension), Hypotension (vasoplegic response), coagulopathy (DIC)

Key Pearls:

1. AFE has a classic progression of symptoms, starting with hypoxemia followed by hypotension, then a developing hemorrhagic shock secondary to DIC.
2. AFE most commonly presents during labor or within 30 minutes of delivery

Early Management

- **Form your team EARLY**
 - Make sure OB is notified of patient and updated on clinical status
 - Managing these patients will often utilize a surgical and medical approach
 - OB may choose to perform emergent hysterotomy in the crashing patient as the fetus is often in distress secondary to uterine malperfusion
- As soon as hypoxia is recognized, it's important to address the "early killers" from AFE which are hypoxia and right ventricular dysfunction.
- Early focused/point-of-care echocardiography can identify RV dilation and dysfunction, along with other signs of pressure overload due to acute pulmonary hypertension.
- **Reverse hypoxemia:** Start with non-rebreather but be prepared for rapid intubation.
 - Be particularly cautious with intubation – while it may be inevitable, be prepared to intubate using an RV protective strategy.
 - This may include pre-intubation initiation of vasopressor (epinephrine may be ideal) or inotropic support
 - Early initiation of inhaled epoprostenol or nitric oxide, coinciding with systemic inodilators (dobutamine, milrinone) may be beneficial.
 - **Beware: this may not be completely due to pulmonary edema – poor peripheral perfusion due to RV failure/obstructive shock can also give low pulse-ox value.**
- Fluid management is often complex – particularly in the setting of active or recent delivery, but in general, patients with cor pulmonale do not tolerate fluid resuscitation well.
- If the patient does arrest, standard ACLS is recommended

Focus on Coagulopathy

- While hypoxemia and cardiovascular collapse are often the early killers in patients with an AFE, coagulopathy and the development of DIC leading to hemorrhagic shock are the primary cause of death should the patient survive their initial resuscitation.
- Amniotic fluid causes platelet activation, compliment activation, and is also a significant source of tissue factor leading to fibrinolysis.
- Obviously, this can be devastating in the patient who recently delivered patient with active bleeding issues.

Key Pearl

1. **Beware making the diagnosis of AFE prematurely in the critically ill obstetrics patient and treating uterine atony with secondary coagulopathy. These patients will often not have other symptoms such as hypoxemia and RV dysfunction.**

- Uterine atony is common, and the use of oxytocin or prostaglandins should be used aggressively to attempt to minimize uterine bleeding. If an emergent hysterotomy is performed with significant ongoing hemorrhage, the OB surgeons may decide to perform damage control pelvic packing and delayed closure.
- Early recognition of abnormal bleeding from IV sites, hematuria, GI hemorrhage, or worsening vaginal/surgical bleeding are critical when considering DIC.
- TEG guided therapy may be useful
- Resuscitation of the actively hemorrhaging patient should include balanced blood product resuscitation (probably massive transfusion activation)
 - Attempting to keep the quantitative platelet count > 50,000 and normalized PTT with FFP and cryoprecipitate
 - The use of PCC has not been well described here
- **Hyperfibrinolysis:** consider early TXA or aminocaproic acid
- The use of recombinant Factor VII has been described, its use can be considered as a last resort, but comes at the risk of significant thrombosis.

Nuances of high-quality post-arrest care – THINGS we do regularly

- The use of VA ECMO has been described as a salvage measure, but not routinely recommended due to difficulty with coagulopathy
- Hemodynamic targets should include a MAP > 65 mmHg
- Avoiding hyperoxia
- TTM (32-36 degrees) for 24-hour is recommended to try and prevent secondary ischemic-reperfusion injury.
 - If significant bleeding/DIC is ongoing, a target of 36 degrees is recommended
- Critical to sit down and discuss with family what happened and what the plan is from here

Take Home Points

- AFE is an uncommon complication with devastating outcomes
- Usually presents with a predictable progression from hypoxemia to RV failure to coagulopathy
- Early recognition with attention to right ventricular failure and cardiovascular dysfunction may significantly impact patient outcome
- Identifying uncontrolled uterine bleeding is vital, but key pearl is that these patients usually don't present with hypoxia or RV failure.