

# respiratory failure in pregnancy [created by Paul Young 09/10/07]

## causes

### pregnancy related

- Tocolytic-induced pulmonary edema
- Eclampsia
- Aspiration of gastric contents
- Chorioamnionitis
- Amniotic fluid embolism
- Trophoblastic embolism
- Placental abruption
- Obstetric hemorrhage-relate cause
- Endometritis
- Retained placental products
- Septic abortion
- Increased infections
  - Viral: varicella, pneumonia
  - Bacterial: listeria, pyelonephritis
  - Fungal: blasto, coccidiomycosis
  - Protozoal: malaria

### non pregnancy related

- Sepsis
- Pneumonia and pneumonitis
- Severe trauma: pulmonary contusion
- Multiple transfusions
- Aspiration of gastric contents
- Acute pancreatitis
- Inhalational injury
- Fat emboli
- Drug overdose
- Near drowning

## ARDS

### general

- Although the occurrence of ARDS during pregnancy is rare, it is often lethal and has been reported to be a major factor in maternal mortality.
- Incidence appears similar to the general population.
- Pregnancy increases the spectrum of causes for ARDS and complicates the management of ARDS.

### therapy:

- Although no published studies have investigated the use of low tidal volumes in the treatment of pregnant patients with ALI, the proven efficacy of this method of ventilation in nonpregnant patients with ARDS provides strong support for its universal use. There are no human data regarding the effect of permissive hypoventilation on the uteroplacental and umbilical blood flow.
- Fetal oxygenation depends on maternal cardiac output. This dependence places several limitations on the type of therapy that can be given for ARDS before delivery of the baby. Diuresis, PEEP, and vasopressor treatments can change the maternal blood flow distribution and may shunt blood away from the uterus.
- Consideration for elective delivery should be given in pregnancies of at least 32 weeks of gestation. Even in stable patients with ARDS, abrupt fetal deterioration is not uncommon. Elective delivery needs to be considered at every opportunity, and risks and benefits should be individualized in each case with input from various management teams. Delivery may have a positive impact on maternal condition in patients with ARDS who are deteriorating, and delivery needs to be considered as a therapeutic option.

### Effects of respiratory distress syndrome on pregnancy

#### - ARDS has four major effects on pregnancy:

- (1) impaired maternal oxygenation causing fetal distress;
- (2) premature labor triggered by the underlying maternal condition or the complications of ARDS;
- (3) limited assessment window of the fetal well-being because of therapies used to treat ARDS; and
- (4) exposure of the fetus to drugs used in the routine management of patients with ARDS.

### Fetal monitoring

- Ongoing fetal assessment is best performed with continuous fetal heart rate monitoring and periodic fetal assessment with bedside sonographic examinations (the biophysical profile).
- Fetal movement, along with fetal movement related heart rate accelerations, is a reassuring sign of fetal health.
- Fetal movements are affected by the maternal use of sedatives, anxiolytics, and neuromuscular blocker drugs.

## aspiration

- Parturient patients are vulnerable to aspiration because of:
  - (i) the relaxed gastroesophageal sphincter,
  - (ii) elevated intragastric pressure because of the enlarged uterus,
  - (iii) decreased gastric motility, and
  - (iv) diminished gastric emptying during labor.
- regional anesthesia can lead to abdominal and intercostal muscle weakness, depressing the ability of patients to cough and clear the airway. Opiates and sedatives can obtund protective laryngeal reflexes
- the incidence of failed intubation is much higher in pregnant patients than in general surgical patients. Many cases of fatal aspiration occur during difficult or failed intubation.

## venous air embolism

- causes:
  - Venous air embolism can occur in a wide variety of circumstances in pregnant patients. This complication can arise during delivery, labor, abortions, placental anomalies, central venous access, & surgical procedures
  - Venous air embolism can occur at any time during delivery and may be more common during cesarean deliveries. The mechanism is attributed to air entry at the subplacental venous sinuses.
- clinical manifestations:
  - Massive venous air embolism can present as a sudden, dramatic, and devastating event with hypertension, tachycardia, tachypnea, diaphoresis, hypoxemia, and cardiac arrest.
  - Venous air embolism may cause a less dramatic picture with chest pain, decreased oxygen saturation, and dyspnea. Physical examination may reveal a mill wheel murmur across the precordium. ECG changes of ST-segment depression may be noted in 25% to 50% of cases.

### Treatment

- Measures should be taken to prevent further air entrapment. The patient should be placed on 100% oxygen to hasten removal of nitrogen from the air bubbles.
- The patient can be placed in left lateral decub position with the Trendelenburg position to prevent air lock and reduction of forward blood flow at the pulmonary artery outflow tract.
- If the catheter is already in place, some clinicians advocate active aspiration of air from the right ventricle.
- Hyperbaric treatment may be beneficial in patients with paradoxical cerebral embolism.
- Most patients who survive the initial insult can be extubated within 72 hours.

## pulmonary oedema

### general:

- Cardiovascular changes associated with pregnancy [increased CO, increased blood volume, increased heart rate and decreased oncotic pressure] lower the threshold for pulmonary oedema
- In the postpartum period, there is a further reduction in the plasma protein osmotic pressure.
- These physiologic changes may explain the development of pulmonary edema with normal or minimally elevated pulmonary capillary wedge pressure in pregnant patients and the increased incidence of pulmonary edema in the postpartum period

### general:

- Preeclampsia is the most common reason for ICU admission of pregnant patients and is a common cause of pulmonary oedema in pregnancy
- Thirty percent of cases develop in the antepartum period, and 70% develop in the postpartum period.

### treatment:

- Initial management includes supplemental oxygen and fluid restriction.
- iv furosemide or afterload reduction may be indicated
- mechanical ventilation may be needed in severe cases

## pre-eclampsia related pulmonary oedema

### outcome:

- The maternal mortality rate can be as high as 11%.
- The perinatal mortality rate, which is related to gestational age, ranges between 9% and 23%

### general:

- Tocolytic-induced pulmonary edema is a unique syndrome arising as a complication of sympathomimetic therapy for premature labor.
- This complication can be seen during the infusion or up to 12 hours after discontinuation of the tocolytic agent.

### pathophysiology:

- The mechanism is not clear, but a number of factors have been implicated including:
  - (i) normal cardiac physiologic changes of pregnancy combined with the use of beta 2 agonists
  - (ii) increased capillary permeability from occult infection
  - (iii) aggressive volume resuscitation in response to maternal tachycardia and hypotension.
  - (iv) fluid retention induced by glucocorticoids administered for enhancing fetal lung maturity.

### clinical features:

- Dyspnea, chest pain, and cough are the major symptoms of tocolytic-induced pulmonary edema that usually develop before delivery and rarely occur beyond 12 hours after delivery.
- The physical examination typically reveals tachypnea and tachycardia, and auscultation reveals bibasilar crackles without any clinical evidence of heart failure. Hypoxemia and reduced hematocrit as a result of iv hydration are characteristic.
- The chest radiograph demonstrates bilateral diffuse interstitial opacities with reticular pattern, and pleural effusions are uncommon.
- An echocardiographic examination of the heart is usually within normal limits.

## tocolytic-induced pulmonary oedema

### treatment:

- immediate discontinuation of tocolytic therapy if it is being administered, initiation of an intravenous loop diuretic, and administration of supplemental oxygen.
- If pulmonary edema does not resolve within 12 to 24 hours, alternative causes for respiratory distress should be considered.
- Intubation and mechanical ventilation are necessary in only a small number of patients. Mortality is rare.