

CARDIOGENIC PULMONARY EDEMA (CPE)

(Last updated 1/23/2020; Reviewers: Chaomeng Wu, MD)

PRESENTING COMPLAINT: Shortness of breath, pink frothy sputum, generalized swelling

FINDINGS

- **A** Check airway, pink frothy sputum
- **B** ↑ RR, accessory muscles, inspiratory rales, wheezing (“cardiac asthma”), ↓SpO₂
- **C** ↑ HR, ↑ BP (+/-), ↑JVP, ↓ BP if cardiogenic shock
- **D** Usually awake A, sometimes Delirium*
- **E** Sweating, cold and clammy skin
- **L_{PC}** ↑ BNP/NT-proBNP ↑ Cardiac enzymes, ↑ lactate
- **U_{PC}** Valve abnormality (MR, MS, AS), ↓ LV/RV EF or E/E' >15; confluent B lines, pleural effusions

***A (awake) V** (verbal), **P** (pain), **U** (unconsciousness), **D** (delirious)

U_{PC} (point of care ultrasound) **L_{PC}** (point of care labs)

OTHER HISTORY

Symptoms/signs: Tachypnea, orthopnea; crackles, S3/4 murmurs, wheezing (+/-); Jugular vein distention (JVD), peripheral edema (+/-).

Predisposing Conditions: CHF (treatment non-compliance), MI, valvar disease, atrial fibrillation, cardiomyopathy (Takotsubo, cardiotoxic agents: e.g. alcohol, cocaine), severe hypertension, renal failure, anemia, thyroid dysfunction, fever, infection (sepsis cardiomyopathy, myocarditis)

DIFFERENTIAL DIAGNOSIS

ARDS (both may coexist), PE (pulmonary embolism), pneumonia (atypical including TB), asthma, COPD, Interstitial lung disease, alveolar hemorrhage, neurogenic pulmonary edema

OTHER INTERVENTIONS

- **Labs:** BNP/NT-proBNP (low values exclude CPE except in obese patients); cardiac enzymes; creatinine and electrolytes(EUC), INR, Full blood count(FBC), Liver function test(LFT) , arterial blood gas (ABG)
- **Monitoring:** ECG, oximetry, blood pressure, urine output, CVP
- **Imaging:**
 - **Chest X-ray/US:** bilateral infiltrates and/or B-lines, pleural effusion, wide vascular pedicle
 - **ECHO:** valve abnormality, systolic (reduced LV/RV EF) or diastolic (E/E' >15) dysfunction

THERAPEUTIC INTERVENTIONS

- **Position:** upright position/reverse Trendelenburg
- Sublingual **nitroglycerin** (if no hypotension)
- **Oxygen** (consider high flow)
 - Non-invasive ventilation early (NIV: CPAP, BiPAP) unless contraindicated
 - Consider intubation if NIV failure or contraindication
 - PEEP = 8-10 mmHg or higher
- **Diuretics** IV (loop diuretics e.g. furosemide) or **hemodialysis** (if end-stage renal disease)
- Add **morphine:** small dose of 2.5-5mg
- Add IV **vasodilators** (if no hypotension): nitroglycerin, nitroprusside, nesiritide (IV)
- **Rate control** (if tachyarrhythmia): amiodarone, metoprolol (caution in shock), cardioversion
- Add **vasopressors** (if hypotension): norepinephrine, epinephrine, dopamine. Dobutamine can be used with caution but may cause hypotension
- **Treat hypertension** if present

ONGOING TREATMENT

- **Consider further treatment as appropriate:** Salt and fluid restriction, coronary revascularization, valve replacement or repair, implantable cardioverter-defibrillator, cardiac resynchronization therapy, referral for heart transplantation
- **Consider long-term use of:**
 - If **systolic dysfunction:** Beta-adrenergic blockers, angiotensin converting enzyme inhibitors or angiotensin-receptor blockers, diuretics, mineralocorticoid receptor antagonist (spironolactone or eplerenone) – if renal function and potassium can be monitored
 - If **diastolic dysfunction:** Beta-adrenergic blockers, mineralocorticoid receptor antagonist (spironolactone or eplerenone) – if renal function and potassium can be monitored

CAUTION

- Inotropes and ultrafiltration are rarely helpful
- Caution with beta-blockers in over/impending cardiogenic shock

REFERENCES&ACKNOWLEDGEMENT

Acknowledgement: *Benjamin Bonneton, MD; Gustavo Matute-Bello, MD; Tyler Albert, MD; Elisabeth D. Riviello, MD, MPH*

- 2016 ESC Guidelines for the diagnosis and treatment of acute and chronic heart failure European Heart Journal (2016) 37, 21292200.
- 2009 Focused Update: ACCF/AHA Guidelines for the Diagnosis and Management of Heart Failure in Adults. J Am Coll Cardiol 2009;53(15):e1-e90.

- Noninvasive ventilation in acute cardiogenic pulmonary edema. Gray A, Goodacre S, Newby DE, Masson M, Sampson F, Nicholl J; 3CPO Trialists. N Engl J Med. 2008 Jul 10;359(2):142-51.
- Heart Failure Society of America, Lindelfeld J, Albert NM, et al. HFSA 2010 Comprehensive Heart Failure Practice Guideline. J Card Fail 2010, 16:e1.