CALCIUM CHANNEL BLOCKERS OVERDOSE

(Last updated October 2020; Reviewer: Alzbeta Glancova, MD; Aysun Tekin, MD; Ognjen Gajic, MD)

PRESENTING COMPLAINT: Lightheadedness, syncope, chest pain.

FINDINGS

- **A** Check airway
- **B** ↓/↑/N RR
- **C** ↓ BP, ↓ HR
- **D** Altered variable (V,P,U,D)*
- **E** Flushing, diaphoresis, abdominal pain and distention
- **U_{PC}** pulmonary edema, LV dysfunction
- **L_{PC}** ↑ glucose, ↓ calcium, ↓ potassium, ↑ lactate, ABG: ↓ pH, ↓ HCO_3, ↓ CO_2

*V (verbal), **P** (Pain), **U** (unconsciousness), **D** (delirious)

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

OTHER HISTORY

Signs & Symptoms:

- Negative inotropic & chronotropic effects with systemic vasodilatation leading to hypotension & bradycardia.
- Progression to altered mental status and cardiovascular collapse in severe cases.
- Non-dihydropyridines (e.g., diltiazem, verapamil) have more profound conduction and contractility effects compared to dihydropyridines (e.g., nifedipine, amlodipine), which are more potent vasodilators.
- Abdominal pain, distention, and altered sensorium may also develop.

DIFFERENTIAL DIAGNOSIS

- Beta blocker, digoxin, and/or clonidine overdose
- Narcotic or sedative/hypnotic intoxication
- Inferior myocardial infarction
- Sepsis
- Anaphylaxis

OTHER INVESTIGATIONS

Monitoring:

- ECG:
    - prolonged PR interval due to SA and AV nodal blockade
- Continuous cardiac monitoring
- Serial neurologic examinations

Additional tests: serum/urine toxicology screening, glucose (hyperglycemia common), electrolytes, BUN, creatinine, bicarbonate (metabolic acidosis), cardiac biomarkers.

Imaging:

- CXR for respiratory symptoms (pulmonary edema)
- CT brain for altered level of consciousness.
- Abdominal imaging (to rule out bowel obstruction)

THERAPEUTIC INTERVENTIONS

Initial stabilization:

- Admit to ICU bed,
- Airway stabilization
- Fluid resuscitation,
- Give atropine (in symptomatic bradycardia), glucagon , and consider calcium salt bolus.
- High dose insulin and glucose
- Gastric lavage, activated charcoal or whole-bowel irrigation for extended-release formulations or if presentation within 1-2 hours of ingestion.
- Correct electrolyte/acid-base disturbances.
- Consider vasopressors, including dopamine, dobutamine, norepinephrine (1^{st} choice), or epinephrine if initial efforts fail.

CCB-specific antidotes:

- Calcium salts (bolus or infusion),
- Insulin and glucose (bolus followed by infusion),
- Glucagon (bolus followed by infusion),
- Lipid emulsions, and/or amrinone.

Procedures:

- Gastric lavage (within 1-2 hours of ingestion),
- Whole bowel irrigation (consider if ingested non-dihydropyridine, even in asymptomatic patients),
- Consider arterial line and central venous access,
- Cardiac pacing and/or balloon pump may be considered in refractory cases.

Contact / Cosult:

- local poison control center and toxicologist

MANAGEMENT AFTER STABILIZATION

Follow-Up:

- Observe in ICU for minimum of 12 hours or 24 hours for extended release formulations,
- Monitor glucose, potassium at regular intervals while on insulin infusion.

Further Treatment:

- Consider additional CCB-specific antidotes if initial therapies fail to improve hemodynamics.

Manage Complications:

- Mechanical ventilation for respiratory failure and airway protection in the setting of neurologic deterioration.

CAUTIONS

● Avoid vagal stimulation (*e.g.,* gastric lavage) in pts with bradycardia or heart block.

● Calcium salts contraindicated in the setting of concomitant digoxin toxicity.

● GI decontamination contraindicated in the setting of ileus.

● Caution with excess fluid administration due to propensity to develop pulmonary edema.

5) REFERENCES & ACKNOWLEDGMENT

-This card was originally developed and reviewed by: *Author: William T. Atchley, MD PhD, Prashant Jagtap, MD, Moldovan Sabov, MD*

-Engebretsen, K. M., Kaczmarek, K. M., Morgan, J., & Holger, J. S. (2011). High-dose insulin therapy in beta-blocker and calcium channel-blocker poisoning. *Clinical Toxicology (Philadelphia, Pa.)*, *49*(4), 277–283. doi:10.3109/15563650.2011.582471

-Levine, M., Curry, S. C., Padilla-Jones, A., & Ruha, A.-M. (2013). Critical care management of verapamil and diltiazem overdose with a focus on vasopressors: a 25-year experience at a single center. *Annals of Emergency Medicine*, *62*(3), 252–258. doi:10.1016/j.annemergmed.2013.03.018

-Salhanick, S. D., & Shannon, M. W. (2003). Management of calcium channel antagonist overdose. *Drug Safety*, *26*(2), 65–79. doi:10.2165/00002018-200326020-00001

-St-Onge, M., Dubé, P.-A., Gosselin, S., Guimont, C., Godwin, J., Archambault, P. M., et al. (2014). Treatment for calcium channel blocker poisoning: a systematic review. *Clinical Toxicology (Philadelphia, Pa.)*, *52*(9), 926–944. doi:10.3109/15563650.2014.965827

-UpToDate 2017; Calcium channel blocker poisoning https://www.uptodate.com/contents/calcium-channel-blocker-poisoning