Calcium Channel Blocker Poisoning or Overdose

Aliases

Anti-hypertensive

Patient Care Goals

1. Reduce GI absorption of oral agents with some form of binding agent (activated charcoal) especially for extended release.
2. Provide early airway protection; this is required as patients may have rapid mental status deterioration.
3. Assure adequate ventilation, oxygenation and correction of hypoperfusion.

Patient Presentation

Calcium channel blockers interrupt the movement of calcium across cell membranes. Calcium channel blockers are used to manage hypertension, certain rate-related arrhythmias, prevent cerebral vasospasm, and angina pectoris. Patients may present with:

1. Bradycardia
2. Hypotension
3. Decreased AV Nodal conduction
4. Cardiogenic shock
5. Hyperglycemia

Inclusion Criteria

1. Patients who have may have taken or been administered calcium channel blockers
    a. Calcium channel blocker examples:
        i. Amlodipine (Norvasc®)
        ii. Diltiazem (Cardizem®, Tiazac®)
        iii. Felodipine
        iv. Isradipine
        v. Nicardipine
        vi. Nifedipine (Adalat CC®, Afeditab CR®, Procardia®)
        vii. Nisoldipine (Sular®)
        viii. Verapamil (Calan®, Verelan®)

Exclusion criteria

No recommendations

Patient Management

Assessment

1. Assess ABCDs and, if indicated, expose and then cover to assure retention of body heat.
2. Monitor vital signs, including temperature.
3. Apply a ECG cardiac monitor, and consider obtaining a 12- lead ECG**.**
4. Check blood glucose Level
5. Monitor pulse oximetry and $ETCO_2$for respiratory decompensation.
6. Identify specific medication taken (noting immediate release vs. sustained release formulations), time of ingestion, and quantity.
7. Obtain pertinent cardiovascular history or other prescribed medications for underlying disease.
8. Patient pertinent history.
9. Physical exam.

Treatment and Interventions

1. Consider activated charcoal without sorbitol. If risk of rapid decreasing mental status, do not administer oral agent without adequately protecting the airway.
2. 20 mL/kg up to 2 liters ***[AEMT].***
3. Consider **Atropine Sulfate** for symptomatic bradycardia ***[PARA]***
    - Adult: 1mg IV/IO q5 minutes (maximum total dose of 3mg)
    - Pediatric: 0.02mg/kg IV/IO q5 minutes (maximum total dose of 3mg)
4. Consider **Calcium Gluconate (preferred)** ***[PARA]***
    - Adult: 1gram IV/IO push OR infusion over 2 min May repeat up to total of 3g for ongoing symptoms
    - Pediatric: 60 mg/kg max dose 3 grams IV/IO push over 2 min
5. Consider vasopressors after adequate fluid resuscitation for the hypotensive patient ***[PARA]*** [see Shock guideline for adult vs. pediatric dosing] if atropine, calcium, and vasopressors have failed in the symptomatic bradycardia patient
6. Consider **transcutaneous pacing** ***[PARA]*** if refractory to initial pharmacologic interventions.
7. If seizure, consider **Midazolam** ***[PARA]*** (benzodiazepine of choice)
8. For symptomatic patients with cardiac effects (i.e. hypotension, bradycardia) consider **Glucagon** ***[PARA]/Interfacility]***. (**Dosing not carried pre-hospital, infusion dosing per sending physician)**
    - **Adult: 5mg IV/IO, can be repeated in 5-10 minutes as necessary**
    - **Pediatric: 1mg IV/IO push (25-40kg) or 0.5mg IVP (≤25kg) every 5-10 minutes as necessary**

Patient Safety Considerations

Transcutaneous pacing may not always capture nor correct hypotension when capture is successful.

Notes and Educational Pearls Key Considerations

- While most calcium channel blockers cause bradycardia, dihydropyridine class calcium channel blockers (e.g. nifedipine, amlodipine) can cause a reflex tachycardia (torsade de pointes) early in the ingestion. The patient can become bradycardic as the intoxication worsens.
- Administering calcium chloride or calcium gluconate to a patient on cardiac glycosides (e.g. digoxin) is an appropriate intervention. It is now accepted that the traditional avoidance of this intervention (due to its supposed potential to precipitate toxicity and associate fatal arrhythmias) is a historical belief and is not supported.
- A single pill can kill a toddler. It is very important that a careful assessment of medications the toddler could have access to is done by EMS, and suspect medications brought into the ED.
- Calcium channel blockers can cause many types of rhythms that can range from sinus bradycardia to complete heart block.
- Hyperglycemia is the result of the blocking of L-type calcium channels in the pancreas. This can help differentiate these ingestions from beta blockers. There may also be a relationship between the severity of the ingestion and the extent of the hyperglycemia.
- Atropine may have little or no effect (likely to be more helpful in mild overdoses).
- Hypotension and bradycardia may be mutually exclusive and the blood pressure may not respond to correction of bradycardia.

Pertinent Assessment Findings

- Conduct close monitoring of ECG and document changes and dysrhythmias
- Serial frequent assessments are essential as these patients often have rapid deterioration with profound hypotension.

Quality Improvement

- **Associated NEMSIS Protocol(s) (eProtocol.01)**
  9914217—Medical-Calcium Channel Blocker Poisoning/Overdose

Key Documentation Elements

- Repeat evaluation and documentation of signs and symptoms as patient clinical conditions may deteriorate rapidly
- Identification of possible etiology of poisoning
- Time of symptoms onset and time of initiation of exposure-specific treatments
- Therapy and response to therapy

Performance Measures

- Early airway management in the rapidly deteriorating patient
- Accurate exposure history
    - Time of ingestion or exposure
    - Route of exposure
    - Quantity of medication or toxin taken (safely collect all possible mediations or agents)
    - Alcohol or other intoxicant taken
- Appropriate protocol selection and management
- Multiple frequent documented reassessments

References

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