Treatment of calcium channel blocker poisoning: a systematic review

Disclosure

We have no relevant financial or nonfinancial relationships to disclose except...
Introduction

• Burden of calcium channel blocker poisoning

• Third increased rate exposure (Bronstein et al., 2010)

• Mortality 6% / Morbidity 50% (St-Onge et al., 2012)
Objective

Evaluate the efficacy of interventions considered for the treatment of CCB poisoning
Research question

P: In adults poisoned with a CCB
I: which intervention(s)
C: when compared to no-intervention or to other intervention(s)
O: improve primary outcomes (mortality, hemodynamics, functional outcomes) or secondary outcomes
S: as shown by any type of study?
Methods

- Search strategy planned with 2 librarians
- Articles selection by 2 blinded reviewers
- Data abstraction by qualified independent reviewers using pilot tested forms
- Quality analysis by independent reviewers:
  - STROBE checklist and Thomas tool
  - Institute of Health Economics tool
  - ARRIVE checklist and NRCNA checklist
Study selection:
Kappa = 0.85
(95%CI 0.73-0.89)
## Quality of included trials

<table>
<thead>
<tr>
<th>Interventions</th>
<th>Observational studies</th>
<th>Case series</th>
<th>Animal studies</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n</td>
<td>STROBE checklist /22</td>
<td>THOMAS' tool</td>
</tr>
<tr>
<td>High-dose insulin</td>
<td>3</td>
<td>6 (4-9)</td>
<td>Weak</td>
</tr>
<tr>
<td>(n = 33, 22 CR)</td>
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<tr>
<td>Extracorporeal life support</td>
<td>1</td>
<td>17</td>
<td>Weak to moderate</td>
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<tr>
<td>(n = 11, 7 CR)</td>
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<tr>
<td>Calcium</td>
<td>0</td>
<td></td>
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<td>(n = 38, 20 CR)</td>
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<tr>
<td>Vasopressors</td>
<td>0</td>
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<tr>
<td>(n = 27, 10 CR)</td>
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<tr>
<td>Decontamination</td>
<td>0</td>
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<td>(n = 8, 2 CR)</td>
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<tr>
<td>Pacemaker</td>
<td>0</td>
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<td>(n = 7, 2 CR)</td>
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<tr>
<td>Glucagon</td>
<td>0</td>
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<tr>
<td>(n = 16, 10 CR)</td>
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<tr>
<td>Atropine</td>
<td>0</td>
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<tr>
<td>(n = 5, 0 CR)</td>
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<tr>
<td>4-aminopyridine</td>
<td>0</td>
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<tr>
<td>(n = 10, 0 CR)</td>
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<tr>
<td>Lipid emulsion</td>
<td>0</td>
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<tr>
<td>(n = 20, 16 CR)</td>
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<tr>
<td>Levosimendan</td>
<td>0</td>
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<tr>
<td>(n = 8, 3 CR)</td>
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<tr>
<td>Plasma exchange</td>
<td>0</td>
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<td>(n = 3, 2 CR)</td>
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</table>
Reported survival benefit

- **Observational studies:**
  - High-dose insulin (2): type of HDI protocols
  - Extracorporeal life-support (1): ECLS vs not

- **Case series (CS) and Animal studies (AS):**
  - Calcium (5 CS and 5 AS)
  - Epinephrine, dopamine, norepinephrine (5 CS, 7 AS)

- **Animal studies:**
  - Lipid emulsion for IV CCB intoxication (3)
Reported hemodynamic improvement

- Observational studies:
  - High-dose insulin (2): type of HDI protocols
  - Extracorporeal life-support (1): ECLS vs not

- Case series (CS) and Animal studies (AS):
  - Epinephrine, dopamine, norepinephrine (3 CS, 8 AS)
  - Levosimendan (1 CS, 3 AS)
  - 4-aminopyridine (2CS, 7 AS)
  - Plasma exchange (1 CS)

- Animal studies:
  - Lipid emulsion (3), liposomes (1)
Summary

• High-dose insulin:
  – Hemodynamic improvement and possible survival benefit
  – Risks: hypoglycemia, hypokalemia
  – Level of evidence: low

• ECLS:
  – Possible survival benefit in patients in severe refractory shock or cardiac arrest
  – Risks: bleeding, thrombosis, limb ischemia
  – Level of evidence: low
Summary

• Dopamine, norepinephrine, epinephrine:
  – Hemodynamic improvement
  – Risks: ischemic complications
  – Level of evidence: very low

• Calcium:
  – Hemodynamic improvement (some inconsistency)
  – Risks: hypercalcemia
  – Level of evidence: very low
Conclusion

• First systematic review concerning the effects of treatments for CCB poisoning.

• Head-to-head comparisons in human clinical trials should be done concerning the use of HDI, ECLS and vasopressors.

• The future: International guideline for the treatment of CCB poisoning.
Red alert! Red alert!

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\begin{align*}
\text{NaCl} \\
\text{NaOH}
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The base is under a salt!