

# Ionized hypocalcemia as a prognostic indicator in dogs following trauma

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## **Abstract**

**Objective** – To determine the incidence of ionized hypocalcemia (iHCa) in dogs with blunt and penetrating traumatic injuries upon presentation to a hospital, and to determine the association of iHCa with mortality, duration of hospitalization, and requirement for intensive care therapies.

**Design** – Retrospective study (January 2007–December 2008).

**Setting** – University veterinary teaching hospital.

**Animals** – Eighty-eight dogs admitted to the ICU within 24 hours of a traumatic event and with assessment of a venous blood gas sample, including ionized calcium, at hospital admission.

**Interventions** – None.

**Measurements and Main Results** – Most dogs (72%) sustained injuries as a result of a motor vehicle accident. iHCa ( $<1.25$  mmol/L [ $<2.50$  mEq/L]) was present in 14 of 88 dogs (16%). Dogs with abdominal trauma were significantly more likely to have iHCa ( $P = 0.020$ ) than dogs with other injuries. Dogs with iHCa spent significantly longer time in the hospital ( $P = 0.036$ ) and ICU ( $P = 0.005$ ), and were more likely to require oxygen supplementation ( $P = 0.048$ ), synthetic colloids ( $P = 0.020$ ), vasopressors ( $P = 0.0043$ ), and blood transfusions ( $P < 0.0001$ ). Six of 14 dogs (43%) with iHCa demonstrated clinical signs consistent with hypocalcemia during the course of hospitalization, and calcium gluconate was administered intravenously to one dog. Overall mortality was 16% (14/88) and dogs with iHCa were significantly less likely to survive ( $P < 0.001$ ).

**Conclusions** – The incidence of iHCa upon hospital admission in this group of dogs with blunt and penetrating trauma is similar to the incidence of iHCa in critically ill dogs. Findings further suggest that dogs with iHCa are more severely injured and subsequently require increased intensive care therapies and have a lower likelihood of survival compared to dogs with normocalcemia. Ionized calcium concentration may therefore be a useful prognostic indicator in dogs with blunt and penetrating traumatic injuries.

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Previous predictors of death/euth for trauma:

- Arrhythmias, body wall hernias, severe soft tissue injuries, vertebral fractures, recumbency at admission
- iCa is predictor of mortality in humans

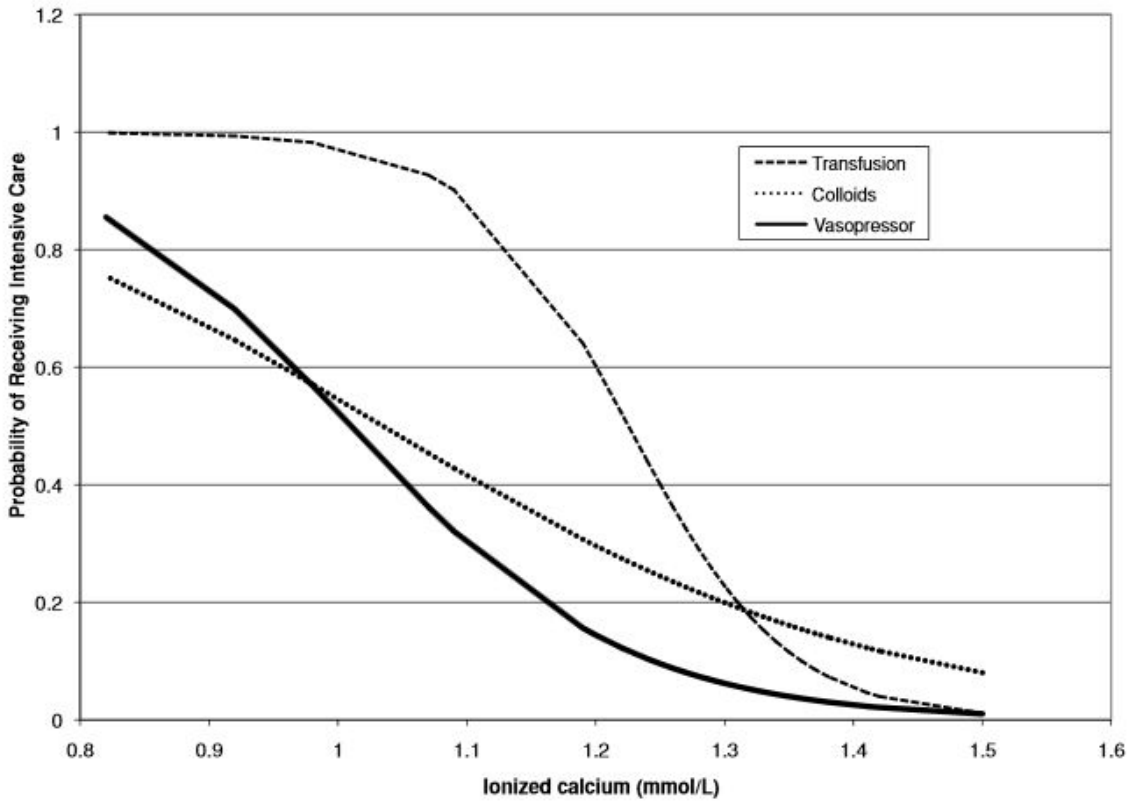
Proposed mech of ionized hypocalcemia in trauma

- Increased calciuresis
- dilution from fluids
- cellular uptake by injured muscles
- blood product administration
- lactate complex formation
- changes in PTH, calcitonin, Vit D and Mg<sup>++</sup>

Results

- Both penetrating and blunt force trauma were equally associated with hypocalcemia
- Abdominal injury more likely to be hypocalcemic

- Hypocalcemic animals more likely to need oxygen, colloids, vasopressors or transfusions



- Overall mortality was 16% (14/88)
  - Mortality with hypocalcemia was 85% (5/6) for iCa < 1.20
    - 99% specificity for death (35% sensitivity)
  - Mortality was 42.9% for iCa < 1.25
- Only 1 dog treated with Ca Gluconate



