



Calcium Chloride vs Calcium Gluconate

Introduction

1. Calcium is a commonly used treatment for several indications in the emergency department including hyperkalemia, hypocalcemia, calcium channel blocker overdose, and beta blocker overdose
2. Two formulations of calcium are readily available including both calcium chloride (CaCl₂) and calcium gluconate (CaGlu)
3. It is known that CaCl₂ provides 3 times more elemental calcium than an equivalent amount of CaGlu
4. Due to its vesicant properties, CaCl₂ is generally avoided as CaGlu is less likely to cause tissue necrosis
5. It has previously been discussed in the literature that CaCl₂ has a greater bioavailability and a faster onset of action when compared to CaGlu, however, this topic warrants further investigation

Pharmacology

	Calcium Chloride	Calcium Gluconate
Dose	Adults: 1 g/dose Peds: 10-20 mg/kg/dose	Adults: 2-3 g/dose Peds: 60-100 mg/kg/dose
Administration	IV or IO over 2-5 minutes (central line preferred)	IV or IO over 2-5 minutes
PK/PD	Minimal metabolism required to release iCa	Requires hepatic metabolism to release iCa
Adverse Effects	Vesicant; skin necrosis is possible	Negligible
Cost	1g/10 mL: \$8.80	1g/10 mL: \$7.41; 2g/100 mL: \$16.70
Comments	CaCl ₂ 10% injection contains 27 mg elemental calcium per mL; CaGlu 10% injection contains 9.3 mg of elemental calcium per mL	

Overview of Evidence

Author, year	Design/ sample size	Intervention & Comparison	Outcome
Martin et al, 1990	Prospective Adult patients undergoing liver transplantation with minimal hepatic function (n=15)	-CaCl ₂ 10 mg/kg (n=8) vs CaGlu 30 mg/kg (n=7) -Arterial calcium levels were measured at 30s, 1 min, 3 min, 5 min, and 10 mins	-Similar degrees of hypocalcemia developed in both groups (0.68 mM vs 0.74 mM) - Calcium levels increased comparably in both groups at all time points, with CaGlu having a slightly higher nadir (0.89 vs 0.76 at 10 min)

Cote' et al, 1987	Prospective Children undergoing burn wound excision and grafting and dogs undergoing halothane anesthesia (n=15)	-CaCl ₂ vs CaGlu (equipotent doses) -Ionized calcium was measured at 0, 0.5, 1, 3, 5, and 10 min after administration	-When equipotent doses are given, similar efficacy and time to efficacy are seen with both agents
Heining et al, 1984	Prospective Ferrets undergoing pentobarbitone anesthesia and adult volunteers donated blood (n=8)	-CaCl ₂ and CaGlu (equipotent doses) -Calcium levels were assessed in vivo using a calcium electrode positioned in the aorta	-During first pass through circulation, ionization was comparable with both agents which leads to the assumption of similar onsets of action

Conclusions

- Based on minimal available literature, it is thought that CaGlu should result in comparable efficacy and similar time to onset as CaCl₂ if equipotent doses are given, even in the setting of minimal hepatic function
- Patients with significant hepatic impairment or states in which the liver may not function as well (e.g., shock, cardiac arrest) warrant further studies to determine if CaGlu is truly as efficacious as CaCl₂
- The decision of whether to use CaCl₂ or CaGlu should be dependent on patient specifics, availability, and access (central vs peripheral) to limit the risk of adverse reactions (e.g., extravasation)
- In the emergency department, we have both CaGlu 2g and CaCl₂ 1g readily available for use

References

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