ISSUES & ANSWERS
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Parenteral Calcium for Hypocalcemia: Different Salts, Different Dosages

ISSUE

BECAUSE LIFE-THREATENING HYPOCALCEMIA IS UNCOMMON IN SMALL ANIMALS, the need for parenteral calcium for acute management is infrequent. It may, however, be required in certain clinical situations, including in patients with eclampsia (i.e., periparturient hypocalcemia) or hypoparathyroidism (primary or secondary). Injectable calcium gluconate has been the preferred salt for parenteral use in small animals but may not always be available, making use of other parenteral calcium salt products (e.g., calcium chloride, calcium borogluconate) necessary. However, differing calcium concentrations of these alternative calcium salts as compared with calcium gluconate can lead to inaccurate dosing and increased risk for adverse effects and/or therapeutic failure.

DOSING PARENTERAL CALCIUM CAN BE CONFUSING AND DANGEROUS. Dosages vary among references and are listed by mL/kg, mEq/kg, mmol/kg, or mg/kg. These may be for the calcium salt used or for elemental calcium. For example, calcium chloride 10% (100 mg/mL) injection contains ≈3 times more elemental calcium per mL as compared with calcium gluconate 10% (100 mg/mL). All dosages should be double-checked by another veterinary professional.

ANSWERS

The anecdotal dosage for severe hypocalcemia (e.g., tetany, seizures) in dogs and cats ranges from 5 to 15 mg/kg of elemental calcium IV slowly over 10 to 30 minutes.

- When using calcium gluconate 10% injection, each mL contains 9.3 mg of elemental calcium, so 5 to 15 mg/kg elemental calcium would equate to 0.54 to 1.61 mL/kg of calcium gluconate 10% injection.
- When using calcium chloride 10% injection, each mL contains 27.2 mg of elemental calcium, so doses of 5 to 15 mg/kg elemental calcium would equate to 0.18 to 0.56 mL/kg of calcium chloride 10% injection.
- When using other concentrations or other salts (e.g., calcium borogluconate), the actual volume to inject will vary, depending on the concentration of the solution and which salt is being used (e.g., calcium borogluconate 23% contains 19.14 mg of elemental calcium per mL).
Patient response determines the final calcium dose. During infusion, continually monitor the patient’s heart rate and rhythm (via electrocardiogram) and respiratory rate.

- If bradycardia, ST segment elevation, or QT interval shortening occurs, temporarily stop the infusion; restart at a lower rate if the patient requires additional parenteral calcium treatment.

**CAUTIONS**

Calcium gluconate (not calcium chloride) diluted 1:1 has generally been regarded as safe to administer SC for the treatment of primary hypoparathyroidism in dogs, but there are now case reports of severe tissue reactions (eg, pyogranulomatous panniculitis, adipocyte mineralization) at the injection site.\(^1,2\)

Cats, smaller dogs, and patients with concurrent hypophosphatemia may be more susceptible.

- Use caution when considering SC administration, particularly in smaller dogs or when used concurrently with calcitriol.
- A recent review article on hypocalcemia in critically ill dogs and cats stated that SC administration of calcium salts is not recommended.\(^3\)

Other adverse effects associated with parenteral calcium include hypercalcemia and venous (IV) irritation.

- Calcium chloride may be more irritating and more likely to cause hypotension than other parenteral salts.
- Too-rapid IV calcium injection can cause hypotension, cardiac arrhythmias, and cardiac arrest.

If calcium salts are inadvertently infused perivascularly, stop the infusion.

- Treatment may include infiltrating the affected area with normal saline, locally administering corticosteroids, applying heat to and elevating the area, and infiltrating the affected area with a local anesthetic and hyaluronidase.\(^4\)

Avoid admixing parenteral calcium salts with other drugs, particularly carbonate, phosphate, sulfate, or tartrate salts.

- Chelation occurs when calcium salts are mixed with tetracyclines.
- Death has been reported in human neonates when calcium salts are administered with ceftriaxone.\(^5\)
SUGGESTED READING

REFERENCE

SUGGESTED READING