

A pilot study comparing a protocol using intermittent administration of glargine and regular insulin to a continuous rate infusion of regular insulin in cats with naturally occurring diabetic ketoacidosis

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Abstract

Objective – The goal of this pilot study was to compare regular insulin administered by continuous rate infusion (CRI) to an approach using insulin glargine and regular insulin administered intermittently.

Design – Prospective randomized clinical trial.

Setting – University teaching hospital.

Animals – Sixteen cats with diabetic ketoacidosis (DKA).

Interventions – Cats with DKA were randomized to either low-dose regular insulin CRI (CRI group; $n = 8$) or intermittent short- and long-acting insulin injections (subcutaneous [SC] glargine plus intramuscular [IM] regular insulin; SC/IM group; $n = 8$).

Measurements and Main Results – Time of normalization of pH, bicarbonate, hyperglycemia, ketonemia, and appetite, as well as duration of hospitalization were recorded. Eleven of 16 cats (59%) survived to discharge, with no difference in survival between groups ($P = 0.99$). Times of resolution of hyperglycemia ($P = 0.02$) and ketonemia ($P = 0.04$), and normalization of pH ($P = 0.04$), and bicarbonate ($P = 0.03$) were significantly shorter in the SC/IM group. Cats in the SC/IM group also had a significantly shorter duration of hospitalization (SC/IM: median = 54 hr [range, 19–118 hr]; CRI: median = 111 hr [range, 58–271 hr]; $P = 0.04$). Time of first meal was not significantly different between groups.

Conclusions – Although further research is required, an approach using intermittent short- and long-acting insulin injections appeared to be an effective option for treatment of DKA in cats.

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Rationale

- Human medicine has seen trend towards simplification of DKA treatment
 - DKA is #1 cause of death in type 1 diabetic children
 - CRI is standard of care
 - Some prelim studies show that SC long acting and CRI resulted in shorter hosp
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Prospective randomized clinical trial

- Two treatment arms
 - Low dose CRI group
 - Sliding scale (table 1)
 - SC glargine with IM regular insulin group
 - Glargine @ 0.25U/kg SQ Q12h
 - 1U reg insulin IM up to every 6 hours if BG >250 mg/dl
 - BG at other times did NOT result in insulin administration regardless of value
 - Dextrose added if BG was <250

- All other treatments for DKA were allowed and clinician decided
- BG Q2-4, ketones Q8
- Blood gas, electrolytes and renal values monitored q8

If glucose is ... (mg/dL)	Fluids	Insulin – 1 U/kg regular insulin/ 240 mL 0.9% NaCl (mL/hr)
>500	0.9% NaCl	20
400–500	0.9% NaCl	15
250–399	0.9% NaCl	10
80–249	0.9% NaCl + 2.5% dextrose	0-5
<80	0.9% NaCl + 5% dextrose + bolus IV 0.5 ml/kg 50% dextrose	0

Note: Potassium phosphate and potassium chloride also were added as needed based on serum potassium and phosphorus concentrations. NaCl, sodium chloride.

Table 1

Endpoints

- Primary endpoint was pH normalization defined as 7.35-7.44
- 2' endpoints were
 - Duration of hospitalization
 - Time until first meal
 - Time until resolution of hyperglycemia and ketonemia
 - Time until normalization of bicarb

Results

- 16 cats
 - No significant difference in baseline ketones, pH, bicarb, or biochem
 - Overall survival was 70%
 - 1 cat diet, 4 were euthanized
- No difference in 1' endpoint
- Shorter time in hospital and to normalization of bicarb, resolution of hyperglycemia, and ketonemia for the SC/IM group

Discussion

- Appears the the SC/IM is at least no worse than standard of care, and has potential benefits

Questions

1. Based on this study and others, what is the overall survival of cats with DKA
 - a. 50%
 - b. 60%
 - c. 70%
 - d. 80%

2. True/False: Cats with DKA are most often simultaneously diagnosed as diabetics (as in, new diabetics)