Intraperitoneal, subcutaneous and intravenous glucagon delivery in rats: Effect on glucose levels

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Background

Aim:

To investigate the glucose response after intraperitoneal (IP) glucagon administration compared to subcutaneous (SC) and intravenous (IV) administration.

Motivation:

Limited available information about the glucose response after IP glucagon administration.

Challenges:

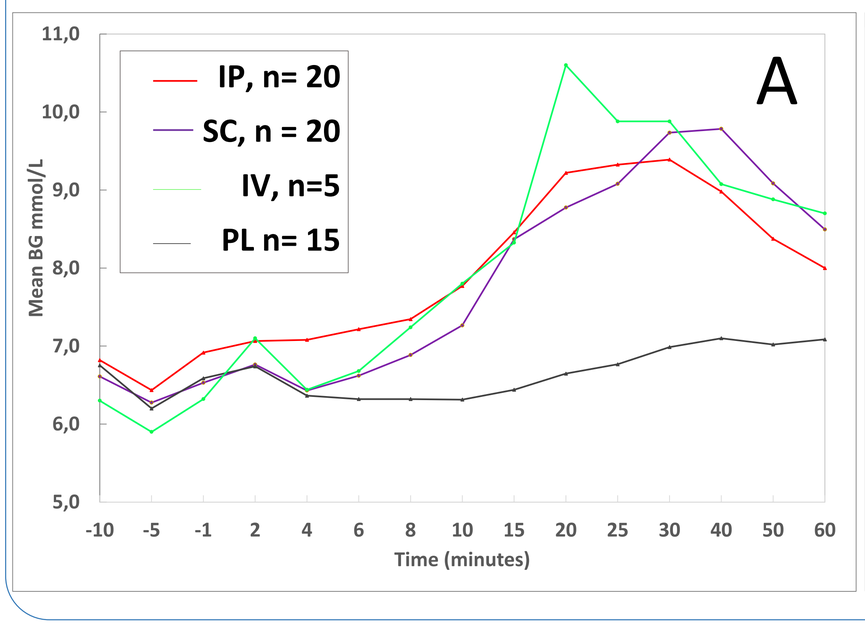
- Confounding by endogenous glucagon and insulin secretion.
- Isoflurane anesthesia increases blood glucose (BG).
- Blinded IP injection.
- Frequent blood sampling from conscious rats.

Methods

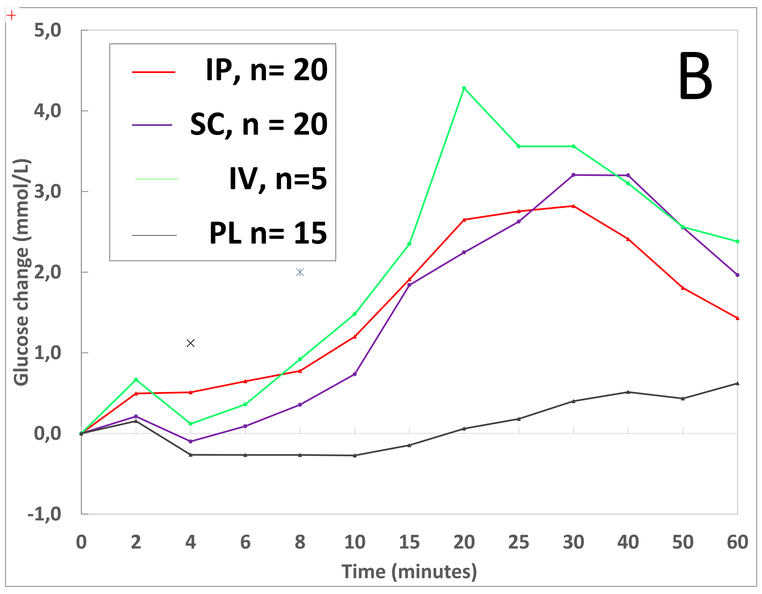
- A prospective, randomized, controlled, open-label, crossover trial in 20 octreotide treated rats.
- Three interventions, one week apart, in a randomized order, in each rat.
- 15 rats: **IP** and **SC glucagon** injections and **placebo** (isotonic saline) injection.
- 5 rats: IP, SC and intravenous (**IV**) glucagon injections.
- The dose of glucagon – **5 µg/kg body weight** (all routes).
- BG levels measured before and until 60 min after the glucagon/placebo injection.

Results

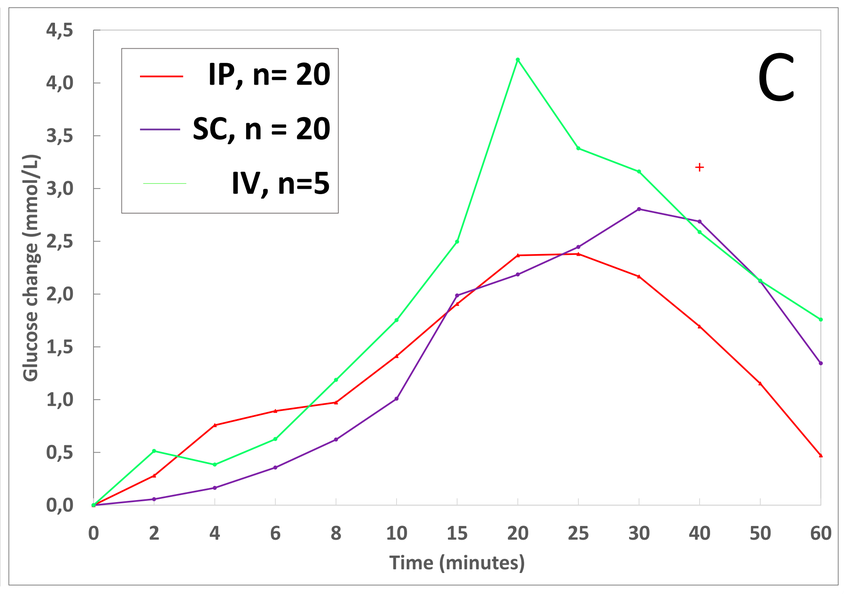
Raw data



Glucose change



Glucose change adjusted for placebo effect



Summary

- IP glucagon – significant BG increase after 4 min. (p=0.009) (×) (fig.B and C)
- SC or IV vs placebo – significant BG increase after 8 min. (p=0.002, p<0.010) (✳) (fig.B and C)
- Glucose level at 40 minutes lower after IP compared to SC glucagon delivery (p=0.005) (+)(fig.C)

Conclusions

When glucagon is injected in the peritoneal cavity compared to subcutaneous tissue:

- the initial glucose response is faster.
- the maximum glucose response is reached earlier.
- the decline in glucose response seems to be faster.

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