Diabetologia (1992) 35: 398

Diabetologia

Letter to the editor

Intranasal glucagon in the treatment of hypoglycaemic attacks in children: experience at a summer camp

Dear Sir,

We have recently shown [1, 2] that intranasal glucagon (i.n.-glucagon) was effective in quickly correcting experimentally-induced hypoglycaemia in volunteer diabetic patients. We observed that the i.n.-route initiated a blood glucose rise earlier than did the subcutaneous injection, although the effect of the latter was more sustained. We concluded that i.n.-glucagon was probably a clinically relevant alternative to its parenteral equivalent. We would like to report the results of a controlled study done on diabetic children at a summer camp. Informed consent was obtained from the parents of the children who participated in this study: they accepted that if a severe hypoglycaemic episode occurred it would be treated by glucagon, administered either intranasally or subcutaneously, on a random basis. Twenty consecutive severe hypoglycaemic events (i.e. hypoglycaemic status in which oral glucose administration was judged as impractical or potentially hazardous by the leader of the group, always a medical doctor) occurred spontaneously during leisure activities in 20 young diabetic subjects. As soon as the decision was taken to administer glucagon, a capillary blood glucose determination was done using a glucometer (Glucometer II, Ames-Bayer Diagnostics, Puteaux, France) and Glucostix strips. A box was then opened which randomly contained either a 1 mg glucagon kit for s.c. administration (Novo-Nordisk, Boulogne, France) or an i.n.-glucagon kit (the product to be insufflated into the nostril was made of a lyophylised mixture of 1 mg glucagon + 1 mg sodium glycocholate (Laboratoires Organn St. Denis, France), as previously described [2]. Blood glucose values were measured at recognition of the hypoglycaemic state (t_0), then at $t_{+10\,min}$ and $t_{-30\,min}$; the time which elapsed between the decision to inject and completion of the injection (operating time delay); the time which elapsed until the subject was able to consciously take a glass of orange juice in his hand and drink it (clinical recovery). The results are shown in Table 1. The main observations which could be drawn from this experience are: (1) that i.n.-glucagon was quickly effective. We observed only one treatment failure with one dose of i.n.-glucagon in a child who, by mistake, had injected himself with twice the dosage of insulin when an i.v. injection of glucose had to be administered; we also observed one apparent failure with s.c.-glucagon in an epileptic boy whose blood glucose was 60 mg at t_0. (2) i.n.-glucagon was administered more rapidly than s.c.-glucagon, although the difference did not reach statistical significance. In any case all the users found the i.n.-route much easier to operate. (3) i.n.-glucagon seemed to act at least as rapidly as s.c.-glucagon. However, the increment over 30 min was two-fold greater with i.n.-glucagon although the difference was not significant. If this latter observation is confirmed by further studies involving a larger number of patients, this might be of interest in avoiding overcorrection of hypoglycaemia; this would be consistent with the pharmacological features of i.n. administered glucagon i.e. more rapid onset and shorter action [2, 3]. (4) Side effects (headache, nausea, vomiting) were observed in both groups.

This work is the first to demonstrate and quantify the efficiency of i.n.-glucagon in the treatment of hypoglycaemic attacks under pragmatic conditions.

Table 1. Comparative effects of intranasal and subcutaneous glucagon in 20 hypoglycaemic children (mean ± SEM)

	Intranasal	Subcutaneous
n	13[a]	7[a]
Age (years)	13 ± 1	13 ± 1
Sex (male/female)	6/7	5/2
Blood glucose at t_0 (mmol/l)	2.4 ± 0.3	3.2 ± 0.3
Blood glucose increment (mmol/l)		
t_{10}-t_0	2.9 ± 0.8 (13)	2.2 ± 0.6 (6)
t_{30}-t_0	3.1 ± 1.0 (11)	6.1 ± 2.0 (5)
Operating time (min)	3 ± 1	7 ± 2
Clinical recovery (min)	18 ± 3	31 ± 5
Side effects	4	3
Treatment failure	1	1

[a] unless otherwise indicated (number in parentheses)

Due to the ambulatory conditions of this trial, some blood glucose values are missing: in the intranasal groups, two values at t_{30} and, in the s.c. group, one value at t_{10} and two values at t_{30}. None of the mean values observed in the two groups was significantly different

Yours sincerely,

G. Slama, G. Reach, M. Cahane, C. Quetin and F. Villanove-Robin

References

1. Freychet L, Rizkalla SW, Desplanque N et al. (1988) Effect of intranasal glucagon on blood glucose levels in healthy subjects and hypoglycaemic patients with insulin-dependent diabetes. Lancet II: 1364–1366
2. Slama G, Alamowitch C, Desplanque N, Letanoux M, Zirinis P (1990) A new non-invasive method for treating insulin-reaction: intranasal lyophylised glucagon. Diabetologia 33: 671–674

Dr. G. Slama
Service de Diabétologie
Hôtel-Dieu de Paris
1, place du Parvis Notre-Dame
F-75181 Paris Cedex 04
France