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Use of differential temperature evaluation as feedback for insulin delivery monitoring in acute severe (life threatening) glucose metabolism disorders

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Introduction: Up to now hypoglycemia episodes and yo-yo events remain a problem during insulin therapy in diabetic patients. Last year at this meeting and at WCDT-2016, we have shown that an Apparatus for Diabetes Diagnosis coupled with Complex for Insulin Therapy (ADD-CIT), using differential temperature (Dt) evaluation dynamics as feedback for pump insulin delivery, could be useful in the treatment of acute life threatening alterations of the glucose metabolism due to type 1 diabetes. We hypothesized that Dt, representing energy production and utilization, thus reflecting glucose metabolism, could be a valuable complement to blood glucose measure for monitoring insulin therapy.

Objective: If this hypothesis is true, ADD-CIT use could be useful in any glucose metabolism disorders. The aim of the present work was to verify this assertion.

Methods: Three groups of patients were considered and studied: with type 1 diabetes (DM-1 - 83); with type 2 diabetes (DM-2 - 45); and patients without known diabetes (DM-0 - 66) but presenting a severe pathology causing acute hyperglycaemia difficult to control. The evolution of Dt was also investigated in a group of 10 healthy volunteers. Part of these patients was treated according to usual schemas; the other part was treated by ADD-CIT (Tab. 1). After informed consent, the main inclusion criterion was the presence of hyperglycemia > 11.1 mmol/l (200 mg/dl) at admission (mean values in different groups - 15±3.5 mmol/l). Age, sex, BW were comparable. Observation or session duration was up to 8 hours. Usual clinical investigations were provided including glucose blood level measurement every hour (Acutrends strips or gasometer apparatus ADL-90 Flex).

Results: In the ADD-CIT group of patients, a glycaemia decrease of 30-40% from its initial value was observed within 2-4 hours and a stable mean glucose level equal or inferior to 11.1 mmol/l was obtained. Rare episodes of hypoglycaemia (<4.3 mmol/l) and no yo-yo phenomena were observed. In the control groups monitored only by glycaemia evaluation, this result was attained only after 5-7 hours with frequent yo-yo phenomena. Hypoglycemia events were also present. No correlation was noted between Dt and glycaemia. Dt values were negative mainly in decompensated DM 1 patients. Dt decreased during the sessions in DM 2 patients but rarely reached negative levels. Dt increased at the end of any successful session approaching values observed in healthy controls. This increase was an indication for stopping the session. In some cases Dt abnormally felt at the end of a session whereas glycaemia remained stable; then a caution glucose injection corrected the situation without glycaemia modification.

Table 1: Patients cohort

Series	DM 1	DM 2	DM 0	Healthy control
ADD-CIT treated	64 (including 50 with kidney insufficiency)	36 (including 18 with heart pathology)	27 (with heart pathology)	10 (observation only)
usual schema	19	9	39 (24 ABCA, 15 with heart pathology)	0
Total	83	45	66	10

Discussion & Conclusion: Though our series were small and not fully matched, the results of the ADD-CIT groups of patients in terms of glycaemia decrease and stabilization was convincingly better than patients treated using the usual procedure based only on glycaemia measurements. This confirms the usefulness of Dt evolution evaluation as a complementary feedback for insulin delivery not only in DM 1 patients but also in DM 2 and any other patients with acute severe glucose metabolism disorders.

Remaining Questions: Is Dt feedback applicable to chronic treatment of glucose metabolic disorders? And what may be the diagnostic or prognostic signification of Dt levels and dynamics?

Biography

V Coulic has completed his education at the age of 25 years from abroad. He is working at Université libre de Bruxelles, Belgium. He has published more than 20 papers in reputed journals and has been serving as an editorial board member of repute.

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