Determinants of intra-individual variation of glucoregulation in diabetes mellitus type 1

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Objective:1. To determine intra-individual variations of post absorptive glucose metabolism in patients with DM1 and healthy individuals.2. To determine the effect of short sleep deprivation on glucoregulation in patients with DM1 and healthy...

Ethical review	Approved WMO
Status	Pending
Health condition type	Glucose metabolism disorders (incl diabetes mellitus)
Study type	Interventional

Summary

ID

NL-OMON32016

Source
ToetsingOnline

Brief title
intra-individual variations in glucoregulation in DM type 1

Condition

- Glucose metabolism disorders (incl diabetes mellitus)

Synonym
diabetes, glucose metabolism disorders

Research involving
Human

Sponsors and support

Primary sponsor: Leids Universitair Medisch Centrum
Source(s) of monetary or material Support: Ministerie van OC&W

Intervention

Keyword: diabetes mellitus type 1, glucoregulation, sleep deprivation

Outcome measures

Primary outcome

- EGP determined by 6,6-D2 glucose infusion in the basal state and during a hyperinsulinemic euglycemic clamp.

- Whole body glucose disposal determined by 6,6-D2 glucose infusion in the basal state and during a hyperinsulinemic euglycemic clamp.

- Glucose and FFA oxidation as determined by indirect calorimetry

- TEE determined by an actimeter

- Calorie intake determined by diet diaries

Secondary outcome

none

Study description

Background summary

Type 1 diabetes mellitus (DM1) is caused by a loss of β-cell mass, due to an auto-immune process which leads to absolute insulin deficiency. The Diabetes Control and Complications Trial (DCCT) proved that there is a curvilinear relation between the degree of glycaemic control, maintained over the long term and the onset or progression of microvascular and macrovascular complications. However, in patients with DM1, glucoregulation can not be normalized despite intensive insulin therapy and/or lifestyle adaptions. There are unexpected variations in glucoregulation in these patients on a day to day basis. We hypothesize that these intra-individual variations in glucoregulation in DM1 are caused to a large extend by variations in physiological determinants of glucoregulation.
In healthy individuals, plasma glucose homeostasis results from a tightly controlled balance between glucose production and glucose utilization, in which variations in insulin secretion play a key role. Normal glucose regulation

shows a 24h circadian rhythmicity with variations in glucose tolerance. However, these variations normally do not affect plasma glucose levels, due to concomitant variations in insulin secretion. In contrast, DM1 patients can not compensate these variations in glucose tolerance by subtle changes in endogenous insulin secretion.
Increasing evidence exists for an important role of sleep in diurnal variations in glucose metabolism. Recently, attention has been focussed on the pathophysiological effects of sleep loss on glucose metabolism and endocrine function. Decreased quality of sleep and sleep loss impair glucose tolerance and insulin sensitivity, even in healthy individuals. We postulate that disturbed sleep duration and/or quality could be one of these important physiological determinants which can disturb glucoregulation in DM1.
This study is aimed to elucidate the effects of disturbed sleep on intra-individual variations on glucose regulation at basal conditions and during hyperinsulinemic euglycaemic clamp studies before and after sleep deprivation.

Study objective

Objective:
1. To determine intra-individual variations of post absorptive glucose metabolism in patients with DM1 and healthy individuals.
2. To determine the effect of short sleep deprivation on glucoregulation in patients with DM1 and healthy individuals.

Study design

The study is a prospective, intervention study.

Intervention

normal sleep vs short sleep (9.45 vs 5 uur)

Study burden and risks

Burden:
Subjects will spent 3 nights in our resaerch center, of which 2 nights with normal sleep and 1 night with short sleep. No adverse events are expected from this. Subsequently, will be in our hospital for half a day and for 2 whole days. During these study days, subjects will lie in bed and blood will be drawn from an infusion. In total, during this whole study period of 10 weeks, 501 ml bloodwill be drawn from each subject.
Basal experiment: infusion of labeled glucose which is not radioactive en therefore no adverse effects are expected
Hyperinsulinaemic euglyceamic clamp: infusion of insulin and labeld glucose. Blood glucose measurements will be made at regular time intervals to adjust

glucose infusion and prevent hypoglycemia.

Contacts

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Trial sites

Listed location countries

Netherlands

Eligibility criteria

Age
Adults (18-64 years)
Elderly (65 years and older)

Inclusion criteria

• Informed consent
• HbA1c< 8%
• Plasma creatinine levels < 100 µmol/l
• Well regulated blood pressure (i.e. RR < 140/90 mmHg)
BMI 20-25 kg/m2

Exclusion criteria

• Psychiatric disorders and/or use of antipsychotic or antidepressant drugs at present or in the past
• Use of β-blocking agents, aspirin and prokinetic drugs
• Sleep disorders and/or use of sleep medication
• Renal, hepatic or other endocrine disease
• Any significant chronic disease
• Any significant abnormal laboratory results found during the medical screening procedure
• Pregnancy
• Smoking
• Difficulties to insert an intravenous catheter
• Recent blood donation (within the last 3 months)
• Recent participation in other research projects within the last 3 months or participation in 2 or more projects in one year

Study design

Design

Study type:	Interventional
Intervention model:	Other
Allocation:	Non-randomized controlled trial
Masking:	Open (masking not used)
Control:	Active
Primary purpose:	Basic science

Recruitment

NL

Recruitment status:	Pending
Start date (anticipated):	01-07-2008
Enrollment:	20
Type:	Anticipated

Ethics review

Approved WMO

Application type:	First submission
Review commission:	METC Leids Universitair Medisch Centrum (Leiden)

Study registrations

Followed up by the following (possibly more current) registration

No registrations found.

Other (possibly less up-to-date) registrations in this register

No registrations found.

In other registers

Register	ID
CCMO	NL23480.058.08