Pharmacokinetic and pharmacodynamic profile of rapid-acting insulin injected by needle-free jet-injection

Published: 02-10-2009
Last updated: 04-05-2024

To compare the pharmacokinetic and pharmacodynamic profile of the rapid-acting insulin analogue aspart (Novorapid®) injected with jet-injection to that of the same insulin injected with a conventional pen.

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

Summary

ID

NL-OMON32491

Source
ToetsingOnline

Brief title
Pharmacology of insulin injected with jet-injection

Condition

- Glucose metabolism disorders (incl diabetes mellitus)

Synonym
juvenile diabetes, type 1 diabetes mellitus

Research involving
Human

Sponsors and support

Primary sponsor: Universitair Medisch Centrum Sint Radboud
Source(s) of monetary or material Support: Diabetes Management International B.V.

Intervention

Keyword: Insulin, Jet-injector, Pharmacodynamic profile, Pharmacokinetic profile

Outcome measures

Primary outcome

Pharmacodynamic parameters: maximal exogenous glucose infusion rate (GIR Cmax) and time to maximal GIR (GIR Tmax) to maintain euglycaemia, area under the GIR curve, and time to median GIR (TAUC*).

Secondary outcome

Pharmacokinetic parameters: maximal insulin concentration (Cmax) and time to maximal insulin concentration (Tmax) after insulin injection, and area under the insulin concentration curve (AUC).

Study description

Background summary

The pharmacological profile of rapid-acting insulin analogues injected subcutaneously with conventional insulin pens is still far from mimicking the profile of endogenous insulin release. Insulin injected with a needle-free jet-injector device may be absorbed faster from the subcutaneous site than insulin injected with conventional pens.

Study objective

To compare the pharmacokinetic and pharmacodynamic profile of the rapid-acting insulin analogue aspart (Novorapid®) injected with jet-injection to that of the same insulin injected with a conventional pen.

Study design

Double-blind randomised controlled cross-over

Intervention

The pharmacokinetic and pharmacodynamic profile of insulin aspart will be determined with the euglycaemic glucose clamp technique. All participants will be investigated twice, where on one occasion the jet-injector device will be used to inject a standardised dose of insulin and a conventional insulin pen to inject a placebo solution, and on the other occasion insulin will be injected with the conventional pen and placebo with the jet-injector. The order of these occasions will be randomised.

Study burden and risks

All participants will undergo a standard physical examination to determine eligibility as well as two clamp studies. During the clamps, two cannulae will be inserted intravenously, one for glucose 20% infusion, the other for blood sampling. A total of 148 ml of blood will be drawn during each clamp for laboratory measurements, thus 296 ml for the whole study. Insulin injections may cause hypoglycaemia, the risk of which is small due to the nature of the euglycaemic clamp (where continuous glucose infusion is aimed at maintaining euglycaemia). Intravenous glucose 20% may cause local irritation and occasionally phlebitis.

Contacts

Public
Universitair Medisch Centrum Sint Radboud

Postbus 9101
6500 HB Nijmegen
NL
Scientific
Universitair Medisch Centrum Sint Radboud

Postbus 9101
6500 HB Nijmegen
NL

Trial sites

Listed location countries

Netherlands

Eligibility criteria

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

Inclusion criteria

Inclusion criteria for healthy subjects
• Age 18-50 years
• Body-mass index 18-28 kg/m2
• Blood pressure <160/90 mmHg
Inclusion criteria for patients with type 1 diabetes
• Age 18-50 years
• Body-mass index 18-28 kg/m2
• Stable glycaemic control with HbA1c 6.5-9.0%
• Duration of diabetes >1 year
• Blood pressure <160/90 mmHg

Exclusion criteria

Exclusion criteria for healthy subjects
• Inability to provide informed consent
• Chronic use of medication other than oral contraceptives or thyroid hormone replacement therapy (with stable euthyroidism for at least 3 months)
• Type 2 diabetes in first-degree relatives
• History of a major cardiovascular disease event (myocardial infarction, stroke, symptomatic peripheral artery disease, coronary bypass surgery, percutaneous coronary or peripheral artery angioplasty)
• Pregnancy
Exclusion criteria for patients with type 1 diabetes
• Inability to provide informed consent
• Chronic use of medication other than insulin, oral contraceptives, thyroid hormone replacement therapy (with stable euthyroidism for at least 3 months), or low-dose angiotensin-converting enzyme (ACE) inhibitor or angiotensin receptor blocker (ARB) treatment
• Macroalbuminuria, i.e. urinary albumin excretion >200 *g/min in collected urine sample or urinary albumin-to-creatinine ratio >300 mg/g in spot urine sample
• Symptomatic diabetic neuropathy
• Proliferative diabetic retinopathy (a history of proliferative retinopathy that was successfully treated with laser coagulopathy is not an exclusion criterion)
• History of a major cardiovascular disease event (myocardial infarction, stroke, symptomatic peripheral artery disease, coronary bypass surgery, percutaneous coronary or peripheral

artery angioplasty)
• Pregnancy

Study design

Design

Study type:	Interventional
Intervention model:	Crossover
Allocation:	Randomized controlled trial
Masking:	Double blinded (masking used)
Control:	Placebo
Primary purpose:	Treatment

Recruitment

NL

Recruitment status:	Recruitment stopped
Start date (anticipated):	15-12-2009
Enrollment:	48
Type:	Actual

Medical products/devices used

Generic name:	jet injector
Registration:	Yes - CE intended use
Product type:	Medicine
Brand name:	Novorapid
Generic name:	insulin analogue aspart
Registration:	Yes - NL intended use
Product type:	Medicine
Brand name:	Test Medium Penfill
Generic name:	Placebo
Registration:	Yes - NL outside intended use

Ethics review

Approved WMO Date:	02-10-2009
Application type:	First submission
Review commission:	CMO regio Arnhem-Nijmegen (Nijmegen)
Approved WMO Date:	03-11-2009
Application type:	First submission
Review commission:	CMO regio Arnhem-Nijmegen (Nijmegen)

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
EudraCT	EUCTR2009-015398-11-NL
ClinicalTrials.gov	NCT-nummernognietbekend
CCMO	NL29503.091.09