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Investigation of the cerebral responses to hunger, satiety and food ingestion in people with obesity-related insulin resistance and Type 2 diabetes. A neuroimaging study using an obesity surgery (Roux-en-Y Gastric Bypass) model

Submission date
30/06/2010

Recruitment status
No longer recruiting

Registration date
30/06/2010

Overall study status
Completed

Last Edited
11/04/2017

Condition category
Nutritional, Metabolic, Endocrine

[ ] Prospectively registered
[ ] Protocol
[ ] Statistical analysis plan
[ ] Results
[ ] Individual participant data
[ ] Record updated in last year

Plain English summary of protocol
Not provided at time of registration

Contact information

Type(s)
Scientific

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Additional identifiers

Protocol serial number
7405

Study information

Scientific Title
Investigation of the cerebral responses to hunger, satiety and food ingestion in people with obesity-related insulin resistance and Type 2 diabetes. A neuroimaging study using an obesity surgery (Roux-en-Y Gastric Bypass) model

Acronym
DRN 381 (RYGB)

Study objectives
Obesity and related health problems such as Type 2 diabetes are becoming much more common and cause ill health and early death. We do not understand why some people are particularly prone to weight gain and diabetes. One possible explanation is that brain mechanisms controlling food intake are abnormal in people predisposed to obesity and/or diabetes. Roux-en-Y Gastric Bypass (RYGB), a type of surgery for obesity, is effective at causing weight loss. People who have had RYGB exhibit changes in appetite (the drive to eat) and/or satiation (feeling of fullness).

Hypotheses:
Our overarching hypothesis is that brain control of food intake is abnormal in insulin-resistant states, predisposing to obesity and Type 2 diabetes, in a way that is amenable to correction e.g. by RYGB and to increase our understanding of the mechanisms involved. We will examine the following hypotheses:
1. That in people who have had successful RYGB the central (brain) responses to food ingestion are different when the effect of surgery is inhibited (mimicking the pre-operative state) and when it is active (the post-operative state)
2. That the central responses to food ingestion are abnormal in insulin resistance and obesity

Protocol:
We are measuring, in the fasted and fed (post 400 kcal meal) state: regional brain activation using (18F)-fluoro-deoxyglucose positron emission tomography (FDG-PET) brain imaging; gut peptides; and appetite and satiety (using visual analogue scales and an ad-libitum meal).

Study One will be performed in 12 people who have lost weight after RYGB in their normal state and using somatostatin infusion to inhibit the satiety effects of surgery.

Study Two compares responses between three groups of 12 people (who have not had obesity surgery):
1. Normal weight (body mass index [BMI] 20 - 25 kg/m^2)
2. Overweight insulin sensitive (BMI 25 - 40 kg/m^2 and updated homeostatic model assessment [HOMA2-IR] greater than or equal to 0.76)
3. Overweight insulin resistant (BMI 25 - 40 kg/m2 and HOMA2-IR greater than or equal to 1.47)

Ethics approval required
Old ethics approval format

Ethics approval(s)
MREC approved, ref: 08/H0801/152

Study design

Single-centre observational screening cross-sectional study

Primary study design
Observational

Study type(s)
Screening

Health condition(s) or problem(s) studied
Topic: Diabetes Research Network; Subtopic: Type 2; Disease: Obesity

Interventions
Intravenous somatostatin infusion (to inhibit the satiety effects of RYGB) compared to intravenous saline control (Study One, post RYGB only). Post 400 kcal meal compared to no food intake.

Intervention Type
Other

Phase
Not Specified

Primary outcome(s)
Regional brain activation: regional brain activation using FDG-PET brain imaging

Key secondary outcome(s))
1. Appetite and satiety using visaul analogue scales and an ad-libitum meal
2. Gut peptides

Completion date
30/09/2011

Eligibility

Key inclusion criteria
1. Aged 18 years or over
2. Able to provide informed consent to participate in the study
3. Able to lie flat in the scanner for duration of scans
4. Right handedness (because of the possibility of lateralisation of cerebral responses)
5. For women of childbearing potential in all groups:
5.1. Using effective form of contraception
5.2. Willing to have a pregnancy test at the start of each scanning visit
5.3. Willing to attend for scanning visits during the first 10 days of their menstrual cycle
6. For STUDY ONE (RYGB):
6.1. Roux-en-Y gastric bypass 3 months to 10 years previously
6.2. BMI 25 - 40 kg/m^2
6.3. Weight loss of more than 10% of excess body weight since surgery
7. For STUDY TWO, Group A (non-overweight, no obesity surgery group):
7.1. No previous obesity surgery
7.2. BMI 20 - 25 kg/m^2

8. For STUDY TWO, Group B (overweight/obese, no obesity surgery with insulin resistance with or without Type 2 diabetes):
8.1. No previous obesity surgery
8.2. BMI 25 - 40 kg/m^2
8.3. HOMA2-IR greater than or equal to 1.47 with or without Type 2 diabetes (managed with diet /exercise/metformin only)
9. For STUDY TWO, Group C (overweight/obese, no obesity surgery, insulin-sensitive group):
9.1. No previous obesity surgery
9.2. BMI 25 - 40 kg/m^2
9.3. HOMA2-IR greater than or equal to 0.76

Participant type(s)
Mixed

Healthy volunteers allowed
No

Age group
Adult

Lower age limit
18 years

Sex
All

Key exclusion criteria
1. Inability to give formal consent
2. Unable to communicate in spoken English (due to the importance of being able to communicate while study subjects are in the scanner)
3. Age less than 18 years
4. Pregnancy, planning pregnancy, or breastfeeding
5. Currently enrolled in other clinical study
6. Left-handedness
7. Taking any glucose-lowering medications (except metformin). Subjects taking metformin will be asked to omit it the day before the Test Meal/OGTT visit and the PET scanning visits because metformin affects gastric emptying and thus may affect nutrient absorption).
8. Advanced retinopathy
9. Any significant brain disorder, e.g. previous significant head injury, epilepsy, cerebrovascular disease
10. Use of psychotropic medication, e.g. antidepressants, antipsychotics
11. Unstable angina, myocardial infarction in the previous year, uncontrolled congestive cardiac failure
12. Chronic kidney disease (Stage 3 - 5)
13. Liver function tests more than three times the upper normal limit
14. Coagulopathy (international normalised ratio [INR] greater than 1.5 or platelets less than 50 x 10^9/L)
15. Anaemia (Hb less than 10 g/dL)
16. Recent history of cancer (less than 5 years)
17. Contraindication to magnetic resonance imaging, e.g. cardiac pacemaker

Date of first enrolment
03/06/2009

Date of final enrolment
30/09/2011

Locations

Countries of recruitment
United Kingdom

England

Study participating centre
133 Coldharbour Lane
London
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SE5 9NU

Sponsor information

Organisation
Kings College London (KCL) (UK)

ROR
https://ror.org/0220mzb33

Funder(s)

Funder type
Charity

Funder Name
Diabetes UK (UK)

Alternative Name(s)
The British Diabetic Association, DIABETES UK LIMITED, British Diabetic Association

Funding Body Type
Private sector organisation

Funding Body Subtype

Trusts, charities, foundations (both public and private)

Location
United Kingdom

Results and Publications

Individual participant data (IPD) sharing plan

IPD sharing plan summary
Not provided at time of registration