

Prolonged Oral Glucose Tolerance Test (GTT) and Mixed Meal Test (MMT) for Hypoglycaemia - Full Clinical Guideline

(Document Code: CHISCG37)

**THIS TEST IS ONLY TO BE PERFORMED FOLLOWING DISCUSSION
WITH A CONSULTANT BIOCHEMIST OR ENDOCRINOLOGIST**

1. Introduction

Hypoglycaemia in the absence of drugs that lower serum glucose, particularly during treatment for diabetes mellitus, is a rare event. Symptoms compatible with hypoglycaemia are comparatively common. It is important to be able to confidently identify the small proportion of people with these symptoms who have genuine hypoglycaemia, especially those with fasting insulin excess (e.g. insulinoma patients).

Where possible it is important to confine investigations to those patients with Whipple's Triad;- symptoms or signs of hypoglycaemia, low serum glucose at the time of the attack and resolution of symptoms or signs after glucose concentration is raised. It is acknowledged that confirmation of low serum glucose may require formal investigation.

It is appropriate to focus testing on circumstances known to precipitate symptoms. The initial test for a patient with fasting symptoms is therefore a prolonged fast whereas the Mixed Meal Test or Prolonged Oral Glucose tolerance test is appropriate for most patients with daytime symptoms.

Guidance in this protocol is based on The Endocrine Society Clinical Guideline; 'Evaluation and Management of Adult Hypoglycaemia Disorders'.

Note; Critical illness can be associated with hypoglycaemia due to sepsis, hepatic, renal or cardiac failure- this test should not be used in these circumstances.

2. Guideline

INDICATIONS

Confirmation and differential diagnosis of suspected hypoglycaemia

CONTRAINDICATIONS

Severe acute illness as above

Hypoglycaemic drugs for diabetes

Untreated adrenal insufficiency- to be excluded prior to test

SIDE EFFECTS

Nil, but test potentially unpleasant due to severe hunger

PRECAUTIONS

Nil

PREPARATION

The patient should have been on a diet containing adequate amount of carbohydrate (250g/day) for at least 3 days before the test.

The patient should fast from 10p.m. the previous evening, to give a minimum 10 hour fasting period, and not eat or drink anything other than water, until the test is completed. Discontinue all non-essential medications on day of commencing test.

PROCEDURE

Substrate preparation:

- GTT
 - Prepare Polycal - this is a carbohydrate drink based on maltodextrin, a partial hydrolysate of corn starch. It is supplied by Cow and Gate in 200 mL bottles. Only 113 ml is required for each patient. This is equivalent to 75g anhydrous glucose. Measure 113 mL Polycal into a special beaker, add water up to 200 mL mark. Secure plastic cap firmly onto beaker, shake to mix. Polycal is now ready.
- MMT
 - Prepare Ensure Plus- This is a mixed drink which contains protein, fat and carbohydrates and the standard presentation is 200ml bottle. This will give 330Kcal (13.8g Protein, 10.8g Fat and 44.4g carbohydrates Abbott laboratories, Abbott Park, IL). The drink is given to the patient as it comes.

Note: A further 100 mL of water must be drunk by the patient to make the final volume 300 mL.

TIME	For each time point request: glucose, insulin, C-peptide and sample STORE
08:45	Insert the venous cannula
0 min (i.e. 09:00)	Give Substrate - as above Send grey top and yellow top.
30 minutes	Send grey top and yellow top.
60 minutes	Send grey top and yellow top.
90 minutes	Send grey top and yellow top.
120 minutes	Send grey top and yellow top.
150 minutes	Send grey top and yellow top.
180 minutes	Send grey top and yellow top.
210 minutes	Send grey top and yellow top.
240 minutes	Send grey top and yellow top.

Sulphonylureas will only be measured if results suggest insulin excess (on single sample).

The test ends when laboratory glucose is less than 2.5 mmol/L and the patient is symptomatic or displaying signs of hypoglycaemia (e.g. confusion if hypoglycaemia unaware patient) or when 4 hours have elapsed since Polycal. Do not end the test on the basis of a bedside sugar test. Do not end the test in an asymptomatic patient with low serum glucose. **It is important that details of symptoms including timings are documented during the test.**

If it is judged necessary to treat hypoglycaemia urgently due to severe or dangerous symptoms, obtain samples as above and then administer carbohydrate.

INTERPRETATION

The first use of the test is to compare blood glucose levels during the test with symptoms. This can help to confirm or refute hypoglycaemia as a cause of symptoms. Comparison of blood glucose and symptoms can also help to define the group of patients with severe symptoms relating to biochemically mild hypoglycaemia. This is a further group in whom underlying significant organic pathology is extremely unlikely.

A period of relative hyperglycaemia followed by symptomatic hypoglycaemia later in the test, accompanied by symptoms is indicative of 'reactive' hypoglycaemia. This pattern can be associated with abnormal glucose tolerance of 'pre-diabetes'. Reactive hypoglycaemia is not usually indicative of significant other underlying pathology and is usually best managed by dietary modification with regard to reducing intake of high glycaemic index foods. Case reports suggest that severe reactive hypoglycaemia can occasionally be a presenting feature of insulinoma.

TURNROUND TIME

Glucose, Insulin and C-peptide results are available within one working day.

Samples that have been requested to be stored are kept frozen for 3 months before being discarded. The decision to add on further tests to these samples must be made within this time. Sulphonylureas are not analysed at Royal Derby Hospital and results may take up to 3 weeks to return.

3. References

Evaluation and Management of Adult Hypoglycaemic Disorders
An Endocrine Society Clinical Practice Guideline, 2009, JCEM; 94: 709-728

4. Documentation Controls

Reference Number CHISCG37	Version: 5.0.0	Status Final	Authors: Specialist Healthcare Science Practitioner (Helen Seddon), Consultant Endocrinologist (Antonia Ugur)	
Version /	Version	Date	Authors	Reason

Amendment History	5.0.0	Mar 2024	Helen Seddon, Antonia Ugur	Update
Intended Recipients: Endocrinology (medics and nurse specialists) and Biochemistry staff				
Training and Dissemination: Guideline reviewed and agreed at the monthly Biochemistry/Endocrine MDT meeting. All relevant staff are aware of this guideline.				
Linked Documents: None				
Keywords: Hypoglycaemia, GTT				
Business Unit Sign Off		Group: Biochemistry/Endocrinology MDT meeting Date: 28/02/2024		
Divisional Sign Off		Group: Division of Cancer, Diagnostics & Clinical Support Date: 02/04/2024		
Date of Upload			2/4/2024	
Review Date			March 2027	
Contact for Review			Consultant Healthcare Scientist (Julia Forsyth) Specialist Healthcare Science Practitioner (Helen Seddon)	