

Oral Glucose Tolerance Test

Test Name: GLUCOSE TOLERANCE TEST

Principle

In normal individuals, pancreatic insulin secretion maintains blood glucose within a tight concentration range following an oral glucose load. Failure of insulin secretion, or resistance to insulin action, will result in an elevation in blood glucose. The Glucose Tolerance Test is usually used to exclude/confirm a diagnosis of Glucose intolerance or Type 2 Diabetes Mellitus. The test is unnecessary if a child has characteristic symptoms of diabetes (e.g., weight loss, thirst, polyuria) and either a random venous plasma laboratory glucose concentration of ≥ 11.1 mmol/L, or a fasting concentration of ≥ 7.0 mmol/L.

Indication

- The oral glucose tolerance test is used to clarify borderline elevation in fasting plasma glucose. The OGTT is not indicated when a patient has an unequivocally elevated fasting or random plasma glucose. An OGTT only needs to be performed in a child with an equivocal result for the diagnosis of diabetes.

Precautions

- This test is only necessary if fasting glucose measurements are equivocal i.e., 5.6 - <7.0 mmol/L. This test should not be performed in patients who fulfil the criteria for diabetes mellitus: Two diagnostic glucose results on separate occasions (either fasting plasma glucose ≥ 7.0 mmol/L or random plasma glucose of ≥ 11.1 mmol/L), or one diagnostic glucose result and clinical symptoms of diabetes e.g., polydipsia, polyuria, ketonuria and rapid weight loss.
- Do not perform glucose tolerance tests on patients with uncontrolled thyroid dysfunction or patients who are under physical stress e.g., post surgery, trauma or infection or extreme psychological stress as these may give misleading results due to altered insulin sensitivity in these circumstances.
- This test should also not be performed on patients with hypokalaemic periodic paralysis.
- Do not perform this test at the same time a synacthen test. However, the oral glucose tolerance may be performed after the synacthen test.

Side Effects

Some patients feel nauseated and may have vasovagal symptoms during this test.

Preparation

- Before subjecting a patient to an OGTT ensure that there has been an appropriate diagnostic work-up (see WHO guidelines).
- Ensure that the child has had an adequate diet (minimum of 150 g/day of carbohydrate) for at least 5 days before the test.
- Fast the patient overnight (4 hours for infants) but avoid more prolonged fasting. Drinks of water (no sweet drinks) are allowed during this period.
- Physical exercise is not allowed in morning prior to and/or during the test.
- Test should be performed in the morning.

Protocol

- Ensure the patient's fasting blood glucose concentration, checked with a capillary blood sample obtained by finger prick testing with a glucometer, is ≤ 7.0 mmol/L before proceeding with the test. If the result is higher, take a venous blood sample and send it to the lab to confirm the glucometer result.
- Prepare the glucose load using **ONE** of the following:
 - POLYCAL® (Nutricia Clinical) liquid (contains 0.66g anhydrous glucose per mL; 1.51 mL = 1g anhydrous glucose):** Dose of POLYCAL must be adjusted for the weight at a dose of 2.64 mL POLYCAL/kg body weight (maximum dose 113 mL POLYCAL, equivalent to a 75g glucose load). Add water to make up to a volume of 200 mL.

OR

- **Glucose tolerance test (RapiLOSE) Solution:** Contains 75g anhydrous glucose in 300 mL. For children weighing less than 43kg, the dose is 7 mL (1.75g anhydrous glucose)/kg body weight. The total dose should not exceed 75g anhydrous glucose. If the volume is less than 200 mL, add water to make up to 200 mL.
4. Take a basal sample for glucose (t = 0). Write “t=0” on the tube of blood and time of sampling. Besides sending the sample to lab, use the sample to check bedside point of care blood glucose and record it in the notes.
 5. The child should drink the glucose load over a period of no more than 5 min.
 6. Take a further blood sample 2hrs (120 min) after finishing the glucose drink. Write “t=120” on the tube of blood and time of sampling. Besides sending the sample to lab, use the sample to check bedside point of care blood glucose and record it in the notes.

Samples

Glucose

- 1.2 mL fluoride oxalate tube (yellow top).
- A drop of blood for bedside blood glucose measurement.

If it is impossible to collect a venous sample, then 0.5 mL (minimum) capillary blood in a fluoride tube may be substituted but the result interpretation is different (see table below). Samples taken at 0 and 120 min must always be the same type.

Interpretation

The flow chart on the following page indicates the diagnostic criteria for Diabetes mellitus.

Venous plasma:

- A fasting glucose level of >7.0 mmol/L or a level of >11.1 mmol/L 120 min post-glucose load confirms a diagnosis of diabetes mellitus.
- Levels between 7.8 – 11.0 mmol/L 120 min post glucose load indicate impaired glucose tolerance.
- Values for diagnosing diabetes using different sample types are indicated in the table below:

	Glucose Concentration (mmol/L)		Glucose Concentration (mmol/L)	
	Whole blood		Plasma	
	Venous	Capillary	Venous	Capillary
Diabetes Mellitus				
Fasting	≥6.1	≥6.1	≥7.0	≥7.1
120 min post-glucose	≥10.0	≥11.1	≥11.1	≥12.2
Impaired glucose tolerance				
120 min post-glucose	≥6.7 and <10.0	≥7.8 and <11.1	≥7.8 and <11.1	≥8.9 and <12.2
Impaired fasting glycaemia				
Fasting	≥5.6 and <6.1	≥5.6 and <6.1	≥6.1 and <7.0	≥6.1 and <7.0

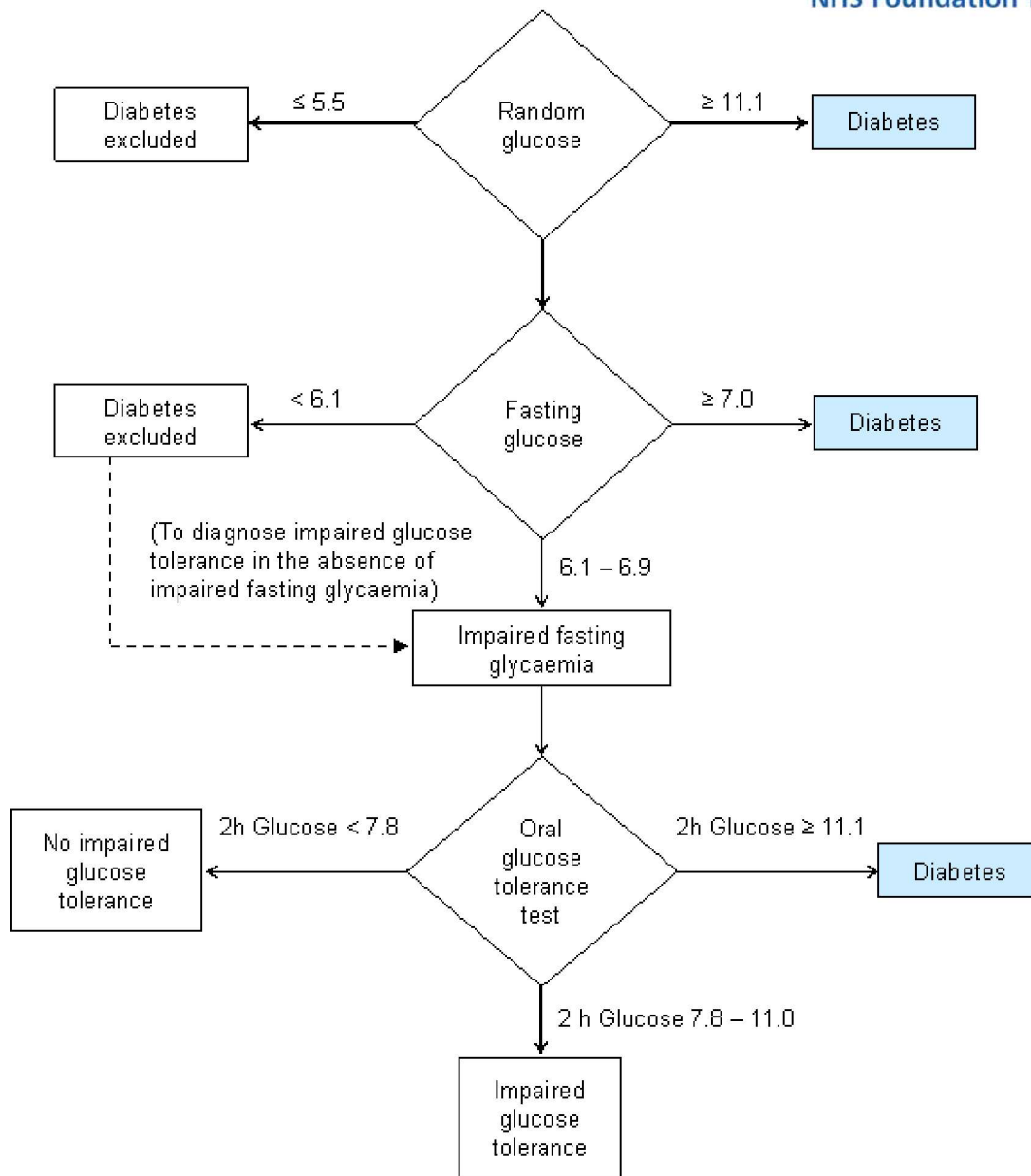


Diagram taken from Brooks *et al* 2005.

References

1. East Kent Hospitals University NHS Foundation Trust Clinical Biochemistry: OGTT – Protocol for paediatrics
2. Colley C.M. & Lerner J.R. (1990) The use of Fortical in glucose tolerance tests. *Ann Clin Biochem* 27: 496 – 498
3. WHO/IDF report (2006) Definition and diagnosis of diabetes mellitus and intermediate hyperglycaemia
4. Brooks C., Clayton P. & Brown R. (2005) *Brook's clinical paediatric endocrinology*, 5th edition. Blackwell publishing, Oxford.