USE OF HYDROGEN BREATH TESTING FOR DIAGNOSIS OF DIETARY FRUCTOSE MALABSORPTION

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Introduction

Fructose is a simple monosaccharide which is found in many plant foods. It is also used as a sweetening additive in the form of fructose corn syrup, a mixture of glucose and fructose. Its consumption is, in general, rising among the population. Setting aside the condition of hereditary fructose intolerance (which is relatively rare), it is possible for dietary intake of fructose to overload the enterocytes. This is consistent with the limited absorption capacity of the enterocyte transporter GLUT5, which is used by fructose to cross the intestinal epithelium [1]. Non-absorbed ffructose produces gastrointestinal symptoms from its metabolism by colonic bacteria, which may be an undiagnosed cause of recurrent abdominal pain. It has also been suggested that fructose malabsorption may underlie the gastrointestinal symptoms seen in patients with irritable bowel syndrome [2].

The most common mutations responsible for fructose intolerance in Northern European populations [3] are on the aldolase B gene (A149P and A174D); however these mutations only account for 80% of cases and give information as to susceptibility, rather than clinical symptoms.

Breath testing is therefore the method of choice for the diagnosis of fructose intolerance. Earlier protocols used a 50 gm dose of fructose, which often exceeded the absorptive capacity for fructose in normal individuals. 25 gm appears to be the cut-off dose to investigate fructose malabsorption, with a positive breath test at this dose suggesting abnormally low capacity to absorb fructose. This low level may be difficult to exclude from the daily diet, resulting in symptoms of fructose malabsorption [4].

Indications

Fructose malabsorption should be considered in subjects with unexplained gastro-intestinal symptoms, especially after consumption of fruit and fruit drinks. Fructose malabsorption may also contribute to the symptoms of irritable bowel syndrome.

Patient preparation

No food and no alcohol for 12 hours prior to the test, with only water to drink. Avoid slowly digesting foods such as beans on the day before the test. Recent antibiotic therapy may interfere with the result.

Test Protocol

For the fructose breath test, the patient is given 25 gm of fructose in 250 ml of water and alveolar air samples are collected at baseline and every 60 minutes for 3 hours (3 samples in all). If the patient is a child, the dose of lactose should be reduced to 1gm per kg body weight.

Specimen requirements: alveolar breath samples. Collection bags are available for postal samples.

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Interpretation

Subjects who do not absorb fructose (a monosaccharide normally present in food) produce hydrogen and perhaps methane as the carbohydrate passes into the lower gut. A fructose breath test is *positive* if either the hydrogen peaks by ≥20 ppm compared to the basal sample or if the methane peaks by ≥12 ppm compared to the basal sample.

Methodology: Breath hydrogen and methane are measured by gas-liquid chromatography.

Turnaround time: Same day; the test must be booked in advance.

References

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