How to Interpret Nutrition Drink Test

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Nutrient drink test is one of the drink test techniques to assess gastric accommodation and to quantify meal-induced symptoms. It uses nutrient-containing solution instead of water and has been proposed as a surrogate method for estimating gastric volumes and validated for assessing satiation, sensation of bothersome symptoms after meal ingestion. Various nutrient-containing solution and drinking rates have been used and there were no widely accepted reference values for nutrient drink test until now. However, tests results are usually reported as the maximum tolerated volume, individual and cumulative symptom scores. The accommodation response, gastric sensation and gastric emptying may influence the maximum tolerated volume of nutrient drink. Although drink test is a useful tool for assessing gastric accommodation and sensation, it remains unclear exactly what physiologic processes are assessed by nutrient drink tests.

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Key Words
Drink; Maximum tolerated; Nutrient

Introduction
Assessment of gastric sensation and accommodation is measured using a barostat-balloon study. This is the gold standard for their measurement, however it is invasive, time consuming and uncomfortable, therefore is not considered suitable for routine clinical practice.1 To overcome these shortcomings, drink tests were developed as a noninvasive methods to assess gastric sensation and accommodation. Drink tests are well tolerated, inexpensive and easy to perform.

It is still unclear whether drink tests estimate gastric sensation and accommodation exactly.1-3 Although drink tests have not been used in clinical practice, they are often performed in clinical researches evaluating patients with functional dyspepsia or gastroparesis.4 Nutrient drink tests seem to be performed more often than water load tests in clinical research despite no comparative studies among them. This paper deals with performance and interpretation of nutrient drink tests.

Performing Nutrient Drink Tests
Nutrient drink tests should be performed in the morning after an overnight fast. Any medications which can alter gastrointestinal sensation, accommodation or gastric emptying can be stopped before performing nutrient drink tests. Different nutrient drink tests based on various nutrient containing solutions, are performed with various drinking rates.1-3 Nutrient drink test developed by Mayo Clinic presents the simplest method among other tests.4 Subjects consume 120 mL of Ensure™ (Abbott Laboratories, Abbott Park, IL, USA), which contains 1.06 kcal/mL with 65% of carbohydrate, 20% of fat and 15% of protein, every 4
Nutrient Drink Test

Table. Nutrient Drink Test Results: Adolescents vs Adults (Adapted from Chial et al)

| Assessment                  | Males                  | P-value | Females                  | P-value |
|-----------------------------|------------------------|---------|--------------------------|---------|
|                             | Adolescents            | Adults  |             | Adolescents            | Adults  |
| Maximum tolerated volume (mL) | 1,101 ± 109            | 1,516 ± 115 | 0.006\(^a\) | 80 ± 64               | 1,269 ± 57 | < 0.0001\(^a\) |
| Aggregate symptom score     | 138 ± 13               | 158 ± 15 | 0.3\(^b\)    | 41 ± 6               | 44 ± 6   | 0.2\(^b\) |
| Nausea                      | 24 ± 6                 | 31 ± 6  | 0.4\(^b\)    | 10 ± 7               | 64 ± 5   | 0.0006\(^b\) |
| Bloating                    | 38 ± 6                 | 49 ± 6  | 0.2\(^b\)    | 18 ± 4               | 48 ± 7   | 0.007\(^b\) |
| Pain                        | 14 ± 5                 | 31 ± 8  | 0.1\(^b\)    | 72 ± 4               | 44 ± 8   | 0.07\(^b\) |
| Fullness                    | 62 ± 5                 | 47 ± 8  | 0.2\(^b\)    |                     |         |             |

\(^a\)Mann-Whitney test using body mass index as a covariate, \(^b\)Mann-Whitney test using maximum tolerated volume as a covariate.

Nutrient drink test results are reported as the maximum tolerated volume, 4 individual and aggregate symptom scores. If emesis occurs, the volume of emesis should be recorded and subtracted from the total ingested volume. An extremely low maximum tolerated volume may suggest that extra-gastric or central factors are playing an important role in symptom generation, while low maximum tolerated volume may predict impaired gastric accommodation.

Some patients with functional dyspepsia showed lower maximum tolerated volumes than controls. Since several physiologic factors including gastric sensation, accommodation and gastric emptying may influence the maximum tolerated volume of nutrient drink, the results of maximum tolerated volume cannot be used to guide therapy.

Four individual and aggregate symptom scores are more likely to be higher in patients with functional dyspepsia than controls.

Conclusion

Various nutrient drink tests are used in clinical researches evaluating patients with unexplained upper gastrointestinal symptoms. Standardization of nutrient drink tests is required to be widely performed in patients with functional dyspepsia. The maximum tolerated volume, individual and cumulative symptom scores can be reported as results of nutrient drink tests.

References

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