Orocecal Transit Time in Normal Adults at Cipto Mangunkusumo National Center General Hospital, Jakarta

Paulus Simadibrata, Rino A. Gani**, Marcellus Simadibrata. K***, A. Aziz Rani****

* Department of Internal Medicine, Faculty of Medicine,
University of Indonesia/Cipto Mangunkusumo Hospital, Jakarta

** Division of Hepatology, Department of Internal Medicine, Faculty of Medicine,
University of Indonesia/Cipto Mangunkusumo Hospital, Jakarta

*** Division of Gastroenterology, Department of Internal Medicine, Faculty of Medicine,
University of Indonesia/Cipto Mangunkusumo Hospital, Jakarta

ABSTRACT

Background

Orocecal transit time can be used to measure intestinal tract motility. Orocecal transit time measurement can be beneficial in various clinical conditions. This study aims at determining the orocecal transit time in healthy adults at the Cipto Mangunkusumo National Center General Hospital, Jakarta.

Materials and method

The 36 healthy adults in this study were taken from the Cipto Mangunkusumo National Center General Hospital community, Jakarta. Orocecal transit time was determined using the hydrogen breath test using 20 mL of lactulose (13.3 g). After fasting of at least 10 hours, subjects were asked to undergo the hydrogen breath test while fasting for 30 minutes for a total of 3 hours. Increased H_2 concentration of equal to or over 10 parts per million from the basal (fasting value) was considered as the point when lactulose reached the caeccum, thus considered as the orocecal transit time. If no H_2 increase was found during the evaluation, the subject was considered to have produced no H_2.

Results

Out of the 36 study subjects, 31 people (86.1%) produced H_2, thus available for orocecal transit time evaluation. The average orocecal transit time from the 31 subjects was 93.9 ± 31.7 minutes. The other five subjects did not have increased H_2 concentration in the 3 hours of hydrogen breath test, and thus were considered as non-H_2 producers.

Conclusion

The average orocecal transit time from the 31 healthy adults from the Cipto Mangunkusumo National Center General Hospital community was 93.9 ± 31.7 minutes. The hydrogen breath test is an easy, safe, quick, and relatively low-cost method of evaluation that can be clinically applied, even though its specificity and sensitivity varies from one study to another in foreign countries.

***Key words:** Orocecal transit time, hydrogen breath test, normal adults.*

BACKGROUND

Gastrointestinal motility has gained attention from gastroenterologist all over the world for its important role in the pathogenesis of various bowel symptoms. Various studies on gastrointestinal motility have been conducted with various different methods. Meanwhile, even though there have been great development in the understanding of the neuro-hormonal control mechanism on gastrointestinal motility, its clinical application is still limited. Thus, gastroenterologists greatly focus their attention on a non-invasive and easy method of evaluation of gastrointestinal transit time.[1] Presently, several methods of evaluation have been utilized, including manometry; scintigraphy with standard radio-labeled fluid or solid substrates, radio-opaque markers, bio-magnetic method, and breath test evaluation.[2,3,4] Evaluation of intestinal motility stated as the oro-cecal transit time (OCTT) have also been frequently used abroad, both using simple and complicated techniques. The technique of OCTT evaluation in humans includes the hydrogen breath test and gamma scintigraphy using radioactive markers.

OCTT evaluation has been conducted frequently under various clinical conditions, including scleroderma and systemic sclerosis. Thus, it is beneficial in further management of the patient.[5,6,7] However, the normal OCTT value varies greatly from different literatures, and there has been no report on OCTT evaluation results from Indonesia. This study aims to determine the normal value of OCTT in healthy adults. The benefit of this study is to determine a normal OCTT value to be used as a standard of comparison with OCTT values from patients with gastrointestinal dysmotility in Indonesia.

MATERIALS AND METHOD

Thirty-six healthy adults from the Cipto Mangunkusumo National Center General Hospital community, Jakarta, participated in this study. All study subjects did not demonstrate any gastrointestinal complaints, and did not suffer from any infectious disease in the preceding month. Subjects with history of diabetes mellitus were excluded from the study. Routine blood evaluation was conducted as baseline data. Subjects were required to fast at least 10 hours prior to the hydrogen breath test. Subjects were required to avoid smoking and exercise one day prior to the test. All subjects gave oral informed consent.

The hydrogen breath test was conducted using 20 ml (13.3 g) of lactulose substrate (Lactulax®, PT. Ikapharmindo, Jakarta). The hydrogen breath test was performed once during fasting as a basal value, then every 30 minutes up to a total of 3 hours. The instrument used for the hydrogen breath test was a Lactomer manufactured by Hoek Loos, Netherlands, that is capable of detecting up to 0-200 ppm H_2 with an accuracy rate of ± 2%.[8,9] The point when H_2 was increased to 10 parts per million (ppm) or more from the basal value was considered as the time when lactulose entered the caecum, and was considered as the OCTT (in minutes).[10] If there was no increase in H_2 concentration from the basal value, the subject was considered as a non-H_2 producer.

RESULTS

Out of the 36 study subjects, the average age was 38.8 ± 12.1 years, with the greatest age group being from 30-39 years, consisting of 31 subjects (33.3%) The characteristics of study subjects can be found in Table 1 as follows.

Table 1. Characteristics and Laboratory Data of 36 Subjects

Sex (M/F)	13/23
Age (year)	38.8 ± 12.1
Height (cm)	160.6 ± 8.5
Body weight	61.0 ± 11.7
BMI (kg/m^2)	23.6 ± 3.8
Hb (g/dL)	13.4 ± 1.1
Ureum (mg/dL)	27.9 ± 7.1
Creatinine (mg/dL)	0.8 ± 0.2
Blood sugar (g/dL)	89.2 ± 7.9

All values are expressed as mean ± standard deviation. M: male; F: female; BMI: body mass index; Hb: haemoglobin level.

Out of the 36 subjects, only 31 subjects (86.1%) demonstrated an increased H_2 concentration of over 10 ppm from the basal value, thus providing an OCTT value, while the remaining 5 (13.9%) did not produce an increase in H_2 (Figure 1). The average OCTT value of the 31 subjects was 93.9 ± 31.7 minute with a median value of 90 minutes (minimum 60 minutes-maximum 150 minutes).

Analysis using t test demonstrated no statistically significant association between OCTT and sex (p = 0.841). Because the variation coefficient is over 20%, wecontinued with the non-parametric test (Mann-Whitney test), which did not demonstrate a statistically significant relationship (p = 0.602) (Table 2).

There was no statistically significant relationship between OCTT and age group. One-way analysis of variance (ANOVA) found a p value of p = 0.684 (Table 2).

There was no statistically significant relationship between OCTT and body mass index (BMI). One-way analysis of variance (ANOVA) found a p value of p = 0.727 (Table 2).

Table 2. Distribution and Significance of the Correlation Between OCTT and Sex

Sex	n	OCTT Significance (minute)	Significance test ($p < 0.05$)
Male	11	Mean 95.5 ± 26.2 Median 90 (60-150) Mann-Whitney	p = 0.602
Female	20	Mean 93.0 ± 35.0 Median 90 (60-150)	(NS)

NS: non-significant

Table 3. Distribution and Significance of the Correlation Between OCTT and Age

Age (year)	n	OCTT (minute)	Significance test	Significance (p < 0.05)
17–19	1	Mean 60.0 Median 60 (60-60)		
20-29	7	Mean 85.7 ± 36.5 Median 60 (60-150)		
30-39	12	Mean 102.5 ± 32.5 Median 90 (60-150)	One-way ANOVA	p = 0.684 (NS)
40-49	6	Mean 90.0 ± 32.9 Median 90 (60-150)		
50-59	4	Mean 90.0 ± 24.5 Median 90 (60-120)		
60-69	1	Mean 120.0 Median 120 (120-120)		

NS: not significant

Table 4. Distribution and Significance of the Correlation Between OCTT and BMI

BMI (kg/m^2)	n	OCTT (minute)	Significance test	Significance (p < 0.05)
< 18.5	4	Mean 82.5 ± 28.7 Median 75 (60-120)		
18.5 - 25.0	20	Mean 94.5 ± 31.2 Median 90 (60-150)	One-way ANOVA	p = 0.727 (NS)
> 25.0	7	Mean 98.6 ± 37.6 Median 90 (60-150)		

NS; not significant

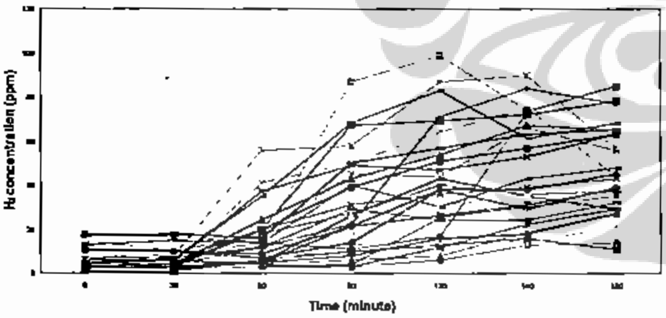

Figure 1. Result of The Hydrogen Breath Test of 31 Subjects

DISCUSSION

OCTT evaluation using the hydrogen breath test has frequently been performed in various studies abroad using various specificity and sensitivity.[10] The hydrogen breath test has been compared to other methods in various studies, and demonstrated a close correlation between the point of hydrogen increase with isotop appearance in the caecum or ascending colon.[11] We chose the hydrogen breath test since it is a relatively low-cost, easy, quick, safe, and non-invasive method compared to evaluation methods using radioactive materials or manometry using electrodes that need to be inserted into the gastrointestinal tract.

The hydrogen breath test was performed in the morning, not during other times, noting the clear circadian pattern in the hydrogen breath test, being higher in the morning and decreasing to the nadir point in the afternoon.[12] Smoking can increase the concentration of H_2 in the expiration air, while exercise or hyperventilation can reduce H_2 concentration in the expiration air.[15] Thus, subjects were asked not to smoke or exercise one day prior to the hydrogen breath test.[13,14] In addition, it has been proven that smoking and nicotine increases the oro-cecal transit time.[15] The lactulose we used as substrate for the hydrogen breath test was a carbohydrate that is not absorbed in the gastrointestinal tract. Thus, it is expected to reach the caecum for fermentation by bowel bacteria to produce H_2 gas that can be measured.[16]

The finding that 13.9% subjects did not produce H_2 gas was in accordance with data from studies abroad that 0-27% of all people are not H_2 producers. However, the incidence of non-H_2 producers depend on the criteria used as a cutoff point for H_2 production.[17] Data from a large study demonstrated that 98% of the United States population secreted H_2, while 33% secreted CH_4.[18] The possibility that the subjects of our study were CH_4 producers cannot be eliminated, but to determine this fact, other methods for CH_4 evaluation would need to be used.

Our study found an average OCTT value of 93.9 ± 31.7 minutes, which was similar to that found in various studies abroad.[19,20,21] Nevertheless, further study using larger samples is required to establish a more accurate and reliable normal value for the Indonesian population.

From statistical analysis, OCTT and sex, age, and BMI did not demonstrate a statistically significant correlation. Previous studies also did not demonstrate a correlation between OCTT and sex or age.[22] A study by Madsen (1992) reported that sex, age, and BMI did not influence gastrointestinal transit time.[23] However, a study by Wald et al (1981) demonstrated significant elongation of OCTT in the luteal phase is compared to the follicular phase of the female menstruation cycle.[24]

CONCLUSION

We have conducted a study on intestinal motility established through the OCTT of 36 healthy adults from the Cipto Mangunkusumo National Central General Hospital, Jakarta. We found an average value of 93.9 ± 31.7 out of 31 subjects. There was no statistically significant correlation between OCTT and age, sex, and BMI. The use of the hydrogen breath test to determine OCTT in daily clinical application may be recommended, since it is non-invasive, easy, fast, safe, and costs relatively less than other methods of evaluation.

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