Orocaecal Transit Time in Chronic Diarrhea

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ABSTRACT

***Background**: The diagnosis and treatment of chronic diarrhea is sometimes difficult. Orocaecal transit time may explained some pathogenesis mechanism in chronic diarrhea.*

***Materials & Methods**: Twenty six chronic diarrhea patients and 35 normal adult subjects were included in this study. After fasting for at least 10 hours, subjects were asked to drink 20 ml (13.3 g) lactulose, then performed the breath hydrogen test. If there were an increment of H_2 concentration 10 ppm in ½ -1 hour, the subject was considered as rapid transit time. If an increment of H_2 concentration 10 ppm in 1 - 2 hour, the subject was considered as normal transit time. If an increment of H_2 concentration 10 ppm in 2 - 3 hour,the subject was considered as delayed transit time*

***Results**: In the chronic diarrhea group, 10 (38.4%) had rapid OCTT, 15 (57.6%) had normal OCTT and only 1 (4%) had delayed OCTT. In the normal adults group, 2 (5.7%) had rapid OCTT, 22 (62.9%) had normal OCTT and 11 (31.4%) had delayed OCTT. The difference was statistically significant ($p < 0.001$). The mean value of OCTT in chronic diarrhea and normal adults were 84.23 ± 39.82 min vs. 114.00 ± 51.35 min ($p = 0.027$).*

***Conclusions**: The rapid OCTT was more likely to be found in the chronic diarrhea patients compare to normal adults significantly. The mean OCTT in chronic diarrhea was shorter than the mean OCTT in normal adults.*

Keywords: orocaecal transit time, OCTT, chronic diarrhea

INTRODUCTION

The prevalence of chronic diarrhea in Asian hospitals is between 0.8-1%.[1] The prevalence of chronic diarrhea in Western population is 4-5%.[2]

The diagnosis of etiology and treatment in chronic diarrhea is sometimes difficult. A case of chronic diarrhea may have more than one etiology or cause. There might be more than one pathomechanisms of diarrhea in a single case of chronic diarrhea.[3] The common pathomechanisms were as follows, osmotic diarrhea, secretory diarrhea, bile acid - fat malabsorption, defect in the system of anion exchange or transport of active electrolyte in the enterocyte, abnormal and rapid motility impairment, bowel permeability impairment, excessive exudation of fluid, electrolyte and mucus from the bowel mucosa.[1-5] Despite a vigorous attempt, the etiology of 10-15% of chronic diarrhea cases could not be determined, which may have a neuroendocrine secretion disorder or other unknown pathomechanism.[5]

One of the pathomechanisms in chronic diarrhea which can be evaluated is abnormal or rapid motility.[3,4] Orocaecal transit time (OCTT) can be used to evaluate gastrointestinal tract motility.[2,4,6-21] OCTT can be examined by measuring the hydrogen (H_2) in expiratory air with lactometer.[11] H_2 is generated in the intestinal lumen by bacterial action on carbohydrates in the large or small intestine. This H_2 diffuses into the bloodstream and then to the alveoli. Thereafter, it can be detected in expiratory air.

In this study we examine the OCTT in patients with chronic diarrhea and compare to normal adult subjects.

MATERIALS & METHODS

Twenty six chronic diarrhea patients and 35 normal adults (normal volunteers) in the year 2003-2004 were included in this study. After fasting for at least 10 hours, subjects were asked to drink 20 ml (13.3 g) lactulose, then performed the breath hydrogen test in the Division of Gastroenterology, Department of

Pediatric. First at a fasting state and then at 30 minutes interval for the next 3 hours. The equipment used for this examination was a lactometer (Hoek Loos, made in the Netherlands). An increment of H_2 concentration of 10 parts per million (ppm) from basal value (fasting) was considered as the time lactulose entered into the caecum and was recorded as the orocaecal transit time. If an increment of H_2 concentration 10 ppm was obtained in ½ - 1 hour, the subject was considered as having a rapid transit time. If an increment of H_2 concentration 10 ppm was obtained in 1 - 2 hour, the subject was considered as having a normal transit time. If an increment of H_2 concentration 10 ppm was obtained in 2 - 3 hour, the subject was considered as having a delayed transit time.[9-11,18,19] Statistical analysis was done using chi-square test and anova.

RESULTS

Nineteen of twenty six (73.1%) chronic diarrhea patients were caused by infection. Most of chronic diarrhea patiens were 50 to 59 year old (34.6%) and there were more male compare to female patients (65.4% vs. 34.6%) (see table 1).

From the test result, the mean H_2 concentration in the chronic diarrhea group was higher than the normal group, within 30 minutes and 60 minutes ($p < 0.05$). On the other hand, at minute-90 and minute-120 the mean H_2 concentration were not statistically significant between the two groups ($p > 0.05$) (see table 2 and figure 1).

Table 1. Characteristics of the chronic diarrhea patients

Chacteristics		Frequency (%)
Age		
	10 – 19	0 (0%)
	20 – 29	5 (19.2%)
	30 – 39	4 (15.5%)
	40 – 49	3 (11.5%)
	50 – 59	9 (34.6%)
	60 – 69	3 (11.5%)
	70 – 79	2 (7.7%)
Sex		
	Male/female	17/9 (65.4%/34.6%)
Cause of chronic diarrhea		
	Infective	19 (73.1%)
	Non-infective	7 (26.9%)

In the chronic diarrhea group, 10 (38.4%) patients had rapid OCTT, 15 (57.6%) patients had normal OCTT and only 1 (4%) patient had delayed OCTT. In the normal adults group, 2 (5.7%) volunteers had rapid OCTT, 22 (62.9%) volunteers had normal OCTT and 11 (31.4%) volunteers had delayed OCTT. The difference was statistically significant ($p < 0.001$). The mean value of OCTT in chronic diarrhea and normal adults were 84.23 ± 39.82 min vs. 114.00 ± 51.35 min (table 3). This difference of mean OCTT between the two groups was also statistically significant ($p = 0.027$).

Table 2. Result of mean H_2 breath test concentration

Minutes	Mean H_2 concentration (ppm)		p value
	Chronic diarrhea	Normal adults	
N-0	5.8 ± 6.2	4.8 ± 4.2	0.637
N-30	9.8 ± 7.5	5.1 ± 3.9	0.008
N-60	23.2 ± 19.6	11.8 ± 10.7	0.019
N-90	23.1 ± 22.7	22.9 ± 19.6	0.940
N-120	35.0 ± 31.2	31.0 ± 23.1	0.892

Note: N minute

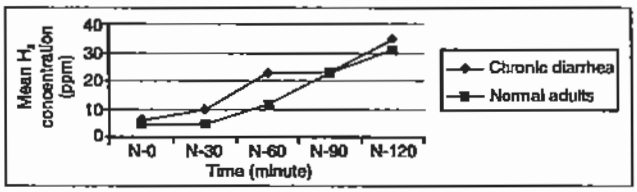

Figure 1. Result of hydrogen breath test in chronic diarrhea patients and normal adults

Table 3. Relation of H_2 breath test result and chronic diarrhea

H_2 breath test result	Chronic diarrhea n = 26	Normal adults n = 35	P value
Orocaecal transit time			
- Rapid	9	2	
- Normal	16	22	< 0.001
- Delayed	1	11	
Mean of orocaecal transit time (minutes)	84.23 ± 39.82	114.00 ± 51.35	0.027

Note: Significancy $p < 0.05$

DISCUSSION

In this study 26 cases of chronic diarrhea were evaluated with hydrogen breath test to measure the OCTT. Most patients in the chronic diarrhea group was 50 – 59 years old, and male, similar to the previous study that had the same data.[1] Most of the patients was known to have infection as the etiologic cause of diarrhea, this was also similar to the previous study.[1] This variation of characteristics was different in several studies, depending on countries or study population. In Indonesia, as well as other developing countries,infection was still an important factor as the cause of chronic diarrhea.[1,3,4]

From this study, we found that patients with chronic diarrhea is more rapidly to have increased H_2 concentration at minute-30 and minute-60 compare to normal subjects significantly ($p < 0.0001$). This study had demonstrated that some cronic diarrhea patients had more rapid OCTT compare to normal adult subjects. Only few studies related to OCTT in chronic diarrhea patients, but our study results were similar to previous studies.[18,22]

This study showed that Rapid OCTT was found more frequently in chronic diarrhea patients compare to normal adults significantly ($p < 0.001$). Mean OCTT in chronic diarrhea patients was significantly shorter compare to control group. This result was similar to those of a study in AIDS patients with chronic diarrhea which showed a rapid intestinal transit contribute to diarrhea in over 50% patients.[22] In a study which included partial gastrectomy patients with chronic diarrhea, compared to without chronic diarrhea, there was also found more rapid OCTT in chronic diarrhea patients.[18] Rapid OCTT in our patients could not be yet explained, but may be multifactorial, such as enteric nerve disorder, autonomic neuropathy and intrinsic nerve plexus impairment that was caused by intestinal infection or non-infection inflammation.[22] There were numerous studies to determine OCTT using hydrogen breath test in liver cirrhosis, liver disorder, partial gastrectomy and others, but none in chronic diarrhea patients.[18-20]

Levitt in 1969, concluded that normal intestine more than 99% H_2 production originating from colon.[23] Because the property of H_2 is able to difuse very easily, H_2 is rapidly enter the blood stream. Then in 1 or 2 minutes period of time about 14% of total H_2 production is secreted in the lungs. On the other hand, breath H_2 excretion had good correlation with H_2 production. Thus, H_2 excretion can be used as indicator of intestinal H_2 production.[12] Furthermore, Bond and Levit in 1975 had demonstrated that administration of nonabsorbable carbohydrate (lactulose) could increase breath H_2 in few minutes after the substrates enter anaerobic area such as caecum.

Hydrogen breath test was used to measure OCTT and small intestinal motility in this study, because the test has sensitivity of 68% dan specificity of 44%, less expenssive, no side effects, non-invasive and can be performed easily in Indonesia. This method of examination was often used to measure OCTT, as well as other methods, such as ^{13}C- labelled glycosyl ureides, pH telemetry, Scintigraphic determination.[13,15,24,25] A study to determine small intestinal transit time using a scintigraphic determination compare to hydrogen breath test, showed no significant differences between both methods. The mean small intestinal transit time with the scintigraphic method, 73.0 ± 6.5 minute (mean ± SEM), was similar to the results from the hydrogen breath test technique, 73.1 ± 8.3 minute.[13]

CONCLUSIONS

There were significantly more rapid orocaecal transit time (OCTT) in the chronic diarrhea patients compared to normal adults. The mean OCTT value in chronic diarrhea group was lower than in normal adults.

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