

ORIGINAL ARTICLE

Steatocrit: A Simple Method for Detection Fat Malabsorption

by

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Abstract

Steatocrit was determined through microcentrifugation of fecal hemogenate from 45 patients with chronic diarrhoea. In the same patients urine materials were collected to determine fat malabsorption using Liptodol absorption test. There were 28 male and 17 female patients. Severe malabsorption using steatocrit was detected in 31 patients (68.9%), while LAT determined severe malabsorption in 34 patients (75.5%). The overall sensitivity was 88.2%, and spesificity was 90.9%. Nutritional status did not influence the sensitivity and spesificity of steatocrit. We propose that this simple semiquantitative test can be used as an alternative method for detecting fat malabsorption particularly in laboratories with limited technical expertise.

Introduction

Management of chronic diarrhoea is not always easily achieved. Many factors are involved in chronic diarrhoea, these in turn may lead to serious complications such as severe malnutrition, intercurrent infections, and even death. The main underlying mechanism is prolonged mucosal injury of the small intestine [1]. One of the secondary effects of the small intestinal mucosal injury is malabsorption, including fat malabsorption. As we know lipids are the main energy source during early development. They also play a role as structural membranes and as precursors of biologically active compounds. Since the biological functions of lipids are of specific significance during fetal and post natal life, levels and quality of fat intake and mechanism for its absorption during the various stages of development are of critical importance [2].

There are many methods for fecal fat

measurement but they always too cumbersome and time consuming to be used as a test for the frequent monitoring of fat absorption [3,4,5].

Even method of van de Kamer et al. [3] is the most accurate and quantitative, because that method cannot be done in Indonesia, so Lipiodol absorption test until now is used as a standard method for the diagnosis of fat malabsorption in Gastroenterology Subdivision [6].

This report is an experience with a simple semiquantitative micromethod for the estimation of stool fat content, the steatocrit. This method was first described by Phuapradit et al [7], who used it as a screening test for newborns suspected of having fat malabsorption in patients with cystic fibrosis. There are many authors who wrote about steatocrit and reports good result too [8,9,10,11,12].

Materials and Methods

For steatocrit 45 sample of feces were analyzed. They were obtained from children who come to RSCM with chronic diarrhoea. In the same patients urine was collected to determined fat malabsorption by Lipiodol absorption test.

The stool were weighed and two volumes of water added. Hand homogenization was carried out by using mortar. For steatocrit determination, small amounts of homogenized stool were drawn into a capillary tube (designed for hematocrit centrifuge); the tube was sealed in at one end with sealing wax and centrifuged for 15 min at 12.000/min. using hematocrit centrifuge. After centrifugation, the tubes were placed in vertical position so that the presence of different layers was clear-

ly evident; there was always a basal solid layer (S) and an intermediate liquid one, and there was sometimes an upper fatty layer. We measured, by means of a magnifying lens, the length of the solid and that of the fatty layer (when present). Steatocrit is the percentage of the length of the fatty layer, over the length of the solid plus the fatty layer :

$$\text{Steatocrit} = \frac{F}{S + F} \%$$

The diagnosis and the degree of that malabsorption in the same patient was determined by the Lipiodol absorption test [5].

Results

There were 45 patients suitable for analysis, consisting of 26 boys and 17 girls (Table I). The nutritional status was presented in Table II.

Overall Sensitivity and Specificity of Steatocrit

Severe malabsorption was found in 31 patients (68.9%), while using LAT severe malabsorption was detected in 334 pa-

tients (75.5%). The overall sensitivity and specificity for steatocrit were 88.2% and 90.9%. The accuracy and predictive value of the diagnostic test is shown in Table III.

Influence of nutritional status

When nutritional status index was performed, the sensitivity of steatocrit were not changed (Table IV and Table V).

(Table I. Sex distribution of 45 patients with chronic diarrhoea)

Sex	No of patients	%
Male	28	62.2
Female	17	37.8
Total	45	100.0

(Table II. The nutritional status of 45 chronic diarrhoea patients)

Nutritional status	No of patients	%
Normal	17	37.8
Mild to moderate malnutrition	7	15.5
Severe malnutrition	21	46.7
Total	45	100.0

Table III. Sensitivity, specificity, predictive values, and accuracy of steatocrit detecting fat malabsorption in 45 patients with chronic diarrhoea using LAT as 'gold standard'

Steatocrit	LAT		
	Severe	Moderate/Mild	Total
Severe	30	1	31
Moderate/Mild	4	10	14
Total	34	11	45

Sensitivity	: 88.2%	Specificity	: 90.9%
PPV	: 73.2%	NPV	: 71.4%
Accuracy	: 88.9%		

Table IV. Sensitivity, specificity, predictive values, and accuracy of steatocrit detecting fat malabsorption in 24 patients with severe and mild moderate malnutrition

Steatocrit	LAT		
	Severe	Moderate/Mild	Total
Severe	15	1	16
Moderte/Mild	2	6	8
Total	17	7	24

Sensitivity	: 88.2%	Specificity	: 85.7%
PPV	: 93.7%	NPV	: 75.0%
Accuracy	: 87.5%		

Table V : Sensitivity, specificity, predictive values, and accuracy of steatocrit detecting fat malabsorption in 21 patients with severe and moderate / mild malnutrition.

Steatocrit	LAT		Total
	Severe	Modertae/Mild	
Severe	15	0	15
Moderate/Mild	2	4	6
Total	17	4	21

Discussion

Chronic diarrhoea up till now is still a major cause of morbidity and mortality of children in Indonesia. Even only few cases of chronic diarrhoea, but these cases are very important due to the following reasons : they account for 45 - 50% of total diarrhoeal days; they have a risk of growth featuring with weight loss of 3 .lh9

times greater than those which the episodes lasting less than 7 days; they have a high risk of death, up to 5 - 7 times higher compared to acute diarrhoea; and they account for 30 - 50% of total diarrhoea death. Because of these factors, chronic diarrhoea are often brought to doctors and occupy a large percentage of diarrhoea beds in hospitals. Fat malabsorption is one of the major problem in chronic diarrhoea; the severity of steatorrhea is variable among different patients but can also vary in the same subject on different days. A regular monitoring of fecal fat excretion is therefore essential since by prescribing special formula or additional enzymes or adjuvant therapies, steatorrhea can be effectively reduced. Fecal fat measurement is rather complicated and, if a balance study (van de

Kamer) has to be performed, it is also expensive and time consuming; since both quantitative of fat intake and stool collection must be very accurate, the patient is often required to some days in the hospital. Errors due to inadequate stool collection are particularly frequent in infants and toddlers and, therefore, the performance of fat balance is generally possible only after the child is toilet trained. LAT is also complicated, it is also expensive and time consuming; since urine collection must be very accurate. Errors due to difficulties in urine collection are particularly frequent in infants and toddlers.

Steatocrit is a simple and rapid micro method that allows a semi quantitative estimation of stool fat content; through microcentrifugation of fecal homogenate, fractional separation of fat from solid fecal materials is easily obtained. The nature of this test is basically semiquantitative and, of course, it cannot substitute for correct fat balance study. However, although steatocrit cannot define the exact level of fat malabsorption because we cannot use van de Kamer as 'gold standard', the result indicated that the sensitivity dan specificity of steatocrit in de-

tecting fat malabsorption were good. These were not different with D'Agostino et al. reports [9]. Nutritional status was not influence the sensitivity and specificity of steatocrit. Moreover, due to the fact that steatocrit is inexpensive and not invasive at all, it can be repeated at short time intervals, thus enabling a longitudinal monitoring of fat absorption in each patient based on individual dietary/enzymatic regimen. For this reason, we propose steatocrit as an alternative method for measurement of fat malabsorption

in infants and children, to be used particularly in laboratories with limited technical experience and may also provide a crude method for monitoring the response of patients receiving special formula or specific enzymes supplement during treatment on chronic diarrhoea.

In conclusion, considering the accuracy, the low cost, and the case performance of steatocrit, we propose it as a semiquantitative test for the quick and frequent assessment of fat absorption in infants and young children.

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