

Delayed gastric emptying in children with poor appetite

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Abstract

Background : In this study we aimed to evaluate gastric emptying time in children with poor appetite.

Methods : Anthropometrical measurements, daily energy intakes and gastric emptying times were determined in 36 children with poor appetite. The children were grouped as those with normal and delayed gastric emptying. These groups were then compared with respect to age and nutritional status.

Results : Malnutrition was found in 63.9% and gastric emptying was delayed in 58.3% of all cases. Children with delayed gastric emptying were significantly older and malnutrition was significantly higher in this group (7.2 ± 3.1 vs 3.9 ± 1.5 years, $P : 0.001$ and 81.0% vs 40.0% , $P : 0.017$, respectively). Daily mean energy intake was significantly lower than daily mean energy requirement in children with delayed and normal gastric emptying ($P = 0.002$ and 0.026 respectively).

Conclusion : In children with poor appetite, probability of gastric motility disorders should be taken into consideration. Especially in children with failure to thrive at preschool and early school years gastric motility studies should be undertaken. (*Acta gastroenterol. belg.*, 2005, 68, 230-232).

Key words : children, gastric emptying, malnutrition, poor appetite.

Introduction

Poor appetite is a common complaint in childhood. Some of these children may only be "picky" eaters without lack of weight gain. However, poor appetite may also be a symptom of feeding disorders and causes failure to thrive (1). Even though the etiology of feeding disorders may be classified as organic or functional, it indeed reflects the complex interaction of biological, behavioural and social factors (2,3). In the study by Manikam and Perman (4), 77% of the children with feeding disorders were found to have gastrointestinal-related disorders. Additionally gastroduodenal motility disorders may be related with poor appetite (3). Therefore with this study, we aimed to evaluate gastric emptying (GE) by ^{99m}Tc-tincolloid scan (^{99m}Tc-tincolloid) in children who presented with poor appetite.

Patients and methods

Patients

This is a prospective study from July 2001 through June 2002. From 57 children who presented to our outpatient clinic with poor appetite in this period, 36 children whose parents accepted enrolling in the study were evaluated. Complaints expected in gastric motility

disorders are questioned. Physical examination was performed ; weight and height was measured. Malnutrition was defined according to Waterlow criteria (5). Mild acute malnutrition is defined as weight for height ratio between 80-89%, moderate acute malnutrition between 70-79% and severe acute malnutrition < 70%. If height standard % value is < 90% malnutrition is accepted as chronic (5). Daily energy intakes were calculated from the 3-day-diet lists reported by parents. Complete blood count, urinalysis, liver function tests, stool examinations for parasites, fat and reducing agent and in selected patients, urine culture, thyroid function tests, anti-gliadin antibodies, stool a₁ antitrypsin, X-ray for bone age and abdominal ultrasonography were performed.

Measurement of gastric emptying time

Gastric emptying time was measured by using pudding labelled with ^{99m}Tc-tincolloid in all cases. For radioactive marking, the dose of ^{99m}Tc-tincolloid used was 1.0 mCi. It was used within six hours after preparing. The energy content of the pudding was 20 Kcal/kg. Scan was performed after four hours of starvation for children and a routine interval between mealtimes for infants. It was confirmed that patients were not using drugs affecting gastrointestinal motility. General Electric (GE XRT) gamma camera was used. The patient was placed in supine position for a recording of one hour. Regions of interest were drawn over stomach, time-activity curves were formed and GE time defined as the percentage of the initial activity remaining at 60th minute (R60%) was determined and these values were compared with the ones found in the study by Di Lorenzo *et al.* (6). In addition, half emptying time (T_{1/2}) was also calculated and its correlation with R60% was evaluated.

Statistical analysis

Results are expressed as percentages and as means \pm standard deviation (SD). Statistical analyses were

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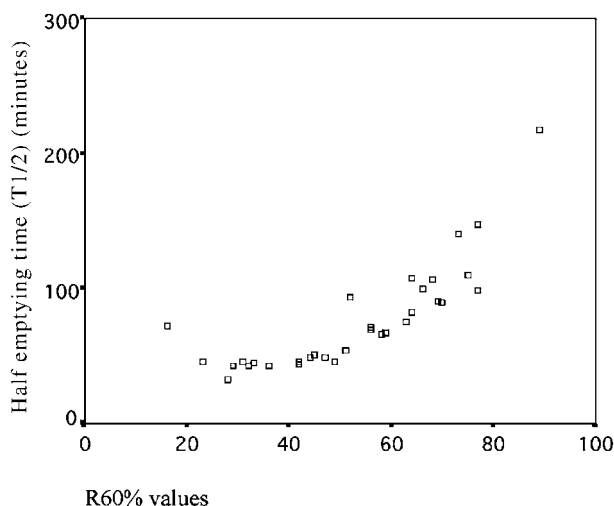


Figure 1. — Correlation between R60% and T_{1/2} values

carried out by the Wilcoxon signed rank test for difference in two related groups of measures, Mann-Whitney U test in two independent groups of measures, χ^2 test for differences in proportions, Spearman's rank correlation analysis for the relation between two variables on SPSS 10.0 program. A p value < 0.05 was considered significant in all analyses.

Results

Of the 36 children with poor appetite, 17 (47.2%) were females, 19 (52.8%) were males and their ages were between 1.2-12.9 years (mean : 5.8 ± 3.0 years). Laboratory tests for excluding organic diseases revealed normal results. Of 36 children 51.4% had early satiety, 25.7% abdominal pain, 20% postprandial flatulence, 17.1% postprandial belching, 14.3% bloating, 14.3% nausea, 11.4% epigastric pain, 11.4% constipation and 5.7% recurrent vomiting. Malnutrition was found in 23 (63.9%) of the 36 cases being acute mild malnutrition in 7 (7/23 ; 30.4%) and chronic malnutrition in 16 (16/23 ;

69.6%) children. Daily mean energy intake was significantly lower than daily mean energy requirement in the whole group ($p < 0.001$) (Table I).

Gastric emptying was delayed in 21 (58.3%) children with respect to R60% values (Table II). Mean half emptying time of radioactivity was found 76.3 ± 39.2 minutes in all cases. It was 92.9 ± 43.0 min. (range : 43-218 min.) in children with delayed GE and 55.0 ± 19.5 min (range : 33-108 min) in children with normal GE ($p = 0.003$). There was a positive correlation between T_{1/2} and R60% values ($r = 0.875$, $p < 0.01$) (Figure 1).

When we compared the children with delayed and normal GE with respect to gender, age, malnutrition ratio, daily mean energy intake and daily mean energy requirement, children with delayed GE were significantly older than the children with normal GE ($p = 0.001$) and malnutrition rate was significantly higher in the former group ($p = 0.017$). Daily mean energy intake was lower than daily mean energy requirement in children with delayed and normal GE ($p = 0.002$ and 0.026 respectively) (Table I).

Discussion

Poor appetite is a common complaint in childhood. This symptom, which is notified by mothers usually, is sometimes not taken into consideration by paediatricians. However, because feeding disorders, one of which is poor appetite, are more common than expected (4,7) and they may cause serious complications, it is important to recognize and treat them. There are many etiological factors of feeding disorders. Organic factors include gastric motility disorders besides many diseases (2,4). Therefore, gastric emptying may be evaluated in patients with feeding disorders (1,3). In this study, we evaluated the relationship between poor appetite and gastric motility. Malnutrition was found in 63.9% of the cases supporting the idea that feeding disorders may be seen in well nourished children besides children with failure to thrive (7).

Table I. — Gender, age, malnutrition, daily energy intake, daily energy requirement, mean energy deficit and malnutrition rate in children with delayed and normal gastric emptying

	All cases (n = 36)	Delayed gastric emptying (n = 21)	Normal gastric emptying (n = 15)
Gender (M/F)	19/17	12/9	7/8
Age (years) ^a	5.8 ± 3.0	7.2 ± 3.1	3.9 ± 1.5
Daily energy intake ^b (Kcal/d)	1219.7 ± 404.3	1322.5 ± 390.3	1074.2 ± 393.7
Required energy intake ^b (Kcal/d)	1593.1 ± 315.6	1710.4 ± 314.7	1411.8 ± 225.6
Malnutrition (%) ^c	23 (63.9%)	17 (81.0%)	6 (40.0%)

Values presented as mean \pm SD

^a Significantly different between the patients with delayed and normal gastric emptying ($p : 0.001$).

^b Daily energy intake is lower than required energy intake ($p : 0.002$ in patients with delayed gastric emptying and $p : 0.026$ in patients with normal gastric emptying).

^c Significantly different between the patients with delayed and normal gastric emptying ($p : 0.017$).

Table II. — R60% values of children with delayed and normal gastric emptying, and the normal reference values according to ages

Age (year)	Cases with delayed gastric emptying (n = 21)	Cases with normal gastric emptying (n = 15)	Normal values according to ages*
1-3 years	79.2 ± 19.7% (n = 3)	50.2 ± 16.3% (n = 6)	60.5 ± 3.7%
4-6 years	73.1 ± 12.7% (n = 6)	37.1 ± 12.9% (n = 8)	53.0 ± 4.5%
7-14 years	59.4 ± 16.3% (n = 12)	23.0 ± 0.0% (n = 1)	25.1 ± 2.5%

* Di Lorenzo C, Piepsz A, Ham H, Cadranel S. Gastric emptying with gastro-oesophageal reflux. Arch Dis Child 1987 ; 62 : 449-53.

Significantly lower daily energy intake than the energy requirement of the cases suggests that, actually poor appetite complaint is important and affects the energy intake of some children. When this is compared in children with delayed and normal GE separately, *P* value was lower in the former group. It may be possible that energy intake is more impaired in children with delayed GE. On the other hand, gastric emptying may be important, but not the only factor affecting poor appetite and daily intake.

In literature, gastric motility disorders in children with poor appetite have not been reported previously (8). Gastric emptying was delayed in 58.3 % of children with poor appetite in this study. These children were older than the cases with normal GE. Thus, it seems that in older children with poor appetite it is much more probable to find delayed GE. Also, malnutrition is significantly higher in children with delayed GE. This emphasizes the importance of gastric motility. Israel and Mahdi (9) reported four cases between two months and three years old with limited intake, emesis or food refusal in which there was no pathology other than markedly delayed GE. That study suggests that delayed GE can be the reason of feeding disorders and malnutrition. In another study (10) a case with food refusal and inadequate growth was reported. She was diagnosed as having gastroesophageal reflux and delayed GE based on scintigraphic findings. According to these studies and our results it may be suggested that gastric motility disorders should be considered in children with failure to thrive. On the other hand, as it is proposed in cases with anorexia nervosa delayed gastric emptying may be the consequence, however it is still controversial (11). Since weight gain is obtained with prokinetic therapy, it may be considered that delayed gastric emptying is the reason rather than the consequence (12,13).

Besides R60% values, $T_{1/2}$ of radioactivity was calculated. Half emptying time values are found less acceptable than R60% values (14). In contrast with that, we found both values being correlated positively in our

study. Therefore, we suggest that $T_{1/2}$ may be used as well as R60% values in children tested with labelled pudding.

In conclusion, this study emphasizes the importance of poor appetite as a feeding disorder. Even if there is no demonstrable organic factor, probability of gastrointestinal motility disorders should be considered. Especially in children with failure to thrive at preschool and early school years, gastric motility studies should be undertaken.

References

- Arvedson JC. Behavioral issues and implications with pediatric feeding disorders. *Semin Speech Lang* 1997 ; 18 : 51-69.
- Sanders MR, Patel RK, Le Grice B, Shepherd RW. Children with persistent feeding difficulties : an observational analysis of the feeding interactions of problem and non-problem eaters. *Health Psychol* 1993 ; 12 : 64-73.
- Babbitt RL, Hoch TA, Coe DA, Cataldo MF, Kelly KJ, Stackhouse C, Perman JA. Behavioral assessment and treatment of pediatric feeding disorders. *J Dev Behav Pediatr* 1994 ; 15 : 278-291.
- Manikam R, Perman JA. Pediatric feeding disorders. *J Clin Gastroenterol* 2000 ; 30 : 34-46.
- Waterlow JC. Classification and definition of protein-calorie malnutrition. *Br Med J* 1972 ; 3 : 566-569.
- Di Lorenzo C, Piepsz A, Ham H, Cadranel S. Gastric emptying with gastro-oesophageal reflux. *Arch Dis Child* 1987 ; 62 : 449-453.
- O'Brien S, Repp AC, Williams GE, Christophersen ER. Pediatric feeding disorders. *Behav Modif* 1991 ; 15 : 394-418.
- Israel DM, Mahdi G. Delayed gastric emptying as a cause of failure to thrive in children. *J Pediatr Gastroenterol Nutr* 1996 ; 22 : 115-116.
- Van Den Driessche M, Veereman-Wauters G. Gastric emptying in infants and children. *Acta Gastroenterol Belg* 2003 ; 66 : 274-282.
- Heyman S, Eicher PS, Alavi A. Radionuclide studies of the upper gastrointestinal tract in children with feeding disorders. *J Nucl Med* 1995 ; 36 : 351-354.
- Stacher G, Kiss A, Wiesnagrotzki S, Bergmann H, Hobart J, Schneider C. Oesophageal and gastric motility disorders in patients categorized as having primary anorexia nervosa. *Gut* 1986 ; 27 : 1120-1126.
- Sansone RA, Sansone LA. Metoclopramide and unintended weight gain. *Int J Eat Disord* 2003 Sep ; 34 : 265-268.
- Stacher G, Abatzi-Wenzel TA, Wiesnagrotzki S, Bergmann H, Schneider C, Gaupmann G. Gastric emptying, body weight and symptoms in primary anorexia nervosa. Long-term effects of cisapride. *Br J Psychiatry* 1993 Mar ; 162 : 398-402.
- Malagelada JR. Where do we stand on gastric motility ? *Scand J Gastroenterol* 1990 ; 25 : 42-51.