

# Clinical features and outcome of fecal retention in infancy

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## Research article

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# Abstract

**1) Background:** To understand the clinical features and outcome of fecal retention in infancy(FRI), so as to guide the focus and intervention methods of such infants.

**2) Methods:** The electronic medical record system(EMRS)was used to collect and screen out cases diagnosed as fecal retention from June 2018 to June 2019 in outpatient clinic of our hospital. The age, feeding method, frequency and traits of stool, and accompanying symptoms were recorded. The changes of clinical symptoms, medical examinations and drug treatment by the age of 1 year were investigated by means of electronic medical record review and telephone follow-up.

**3) Results:** A total of 286 infants were enrolled, 7 were lost to follow-up, and 279 were effectively followed up. There were 157 males and 129 females, with an age of  $3.6 \pm 1.5$  months. The average stool frequency was  $5.9 \pm 1.8$  days. 63.3% of the infants were breast-fed, 16.8% were formula-fed, and the rest were mixed-fed,all without supplementary food. 9.1% of the infants showed corresponding gastrointestinal symptoms, such as bloating, increased crying, decreased milk intake, and laborious defecation. 87.1% of the infants received medical treatment, including glycerin enema, probiotics, and Chinese herbal preparations, with an effective treatment rate of 7.8%. 38.7% of infants have undergone medical examination, including abdominal ultrasound, X-ray film / barium enema, blood test, etc, the positive rate is 14.8%. The duration of fecal retention in 53% of infants was  $\leq 2$  months, 22.6% between 2–3 months, 24.4%  $\geq 3$  months, with an average of  $2.6 \pm 1.1$  months. At the age of followed up to 1 year, 16.8% of infants developed functional constipation(FC). Compared with other infants with normal defecation, there was no significant difference in age, frequency of stool, the proportion of breast milk feeding and receiving treatment, and there was a significant difference in the duration of fecal retention. The duration of FC group was longer than normal defecation group by which was  $3.49 \pm 0.83$  months.

**4) Conclusions:** Infants with fecal retention are more likely to develop FC at age 1 than general population, and may be positively related to the duration of fecal retention.

## 1. Background

FRI has neither a relevant definition nor clear epidemiological survey data, but such infants are common in pediatric clinics. In order to distinguish it from functional fecal retention, the author defines it as the bowel movement reduced ( $< 2$  times / week) but the stool characteristics are normal, the duration of symptoms is more than 1 month, the infant's age is less than 6 months and no supplementary food is added, and organic diseases associated with abnormal bowel movements are excluded. Because related literature and guidelines are rarely reported, many pediatricians lack awareness and easily confuse them with other functional gastrointestinal diseases(FGIDs), leading to inappropriate medical interventions.

This kind of infants often have repeated visits and consultations due to persistent symptoms, so they are easily overdiagnosed and treated, such as performing abdominal ultrasound, X-rays, barium enema, blood tests and other related tests, as well as receiving multiple drug interventions, but there is no obvious

clinical benefit from these medical tests and drug treatment, and even caused adverse reactions. The clinical characteristics, occurrence factors, developmental outcomes, health effects, and necessity of examination and treatment of FRI have not been studied and reported. This article retrospectively analyzes the data of infants within 6 months of age diagnosed as fecal retention in the outpatient clinic of Guangzhou Women and Children's Medical Center in Guangdong Province. The stool frequency, traits, accompanying symptoms, medical examinations and medications received between the first diagnosis and 1 year old were collected to summarize their clinical characteristics, guide focus and interventions.

## 2. Methods

The cases diagnosed as fecal retention in the outpatient department of our center were screened, mainly manifested in healthy infants with defecation frequency < 2 times / week, normal stool characteristics, duration of symptoms > 1 month, age  $\leq$  6 months, and no supplementary food. These are the kinds of babies that we studied. Any organic disease that can cause abnormal fecal discharge, including congenital megacolon, megacolon-like disease, congenital anorectal deformity, cystic fibrosis, spinal disease, other metabolic or entero-neurogenic abnormalities, was excluded from this study.

The specific research method was retrospective analysis through the outpatient EMRS to retrieve infants who met the diagnosis of fecal retention, and recorded data on stool frequency and traits, feeding history, and related digestive tract symptoms at the initial diagnosis. The EMRS and telephone follow-up were used to investigate the medical examination and drug treatment, changes in gastrointestinal symptoms, stool frequency and traits of infants to 1 year old. They were divided into FC group and normal group with reference to the Roman  $\boxtimes$  standard. After all the initial and follow-up data were collected, SPSS 16.0 software was used for data statistics and analysis. Measurement data that conformed to the normal distribution were expressed as (see Formula 1 in the Supplementary Files). The comparison between the two groups was performed using the t test. The comparison of the count data was performed using the  $\chi^2$  test.  $P < 0.05$  on both sides was considered statistically significant.

## 3. Results

**3.1 Initial data:** A total of 286 cases of fecal retention in infancy were selected from the outpatient department from June 2018 to June 2019. Among them, there were 157 male infants and 129 female infants; the youngest was more than 20 days and the maximum was 6 months, with an average age of  $3.6 \pm 1.5$  months. 238 cases of stool frequency  $\leq$  7 days, 39 cases of 7–14 days, and 9 cases > 14 days, the average was  $5.9 \pm 1.8$  days. Due to the anxiety of infants' defecation behavior, most guardians use glycerin enema to intervene, therefore the actual frequency of voluntary defecation is difficult to estimate and should be longer than the statistical data. In the feeding method, 181 cases were breast-fed, 48 cases were formula-fed, 57 cases were mixedmilk-fed, all without supplementary food. 26 infants were accompanied by corresponding gastrointestinal symptoms, mainly including vomiting, abdominal distension, laborious defecation, and decreased milk intake, some infants had multiple symptoms.

Table 1  
data of initial diagnosis of FRI [n(%)]

<b>Gender: men 157(54.9),female129(45.1)</b>
Age: ≤1 month 27(9.4),1-3 months 117(40.9),3 months 142(49.7); On average: 3.6 ± 1.5 months
Defecate frequency: ≤7 days 238(83.2),7-14 days 39(13.6),14 days 9(3.1); On average: 5.9 ± 1.8 days
Feeding way: Breast milk 181 (63.3), formula 48 (16.8), mixed 57 (19.9)
Associated symptoms: 26 (9.1); Vomiting: 3 (1.0), abdominal distension: 12 (4.2), defecation difficulty: 18 (6.3), milk intake decreased 12 (4.2)

**3.2 Follow-up data:** All infants were follow-up to 1 year old by EMRS and telephone, 7 cases were lost to follow-up, and 279 cases were effective. 243 infants received treatment, with an effective rate of 7.8% (the effective standard for treatment is stool frequency  $\geq 2$  times / week, duration  $\geq 1$  month). The main medications include glycerin enema, probiotics, various Chinese herbal preparations, etc. 108 children underwent medical examinations including abdominal ultrasound, X-rays / barium enema, blood tests (blood routine, food allergens, etc.). Positive results were found in 16 cases, including intestinal flatulence, delayed barium excretion, eosinophils or serum milk protein IgE levels are elevated. The duration of fecal retention ranges from 1 month to 5 months, 53% of infants  $\leq 1-2$  months, 22.6% for 2-3 months, and the remaining 24.4%  $> 3$  months. At the age of 1 year, 47 infants developed FC, accounting for 16.8%, and the remaining 232 cases had normal bowel movements.

Table 2  
follow-up data of FRI [n(%)]

<b>Treatment: 243 (87.1), effectiveness: 19 (7.8)</b> <b>glycerin enema: 228 (81.7), probiotics: 193 (69.2), Chinese herbal preparations: 94 (33.7)</b>
Examination: 108 (38.7), positive: 16 (14.8)
Ultrasound: 94 (32.9), X-ray/barium enema: 67 (23.4), blood test: 29 (10.1)
Duration: $\leq 2$ months 148 (53.0), 2-3 months 63 (22.6), $> 3$ months 68 (24.4)
Average: 2.6 ± 1.1 months
FC group: 47 (16.8), Normal group: 232 (83.2)

**3.3 Follow-up contrast:** All infants were divided into a FC group and a normal group at the age of 1 for comparison. There was no significant difference in age, frequency of stool, the proportion of

breastfeeding and treatment. The duration of fecal retention was significant difference, the FC group was longer than normal group by which was  $3.49 \pm 0.83$  months.

Table 3  
comparison of data of FC group and Normal group

Comparative study	Normal group	FC group	$\chi^2(t)$	P
N(%)	232,(83.2)	47,(16.8)		
Age(month)	$3.60 \pm 1.58$	$3.34 \pm 1.22$	-1.255	0.213
Defecate frequency(day)	$5.83 \pm 1.76$	$6.02 \pm 1.74$	0.673	0.502
Duration(mouth)	$2.42 \pm 1.03$	$3.49 \pm 0.83$	6.702	< 0.01
Breastfeeding(n)	148,63.8%	33,70.2%	0.707	0.401
Treatment(n)	204,87.9%	39,83.0%	0.853	0.356

## 4. Discussion

FRI is a symptom rather than a disease. Through outpatient EMRS screening, many pediatricians lack awareness or ambiguous probability of this symptom, and thus diagnose other FGIDs such as constipation, difficulty defecation, or Functional fecal retention. FC is mainly manifested by a decrease in the number of stools accompanied by dryness of stool characteristics<sup>[1]</sup>. The etiology is often caused by factors such as unreasonable diet structure and long-term restraint of defecation<sup>[2]</sup>. Defecation difficulties in infants are accompanied by screaming and crying during defecation, flushing is often caused by laborious defecation. The defecation time and labor symptoms can last for tens of minutes, and defecation can occur several times a day<sup>[1]</sup>. Functional fecal retention occurs at older age and is more common in infants and young children after foods supplementation. It is a pre-symptom of FC and may eventually develop into FC<sup>[3]</sup>. Although there is no precise definition of FRI, it can be clearly distinguished from the above diseases by its clinical symptoms.

In this study, the infants with fecal retention started from more than 20 days to 6 months of age, with an average age of  $3.6 \pm 1.5$  months. Children with FC are generally older and often associated with dietary supplements<sup>[4]</sup>. The duration of FRI ranged from 1 month to 5 months, with an average of  $2.6 \pm 1.1$  months. The symptoms of FC may last for months or even years, and are prone to recurrent episodes. 63.3% of the feeding methods are mainly pure breast milk, which may be related to public health's active promotion of breastfeeding and higher breast milk penetration rate, while children with FC are mainly fed with formula milk. The above clinical characteristics suggest that FRI and FC may be two different mechanisms. Since most babies with fecal retention are breastfeeding, some guardians may consider there is something wrong with the milk and stop breastfeeding. Medical staff should always emphasize the benefits of breastfeeding and provide appropriate support to ensure that the guardian continues breastfeeding.

The cause of FRI is not known. As some babies will have a combination of laborious defecation, and the onset age of symptoms is also similar to the babies with difficulty defecation, all begin to show symptoms several weeks after birth. Therefore, some of the causes of difficulty defecation of infants such as intra-abdominal pressure inconsistencies in elevation and relaxation of pelvic floor muscles may also cause FRI<sup>[5]</sup>. In addition, abnormal colorectal transmission function may also be one of the reasons. Even individual physical differences, intestinal flora colonization types, and the dietary structure of breastfeeders may be potential factors. This depends on subsequent further research including rectal manometry, colon transit time measurement, intestinal flora culture identification, etc.<sup>[6-8]</sup>. Since FRI does not belong to any kind of FGIDs, and the infant itself does not have any health problems, it is not ruled out as a normal physiological state<sup>[9]</sup>.

Most infants have no obvious clinical discomfort symptoms. About 9.1% of the babies have related symptoms such as vomiting, abdominal distension, and laborious defecation, but they are mild. Although there was no significant health impact on babies during follow-up, most guardians develop significant anxiety and therefore increase outpatient visits, tests, and medications. This study found that 38.7% and 87.1% of babies had undergone various tests and treatments respectively. Common tests include gastrointestinal ultrasound, abdominal X-rays, barium enema, and blood tests for food allergens. Although some children (14.8%) have positive results, such as flatulence, gastrointestinal disorders, or serum milk protein IgE values increased, but these results have no significant clinical significance for infants with simple stool retention. Among the intervention measures, 81.7% of guardians would use glycerin enema for defecation because the baby had not been able to defecate autonomously for a long time. Other treatment methods included oral probiotics, various Chinese herbal preparations, and traditional Chinese medical therapy massage, with an effective rate of 7.8%. Glycerin enema belongs to hypertonic laxative, which can lubricate bowel wall and soften stools, it is often used for one-time laxative treatment. For infants and young children, the conditional of waiting for anal stimulation before defecation may be formed, thereby affecting voluntary defecation, so long-term use should be avoided.

Based on the fact that fecal retention will not cause obvious health effects to infants, and the treatment measures for fecal retention are ineffective, and subsequent comparative analysis found that treatment does not prevent the occurrence of FC in the future, so it is questionable whether medication is needed. The author suggests that attention should be paid to alarm symptoms, such as meconium delay, abdominal distension, and nutritional status assessment when treating infants with fecal retention. Physical examination should pay attention to digital anal examination, which can simply and quickly screen anorectal deformities, congenital megacolon and other related diseases that cause abnormal defecation. Additional imaging, blood tests, and medications are not recommended without considering organic disease. Detailed medical history inquiry, physical examination, and psychological comfort to the guardian to reduce their anxiety are more important rather than alleviating symptoms.

The literature reports that the prevalence of infant FC in the first year after birth is 2.9%, and it increases to 10.1% in the second year, the prevalence is independent of gender<sup>[1]</sup>. We calculated that the incidence of the infants with FRI developing FC at 1 year old was 16.8%, which is significantly higher than the

normal population. By comparison with other infants with normal defecation, it was found that there was no significant difference in age, frequency of stool, proportion of breastfeeding and treatment, except for duration of fecal retention. The average duration of fecal retention in FC group was  $3.5 \pm 0.8$  months, which was longer than that in normal group. There was a significant difference between the two groups. Although the relationship between fecal retention and the risk of constipation cannot be demonstrated in this study, it is clinically judged that the longer the duration of fecal retention in infants, the higher the incidence of FC at 1 year old. Therefore more attention should be paid to how to prevent the possibility of future development of FC rather than how to relieve the current symptoms for infants with fecal retention especially those whose symptoms persist for more than 3 months.

Rationalization of diet and guidance of defecation behavior are essential to prevent FC. Some scholars believe that infants can train regular bowel movements in the early months<sup>[10]</sup>. Defecation often occur because bowel movements are accelerated after eating. Therefore it is advisable to induce infants to defecate after meals and establish conditioned radiation. Once a good defecation pattern is formed, it can be maintained for a long time, and it can effectively prevent the occurrence of FC. Cow's milk is high in casein, and calcified casein easily forms insoluble calcium soap in the intestine, leading to dry stool<sup>[11]</sup>. In addition too little dietary fiber and water intake in the diet can also easily cause FC<sup>[12]</sup>. Therefore reasonable adjustment of diet structure, such as promoting breastfeeding, and appropriately increasing the daily dietary fiber and water intake will help prevent FC. Although some studies have confirmed the role of bowel habits training and dietary changes in the prevention and treatment of constipation in infants and young children, some studies have reached the opposite conclusion, so more clinical evidence is needed to support it<sup>[13, 14]</sup>.

## 5. Conclusion

FRI is a symptom different from other FGIDs, and has its own unique clinical manifestations, which is not ruled out as a normal physiological phenomenon. The specific reasons have not been known for the time being, which may be related to increased intra-abdominal pressure, uncoordinated relaxation of pelvic floor muscles, and abnormal colorectal transmission. Although fecal retention does not have a significant health impact on babies, it can cause significant anxiety among caregivers and increase excessive medical diagnosis and treatment, frequent replacement of milk formula and even interruption of breastfeeding. Therefore, instead of trying to change the baby's bowel habits, more attention should be paid to the guardian's psychology and behavior. If sufficient medical history and physical examination are performed, additional medical examinations and medications are not recommended without considering organic diseases. Fecal retention infants are more likely to develop FC later than the normal population, and may be positively related to the duration of fecal retention. Therefore, in the outpatient medical consultation, in addition to detailed explanation of the condition to guardian to reduce their anxiety, it is also necessary to put forward suggestions on behavior guidance, diet and other aspects to prevent the future development of FC.

# Abbreviations

FRI: fecal retention in infancy

EMRS: electronic medical record system

FC: functional constipation

FGIDs: functional gastrointestinal diseases

# Declarations

## Ethics approval and consent to participate

The study protocol was approved by the Institutional Guangzhou Women and Children's Medical Center (IRB registration number 2020033010253622). Informed consents were obtained from the parents of children in the study.

## Consent for participate and publication

Consent for publication has been obtained in writing from the appropriate parent/guardian.

## Availability of data and materials

All data generated or analysed during this study are included in this published article.

## Competing interests

The authors declare that they have no competing interests.

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None.

## Authors' Contributions

Conceptualization, L.L.G. and L.R.; validation, L.L.G., H.L.W., and L.R.; investigation, L.R.; data curation, H.L.W., L.Y.X. and J.X.; writing—original draft preparation, L.R.; writing—review and editing, P.Y.C. and L.L.G.; supervision, L.L.G. and S.T.G. All authors have read and approved the manuscript, and ensure that this is the case.

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