

## Sedative effects of right breast feeding chloral hydrate retention enema in MRI examination of infants

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**Abstract:** To explore the application effect of chloral hydrate retention enema in MRI examination of sedation with the right breast-feeding position of parents and the depth of anal canal insertion. From June 2017 to June 2018, 98 infants who were sedated by chloral hydrate retention enema in the medical imaging center of our hospital were randomly divided into observation group and control group by using random number table method. In the observation group, the right breast-feeding position of the parents was adopted, and the insertion depth of the anal canal was increased to perform chloral hydrate retention enema. After enema, the parents did not change the position of the breast-feeding children. The control group was treated with chloral hydrate enema by traditional retention enema. The drug spillage, average sleep time, Ramsay Sedation score and braking effect were compared between the two groups. The overflow rate of enema fluid in the observation group was less than that in the control group ( $P < 0.05$ ), the onset time of sedation after enema was significantly faster than that in the control group ( $P < 0.05$ ), and the average sleep time was less than that in the control group ( $P < 0.05$ ). Ramsay Sedation score and braking effect were better than those in the control group, with a statistically significant difference ( $P < 0.05$ ). The modified chloral hydrate retention enema with right breast-feeding position of parents and increased insertion depth of anal canal can reduce the anxiety and fear of children, effectively reduce the spillover of liquid medicine, which is easy to operate, practical and better than the traditional retention enema.

**Keywords:** Infants; Chloral hydrate; Retention enema; Sedation evaluation tool; Sedation effect

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### 1. Introduction

In clinic, 10% chloral hydrate solution is commonly used as sedative and hypnotic drug for children before MRI examination. It is easy to be absorbed, quickly effecting, and can be maintained for 4-6 hours. There is no obvious aftereffect after waking up, so it can be administered orally or by retention enema [1]. However, due to its pungent, bitter and astringent taste, it is easy to cause adverse reactions such as choking cough and vomiting in children, so it is generally not recommended to take orally, and now it is mostly given by enema [2]. The traditional method of chloral hydrate retention enema often results in the increase of abdominal pressure and restlessness due to the crying of children, which makes the dosage of the medicine liquid overflowing from the anus inaccurate and affects the sedative effect [3]. Moreover, 10% chloral hydrate is a high-risk drug. Multiple administration can make the drug dose accumulate and increase the risk of drug effectiveness. In order to alleviate the crying and anxiety of the parents, improve the success rate of the first retention enema, and reduce the damage of the second or multiple enema operations to the children, this study tried to use the modified chloral hydrate retention enema method, which was adopted

by the parents to hold the children in the right breast-feeding position and increase the insertion depth of the anal canal. Compared with the traditional enema method was to explore the modified chloral hydrate retention enema.

### 2. Data and methods

#### 2.1. General data collection

From June 2017 to June 2018, 98 children, 60 males and 38 females, who were sedated by chloral hydrate retention enema during MRI examination in the medical imaging center of our hospital, ages from 2 months to 36 months. Before enema, there was no history of diarrhea, bloody stool, proctitis, colitis and fecal incontinence, and chloral hydrate allergy. The parents of the children signed the informed consent form and informed the relevant risks and possible adverse consequences. This study was approved by the medical ethics committee of our college.

#### 2.2. Methods

All the children's parents were informed to make an appointment for the specific examination time. If the examination was conducted in the morning, the children should get up 2-3 hours early. If the examination was conducted in the afternoon, the

lunch break time would be cancelled to keep the children awake. The parents assisted the children in defecation one hour before the examination. If not, Kaiselu could be used for defecation. The time of enema was chosen when the child felt sleepy. According to the order of appointment, the patients were randomly divided into two groups: the observation group and the control group. 10% chloral hydrate solution was used in both groups. According to the doctor's instructions, the nurse calculated the dosage (0.5ml/kg, 50mg/kg). According to the weight of the child, and then pumped the chloral hydrate solution with the temperature of 37-39 °C through 10ml sterile syringe, then added 0.1ml, connected the disposable sterile catheter for children (6Fr or 8fr, without balloon) and vented.

## 2.2.1. Enema method

Observation group: the parents take the position of standing or sitting, the right breast-feeding baby, face-to-face interaction with the baby, the baby's back to the nurse, the nurse wearing disposable gloves, paraffin oil lubrication catheter throughout the whole process, left thumb, index finger separated from the baby's buttocks exposed anus, right hand gently inserted catheter into the baby's anus, increase the insertion depth of disposable catheter, the baby is 5-10cm, 10-15cm for children, pause for 3-5s, at this time, fix the catheter with the left hand, slowly push the solution with the right hand, 2-3min / 10ml is appropriate, pause for 2-3min after pushing, use the toilet paper towel to block the anus of children, pinch the skin and muscles around the anus of children, quickly pull out the catheter, guide parents not to change the position of holding children, and gently rub the anus with toilet paper for 5-10min, inhibit defecation reflex and avoid the outflow of medicine. (2) control group: the traditional chloral hydrate retention enema method was used: the left side of the child was taken, the legs were bent, the hips were padded 10 cm high, the hips were fully exposed, the depth of catheter insertion was 3-5 cm for infants and 5-10 cm for infants [4]. After the injection of the solution, let the child keep his head low and buttock high, instruct the parents to continue to clamp the buttock of the child for 5 to 10 minutes, and the elder children should pay attention to divert their attention, so as to avoid the premature discharge of the enema.

## 2.2.2. Evaluation index

After enema, the children in the two groups chose a quiet waiting room to guide their parents to pat their children's back, reduce crying and struggling, and induce them to fall asleep as soon as possible. Special personnel were assigned to observe and record the post enema reaction of the two groups: (1) the overflow of enema fluid: if the patient had anal

exhaust or defecation within 3-5 minutes after enema retention, the solution of chloral hydrate should be added once depending on the amount of overflow, and if the solution of chloral hydrate overflowed more than 5 ml within 5-10 minutes, the solution of chloral hydrate should be added once, and if it overflowed more than 10 minutes, the solution of chloral hydrate should not be added. (2) average sleep time: record the time from the time when the enema tube is pulled out to the time when the child's limbs are soft and sleep peacefully after enema. (3) sedation score: Ramsay Sedation score [2,5] was performed after 5 minutes of removal from anal canal: score 1: anxiety and restlessness; score 2: cooperation of children, directional and quiet; score 3: children respond to instructions; score 4: drowsiness, quick response to light or loud auditory stimulation; score 5: drowsiness, slow response to light or loud auditory stimulation; score 6: drowsiness, no response. (4) drug braking effect. (5) according to Ramsay Sedation score and MRI examination, cases can be divided into 3 groups. First is significant effect group: the sedation level reaches Ramsay 5 points 15-30 minutes after medication, children's limbs are soft, sleep quietly, and can complete the examination smoothly. Second is effective group: the score of somnolence Ramsay was 4 or more in 30-60 minutes after treatment. Sometimes, the child may have slight restlessness, but it can complete MRI examination. Third is invalid group: 1 hour after medication, although it has sedative effect, there is restlessness in the examination of children, who can't cooperate to complete the examination, even crying and restlessness. Other drugs are needed to be supplemented by sedation.

## 2.3. Statistical methods

SPSS 17.0 software was used to analyze the data. The mean  $\pm$  standard deviation ( $\bar{x} \pm s$ ) was used as the measurement data, and t test was performed. The number and rate of cases were used as the measurement data, and  $\chi^2$  test was used. The difference was statistically significant ( $P < 0.05$ ).

## 3. Results

There were 29 males and 20 females in the observation group, with an average age (2-34 months,  $18.7 \pm 3.2$ ) months and weight (5.1-19.5 kg,  $17.3 \pm 2.2$ ) kg. In the control group, there were 26 males and 23 females, aged 2-36 months, with an average age ( $19.2 \pm 2.7$ ) months, weight 7-20.8 kg, with an average weight ( $16.9 \pm 3.1$ ) kg. There was no significant difference between the two groups in sex, age, weight and disease severity ( $P > 0.05$ ).

Comparison between the two groups of children after enema the observation group did not overflow

cases within 5 minutes after enema. 2 cases of children within 5 to 10 minutes had small amount of anal defecation, drainage, no two additional enema. In the control group, children left their parents' arms, crying was more obvious in the process of enema, and the degree of coordination was poor. In the 5 minutes after enema, there were 12 cases of overflow of enema fluid, including 8 cases of secondary enema, 6 cases of anal defecation and drainage within 5-10 minutes, and 3 cases of additional enema. The modified chloral hydrate retention enema was used in the additional enema. The proportion of drug overflow in the observation group was significantly lower than that in the control group ( $P<0.01$ ) (Table 1).

Comparison of the onset time of sedation and the average sleep time of the children in the observation group during enema and after enema compared with the control group, the onset time of sedation after enema was faster than that in the control group, most

of the children fell asleep within 30 minutes, while the children in the control group fell asleep after stopping crying for more than 30 minutes. The average sleep time of children in the observation group was significantly shorter than that in the control group ( $P<0.05$ ), as shown in Table 2.

Comparison of Ramsay score and drug braking effect between the two groups Ramsay Sedation score of the observation group reached 4 or more points within 60 minutes after enema. The children's limbs were soft and fell asleep peacefully. One child woke up restless and failed to complete the examination. Ramsay Sedation score of 3 children in the control group was not up to 4 points after 1 hour of enema. The children were crying and restless. MRI examination was not carried out, and the examination time was scheduled again. The differences of Ramsay score and drug braking effect between the two groups were statistically significant ( $P<0.05$ ), as shown in Table 3.

**Table 1. Comparison of enema overflow between two groups**

group	cases	Enema overflow		
		<5 min	5~10 min	No overflow
Observe	49	0	2	47
Control	49	12	6	31
$\chi^2$		9.69		
p		0.05		

**Table 2. Comparison of sedation effect and average sleep time between the two groups**

Group	Cases	Onset time			Average sleep* time (t / min)
		5~15 min	16~30 min	>30 min	
Observe	49	28	12	9	11.43 ± 4.69
Control	49	18	6	25	19.67 ± 7.53
$\chi^2$		6.045			6.037*
p		0.023			0.017*

note: \*t test

**Table 3. Comparison of Ramsay score and drug brake effect between the two groups**

Group	Cases	Ramsay		Drug braking effect		
		≥4	<4	Significant effect group	Effect group	Invalid group
Observe	49	49	0	30	18	1
Control	49	46	3	15	31	3
$\chi^2$		6.045		6.045		
p		0.023		0.023		

## 4. Discussion

As a medical imaging examination method, MRI has been more and more used in the diagnosis and differentiation of infant diseases because of its advantages such as no radiation damage, arbitrary tomography, high resolution and so on. However,

due to its long scanning duration, loud noise, and sensitivity to movement, it is necessary for children to successfully complete the examination in the state of drug sedation and braking [6]. In the traditional method of chloral hydrate retention enema, children

usually take the left lying position, with legs bent and hips padded 10 cm high. After the liquid medicine is injected, they need to keep their heads low and hips high for 5 to 10 minutes. In the process of enema, the children left their parents' arms, lost their sense of safety, were prone to fear, anxiety and crying, which caused the central nervous system and sympathetic nervous system to be over excited, the abdominal pressure increased, resulting in anal exhaust and defecation in the process of anal administration, making the liquid overflow and dosage inaccurate [7]. After the injection, it is difficult to keep the head low and hip high for 5-10 minutes. The patient's body position is changed due to fidgety and writhing, which can accelerate the spillover of the drug, make the drug malabsorption and reduce the sedative effect. Many children have to be sedated twice or many times, because the sedation effect is not good, and can not complete MRI examination.

According to the characteristics of infants' psychological needs, this study adopted the right breast-feeding position of the parents: the parents take the position of standing or sitting, the right breast-feeding position of the children, the right hand encircles the waist, the left hand encircles the thigh root, which is easy to fix and expose the buttocks. This method of holding children is easy to produce a sense of security. Parents interact with children face to face and distract their attention. The child's back to the nurse, the sense of safety will not be threatened, the mood is stable, it can effectively avoid crying or shorten the crying time, reduce the abdominal pressure, and avoid or reduce the leakage of liquid medicine in the process of anal administration. After enema, the parents were instructed not to change the position of the children in their arms, and the anus was gently rubbed with toilet paper for 5-10 minutes to stimulate the excitation of the nerves under the abdomen, promoting the relaxation of the sigmoid colon and rectum and the contraction of the internal sphincter of the anus, inhibiting the defecation reflex, prolong the time for the liquid to stay in the sigmoid colon and rectum crypt, promoting absorption and improve the sedative effect. Compared with the traditional method of chloral hydrate retention enema, the children in the enema position did not leave their parents' arms. The crying degree was significantly reduced. The children were quiet or slightly crying in the parents' arms, and the enema operation was successfully completed after pacification. After enema, parents do not need to change the position of holding the child, to avoid the resistance of passive head low hip high writhing. By tapping the child's back, language appeasement could induce the child to fall asleep as soon as possible, which can effectively reduce the crying and struggle of the child, is easy to operate, and is easily accepted by parents,

so as to improve the satisfaction of parents of the child and the work efficiency of nurses.

According to the growth and development of children, the physiological and anatomical structure of rectum and anus, the insertion depth of catheter in the control group was 3-5cm for infants and 5-10cm for child. After enema, the solution entered the rectum to stimulate the perirectal receptors, which was easy to cause defecation reflex. In order to avoid the benefit of the solution and increase the retention time of the solution in the intestine, the head and buttock of the child should be kept at a high level for 5-10min, and the child often had to Twisting resistance, difficult to match. In the observation group, the insertion depth of the catheter was increased to 5-10 cm for infants and 10-15 cm for child. Beyond the normal depth, the front end of the catheter reached the middle of the sigmoid colon. With the right breast-feeding position of the parents, the solution could be retained in the sigmoid colon and the rectal crypt due to the gravity. The solution was absorbed by the intestinal mucosa near the rectum at the near end of the sigmoid colon. Because of the large volume of colon, it is not easy to cause defecation, and can be absorbed to play a role to the maximum extent. Therefore, the patients in the observation group didn't need passive head low hip high position after enema. The cooperation degree of the children and their parents was significantly improved, and the proportion of drug overflow after enema was significantly lower than that in the control group ( $P<0.01$ ). All the children in the control group were sedated successfully with the first dose. The losers in the control group were also sedated with the modified enema.

## 5. Conclusion

In a word, the modified chloral hydrate retention enema with right breast-feeding position of parents and increased insertion depth of anal canal can effectively reduce crying and struggling of children and relieve anxiety of parents, minimizing spillover of liquid medicine, improving the power of enema retention for the first time, avoid repeated administration and increase the safety of children's medication. It is simple and practical using. The effect is better than traditional retention enema.

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