

Research Article

Effect of White Noise Combined with Chloral Hydrate Sedation on Improving the Success Rate of MRI Examination in Neonatal

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Abstract

Objective: Observe the sedative effect of white noise combined with hydrolytic aldarin in the newborn MRI examination. **Methods:** Selected 70 newborns of MRI inspections received by Zhuhai City People's Hospital from November 2021 to November 2023, using random digital tables to divide them into the observation group and control group, each group of 35 cases. The control group used 10% chloral hydrate solution to perform retention enema 30 minutes before MRI examination according to the dosing standard of 0.5 ml/kg. The observation group used laxative drugs for retention enema 15 minutes before chloral hydrate administration, and white noise intervention was given for sleep deprivation on the basis of the control group. Compare the two sets of MRI to check successful power, as well as Brussels sedation score and vital signs at different time points before and after intervention. Observe the occurrence of adverse reactions in the two groups. **Results:** Brussels sedation score in both groups showed a downward trend with the progress of time, and the change range in the observation group was greater ($P<0.05$). The blood oxygen saturation in both groups showed an upward trend with the progress of intervention time, while the systolic blood pressure, heart rate and respiratory rate showed a downward trend ($P<0.05$). The heart rate and respiratory rate in the observation group decreased significantly compared with those in the control group ($P<0.05$). There were no adverse reactions such as bradycardia, hypotension and decreased oxygen saturation in both groups. **Conclusion:** White noise combined with chloral hydrate has obvious sedative and analgesic effects in neonatal MRI examination, which is safe and worth popularizing.

Keywords

White Noise, MRI, Chloral Hydrate, Newborns

1. Introduction

Magnetic resonance imaging (MRI) is often used to judge the degree of brain development and diagnose various brain injuries in clinical work, which can help doctors guide patients to further treatment and judge the prognosis [1, 2]. However, because MRI examination usually takes a long time and is accompanied by loud noise, it is a special chal-

lenge for newborns, because it is difficult for them to stay still during the examination, which usually requires the use of sedatives to ensure the quality of imaging [3]. The use of anesthesia and sedatives in children under 3 years old may have potential neurotoxicity, which has aroused widespread concern about the safety of children using such drugs [4].

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White noise refers to the monotonous repetitive noise whose power spectral density is evenly distributed in the whole frequency domain, which can improve the sense of security and comfort of newborns, and has a soothing effect on newborns, and has a significant calming effect [5, 6]. The purpose of this study is to explore the sedation effect of white noise combined with chloral hydrate in neonatal MRI examination, and to provide reference for sedation intervention in neonatal MRI examination.

2. Objects and Methods

2.1. Subjects of the Study

Selected 70 newborns of MRI inspections received by Zhuhai City People's Hospital from November 2021 to November 2023, using random digital tables to divide them into the observation group and control group, each group of 35 cases. There was no significant difference in baseline data between the two groups ($P>0.05$). The specific values are shown in Table 1.

Table 1. Comparison of baseline data between two groups.

Groups	Case	Gender		Birth gestational age (week)	Age (day)	Weight (g)
		Boy	Girl			
Observation group	35	22	13	39.60 (38.40, 40.30)	3.00 (2.00, 7.00)	3214.31±558.99
Control group	35	21	14	39.40 (38.90, 40.00)	4.00 (2.00, 11.00)	3238.86±323.75
$t/Z/\chi^2$	-	0.060		612.500	581.500	0.225
P	-	0.806		1.000	0.713	0.823

2.2. Inclusion and Exclusion Criteria

Inclusion Criteria: (1) MRI was required; (2) No hearing impairment after hearing screening; (3) Gestational age ≥ 34 weeks, birth weight ≥ 2000 g. Exclusion criteria: (1) diarrhea, rectal surgery or other patients who are not suitable for retention enema; (2) Those who are allergic to chloral hydrate or accompanied by other congenital malformations; (3) Those who give up the enema or transfer to a higher level hospital halfway.

2.3. Methods

The control group used 10% chloral hydrate solution to perform retention enema 30 minutes before MRI examination according to the dosing standard of 0.5 ml/kg. The observation group used laxative drugs for retention enema 15 minutes before chloral hydrate administration, and white noise intervention was given for sleep deprivation on the basis of the control group.

2.4. Observation Index

Brussels sedation score was performed before intervention, 10 min after intervention and 30 min after MRI examination, with a total score of 1 ~ 5, and the score was inversely proportional to the degree of sedation.

The occurrence of adverse reactions.

2.5. Statistical Methods

SPSS27.0 statistical software was used for data analysis. The measurement data that conform to the normal distribution are expressed by mean standard deviation, and the group t test is used for comparison between groups. The measurement data of skewed distribution are expressed by median, and rank sum test is used for comparison between groups. The analysis of variance of repeated measurement was used to compare the repeated measurement data between groups. Counting data were expressed by the number of cases (%), and χ^2 test was used for comparison between groups. $P < 0.05$ is statistically significant.

3. Results

3.1. Comparison of Brussels Sedation Score Between the Two Groups at Different Time Points Before and After Intervention

Brussels sedation score in both groups showed a downward trend with the progress of time, and the change range in the observation group was greater ($P < 0.05$). The specific values are shown in Table 2.

Table 2. Comparison of Brussels sedation score between the two groups at different time points before and after intervention ($\bar{x} \pm s$).

Groups	Case	Before intervention	10 minutes after intervention	30 minutes after the inspection
Observation group	35	3.57 \pm 0.50	2.40 \pm 0.55	2.17 \pm 0.45
Control group	36	3.46 \pm 0.51	2.80 \pm 0.80 [#]	2.49 \pm 0.66 [#]

(Compared with the observation group at the same time point, [#] $P < 0.05$)

3.2. Incidence of Adverse Reactions in the Two Groups

There were no adverse reactions such as bradycardia, hypotension and decreased oxygen saturation in the two groups.

4. Discussion

At present, sedation is essential in the process of neonatal diagnosis and treatment. However, different diagnosis and treatment measures have different requirements for sedation depth and duration, and sedation schemes are also different. Generally speaking, the ideal sedation scheme should have a high success rate and the lowest possible incidence of adverse reactions. Chloral hydrate has been used in clinic for more than 100 years, and it is still the most commonly used sedative, but the success rate of sedation by magnetic resonance imaging alone is low [7, 8].

With the continuous improvement of medical level and the gradual improvement of medical management content, Non-drug intervention programs are gradually applied to newborns undergoing medical examination. Torres [9] shown that infants aged 0-24 months, the non-drug sedation method was used. The application progress of obtaining effective magnetic resonance images in children is systematically reviewed and reviewed comprehensive elaboration shows that non-drug intervention measures can be used in magnetic resonance examination achieve a higher success rate.

Newborns with normal sleep are easily awakened by noise, etc. Compared with newborns with normal sleep, newborns with short sleep deprivation show a deeper sleep state in subsequent compensatory sleep, which is quieter and less likely to be interrupted by external noise [10]. It is beneficial to improve the success rate of examination by short sleep deprivation before examination [11, 12]. White noise is a continuous and monotonous sound, which has a good signal frequency, can shield the interference of the external environment, is conducive to maintaining the stability of neonatal physiological indicators, improving the quality of neonatal sleep and promoting the growth and development of newborns. In this study, brussels sedation score in both groups showed a downward trend with the progress of time, and the change range in the observation group was greater.

There were no adverse reactions such as bradycardia, hypotension and decreased oxygen saturation in the two groups.

5. Conclusion

In this study, the Brussels sedation score in the observation group showed a downward trend with time. There were no adverse events in either group. Chloral hydrate combined with white noise intervention can improve the sedative effect of neonatal MRI examination, and the operation method is safe and convenient, which is worthy of clinical promotion.

Abbreviations

MRI Magnetic Resonance Imaging

Author Contributions

Hongyan Wei: Conceptualization, Funding acquisition, Resources, Writing – original draft, Writing – review & editing

Ling Yan: Data curation, Methodology, Resources, Supervision, Validation, Writing – original draft

Xueqing Liu: Data curation, Formal Analysis, Investigation, Software

Xiaosan Feng: Resources, Supervision

Ying Liu: Conceptualization, Funding acquisition, Supervision, Visualization

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Conflicts of Interest

The author of this article declares no conflicts of interest.

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