



Cochrane
Library

Cochrane Database of Systematic Reviews

Chloral hydrate as a sedating agent for neurodiagnostic procedures in children (Review)

Fong CY, Tay CG, Ong LC, Lai NM

Fong CY, Tay CG, Ong LC, Lai NM.

Chloral hydrate as a sedating agent for neurodiagnostic procedures in children.

Cochrane Database of Systematic Reviews 2017, Issue 11. Art. No.: CD011786.

DOI: 10.1002/14651858.CD011786.pub2.

www.cochranelibrary.com

[Intervention Review]

Chloral hydrate as a sedating agent for neurodiagnostic procedures in children

Choong Yi Fong¹, Chee Geap Tay¹, Lai Choo Ong¹, Nai Ming Lai²

¹Division of Paediatric Neurology, Department of Paediatrics, Faculty of Medicine, University of Malaya, Kuala Lumpur, Malaysia.

²School of Medicine, Taylor's University, Subang Jaya, Malaysia

Contact address: Choong Yi Fong, Division of Paediatric Neurology, Department of Paediatrics, Faculty of Medicine, University of Malaya, Kuala Lumpur, 50603, Malaysia. cyfong@ummc.edu.my, choongyi@hotmail.com.

Editorial group: Cochrane Epilepsy Group.

Publication status and date: New, published in Issue 11, 2017.

Citation: Fong CY, Tay CG, Ong LC, Lai NM. Chloral hydrate as a sedating agent for neurodiagnostic procedures in children. *Cochrane Database of Systematic Reviews* 2017, Issue 11. Art. No.: CD011786. DOI: 10.1002/14651858.CD011786.pub2.

Copyright © 2017 The Cochrane Collaboration. Published by John Wiley & Sons, Ltd.

ABSTRACT

Background

Paediatric neurodiagnostic investigations, including brain neuroimaging and electroencephalography (EEG), play an important role in the assessment of neurodevelopmental disorders. The use of an appropriate sedative agent is important to ensure the successful completion of the neurodiagnostic procedures, particularly in children, who are usually unable to remain still throughout the procedure.

Objectives

To assess the effectiveness and adverse effects of chloral hydrate as a sedative agent for non-invasive neurodiagnostic procedures in children.

Search methods

We used the standard search strategy of the Cochrane Epilepsy Group. We searched MEDLINE (OVID SP) (1950 to July 2017), the Cochrane Central Register of Controlled Trials (CENTRAL) (the Cochrane Library, Issue 7, 2017), Embase (1980 to July 2017), and the Cochrane Epilepsy Group Specialized Register (via CENTRAL) using a combination of keywords and MeSH headings.

Selection criteria

We included randomised controlled trials that assessed chloral hydrate agent against other sedative agent(s), non-drug agent(s), or placebo for children undergoing non-invasive neurodiagnostic procedures.

Data collection and analysis

Two review authors independently assessed the studies for their eligibility, extracted data, and assessed risk of bias. Results were expressed in terms of risk ratio (RR) for dichotomous data, mean difference (MD) for continuous data, with 95% confidence intervals (CIs).

Main results

We included 13 studies with a total of 2390 children. The studies were all conducted in hospitals that provided neurodiagnostic services. Most studies assessed the proportion of sedation failure during the neurodiagnostic procedure, time for adequate sedation, and potential adverse effects associated with the sedative agent.

The methodological quality of the included studies was mixed, as reflected by a wide variation in their 'Risk of bias' profiles. Blinding of the participants and personnel was not achieved in most of the included studies, and three of the 13 studies had high risk of bias

for selective reporting. Evaluation of the efficacy of the sedative agents was also underpowered, with all the comparisons performed in single small studies.

Children who received oral chloral hydrate had lower sedation failure when compared with oral promethazine (RR 0.11, 95% CI 0.01 to 0.82; 1 study, moderate-quality evidence). Children who received oral chloral hydrate had a higher risk of sedation failure after one dose compared to those who received intravenous pentobarbital (RR 4.33, 95% CI 1.35 to 13.89; 1 study, low-quality evidence), but after two doses there was no evidence of a significant difference between the two groups (RR 3.00, 95% CI 0.33 to 27.46; 1 study, very low-quality evidence). Children who received oral chloral hydrate appeared to have more sedation failure when compared with music therapy, but the quality of evidence was very low for this outcome (RR 17.00, 95% CI 2.37 to 122.14; 1 study). Sedation failure rates were similar between oral chloral hydrate, oral dexmedetomidine, oral hydroxyzine hydrochloride, and oral midazolam.

Children who received oral chloral hydrate had a shorter time to achieve adequate sedation when compared with those who received oral dexmedetomidine (MD -3.86, 95% CI -5.12 to -2.6; 1 study, moderate-quality evidence), oral hydroxyzine hydrochloride (MD -7.5, 95% CI -7.85 to -7.15; 1 study, moderate-quality evidence), oral promethazine (MD -12.11, 95% CI -18.48 to -5.74; 1 study, moderate-quality evidence), and rectal midazolam (MD -95.70, 95% CI -114.51 to -76.89; 1 study). However, children with oral chloral hydrate took longer to achieve adequate sedation when compared with intravenous pentobarbital (MD 19, 95% CI 16.61 to 21.39; 1 study, low-quality evidence) and intranasal midazolam (MD 12.83, 95% CI 7.22 to 18.44; 1 study, moderate-quality evidence).

No data were available to assess the proportion of children with successful completion of neurodiagnostic procedure without interruption by the child awakening. Most trials did not assess adequate sedation as measured by specific validated scales, except in the comparison of chloral hydrate versus intranasal midazolam and oral promethazine.

Compared to dexmedetomidine, chloral hydrate was associated with a higher risk of nausea and vomiting (RR 12.04 95% CI 1.58 to 91.96). No other adverse events were significantly associated with chloral hydrate (including behavioural change, oxygen desaturation) although there was an increased risk of adverse events overall (RR 7.66, 95% CI 1.78 to 32.91; 1 study, low-quality evidence).

Authors' conclusions

The quality of evidence for the comparisons of oral chloral hydrate against several other methods of sedation was very variable. Oral chloral hydrate appears to have a lower sedation failure rate when compared with oral promethazine for children undergoing paediatric neurodiagnostic procedures. The sedation failure was similar for other comparisons such as oral dexmedetomidine, oral hydroxyzine hydrochloride, and oral midazolam. When compared with intravenous pentobarbital and music therapy, oral chloral hydrate had a higher sedation failure rate. However, it must be noted that the evidence for the outcomes for the comparisons of oral chloral hydrate against intravenous pentobarbital and music therapy was of very low to low quality, therefore the corresponding findings should be interpreted with caution.

Further research should determine the effects of oral chloral hydrate on major clinical outcomes such as successful completion of procedures, requirements for additional sedative agent, and degree of sedation measured using validated scales, which were rarely assessed in the studies included in this review. The safety profile of chloral hydrate should be studied further, especially the risk of major adverse effects such as bradycardia, hypotension, and oxygen desaturation.

PLAIN LANGUAGE SUMMARY

The effectiveness of chloral hydrate as a sedative agent for children undergoing neurodiagnostic procedures

Review question

In children undergoing non-invasive neurodiagnostic procedures, is oral chloral hydrate more effective at producing adequate sedation and safer than other ways of achieving sedation?

Background

Neurodiagnostic procedures are non-invasive neurological investigations important for children with suspected neurological disorders. These investigations include brain imaging and brain electrical activity testing. For these tests to be successfully performed, the child needs to remain still for at least 30 to 45 minutes during the investigation period. Sedative agents are required for children, who are usually unable to remain still for this period of time.

Search date

We performed a search in multiple medical databases in July 2017.

Study characteristics

Thirteen studies involving a total of 2390 children fit our inclusion criteria. These studies were all performed in hospitals that provided neurodiagnostic services. Most of the studies assessed three main outcome measures: i) proportion of children who were unsuccessfully sedated for the neurodiagnostic procedure, ii) length of time taken for adequate sedation, and iii) side effects associated with the sedative agent. The quality of the included studies was mixed, ranging from very low to high. The quality of the studies was affected mainly because those closely involved in the trials, such as the doctors giving the sedation or the parents of the child, were not masked from knowing which sedative agent was given to the child, which could have affected their recording or interpretation of the results.

Key results

We summarised the evidence of effectiveness and harms of oral chloral hydrate sedation when compared with other sedative medications. We included 13 studies with a total of 2390 children (age up to 18 years old). The studies were all conducted in hospitals that performed neurodiagnostic procedures. Our review suggests that oral chloral hydrate is just as effective a sedative agent with similar sedation failure rate when compared with oral dexmedetomidine, oral hydroxyzine hydrochloride, and oral midazolam; and probably a more effective sedative agent with lower sedation failure rate when compared with oral promethazine. While most of the included studies showed that chloral hydrate was safe with no increased side effects when compared to other sedative agents, one study reported an increased risk of adverse effects when compared with oral dexmedetomidine.

Quality of the evidence

The quality of most of the evidence was poor due to methodological flaws in the included studies and the small sample size of each study. Consequently our confidence in the results of the studies is reduced. The major factor affecting the quality of the evidence was lack of precision in the result estimates, as the calculated plausible range of the effects were wide.

Conclusions

Apart from intravenous pentobarbital and music therapy, oral chloral hydrate is either just as effective or more effective a sedative agent when compared to other sedative agents for children undergoing non-invasive neurodiagnostic procedures. In view of the poor quality of the evidence, we could draw no clear conclusions on the effectiveness or safety of any paediatric sedative agent. The side effects profile of oral chloral hydrate when compared to other sedatives requires further study.