

## **Audit on: The use of Chloral Hydrate in Sedating Paediatric Patients During Short Neurophysiological Procedures**

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### **Abstract**

**Objective:** We aim to evaluate our current practice of using chloral hydrate in sedating paediatric patients undergoing short term neurophysiology procedures in both inpatient and outpatient settings to identify the best practice regarding its use for this indication; we stressed on its effectiveness, safety profile and tolerability.

**Methods:** Retrospective analysis of paediatric patients from the age of 0 - 18 years who presented to our neurophysiology department for short term neurophysiology procedures, at Al-Takhassusi hospital, HMG through the period 01<sup>st</sup> January to 09<sup>th</sup> October 2014.

**Results:** Normal sleep was successfully achieved in almost 80 % of paediatric patients through proper counselling to their parents about necessary actions to be taken the day prior to the procedure.

**Conclusion:** The use of chloral hydrate should be limited to the minimum, only in critical case setting or in case of urgent procedure. For outpatients, parents should be counseled about partial sleep deprivation one night prior to the procedure.

**Keywords:** *Chloral Hydrate; Sedating Paediatric Patients*

### **Abbreviations**

EEG: Electroencephalogram; ABR: Auditory Brainstem Response; VEP: Visual Evoked Potential; CP: Cerebral Palsy; CH: Chloral Hydrate

### **Introduction**

Sleep is an essential pre-requisite in performing many neurophysiology procedures in paediatric practice. Sleep EEG study is considered an essential tool in assessment of paediatric patient with seizure disorder, in addition, other procedures in the neurophysiology department, like ABR, VEP and others require the patient to be quiet and fully relaxed to avoid movement artifacts. Evoked potentials recordings can produce false positive findings or even unclear recordings in case of patient's movements and restlessness [1].

Sleep deprivation one night before the procedure date remains an effective measure in potentiating natural sleep during performing variant neurophysiology procedures, though not all parents will be compliant with given instructions, some of them will find it so tiring to keep their child sleep deprived for a considerable period the night before the procedure.

Chloral hydrate have been successfully used in our institution to induce sleep in paediatric patients while performing neurophysiology procedures.

### Objective

We aim to evaluate our current practice of using CH in sedating paediatric patients undergoing short term neurophysiology procedures in both inpatient and outpatient settings to identify the best practice regarding its use for this indication; we stressed on its effectiveness, safety profile and tolerability. We were keen to investigate why paediatric patients are in need to receive chloral hydrate prior to short term neurophysiology procedures. We started by reviewing our current practice in using CH, recommended dosage, contraindications and interactions with other medications. We wanted to evaluate how many neurophysiology procedures in paediatric patients needed sedation with chloral hydrate to be performed, to promote multidisciplinary collaboration in the provision of care and to explore the availability of other alternative measures.

### Methodology

This was a retrospective analysis of paediatric patients from the age of 0 - 18 years who presented to our neurophysiology department for short term neurophysiology procedures, at Al-Takhasusi hospital, HMG through the period 01<sup>st</sup> January to 09<sup>th</sup> October 2014.

**Stake Holders:** Paediatric Specialists and Residents involved in paediatric inpatients and outpatients' care. Paediatric Intensive Care Unit (PICU) Specialists involved in critical paediatric patients' care. Neonatal Intensive Care Unit (NICU) Specialists involved in care of neonates and infants. Neurophysiology Procedure Nurses and Technicians. Neurophysiology Head Nurse.

### Results

Total of 537 procedures were done through the period Jan-Oct 2014, 421 procedures were done without sedation, patients could sleep normally while doing the procedure, though 116 procedures (36 females versus 80 males) required CH (21.6 %). Ratio of male to female was 2.2:1. EEG was the most commonly performed procedure in comparison to VEP and ABR. The reason of why CH was used: uncooperative patient in neurophysiology setting, hyperactive, need for sleep study. Nine patients did not sleep with the first setting despite receiving CH dose and should be rebooked in a later setting and receive another dose.

Children's ages ranged between 2 months to 14 years (mean = 4.7 years). Natural sleep was recorded in 78.4% (only 25% were sleep deprived). Chloral hydrate sedation was given to 21.6 %. Children with chronic neurological diseases, e.g. CP patients were more likely to receive chloral hydrate. Chloral hydrate was effective in inducing sleep in all given patients at the standard dose of 50 mg/kg. A second dose (25 mg/kg) was necessary in 8% of the patients. Recording an initial period of wakefulness followed by sleep onset was more likely achieved in natural sleep electroencephalograms when compared to the sedated group as they were uncooperative during wake state.

### Discussion

Many neurophysiology procedures are performed in paediatric population every year [2]. Most of them are performed without the use of chloral hydrate sedation [2]. Use of chloral hydrate was well tolerated; we did not encounter any serious side effects from its use. CH has negative effect on EEG quality, its effect is much less when it comes to evoked potentials. Use of CH was associated with less frequent recording of wake state due to excessive sleepiness.

Various adverse events have been reported upon use of CH for sedation; milder ones include: failure to sleep, nausea, vomiting, motor imbalance, excessive sleepiness and paradoxical reactions. Serious but less frequent side effects include: accidental overdose (no specific antidote available for CH), cardiac problems, aspiration, death [3,4].

Although CH was effective in sleep induction, the sleep onset and transition periods between sleep and wakefulness were frequently missed and the hypnotic effects were not sustained, particularly in children with chronic neurological diseases [5]. Parents' worry regarding adverse events of CH added to our concerns regarding its use.

We highly recommended that the use of chloral hydrate should be limited to the minimum, only in critical case setting or in case of urgent procedure. For outpatients, parents should be counselled about partial sleep deprivation one night prior to the procedure.

Sleep deprivation is underutilized, it needs to be more frequently used, if parents follow recommendation regarding partial sleep deprivation one night prior to the procedure. In addition, child friendly environment, relaxation techniques in the neurophysiology room; nursery rhymes, dim light and limited manipulations can help in avoidance of CH use in neurophysiological tests.

### Re-audit

Based on previous findings, we suggested that there is no need to use CH in our neurophysiology lab, this was achieved on 02<sup>nd</sup> December 2014.

A follow up retrospective analysis of paediatric patients from the age of 0-18 years who presented to our neurophysiology department for short term neurophysiology procedures, at Al-Takhasusi hospital, HMG through the period 01<sup>st</sup> March to 31<sup>st</sup> December 2015.

A total of 730 total neurophysiology procedures (EEG/ABR/VEP) were successfully done, 13 cases (1.8%) were incomplete due to lack of sleep record and they should be rebooked for a second procedure setting.

Quality of natural sleep EEG recordings is much better than those with CH sedation as wake, transition state and sleep studies are available. This provides full study that aids in patient's management.

This proves our previous recommendation that the use of CH should be only used in critical care settings, upon need of emergency procedure, otherwise normal sleep using sleep deprivation, relaxation techniques should be the standard of care for paediatric patients undergoing neurophysiology procedures.

### Conflict of Interest

"The authors declare that there is no conflict of interest regarding the publication of this paper".

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