

## CHLORAL HYDRATE (Commentary)

**Strategies for sedating babies less than a year old**

Chloral hydrate has long been used to sedate babies undergoing painless procedures such as computed tomography (CT) scans, magnetic resonance imaging (MRI) of the brain, and detailed echocardiography, and it has a good safety record as long as the recommended dose is not exceeded, and as long as pulse oximetry is used to watch for signs of desaturation if high dose treatment proves necessary. There is also the added attraction that it can be given by mouth, although it does have a rather bitter taste only partially disguised by giving fruit juice as well. Trials show that, although chloral hydrate does not always work well in children over two years old, it provides good sedation in nearly 95% of all children younger than this. It seems to work better than oral midazolam (McCarver-May *et al.*, 1996; D'Agustino *et al.*, 2000; Wheeler *et al.*, 2001), and to work at least as well as IV pentobarbital and secobarbital (otherwise known as quinalbarbitone) in young children – two potent short acting barbiturates that are not currently available in the UK (Holman *et al.*, 1995; Chung *et al.*, 2000; Simpson *et al.*, 2003; Mason *et al.*, 2004).

The main problem with chloral hydrate, and with triclofos, is that it may take a variable time to work, and that it leaves small babies drowsy for a rather unpredictably long time afterwards. More seriously, there is no certain known antidote. Because of this, although it has been shown that a dose of 100 mg/kg works better than a dose of 70 mg/kg (Marti-Bonmati *et al.*, 1995) it is probably better, where possible, to use a 50 mg/kg dose to start with, especially children less than a year old, and then give a further 50 mg/kg after 30–40 minutes if the first dose does not seem to have been adequate (Vade *et al.*, 1995).

Indeed there seems to be little doubt that chloral hydrate is the drug of choice in young children when sedation for a *non* painful procedure is all that is required. Some degree of respiratory depression is almost the only complication seen in children less than two years old. Vomiting, or an initial brief period of restlessness or hyperactivity, is the complication more commonly seen in children older than this (Greenberg *et al.*, 1993), but hyperactivity does not usually last long – it usually merely results in the procedure having to be delayed half an hour.

The only death ever ascribed to sedation with chloral (Çaksen *et al.*, 2003) could have had a range of other causes. Nevertheless, because respiratory depression, with apnoea or bradycardia, is the only common complication of use in the first year of life, and because pulse oximeters are now so widely available, some such device should always be used to monitor every sedated child, even though serious respiratory depression is rare. It is also rare for sedation to persist for more than four hours in children who are more than one year old but, because the half life of the active drug trichloroethanol is nearly 30 hours shortly after birth, compared to 10 hours in adults and in children more than a year old (Mayers *et al.*, 1991), prolonged sedation is quite a common problem in very young children, and can sometimes make overnight admission necessary for what was expected to be just a 'day-case' study.

**Contraindications:** Troublesome airway problems, the need for supplemental oxygen (a functional saturation of less than 94%), raised intracranial pressure, epilepsy, ileus or suspected intestinal obstruction, and serious liver or renal disease, are generally looked upon as reasons for not letting anyone other than a trained anaesthetist sedate a child even for a painless procedure (Suri *et al.*, 1999; SIGN, 2004). However, one recent paper has suggested that even in neurologically impaired children a successful MRI scan can usually be obtained just using chloral hydrate, and that, if a stepped, sequential, approach is taken to the delivery of sedation, 80% these children can be managed without the use of a more complex strategy, or the need to seek anaesthetic help (Cortellazzi *et al.*, 2007).

**Other strategies:** The use of ketamine or propofol (q.v.) or a short acting barbiturate to provide analgesia and/or anaesthesia as well as sedation is only appropriate where there is an element of pain or discomfort that cannot be addressed by using a local anaesthetic, and these other drugs should never be employed unless there is someone with anaesthetic expertise in attendance at all times. Many have, however, shown that where chloral hydrate is the only sedative in use a nurse-led service can deliver safe, high quality, care. Clinicians at the Hospital for Sick Children in London were among the first in 1995 to develop, audit and describe such a service (Duri *et al.*, 1999), but it is an approach that has been widely and successfully replicated elsewhere. Although alimemazine, diphenhydramine, hydroxyzine, or temazepam and droperidol, have often been used to augment the sedative effect of chloral hydrate in children more than a year old, there is no evidence that such supplements are necessary or helpful in children younger than this. Indeed, the authors of the SIGN guideline on safe sedation in 2004 felt that "sedative drug combinations should be avoided", and the very fact that such a wide range of supplements are currently in use is evidence in itself that the added value of these combinations has not yet been studied. [This SIGN guideline has been withdrawn]

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