

Oral ketamine/midazolam is superior to intramuscular meperidine, promethazine, and chlorpromazine for pediatric cardiac catheterization.

Authors: Auden SM, Sobczyk WL, Solinger RE, Goldsmith, LJ

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Reviewer(s): Joseph P. Cravero, MD, Dartmouth-Hitchcock Medical Center

Abstract:

An IM combination of meperidine, promethazine, and chlorpromazine (DPT) has been given as sedation for pediatric procedures for more than 40 years. We compared this IM combination to oral (PO) ketamine/midazolam in children having cardiac catheterization. A total of 51 children, ages 9 mo to 10 yr, were enrolled and randomized in this double-blinded study. All children received an IM injection at time zero and PO fluid 15 minutes later. We observed acceptance of medication, onset of sedation and sleep, and sedative efficacy. The cardiorespiratory changes were evaluated. Sedation was supplemented with IV propofol as required. Recovery time, parental satisfaction, and patient amnesia were assessed. Ketamine/midazolam given PO was better tolerated ($P < 0.0005$), had more rapid onset ($P < 0.001$), and provided superior sedation ($P < 0.005$). Respiratory rate decreased after IM DPT only. Heart rate and shortening fraction were stable. Oxygen saturation and mean blood pressure decreased minimally in both groups. Supplemental propofol was more frequently required ($P < \text{or} = 0.02$) and in larger doses ($P < 0.05$) after IM DPT. Parental satisfaction ratings were higher ($P < 0.005$) and amnesia was more reliably obtained ($P = 0.007$) with PO ketamine/midazolam. Two patients needed airway support after the PO medication, as did two other patients when PO ketamine/midazolam was supplemented with IV propofol. Although PO ketamine/midazolam provided superior sedation and amnesia compared to IM DPT, this regimen may require the supervision of an anesthesiologist for safe use. *Implications:* Oral medication can be superior to IM injections for sedating children with congenital heart disease; however, the safety of all medications remains an issue.

Commentary:

Before anyone writes a scathing letter about DPT injection – please read the introduction to this paper as it reviews all the pitfalls (painful route of administration, slow onset, unreliable onset and depth of sedation, occurrence of restlessness, respiratory depression and death) of this old combination. The fact that anyone still uses this combination is surprising; the fact that as of 1995 as many as 60% of cardiac catheterization labs still used it is nothing short of amazing! The authors carefully point out that the AAP committee on drugs warned against its use seven years ago. In spite of this, since the cardiac cath lab at Kosair Children's Hospital was still using this combination, the investigators sought to compare it to an oral combination of versed and ketamine. Although there is little literature on the safety and effectiveness of this oral combination, the authors report an excellent experience with relatively few side effects and good acceptance of the liquid by the patients (a major accomplishment for anything with versed in it). The study includes copious data on parental satisfaction, recall, oxygen saturations etc. All patients received an IV and had supplemental propofol if sedation was not adequate. Most concerning is the fact that 2 of the 23 patients receiving the oral medication required airway

support during the procedure. Clearly this is not a combination to be given by non-experts – and the authors recognize this in their discussion.

This study makes interesting reading in terms of the history of DPT and direct comparison of its performance relative to an oral combination many readers will not be familiar with. The conclusion that oral medications may be superior to IM medications certainly cannot be made until the best options for both routes of administration have been compared, and this is not the case in this study. Finally one wonders (outside the context of this particular study): since an expert airway provider has to be present and an IV is to be placed in these patients, why not start with EMLA cream and give an IV sedation that is more easily titrated and therefore safer than either one of these combinations?