Behavioural Reactions following Ketamine Anaesthesia in Paediatric Patients: A Prospective Audit Examining the Effects of Midazolam and Propofol

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Introduction: Paediatric patients undergoing anorectal manometry require ketamine anaesthesia as other anaesthetic agents affect the anorectal sphincter tone (1). Additionally, if anorectal stretch follows manometry studies, intravenous propofol is administered to relax the sphincter tone. In this study some children were also given concomitant midazolam so as to ameliorate unpleasant emergence reactions to ketamine. Although these reactions have been shown to be less common in the paediatric age group (2,3), they were still a concern for some anaesthesiologists. The aim of our study was to observe the combinations being used and examine their possible influence on adverse behavioural events in recovery, on the first post-operative day and during the month following the procedure.

Methods: Following hospital audit committee approval and parental consent, a prospective audit of consecutive patients undergoing anorectal manometry was carried out over one year from May 2003 to June 2004. As per standard practice, patients were induced with ketamine 2mg.kg^{-1} after establishing monitoring and intravenous access. The anaesthetic was maintained with either intravenous boluses or infusion of ketamine at the discretion of the anaesthesiologist. All children maintained spontaneous ventilation. Patients requiring anal stretch following anorectal manometry received propofol 3-5 mg.kg^{-1} . Additionally, following manometry studies, intravenous midazolam 0.1mg.kg^{-1} was sometimes administered again at the discretion of the anesthesiologist. Intra-operative adverse events, post-operative behavioural reactions, adverse events and times to spontaneous awakening and discharge were recorded. Auditors spoke to the parent on the first postoperative day and then by telephone after a period of one month.

Results: Of the 97 children, complete data was obtained from 82 children. Patients were retrospectively cohorted into four groups depending on the anaesthetic agents received: K (Ketamine only), KM (Ketamine and Midazolam), KP (Ketamine and Propofol) and KPM (Ketamine, Propofol and Midazolam). Mean time to spontaneous awakening and discharge from recovery were significantly shorter in K versus KPM and KM groups (see table). There was no statistical difference in the occurrence of behavioural reactions in recovery in the four groups. On the first postoperative day follow-up, 79% of the patients in the KPM group had no adverse events compared to only 31% in the K group (p=0.01), but the occurrence of behavioural reactions in the four groups did not reach statistical significance. At one-month follow-up, new onset nightmares were reported in two patients in the KPM group and one in the KM group. These symptoms had resolved completely at a further three-month follow-up.

Discussion: Our study findings suggest that neither the use of midazolam , propofol or combination are beneficial in preventing the occurrence of behavioural reactions following ketamine anesthesia. Whilst contributing little to decreasing the incidence and severity of behavioural reaction it significantly prolongs both, the time to spontaneous awakening as well as discharge from recovery. We observed no long-term psychological sequelae.

Parameter	K (n=16)	KM (n=10)	KP (n=27)	KPM (n=29)	P-value
Mean Spontaneous awakening time ± SD (minutes)	17.8 ± 20.2*	38.2 ± 27.4	35.2 ± 25.2*	61.7 ± 24.4*	P<0.001*
Mean Recovery discharge time ± SD (minutes)	56.5± 29.6**	87.5 ± 27.7	72.8 ± 39.4**	101.2 ± 31.5**	P < 0.001**
Median Sedation Score in recovery room (scale 1-4)	2	4	4	4	P<0.001***
Behavioural event in recovery	9 (56%)	4 (40%)	14 (52%)	10 (34%)	P=0.45 •
Behavioural event on post-op day 1	6 (37%)	1 (10%)	3 (11%)	3 (10%)	P=0.07 •
Behavioural events at one-month follow-up	1 (7.6%)	1 (10%)	5 (19.2%)	6 (21%)	P=0.569 •

SD = Standard deviation *p < 0.001, KPM vs. K and KP (ANOVA, Holm-Sidak method), **p<0.001, KPM vs. K and KP (Kruskal- Wallis, Dunn's method), ***Kruskal-Wallis, • Chi-squared.

References:

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