Comparison of oral pentazocine, oral diazepam and intramuscular pentazocine for paediatric pre-medication

Lucida Rita MD, Frank L. Seleny MD,
Mashallah Goodarzi MD

Oral pentazocine-atropine, oral diazepam-atropine and IM pentazocine-atropine were compared as preoperative medication in children. Observations in 300 children ages 1–14 years included the emotional state at time of induction of anaesthesia, smoothness of induction, dryness of oral mucosa and tongue, incidence of vomiting, and emotional state and length of stay in the recovery room. The incidence of a calm state at the time of induction and smoothness of induction of anaesthesia was the same following oral and IM premedication. There was satisfactory drying of salivary secretions. The incidence of vomiting in the recovery room was the same following oral and IM premedication. However, children in age groups 1–4 and 5–9 years who received diazepam-atropine were more restless in the recovery room than those who received oral or IM pentazocine-atropine. More children in groups 1–4 and 5–9 years who received IM pentazocine-atropine stayed longer in the recovery room. We conclude that oral diazepam-atropine and oral pentazocine-atropine are comparable as to preoperative medication IM pentazocine-atropine and that they can be given as an alternate to intramuscular injection.

Key words

PREANESTHETIC MEDICATION, ORAL: pentazocine-atropine; diazepam-atropine; intramuscular: pentazocine-atropine
ANAESTHETICS, VOLATILE: halothane.

From the Department of Anesthesia, Children's Memorial Hospital and Northwestern University Medical School, Chicago, Illinois.

Address correspondence to: Dr. Lucida Rita, Children's Memorial Hospital, 2300 Children's Plaza, Chicago, Illinois 60614.

Most children are afraid of injections. Oral premedication is an alternative for intramuscular injection and alleviates this unpleasant preoperative experience. Several studies have reported use of different drugs for oral preoperative medication in children; chloral hydrate,^{1–3} trichlorethyl phosphate (trichlofos),⁴ trimeprazine,^{5,6} flunitrazepam (lorazepam),^{7,8} droperidol⁹ and diazepam.^{6–10} However, the efficacy of oral compared to intramuscular premedication has not been studied, except for diazepam. Root *et al.*¹⁰ found that IM diazepam was less effective than oral diazepam.

We decided to compare the effects of oral pentazocine and oral diazepam with IM pentazocine. We have used IM pentazocine premedication since 1970.¹¹ We also compared the effects of the oral analgesic pentazocine to diazepam, a tranquilizer.

We did not include an untreated control group in this study because our previous study showed that children given pentazocine had a smoother and shorter induction period and calm emergence in the recovery room compared to children that were not given any premedication.*

Methods

The study was approved by the Research Committee and Human Ethics Committee. Consent was obtained from the parent or guardian.

In a preliminary study in 20 children, we determined that tripling the usual parenteral dose of

*Pediatric outpatient anesthesia. Premedication versus no premedication. *Anesthesiology Review* 9–13 (1974).

diazepam $0.3 \text{ mg} \cdot \text{kg}^{-1}$ and pentazocine $2 \text{ mg} \cdot \text{kg}^{-1}$ and giving them orally produced good sedation and smooth induction of anesthesia. We followed Unna's¹² recommended oral atropine dose, three times the IM dose ($0.09 \text{ mg} \cdot \text{kg}^{-1}$). The maximum oral dose of pentazocine was 100 mg, diazepam 10 mg, and atropine 1 mg.

Three hundred children, varying in ages from 1–14 years, ASA physical status I, with no cardiovascular or central nervous system abnormalities were included in this study. Children for whom specific consent could not be obtained were given the routine IM pentazocine-atropine premedication.

The oral pentazocine and diazepam were prepared in a liquid chocolate flavoured solution by the hospital pharmacy. Atropine was prepared from the solution for IM injection. The calculated dose of atropine was mixed with the oral calculated dose of pentazocine or diazepam just before it was given to the study patients as preoperative medication. The drug that was prepared by the pharmacy for the day at random was given to the study patients as preoperative medication. Only the pharmacy and the principal investigator knew the code, in case emergency intervention was needed.

One of the three anaesthesiologists participating in the study examined the child preoperatively in the holding area noting his emotional state (sleepy, calm, apprehensive, crying). He gave the premedication 60–90 minutes before induction of anaesthesia.

Another anaesthesiologist participating in the study, unaware of the kind of premedication given, observed the patient's emotional state, using the same parameters at time of induction of anaesthesia. He noted whether the induction was smooth (child accepted the mask and went to sleep quietly) or stormy (child was agitated, crying or fighting), whether the oral mucosa and tongue were dry or moist, and if the child developed bradycardia during induction. The same anaesthesiologist observed the child in the recovery room. He noted the child's emotional state on waking (calm, crying, restless) and if the child vomited. He discharged the patient from recovery room when the child responded to verbal stimuli and noted the length of stay in recovery room.

An anaesthesiologist not participating in the study gave the anaesthetic. All children had inhalation inductions using $\text{N}_2\text{O}/\text{O}_2$ and halothane. Main-

TABLE I Distribution of patients by age and type of premedication

	Oral		Intramuscular
	Pentazocine-atropine	Diazepam-atropine	Pentazocine-atropine
Total No. Patients	100	100	100
Age (years):			
1–4	45	50	52
5–9	40	38	36
10–14	15	12	12

tainance of anesthesia was with halothane and nitrous oxide and oxygen (50:50).

Data were analyzed using Chi-square analysis. $P < 0.05$ was considered significant.

Results

The number of patients in the different age groups and for each type of premedication is shown in Table I. The surgical procedures are listed in Table II.

The effects of oral pentazocine and diazepam and IM pentazocine on the emotional state of the child in different age groups at time of induction of anaesthesia and emergence in recovery room, the smoothness of induction, incidence of vomiting, and length of stay in recovery room are reported in Table III.

There was no statistically significant difference in the emotional state at time of induction in children premedicated with oral pentazocine or diazepam or IM pentazocine (Table IV). There was also no statistically significant difference in the smoothness of induction between oral pentazocine or diazepam, or IM pentazocine. Nevertheless, there was statistically significant difference in the emotional state of patients in recovery room. There were more restless and crying children in age groups 1–4 and 5–9 years premedicated with diazepam (Table IV).

Significantly more children in age groups 1–4 and 5–9 premedicated with IM pentazocine stayed in recovery room for more than one hour. However, there was no significant difference in the comparison of the mean length of stay in the recovery room between children premedicated

TABLE II Number of patients for each surgical procedure

<i>Surgical procedure</i>	<i>Oral</i>		<i>Intramuscular</i>
	<i>Pentazocine-atropine</i>	<i>Diazepam-atropine</i>	<i>Pentazocine-atropine</i>
Urology (cystoscopy, meatotomy orchidopexy, urethroplasty closure urethral fistula)	30	25	27
ENT (tonsillectomy, adenoidectomy, myringotomy and tubes)	17	19	14
Eyes (muscle surgery, cataract, lacrimal duct probing, eye examination)	6	6	10
Orthopaedics (arthrogram, arthroscopy, cast change, pin removal)	8	10	14
Plastic (cleft palate, excision nevus, hemangioma or scar, skin graft)	8	5	8
General surgery (herniorrhaphy, I and D abscess, removal foreign body)	29	34	27
Dental restorations and extractions	2	1	0

with oral pentazocine-IM pentazocine, oral diazepam-IM pentazocine, and oral pentazocine-oral diazepam.

All 100 children who received IM atropine had dry oral mucosa and tongue. Eight of the 200 children who received oral atropine had moist oral mucosa and tongue. Four children who received oral atropine and one child who received IM atropine developed bradycardia at induction, with a pulse rate less than 90/min.

Discussion

Preoperative medication was readily accepted by the children when they were told they would be given an oral dose instead of an intramuscular injection. We chose to give a liquid preparation to all children, for uniformity of the study. Vomiting is a major complication of oral premedication.⁴ In our experience, diluting the medicine with a little water prevented gagging and vomiting.

The premedication was given 60-90 minutes

TABLE III Distribution of patients according to emotional state at time of induction and in recovery room, smoothness of induction, vomiting, and recovery room stay

<i>Age in years</i>	<i>Emotional state (% calm)</i>			<i>Recovery room</i>			
	<i>Induction</i>	<i>Recovery room</i>	<i>Smooth induction</i>	<i>Vomiting</i>	<i>> 1 hr. stay*</i>	<i>Mean (minutes)</i>	<i>S.D.</i>
<i>Oral pentazocine-atropine</i>							
1-4	31	19	24	5	9	58.5	±15.6
5-9	33	29	31	3	2	48.6	±16.9
10-14	12	11	8	1	2	56.6	±21
<i>Oral diazepam-atropine</i>							
1-4	31	12	28	1	8	54.0	±17.1
5-9	41	19	34	4	6	52.8	±18
10-14	10	7	8	0	2	58.3	±9.6
<i>IM pentazocine-atropine</i>							
1-4	35	24	27	2	20	62.6	±14.3
5-9	42	26	30	6	16	62.7	±14.9
10-14	9	10	8	2	5	66.6	±20.9

*Maximum two hours.

TABLE IV P-values from Chi square analysis comparing pentazocine oral-pentazocine IM, diazepam oral-pentazocine IM, diazepam-pentazocine oral

Age in Years	Emotional state (calm)		Smooth induction	Recovery room	
	Induction	Recovery room		>1 hr. stay	Mean
Pentazocine oral-pentazocine IM					
1-4	NS	NS	NS	<0.05	NS
5-9	NS	NS	NS	0.04	NS
10-14	NS	NS	NS	NS	NS
Diazepam oral-pentazocine IM					
1-4	NS	0.04	NS	<0.05	NS
5-9	NS	<0.05	NS	<0.05	NS
10-14	NS	NS	NS	NS	NS
Diazepam-pentazocine oral					
1-4	NS	NS	NS	NS	NS
5-9	NS	<0.05	NS	NS	NS
10-14	NS	NS	NS	NS	NS

NS = not significant.

P < 0.05 = statistically significant.

before induction of anaesthesia. Gamble *et al.*¹³ had shown that the peak plasma concentration of diazepam is reached in 60 minutes following oral administration. However, when given with atropine, there was decrease in diazepam absorption. Atropine decreases gastric secretion and slows gastric emptying, so that absorption of oral drugs may be delayed. Richardson *et al.*⁷ administered oral diazepam without atropine in older children, 90 minutes before operation, and found a satisfactory mental state in 89 per cent of the children. Unna *et al.*¹² demonstrated that the greatest effect of oral atropine was between 60 and 120 minutes.

Boyd *et al.*⁴ had only a 75 per cent satisfactory antisalivary effect with oral diazepam-atropine premedication. Their dose of atropine was 0.03 mg·kg⁻¹. We had 97 per cent satisfactory antisalivary effect with oral diazepam-atropine premedication. We followed Unna's¹² recommended dose of oral atropine, three times the IM dose (0.09 mg·kg⁻¹). We also had a low incidence of bradycardia during induction, which was treated with IV atropine. Our results conform with those of Joseph *et al.*¹⁴ that atropine by mouth is a satisfactory premedication.

Our incidence of vomiting in the recovery period was low compared to Boyd *et al.*⁴ and Gordon *et al.*⁶ We followed the children only while they were in recovery room, two hours at the most while Boyd *et al.* followed them up for 12-18 hours.

There was a higher incidence of restless, crying

children in the recovery room after diazepam premedication in the age groups 1-4 and 5-9 years. Echenhoff *et al.*¹⁵ reported that post-anaesthetic excitement is frequently seen in children and pain plays a role in the stormy awakening from the general anaesthetic. Richardson *et al.*⁷ found 15 of 70 children who received diazepam to be restless in recovery room. This was relieved by giving an analgesic. Boyd *et al.*⁴ reported a less than 17 per cent incidence of postoperative restlessness. They administered analgesic drugs early in the postoperative period.

We conclude that oral pentazocine-atropine and oral diazepam atropine as preoperative medication are comparable to IM-pentazocine with regard to the calm state at time of induction and the smoothness of induction of anaesthesia. There was satisfactory drying of salivary secretions. The incidence of vomiting in recovery room was the same. However, children in age groups 1-4 and 5-9 years who received diazepam-atropine were more restless in the recovery room than those who received oral or IM pentazocine-atropine. A greater number of children in age groups 1-4 and 5-9 years who received IM pentazocine-atropine stayed longer in the recovery room. Oral premedication of diazepam-atropine or pentazocine-atropine can be given as alternative to intramuscular injection. We suggest that for older children the tablet form may be more pleasant to take.

References

- 1 Grimes JG. Oral premedication in children. *Anesth Analg* 1962; 41: 201-3.
- 2 Stetson JB, Jessup G, Van S. Use of oral chloral hydrate mixtures for pediatric premedication. *Anesth Analg* 1962; 41: 203-15.
- 3 Root B. Oral premedication of children with chloral hydrate and scopolamine. *Anesth Analg* 1962; 41: 194-200.
- 4 Boyd JD, Manford MLM. Premedication in children. *Br J Anaesth* 1973; 45: 501-6.
- 5 Davis DR, Doughty, A. Oral premedication in children with trimeprazine. *Br J Anaesth* 1966; 38: 878-85.
- 6 Gordon NH, Turner DJ. Oral pediatric premedication. *Br J Anaesth* 1969; 41: 136-42.
- 7 Richardson FJ, Manford MLM. Comparison of flunitrazepam and diazepam for oral premedication in older children. *Br J Anaesth* 1979; 51: 313-19.
- 8 Kothary SP, Pandit SR. Orally administered diazepam and lorazepam. Sedative and amnesic effect. *Anesthesiology* 1980; 53: S18.
- 9 Fozard JR, Manford MLM. A controlled clinical trial of oral droperidol and droperidol plus diazepam for premedication in children. *Br J Anaesth* 1977; 49: 1147-51.
- 10 Root B, Loveland JP. Pediatric premedication with diazepam or hydroxyzine oral versus intramuscular route. *Anesth Analg* 1973; 52: 717-23.
- 11 Rita L, Seleny FL, Levin RM. A comparison of pentazocine and morphine for pediatric premedication. *Anesth Analg* 1970; 49: 377-82.
- 12 Unna KR, Glaser K, Lipton E, Patterson PR. Dosage of drugs in infants and children: 1. Atropine. *Pediatrics* 1950; 6: 197-207.
- 13 Gamble JAS, Dundee JW, Assaf RAE. Plasma diazepam levels after single dose oral and intramuscular administration. *Anesthesia* 1975; 30: 164-69.
- 14 Joseph MC, Vale RJ. Premedication with atropine by mouth. *Lancet* 1960; 2: 1060-61.
- 15 Eckenhoof JE, Kneale DH, Dripps RD. The incidence and etiology of post-anesthetic excitement. *Anesthesiology* 1961; 22: 667-73.

Résumé

Les associations pentazocine-atropine per os (P.O.) et diazépam-atropine P.O. ont été comparées à l'association pentazocine-atropine intramusculaire (I.M.) comme médications préanesthésiques chez l'enfant. 300 enfants âgés de 1 à 14 ans ont été étudiés. Les phénomènes observés incluaient l'état psychique au moment de l'induction de l'anesthésie, la douceur de l'induction, la sécheresse des muqueuses buccale et linguale, l'incidence de vomissements, l'état psychique et la longueur du séjour en salle de réveil. Les groupes I.M. et P.O. n'étaient pas différents quant à l'incidence d'un état psychique calme à l'induction ou quant à la douceur de l'induction. Les effets sur la salivation étaient satisfaisants. L'incidence de vomissements en salle de réveil était identique pour les groupes I.M. et P.O. Cependant, les enfants dans les groupes d'âge 1-4 et 5-9 ans qui ont reçu l'association diazépam-atropine P.O. étaient plus agités en salle de réveil que ceux qui avaient reçu l'association pentazocine-atropine P.O. ou I.M. On a noté une fréquence plus élevée de séjour allongé en salle de réveil dans les groupes d'âge 1-4 et 5-9 ans qui avaient reçu la pentazocine-atropine I.M.

Nous concluons que le groupe diazépam-atropine P.O./ pentazocine-atropine P.O. est comparable au groupe pentazocine-atropine I.M. Ces combinaisons P.O. peuvent constituer une alternative à l'injection intramusculaire.