

Oral diazepam pre-medication reduces the incidence of post-succinylcholine muscle pains

Andrew O. Davies MD FRCP(c)

In a prospective, double-blind placebo controlled trial, the effect of oral diazepam premedication on post-succinylcholine fasciculations and myalgia was studied. Forty patients undergoing septoplasty procedures received orally identical capsules containing either 10 mg of diazepam or a placebo 90 minutes preoperatively. A standardized anaesthetic regimen included induction with 5 mg·kg⁻¹ of thiopental and 1 mg·kg⁻¹ of succinylcholine. The diazepam and control groups did not differ significantly in extent of fasciculations or ease of intubation. However, only 15 per cent of the diazepam premedicated patients had myalgias postoperatively compared to 50 per cent of the control patients, a statistically significant difference ($p = 0.04$).

Key words

PREANAESTHETIC MEDICATION: diazepam; NEUROMUSCULAR RELAXANTS: succinylcholine, adverse effects.

Many patients experience muscle pains in the postoperative period when succinylcholine is given as part of the anaesthetic for minor surgical procedures. Small doses of non-depolarizing muscle relaxants are commonly used before succinylcholine to reduce fasciculations and postoperative myalgias. However, these drugs interfere with the action of

succinylcholine at the neuromuscular junction. Therefore, the dose of succinylcholine must be increased by about 50 per cent.¹

It has been shown^{2,3} that intravenous (IV) diazepam in doses as low as 0.05 mg·kg⁻¹ four to five minutes prior to succinylcholine injection reduces the postoperative muscle pains, with no effect on the succinylcholine neuromuscular block. There is disagreement on the effect of diazepam on fasciculations.²⁻⁴ Intravenous diazepam is, however, associated with a significant incidence of pain on injection and prolonged local thrombophlebitis.⁵

Since oral diazepam is a commonly used preoperative medication, the author was interested in studying its effects on succinylcholine-induced fasciculations and myalgias.

Methods

After institutional approval for the study had been granted, written informed consent was obtained from forty patients (ASA physical status Class I or II) scheduled to undergo septoplasty procedures. They were told that the purpose of the study was to investigate the effects of premedication in the postoperative period and that one-half the study participants would receive a placebo. No direct mention of myalgias was made preoperatively. The patients were randomly assigned to one of two groups. Patients in the study group were given 10 mg of diazepam orally 90 minutes prior to the scheduled time of their operation. Patients in the control group received a placebo medication with identical appearance. The patients, nurses, surgeons, and the anaesthetist involved had no knowledge of which medication the patients had received until the code was broken at the end of the study.

In the operating room, after preoxygenation of

From the Departments of Anaesthesia, North Bay Civic Hospital, and St. Joseph's General Hospital, North Bay, Ont.

Address correspondence to: Dr. A.O. Davies, 1140 Glenwood Rd., North Bay, Ontario, Canada P1B 4S5.

Presented in part at the Canadian Anaesthetists' Society Annual Meeting, Quebec City, May 1982.

TABLE I Comparison of diazepam-premed and placebo groups preoperatively

	Diazepam	Placebo	Significance (t-test)
Age (years)*	33 ± 11	29 ± 10	N.S.
Sex: Male	8	12	N.S.
Female	12	8	
Weight (kg)*	63 ± 12	70 ± 13	p = 0.05

*Mean ± S.D.

the patients, an intravenous induction was carried out with 5 mg·kg⁻¹ of thiopental, followed by 1 mg·kg⁻¹ of succinylcholine injected as a bolus following loss of consciousness. Without any positive pressure ventilation, laryngoscopy was carried out when the jaw muscles appeared well relaxed (60–90 seconds after injection of succinylcholine). Lidocaine aerosol (1 mg·kg⁻¹) was sprayed into the trachea and larynx prior to insertion of appropriately sized polyvinylchloride cuffed tracheal tube. Anaesthesia was maintained with one per cent halothane and 66 per cent nitrous oxide in oxygen, delivered through a Bain circuit with a fresh gas flow of 70 ml·kg⁻¹. Ventilation was controlled mechanically at a rate of ten breaths per minute and a tidal volume of 12 ml·kg⁻¹. No further muscle relaxants were used during anaesthesia. No narcotics or other analgesics were given until requested by the patient postoperatively.

At induction, the degree of fasciculations were graded from zero to 3+ (zero, no fasciculations; 1+, slight eyelid and facial fluttering; 2+, obvious large muscle twitching; 3+, major movements of arms and/or legs). Intubation conditions were noted as ideal (no movement), adequate (slight muscle movement) or inadequate (coughing and/or straining).

On the first postoperative day (between 26 and 38 hours postoperatively) the patients were visited by the anaesthetist (A.O.D.) and a standard series of questions was asked. These concerned anxiety, postoperative surgical pain and analgesic use, nausea, vomiting and sore throat. The seventh of eight questions was: "Did you have any muscle pain or soreness after the surgery?" If the answer was yes, the location and severity of the pain was noted. Severity was graded as mild, moderate, or severe subjectively by the patient. Pain or stiffness in the shoulders, chest, back or upper abdomen were considered post-succinylcholine myalgias.

Student's t-test was used to assess differences between means and the Chi-square test with continuity correction was used to analyze count data.

Results

There were no significant differences between the two groups in regard to sex or age (Table I). The fact that patients in the placebo group were an average 7 kg heavier than patients in the diazepam group should not affect the results since all drugs were given to the placebo group on a mg·kg⁻¹ basis.

All patients were induced between 90 and 110 minutes after receiving their premedication. There were no significant differences between the two groups with respect to the extent of fasciculations after succinylcholine (Table II) or in intubation conditions (Table III). Postoperatively, there were no significant differences in intensity of surgical pain, sore throat, nausea or vomiting between the two groups (Table IV). The diazepam premedication group had a significantly lower incidence of postoperative myalgias (15 per cent) compared to the placebo group (50 per cent) (Table V).

Discussion

The wide variation in the reported incidence of muscle pains following succinylcholine (0.2–89 per cent) and the difficulty in comparing the results of various studies have been attributed to a lack of standardization of the many factors involved.⁶

TABLE II Extent of fasciculations after succinylcholine

Fasciculations	Diazepam premed number of patients	Placebo group number of patients
0	3	4
1+	3	2
2+	9	7
3+	5	7

Chi square = no significant difference.

TABLE III Intubating conditions

Conditions	Diazepam premed number of patients	Placebo group number of patients
Ideal	19	17
Adequate	1	3
Inadequate	0	0

Chi square = no significant difference.

TABLE IV Postoperative pain, nausea and sore throat

	<i>Diazepam premed</i>				<i>Placebo group</i>			
	<i>Number of patients in each group</i>				<i>Number of patients in each group</i>			
Severity	0	1+	2+	3+	0	1+	2+	3+
Operative pain	2	6	3	9	4	6	6	4
Nausea	12	6	2	0	13	4	2	1
Sore throat	8	7	1	4	9	7	1	3

Chi square = no significant difference.

TABLE V Incidence of postoperative myalgias

<i>Pain severity</i>	<i>Diazepam premed</i>		<i>Placebo group</i>	
	<i>number of patients</i>	<i>Per cent</i>	<i>number of patients</i>	<i>Per cent</i>
None	17	85	10	50
Mild	1	5	6	30
Moderate	1	5	2	10
Severe	1	5	2	10
Total with pain	3*	15	10	50

*Significantly less than placebo group (Chi square = 4.2, $p = 0.04$).

Some of these include: patient age, patient sex, type of premedication, type of anaesthetic used, dose of thiopental, type of operation, speed of postoperative ambulation, and analgesic use postoperatively.

This study was a prospective randomized double-blind trial in patients undergoing a defined peripheral surgical procedure and who received a standardized anaesthetic regimen. All patients were ambulatory on the first postoperative day. Therefore it has all the features which Brodsky and Ehrenwerth⁶ consider necessary in a study of postsuccinylcholine myalgias.

It is interesting to note that the incidence of postoperative muscle pains in the present study after oral diazepam (15 per cent) was close to that noted in the two studies of IV diazepam where the incidence was 13² and 17 per cent.³

There is disagreement in the literature regarding the effect of diazepam on fasciculations. Erkola *et al.*⁴ and this study showed no significant change. Eisenberg *et al.*² and Verma³ found reductions in fasciculations with IV diazepam pretreatment.

A reduction in muscle pains without significant change in the extent of fasciculations, as noted in this study, is not as anomalous as it seems. Previous studies have not been able to correlate fasciculations with muscle pains.^{2,7} "Self taming" of suc-

cynylcholine (using 10 mg as a pretreatment before injecting the full dose), in fact, has been shown to reduce the extent of fasciculations with no change in postoperative pains.⁸ However, very recently this conclusion has been challenged in a letter.⁹

Collier⁷ hypothesized that fasciculations with a frequency greater than 50 Hz damage the muscle spindle apparatus and this causes the pain. He has shown that curare pretreatment, even when it does not abolish fasciculations, reduces fasciculation frequency to less than 50 Hz and these patients do not have postoperative myalgias. A similar mechanism could be proposed for the effect of diazepam in the present study.

In other trials of patients undergoing minor gynecologic surgery, 60 to 70 per cent have postoperative myalgias.⁸ However, in the local clinical setting these cases are usually done on a day-care basis and so there is little opportunity for preoperative interviews and postoperative follow-up. Other studies of inpatient procedures (e.g., staging laparotomy) have shown only a five per cent incidence of myalgias separate from the surgical site.⁸ This is undoubtedly because the patients have more incisional pain and are not mobile postoperatively. All our septoplasty patients are inpatients but the placebo group had a reasonably high incidence

of myalgias (50 per cent). The majority of these patients are young and fit. This opportunity to easily assess and followup healthy patients undergoing a procedure followed by a significant incidence of myalgias makes the septoplasty patients good subjects for trials studying post-succinylcholine myalgias.

In conclusion, this study demonstrated that administration of 10 mg of diazepam orally 90 minutes preoperatively significantly reduced the incidence of post-succinylcholine myalgias from 50 to 15 per cent in patients undergoing septoplasty procedures.

Acknowledgements

The author thanks the pharmacy staff at St. Joseph's General Hospital, North Bay for their invaluable assistance in preparing the placebo medication and in maintaining the study records, and Nancy Davies for preparation of the manuscript.

References

- 1 Wig J, Balil M. Relation of precurarization to suxamethonium to provide ease of intubation and to prevent post-suxamethonium muscle pains. *Can Anaesth Soc J* 1979; 26: 94-8.
- 2 Eisenberg M, Balsley S, Katz RL. Effects of diazepam on succinylcholine induced myalgia, potassium increase, creatinephosphokinase elevation, and relaxation. *Anesth Analg* 1979; 58: 314-7.
- 3 Verma RS. Diazepam and suxamethonium muscle pain (a dose-response study). *Anesthesia* 1982; 37: 688-90.
- 4 Erkola O, Salmenpera M, Tammisto T. Does diazepam pretreatment prevent succinylcholine-induced fasciculations? - a double blind comparison of diazepam and tubocurarine pretreatments. *Anesth Analg* 1980; 59: 932-4.
- 5 Hegarty JE, Dundee FW. Sequelae after the intravenous injection of three benzodiazepines-diazepam, lorazepam and flunitrazepam. *Br Med J* 1977; 2: 1384-5.
- 6 Brodsky JB, Ehrenwerth J. Post operative muscle pains and suxamethonium. *Br J Anaesth* 1980; 52: 215-7.
- 7 Collier C. Suxamethonium pains and fasciculations. *Proc Royal Soc Med* 1975; 68: 105-8.
- 8 Wilson DB, Dundee JW. Failure of divided doses of succinylcholine to reduce the incidence of muscle pains. *Anesthesiology* 1980; 52: 273-5.
- 9 Verma RS. "Self-taming" with succinylcholine and muscle pain. *Anesthesiology* 1983; 58: 487.

Résumé

On a réalisé une étude prospective à double-insu sur l'effet de la prémédication au diazépam par voie orale sur les fasciculations et les myalgies secondaires à l'administration de succinylcholine. Quarante patients subissant une septoplastie ont reçu 90 minutes avant l'opération, soit 10 mg de diazépam, soit un placebo de présentation identique. L'induction de l'anesthésie a été faite avec 5 mg·kg⁻¹ de thiopental et 1 mg·kg⁻¹ de succinylcholine chez tous les patients.

Il n'y a pas eu de différence significative entre les deux groupes en ce qui concerne les fasciculations et la facilité d'intubation. Cependant, seulement 15 pour cent des patients prémédiqués au diazépam ont eu des myalgies dans la période post-opératoire comparativement à 50 pour cent pour les patients du groupe contrôle ce qui est statistiquement significatif (p = 0.04).