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Title : DOSE RESPONSE OF INTRAMUSCULAR SUCCINYLCHOLINE IN CHILDREN

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Introduction. Succinylcholine is frequently administered intramuscularly as an emergency drug to break laryngospasm or to facilitate intubation in pediatric patients who lack a patent intravenous line. The recommended dose of intramuscular succinylcholine ranges from 1.5 mg/kg to 3 mg/kg.[1,2,3] Presently, there is no data in children concerning the effect of intramuscularly administered succinylcholine on neuromuscular transmission utilizing muscle tension measurements and a nerve stimulator. The purpose of this study was to evaluate the neuromuscular blocking effect of different doses of intramuscularly administered succinylcholine in children.

Methods. Fifty ASA Class I children were studied. They ranged in age from 1 to 10 years and weighed between 7.3 and 31 kg. None of the children had muscle abnormalities, and none were on drugs known to affect neuromuscular transmission. Most of the patients were premedicated with rectal Brevital. Anesthesia was maintained by mask with halothane, nitrous oxide and oxygen. Heart rate, blood pressure and EKG were monitored. Ventilation was assisted until succinylcholine was administered. After the drug was given, ventilation was controlled. The ulnar nerve was stimulated in the forearm at 0.1 Hz with 0.2 msec square wave pulses of supramaximal voltage. Thumb twitch was recorded on a Grass polygraph through a FT03 force-displacement transducer. Patients were assigned at random to one of 5 groups. All children were given a 2% solution of succinylcholine intramuscularly. Patients in Groups I, II, and IV received the entire dose of succinylcholine through a single injection into one deltoid muscle. Those children in Groups III and V received half the total dose in one deltoid muscle, followed immediately by injection of the remaining half dose into the other deltoid muscle.

RESULTS

| | Study Groups | | | | |
|---|---|---|---|---|---|
| | I | II | III | IV | V |
| Patients | 8 | 10 | 9 | 9 | 14 |
| Dose (mg/kg) | 2 | 3 | 3 | 4 | 4 |
| Injections | 1 | 1 | 2 | 1 | 2 |
| Max. Twitch Depression (%) | 69±40 | 88±25 | 84±25 | 98±5 | 100±1 |
| Time to Max. Depression (min.) | 4.0 ±2.1 | 4.9 ±2.5 | 5.6 ±3.0 | 3.9 ±1.6 | 3.3 ±1.6 |
| Duration of Action (min.) | 14.0 ±6.6 | 20.5 ±7.8 | 20.3 ±2.9 | 19.6 ±5.1 | 23.7 ±4.1 |

When the group of patients which received 3 mg/kg in one site was compared to the group which received the dose in two intramuscular sites, no difference was found between the maximum twitch depression, the duration of time between the administration of the drug and the onset of maximum twitch depression, and the duration of time between the administration of the drug and the return of twitch height to control level. Similar results were found when the data from the group which received 4 mg/kg total dose in one site was compared with the group which received the dose in two intramuscular sites.

The difference in maximum twitch depression between those patients who received 2 mg/kg and those who received 4 mg/kg is significant at the 5% level. There was no significant difference between the time to maximum depression or the time to full recovery between the groups.

The response to train-of-four (2 Hz for 2 sec.) stimulation was recorded when twitch height returned to 20 to 30% of control in eight patients who received a total dose of 4 mg/kg. The mean train-of-four ratio was .67 ± .13 and none was less than 0.5. There was no difference in the recovery time of this group compared to the rest of the groups.

Conclusions. 1. We found in children that 4 mg/kg is effective in achieving a high percentage of twitch depression, and we recommend that this dose be used if succinylcholine is to be given intramuscularly as an emergency drug. 2. Phase II block (as defined by a train-of-four ratio < 0.5)[4] was not seen after intramuscular administration of 4 mg/kg of succinylcholine. 3. The neuromuscular response to succinylcholine was not altered by the administration of the drug in two injection sites as opposed to one injection site.

References.

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