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EFFECT OF AGE ON EXTRADURAL DOSE REQUIREMENT IN THORACIC EXTRADURAL ANAESTHESIA

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SUMMARY

We have investigated the effect of age on thoracic extradural dose requirements in 62 patients aged 20–79 yr. Fifteen millilitre of 2% mepivacaine was administered at a constant rate (1 ml s^{-1}) by syringe pump through an extradural needle at the T9–10 interspace. A mean of 15.5 (SD 4.2) spinal segments were blocked 15 min after completion of the administration. The extradural dose requirement decreased with increasing age ($r = -0.7$, $P < 0.001$), the requirement in the elderly (60–79 yr) being about 40% smaller than that in young adults (20–39 yr). (Br. J. Anaesth. 1993; **71**: 445–446)

KEY WORDS

Age factors: extradural anaesthesia. Anaesthetic techniques: extradural. Anaesthetics, local: mepivacaine.

Although many investigators have reported the effect of ageing on the extradural dose requirement in lumbar extradural anaesthesia, few have examined the effect of ageing on the extradural dose requirement in thoracic extradural anaesthesia [1]. Some authors have reported a reduction in lumbar extradural dose requirements with age [2, 3], while others have demonstrated that age has little or no effect on the spread of lumbar extradural anaesthesia [4].

If the dose requirement in thoracic extradural anaesthesia does vary with age, to what degree it varies remains unknown. We therefore investigated the effect of ageing on dose requirements in thoracic extradural anaesthesia.

METHODS AND RESULTS

We studied 62 patients aged 20–79 yr who required extradural anaesthesia for upper abdominal surgery. All gave informed consent to the study, which was approved by the Hospital Ethics Committee. All patients were premedicated with atropine 0.5 mg and hydroxyzine 25–50 mg i.m. 1 h before surgery.

The patient was placed in the right lateral position on a horizontal operating table. A 17-gauge Tuohy needle, the bevel of which was pointing cephalad, was introduced at the T9–10 interspace. The interspace was identified by examination and palpation of the spine, counting upward from the line joining the iliac crests which was assumed to correspond with L3–4. The extradural space was identified using the dripping infusion method. When no cerebrospinal fluid or blood flowed out of the needle, 2% mepivacaine 15 ml was injected into the extradural space through the needle at a constant rate of 1 ml s^{-1} by a syringe pump (Kimura Medical, Japan). An extradural catheter was inserted to 5 cm beyond the bevel point of the needle and the patient was turned to the supine position. All blocks were performed by the same anaesthetist. Fifteen minutes after the injection, the upper and lower border of analgesia to pinprick according to a dermatome chart was assessed on the left and right sides. The number of spinal segments blocked was expressed as the average number of analgesic segments on each side. The volume of 2% mepivacaine per spinal segment (dermatome) (ml D^{-1}) (the extradural dose requirement) was calculated using the formula: amount of 2% mepivacaine injected (15 ml) divided by number of spinal segments blocked. After assessment of the spread of analgesia, the patient was anaesthetized. Upper abdominal surgery was performed under combined extradural and general anaesthesia.

The relation between age and extradural dose requirement was evaluated by linear regression analysis. The threshold for statistical significance was set at $P < 0.05$.

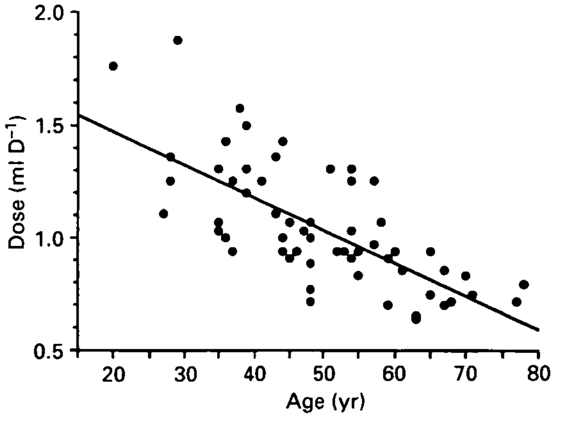

FIG. 1. Relationship between age and extradural dose requirement in thoracic extradural anaesthesia. D = Dermatome. Regression equation (straight line): $y = -0.015x + 1.266$; $r = -0.70$, $P < 0.001$.

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Mean (SD) age, weight and height were 49.2 (12.7) yr, 56.1 (8.7) kg and 1.61 (0.08) m, respectively. Fifteen millilitre of 2% mepivacaine blocked 15.5 (4.2) spinal segments. The calculated extradural dose requirement decreased with ageing ($r = -0.7$, $P < 0.001$) (fig. 1), average extradural dose requirements being: age 20–29 yr ($n = 5$)—1.47 (0.33) ml D^{-1}; 30–39 yr ($n = 11$)—1.24 (0.21) ml D^{-1}; 40–49 yr ($n = 19$)—1.02 (0.21) ml D^{-1}; 50–59 yr ($n = 14$)—1.03 (0.19) ml D^{-1}; 60–69 yr ($n = 9$)—0.78 (0.12) ml D^{-1}; 70–79 yr ($n = 4$)—0.77 (0.05) ml D^{-1}. The extradural dose requirement in the elderly (60–79 yr) was smaller than that in young adults (20–39 yr) by about 40%.

COMMENT

We have shown that a fixed dose of local anaesthetic administered into the thoracic extradural space blocked more segments in older patients compared with younger subjects.

Schulte-Steinberg, Ostermayer and Rahlfs [1] studied the spread of midthoracic extradural anaesthesia with 1% etidocaine and reported little correlation between age and spread of analgesia. The volume given in their study varied between 7 and 10 ml according to age and height: the older and smaller patients received the smaller doses of local anaesthetic. Their results are not directly comparable with ours, because the volume injected in our study was fixed. Furthermore, the method of administration, through a catheter or extradural needle, may affect the spread of local anaesthetic in the extradural space.

Leakage of anaesthetic solution from the extradural space may vary considerably in different spinal segments. Recent studies indicate that an increasing dose of anaesthetic solution resulted in greater leakage and consequently in greater calculated extradural dose requirement [5, 6]. The dependency of extradural dose requirement on volume injected makes evaluation of dose requirement difficult. We consider that extradural dose requirement calculated for a fixed dose may be adequate to evaluate the intrinsic factors that affect extradural spread of anaesthetic.

This was an unblinded study using a fixed dose of local anaesthetic. If two different volumes had been compared and the observer blinded to the volume used, a greater correlation between age and extradural dose requirement might have been obtained. Blinded studies should be performed in future.

Measurements were taken 15 min after extradural administration in this study. Although the maximum spread of extradural analgesia with 2% mepivacaine occurred at 20–30 min, the greater part of this maximum spread was already blocked at 15 min. The T9–10 interspace was identified by examination and palpation of the spine. It is possible that there was some error in identifying the exact interspace. However, this should not affect our conclusions, as we assessed both upper and lower borders of analgesia instead of the height of analgesia.

Despite the use of a fixed dose and constant rate administration by syringe pump, there was a large variation in the spread of analgesia and several factors other than age may affect the spread of local anaesthetic within the extradural space. However, an age-related decrease in thoracic extradural dose requirement was demonstrated. A reduction of the dose in thoracic extradural anaesthesia in the elderly is recommended.

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