PLASMA CONCENTRATIONS OF BUPIVACAINE AFTER STELLATE GANGLION BLOCK USING TWO VOLUMES OF 0.25% BUPIVACAINE PLAIN SOLUTION

P. A. J. HARDY AND N. E. WILLIAMS

SUMMARY

Plasma concentrations of bupivacaine were measured in patients after stellate ganglion block using either 10 or 20 ml of 0.25% plain solution. The mean peak concentrations were greater in the larger volume group, but this was not statistically significant. From 30 min after injection, there was a significantly greater plasma concentration in the larger volume group. The concentrations approached the limit of detection in the smaller volume group at 2 h after block.

KEY WORDS
Anaesthetic techniques, regional stellate ganglion block. Anaesthetics local: bupivacaine.

Sympathetic ganglion block is used in diagnosis and treatment of several chronic painful conditions. The cervicothoracic sympathetic chain may be blocked in the neck using the so-called "stellate ganglion block". Injection is made into the areolar tissue anterior to the precervical fascia, using volumes of up to 20 ml depending on the extent of sympathetic block required [1].

Significant absorption of local anaesthetic may occur from the site of injection. The plasma concentrations of local anaesthetic produced after procedures performed in patients with chronic pain may be important, because i.v. injection of local anaesthetic has been used for treatment of several such conditions [2]. It is possible, therefore, that this may account for the analgesia obtained after sympathetic block in chronic pain [1].

A prospective study was performed in patients receiving stellate ganglion block for treatment of chronic pain to assess plasma concentrations produced after use of two volumes of injectate—10 ml and 20 ml.

METHODS AND RESULTS

The study was approved by the District Ethics Committee and informed consent was obtained from patients. Venous blood samples of 2–5 ml were obtained from an indwelling cannula before and at 5, 10, 20, 30, 60, 90 and 120 min after the stellate block was performed. Two groups of patients were studied: five patients receiving 10 ml and five receiving 20 ml of 0.25% plain bupivacaine. The standard anterior paratracheal approach to the sympathetic chain at C6 was used for all blocks. The carotid sheath on the appropriate side was located and retracted laterally using one hand. A needle was inserted lateral to the trachea to contact the anterior surface of the cervical vertebral body. The needle was withdrawn 0.5 cm to lie anterior to the precervical fascia. After a negative aspiration test for blood or CSF, the appropriate volume was injected.

Blood was centrifuged and the separated plasma frozen and sent to the Department of Biochemistry, St Albans City Hospital for assay for bupivacaine by high pressure liquid chromatography on reverse phase with u.v. detection at 205 nm. This technique has a limit of detection of 0.05 µg ml⁻¹.

Statistical analysis using the Mann–Whitney U test was performed using an Amstrad PCW 9512 with the "Oxstat" package.

Plasma concentrations of bupivacaine reached peak values at 10 min in the smaller volume and
20 min in the larger volume group (table I). The mean peak value was greater in the larger volume group, but this difference was not statistically significant. The concentrations decreased over 120 min, to around or below the limits of detection in the 10-ml group. There was a statistically higher plasma concentration in the larger volume group, from 30 min to 120 min. The plasma concentration did not approach toxic values in any patient.

**COMMENT**

The concentrations of local anaesthetic obtained after stellate ganglion block have not been reported previously [3]. The concentrations obtained after either 10 or 20 ml of 0.25% bupivacaine in this study were substantially less than the reported toxic concentration of 1.5 \( \mu \text{g ml}^{-1} \) [3]. Peak concentrations were obtained in both groups 10–20 min after injection.

The reported time to maximal increase in skin temperature in the hand after stellate ganglion block with 0.5% bupivacaine plain solution is 30 min [4]. The peak plasma concentration in the 20-ml group was maintained up to this period. It is possible, therefore, that part of the effects observed after stellate ganglion block may be related to systemic local anaesthetic and not sympathetic block.

**ACKNOWLEDGEMENT**

We thank ASTRA for funding the cost of bupivacaine assays.

**REFERENCES**