INTRAVENOUS REGIONAL ANAESTHESIA A REPORT ON A NEW LOCAL ANAESTHETIC AGENT

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A LOCAL ANAESTHETIC COMPOUND with reduced toxicity would be a welcome addition to the anaesthetist's armamentarium, particularly with the revival of interest in intravenous regional anaesthesia. The clinical success enjoyed by lignocaine has led to the investigation of compounds with a similar chemical structure¹. One such compound is *a-n*-propylamino-2-methylpropionanilide or Citanest[®].

Pharmacological tests and clinical trials in man have revealed that Citanest[®] has the same local anaesthetic potency as lignocaine. However, Citanest[®] has a low toxicity (approximately 60 per cent that of lignocaine) because of its good localization at the site of injection, a favourable ratio in distribution between cells and extracellular fluid, and a rapid breakdown by liver enzymes. Tissue toxicity or local irritation is minimal²⁻⁵.

A marked difference in both subjective and objective symptoms was recorded by Englesson *et al*⁶ with the intravenous injection in man of 200 mg of lignocaine and Citanest[®]. Lignocaine had a considerably more pronounced effect than Citanest[®]. The subjective symptoms were varied, but were of the same type in each subject. The symptoms noted were sleepiness, a sensation of cold, a feeling of pressure on the chest, auditory disturbances, headache or pressure on the forehead, numbness of the lips and tongue, as well as difficulty in talking. Isolated twitching and E E G changes were not observed with Citanest[®] as they were in some cases with lignocaine. There were no significant changes in heart rate, blood pressure, or arterial oxygen or carbon dioxide tension with either drug. In a small series, six subjects were given 400 mg of Citanest[®] intravenously. Five of the subjects reacted only insignificantly and showed less pronounced symptoms than after receiving 200 mg of lignocaine. The sixth subject showed symptoms similar to those seen after receiving 200 mg of lignocaine.

METHOD

The intravenous use of lignocaine for surgical analgesia in the extremities at the Lagos University Teaching Hospital has been reported by Dawkins *et al*⁷. In the clinical trial reported here, a similar method was used in that sphygmomanometer cuff was applied to the affected extremity of the recumbent patient. Following inflation of the cuff to just above the diastolic blood pressure, venipuncture distal to the cuff was carried out using a 20 c.c. syringe containing the Citanest[®] solution with an SWG 22 needle attached. The cuff was then deflated, and while the syringe was held in place, the extremity was elevated for one-half

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minute to allow venous drainage. The cuff was then inflated above systolic pressure, the extremity was returned to the horizontal position, and the solution of Citanest[®] was administered in a single injection. Following the surgical procedure the sphygmomanometer cuff was deflated.

Citanest[®] hydrochloride in aqueous solutions of 0.5 per cent, 1.0 per cent, and 2.0 per cent was used in the clinical trial. The dosage varied from 75 mg to 800 mg.

The onset and the termination of analgesia were determined by testing the response to pin-prick. In most instances the return of sensation was patchy in nature; the end-point was noted when sensation returned to any portion of the anaesthetized area. It was not uncommon to have a sensation of pain return to the surgical site before the return of skin sensitivity to pin-prick. In these instances the end-point was noted with the onset of pain. Two periods of analgesia were recorded, the period during which the sphygmomanometer cuff was inflated, and that following deflation of the cuff.

A total of 64 patients received intravenous Citanest[®], one patient required surgery to both hands, thus accounting for 65 surgical procedures. The surgical site was the upper extremity in 58 cases and the lower extremity in 7 cases. The majority of patients had infections requiring incision and drainage, but severe lacerations, dislocations, and fractures were also treated. The blood pressure cuff was usually placed below the elbow or knee if such placement did not interfere with the surgical procedure. In the few prolonged procedures involving the hand, the cuff was placed above the elbow and then, following analgesia, a second cuff was placed over the anaesthetized area and inflated. The removal of the first cuff then eliminated the discomfort of having a tourniquet on a non-anaesthetized area.

The analgesic response was graded as good, moderate, or poor. There was some difficulty in assessing the analgesic response because of the language barrier. However, those patients who grimaced or appeared to have some discomfort with surgical stimulation but made no attempt to withdraw the extremity involved and tolerated the surgical procedure were classified as moderate. This classification was considered an acceptable result, as it was felt that the patients were probably reacting to the sensation of touch and pressure. The response was graded as poor if the patient withdrew the extremity or continued to be restless and was distressed by the surgical procedure.

During the immediate postoperative period the patients were observed to note any toxic effects of the local anaesthetic drug. The pulse was palpated to note any change in character, rate, or rhythm. As most patients were sitting up and ambulatory within a few minutes, the blood pressure was not usually recorded.

RESULTS

Analgesia was usually present by the time the injection of Citanest[®] was completed. In a few cases the onset of analgesia did not occur for up to four minutes following the injection. The period of analgesia with the tourniquet inflated ranged from 2 minutes to 1 hour and 29 minutes. The duration of analge-

sia following the deflation of the tourniquet was variable and ranged from 1 minute to 1 hour and 30 minutes. This period of post-tourniquet analgesia seemed to be prolonged with the stronger solutions of Citanest[®] but otherwise was quite unpredictable.

The results are outlined in Table I. The only poor results (2 cases) were obtained in group I, where 0.5 per cent Citanest[®] was used. These were both adult males with infected fingers who complained of severe pain with surgical stimulation. It is interesting to note that they were both analgesic to pin-prick prior to the onset of surgery.

TABLE I

Group	Strength of solution, %	Number of patients	Age	Dosage, mg	Results		
					Good	Moderate	Poor
I	0.5	20	8-40	75-150	15	3	2
IIA	1.0	14	6-50	100-400	12	2	0
IIB	1.0	22	10-60	200	20	2	0
III	1.0 & 2.0	2	21 & 37	400 & 550	2	0	0
IV	2.0	6	9-30	300-800	6	0	0
Total	0.5-2.0	64	6-60	75-800	55 (86%)	7 (11%)	2 (3%)

In group IIA one of the two patients for which the result was moderate was a 13-year-old boy who had received only 12 c.c. of 1.0 per cent Citanest[®] when the injection went interstitial. The other patient was a 15-year-old male who grimaced when the incision was made into his infected thumb, but made no further protestation.

In group IIB the two moderate results were again obtained in young males. The first was an 11-year-old boy who had continuous discomfort in a swollen infected thumb following inflation of the tourniquet. This discomfort was relieved with surgical incision. The second was a 13-year-old male with an infected finger.

The two patients in group III each received initially 1.0 per cent Citanest[®], which was subsequently supplemented with 2.0 per cent Citanest[®]. The first patient, a 21-year-old male, had a traumatic amputation of the distal portion of his thumb. During cleansing of the wound he complained of pain and the tourniquet was found to be deflated below the systolic blood pressure. A Supplementary dose of 10 c.c. of 2.0 per cent Citanest[®] was administered following reinflation of the cuff, and surgery was carried out without further discomfort. The second patient, a 37-year-old male, had received 25 c.c. of 1.0 per cent Citanest[®]. However, there was difficulty with the injection, an undetermined amount having gone into the interstitial tissue on two occasions. Following this, he had anaesthesia in all areas but the index finger. He was then given an injection of 15 c.c. of 2.0 per cent Citanest[®], whereupon complete analgesia was obtained. He had posterior dislocations of his second, third, fourth, and fifth metacarpal-phalangeal joints and a large laceration across his palm. Reduction and suturing were carried out by the surgeon without discomfort to the patient.

Group IV consisted of patients receiving 2.0 per cent Citanest[®]. One patient with a mangled hand, who received 600 mg of Citanest[®], complained of discomfort in his hand after 1 hour and 21 minutes. The cuff had previously been transferred to the anaesthetized area. This discomfort was relieved 8 minutes later when the tourniquet was deflated. However, the cuff was reinflated after 1 minute because of haemorrhaging and surgery was continued for another 15 minutes. The one patient who received 800 mg of Citanest[®] complained of dizziness and diplopia. His symptoms persisted for 30 minutes. The blood pressure and pulse remained stable and there was no nystagmus or twitching. Approximately two hours later he complained of headache.

In addition to the patient mentioned above who received 800 mg, there were five patients who received 400 mg, and two patients who received 550 mg and 600 mg respectively. One 9-year-old boy received 300 mg. No complications were noted in any of these patients.

Minor complications consisted of (a) complaints of discomfort towards the termination of the injection, variously described as sensations of burning, pins and needles, and fulness, and (b) a local swelling of the tissues due to leakage at the site of venepuncture.

DISCUSSION

The regional intravenous technique using Citanest[®] was an effective means of producing surgical analgesia in the extremity. Citanest[®] appeared to have a low toxicity. The only complication in the series occurred in a patient who had received 800 mg of the drug, and who showed mild neurological symptoms. The use of 1.0 per cent Citanest[®] appeared to provide adequate analgesia and a volume of 20 c.c. seemed to be a sufficient adult dosage. While the use of this volume-strength relationship provided a good margin of safety, the volume could be modified for paediatric or geriatric patients.

Occasionally the distribution of analgesia was patchy. Since the veins are distended following the initial injection of the local anaesthetic, a supplemental dose could be given if necessary.

The language difficulty may have been partly responsible for the absence of reported subjective symptoms.

SUMMARY

The technique of intravenous regional anaesthesia was carried out in 64 patients between the ages of 6 and 60 years. A new local anaesthetic, *α-n*-propylamino-2-methylpropionanilide or Citanest[®], was used in 0.5, 1.0, and 2.0 per cent strengths, and in a dosage range of 75 mg to 800 mg. For this dosage range 86 per cent had good analgesia, 11 per cent moderate, and 3 per cent poor, providing 97 per cent adequate anaesthesia in the series. Poor analgesia occurred in only two cases in which 0.5 per cent Citanest[®] had been used. Neurological symptoms appeared in one patient who had received 800 mg of Citanest[®]. There were no other complications.

RÉSUMÉ

On a pratiqué l'anesthésie régionale intraveineuse chez 64 malades âgés de 6 à 60 ans. On a utilisé un nouvel anesthésique local, le *α-n*-propylamino-2-méthylpropionanilide ou Citanest[®] aux concentrations de 0.5 pour cent, 1 pour cent, et 2 pour cent et à des doses allant de 75 mg à 800 mg. À ces dosages, 86 pour cent ont eu une bonne analgésie, 11 pour cent une analgésie légère et 3 pour cent une analgésie faible, donc, 97 pour cent ont eu une anesthésie suffisante. Les deux seuls cas de faible analgésie avaient reçu du Citanest[®] à 0.5 pour cent. On a relevé un cas de troubles neurologiques: il avait reçu 800 mg de Citanest[®]. Il n'y eut pas d'autre complication.

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REFERENCES

- 1 LÖFGREN, N & TEGNÉR, C. Synthesis of Some *α*-Monalkylamino-2-methylpropionanilides, a New Local Anaesthetic. *Acta Chem Scand* 14 153 (1960)
- 2 WIEDLING, S. Studies on *α-n*-Propylamino-2-methylpropionanilide—A New Local Anaesthetic. *Acta Pharmacol* 17 233 (1960)
- 3 ÅSTRÖM, A & PERSSON, N H. Some Pharmacological Properties of *o*-Methyl-*α*-propylaminopropionanilide, a New Local Anaesthetic. *Brit J Pharmacol* 16 32 (1961)
- 4 ERIKSSON, E. L67—Experimental Evaluation of a New Local Anaesthetic in Man. *Acta Anaesth Scand* 5 191 (1961)
- 5 VON BAHR, V & ERIKSSON, E. Citanest (L67)—A New Local Anaesthetic. (Eng.) *Sv Lakartidn* 59 2221 (1962)
- 6 ENGLSSON, S, ERIKSSON, E, WAHLQVIST, S, & ÖRTENGREN, B. Differences in Tolerance to Intravenous Xylocaine and Citanest (L67), a New Local Anaesthetic. A Double Blind Study in Man. *Proc 1st European Congr Anaesthesiology, Vienna, Sept 3-9, 1962*, vol 11, 206-1
- 7 DAWKINS, O S, RUSSELL, E S, ADAMS, A K, HOOPER, R L, ODIAKOSA, O A, & FLEMING, S A. Intravenous Regional Anaesthesia. *Canad Anaesth Soc J* 11 243 (1964)