CONTINUOUS BRACHIAL PLEXUS BLOCK – REGIONAL ANAESTHESIA FOR REIMPLANTATION SURGERY OF THE HAND: A PRELIMINARY STUDY

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SUMMARY

Continuous brachial plexus block in six patients undergoing reimplantation of severed fingers or hand is described. The technique involved placement of a catheter within the neurovascular sheath enclosing the brachial plexus. This enabled us to give the local anaesthetic as required to last the whole duration of surgery.

INTRODUCTION

Hand implantation surgery is always on an urgent basis and lasts for many hours. Simple, safe and reliable anaesthesia would be necessary and many types of anaesthetic techniques have been advocated. General anaesthesia is effective, but there are problems associated with a prolonged general anaesthesia with an increase in the incidence of hypothermia, accidental intraoperative awareness and a prolonged recovery time. Regional anaesthesia with the use of an effective long-lasting local anaesthetic agent, in particular bupivacaine, has been increasingly advocated as the anaesthesia of choice in surgery of the upper limb.[1,2] Continuous brachial plexus block as a technique to achieve a longer lasting regional anaesthesia in the upper limb has been successfully reported.[3,4,5,6] There are several approaches to the brachial plexus: interscalene, supraclavicular, axillary[1] and retroclavicular.[7] The aim in all these methods is to enter the neurovascular sheath enclosing the brachial plexus and the placement of the local anaesthetic therein.

We have used the axillary approach as described by Winnie[1] to place a polyethylene flexible catheter within this neurovascular sheath. This enabled us to give a prolonged regional anaesthesia suitable for hand implantation surgery. The aim of this paper is to present the results of this study.

MATERIALS AND METHOD

Patients

Six healthy adults who sustained traumatic injury to the hand during the period July 1982 to May 1983, were studied.

Technique

An axillary approach was employed in performing the brachial plexus block,[1] using easily available materials. An 18-gauge intravenous polyethylene catheter with metal stylet or a disposable epidural

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needle (18-gauge) was used. With the sedated patient lying supine, the arm to be blocked was abducted to 90° and the forearm flexed. The axillary artery was identified in the axilla at the point of maximal pulsation. Keeping the index finger on the artery, the needle was inserted just above the artery at an angle varying from ten degrees to twenty degrees and pointing towards the axilla. The artery was approached gradually until a 'click 'was encountered, caused by the penetration of the needle into the axillary sheath.[1] The tip of the needle now lay superiorly tangential to the artery within the neurovascular sheath. The needle would be seen to pulsate. After aspirating to ensure that there was no accidental intravascular puncture, a test dose of a local anaesthetic was then given. The epidural catheter was threaded up the needle for about 5 to 7 cm. The needle was then withdrawn, and the catheter firmly strapped in place.

The calculated volume of the anaesthetic agent was then injected. Firm digital pressure was applied during the injection immediately distal to the catheter.[1] The pressure was maintained after the injection for about five minutes during which time, the arm was brought back quickly to the side. The initial amount of bupivacaine was calculated at 2 mg/kg given in a volume of 20 to 40 mls.

Top-up doses of local anaesthetic were given when there was return of motor activity in the affected limb or when the patient was restless. Additional sedation was given in the form of inhalational anaesthetic agents or intravenous narcotics or diazepam. These supplementary drugs were used to enable patients to be comfortable and to lie still for the duration of surgery.

RESULTS

Surgery

The duration of surgery ranged from five hours to 14½ hours (Table I). Good operating conditions were obtained in five cases, though on one occasion when the patient became restless due to a full bladder and needed catheterization. Unsatisfactory operating conditions were seen in one case (case 4) when the patient had to be given a general anaesthetic after two hours of surgery. The patient was a heavy drinker and was in an inebriated condition and could not be adequately sedated.

TABLE I
DURATION OF OPERATIONS AND TYPES OF ANAESTHETICS ADMINISTERED

No.	Age (yrs)	Sex	Duration of Operation	Total Dose of LA		Sedation
				Bupivacaine (mg)	Lignocaine (mg)	
1	24	F	5 hours 20 minutes	200	–	N_2O, O_2, Halothane (0.5%)
2	21	M	1 hour 30 minutes	325	–	Morphine 30 mg/100 mls Hartmans solution 10 drops/min Fenty1 100 µg N_2O, O_2 – nasal prongs
3	16	M	9 hours 50 minutes	300	160	Diazepam 10 mg Fenty 50 µg
4	40	M	12 hours 50 minutes	100	–	Converted to GA after 2 hours
5	17	M	6 hours	230	–	Diazepam 15 mg – given for 3 incremental doses N_2O, O_2
6	21	F	5 hours	200	–	Pre-medication: Omnopon 10 mg Scopolan 0.2 mg Diazepam 2.5 mg

TABLE II
TIME INTERVAL FOR TOP-UPS

Case No.	Initial Dose	1st	2nd	3rd	4th	5th	6th	Average Interval
1	Marcaine with adrenaline 0.5% 25 mls	1 hr Marcaine 0.5% 10 mls	3 hrs 10 mins Marcaine 0.25% 10 mls	–	–	–	–	2 hrs 5 mins
2	Marcaine (plain) 0.5% 25 mls	2 hrs Marcaine 0.5% 10 mls	55 mins Marcaine 0.25% 10 mls	2 hrs 15 mins Marcaine 0.25% 10 mls	1 hr 50 mins Marcaine 0.25% 10 mls	1 hr 30 mins Marcaine 0.25% 10 mls	1 hr 30 mins Marcaine 0.25% 10 mls	1 hr 51.42 mins
3	Marcaine (plain) 0.25% 30 mls plus Lignocaine 1% 10 mls	2 hrs Marcaine 0.25% 10 mls	3 hrs Marcaine 0.25% 10 mls	3 hrs 50 mins Marcaine 25% 10 mls Lignocaine 1% 6 mls	–	–	–.	2 hrs 56 mins
4	Marcaine (plain) 0.25% 40 mls	Coverted to General Anaesthesia after two hours						
5	Marcaine (plain) 0.375% 35 mls	1 hr 35 mins Marcaine 0.25% 20 mls	2 hrs 15 mins Marcaine 0.25% 20 mls	–	–	–	–	1 hr 55 mins
6	Marcaine (plain) 0.375% 25 mls	Continuous infusion. 9 mls/hr of 0.25% Marcaine.						

Local Anaesthetic

Of the six cases studied, five had intermittent doses of bupivacaine. The last case had a continuous infusion. In case 1, 0.5% marcaine with adrenaline was used. Subsequent cases had plain marcaine. In case 3, a mixture of marcaine and lignocaine was given (Anaesthetist's preference). In case 6, we decided to modify our technique and to give a continuous infusion of the local anaesthetic through the indwelling axillary catheter after an initial bolus injection (Table II). This was by using a volumetric infusion pump.[8] The rate was arbitrarily fixed at 9 mls/hr of 0.25% marcaine.

Sedation

Apart from the inebriated patient, restlessness was noted in one patient after eight hours of surgery due to a full bladder. Supplementary inhalational anaesthesia was given to cases 1, 2 and 4 in the form of 50% N_2O and 50% oxygen. In addition, case 1 had 0.5% halothane. Patients were lightly asleep and could be awakened when called upon Case 6 required minimum sedation. Apart from a premedication of omnopon and scopolamine, he required only an intravenous dose of 2.5 mg of valium (Table I).

DISCUSSION

In trauma surgery, with the application of microsurgical techniques to hand surgery, reimplantation of amputated fingers and hands has become a possibility. The development of a viable reimplantation programme presents several problems in the provision of an adequate anaesthetic service. The time interval between the injury and the surgery needs to be as short as possible. Theatre and anaesthetic facilities need to be immediately available. Yet

reimplantation surgery is a time-consuming operation that may run into several hours. This may pose a constraint on available anaesthetic cover for other emergencies. A continuous brachial plexus block may present as a suitable alternative to general anaesthesia. The procedure can be performed easily and effectively.

In our series of six cases of hand trauma, where a continous brachial plexus block was the main anaesthetic technique, surgery of a long duration was successfully completed in five patients. These patients could be kept lightly asleep with supplementary narcotics or inhalational anaesthetic. But they could be awakened at any time during the operation, and their recovery time in the post-operative care room was short.

With the use of a continuous infusion of the local anaesthetic in case 6, the impression was that the patient was even more comfortable requiring less additional sedation. The technique was well accepted by surgeon, patient and anaesthetist. There was no return of unwanted activity during critical moments of surgery and no loss of analgesia Post-operatively the axillary catheter could be maintained and local anaesthetic given for effective pain control and sustained sympathetic block to counteract the vascular spasm[7,2] of hand trauma and to promote wound heeling. Sympathetic blockade also inhibited sweating, thus diminishing possibilities of bacterial infection.

In the future, we hope to extend the regional block into this post-operative period.

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