free of pressure-induced artefacts.[7] After calibration, the apparatus stays stable and can be used continuously for at least six months.

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Intravenous Regional Anesthesia for Sequential Operations on Two Extremities

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Most anesthesiologists limit the use of intravenous regional anesthesia to short procedures on the forearm and hand. Our experience, however, encouraged us to extend the applications of this technique, and one of us (E. M. B.) has described its use for prolonged procedures.[1, 2] The purpose of this communication is to present our experience with intravenous regional anesthesia in operations involving two extremities, both upper and lower.

TECHNIQUE

For the upper extremities, the method is essentially that described by Holmes,[3] using lidocaine, 0.5 per cent. When the operation on the first extremity is nearing completion, anesthesia is induced in the second extremity. After anesthesia in the second extremity has been established, the tourniquet on the first extremity is released, provided that at least 40 minutes have elapsed from the time of initial injection of drug.

Originally, we used the same technique for procedures on the lower extremity, but we found this not completely satisfactory, since patients frequently experienced tourniquet pain despite the use of a double tourniquet. Consequently, we have modified our technique for procedures on the lower extremity. Regardless of the site of operation, the tourniquet is placed at midthigh. Instead of 40–50 ml of 0.5 per cent lidocaine, we use 75–100 ml of 0.35 per cent lidocaine. This concentration is prepared by adding 30 ml of saline solution to 70 ml of 0.5 per cent lidocaine to make 100 ml of 0.35 per cent lidocaine.

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TABLE 1. Patients and Procedures

	Age,Sex	Operation	Dose	Time	Remarks
Patient 1	71,F	Excision bilateral plantar neuromata	225 mg 250 mg	Left 42 min Right 42 min	
Patient 2	57,F	Excision cyst right foot Excision ingrown toenail left foot	250 mg 250 mg	Right 50 min Left 54 min	Severe arteriosclerotic heart disease
Patient 3	50,F	Bilateral Keller arthroplasties	250 mg 250 mg	Left 49 min Right 46 min	
Patient 4	61,F	Bilateral bunionectomy	250 mg 250 mg	Right 1 hour, 7 min Left 52 min	
Patient 5	21,M	Tendon transplant from left foot to right hand	350 mg 200 mg	Leg 1 hour, 4 min Arm 1 hour, 46 min	
Patient 6	57,F	Excision tendon sheath left thumb Keller arthroplasty left foot	200 mg 280 mg	Arm 55 min Leg 50 min	
Patient 7	58,M	Excision rheumatoid nodules, both forearms, arthrodesis right wrist	200 mg 450 mg	Left 50 min Right 2 hours, 31 min	Continuous; cuff deflated after 1 hour, 23 min. Re-inflated for additional hour, 8 min
Patient 8	26,M	Excision Dupuytren's contracture; bilateral	250 mg 250 mg	Left 48 min Right 51 min	
Patient 9	46,F	Bilateral median nerve decompression	250 mg 250 mg	Left 45 min Right 50 min	
Patient 10	75,M	Bilateral median nerve decompression	250 mg 250 mg	Left 32 min Right 34 min	
Patient 11	46,F	Synovectomy left thumb Synovectomy P.I.P. joint right ring finger	200 mg 200 mg	Left 50 min Right 1 hour, 5 min	
Patient 12	56,F	Arthroplasty with bone resection of right foot, syndectomy and proximal phalangectomy of left foot, proximal phalangectomy of right foot	350 mg 350 mg	Right 50 min Left 40 min	

CASE MATERIAL

Twelve patients have received intravenous regional anesthesia for surgical operations on two extremities (table 1). Blood levels of lidocaine were determined in three patients by gas chromatography. Blood samples were drawn from one of the uninvolved extremities.

RESULTS

Anesthesia was judged successful in all of the cases described here. There was no evidence of local anesthetic toxicity. There were no postanesthetic complications. Lidocaine blood levels are shown in table 2.

TABLE 2. Plasma Levels of Lidocaine (μg/ml)

	Dosage	Extremity	Release	Release + 5 Min	Release + 15 Min
Patient 5	350 mg	Left foot	2.8	3.2	2.6
	200 mg	Right hand	1.6	2.0	1.6
Patient 6	200 mg	Left hand	0.9	1.6	1.4
	280 mg	Left foot	2.2	2.8	2.8
Patient 12	350 mg	Right foot	2.5	4.3	3.0
	350 mg	Left foot	2.0	4.0	3.1

COMMENT

The applicability of intravenous regional anesthesia to surgery involving two extremities increases the scope of this procedure and does not appear to increase the risk of local anesthetic toxicity. Although some of the blood levels of lidocaine are somewhat higher than those reported by Mazze *et al.*[4] for operations on single extremities, the values are well below the levels at which toxicity should occur.[5] It should be noted, however, that we have not used this technique for simultaneous operations on two extremities by two teams of surgeons; therefore, we cannot comment on the safety of that procedure.

We have found that this technique, as reported here, can be used for relatively poor-risk patients and outpatients. The only specific contraindications to its use are allergy or hypersensitivity to local anesthetics and conditions that preclude the use of a tourniquet. The method is as safe and reliable for operations on the lower extremity as for those on the upper extremity when 75–100 ml of 0.35 per cent lidocaine are used, even in operations involving two extremities.

SUMMARY

We have described the use of intravenous regional anesthesia for operations on two extremities performed in a single session in the operating room. This method of anesthesia was highly reliable for surgery on lower as well as upper extremities. Use of intravenous regional anesthesia for two extremities does not appear to increase the risk to the patient.

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