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Case Report

Anaesthesia Section

Total Spinal Anaesthesia after Interscalene Brachial Plexus Blockade- A Case Report

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ABSTRACT

Brachial plexus blockade has been used for a variety of procedures on the hand, upper extremities, and shoulder. After giving an effective brachial plexus block, total spinal anaesthesia may develop, perhaps due to epidural or prevertebral diffusion of anaesthetic drugs. When administering regional nerve blocks, the findings should underline the significance of cautious technique, but more significantly, the requirement for good patient monitoring and fast availability of resuscitation equipment. This case report was about a 45-year-old woman who underwent an external fixator application to a forearm injury under an interscalene nerve block. Subsequently, she developed haemodynamic deterioration and respiratory arrest. She was manually ventilated with positive pressure and was administered crystalloids intravenously with complete recovery of neurological function. This is being reported as total spinal anaesthesia, an extremely rare complication of the interscalene brachial plexus block.

Keywords: Apnoea, Bupivacaine, Locked in syndrome, Mask holding, Regional anaesthesia

CASE REPORT

A 45-year-old female, weighing 64 kilograms, with no known medical co-morbidities, had a traumatic fracture in the right forearm [Table/Fig-1]. She was being planned for external fixation of the same. The planned anaesthetic technique was a brachial plexus block of the right arm, by a peripheral nerve stimulator-guided interscalene approach.

The patient with an 18G secured i.v. catheter in her left arm was being prepared for the operative procedure and vital monitoring equipment such as a pulse oximeter, automatic blood pressure measuring cuff, and an ECG monitor were attached. Emergency equipment like instruments for intubation and drugs, including 20 percent intralipid emulsion, was kept ready. The patient was supplied with supplemental oxygen by face mask at 5 litre/minute, and the right neck and shoulder were sterilised with Betadine solution and draped in sterile fashion. After topical anaesthesia of the skin with 2 mL of 1% lidocaine, a 22 G, 5 cm, nerve blockade needle (Stimuplex) was proceeded, under peripheral nerve stimulator guidance, between the bellies of the anterior and middle scalene muscles at the level of the 6th cervical vertebra [1] [Table/Fig-2]. A right median nerve paresthesia was elicited, and the weight of the patient was considered to calculate the toxic doses of the drugs, following which a mixture of 20 millilitres (mL) of 0.375% bupivacaine and 20 mL of 1.4% lidocaine-adrenaline was injected slowly, with negative aspiration after each 2.5 mL. Toward the end of the 5-minute injection, the patient moved her head and neck slightly. She was cautioned not to move, and after repeated negative aspiration, the remaining 5 mL of local anaesthetic was injected.

[Table/Fig-1]: Radiogram of right elbow and forearm, anterio-posterior view.
[Table/Fig-2]: Injection of local anaesthetic agent by interscalene approach using peripheral nerve stimulator technique. (Images from left to right)

Right after three minutes of injection, the patient's responses diminished till she reached a state of unresponsiveness and apnoea, with loss of muscle tone in both upper and lower limbs. The blood pressure dropped from 130/90 to 95/53 mmHg, the oxygen saturation dropped from 100 to 92 percent, and the pulse rate dropped from 96 to 54 beats per minute. No seizure activity was noted. 500 mL intravenous lactated Ringer's solution was administered, and the patient was positively ventilated with 100% oxygen using Bain's circuit via face mask for 50 minutes. Following this, the patient regained consciousness and was able to breathe spontaneously, with adequate tidal volumes, and could follow commands to move her legs and left arm. After the patient was stabilised, surgery was continued as planned. It was assumed that total spinal anaesthesia had occurred. The surgical procedure lasted 2 hours (h). The patient's heart rate and blood pressure remained stable during the procedure. The patient's right arm was unresponsive to surgical stimulation. The right arm anaesthesia and motor blockade gradually resolved over the next four hours.

DISCUSSION

It has been reported that interscalene blockade of the brachial plexus with a variety of needle lengths from 5.1-8.9 cm has resulted in both spinal and epidural anaesthesia [2]. A number of mechanisms have been postulated to explain these complications, including direct injection into the epidural or subdural space secondary to incorrect needle placement; perineural or intra-neuronal injection of drug; paravertebral spread of injected agent; or injection through a correctly placed blockade needle into an abnormally long dural root sleeve [3]. The interpretation of the events in this case is as follows:

- Toward the completion of injection of a successful interscalene block (as argued by the 5-6 h of anaesthesia that resulted in the desired arm), the injection of the last few millilitres of local anaesthetic was either into the epidural or the subarachnoid space, or both, at the level of the 6th cervical vertebra, probably as a result of the advancement of the block needle into the intervertebral foramen.

- The rapidity with which symptoms developed (unconsciousness, apnea, hypotension, and bradycardia) argues for some degree of subarachnoid injection.
- A small quantity of local anaesthetic made its way intracranially, causing bradycardia and hypotension.
- Cervicothoracic spinal anaesthesia with blocking of the cardiac accelerator fibres is the most likely explanation for the observed bradycardia (T1-T4) [4].

These signs lasted for around 50 minutes, at which time the heart rate decreased further, to 52 beats/min, at the end of which the patient seemed to have recovered completely; vital signs had returned to baseline, she was breathing spontaneously, and was able to move three non operative extremities in response to command, and the patient was left with the intended brachial plexus block.

This patient experienced sudden total flaccidity and a subsequent lack of recall. Despite the anaesthesiologists' concerns, the patient showed no signs of seizure activity, which may have been caused by an intravascular injection of lidocaine or bupivacaine [5]. A "locked-in syndrome" was recently documented following a successful brachial plexus block, which was believed to be caused by an intra-arterial injection [6]. In the case reported here, the patient had no recall of the event, and there was no seizure activity. These differences may represent the distinction between applying local anaesthetic agents to the brain via the bloodstream or via the cerebrospinal fluid [7].

However, the effect of local anaesthetic administered via the cerebrospinal fluid on brain stem and cortical function is poorly understood at best. Unlike intravenous or intra-arterial injection, cerebrospinal fluid delivery of local anaesthetics like procaine induced nystagmus, defecation, respiratory depression, vomiting and loss of consciousness [8]. Various pupillary and autonomic findings have been reported in animal studies, and it may be that subclinical electrical seizure activity occurs that cannot be appreciated without the use of electroencephalography [9].

Despite high sympathectomy, the patient's heart rate and blood pressure remained at acceptable levels throughout, and the patient did not require vasopressors or chronotropic drugs. Hypotension, bradycardia, and ventricular arrhythmias can all be caused by injecting local anaesthetics directly into the medullary portion of the central nervous system [10]. Even if one postulated unopposed parasympathetic stimulation as the intracranial local anaesthetic level receded, the patient remained quite stable, as suggested by the decrease in heart rate. However, it is important to note that the patient was young, healthy, and euvolemic; the same complication in an elderly patient or one with serious cardiovascular disease may have produced profound haemodynamic change.

CONCLUSION(S)

A combination of complications occurring after a brachial plexus block by the interscalene approach is being reported. The report should once again emphasise the importance of careful technique, but more importantly, the need for appropriate patient monitoring and immediate access to resuscitation equipment when performing regional nerve blocks. The question of what effect local anaesthetics have on the brainstem and cerebral cortex when applied via the cerebrospinal fluid remains unclear.

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