Bilateral Cervical and Thoracic Epidural Blockade Complicating Interscalene Brachial Plexus Block: Report of Two Cases

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An interscalene approach for perivascular brachial plexus anesthesia has recently been described.[1] The advantages of this supraclavicular technique are that the landmarks are readily palpated even in obese patients and the hazard of pneumothorax is avoided. In this communication, we report two cases of a previously undescribed complication of the interscalene approach to brachial plexus block.

REPORT OF TWO CASES

Patient 1. A 37-year-old woman was admitted to the Emergency Room with a Colles' fracture of the left wrist. The same day, under uneventful axillary block anesthesia, a closed reduction was accomplished, and the patient was sent home in a plaster cast and sling. Five days later, the patient noticed increased swelling and numbness of her left hand, and returned to the Fracture Clinic. Roentgenographic examination revealed increased angulation of distal fragments, and it was decided to undertake closed reduction with pin transfixion.

Except for her present illness, the patient had been in excellent health, with no history of cardiopulmonary or neurologic disease. Results of preoperative physical examination and laboratory studies were within normal limits. Premedication consisted of atropine, 0.6 mg, im, and pentobarbital sodium, 100 mg. Because the patient appeared apprehensive on arrival in the operating suite, premedication was supplemented with diazepam, 5 mg, iv.

A left brachial plexus block using the interscalene approach was planned. Appropriate landmarks were identified and a 22-gauge 1½-inch needle was inserted in the interscalene groove, with needle directed perpendicular to the skin in all planes and slightly caudad. Since no paresthesia was elicited when the transverse process of the sixth cervical vertebra was encountered, the needle was "walked" caudally on the transverse process. Paresthesias in the left antecubital fossa and fingers were then experienced.

Because the operative field included the area of ulnar nerve distribution, it was decided to inject a volume of anesthetic solution larger than that calculated (32 ml) by the method of Winnie[2] to ensure adequate anesthesia. No blood or cerebrospinal fluid were obtained on repeated aspiration, and 40 ml of 1 per cent lidocaine with epinephrine, 1:200,000, were injected. Complete motor and sensory block of the left arm in the distribution of the C5–T1 spinal segments was obtained in 15 minutes, and the operation was started.

Twenty-five minutes after the injection, the patient complained of difficulty in breathing. Physical examination revealed poor diaphragmatic motion and the use of accessory muscles of respiration. In addition, motor block of the right arm and bilateral sensory block from C2 to T8 were present. There was no evidence of Horner's syndrome at any time. Ventilation was assisted with 100 per cent oxygen administered via face mask. Thirty-five minutes after the injection, the patient no longer complained of difficulty in breathing (vital capacity at that time was 0.9 liters). Sensation of touch in the right arm returned 50 minutes after injection. Throughout the procedure the patient was able to talk, although only in a whisper, and no change in the level of consciousness or blood pressure was observed.

When the patient was taken to the Recovery Room an hour and 15 minutes after injection of lidocaine, she appeared to have adequate movement of the right hemidiaphragm but little motion in the left, as determined by physical examination. The level of sensory block had receded from T8 to T4. Two hours and 45 minutes after left interscalene block, she had complete return of sensory and motor function. Vital capacity in the supine position was 2.0 liters. The patient was discharged from the hospital the next day without residual sequelae.

Patient 2. A 32-year-old man was admitted to the Emergency Room with laceration of a flexor tendon and the digital nerve of the right middle

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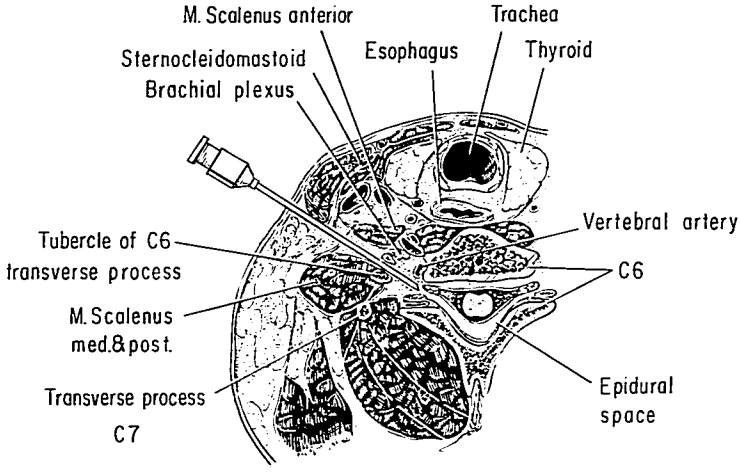

FIG. 1. Transverse section of the neck at the level of the transverse process of the sixth cervical vertebra, illustrating the ease with which the bevel of the needle may enter the epidural space.

finger. He had been in good health prior to the accident. Results of physical examination and laboratory studies were normal. Diazepam, 10 mg, im, was given 45 minutes before the patient was taken to the operating suite.

The premedication was supplemented with Innovar, 2 ml, iv, administered for pain relief in the operating suite. After identification of appropriate landmarks, a right interscalene brachial plexus block was performed as previously described.[1] No paresthesia was elicited until the needle had been "walked" caudally on the transverse process of the sixth cervical vertebra, when sharp pain down the arm and fingers was experienced. Following careful aspiration, 40 ml of 1.5 per cent lidocaine with 0.1 per cent tetracaine and epinephrine, 1:200,000, were injected. Onset of sensory and motor block in the right arm occurred within 4 minutes. The blockade was profound by 10 minutes and had extended from C1 to T4. Eighteen minutes after the injection, the patient complained of increasing difficulty in breathing, and there was evidence of paralysis of the right hemidiaphragm and intercostal muscles. By that time, the sensory and motor block on the left extended from C1 to T12. Blood pressure had fallen from 115/70 to 75/35 mm Hg, and ephedrine, 12.5 mg, iv, was given. Because of the possibility of a full stomach and the need for assisted ventilation, rapid induction with thiopental and succinylcholine followed by endotracheal intubation utilizing cricoid pressure was carried out and respirations were controlled. Anesthesia was maintained with nitrous oxide and oxygen for 80 minutes, the duration of the operation. The trachea was extubated when the patient was awake in the operating room at the end of the operation.

One and a half hours after right interscalene block, the patient still had sensory block from C2 to T6 on the right. Diaphragmatic and intercostal movements could be observed on the left side only, although he no longer complained of dyspnea. Four hours after the block, the patient had complete return of sensory and motor function. He was discharged from the hospital the next day without residual sequelae.

DISCUSSION

The interscalene approach to brachial plexus block provides anesthesia for surgical procedures and/or manipulations of the upper arm and shoulder, and is an alternate anesthetic technique for operation on the hand and forearm. The advantages of this technique have been well described.[1]

In our first patient, the volume of anesthetic solution injected into the left interscalene

space was 25 per cent greater than that calculated to be necessary to ensure anesthesia of the ulnar nerve. This larger volume may explain the motor and sensory block of the left cervical and brachial plexus. However, a bilateral sensory block extending from C2 to T8 and bilateral diaphragmatic and intercostal paralysis cannot be explained on the basis of volume alone. Partial muscle paralysis, as evidenced by incomplete diaphragmatic paralysis and ability to lift the head, occurred in patient 1. The longer duration and completeness of muscle paralysis in patient 2 may be attributable to the higher concentration of lidocaine and the addition of tetracaine.

Subarachnoid injection of the anesthetic solution would explain the bilateral motor and sensory blockade in both cases. But the large volume of anesthetic solution and the high site of subarachnoid injection would then be expected to produce total spinal anesthesia, rather than the limited anesthesia which developed. Retained consciousness, integrity of vital centers, and intact cranial nerve activity were evident in patient 1, as no general anesthetic was used. In patient 2, consciousness returned at the end of the procedure although motor and sensory block persisted. These factors favor an epidural rather than a subarachnoid injection.

A caudad direction of the needle was maintained in performing these blocks. It is possible that the needle was inserted to a greater depth than intended and contacted the body rather than the U-shaped end of the transverse process of the sixth cervical vertebra. When the needle was "walked" caudally and paresthesias were elicited, it probably entered the epidural space. Thus, the anesthetic solution was deposited in the ipsilateral cervical epidural space (fig. 1) and spread to include the contralateral cervical and bilateral thoracic epidural spaces. The spread of anesthetic solution to the epidural spaces as a result of injection of a large volume, although possible, is unlikely. The resultant extensive epidural blockade, including bilateral phrenic nerve paralysis, could have been hazardous if unrecognized and untreated.

The danger of inadvertent epidural injection should be considered when interscalene block is used.

Reference

1. Winnie AP: Interscalene brachial plexus block. Anesth Analg Curr Res 49:455–466, 1970

Hyperosmolar Hyperglycemic Non-ketotic Coma Following General Anesthesia: Report of a Case

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Hyperosmolar hyperglycemic non-ketotic coma is rarely considered as a potential complication of anesthesia. The following is a case report of a young woman who died shortly after general anesthesia with a clinical syndrome of coma, hyperglycemia, and hyperosmolarity without ketoacidosis

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Report of a Case

A 32-year-old woman weighing 260 pounds was admitted to the hospital with a five-day history of epigastric and substernal discomfort, nausea and vomiting. Receiving ward laboratory data included: platelets 4,000/mm³, hemoglobin 8.7 gm/100 ml, leukocyte count 11,600/mm³. Blood pressure was 130/90 torr; temperature was 99.6 F. Physical findings were limited to a petechial rash over the neck, anterior chest and palate. Past medical history included elevated blood pressure during pregnancy at the age of 17 years, but the patient had been normotensive for the past five years. There was no history of recent viral infection or exposure to toxins, and her only medication was birth control pills.