

Stellate Ganglion Block Using Physiologic Saline Solution

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Differential neural blocks are recommended to differentiate psychogenic-, sympathetic-, and somatic sensory-mediated pain.¹ Pain relieved by injection of physiologic saline solution is regarded as psychogenic in origin. Following injection of physiologic saline solution into the stellate ganglion, we have observed two cases of partial relief of pain accompanied by signs of sympathetic blockade.

REPORT OF TWO CASES

Both cases had essentially the following characteristics. The patients were women of approximately 60 years of age who had fractured their wrists and had had them immobilized for as long as three months. The hands, wrists and arms showed the following signs of symptoms of altered sympathetic nervous system function: 1) increased sweating; 2) non-dermatomal burning pain; 3) slight pitting edema, with markedly decreased range of motion. Sensation was normal, and radial pulses and hand skin temperatures were equal bilaterally. The patients appeared nervous and depressed. To confirm the diagnosis and possibly quantitate the psychological component of the pain, both patients received a differential stellate ganglion block using the anterior paratracheal approach.² Approximately 5 min after the block with 10 ml of physiologic saline solution without preservative, Horner's syndrome and nasal stuffiness appeared, accompanied by 50 per cent subjective reduction of the burning pain, in both patients. The skin temperatures of their hands increased by 2 to 3 degrees F. Ten minutes later, the block was repeated with 10 ml of 0.25 per cent bupivacaine. There were further increases of the hand temperatures by 2 degrees F, with complete disappearance of the residual burning pain. The patients' symptoms responded to a series of stellate ganglion blocks (three to five) and physical therapy.

DISCUSSION

Signs of successful sympathetic block include the development of Horner's syndrome, anhydrosis, vaso-

dilatation of the hand and arm, and an injected conjunctiva.² In addition, there is blockade of the psychogalvanic reflex, increased pulse amplitude by digital plethysmography,³ and an increase in capillary blood P_{O_2} exceeding 8 torr.⁴ There is no direct correlation of the signs of sympathetic block with the extent of blockade. These signs have been found inconsistently, and were not always evident when the psychogalvanic reflex was abolished.⁵ The two patients described showed evidence of sympathetic blockade following injection of saline solution.

Physiologic saline solution with 0.9 per cent benzyl alcohol as a preservative has been shown to cause analgesia of the skin, in contrast to plain physiologic saline solution, which caused discomfort on injection without producing such analgesia.⁶ Segmental hypesthesia to pin scratch and cold stimuli, diminution of the psychogalvanic reflex, and partial relief of pain were consequences of intrathecally administered saline solution. These effects were made more pronounced with subsequent injection of 0.2 per cent procaine.⁵

It is possible that the block of the stellate ganglion with physiologic saline solution was secondary to a pressure phenomenon. Compression by a large volume can be postulated, since the ganglion is embedded in the pretracheal lamina of the cervical fascia.⁷

It is necessary to have a placebo injection in the evaluation of pain to rule out psychological complaints. Preservative-free physiologic saline solution has been used for this purpose. However, we have observed that saline solution can produce some of the signs of sympathetic blockade accompanied by reduction of pain. Anesthesiologists should be aware of this possible consequence so as to prevent errors in diagnosis.

REFERENCES

1. Winnie AP, Collins VJ: The pain clinic. I. Differential neural blockade in pain syndromes of questionable etiology. *Med Clin North Am* 52:123-129, 1968

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2. Moore DC: Regional Block. Fourth edition. Springfield, Ill. Charles C Thomas, 1965, pp 123-127
3. Beene TK, Eggers GW: Use of pulse monitor for determining sympathetic block of the arm. *ANESTHESIOLOGY* 40:412-414, 1974
4. Bridenbaugh PO, Moore DC, Bridenbaugh LD: Capillary P_{O_2} as a measure of sympathetic blockade. *Anesth Analg (Cleve)* 50:26-30, 1971
5. Urban BJ, McKain CW: Local anesthetic effect of intrathecal normal saline. *Pain* 5:43-52, 1979
6. Wightman MA, Vaughn RW: Comparison of compounds used for intradermal anesthesia. *ANESTHESIOLOGY* 45:687-689, 1976
7. Eriksson E: Illustrated Handbook in Local Anesthesia. Copenhagen, I. Chr. Sørensen & Co. A/S, 1969, pp 137-139

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Contamination of an Anesthesia System with Liquid Halothane

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Inhalation of a volatile anesthetic drug in the form of liquid or saturated vapor is a rare anesthetic catastrophe.¹⁻³ Such incidents have occurred with both concentration-calibrated vaporizers (*e.g.*, Fluotec®, Fluomatic®, etc.)¹ and flowmeter-controlled devices (*e.g.*, Vernitrol®, Copper Kettle®, etc.),^{2,3} and are related to faulty technique. We recently observed the introduction of liquid halothane into the fresh-gas delivery tubing of an anesthesia machine as the result of an error in technique combined with the use of inappropriate materials in the circuit.

REPORT OF INCIDENT

During a routine preanesthetic check of an anesthesia machine (Ohio Model 2000, Ohio Medical Products, Madison, Wisconsin), we found that the on-off valve of the sidearm Vernitrol vaporizer had been left open overnight, with a flow of 20 ml/min through the vaporizer, which contained 100 ml halothane. After the flowmeter was turned off, the valve closed, and a flow of 5 l/min oxygen through the main oxygen flowmeter begun, a strong odor of halothane was apparent from the system. We then noticed about 5-6 ml of clear liquid collected in the transparent polyvinylchloride (PVC) fresh-gas delivery tubing. When poured from the tubing into a gauze sponge, the liquid evaporated quickly, with the strong odor of halothane.

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ADDITIONAL STUDIES

A similar anesthesia machine was later set up with a clean 4-foot length of PVC tubing (Bentley IT-200, Bentley Laboratories, Inc., Irvine, California) connecting the common gas outlet to a Mapleson D-type patient circuit. The valve of the sidearm vaporizer was opened and a flow of 20 ml/min was directed through the vaporizer, which contained about 100 ml halothane. Room temperature varied between 18 and 20 C. Within 30 min, droplets of liquid were seen condensing on the walls of the tubing. After two hours, more than 2 ml of liquid had accumulated. By four hours, 4-6 ml were present. Most of the liquid evaporated rapidly when an oxygen flow of 5 l/min was begun. The identity of the volatile component as halothane was confirmed by gas chromatography. The residue, an oily liquid, was identified by the technical branch of Bentley Laboratories, Inc., as dioctyl phthalate, a plasticizer, which had apparently dissolved in the liquid halothane.

Similar results were obtained using enflurane instead of halothane, with other Ohio machines with similar vaporizers (Vernitrols), and with a Model 300 Fortrend® machine equipped with a Copper Kettle #1 vaporizer (Foregger Company, Division of Air-Products and Chemicals, Inc., Smithtown, New York).

Halothane would also apparently accumulate if conductive rubber tubing were used in place of the PVC, but most of the halothane was absorbed, with swelling and distortion of the walls of the tubing, and could not be recovered as the liquid. However, liquid accumulation was not observed when a length of bent glass tubing was substituted for the PVC, or when a length of silicone rubber (Silastic®, Dow Corning Corp., Midland, Michigan) was used.

DISCUSSION

The absorption of volatile anesthetics by conductive rubber is well known.⁴ However, it is not immediately