Phantom Sensations During Spinal Anesthesia

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One hundred patients for elective surgical procedures were given tetracaine spinal anesthesia and observations were made in regard to time of injection, onset of motor blockade and limb position before and after blockade. Twenty-four patients experienced a painless phantom sensation which was directly related to the position of their limbs at the time of the motor blockade. Seventy-three patients were supine with outstretched limbs at the time of onset of motor blockade and did not experience phantoms. Three patients who subarachnoid sacral block, did not lose proprioceptive function and did not have phantom sensations.

The phenomena of the “phantom limb” syndrome\(^1\)\(^2\)\(^3\) and of “phantom limb” pain\(^1\)\(^2\)\(^3\)\(^4\)\(^5\)\(^6\) are well documented. However, nowhere can one find a description or an explanation of phantom sensations so commonly observed during spinal anesthesia. The experience is almost always that of an unusual position of the lower extremity in relation to that of the body; e.g., legs being flexed, or elevated, when actually they are in a neutral supine position. The sensations are painless, although real to the patient, and persist until spinal anesthesia disappears. Reassurance usually satisfies the patient but does not alter the existence of the phantom. The investigation to be reported was undertaken in an effort to seek an explanation for the occurrence of the phantom and to determine its incidence.

Method

Spinal anesthesia was administered to 100 successive, unselected patients scheduled for elective lower abdominal, perineal or extremity surgical procedures. Nearly all the patients had received an intramuscular injection of 50–100 mg. of secobarbital and a belladonna drug preoperatively. There were 60 male and 40 female patients. Subjects ranged in age from 14 to 85 years. All lumbar punctures were completed with the patient in a lateral recumbent position except for three who sat upright. Tetracaine 1 per cent with equal parts of 10 per cent dextrose was injected in each patient and a sensory level of anesthesia above tenth thoracic was obtained in all, except the three who sat, in whom sacral block resulted. Observations were made regarding (1) position of the patient during and after the intrathecal injection, (2) time of injection, (3) level of sensory anesthesia (determined by pin prick), (4) time of onset of motor blockade, and (5) position of patients’ lower limbs at the time motor blockade became complete. During and following the procedure the patients were questioned regarding perception of the position of their limbs. Those patients experiencing phantom sensations were asked to note the time of return of motor activity postoperatively and that of the disappearance of the phantom. In most instances patients experiencing phantom sensations were under constant surveillance or were interviewed shortly after the return of motor power. The initial observations were made prior to the surgical procedure, all others during and following operation.

Results

Twenty-four of the 100 patients experienced a painless phantom sensation which persisted throughout the motor blockade, and disappeared as motion returned. The phantoms perceived were directly related to the position of the lower extremities at the time of onset of motor paralysis. Patients in whom motor block began with lower extremities raised as for a leg or perineal sterile preparation felt as though their legs continued to be elevated...
even after they had been returned to the supine position. These patients frequently requested that their legs be lowered.

Fifteen patients who were to have lower extremity surgical procedures were included in this series. Six did not have their legs elevated until after motor paralysis was complete and none experienced phantoms. The nine remaining patients had their legs elevated before motor paralysis was complete and all perceived an “elevated leg” phantom that persisted for the duration of the motor paralysis.

Patients put in the lithotomy position prior to motor blockade felt as if their knees remained flexed after return to the supine position until motor power returned. Eleven of the twenty-five patients placed in the lithotomy position were so positioned prior to motor paralysis and with return to the supine all experienced a “flexed knees” phantom.

The remaining four phantoms were reported by those patients staying in the lateral decubitus position after the subarachnoid injection. Two patients perceived their feet as turned laterally and the remaining two as if their thighs were flexed on the abdomen.

From his own experience the senior author can personally attest to the vividness of this phantom and to the ease of its production. Needing a surgical procedure on the left lower extremity, a spinal anesthetic was given him and unilateral analgesia was sought. The left knee (lower leg) remained flexed and the right (upper) leg was extended immediately after subarachnoid injection. This position was maintained for 5 minutes. When turned to the dorsal recumbent position, bilateral motor paralysis was complete, a vivid phantom sensation of a “flexed knee” was present on the left and remained until the return of motor power two hours later. A phantom sensation was not perceived on the right.

Seventy-six patients did not experience phantom sensations. Seventy-three of these were lying supine with their legs extended in a neutral position at the time of onset of motor paralysis. Not only did they fail to experience phantoms, but they also had complete loss of position sense and were unable to detect the position of their legs. It was as if their legs ceased to exist. The remaining three patients failing to perceive a phantom were given a “sacral block,” did not lose motor function, and did not lose their sense of position.

Motor blockade occurred 3 to 5 minutes after subarachnoid injection, when tetracaine and dextrose were injected. Epinephrine (0.3 to 0.5 mg.) was added to this solution in 11 patients. This extended the time between injection and onset of motor block to 8 to 10 minutes. In the patients given hyperbaric tetracaine spinal anesthetics, the motor paralysis lasted less than 90 minutes in 15 per cent, between 90 and 150 minutes in 55 per cent and more than 150 minutes in 19 per cent. In those with added epinephrine, the motor paralysis lasted between 3 and 6 hours. A further influence of body position during intrathecal injection is indicated in that 70 per cent of all patients demonstrated a lag of 20 to 60 minutes in the return of motor power to the “down” leg as compared to that of the “up” leg. In 5 per cent the “up” leg was moved first and in the remainder no difference was detected. Subjective appreciation of complete return of all sensory perception was delayed by an average of 4 hours after motor activity had been recovered.

A common observation in patients with loss of sensation above seventh thoracic level was the perception of a band of pressure at the junction of the anesthetic area and normal cutaneous sensation. This we have not considered a phantom. Recognition of pressure was associated with a second comment, that of difficulty in breathing even though tidal volume and chest excursion were obviously adequate. Lower sensory levels were not associated with such complaints. As normal sensation returned, the pressure disappeared.

Discussion

According to Greene,7 “The last modality to be blocked is that of proprioception. Even when paralysis of motor nerves is complete, the patient may be able to say where and in which direction his foot is moved.” Gasser and Erlanger8 showed that the susceptibility of nervous tissue to blockade was dependent on fiber size rather than on a protoplasmic difference in the axones. Ehrenberg9 corroborated this by showing that the time required
for blockade of a nerve varies inversely with the concentration of the drug, and directly with the square of the radius of the nerve. The order of nerve tissue blockade has been determined by Arrowood and Sarnoff via differential spinal block. The order of nerve blockade has usually been considered as autonomic nerves first, followed by temperature (cold before warm), pain, touch, pressure, motor and proprioceptive fibers. It is evident that motor and proprioceptive blockade occur close together, and in clinical practice it is difficult, if not impossible, to separate their onset. For our purposes, we can use proprioceptive and motor blockade as occurring simultaneously. It would appear that in some manner the last impulses received by the proprioceptive fibers prior to blockade were "locked in" when the block occurred. If the patient was turned and positioned supine with legs extended, before motor blockade occurred, phantom sensations failed to appear. If the patients' legs were in any other position at the time of loss of motor function, that position appeared indelibly imprinted on the patient's mind until the block was reversed. Phantom sensations could be predicted and produced at will in patients given epinephrine with intrathecal tetracaine because of the increased time to proprioceptive-motor blockade.

The phantom sensations discussed herein differ from the phantom limb syndrome, called the "Natural Phantom" by Henderson and Smyth, in that, (1) the Natural Phantom is a positive perception, described as a pleasant tingling sensation, while the proprioceptive phantom has no subjective sensations other than awareness of position; (2) the Natural Phantom can be moved by the patient at will, while the proprioceptive phantom is wholly dependent on position previous to a spinal anesthesia.

Positive appreciation of the position of a normal limb occurs only when a stimulus is received from the periphery. With spinal anesthesia, peripheral stimuli from the lower extremities are blocked. The appreciation of that limb then depends on proprioceptive impulses. If the proprioceptive fibers are blocked while the legs are extended in the dorsal recumbent, there is no disturbance of proprioception, no appreciation of peripheral stimuli, and the legs cease to exist so far as the patient is concerned. If, on the other hand, the proprioceptive blockade takes place while the legs are in any position other than the neutral, then this abnormal position is "locked in" until proprioceptive function returns.

The painful phantom limb seems in no way related to the proprioceptive phantom. The cause of painful phantoms has been ascribed to neuromas, abnormal excitation of pain pathway in the amputated limb, irritation of the cut ends of sensory trunks and to supraspinal disturbances. The treatment of painful phantoms has varied from tapping the stump with a mallet to cortical ablation. Such therapy is variously successful but in general, the longer the painful phantom has been present, the more fruitless any treatment becomes. Treatment is unnecessary for the proprioceptive phantom. It is self-limiting, lasting the duration of proprioceptive motor blockade and it is not painful. The observations noted herein, demonstrate how sensations from the periphery can become engrained on a central memory in spite of a solid motor and sensory block. They emphasize the need for an overall attack on the problems of the painful phantom rather than the sole use of peripheral measures.

Summary

One hundred patients for elective surgical procedures were given spinal anesthesia and were observed with regard to onset of motor blockade, position of the lower extremities before and after blockade and the development of abnormal sensations regarding limb positions.

Twenty-four of these patients experienced a painless phantom leg sensation persisting for the duration of the motor blockade. In each instance, the phantom was related to the position of the legs at the time of onset of motor block. Seventy-three patients were in the dorsal recumbent position with legs outstretched at the time of the onset of motor blockade, did not experience phantoms and exhibited a complete loss of proprioceptive
function. Three patients given a saddle block spinal did not lose motor or proprioceptive function and failed to experience phantoms.

References

PULMONARY EMBOLUS Bilateral simultaneous stellate ganglion block is recommended in the treatment of pulmonary embolism. Reflex vasospasm is usually bilateral, explaining the severe pain, dyspnea and shock; the coronary arteries also are involved. Unilateral stellate ganglion block does not relieve the vasospasm of the unblocked side. Bilateral stellate ganglion block gives immediate pain relief and prevents or reduces shock. This treatment should be followed, if necessary, by Trendelenburg operation with extracorporeal circulation. (Nolte, H., and Hagelsten, J.: Simultaneous Bilateral Stellate Ganglion Block in the Treatment of Pulmonary Embolism, Der Anaesthetist 13: 160 (May) 1964.)

KAWAIINE Extracts of the Kawa plant were examined in respect to local anesthetic properties. The pyrones, isolated from the rhizoma of the plant, showed no relationship in chemical structure to any of the conventional local anesthetics. As tested on rabbit corneas (topical anesthesia) and on guinea pigs (infiltration anesthesia) the substances were compared to cocaine and procaine. Kawaine was equipotent to cocaine in 0.5 per cent concentration. Its potency as an infiltration anesthetic was slightly less than that of procaine in terms of duration and intensity of action. No tissue damage at the injection site was encountered. Systemic toxicity seems to be nil. (Meyer, H. J., and May, H. U.: Local Anesthetic Properties of Natural Kawa Pyrones, Klin. Wschr. 42: 407 (Apr. 15) 1964.)