



and drainage were made and antibiotic therapy was done. As sweating on the lesion site was observed, right side stellate ganglion was blocked. Tricyclic antidepressant with or without diazepam was tried again and the stellate ganglion block was repeated for about 30 days at one or two days interval. Although the patient said that she felt better, the attack haunted everyday and the itching was so severe that she scratched the affected forehead to the point of bleeding. The transcutaneous electrical nerve stimulation was almost entirely ineffective and even worse because it acted as a stimulus to trigger the attack. Every possible measure we could do seemed to be ineffective and finally I decided to give her the intrathecal saline administration.

After getting an informed consent, lumbar puncture was performed at the L3-L4 interspace in the operating room. As much as 45 ml of cerebrospinal fluid was withdrawn under the thiopental-oxygen anesthesia and the same amount of 10% sodium chloride solution was replaced with the patient head down and the affected side dependent. Immediately after the injection, the facial twitch and neck stiffness were seen for a brief period of time. Blood pressures were raised up to 180/70 from 110/70 mmHg. Pulse and respiratory rate increased to 142 and 38/min. respectively. After she emerged from the anesthesia, she complained of difficulty in breathing, sensory loss, and motor paralysis of the lower legs. Mental state was extremely irritable.

She was transferred to the intensive care unit and oxygen was given via face mask. Endotracheal intubation was considered but spared because the arterial blood  $PO_2$  was satisfactory. Several episodes of vomiting and defecation were noted and the tachypnea lasted for about 10 hours. Her blood gas revealed pH 7.56,  $PCO_2$  27 mmHg,  $PO_2$  92 mmHg. Chest X-ray showed diffuse patch infiltration indicating non-cardiogenic pulmonary edema. Although the respiration became quiet and other vital signs normalized, irritable mental state and

intermittent vomiting continued till the next day morning. Diazepam was given intravenously whenever she became irritable. CBC and other laboratory data were within normal limit. Another 10 hours had passed until she restored the normal mental state.

She was transferred to the ward and consulted to the Department of Urology because of voiding difficulty. Urodynamics showed marked atonic bladder. Foley catheter was kept for 2 days and was substituted to intermittent catheterization with cholinergic drug, methacholine and phenoxybenzamine. Paralytic ileus was also noted for initial few days and fine tremor of extremities was also noted and disappeared after several times of psychotherapy. Sensory and motor function together with ability in voiding improved very slowly. 35 days after admission, the patient was able to void her bladder for herself and walk with some aids but paresthesia around perineum and soles till persist.

She was discharged and recommended to have further treatment by outpatient basis. She has been complaining of extreme tenesmus and cold feet for 12 months after discharge. She feels like that there is thick rug between her feet and shoes, and that she is sitting on a egg sized balloon because of sensory deficit around perineum. Even worse is that her original itching sensation has not been subsided. Chlorpromazine, nomifensine, and clorazepate have been given for her itching with some positive effect. Magnesium oxide and metoclopramide help her with defecation. Gangliosides or Piracetam has been given expecting her neural function to be improved, but the residual neural deficit of cauda equina syndrome caused by large volume of hypertonic saline solution seems to be long lasting because her feet are cold even in a warm blanket and she has still a feeling of sitting on a balloon.

## DISCUSSION

In 1969 Collins and his colleagues<sup>9)</sup> obtained good

to excellent results using subarachnoid injection of normal saline solution in treating postherpetic neuralgia. They injected 8 to 20 ml of 10 or 12% saline solution of 0 to 4°C into cisterna magna with the patient's head and affected side dependent. I considered intracisternal injection of hypertonic saline solution for this patient too, but I selected lumbar route because of technical problem. Large volume of the solution together with head down position was taken in order for the solution to be reached down enough to the cervical region. The injection through the lumbar route compounded by large volume of the solution might be attributable to sphincter disorder, atonic urinary bladder, and sensory deficit around perineum and soles.

Hitchcock<sup>1)</sup> performed lumbar puncture at the usual level and injected 10 to 80 ml of physiological saline solution of 0~4°C after withdrawal of cerebrospinal fluid until subatmospheric pressure had been produced. He stated that the absence of bladder complications and sensory deficits gave the method advantages over phenol. Pulmonary edema must have been neurogenic in origin and was attributed to large volume of hypertonic solution as Thompson<sup>4)</sup> reported pulmonary edema following intrathecal injection of 40 ml of 5% saline solution of 0°C in 1971. The edema induced by Thompson responded well with diuretic therapy. Similarly, no specific treatment except oxygen by mask was needed in this patient. Extensive sympathetic output followed by large volume of intrathecal hypertonic saline<sup>6)</sup> must have caused severe tachycardia, hypertension, and finally pulmonary edema. O'Higgins et al<sup>5)</sup> reported a severe hypertensive episode and cerebral infarction following subarachnoid injection of 50 ml of normal saline after withdrawing the equivalent volume of cerebrospinal fluid at the L3-L4 interspace. Mckean and Hitchcock<sup>6)</sup> showed tachycardia or ventricular ectopic beats after subarachnoid saline injection, while bradycardia and nodal rhythm were produced in association with cisternal injection,

suggesting sympathetic and vagal stimulation respectively according to the site of injection. Hitchcock<sup>1)</sup> described paresthesia, mild confusion, and slight nystagmus following cold subarachnoid irrigation, and severe vertigo, rotatory nystagmus, hyperventilation, sweating, and peripheral circulatory constriction in one patient after injection, but they were all transient. When 20 ml of hypertonic saline was injected, severe paresthesia especially in the lower limbs, hyperventilation, raise in blood pressure, fasciculation together with piloerection, venostasis, and faint cyanosis followed transiently and therefore the patients needed general anesthesia for about 30 minutes<sup>2)</sup>. Sphincter disorders were shown in 8% of the patients but it was unlikely to occur in the absence of previous history of urinary disturbance<sup>2)</sup>. Muscle weakness was also extremely rare<sup>2)</sup>. Finally Lucas and his colleagues<sup>7)</sup> analysed the replies to a questionnaire relating to 2,105 patients who had received subarachnoid saline analgesia. They found that 10.59% had some temporary complication and 1.03% suffered a significant morbidity of which paraplegia or quadriplegia was by far the most common, and two patients died as a result of myocardial infarctions.

It would be conclusively stated that this technique should be reserved for terminal cancer patients with widespread metastasis because the technique creates many problems which may be clarified by further experience and the results produced are variable as well as unpredictable.

## SUMMARY

A case of severe complications following intrathecal administration of 45 ml of hypertonic saline solution for the treatment of postherpetic neuralgia was presented. Transient immediate complications included were tachycardia, hypertension, neck stiffness and muscle twitch. Pulmonary edema, paralytic intestinal obstruction, and the cauda equina syn-

drome including sphincter disorder with atonic urinary bladder developed shortly after the injection. Tenesmus and sensory abnormality around perineum and soles were the longlasting complications.

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