

ACUTE ASEPTIC MENINGITIS FOLLOWING PARAVERTEBRAL LUMBAR SYMPATHETIC BLOCKS

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ONE of the more interesting, and not least significant, of the recent advances in anesthesiology has been the application of somatic and sympathetic nerve blocks as diagnostic, prognostic and therapeutic procedures. This has been attested to by a considerable number of reports in recent years. These papers have emphasized, in the main, the beneficial results obtained; negative results, on the whole, have been unreported. Similarly, untoward sequelae and complications of such nerve blocks have been discreetly, or indiscreetly, overlooked and buried.

The purpose of this paper is to report two cases of acute aseptic meningitis following paravertebral lumbar sympathetic blocks. The term "acute aseptic meningitis" is used to describe an acute inflammation of the leptomeninges of non-infectious origin.† These two complications occurred in a series of 165 sympathetic nerve blocks performed for a variety of conditions, such as causalgia, phantom limb pain and acute and chronic vasospastic states.

A number of complications and untoward sequelae following sympathetic block have been reported. Pneumothorax complicating dorsal sympathetic block is not rare; pleuritic pain and neuritis have been observed after the use of alcohol (1). The Brown-Sequard syndrome has been reported as the result of the accidental introduction of alcohol into the subarachnoid space (2). High spinal anesthesia has occurred in the course of sympathetic nerve blocks (1). However, there have been no papers found reporting the occurrence of acute aseptic meningitis following paravertebral sympathetic nerve blocks.

Case 1.—A white male, aged 26 years, was admitted with multiple penetrating wounds of the lower extremities caused by mortar shell fragments. These wounds were closed secondarily twenty-eight days after the date of injury. Following these secondary closures, the right leg showed persistent edema, cyanosis and coldness. In view of these findings, a right paravertebral lumbar sympathetic block was performed using 30 cc. of 1 per cent procaine. The technic used was that described by Smithwick and White (1). Excellent peripheral vasodilatation in the right leg and foot resulted within ten minutes.

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† The term "acute aseptic meningitis" is used by some as a synonym for acute lymphocytic choriomeningitis; this latter entity, not pertinent to this paper, is a virus meningitis with a clinical course of 10 to 14 days' duration and a lymphocytosis of the cerebrospinal fluid.

Two hours following the nerve block the patient complained of a severe headache; this headache persisted and was intractable. Physical examination three hours later was negative. About nine hours after the nerve block the patient vomited; physical examination showed an alert, feverish patient with marked nuchal rigidity and a positive bilateral Kernig's sign. A lumbar puncture was then performed and sulfadiazine therapy instituted. Study of the spinal fluid revealed the following:

Appearance: Cloudy and colorless
Leukocytes: 4000 per mm.³ (PMN 95 per cent)
Sugar: 63.5 mg. per cent
Total protein: 333.3 mg. per cent

On the following day the patient continued to complain of headache and diminished nuchal rigidity was observed. He was still alert, but irritable with recurring nausea. Lumbar puncture performed on this day showed no change except for a reduction in leukocytes to 2760; smear and culture were negative. Thereafter, the clinical improvement was rapid and seventy-two hours after the onset of this complication the patient was asymptomatic.

Later in this patient's hospitalization an aneurysm of the right posterior tibial artery and vein was discovered and excised under nitrous-oxide ether anesthesia. During this postoperative course, several right lumbar sympathetic blocks were performed with excellent results and without any untoward effects.

Case 2.—A white male, aged 23 years, was admitted with wounds of both legs, caused by small arms fire. The right foot was cyanotic and cold, apparently because of severed posterior and anterior tibial arteries. Seven days following injury, a right lumbar sympathetic block was performed, using 30 cc. of 1 per cent procaine; the technic used was identical with that in Case 1. Vasodilatation in the thigh and upper two-thirds of the leg was noticed, but no objective or subjective improvement in the foot resulted.

Six hours following the nerve block, the patient complained of severe frontal headache. Physical examination revealed moderate nuchal rigidity and a positive bilateral Kernig's sign; there were no other pertinent neurological findings. The patient was alert and cooperative. A lumbar puncture was performed immediately. The examination of the spinal fluid revealed the following:

Appearance: Cloudy and colorless
Leukocytes: 3485 mm.³ (Chiefly PMN)
Sugar: 61.4 mg. per cent
Total protein: 270 mg. per cent
Smear and culture: Negative after five days

Sulfadiazine therapy was instituted in view of the possibility that the patient had a bacterial meningitis. The patient began to show rapid improvement after the first day and by the third day was asymptomatic.

Spinal fluids obtained on the third and fifth days were negative on smear and culture.

The patient's recovery from this episode of meningitis was complete and without any sequelae.

RÉSUMÉ

Two patients, given paravertebral lumbar sympathetic nerve injections with procaine, developed a clinical picture of acute meningitis within six to nine hours after the nerve blocks. The clinical course was comparatively benign and of seventy-two hours' duration; no untoward sequelae resulted. Studies of the cerebrospinal fluid failed to reveal any responsible bacteria. The sequence of events in the clinical pictures, the repeatedly negative bacteriological studies and the normal cerebrospinal sugar titers pointed to a non-infectious causative agent.

DISCUSSION

This discussion may be prefaced with the conviction that these cases of meningitis were neither of bacterial nor of virus origin and were related unequivocally to the lumbar sympathetic nerve blocks.

A study of the pathogenesis in these cases makes two things apparent. First, the subarachnoid space was entered at some time during the procedure and, second, a chemical irritant was introduced intrathecally.

Penetration of the subarachnoid space in the course of a sympathetic nerve block is not very rare and has been experienced by one (M. H. A.) of the authors in several cases. That this occurred in both cases being reported is unquestioned in spite of the fact that no signs of a subarachnoid block were elicited during or following the nerve blocks. This would suggest that a very small volume of procaine solution entered the cerebrospinal fluid probably through an outward extension of the subarachnoid space. The accidental intrathecal penetration by the needles is, in itself, harmless and does not explain the development of a meningitis. Thus, the immediate cause of the meningitis must be found either in the equipment or in the anesthetic solution used. Contamination of sterile lumbar equipment with foreign particulate matter was considered as a possible cause. This possibility seemed to be eliminated by a careful check of the cleansing technics which were identical for spinal anesthesia and nerve block equipment; no complications were experienced in the many spinal anesthetics administered.

It would appear, therefore, that the anesthetic solution was the immediate cause of the meningitis. Procaine is known to have chemotoxic effects and to produce varying degree of leptomeningitis, particularly when used in very high concentrations (3, 4). However, in these cases the absence of signs of a subarachnoid block indicates that little procaine was injected intrathecally. Thus, it appears unlikely that procaine was the responsible agent.

Attention is thus drawn to the solvent used in the preparation of the procaine solution; this was distilled water. It was ascertained that the distilled water was the product of a standard distilling apparatus in the hospital; this water was contraindicated for intravenous use because it was not pyrogen-free. One may well speculate as to what contaminants, other than pyrogens, were present in the distilled water.

In any event, our conclusion is that pyrogen containing distilled water produced a chemical irritation of the meninges and the resultant acute aseptic meningitis. Whether the pyrogens, *per se*, constituted the chemical irritant, or whether some other unknown contaminant was the responsible agent, cannot be stated with any degree of certainty. The probability is that a combination of contaminants produced the meningitis.*

These cases serve to emphasize that paravertebral sympathetic nerve blocks are not without hazard. It behooves the anesthesiologist to exert meticulous care in the performance of such nerve blocks. The skill required is the product of experience. However, certain precautions can and should be taken. We emphasize the following:

a. Use equipment free of contaminating inorganic and organic material.

b. Use anesthetic solutions prepared with pyrogen-free distilled water or saline, preferably the latter.

c. Avoid displacement of the needles once they are inserted. This demands a quiet patient and steadiness on part of the operator.

d. Before injecting the anesthetic, fill the hubs of the needles with the solution and watch for reflux. The reflux of clear fluid is indicative of subarachnoid penetration.

e. Aspirate before, and at frequent intervals during the injection, rotating the needles in at least two planes.

f. Inject 2 cc. of the anesthetic solution through each needle and then check for evidence of subarachnoid anesthesia before injecting the full amount.

SUMMARY

1. Two cases of acute aseptic meningitis following paravertebral lumbar sympathetic nerve block are reported.

2. Their pathogenesis is discussed.

3. Precautions in the performance of paravertebral sympathetic nerve blocks are suggested.

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* Among the foreign substances known to have produced acute aseptic meningitis when introduced into the subarachnoid space are horse serum, air, lipiodol, unbalanced salt solutions, various antiseptics and spinal anesthetic agents (5, 6, 7, 8).