

Persistent Dural Cerebrospinal Fluid Leak

Shown by Retrograde Radionuclide Myelography: Case Report

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Following inadvertent spinal anesthesia for delivery, a patient developed incapacitating post-lumbar puncture headache that persisted for 9 weeks. Scintigrams of the lumbar region, obtained after injection of ^{99m}Tc -human serum albumin into the cisterna magna, showed the cerebrospinal fluid leak. Blood patch repair was carried out, with immediate relief of all symptoms. Because of subsequent atypical headaches, a second cisternogram was done by the same technique. This study confirmed that there was no further dural leak, and other evidence indicated that the recurrent headache was related to functional problems.

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Headache is a recognized sequel to lumbar puncture (1). The symptoms are believed to be secondary to a reduction in cerebrospinal fluid (CSF) volume by leakage through the puncture site. Without a full fluid cushion to rest on, the brain tends to sag when the patient is upright and the resultant traction on pain-sensitive blood vessels and anchoring dura produces the headache (2). Most often, this is a transient complaint that can be minimized by keeping the patient recumbent for several hours. However, the leakage sometimes persists for a prolonged period and may be disabling (3,4). Occasionally, it is necessary to distinguish between post-puncture and other types of headache.

This report presents an unusual case of persistent post-puncture headache in which the dural leak was confirmed by retrograde radionuclide myelography and its closure later shown by a second study following a blood patch application.

CASE REPORT

A 24-year-old woman was in good health before the delivery of her third child. Epidural anesthesia was attempted for the delivery, but difficulty was encountered at both the L2-3 and L3-4 levels. Cerebrospinal fluid leakage occurred, and the patient probably had spinal rather than epidural anesthesia.

The next day she complained of a severe occipital headache whenever she got up, and subsequently her headache increased in intensity despite analgesics. Lying flat always greatly relieved the pain. The patient was discharged, but over the ensuing 7 weeks her headaches continued, frequently associated with vomiting, despite the use of analgesics and tranquilizers. After a period of bed rest, she had a brief respite, followed by return of the headache. Nine weeks from the onset, she was readmitted to hospital. General physical and neurologic examinations were entirely normal, except that application of pressure to the neck and jugular vein allowed her to sit up for a few minutes before the headache would begin. Radiographs of the skull and spine, the brain scan, and electroencephalogram were all normal.

Radionuclide myelography was performed with 1 ml of hyperbaric (8%) sucrose containing 2 mCi of ^{99m}Tc -human serum albumin (0.6 mg) which was injected into the cisterna magna with the patient lying on her side. The injection was administered very slowly to minimize mixing of the injectate with

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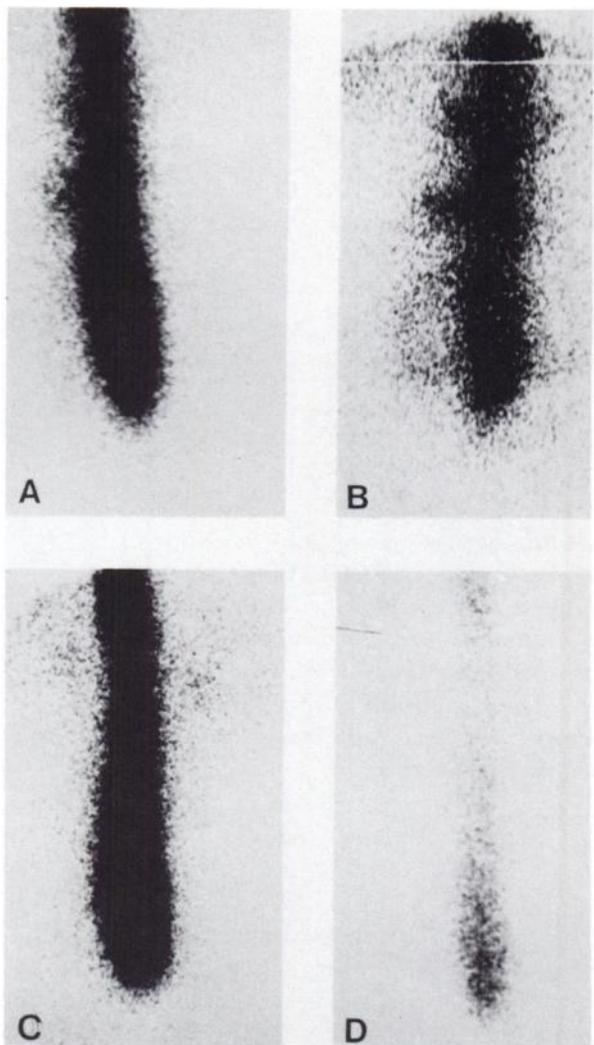


FIG. 1. Radionuclide cisternography performed before (A,B) and after (C,D) blood patch repair. Studies were taken at 7 hr (A,C) and 24 hr (B,D) after cisternal injection of 99m Tc-human serum albumin.

CSF, and the needle was withdrawn. The patient was then slowly raised to about 30° on the tilting table and maintained in this position for 1.5 hr. A scintigram at this time showed normal localization of activity within the subarachnoid space. Scintigrams of the lumbar region were obtained at frequent intervals over 24 hr, but adequate diagnostic information was found in the 7- and 24-hr images. By 7 hr a slight irregularity had appeared along the left lateral aspect of the lumbar CSF distribution (Fig. 1A). At 24 hr a marked "Christmas tree" effect indicated that CSF was entering the epidural space and progressing along the segmental nerve roots (Fig. 1B). This was considered to be diagnostic of a persisting dural CSF leak.

A blood patch repair was carried out at the L2-3 and L3-4 epidural spaces. The headache subsided

and the patient was discharged. Four weeks later, she was readmitted complaining of headaches. These recurrent headaches were not clearly related to posture. A repeat myelogram, using the same technique as before, showed no evidence of leakage from the subarachnoid space (Figs. 1C and 1D). The more recent headaches were ultimately diagnosed as tension headaches related to difficulties that the patient had developed with her husband during her initial prolonged disability. After reassurance, the patient was discharged. Since then, she has been well.

DISCUSSION

The opportunity to restudy this patient was due to the development of a functional complaint which was patterned after a preceding symptom with an organic basis and which was clinically not clearly distinguishable from it. The normal scintigrams obtained in the second study show the efficacy of the blood patch technique in repairing persistent dural leaks.

The spinal subarachnoid space does not usually extend along the segmental nerve roots beyond the dural sac. When such dural sleeves are present, it is to be expected that they would be visualized promptly as the activity diffuses through the subarachnoid space. The subdural space is similarly limited anatomically. However, the epidural space differs in that it extends along the nerve roots for variable distances. In the presence of a CSF leak, activity initially localized within the subarachnoid space would have to traverse the subdural space in order to enter the epidural space. This transit, depending upon the rate of leakage, would be time dependent, as was seen in our patient. These anatomic features can be readily appreciated by observation of the distribution of contrast media in these spaces at contrast myelography (5).

Several technical features pertaining to this case require comment. Injection of the radiopharmaceutical at a distance from the lumbar region was essential since production of a new hole in the lumbar membranes would have rendered the study uninterpretable. The injection of the radiopharmaceutical in hyperbaric medium into the cisterna magna, with subsequent proper positioning, allowed prompt delivery of a high concentration of activity into the spinal subarachnoid space, a necessary requirement in order to ensure that detectable levels of activity would subsequently enter the epidural space. The optimal demonstration of epidural activity occurred at 24 hr, reflecting the time needed for the activity to traverse the subdural space. An albumin tracer was thought to be preferable to one with a smaller molecule since our experience with chelates (e.g., 111 In-DTPA) suggests that these may be rapidly

absorbed from the sub- and epidural spaces. Although a case of persistent CSF leakage has previously been shown with ^{131}I -albumin (4), we do not regard this radionuclide as the preferred agent because of its relatively low photon yield with poor imaging characteristics and the attendant high local radiation dose (6).

REFERENCES

1. TOURTELLOTTE WW, HAERER AF, HELLER GL, et al.: *Post Lumbar Puncture Headaches*. Springfield, Ill., C. C. Thomas, 1964, pp 3-47
2. KUNKLE CE, RAY BS, WOLFE HG: Experimental stud-
- ies in headache: Analysis of the headache associated with changes in intracranial pressure. *Arch Neurol Psychiatry* 49: 323-358, 1943
3. BROWN BA, JONES WW: Prolonged headache following spinal puncture. Response to surgical treatment. *J Neurosurg* 19: 349-350, 1962
4. GASS H, GOLDSTEIN AS, RUSKIN R, et al.: Chronic postmyelogram headache. Isotopic demonstration of dural leak and surgical cure. *Arch Neurol* 25: 168-170, 1971
5. SHAPIRO R: Artifacts. In *Myelography*. Chicago, Yearbook, 1975, pp 124-135
6. ZEIGER SL, HARBERT JC, MCCULLOUGH D, et al.: Beta dose to spinal cord and nerve roots in ^{131}I -HSA cisternography. In *Medical Radionuclides—Radiation Dose and Effects*. Oak Ridge, Tenn., USAEC, 1970, pp 207-222

**CENTRAL CHAPTER
SOCIETY OF NUCLEAR MEDICINE
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October 9-10, 1976

Madison, Wisconsin

Data Processing in Nuclear Medicine: An Assessment of Cost and Effort vs. Benefit

The versatility of available data-processing equipment is well established, but have patient and laboratory benefits been well enough established to warrant purchasing the required specialized equipment in a community hospital setting? And if so, what kind of equipment should be purchased—a simple or a more sophisticated (and more expensive) system; hardwired, hybrid, or programmable computer? How much training, particularly on the part of nuclear physicians and technologist staff, is needed to drive such systems effectively?

The faculty for this meeting will address itself to these topics in the course of a program intended to survey established and imminent applications of data-processing systems.

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