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Outpatient Myelography with Fine-Needle Technique: An Appraisal

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Postmyelography headaches are produced mostly by CSF leakage at the dural puncture site and are therefore largely dependent on the size of the needle used. Our study of 300 consecutive outpatients who had lumbar myelograms performed with 25- and 26-gauge spinal needles shows that the procedure has become virtually innocuous.

We recommend that 26-gauge spinal needles be widely adopted as the standard for fluoroscopically controlled intrathecal injections of contrast material.

Histologic sections of the meningeal envelopes of the lumbar canal show dense connective tissue with scarce elastic fibers. Perforation of these envelopes by needle puncture will not be repaired rapidly, as in the case of blood vessels. All lumbar punctures result in meningeal microfistulas with leakage of CSF, as an increasing function of the diameter of the perforating needles; the puncture should therefore be performed with the smallest needle practical.

Materials and Methods

During a 24-month period, we performed 200 consecutive lumbar myelograms using exclusively 25-gauge BD spinal needles (blue transparent hub) and 100 consecutive myelograms using exclusively 26-gauge BD spinal needles (brown transparent hub). Patients were studied on an outpatient basis if they had had no history of epilepsy and were not receiving neuroleptic drugs. The age range was 17 to 75 years (average, 42½ years). There was no premedication nor preparation of any sort. The patients came to our department accompanied, having had a normal breakfast and lunch. The lumbar puncture was made at the L2–L3 level in a prone position under fluoroscopic control, and 10 ml of either iopamidol (200 mg I/ml) of iohexol (180 mg I/ml) were injected in the lumbar cistern. Upon completion of the usual radiographs, the patients were kept sitting in the waiting room for 2 hr and then allowed to return home accompanied. They were not permitted to drive a car. Patients were advised to remain seated for the rest of the day, to eat normally, and to drink ample fluids.

Results

In the 300 consecutive patients studied, there was a single-level approach with a single dural penetration; therefore, there was no technical failure to reach the subarachnoid space. The injection of contrast medium was totally subarachnoid in 298 patients and partly subdural in two patients (1%), both in the 25-gauge needle group. Except for those two cases, all myelograms were of excellent diagnostic quality.

The authors subsequently contacted every patient to ascertain the postmyelographic effects, if any. The results are as follows. Among the 200 patients in whom 25-gauge needles were used, 149 (74½%) reported a totally uneventful postmyelographic course. Another 31 patients (15½%) reported mild or insignificant headaches or backaches of short duration. Twenty patients (10%) reported unpleasant side effects consisting of either backaches (5%), headaches (5%), or a combination

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of both (8%), and occasionally accompanied by nausea (4%), rarely by vomiting (1%). The backaches appeared shortly after the examination while the headaches occurred some 12–36 hr after the myelogram. These headaches are nearly all described as postural, appearing upon resumption of regular activities and relieved by lying down. The average duration of these side effects was less than 3 days, ranging from 1 day in most instances to 7 days in one case. In the 100 patients in whom 26-gauge needles were used, 90% reported a totally uneventful postmyelographic course. Five patients (5%) reported mild backache or headache, and another five (5%) reported moderate headaches lasting up to 3 days. In both series combined, no patient had discomfort due to myelography lasting more than a week and no patient required any treatment beyond reassurance and mild analgesics. There was no statistical difference in the side effects of the two contrast agents used.

Discussion

One of the desirable features of water-soluble contrast media is their low viscosity, allowing the use of smaller-bore needles. The diameters of spinal needles—20, 22, 25, and 26—are respectively 0.9 mm, 0.7 mm, 0.5 mm, and 0.45 mm; but the areas of the holes they produce represent greater increments: the hole produced by a 20-gauge needle is 0.66 mm^2, that of a 22-gauge needle is 0.40 mm^2, that of a 25-gauge needle is 0.20 mm^2, and that of a 26-gauge needle is 0.16 mm^2. Since CSF is produced at an estimated rate of 0.35 ml/min, it is crucial to minimize the size of the needle so that the loss of CSF through the dural microfistula least approaches its production rate.

In 1972, Tourtelotte et al. [1] published their clinical trials on postlumbar-puncture headaches that followed spinal puncture made strictly for CSF laboratory tests and that therefore did not involve injection of contrast media. In that article, they compared the 22- and 26-gauge needles used in their series of 100 consecutive patients. These authors observed three times less frequent and always less severe adverse effects in the 26-gauge group as compared with the 22-gauge group, postulating the leakage of CSF as an explanation of postlumbar-puncture headache. Lieberman et al. [2] used radioisotope myelography to further demonstrate radiologically the prolonged postlumbar puncture leakage. More recently, Corey et al. [3] brought further confirmation to the hypothesis, reporting that in a series of 100 CT scans of the lumbar region made 1 hr after lumbar myelograms performed with nonionic contrast media, streaks of contrast medium were found in the paravertebral soft tissues in 24 patients. In all cases, the spinal needle used was 22 gauge.

Unlike metrizamide, the second-generation nonionic contrast agents (iohexol, iopamidol) have been universally recognized to have remarkably low toxicity [4, 5, 6]. The side effects occasionally seen after myelography with these new products may be attributable to the puncture, since they are exactly those described by Tourtelotte et al. [1] in their study of postlumbar-puncture headaches. Our present results with contrast medium injection through a 26-gauge needle are in fact remarkably similar to those Tourtelotte et al. reported after spinal taps alone.

Neurotoxic reactions to the contrast agent, should they occur, would obviously appear during the first hours of absorption and would likely relate to the kinetics of intrathecal contrast medium, causing urticaria, facial edema, nausea, and vomiting, and such behavioral disorders as hallucinations or seizures [7, 8]. Occurrence of such symptoms is exceptional [9, 10, 11]. None of our patients have shown any other signs of psychobehavioral syndromes, such as confusion, disorientation, or agitation. The occasional side effects encountered after present-day myelography with the new nonionic agents are the same as those witnessed more frequently in the days of oil myelography: the only common factor in the two methods of investigation is the lumbar puncture. We must conclude that the dreaded headaches of myelography, much like those of spinal taps, are largely due to perforation of the dura with ensuing leakage of CSF at the puncture site; the solution should then be the use of the smallest needle possible.

The manipulation of a fine spinal needle is slightly different, in that it is introduced by spinning it swiftly through the skin vertically for a distance of 10–15 mm to where the needle is self-holding in a vertical position. The position of the needle is checked by a fluoroscopic glimpse and further advanced with all the operator's fingers on the needle shaft. At no time does a finger touch the needle within 3 cm of its tip. The dura is usually not felt with such a small needle so that verification of depth is made by simply removing the stylet: if the intrathecal space is reached, a CSF fluid level immediately appears in the lower part of the transparent funnel-shaped hub of the needle. If no fluid appears, the needle is further advanced 7 mm and the same procedure is repeated. In this fashion, we have had no single bloody tap. No lateral fluoroscopy is used nor brow-up lateral localization films except in rare instances of kissing spinous processes.

There may be objections to the slow removal of CSF for laboratory purposes. If a small amount of CSF is needed, syringe aspiration through the 26-gauge needle easily yields 4 ml/min. In that respect, we are aware that recent articles in the literature [12, 13] conclude that routine CSF laboratory tests made at the time of myelography for sciatic syndrome are seldom informative, and the low efficacy of such tests must be considered. In our department, unless asked specifically, we do not routinely draw CSF but proceed with the injection of contrast medium. Hand injection of contrast agent, preferably with a 10-ml syringe, easily delivers 4 ml/min, so that the injection is completed in 3 min or less. If higher concentration is preferred, contrast media with 240 and 300 mg I/ml flow equally well through the 26-gauge needle so that this needle is currently used as well for all our cervical myelograms. If wanted, the viscosity of the contrast medium can be reduced by warming it to body temperature immediately before injection. The 26-gauge needle technique also offers the lowest risk of subdural injection, and, theoretically, of other potential complications such as epidermal or dermal implantation, hemorrhage, or infection because of the reduced perforating surface.

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