C1–C2 Myelography with Iohexol and Metrizamide: Comparative Study

Comparison of metrizamide and iohexol contrast media for myelography performed via lateral C1–C2 puncture in a total of 64 patients demonstrated superiority of iohexol with respect to the incidence of postprocedure adverse reactions. There was no significant difference between the two media in quality of radiographic demonstration in the cervical region. Patients in whom posterior fossa positive-contrast radiographic examinations were performed at the same time as myelography, using either water-soluble agent, did not demonstrate any increased incidence of side effects over those having myelography alone.

Iohexol, a new, nonionic, water-soluble contrast material, was used in initial clinical trials in patients for lumbar myelography in 1983 [1–5]. These studies indicated improved patient tolerance and less neurotoxicity compared with metrizamide (Amipaque), the water-soluble contrast medium widely used for myelography procedures for several years. These results were also confirmed by later controlled double-blind direct comparison studies of iohexol and metrizamide for thoracolumbar myelography [6, 7]. This report summarizes our experience with iohexol and metrizamide for cervical myelography via lateral C1–C2 puncture in a double-blind comparison study in a total of 64 patients. The study was conducted between October 1983 and June 1984.

Subjects and Methods

The 64 patients were 22–75 years of age, and there were 51 men and 13 women. The preponderance of male patients was because of the inclusion of patients from an affiliate Veterans Administration hospital. Patients under 18 years of age were excluded from the study, as were pregnant or lactating patients. Patients were also excluded if there was known clinical history or strong suspicion of hypersensitivity to iodine-containing contrast material or if any drug had been received known to lower the seizure threshold, such as phenothiazine-derivative medications. Patients were also excluded who had received an intrathecal or subarachnoid puncture within the preceding 48 hr or who had had spinal cord surgery or received any intrathecal or epidural medication in the preceding month.

In all patients, a detailed neurologic examination was performed within 24 hr before myelography, in addition to a complete history and physical examination. Blood samples were obtained from all patients for laboratory studies of serum chemistry and hematologic parameters within 12 hr before and 24 hr after the procedure. The serum chemistry studies included albumin, alkaline phosphatase, creatinine, total protein, SGOT, and BUN. The hematologic parameters measured were hemoglobin, red blood cells, white blood cells, platelets, and sedimentation rate. Vital signs were recorded during the 30 min before and immediately after the conclusion of myelography, and then for the next 24 hr at 1, 6, and 24 hr. Strict adherence was given to maintaining an adequate state of hydration both before and after the procedure, and fluid orders were written and patient fluid intake was recorded for each patient for the 2 hr before and for 4 hr after the myelogram. The patients were required to drink at least 240 ml of fluids every hour for 2 hr before the procedure and for 4 hr after the examination. Every patient received premedication with 100 mg secobarbital intramuscularly within 1 hr before

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TABLE 1: Summary of Adverse Reactions in Patients Undergoing C1-C2 Myelography Using Metrizamide or Iohexol

<table>
<thead>
<tr>
<th>Adverse Reaction</th>
<th>No. of Patients (%)</th>
<th>Metrizamide (n = 31)</th>
<th>Iohexol (n = 33)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nausea or vomiting</td>
<td>13 (42)</td>
<td>5 (15)</td>
<td></td>
</tr>
<tr>
<td>Headache</td>
<td>9 (29)</td>
<td>8 (24)</td>
<td></td>
</tr>
<tr>
<td>Neck pain</td>
<td>3 (10)</td>
<td>2 (6)</td>
<td></td>
</tr>
<tr>
<td>Double vision</td>
<td>0</td>
<td>1 (3)</td>
<td></td>
</tr>
<tr>
<td>Diarrhea</td>
<td>0</td>
<td>1 (3)</td>
<td></td>
</tr>
<tr>
<td>Confusion</td>
<td>1 (3)</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Dizziness</td>
<td>1 (3)</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Lethargy</td>
<td>2 (6)</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Low back pain</td>
<td>1 (3)</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Leg pain</td>
<td>2 (6)</td>
<td>0</td>
<td></td>
</tr>
</tbody>
</table>

Note.—Some patients experienced more than one adverse reaction.

The procedure. Repeat neurologic examinations were performed at 4-6 hr and at 24 hr after myelography. Any patient who developed a poststudy neurologic abnormality or other adverse reaction continued to be examined at 24 hr intervals until the abnormality resolved.

All radiologic examinations were performed with the patient prone and the neck extended. Lateral cervical puncture at the C1-C2 level was performed using a 20 gauge spinal needle. Cerebrospinal fluid samples obtained at the time of puncture were sent for laboratory analysis. The contrast medium was injected in a concentration of 240 mg I/ml for both the metrizamide and iohexol groups, with a total injection volume of 10 ml. The radiologist was not present at the preparation of the contrast material, which was performed by the radiologic technologist, to assure the validity of the double-blind study. After the procedure, the patients were required to remain in bed and to maintain at least a 30° head-elevated position for 6 hr. Thirty-three patients received iohexol and 31 patients received metrizamide.

In 34 patients the study was limited to an examination of the cervical region only, and in 24 patients "complete myelography" (cervicothoracic and lumbar examination) was performed. In nine other patients a posterior fossa examination was performed in addition to the myelographic study. A postmyelographic computed tomographic (CT) scan was also obtained in 25 patients. The radiographic quality of each examination was evaluated, and for those patients who had a postmyelogram CT scan, the time of CT relative to myelography, the anatomic region included in the CT scan, and the CT scan quality were evaluated as well. Myelogram quality was evaluated according to demonstration or nondemonstration of nerve root sleeves and nerve roots in the cervical region; spinal cord in the thoracic region; and nerve root sleeves, nerve roots, and nerves of the cauda equina in the lumbar region. Demonstration was graded as poor, good, or excellent. CT scan quality included an evaluation of whether there was inadequate, adequate, or optimal contrast enhancement of the subarachnoid space, and a judgment was made as to whether or not the CT scan provided new diagnostic information.

Results

A summary of the adverse reactions with metrizamide and with iohexol is given in table 1. There were no clinically significant changes in vital signs or laboratory biochemical and hematologic parameters in either the metrizamide or the iohexol group.

A separate comparison of the two subgroups of patients who either did or did not have contrast material in the posterior fossa at the time of their myelographic examination was also made for both contrast media. The incidence of nausea and/or vomiting was 37% in patients with posterior fossa contrast medium and 50% in patients without posterior fossa contrast medium in the metrizamide group of patients, and it was 8.3% in patients with posterior fossa contrast medium and 19% in patients without posterior fossa contrast medium in the iohexol group. Headache occurred in 32% of patients with posterior fossa contrast medium and in 25% of patients without posterior fossa contrast medium in the metrizamide group, and it occurred in 33% and 19%, respectively, of iohexol patients with and without posterior fossa contrast material. This comparison, therefore, did not disclose any statistically significant increased incidence of either headache or nausea and vomiting, the two most common adverse reactions, in those patients who had posterior fossa contrast medium compared with those who did not for either metrizamide or iohexol. Passage of contrast material above the tentorium was noted on the radiographs of three patients, two of whom received metrizamide and one of whom received iohexol. One of the two receiving metrizamide experienced a single brief episode of vomiting at 5½ hr postprocedure and no other side effect, while the other two patients had no adverse reaction of any kind.

Quality of the radiographic examinations with metrizamide and iohexol showed no significant differences between the two contrast media in the cervical region, where there was overall good or excellent radiographic demonstration in 100% of patients for both contrast materials. In the patients who had total-column myelography with either contrast medium, there were statistically significant (p < 0.002) differences in the quality of radiographic demonstration for the thoracic and lumbar regions between the two contrast materials. Metrizamide produced good or excellent radiographic results in 93% of patients who had thoracic examinations and in 62% of patients for the lumbar region, while the results with iohexol were good or excellent in only 36% of patients for both the thoracic and the lumbar regions. However, as discussed later, it appeared that anatomic differences in the two groups could account for this finding in this small group of patients.

Twenty-five patients had postmyelographic CT studies, and there was no difference in image quality of the CT scans between metrizamide and iohexol. Contrast enhancement of the subarachnoid space was evaluated as optimal in 16 patients, adequate in eight, and inadequate in only one. CT provided new diagnostic information in 17 of these patients. This included confirmation of a suspected syrinx in several patients and additional useful ancillary information in one patient with a thoracic meningeoma and another with a cervical cord tumor. CT of the posterior cranial fossa and craniovertebral junction was helpful in several other patients in whom contrast material was radiographically visible only up to the C1 level at the time of myelography.

Discussion

As table 1 indicates, the common postprocedure complaints were of nausea and/or vomiting and of headache. The
The unexpected result of better opacification of the thoracic and lumbar regions in patients who had total-column myelography examinations when metrizamide was used prompted a retrospective review of the radiographs of the complete myelography examinations for both contrast media. Twenty-four patients had total-column myelography; 13 received metrizamide and 11 received iohexol. It was noted that a narrowed lumbar spinal canal was present in six of these patients, of whom five received metrizamide and only one received iohexol. On the other hand, the subarachnoid space appeared unusually wide and capacious in nine other patients, and six of these patients had received iohexol, while only three had received metrizamide contrast material. Both factors would tend to produce better radiographic demonstration in the metrizamide group, and on the basis of this information, we decided that anatomic differences between the two small groups of patients may have accounted for the differences in quality of radiographic demonstration.

In summary, our investigation yielded four major findings:

1. There were fewer postprocedure side effects with iohexol than with metrizamide in myelography performed via a lateral C1–C2 puncture approach.

2. Iohexol was easier to use than metrizamide because it is supplied as a ready-to-use stable solution, while metrizamide is supplied as a powder that must be mixed with diluent just before use.

3. In a small group of patients, contrast material in the posterior cranial fossa at the time of myelography via lateral C1–C2 puncture did not significantly increase the incidence of postprocedure side effects.

4. When complete myelography was performed, there were statistically significant differences in the quality of radiographic demonstration of the thoracic and lumbar regions between the two contrast materials, but the total number of patients who had complete myelography in this study was small for each subgroup, and the differences appeared to be explainable on the basis of significant anatomic differences between the metrizamide and iohexol complete myelography subgroups. The radiographic quality in the cervical region was not significantly different when either metrizamide or iohexol was used and produced overall good or excellent results in all patients with both contrast media.

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REFERENCES

