Myelography with iohexol (Omnipaque): review of 300 cases.

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AJNR Am J Neuroradiol 1985, 6 (3) 349-351
http://www.ajnr.org/content/6/3/349

This information is current as of October 18, 2023.
Myelography with iohexol (Omnipaque):  
Review of 300 Cases

Edmund H. Burrows

The side effects of iohexol were evaluated in the 300 patients who had nonemergency myelography over a 9 month period. No patients studied with myelography were excluded from the iohexol trial. Age range was 14–86 years. Introduction was by lumbar puncture in 206 patients and by lateral C1–C2 injection in 94. Side effects, including discomfort, were denied by 81.3% of the patients. The other 18.7% had adverse reactions, the most common being headache, reported by 11% of the total population studied. Image quality was judged unsatisfactory in 8.1% of cervical myelograms and in 2.6% of lumbar myelograms. With lumbar injection, cervical myelograms were judged to be inadequate in 13.5%; with cervical injection, lumbar myelograms were inadequate in 25%. Iohexol caused significantly fewer side effects in the 300 patients than would have been expected with metrizamide. The low cost and ease of use are additional factors that favor iohexol as the contrast agent of choice for myelography.

Iohexol (Omnipaque) received official British approval as a myelographic contrast agent in August 1983. This approval was based partly on the success of multicenter clinical trials carried out according to the protocol devised by Eldevik et al. [1, 2]. Southampton was a participating center; the practical experience with iohexol myelograms in 300 patients at Wessex Neurological Centre is reported.

Subjects and Methods

The staff of the Wessex Neurological Centre has tested several myelographic contrast media. Water-soluble myelography was first performed in 1971 using meglumine iothalamate (Dimer X); then, meglumine iothalamate (Conray 280) and metrizamide (Amipaque) underwent early clinical trials [3, 4]. Between 1975 and 1982 over 2000 metrizamide myelograms were obtained. Since January 1983 all myelograms have been obtained with iohexol.

The 300 patients reported here constituted all inpatients requiring nonemergency myelography in a neurosurgical unit over a 9 month period. Contraindications to the examination included clinical evidence of raised intracranial pressure and lumbar puncture within the previous 10 days; in the latter event, a suboccipital puncture was performed. No analgesic premedication or prophylactic phenobarbitone was prescribed, nor were any instructions given concerning diet or fluid intake. Although several patients would have been excluded by Eldevik et al. [1, 2] because they proved uncooperative or had previously undergone spinal operations, no patient accepted for myelography [5] was excluded from the iohexol trial. The patients were 14–86 years old, with an equal male:female distribution. All patients consented to the examination, and all were warned of what to expect during and after the procedure. After myelography, orders were given for the patient to be nursed in bed until the next morning (thereafter the patient could be dismissed from hospital, if without headache), and fluid intake was stepped up and the passage of urine recorded. Analgesics were prescribed, and each patient was told they were available. Pulse and blood pressure were charted before and immediately and 6 and 24 hr afterward, at which time all patients were again assessed clinically. These routine assessments were carried out by physicians and nurses, several of whom had experience in the Southampton metrizamide trial some years before. With the exception of one patient, thecal puncture was not repeated. No electroencephalograms

Received February 13, 1984; accepted after revision October 11, 1984.

The contrast medium used in this study was provided by Nyegaard & Co., Oslo, Norway.

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AJNR 6:349–351, May/June 1985 0195-6108/85/0603-0349 © American Roentgen Ray Society
(EEGs) were obtained, either before or after the procedure, because no patients in the initial trials of Eldevik et al. [1, 2, 6] showed any clinically significant EEG differences or spike activity after iohexol myelography. Consequently, it was considered unnecessary to monitor this parameter again.

In all the 300 patients the contrast medium was successfully introduced into the subarachnoid space, in 206 by lumbar puncture and in 94 under control fluoroscopy by lateral C1–C2 injection. A fixed concentration of iohexol was used (180 mg/ml), but the volume was varied according to clinical requirements. Cervical examination was usually successful with 6–8 ml; lumbar and whole-spine studies required up to 15 ml. A standard 19-gauge cisternal needle was used, and the lumbar punctures were made with 19- or 22-gauge needles. All the examinations were carried out using a conventional couch fitted with biplane image intensification fluoroscopy.

### Results

#### Side Effects

It must be emphasized that adverse reactions were actively sought. Each patient was questioned and observed upon completion of the myelogram and visited on several occasions thereafter for further assessment. Of the 300 patients, 244 (81.3%) reported no side effects to the radiologic staff making these inquiries nor to the ward nurses. When questioned later, discomfort was denied.

Fifty-six patients (18.7%) had adverse reactions to myelography. There was an equal gender and age distribution. Table 1 shows that the most common reaction was headache, which was experienced by 33 patients (11%). The time of onset was immediately upon injection in six patients, 6 hr later in 14, 24 hr later in 11, and 48 hr later in two. However, several patients complained of persistent headache, which altered the total number of patients suffering from headaches: immediately, six patients; at 6 hr, 18; at 24 hr, 24; and at 48 hr, four. In none did the headache persist beyond day 2. The severity of the headache was graded empirically in each patient as "mild" or "severe"; this was found to be aggravated if prolonged, that is, headaches that persisted were usually severe. In all but one of the eight patients with headache after C1–C2 injection the headache was mild; in the eighth it was severe and continued for 24 hr. Of the 25 headache patients after lumbar injection, 17 experienced the headache for 24 hr, and in 14 it was sufficiently severe to require analgesic medication.

One patient, a 25-year-old man with sciatica, developed neck stiffness accompanied by a febrile constitutional reaction 15 hr after lumbar myelography. Lumbar puncture 24 hr after the myelogram revealed turbid cerebrospinal fluid containing 5620 white blood cells/mm³, mostly polymorphonuclear leukocytes. No organisms were seen, and none were grown after 5 days. The patient was treated prophylactically with intravenous gentamicin 2 g/8 hr and recovered uneventfully, undergoing laminectomy for lumbar disk prolapse 1 month later.

#### Image Quality

Image quality was evaluated in light of a 12-year experience of interpreting water-soluble myelograms. It was judged by reviewing the radiographs of each regional examination and scoring them as excellent, adequate, or undiagnostic. Separation of the 300 myelograms into cervical and lumbar examinations, irrespective of the site of injection of the contrast medium, yielded the following results: Of 165 cervical myelograms, 110 were excellent, 46 were adequate, and nine (8.1%) were unsatisfactory. Of 225 lumbar myelograms, 202 were excellent, 17 were adequate, and six (2.6%) were unsatisfactory.

A more practical assessment of image quality was made by reviewing only those cases in which both cervical and lumbar regions were imaged during the same examination. Ninety such whole-spine myelograms were available, and they were scrutinized according to two criteria of image quality:

### TABLE 1: Side Effects in Patients Undergoing Iohexol Myelography

<table>
<thead>
<tr>
<th>Side Effect</th>
<th>After C1–C2 Injection</th>
<th>After Lumbar Puncture</th>
<th>Total</th>
<th>% of Series' Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Headache</td>
<td>8</td>
<td>25</td>
<td>33</td>
<td>11</td>
</tr>
<tr>
<td>Nausea, vomiting</td>
<td>4</td>
<td>13</td>
<td>17</td>
<td>6</td>
</tr>
<tr>
<td>Backache</td>
<td>4</td>
<td>11</td>
<td>15</td>
<td>5</td>
</tr>
<tr>
<td>Neck pain</td>
<td>7</td>
<td>2</td>
<td>9</td>
<td>3</td>
</tr>
<tr>
<td>Hypotension</td>
<td>4</td>
<td>2</td>
<td>6</td>
<td>2</td>
</tr>
<tr>
<td>Sciatic pain</td>
<td>0</td>
<td>3</td>
<td>3</td>
<td>1</td>
</tr>
</tbody>
</table>

*Note*:—No mental symptoms or seizures were reported by any patients.

### TABLE 2: Image Quality in Full-Spine Iohexol Myelograms

<table>
<thead>
<tr>
<th>Site of Injection</th>
<th>Quality</th>
<th>No. (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lumbar C1–C2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lumbar</td>
<td>Excellent</td>
<td>24</td>
</tr>
<tr>
<td></td>
<td>Adequate</td>
<td>33</td>
</tr>
<tr>
<td></td>
<td>Undiagnostic</td>
<td>9 (13.6)</td>
</tr>
<tr>
<td>Lumbar</td>
<td>Excellent</td>
<td>66</td>
</tr>
<tr>
<td></td>
<td>Adequate</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>Undiagnostic</td>
<td>0 (25)</td>
</tr>
</tbody>
</table>

### TABLE 3: Side Effects of Myelography: Southampton Experience

<table>
<thead>
<tr>
<th>Contrast Agent [Reference]</th>
<th>Total No. of Patients</th>
<th>% with Side Effects</th>
</tr>
</thead>
<tbody>
<tr>
<td>Iodophendylate (Myodil) [3]</td>
<td>54</td>
<td>74</td>
</tr>
<tr>
<td>Metrizamide (Amipaque) [4]</td>
<td>215</td>
<td>49</td>
</tr>
<tr>
<td>Iohexol (Omnipaque) [this series]</td>
<td>300</td>
<td>19</td>
</tr>
</tbody>
</table>
(1) With lumbar injection, would tonsillar ectopia have been recognized? (2) With cervical injection, would a lumbar disk prolapse have been recognized? Table 2 gives the answers: (1) With lumbar injection, the cervical myelograms were inadequate in nine (13.6%) of 66 patients. (2) With cervical injection, the lumbar myelograms were inadequate in six (25%) of 24 patients.

Discussion

Side Effects

The present yardstick for evaluating any contrast agent is the accumulated experience of metrizamide myelography, and suitability is to be measured largely by the extent to which the new contrast agent reduces or abolishes side effects. Enthusiasm for the diagnostic benefits of metrizamide has always been tempered by recognition of its disadvantages: the risk of epilepsy, drug synergism and transient mental obfuscation, and high cost.

Before the introduction of metrizamide, thecal scarring was the major hazard of myelography; table 3 shows that it could be expected in three of every four patients examined with oily contrast agents. When this severe delayed complication was virtually eliminated through the use of nonionic agents of low osmolality [8], the other disadvantages were subjective side effects, most of which are encountered within the first 24 hr after examination.

Table 3 reveals that these side effects are significantly reduced when iohexol is used instead of metrizamide. Rolfe and Maguire [4], in evaluating the complications of 215 metrizamide myelograms in Southhampton, found that nearly half of the patients experienced one or more of the side effects listed in table 1. The present study, using the same assessment technique, shows that iohexol considerably reduces the risk of complications, from 49% to 18.7%. Neither seizures nor transient mental disturbances occurred with iohexol. Headache, the other major source of discomfort after myelography, was recorded in only 11%, a low figure approximating that reported for diagnostic lumbar puncture by Tourtellotte et al. [9]. Thus, in this series of patients, iohexol failed to exert either a depressant or an excitatory reaction on the central nervous system. This result confirms other clinical experience [5, 10] and tolerance testing of iohexol in animals [11, 12].

Thecal scarring from iohexol remains a possibility to be excluded by future clinical trials. However, the favorable experience documented with metrizamide, a chemically similar substance, makes this complication unlikely.

Image Quality

This review confirms two fundamental precepts of water-soluble myelography: (1) optimal results accrue from "dedicated" examination, that is, introducing the contrast medium close to the level of the clinical lesion, and (2) "other-end" injection, although an essential skill of the neuroradiologist, does not guarantee a successful result. Table 2 shows that nearly all the cases with undiagnostic image quality followed "other-end" injections. The other causes of poor results—operator inexperience or patient noncooperation—cannot be attributed to iohexol, being common to all water-soluble myelographic agents. The author, from his experience with metrizamide, doubts whether increases in either the concentration or volume or both of iohexol would significantly improve image quality.

Product Suitability

The practical advantages of iohexol over metrizamide include no need to premedicate, fewer and less severe side effects, no delay in preparing the contrast medium, and major savings in cost. Crystallization has not been reported in the laboratory or in the clinical environment; therefore, preinjection filtration of iohexol is unnecessary [13].

ACKNOWLEDGMENTS

I thank my departmental colleagues for their work, especially Sister Martin and her staff, for helping to monitor patient reactions.

REFERENCES