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Clinical Experience with Iopamidol for Myelography

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Within 20 months 145 ascending thoracocervical myelographies and 155 lumbar myelographies with the nonionic water-soluble contrast medium iopamidol were performed. The iodine concentration given was 250 mg I/ml or 200 mg I/ml respectively. The total iodine never exceeded 2.5 g (8–10 ml). Image quality was assessed in terms of diagnostic value having experience of more than 1,000 myelographies using metrizamide. Picture quality was similar to metrizamide of equal iodine concentration. In 35 patients electroencephalography (EEG) was recorded before and after myelography with iopamidol 250. No changes that could be referred to the contrast medium were seen. There were no adverse reactions to lumbar myelography other than those following the lumbar puncture. In thoracocervical myelography mild and transient side effects occurred in 41 (28.3%). The most common were headache (41 cases), nausea (12), radicular pain (10), and dizziness (five). General seizures and psychopathologic symptoms were not observed.

The nonionic water-soluble contrast medium metrizamide has widely taken the place of other positive contrast media used previously for myelography. Adverse reactions such as seizures, psychopathologic and neuropsychological symptoms, and complaints of headache, nausea, vomiting, and other minor discomfort [1, 2] suggest that an active search for even less toxic substances is necessary. Therefore, we decided to use iopamidol, a new, nonionic, water-soluble contrast medium, which seemed to be a potentially safer substance according to preclinical studies [3–6].

Subjects and Methods

The iodine concentration given was 200 mg I/ml in lumbar myelography and 250 mg I/ml in thoracocervical myelography. The total iodine never exceeded 2.5 g. The chemical and physical properties of iopamidol and its analogues are described by Pitré and Felder [6], among others. In neuroradiologic use the compound is stable both in solution and in cerebrospinal fluid. At the concentration of 200 mg I/ml (250 mg I/ml), the density is 1.21 (1.26), the osmolality is 0.413 (0.580) mol/kg, and viscosity is 2.0 (3.04) cP, all properties given at 37° C.

We performed 155 lumbar and 145 thoracocervical myelographic examinations on 300 patients from neurologic, neurosurgical, and orthopedic hospitals. The indications for myelography were given by clinical signs and symptoms, either to prove or to exclude disk herniation, other space-occupying lesions such as tumors and metastases, or malformations. The patients were 16–81 years old; the mean age was 50.4 years. The contrast medium was given after usual lumbar puncture under fluoroscopic centering. Lumbar myelography was performed on a Mimer III (Siemens) in sitting or standing position. Images were obtained with 80 kV and 200 mA by phototimed spot filming. Cervicothoracic myelography was performed with the patient prone after lumbar puncture on a Sireskop 2 (Siemens) with fluoroscopic device in two planes, thus avoiding patient movements. Images were obtained in the thoracic anteroposterior view with 85 kV and 150 mA, lateral with 110 kV and 125 mA, and cervical in both planes with 80 kV and 150 mA by phototimed spot filming.

Assessment of image quality did not use a rating scale because many factors influence the quality of the pictures besides the contrast medium. In all myelographic examinations but two, where the contrast medium was too diluted in the cervical region, all information necessary for diagnosis was obtained.

Adverse effects were monitored using a standard protocol for each patient comprising personal data, clinical findings, individual performing the procedure, postmyelographic treatment if necessary, and adverse reactions as they were observed. The patients were not premedicated. After myelography, the patients were well hydrated and were advised to keep their heads upright.

In 35 patients the electroencephalogram (EEG) was recorded before and at 6 and 24 hr after myelography with 10 ml iopamidol, 250 mg I/ml. In 30 of these patients additional recordings of the EEG were made immediately after the examination.

Results

In our group of patients adverse reactions rarely exceeded complaints after simple lumbar puncture. In 28.3% of the patients in the group of ascending thoracocervical myelography, side effects as shown in table 1 were observed. EEG changes that could be referred to the contrast medium were not seen. General seizures

TABLE 1: **Adverse Reactions after Ascending Thoracocervical Myelography with Iopamidol**

Adverse Reactions	No. Patients (n = 145)
Headache	41
Nausea	12
Vomiting	2
Dizziness	5
Radicular pain	10
Nuchal rigidity	3
Abnormal sleepiness	3
Restlessness	1
Profuse sweating	4
Hypotension	3

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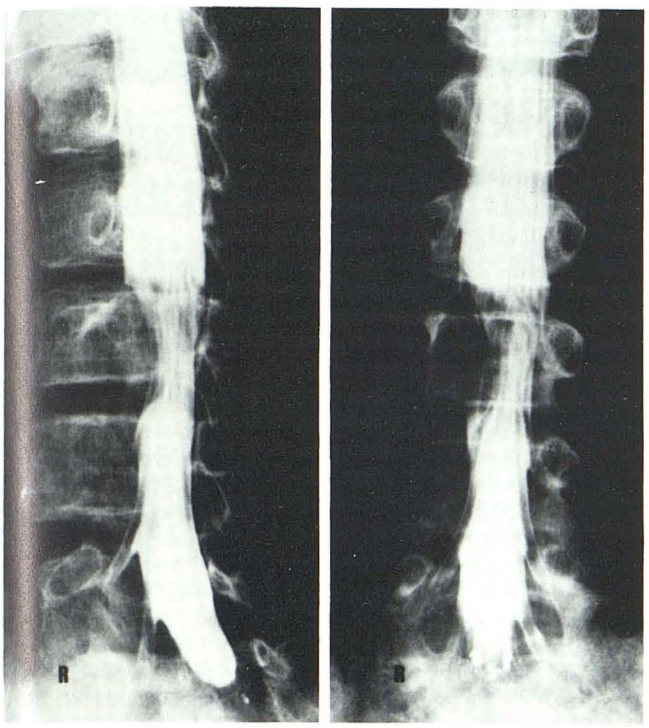

Fig. 1.—Iopamidol 200 mg I/ml. Space-occupying lesion (sarcoma) from right in lumbar spinal canal. Nerve roots are very well distinguished.

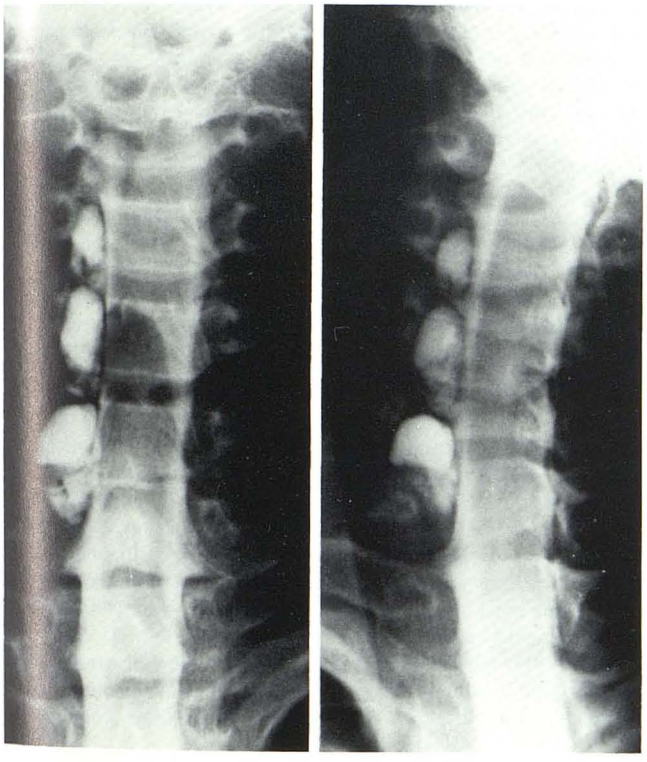

Fig. 2.—Iopamidol 250 mg I/ml. Avulsion of cervical nerve roots on right.

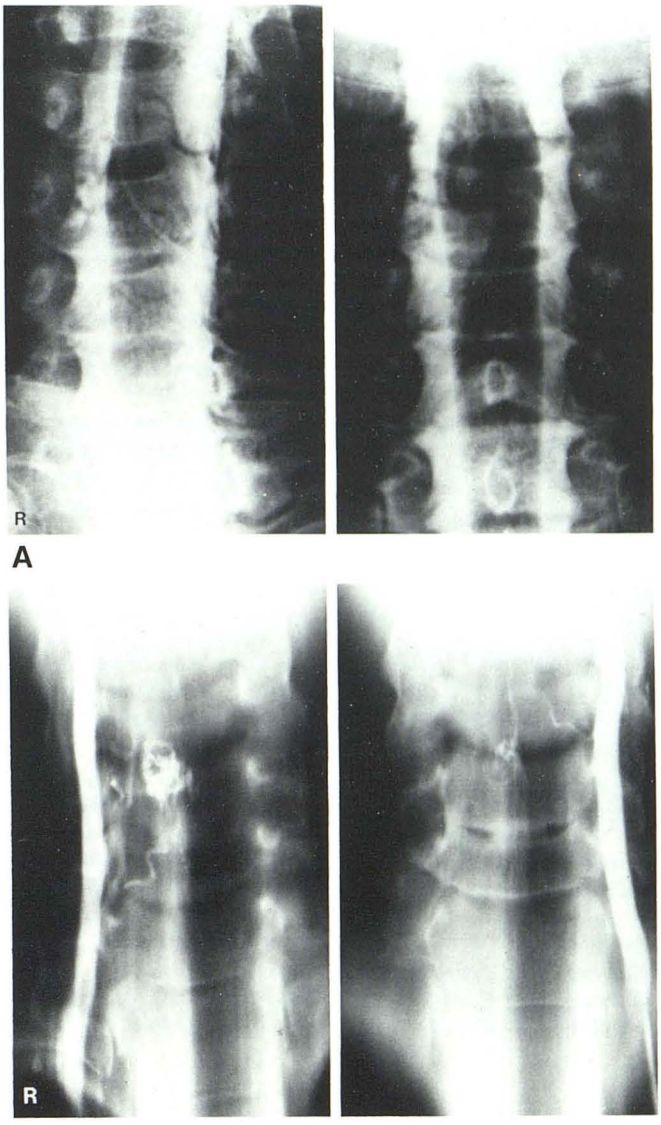

Fig. 3.—Vascular supply of expanding lesion of cervical spinal cord. **A**, Myelogram. **B**, Angiotomogram.

were not observed. Psychopathologic and neuropsychologic symptoms such as aphasia, hallucinations, psychic agitation, and euphoric or depressive states were not seen.

Picture quality was not different from that seen with metrizamide of equal iodine concentrations in over 1,000 previous myelographic examinations. The low viscosity leads to excellent detail in the visualization of the nerve roots in the lumbar canal (fig. 1). The edges of the spinal cord and the avulsion of nerve roots is well defined in cervical myelography (fig. 2). Even in ascending cervical myelography details such as vascular supply of an expanding lesion of the cervical spinal cord can be seen (fig. 3A) as the angiotomographic study demonstrates (fig. 3B).

Discussion

In 300 patients no severe adverse reactions were observed after myelography with iopamidol. We could not find EEG changes as

reported by other investigators [7–10]. However, they used higher concentrations of contrast medium up to 370 mg I/ml and in larger amounts up to 20 ml, which makes a total exceeding 6 g iodine. We have no explanation for the EEG changes observed by Drayer et al. [11] on two patients after lumbar myelography with 10 ml iopamidol 200 mg I/ml. In their group of 12 patients the side effects were otherwise mild.

The EEG changes observed by Hammer [9] were not due to high concentration or high total iodine. He performed computed tomographic cisternography in the horizontal position after intrathecal application of 10 ml iopamidol, 150 mg I/ml. This means he moved the contrast medium into the intracranial cisterns, which we try to avoid in myelography. Hammer [9] did not observe general seizures, which were seen by Carella et al. [8] in two patients. These patients were investigated with 20 ml iopamidol 300 mg I/ml.

In our group of patients adverse reactions were less severe. In our opinion this is due to the limitation of both the iodine concentration (no more than 250 mg I/ml) and the total iodine (no more than 2.5 g). Iopamidol is certainly neurotoxic, as reports of general seizures confirm. We do not agree with Bacarini et al. [7] that iopamidol seems to produce no irritation to nerve cells. Compared with our experience with metrizamide, however, we believe that iopamidol produces less severe adverse reactions, in good correlation to animal studies [4, 5] and preclinical findings [3]. In addition, iopamidol is already in solution, which has practical advantages. In conclusion iopamidol gives excellent results in myelography and is well tolerated if concentration and total iodine dose are carefully chosen.

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