LUMBER RADICULOGRAPHY IN INVESTIGATION OF LOW BACK PAIN
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INTRODUCTION

MYELOGRAPHY with water-soluble contrast media to establish the diagnosis of prolapsed intervertebral discs is an established part of orthopaedic practice. The perfect myelographic contrast medium has not yet been developed. Ideally, it would be free of complications, be absorbed quickly from the CSF, and give a high diagnostic accuracy.

The first agent to be used in Musgrave Park Hospital was iohendylate (Myodil), introduced in the early nineteen fifties. This was a viscous, oil-soluble, iodinated material which could be used throughout the subarachnoid space. Its disadvantages were that it was absorbed only very slowly and could cause chronic arachnoiditis. It was immiscible with C SF and could not, therefore, outline nerve root sheaths. Halliday¹, reporting on the diagnostic accuracy of Myodil in clinically atypical disc protrusions, found that only 63 per cent of myelograms showing a definite or probable prolapse were correct. He noted also a significant number of false negative examinations and he concluded that Myodil myelography gave only limited assistance in the diagnosis of clinically doubtful prolapsed lumbar discs.

In search of a more accurate agent, Myodil was replaced by the water-soluble agent, meglumine iocarmate (Dimer-X) in 1974. Water-soluble agents had first been introduced in 1931 but the early materials were highly irritating and could not be allowed to come into contact with the spinal cord. Dimer-X gave a high diagnostic accuracy rate by producing excellent visualization of the lumbo-sacral nerve roots and leading to the use of the term radiculography. Pressure on a nerve root due to disc prolapse leads to lack of filling of the root sleeve which is easily seen on the radiculogram. The figure illustrates a root sheath filling on the right side at L.4/5 and a block to the filling of the sheath on the left side at L.4/5.

Filling of root sheath on right side at L4/5 and block to filling on left side at L4/5
Dimer-X had, however, certain adverse side effects. Headache was often severe but the most serious complication was epileptiform seizures. During one such Dimer-X induced attack, a patient sustained a central fracture/dislocation of the hip due to myoclonic spasms. A similar case has been reported. Following this alarming complication, the use of Dimer-X was discontinued in Musgrave Park Hospital and replaced by metrizamide (Amipaque) in 1978. Metrizamide is a water-soluble, iodinated, non-ionic contrast medium, first introduced by Nyegaard and Company of Oslo in 1972. It has a low osmolality and is isotonic with CSF. Early reports were encouraging of a high diagnostic accuracy with low neurotoxicity.

The purpose of this paper is to report our experiences with metrizamide in 419 patients with particular reference to the operative correlation with the radiculogram result and to the complication rate.

METHOD

The records of 419 patients undergoing Amipaque radiculography during the period March 1978 till July 1979 were examined retrospectively — 422 radiculograms were performed, three patients having repeat examinations following technical failures.

The indications for myelography included:

(a) Symptoms of low back pain with or without sciatica, unrelieved by a period of conservative treatment which usually consisted of pelvic traction.

(b) Neurological signs present after conservative therapy — e.g., reduced straight leg raising, absent reflexes or weakness of muscle groups.

(c) Signs of acute foot drop or urinary retention — demanding emergency radiculogram.

There were 243 males and 176 females with an age range of 15 to 73 years and a mean of 41 years. The patients with sciatica numbered 397 and 22 had backache alone.

The radiculograms were performed following standard lumbar puncture at the L.3/4 level with the patient either sitting up or in the left lateral position. The metrizamide solution was prepared by injecting bicarbonate buffer solvent into the vital containing freeze-dried, powdered metrizamide. Following withdrawal of a sample of CSF for routine laboratory examination, the metrizamide solution was injected into the subarachnoid space. Standard AP, cross-table lateral and right and left oblique films were taken immediately on a tilting x-ray table.

The radiculograms were reported on by one of two radiologists and their reports were graded into four groups —

1. Positive — showing definite filling defect, thought to be due to prolapsed disc. Other pathology producing a similar radiological picture — e.g., nerve tumours, scarring from previous infection and congenital or acquired bony abnormalities — have to be borne in mind.

2. Negative — no abnormality detected.
3. Equivocal — showing a slight abnormality of the contrast column, indicating a possible prolapse.

4. Technical failure — due to the contrast material being wholly or partially outside the subarachnoid space.

RESULTS

Of the 419 patients, 224 underwent operation within one month of the investigation and these allowed assessment of the accuracy of the radiculograms. Of the operations performed on the 188 patients with positive reports, 171 were confirmed as having a prolapsed disc at the level suggested, an accuracy rate of 91 per cent. In one case, the radiculogram showed a complete block at L1 in a patient with a kyphus at this level, due to tuberculous scarring. Fifteen cases (7.5 per cent) were deemed by the surgeon as not showing prolapsed discs at the level indicated. These can be called false positive results. Alternative explanation for most of these cases was possible and this will be discussed later.

There were twelve wrong level diagnoses — that is, the surgeon diagnosed a prolapsed disc at a different level from that suggested by the radiculogram. Of the nine double-level reports, seven subsequently had surgery. In three of these cases, prolapsed discs were diagnosed at both levels and, in the remaining four, one level was confirmed. In one case of an L.5/S.1 positive report, the surgeon considered both L.4/5 and L.5/S.1 discs to be abnormal.

Of the twelve negative results, ten were confirmed as being negative and, in two, prolapsed discs were removed. Thus, there were two false negative results but, as there were only twelve patients with negative reports operated upon, these numbers are too small to attach much significance to them.

Of the twenty-two equivocal results, only seven were confirmed as showing abnormal discs at the level suggested and one of these was at a different level. Twelve were considered normal, two doubtfully abnormal discs were removed and, in one case, a spinal fusion was performed without inspecting the disc spaces.

There were 198 patients who did not have surgery within one month of the radiculogram, some may have had surgery several months later but these patients are not included in this series. It is interesting to note that 53 patients with radiologically confirmed disc prolapses and 54 with equivocal findings did not require immediate surgery on clinical grounds.

Three hundred and twelve patients (74 per cent) had no recorded complications following radiculography. One hundred and ten patients (26 per cent) did have complications, the most common of which was headache and these are listed in the Table. There were no serious adverse reactions.
TABLE

COMPLICATIONS IN 422 RADICULOGRAMS

|   |   |
|---|---|
| 52 | Headache alone. |
| 40 | Headache and nausea/vomiting. |
| 8  | Nausea and vomiting. |
| 2  | Headache and dizziness. |
| 2  | Hot and clammy. |
| 1  | Blurred vision. |
| 1  | Headache, dizziness and blurred vision. |
| 1  | Headache and insomnia. |
| 1  | Headache and neck stiffness |
| 1  | Headache and photophobia. |
| 1  | Neck stiffness. |

TOTAL 110 (26%)

DISCUSSION

The radiological diagnosis of prolapsed lumbar intervertebral discs was confirmed at operation in 91 per cent of cases. If one also takes into consideration the operative confirmation of the negative radiculograms, then the overall accuracy of radiculography, excluding the equivocals, is 90.5 per cent.

A certain number of positive radiculograms were not confirmed surgically as being due to prolapsed discs. In this series, there were fifteen out of 188 (8 per cent) false positive examinations. There were reasons for twelve of these reports — five of them being due to the presence of arthritic changes in the lumbar spine. Of the others, two each had previous surgery and spondylolisthesis and one each had a tumour, a bony ridge or an abnormal ligamentum flavum. In only three was no cause for error found. Especially if these complicating conditions are excluded, the study confirms the high diagnostic accuracy of metrizamide radiculography and corresponds favourably with the experiences of others 3 4.

Another important point to come out of these results is the high number of patients (53) with positive radiculograms upon whom operations were not immediately carried out. The main reason for this was that the clinical signs had settled and it was felt by the surgeon that operation was not indicated in spite of the report. Some of these patients may well have had subsequent surgery but have not been included in a prolonged follow-up in this study.

Radiculography is not of great help when the surgeon is presented with an equivocal report. Of the twenty-two equivocal results who had surgery, half were normal and one third were abnormal. Thus, a surgeon operating on a patient with sciatica who has had an equivocal radiculogram is not certain of finding a prolapsed disc.

It would seem unwise to operate on a patient who has had a negative radiculogram in the hope of finding a prolapsed disc as the cause of his symptoms. Of eighty-six negative examinations, only twelve had surgery and ten of these had normal discs. Two false negative examinations out of twelve is too small a number to be of statistical significance.

Surprisingly, there were twelve wrong level diagnoses in which the surgeon diagnosed a disc at a different level from that suggested by the radiculogram. Either the surgeon was mistaken in his levels — perhaps due to some anatomical
abnormality, e.g., sacralisation of the fifth lumbar vertebra, or the radiculogram was wrong — not once but twice, with a false negative at one level and a false positive at the other. In view of the already established high accuracy of metrizamide, we believe the former explanation to be the more likely. One way of reducing the likelihood of operating on the wrong level is by use of a marker x-ray. This is a technique in which a radio-opaque material such as a coin is placed over the lower lumbar vertebrae and a standard lateral x-ray, with the patient in the flexed position, is taken before operation. On the x-ray, the coin is seen to be opposite a particular vertebra and the position is marked by a scratch on the skin. This is an additional aid to identify the level at which the surgeon is operating.

There were nineteen technical failures (4.5 per cent) due to failure to enter the subarachnoid space or the presence of the contrast medium outside the dura. This is half the failure rate when compared with Halliday's results of 1969, in the same hospital. Most of the injections were performed by junior staff in training, some of whom were doing lumbar punctures for the first time. We feel that, with practice, this rate can be lowered even further.

Just over one quarter of our patients had complications (Table 1). This is considerably lower than the 34 per cent6 or the 43 per cent4 reported. The presence of adverse reaction has, in the past, been the limiting factor in the use of other water-soluble agents and was the reason for discontinuing Dimer-X examinations in Musgrave Park Hospital. There were no serious complications in this metrizamide series. Headache was the most common and troublesome reaction. It must be remembered that headache follows lumbar puncture alone without the injection of noxious agents into the C S F in approximately 33 per cent of cases8. We cannot, therefore, say conclusively that the headaches observed were due to chemical irritation of the meninges by metrizamide. Some of the headaches recorded in our series were so severe and prolonged that several patients admitted that they would never subject themselves to the experience again. Nausea and vomiting, present in eight patients, was often troublesome for up to 48 hours.

No myoclonic spasms or convulsions occurred in this series but have done so in other instances7, and are more likely following cervical examination. One reason for the low neurotoxicity is apparently related to the low osmolality of metrizamide4. We must take steps to reduce the incidence of this complication. It is known that phenothiazines can provoke epileptiform activity on the E E G and act synergistically with metrizamide to produce epileptic seizures8. Any patient taking these drugs must have them discontinued before undergoing radiculography. Premedication with diazepam has apparently lowered the convolution rate8. Though most of the examinations in our series were carried out without prior administration of diazepam, it would be reasonable to prescribe it before and after puncture in an attempt to prevent convulsions. It has also been the practice in Musgrave Park Hospital to keep the head of the bed tilted up at
30° for twenty-four hours following examination, to avoid the contrast medium coming into contact with the central nervous system. It is hoped that attention to these points will reduce the risk of convulsions occurring.

SUMMARY

The accuracy of metrizamide contrast medium in diagnostic lumbar radiculography was assessed on 224 patients who had surgical treatment for low back pain and sciatica. Of 188 with positive reports, the diagnosis was accurate in 91 per cent, the complication rate was low and there were no serious adverse reactions.

Metrizamide is an accurate and safe medium for use in diagnostic radiculography and its use is recommended in all patients in whom disc surgery is contemplated.

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