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The water-soluble contrast medium lumbar myelogram and its surgical correlations

Henri C. Labasse, MD*

The water-soluble contrast medium lumbar myelogram is a very helpful tool in the diagnosis of herniated nucleus pulposus (HNP) in patients who suffer unilateral root pain of mechanical course. One can often make the differential diagnosis between a ruptured disc and a protruding disc. Unless the disc fragment lies way out in the intervertebral foramen, the myelogram will show some kind of anomaly. Therefore, fewer exploratory operations will be performed on patients having normal myelograms.

Metrisamide, a newcomer among the water-soluble contrast media, is nontoxic for the spinal cord. Therefore, if the usual myelogram is normal and one fears a lesion at the upper lumbar or lower thoracic level, the solution may be moved upwards in the spinal canal by tilting the x-ray table. All water-soluble contrast media are quickly absorbed from the cerebral spinal fluid into the serum. Metrisamide is 99% absorbed in a matter of three hours.

The water-soluble contrast media have been used in Western Europe for lumbar myelograms for over a decade. In the United States, the FDA has opposed their use for myelograms on the basis of their potential neurological complications such as sphincter disturbance or paraparesis. This fact is undisputed for compounds such as Dimer X (Conray) or Kontrast U (Abordil) but it should be stressed that, properly used, the water-soluble contrast media are not more dangerous to the patient than the disc operation performed by an expert surgeon. Moreover, Metrisamide is totally innocuous to the spinal cord.

In our Institution, Clinique Reine Fabiola, Belgium, over 1,000 water-soluble contrast medium lumbar myelograms have been performed in the last 10 years without neurological complications. It is our belief that water-soluble contrast media provide much more information than iodophendylate (Pantopaque) because they fill the nerve root sleeves. This gives one more morphological parameter to integrate in the diagnosis of a herniated disc (Figure 1).

All neurosurgeons know that ill-adevised disc surgery as well as repeat disc surgery may be the beginning of a life-long ordeal for the unfortunate patient plagued with pain.

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Figure 1

All nerve roots sleeves from L3 through S2 are demonstrated on the right side in this patient with right sciatica. No HNP.
Water-soluble contrast medium myelogram

Disc pathology

When dealing with unilateral root pain in the lower extremities, two kinds of disc pathology may be encountered, i.e., a herniated disc or a bulging disc (protruding disc). A disc herniation is made up of one or several disc fragments either free in the spinal canal or extruded under the posterior longitudinal ligament. In this case, incising the latter allows the disc material to egress either spontaneously or with the assistance of a nerve hook that teases it out.

In a protrusion (bulging disc), the disc material has to be pulled out of its space with a forceps after the posterior longitudinal ligament has been opened.

If surgical operation is the obvious answer to herniation, we feel that bulging discs should not be operated upon if the differential diagnosis between both types of disc pathology could be made before the operation. Indeed, for the occasional patient suffering from a bulging disc who does well after surgery, many others keep complaining and account for most of the failures of disc operations. In our opinion, disc bulging most of the time is a red herring in patients with nerve root pain. We can be sure that many asymptomatic persons have one or more bulging discs.

The water-soluble contrast media

The water-soluble contrast medium lumbar myelogram is of great help in the differential diagnosis between a herniation and a protrusion. As they were made available, three water-soluble contrast media have been successively used in our institution: first, Kontrast U (similar to Abrodil), then Dimer X (similar to Conray) and, finally, in 1976, Metrisamide. The latter offers several advantages, the main one being its nontoxicity for the spinal cord. This makes it suitable for cervical myelograms as well as for checking the upper lumbar and lower thoracic areas if the routine lumbar myelogram is normal.

Metrisamide is a nonionic compound of low osmolality. This explains its low toxicity as the more hypertonic a compound is, the more toxic to the nervous tissue it becomes. Its very low density as compared to previously used contrast media explains the better filling of the nerve root sleeves and its high iodine concentration makes it an outstanding contrast medium as compared to others. There remains, however, a drawback, and that is its epileptogenic tendency if it reaches the convexity of the cerebral hemispheres, a definite hazard in cervical myelograms. It is reported that the prophylactic use of Phenobarbital (100 mg the night before the study is made, 100 mg before the patient leaves the floor and 100 mg 8 hours after the study) prevents the patients from developing seizures.

Scanning in Myelography

Whatever water-soluble contrast medium is being used, one should always "scan" the dural sac. If Metrisamide is used, it can be injected with the patient in the sitting position. Afterwards, he is placed on the symptomatic side with the head end of the x-ray table tilted 15 degrees up. The x-ray tube is positioned in front of the patient. After the first x-ray is taken, the patient is turned forwards 10 degrees at a time on three occasions and each time an x-ray taken. The x-ray tube is now placed above the patient for a lateral view, the patient having moved back on his side; then he turns into a prone position for an A.P. view. Finally, he lies on the asymptomatic side and the procedure outlined above is repeated.

"Scanning" the dural sac is of utmost importance. Experience has shown that a nerve root sleeve may not fill at first, but does so as the patient is turned forwards and successive films are taken (Figures 2 and 3). In such cases, we found, at operation, that we were dealing with a protrusion rather than a herniation. Another important feature to stress is that one should always compare the x-rays taken with the patient lying on
The arrows point to the left S1 nerve root sleeve which, in Figure 2, this page, does not fill whereas it is filled in Figure 3, opposite page, when the patient was moved farther forwards during the dural sac scanning process.
Water-soluble contrast medium myelogram
Labasse

each side, as will appear from an account of anomalies corresponding to disc herniation at various levels.

Lumbar myelogram abnormalities

1) Complete block
   Any kind of contrast medium may demonstrate this.

2) Dural sac filling defects
   a) Anteromedial filling defects usually are related to a bulging disc in those patients suffering from unilateral root pain and/or low back pain (Figure 4). However, in the presence of a cauda equina syndrome, a large filling defect may correspond to a medial disc herniation. It should also be noted that these defects may be observed at several levels (multiple bulging degenerated discs). Moreover, they can be associated with an anterolateral filling defect.
   b) Anterolateral filling defects are due to a herniated disc (Figure 5) and are associated with a nerve root sleeve defect.

3) Nerve root sleeve filling defects vary in significance according to the level at which they occur and the presence or absence of the same finding on the asymptomatic side (see below). Most of the time, they correspond to a herniated disc (Figure 6).

4) Filling asymmetry of the sleeves of both S1 nerve roots, in our experience, is related to a herniated disc in patients suffering from unilateral root pain, the shorter nerve root sleeve being on the symptomatic side. This is a rather uncommon finding seemingly encountered in patients with a short dural sac. In those cases, the S1 nerve root sleeves take off higher in the spinal canal and, by the same token, are longer. If one of them overrides a herniated disc, it may fill incompletely. Hence, before labeling a lumbar myelogram “normal” in a patient with unilateral nerve root pain, one should always compare both sides of the myelogram.

Myelographic findings in herniated discs.

According to the level considered, a ruptured disc may give rise to various myelographic pictures, as follows:

L3-L4 HNP. This shows up on the myelogram as a L4 nerve root sleeve defect which may or may not be associated with an anterolateral dural sac defect.

L4-L5 HNP. Unless there is an obvious anterolateral dural sac filling defect which reflects a ruptured disc, this diagnosis is difficult to ascertain from the myelogram. If there is an unilateral nerve root sleeve defect on the symptomatic side, the chances are that it corresponds to an HNP; in only one case have we seen this happen with a bulging disc.

However, many patients especially in the older age group have a myelogram with bilateral L5 nerve root sleeve defects, although their root pain is unilateral. In such cases, the defect on the asymptomatic side is likely to result from a protrusion, whereas on the symptomatic side it does not always reflect a ruptured disc. In a sizable number of patients, it is also associated with a disc protrusion. Only the clinical picture leads you to operate or to hold off.

L5-S1 HNP. Here, there is a nerve root sleeve filling defect associated or not with a dural sac filling defect on the symptomatic side. In rare cases, we find only an asymmetry of both S1 root sleeves filling, the one on the symptomatic side being shorter.
Figure 4
Anteromedial dural sac filling defect related to bulging of the medial portion of the L4-L5 disc.
The arrow points to the anterolateral filling defect of the dural sac. This is associated with non-filling of the left S1 nerve root sleeve due to a left L5-S1 HNP.
Water-soluble contrast medium myelogram

Figure 6
Left L4 nerve root sleeve filling defect due to a left L4-L5 HNP.
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