Dimer-X Myelography, Including the Neck

P. D. DE VILLIERS

SUMMARY

Water-soluble Dimer-X (Maybaker) is generally recommended for the limited examination of lower lumbar radiculography, in a dose not exceeding 5 ml, diluted with cerebrospinal fluid.

In the light of experience of over 600 examinations, 3 modifications of technique are recommended:

1. The routine use of a 10 ml dose of undiluted Dimer-X for adults, for diagnostic accuracy.

2. Extension of the examination to the thoracic and cervical regions whenever necessary.

3. Routine drainage of the contrast medium after examination.

The reasons for the recommended changes are indicated.

S. Afr. Med. J., **48**, 2629 (1974).

We have performed 637 Dimer-X radiculograms and myelograms at Eugene Marais Hospital, Pretoria. We used 10 ml of undiluted contrast medium as a routine in adults, this being double the recommended dose. During higher lumbar region examinations, contrast medium was often seen to extend into the thoracic region without apparent ill-effect. Since Dr Lombaard's[1] successful examination of the thoracic region in a paraplegic child, we have included thoracic myelography in more and more of our cases, bringing the present total of thoracic Dimer-X myelograms to 194. In thoracic examinations contrast inevitably sometimes spilled over into the cervical region, which has encouraged us to extend the examination to the neck in 51 cases.

In the last 57 cases of the series we drained the contrast medium after examination, and wish to advocate this precaution strongly, in view of the incidence of unpleasant side-effects and the (remote?) possibility of inducing arachnoiditis.

The first 130 large-dose lumbar and thoracic myelograms have been reported previously.[1]

PATIENTS AND METHODS

Patients were referred because of symptoms and/or signs suggesting possible compression of the cord and spinal nerves. These indications did not generally differ from the indications for myelography, except that myelography is much more commonly requested by clinicians than in the days before Dimer-X. Clinicians who have seen the results are thoroughly convinced of the diagnostic superiority of the new method. Many orthopaedic surgeons who used to operate 'blind' on some suspected disc lesions, rather than subject patients to myelograms and still be left in doubt, now prefer routine pre-operative Dimer-X myelography. They are now usually willing to cancel a planned operation on the evidence of a negative myelogram. A number of patients in whom myelography with oily media had been negative, were referred for re-examination, and a number of chronic sufferers and patients with disappointing results after previous operations were referred for reassessment.

Apart from specific indications of localisation above the lumbar region, the thoracic region is included in the examination whenever there is any doubt at all about lumbar localisation of a lesion, whenever the lumbar examination is negative, and in all patients who have already had unsuccessful operations on the spine. (Incidentally, the incidence of unsuspected, significant abnormalities in the thoracic region has been negligible.)

Of the 51 examinations of the cervical region, 7 were for suspected Arnold-Chiari malformations.

Pre- and Postmedication

All our patients are given 10 mg Valium by injection before examination. Before we introduced routine removal of contrast, we combined the Valium with Depo-Medrol. All patients take 5 mg Valium with 2 Panado tablets 3 times daily for 2 days after examination, to avoid headaches and other discomfort. **All patients are kept under observation in hospital for one full day.**

The Dose of Dimer-X

Anyone with experience of the 5-ml dose for radiculography or myelography will agree that the volume is often too small, or the dilution too great, for confident conclusions. In a patient with a wide spinal canal, diagnosis must often be inaccurate.

The 10 ml Dimer-X is injected undiluted, usually by lumbar puncture, the patient lying on his side on a screening table with his feet tilted down by 10° or 15°, and his head propped high on a bolster or firm pillow.

Positioning and Radiography

Care is taken to keep the contrast medium out of the patient's head throughout the examination, and for 6 hours afterwards: **the patient will surely develop convulsions if the table is tilted into the Trendelenburg position without his head having been elevated, or if he lies flat in bed after the examination.**

Eugene Marais Hospital, Pretoria
P. D. DE VILLIERS

Date received: 22 May 1974.

All films are taken on the cassette carrier of the screening table, with the single exception of the lateral projection of the neck, which is done with a horizontal beam. The risk of contrast running into the head would be too high, if the patient were turned on his side after the spinal canal of the neck had been filled.

The lumbar region is examined first, with the feet tilted as low as the appearance on screen control dictates, which may rarely be nearly erect for filling of the sacral canal in the prone position. For the necessary projections the patient lies firstly on his side, then prone and prone oblique. It is necessary to film a separate series each for the lower half and the upper half of the lumbar region.

The thoracic region of the canal is best filled with the patient lying on his side, the head of the table tilted down by not more than 10° to 15°, with his head flexed laterally to the upper shoulder. After a lateral film has been exposed, the patient is promptly turned onto his back, without the table's being levelled, while the head is kept well flexed. By this manoeuvre the thoracic curve is filled quickly and effectively. The table is levelled before the anterior exposures are made.

Filling of the cervical canal requires a little extra care, but very little time. It is never necessary, or indeed desirable, to tilt the head of the table down by more than 10 or rarely 15°. A table with the facility for more than 15 tilt is therefore no longer necessary for myelography, nor do we need shoulder rests. We start from the position in which the patient lies supine, with the neck well flexed and the contrast pool in the thoracic kyphotic hollow, and the patient is to be turned prone. The secret of success is not to raise the shoulders at any stage, as this would run the contrast back to the lumbar

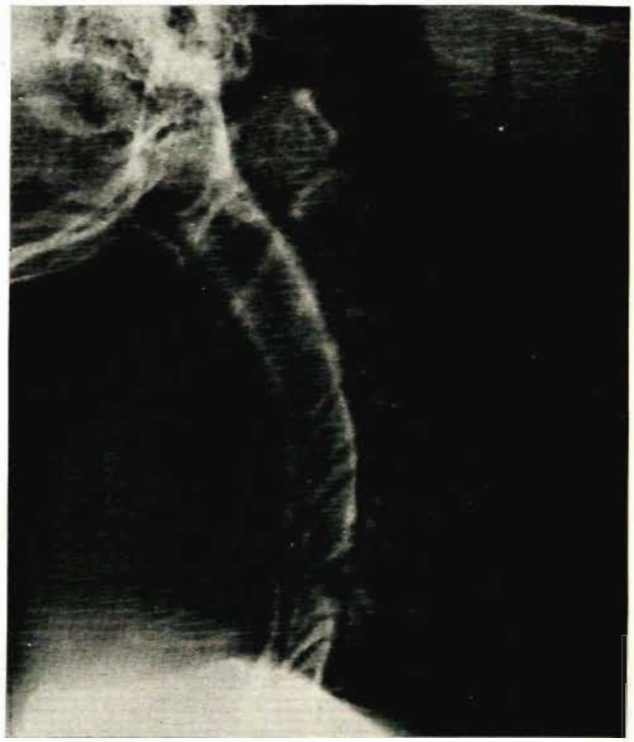

Fig. 2. Cervical myelogram, lateral view, prone. Large pressure effect at level C5-6.

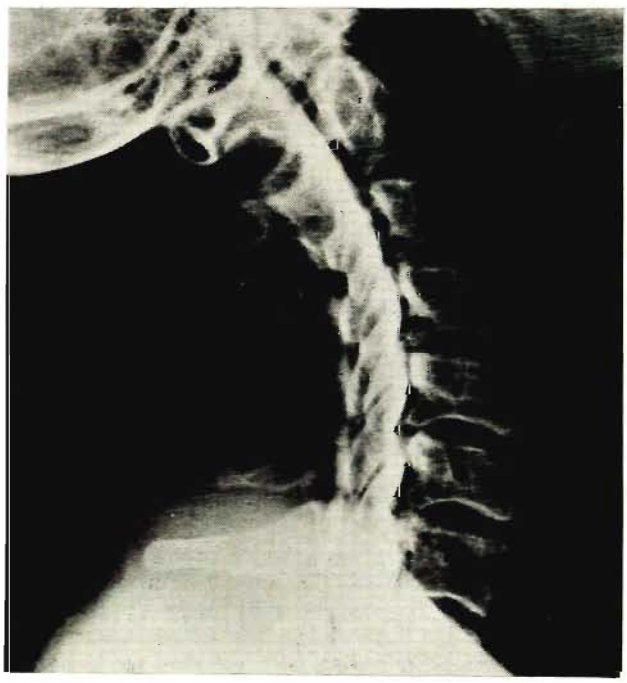

Fig. 1. Lateral view of cervical Dimer-X myelogram, prone. Multiple pressure effects opposite discs.

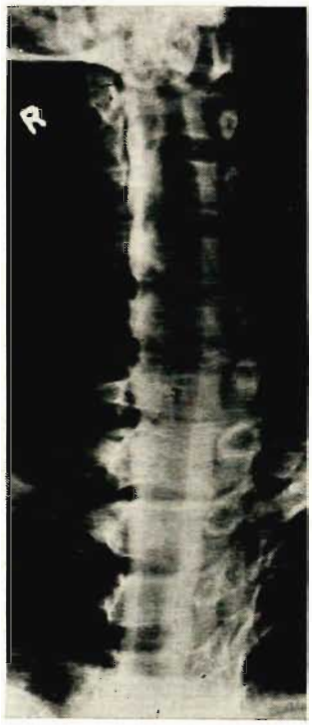

Fig. 3. Cervical myelogram, oblique view.

curve. We keep the head of the table tilted down by 10° or slightly more during rotation. The patient lies supine first, with head flexed, then on his side with head tilted to the upper shoulder, then prone, with the head extended fully. The operator guides the head during rotation, and screen control is unnecessary. There will now be a pool of contrast in the cervical canal, and the table may even be levelled for the exposures: an anteroposterior projection on the screening cassette, and a lateral view with horizontal beam (Figs 1 and 2). Oblique views can also be obtained by turning the head laterally, but always without lowering it (Fig. 3).

It is possible, in this prone position, with a 15° tilt and slight flexion of the head, to get a lateral view of contrast running upwards over the clivus and upper surface of the sella. However, in one early case, by overtilting the table, we ran contrast over the inferior surface of the frontal lobes as well, and our patient suffered from convulsions.

If the area of the foramen magnum and cerebellar tonsils is to be examined (for which the indications are fortunately less common), a similar additional risk will have to be faced. The patient is now turned supine, the head is slightly extended, and a lateral film is immediately exposed. The head is flexed again at once, and the feet tilted downwards. The lateral view of the cistern should outline the cerebellar tonsils. The anteroposterior projection (Fig. 4) of this region is less informative than with Myodil, but the lateral view will be found to be adequate.

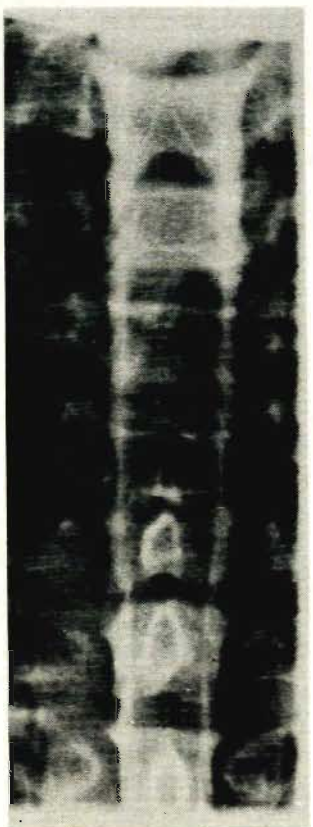

Fig. 4. Anterior view of cervical myelogram.

There does not appear to be any harm in keeping the contrast in contact with the spinal cord in the thoracic and cervical regions for many minutes. Fortunately, the Dimer-X does not mix so completely with cerebrospinal fluid that it cannot run down to the lumbar region again afterwards.

COMPLICATIONS AND REACTIONS

The untoward effects and accidents of Dimer-X radiculography have repeatedly been documented more accurately, and in larger series than we hope to repeat. None of these includes larger doses, or thoracic and cervical examinations. The Maybaker publication[2] quotes a French report by 14 (!) authors on well over 3 000 collected cases of Dimer-X radiculography. Our own experience of the incidence of serious complications correlates with their figures. They found fainting and circulatory collapse in 3% of cases, and thought these might have been due to the effect of lumbar puncture, accentuated by the injection. Vasopressor drugs are recommended. Clonic spasms are reported as occurring in 1% of cases, and are said to be prevented or cured by diazepam (Valium) repeated every 4 hours. Spasms may be severe enough to produce vertebral compression fractures.[3]

Our follow-up of minor reactions like headaches and other aches was not good enough to have statistical value. Headaches are not uncommon after Dimer-X myelography, generally, (or even after lumbar puncture), but we hope to keep the incidence and severity low with Valium and Panado given for 2 days after examination. Occasionally headaches persist for 2 to 3 weeks.

Nausea and vomiting are rarely seen, for a variable time after examination.

Of the more serious complications with which we are mainly concerned, myoclonic spasms and circulatory collapse may each be expected to occur once in every 100 examinations. Convulsions are probably avoidable. The possibility of arachnoiditis has not, we believe, finally been obviated.

Convulsions

This has been a feared complication of myelography with water-soluble compounds. In our 51 cervical myelograms we have seen it happen 3 times, quite obviously only when a fair amount of the Dimer-X is allowed to overflow into the cranial cavity. With a little care this is always avoidable in examination of the neck itself.

In examinations of the inferior surface of the cerebellar tonsils, some contrast must inevitably enter the great cistern, apparently without ill effect. However, when we have poured contrast upwards over the clivus and the sella, and inadvertently over the inferior surface of the frontal lobes, our patients have suffered from convulsions — the suprasellar cisterns are more comfortably examined with air! We believe that convulsions need never happen

again with cervical myelograms, once it is realised that the degree of tilting required for oily media must be strictly avoided. Before the present series of large-dose myelograms, convulsions were also seen in 3 patients who lay flat in bed after lower lumbar radiculography with 5 ml doses of Dimer-X.

Myoclonic Spasms

Painful cramps in the legs on the first day or 2 after examination was a frequent complaint of our early patients. More severe myoclonic spasms of the back and limbs were seen in 5 patients, twice with voiding of urine during spasm and once with loss of consciousness, but never with cyanosis. These spasms, like convulsions, are said to be best treated with Valium. Apparently 30 to 40 mg is required, in divided doses. We have seen no response whatever to a 10-mg injection.

Shock

Simple fainting with sweating, pallor and momentary loss of consciousness, occurs occasionally at some stage of the examination, sometimes before introduction of the contrast medium (or even on premedication). However, in our 637 cases we have seen 6 rather more alarming cases of another kind of shock reaction, with pallor, pulselessness and loss of consciousness, occurring some 10 minutes after examination, and being unassociated with the profuse perspiration of syncope. Fortunately the attacks have never lasted more than a few minutes. These patients could not, of course, be nursed in a horizontal position after introduction of the Dimer-X. We treated them with rapid intravenous saline infusion, which was possibly alarmist treatment. The pulse was already returning by the time the drip was started. We should, however, be warned of reactions of this kind, and should make sure (as with all contrast examinations) that efficient methods of artificial respiration and cardiac massage are at hand.

Arachnoiditis

Aggravation of symptoms occurs occasionally after Dimer-X myelography, but is naturally difficult to evaluate. Possibly patients with residues of oily media in the nerve sheaths suffered more aggravation of symptoms, but this was only an impression. It would seem reasonable to assume that pre-existing arachnoiditis is likely to flare up on the introduction of any new irritant.

Arachnoiditis is the most persistent and irreversible complication of myelography. It has always been known to be a very real danger after myelography with oily media. Some people believed that the bleeding produced during attempts at aspiration of the contrast only increased the risk. It is very common to find at least occlusion of the lumbar root sheaths in patients who have had previous myelography with oily media (much like the appearance commonly seen in patients who have had previous spinal surgery).

Earlier forms of water-soluble contrast media for myelography, such as Abrodil, became notorious for a high incidence of arachnoiditis, and distressing permanent symptoms such as incontinence.

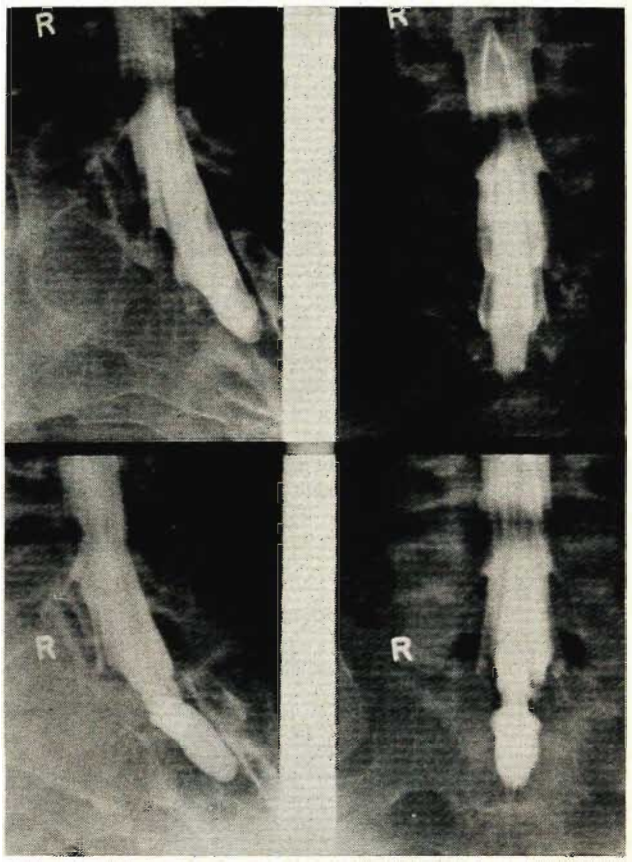

Fig. 5. Arachnoiditis after myelography and laminectomy. Top pair: **anterior and oblique views of a disc prolapse.** Bottom pair: **anterior and oblique views 6 months later, with distal thecal sac stenosis.**

Dimer-X is obviously less irritant than any myelographic medium previously used. We repeated a number of Dimer-X myelograms after a varying interval of months, and demonstrated clean nerve sheaths. However, in 2 patients a re-examination after 6 months showed an alarming change, with severe stenosis of the distal thecal sac, and occlusion of nerve sheaths (Fig. 5). One of the patients had meanwhile also been subjected to laminectomy, and the other to a discogram and intradisc medication. The relative responsibility of the myelogram and the operative procedure for the stenosis is difficult to apportion, but for the moment we should accept that it is not impossible for a Dimer-X myelogram to cause arachnoiditis. French workers with very extensive experience of Dimer-X have recently stated that 'the development of arachnoiditis due to its use for radiculography cannot be entirely excluded'.[1]

DRAINAGE OF CONTRAST MEDIUM

We have had far better results since we introduced routine withdrawal of Dimer-X after myelography or radiculography. So far, in the 57 cases in which this has been done, we have seen no muscle spasms and no shock. Much more important, we hope never to see arachnoiditis developing.

The major advance with Dimer-X myelography is accuracy of diagnosis. Convenience is only a welcome byproduct. If the contrast medium is not withdrawn, it virtually disappears from the cerebrospinal fluid within 6 to 12 hours, and is excreted by the kidneys during the first 3 days. However, drainage of most of the contrast medium, mixed with cerebrospinal fluid, is a simple matter for both the patient and the operator. The patient lies on his side in a position of scoliosis, obtained by raising the shoulders and head on bolsters, and tilting the foot of the screening table **up.** After reintroduction of the lumbar puncture needle (through the area anaesthetised for the first puncture), screen examination will ensure that the needle point lies in the opaque column. We have found drainage to be easier through a slightly higher rather than through a lower puncture.

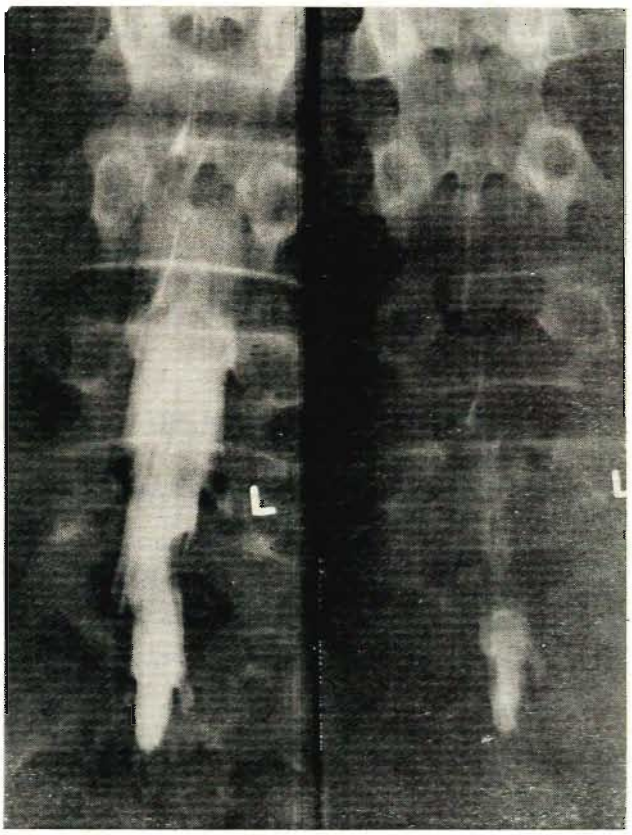

Fig. 6. Erect films of the lower lumbar region before and after drainage — an average result. Sometimes practically all the visible contrast can be removed, sometimes more remains.

After simple passive drainage of 15-20 ml of fluid the contrast will be seen to be markedly reduced (Fig. 6). We estimate that not more than about 2 ml of diluted Dimer-X should remain.

CONCLUSIONS

One is always loath to introduce an unabsorbable contrast medium into the spinal canal without knowing whether it will produce arachnoiditis, how much of it will be left behind, or how much blood may mix with it during attempted extraction. It is always disconcerting to see the droplets left behind in the head after cervical myelography, and their persistence years later.

The dense media, obscuring detail and breaking up into oily globules, producing false defects, have always been disappointing.

Water-soluble myelography has long been an ideal. Dimer-X has at last realised this ideal, as far as ease of examination and clarity of demonstration of the cord and nerve roots are concerned. For diagnostic accuracy it leaves nothing to be desired. However, accuracy of diagnosis requires doubling of the recommended dose to 10 ml. Even with the better opportunity afforded by the larger dose, careful study may be required to recognise minimal signs. The incidence of serious reactions did not appear to be higher with the larger dose, nor with examinations, including the thoracic and cervical levels.

In view of the possibility of arachnoiditis, it appears reasonable to drain even the water-soluble medium after examination.

It is hoped that the present report may be reassuring, even to workers who still prefer to limit Dimer-X examinations to the lumbar or lower lumbar region, as it will indicate their considerable safety margin. We believe that experience will prove the 5-ml dose unsatisfactory to most workers. We also believe that Dimer-X will soon be preferred to oily media for all segments of the spinal canal in most centres where investigations of this kind are done regularly.

It is wise to remove the contrast medium after examination, whatever the dose.

Dimer-X examination should not be done as an outpatient procedure, although 97% of patients are likely to suffer no serious reactions.

REFERENCES

1. De Villiers, P. D., Lombaard, C. M. and Nel, L. (1973): S. Afr. Med. J., **47**, 2461.
2. May & Baker (1972): *Preliminary Information on Dimer-X for Clinical Investigators,* 2nd ed. Dagenham, Essex: May & Baker.
3. Haase, J., Jepsen, B. V., Bech, H. and Langeback, E. (1973): *Neuroradiology,* vol. 6, pp. 65 - 70. Berlin: Springer-Verlag.
4. Cécile, J. P., Regnier, G., Quaguiére, A., Doffiny, L. and Cuvelier, A. (1974): *Ibid.*, vol. 7, pp. 167 - 172.