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DIAGNOSTIC PUNCTURE OF INTERVERTEBRAL DISKS IN SCIATICA

BY

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In early stages the degeneration of a lumbar disk is often followed by a radial rupture of the annulus fibrosus, that is a channel through which the central masses of the disk herniate and cause a protrusion of the corresponding part of the disk surface (Figs. 1-2). In the lower lumbar region the usual direction of a radial rupture is postero-lateral or posterior. The neighbouring roots and nerves are compressed to a very great extent. These facts were established by anatomical studies on disks, injected with red lead through anterior punctures (*Lindblom* 1941 and 1944). The red lead filled the central cavities of the nucleus pulposus (*Luschka*) and passed through the radial ruptures to the surface of the disks, spreading concentrically under the outmost layer of the annulus or outside the annulus along nerves and other structures.

Since the red lead leaked through the disk ruptures in the anatomic specimens another contrast medium injected in living human should also demonstrate the presence of radial ruptures and disk protrusions. The original intention was to continue the anatomical studies on clinical material, but reports of disk lesions caused by lumbar punctures (*Pease*, and others) made me hesitate. In 1941 *Lindgren* demonstrated a case of normal disk injected with parabrodil, but on account of the above mentioned lesions, I warned against the method. Later *Hirsch* found that disk punctures during operation caused no immediate

prolapses through the puncture canal and no consecutive troubles. On the bases of theses observations, I resumed my original intention of performing diagnostic disk punctures.

INDICATIONS

So far the indications for a diagnostic disk puncture is long-standing sciatica, which was not improved by conservative treat-

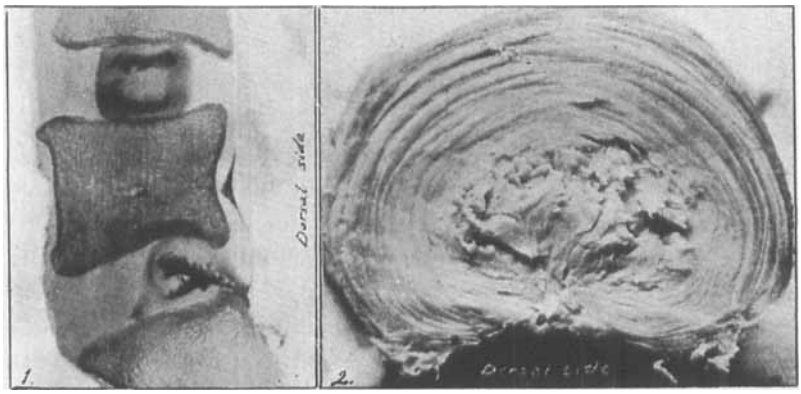


Fig. 1.

Lateral roentgenogram of an anatomic specimen after injection of red lead into disk cavities. The upper disk is normal. The lower disk has a posterior rupture with leakage to epidural spaces. The ragged contours of the ruputre correspond to the edges of the torn fibres of the annulus. af the rupture correspond to the edges of the torn fibres of the annulus.

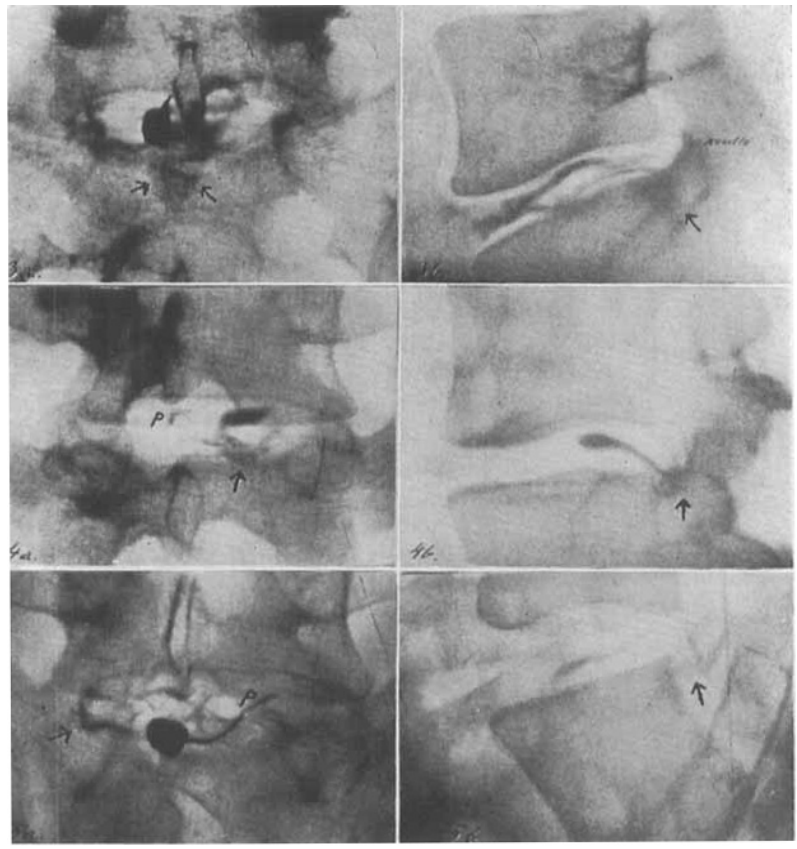
Fig. 2.

Photograph of a disk with a posterior radial rupture.

ment and which had been myelographed by abrodil without definite localization of the disk protrusion.

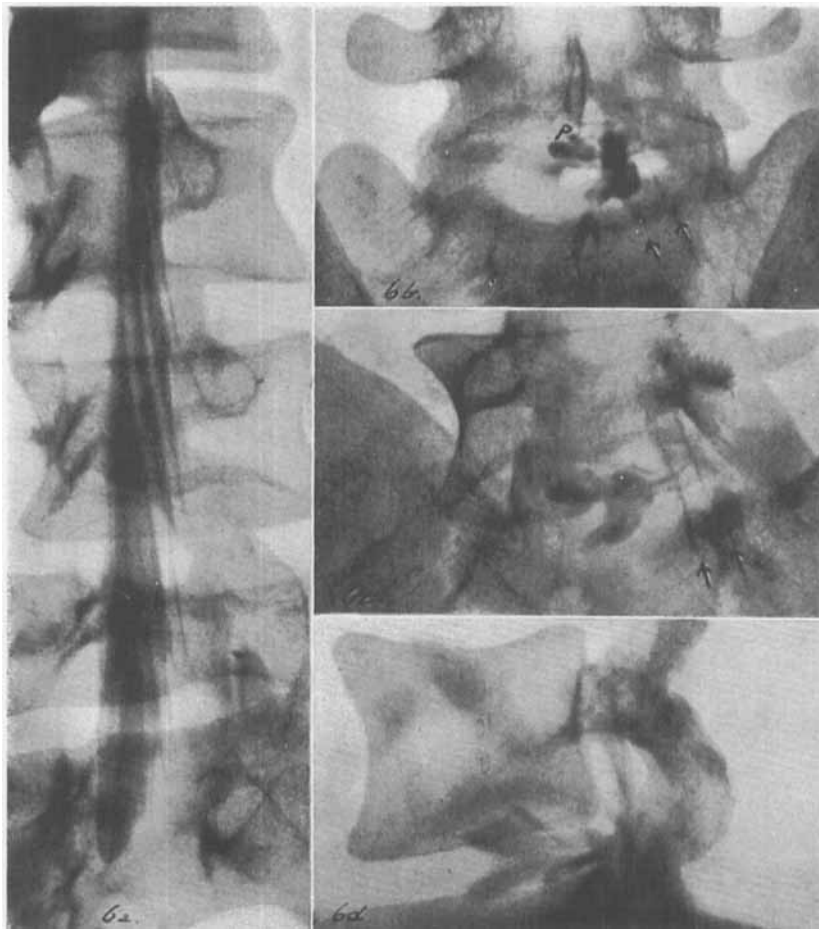
The radial ruptures of the disks cause nerve compressions in the region of the intervertebral foramina, where the homonymous nerve crosses the disk. These lateral compressions are very common in anatomical material (*Lindblom*) and also seem to be a usual cause of sciatica in clinical material (personal communication by *Hirsch*). In cases of short root sheathes also

disk protrusions into the spinal canal may escape detection through myelography; the disk prolapse is too lateral in relation to the extension of the dural sac even if the medium is abrodil, which fills the root sheathes very completely.



Figs. 3-5.

A.p. and lateral roentgenograms of three cases of ruptured L 5 disks injected with perabrodil. Figs. 3 a-b illustrate the position of the needle. and anterior and posterior ruptures with a medium desosit (↑) of contrast under the posterior longitudinal ligament. Figs. 4 a-b show a posterior rupture similar to that in Figs. 1-2. Figs. 5 a-b demonstrate a dorso-lateral rupture toward the right intervertebral foramen. (↑).



Figs. 6 a-d.

A case of lumbago-sciatica. Myelogram with abrodil and roentgenograms after L 5 disk puncture and injection of perabrodil. The myelogram does not demonstrate the compression of the left S. 1. The disk puncture shows a posterior rupture toward S 1 with communication to the perineural space of the S 1 (↑). Healed by lateral incision and curettage of the disk.

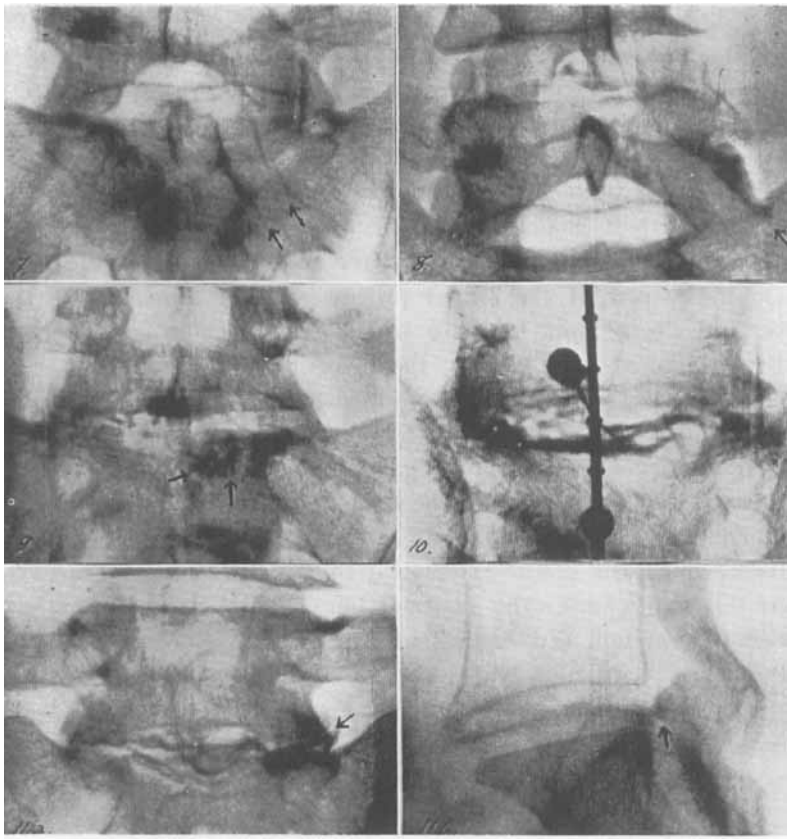


Fig. 7.
Injected L 5 disk with communication with perineural space of left S 1. (↑).

Fig. 8.
Injected L 4 disk with communication with the perineural space of left L 5 (↑). Puncture canal atP.

Fig. 9.
Injected L 5 disk. Epidural deposit of mottled appearance (↑).

Fig. 10.
Injected L 5 disk. Advanced degeneration with cavity in the whole disk.

Figs. 11 a-b.
Injected L 5 disk in late stage of degeneration with dorso-lateral leakage toward the left intervertebral foramen (↑).

TECHNIQUE

In outlines, the procedure of the diagnostic disk puncture is the following: Under control of screening and roentgenography a tiny needle is inserted into the nucleus of the disk. A little amount of a wetersoluble contrast medium is injected and the spreading of the medium is studied on roentgenograms.

The patient is placed in a prone position with pads under his stomach. A centimeter indicator scale is fixed to the back along the row of the spinal processes. In a lateral view the vertical depth from the skin to the disk nucleus is measured. By the aid of an a.p. view the insertion point on the skin is determined. The puncture is performed by a double needle, the inner one with a diameter of 0.5 mm. The outer needle is inserted to the posterior longitudinal ligament. The inner needle is forced through the ligament into the disk to its centre. The puncture is controled by screening in antero-posterior direction; the insertion of the needle is vertical in the direction of the rays. As the needle passes the posterior longitudinal ligament a slight resistance is felt, and the patient notes a back pain as a moderate lumbago.

The opaque medium is a mixture of 2 cc of 35 percent perabrodil or diodrast and 0.5 cc of 2 percent novocain. An amount of 0.5-2 cc is used. The injection is followed by low back pain, and in cases of ruptured disk a sciatic pain may occur. If the punctured disk is the cause of the symptoms of lumbago and sciatica, the pains caused by the injection will remind the patient of his usual complains. Thus he may note that the injection lumbago is at the same level or at a higher or lower one. If his usual sciatic pains become worse by the injection this means that the punctured disk is the ruptured one responsible for the root or nerve compression.

Material and roentgenographical appearance of injected disks.

Until now 13 patients were examined by disk punctures. The number of injected disks was 15: the fourth disk in 5 cases, the fifth in 10 cases.

Only in one case was the punctured disk normal or almost normal. Radial ruptures towards the spinal canal were present in 8 disks. Postero-lateral ruptures towards the intervertebral foramina occurred in 3 disks. The remaining 3 disks showed a spreading of the contrast medium in the whole disk as a sign of general degeneration without remnants of the original rupture and without spreading of the contrast outside the disk.

Radial ruptures are illustrated in Figs. 3-6. Most easily interpretated is the rupture in Figs. 4 a and b. From the puncture canal (p) the opaque solution has filled an oval cavity somewhat to the right near the disk centre. From this cavity the solution runs backwards to an irregular cavity at the posterior side of the disk, that is into the disk prolapse. In Figs. 5 a and b the rupture runs to the left into the intervertebral foramen, where the disk prolapse was found. Figs. 3 a and b illustrate a posterior rupture in the midline with the contrast spreading on the dorsal surface of the sacral corpus under the posterior longitudinal ligament; in this case ruptures are seen also in anterior direction.

It is known, from the anatomical studies mentioned above, that the cavities in a ruptured disk may communicate with the epidural and perineural spaces and that a high pressure by injection may establish an artificial communication with the adjacent veins epidurally and in the vertebral bodies. The epidural and perineural spreading of the opaque solution is demonstrated in the cases illustrated in Figs. 6 a-d, 7 and 8. In Fig. 8 the solution surrounds the lateral side of the fifth nerve, coming from the injected fourth disk and escaping through a dorso-lateral rupture towards the intervertebral foramen. The other cases had ruptures of the fifth disk into the spinal canal, and the solution surrounds the first sacral nerve epidurally. The epidural deposite of solution may be mottled as demonstrated in Fig. 9.

In cases of general degeneration of the disk the opaque solution spreads in the whole disk as illustrated in Figs. 10, and 11 a and b. In the latter case the solution also ran outside the disk in a dorso-lateral direction; the operation revealed a lateral

disk prolapse in the intervertebral foramen under the fifth nerve, and the patient was free from symptoms immediately after operation.

The value of diagnostic disk puncture.

Until now we dispose of too little material to warrant general conclusions on the value of the diagnostic disk puncture. However, as related above the symptoms of pains give a definite hint as to whether the punctured disk is the right one or not. In a few cases of advanced degeneration with wide-spread ruptures in different directions the interpretation of the roentgenograms may be difficult, but on the whole, of all methods the diagnostic disk puncture gave the most exact diagnosis and the agreement with the operation findings was complete.

The diagnostic disk punctures were not followed by any late complaints of the patient or other complications. In the first cases the outer needle was inserted only to the ligamentum flavum and the inner needle was to flexible to retain direction; thus it was difficult to reach the disk centre. In two cases no injection could be made for the same reason. At the insertion of the needle through the dural sac two patients experienced shooting pains from root puncture; but after a slight change of direction the needle bypast the roots without causing pains.

SUMMARY

Diagnostic disk puncture with injection of opaque medium demonstrates disk ruptures and protusions and tells if the patients symptoms originate form the punctured disk. The method seems to be of great practical value.

RÉSUMÉ

La ponction diagnostique du disque intervertébral suivie d'une injection de substance opaque, met en évidence les ruptures et protrusions du disque. Elle précise, egalement, si le disque en question est bien celui qui cause les symptomes du patient. La méthode semble être d'un vif intérêt pratique.

LIST OF AUTHORS

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