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AN ATTEMPT TO DIAGNOSE THE LEVEL OF A DISC LESION CLINICALLY BY DISC PUNCTURE

BY

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In recent years spinal fusion has been increasingly used in the treatment of recurrent low back pain. Its aim is to eliminate movement in one or more intervertebral spaces and joints by transplanting bone to between the spinous processes or onto the vertebral arches. There is increasing support for the view that lumbar pain arises from changes in the intervertebral discs.

PATHOLOGICAL ANATOMY

It appears from the anatomical investigations of *Friberg* and the author (1948) that degeneration of the lower lumbar discs is usually accompanied by rupture of the posterior border of the annulus fibrosus. This means that the protection which the annulus gives against the posterior longitudinal ligament and the dural sac is reduced. It seems that when there is a rupture of the annulus the pressure which occurs within the disc with movement is distributed unfavourably and one would therefore expect degeneration in the lower lumbar discs to be accompanied by an increasing deformity of the disc posteriorly.

In some cases rupture of the annulus is limited to a small area and a marked local protrusion occurs, and gives rise to root compression if it is in the neighbourhood of a nerve root.

In other cases the deformity may be more diffuse and cause pressure on and change of tension in the longitudinal posterior ligament which contains nerves.

The structure of the disc when the annulus is ruptured suggests that intradiscal pressure is of considerable importance (see Fig. 1). When the annulus ruptures the direction of the fibres is altered and they deviate towards the periphery,

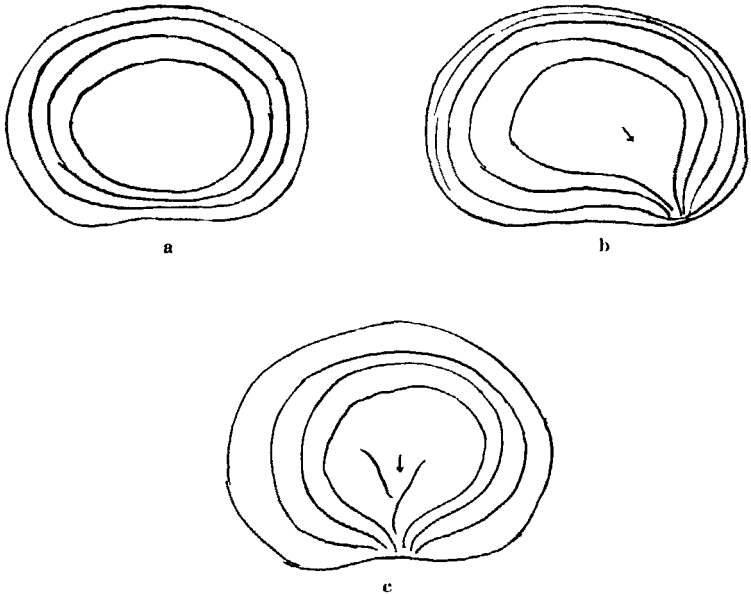

Fig. 1

(a) Normal disc structure.
(b) Lateral rupture in the posterior part of the annulus fibrosus.
(c) Midline rupture.
The ruptured cases show a change in the direction of the fibres.

presumably as a result of the pressure within the disc, and the nucleus is pressed out through the rupture towards the periphery. The nucleus is a plastic mass which distributes the pressure when the disc is compressed. When the annulus is ruptured its fibres are pushed aside and yield outwards. The result is an increased strain on the outer border of the disc.

In the lower lumbar spine ruptures of the annulus are often found in the posterior border of the disc either in the midline or laterally. The ruptures may be partial, and are then near the nucleus pulposus, or complete, across the annulus in a limited area. The whole structure of the disc is often altered as a result of the rupture. Most frequently one finds a bulbous formation of the fibrous structure of the disc (*Friberg* and *Hirsch*, 1948). One can imagine that the annulus behaves just like certain tendons (Achilles tendon, supraspinatus tendon), which with advancing age or increased strain show degenerative phenomena followed later by rupture and retraction of the fibres.

SCHEME OF THE INVESTIGATION

If it is true that rupture of the annulus fibrous weakens the posterior border of the lower lumbar discs, and thereby reduces their protection against mechanical strain, it is justifiable to wonder whether an experimental increase of pressure within the disc would elicit lumbar pain. Theoretically one can imagine that a weakened posterior barrier allows an increased deformity of the disc with protrusion to occur in certain positions and that this deformity causes irritation of the posterior longitudinal ligament and the lumbar pain.

In the following material we have studied the reactions of patients to pricking and pressure on the posterior border of the lower lumbar discs and to an increase of intradiscal pressure by the injection of normal saline. Further, we have studied the effect on the lumbar pain of the injection of small quantities of novocain (0.5 cc. 1 % solution) into the intervertebral space.

It is a common observation that lumbar pain can sometimes be produced in patients at lumbar puncture if the needle goes in too far, that is to say, if it reaches the disc. At this orthopaedic clinic we have sometimes observed, at operations for ruptured disc under local anaesthesia, that patients complain of pain in the back when a disc is pressed on.

TECHNIQUE OF DISC PUNCTURE

Radiographs of the lumbar spine, both antero-posterior and lateral, are taken to give an idea of the shape of the vertebrae and the height of the disc. Further lateral views are taken with the patient sitting on a table with maximum flexion of the spine (the legs hang over the edge of the table). One must have sharp pictures of the spines. These pictures show whether it is possible to puncture the disc by passing a lumbar puncture needle between the spines and transdurally. Sometimes the spines are so downwardly directed that it is impossible to draw a straight line between them to the disc without crossing bone. In such cases it is best to abandon the puncture investigation.

The patient is placed prone on an operating table in maximum flexion with a support under the iliac spines. The vertebral spines are palpated and their distal ends marked. Usually the disc is easily found if the puncture is made at the lowest border of the spinous process and the needle is pushed in at right angles to the spinal column. No local anaesthetic is injected into the skin as this may impede palpation. If necessary morphine and scopolamine may be given in the usual pre-operative doses.

The needle is pushed in a little way and then a lateral radiograph is taken to show whether the needle is correctly directed. If it is not, the needle is moved until the correct direction is obtained and is then pushed in. It is easy to know when it passes through the ligamentum flavum and enters the dural sac. It is now necessary to move it carefully so as to avoid damaging a nerve. When the disc itself is reached a relatively tough resistance is felt and yields suddenly as the needle enters it. The needle should pass about half a centimetre into the disc. Radiographs are taken to control its position.

When the needle is in position other discs are punctured. We have usually punctured discs 4 and 5, and in some cases also 3. It is simplest to begin with the fourth, as then the needle is well placed for puncture of the other two. It must

be admitted that it is sometimes difficult to place the needle correctly, but the procedure becomes easier with practice.

THE MATERIAL

The sixteen cases which were punctured were all cases of low back pain resistant to prolonged conservative treatment including both rest in bed and corsets. Some of the patients had, in addition, pain in the lower limb and some showed peripheral nerve signs which were compatible with root involvement, though there were no detectable changes in the abrodil myelogram. In all cases Lasègue's sign was definitely positive on either one or both sides. In most cases the radiograph was negative for disc degeneration (reduced disc space, sclerosis, osteophytes, instability).

FINDINGS

In all cases pain was produced from one or both of the lowest lumbar discs. The patients reported pain somewhere deep in the lumbar muscle and described it as typical of the back pain. In cases where one or other disc gave pain the patient recognised it as identical with his spontaneous pain. When two discs gave pain the patient could distinguish between the two pains and could say if both or only one corresponded with what he had felt previously. In such cases, where pain was produced from two discs, the patient could distinguish the different levels in the back.

In some cases discomfort was produced as soon as the needle penetrated the disc, and in others only when the needle was carefully moved up and down within the intervertebral space. In those cases in whom the puncture or movements of the needle increased the actual low back pain ½ cc. 1 % novocain was injected. Usually it was very easy to introduce ½ cc. but sometimes it was necessary to use considerable pressure on the syringe. The increased pressure would then be accompanied by a temporary increase in the patient's pain. After

two to three minutes the pain disappeared completely. The amount of anaesthetic used was too little for the effect to be due to anaesthesia of the epidural tissue or of a root. After three minutes the patient moved back to his bed and a few minutes later the Lasègue test would be negative or considerably reduced and the mobility of the spine normal. Spasm was relaxed and the patient considered himself quite free of his lumbago.

A neurological examination was made at 5 and 30 minutes after the injection. No evidence of anaesthesia in the lower extremities was found and no motor or sensory peripheral sign appeared. The patient was then allowed to get up.

Usually the effect was short-lived, about 2-4 hours. Two cases showed lasting freedom from pain: the others presented on the following day the same picture as before the investigation. In no case was the condition made worse.

When insertion of the needle did not cause pain, normal saline was injected under pressure. In some discs, this was impossible and little or no reaction could be obtained; in others, up to 2 cc. could be injected and pain was sometimes produced when the pressure in the syringe was increased. When it was released the patient's lumbago was relieved. Sometimes the patient felt first pain in the back and then, as the pressure was further raised, pain in the leg which entirely dominated the pain in the back and the patient would describe it as a typical root pain, corresponding in distribution with one of the two lower lumbar roots. Usually the patient was worse after the saline but after some hours his original condition was restored.

RESULTS

In 16 cases of severe lumbago it has been possible to produce pain identical with the patient's spontaneous pain by the introduction of a needle into one or both of the two lower lumbar discs and by increasing the intradiscal pressure.

COMPLICATIONS

There have been no complications. When the patients left the hospital they were carefully instructed to report any deterioration in their condition, especially the appearance of pain in the lower limbs. There has been no such case. There has been no evidence of disc rupture. 2 patients have been operated after disc puncture. In both cases the discs were explored to find if anything significant had occurred. No trace of the puncture could be found on the discs. Our experience from operations on ruptured discs indicates that incision of a disc does not lead to prolapse and this has been confirmed experimentally where puncture followed by compression gave no protrusion of the disc mass. The investigation has not suggested that the procedure causes any harm which might be a contra-indication to its use.

VALUE OF THE PROCEDURE

A follow-up investigation of cases of disc degeneration treated by spinal fusion in this orthopaedic clinic (*Unander-Scharin* 1948) has shown that the result is not always satisfactory. Some of the patients are not cured of their pain. There are many reasons why one sometimes fails to get the desired result. Whatever the technique, a certain percentage of failed fusions must be expected, and even successful grafting does not give complete fixation. The strains on the graft are considerable and fractures are not rare. In addition it has been made impossible to decide which disc is causing the patient pain. The evidence of a degenerated disc on the radiograph does not necessarily mean that it is that disc which is giving pain. From a study of over 9000 radiographs from cases with low back pain (*Friberg* and *Hirsch* 1948) it was shown that 39 % of all cases showed evidence of disc degeneration; while an anatomical investigation of 500 lumbar intervertebral discs (*Friberg* and *Hirsch* 1948) showed that definite changes, with rupture of the annulus fibrosus, could

occur in many cases without evidence of change in the radiograph. Thus a negative radiograph in no way excludes the possibility that the patient's pain originates in a disc. One must expect to see no radiographic changes in many cases of low back pain.

Disc puncture is an attempt to make a clinical diagnosis of the level of the lesion in lumbago.

It is difficult to judge the value of these investigations. A more exact picture of a disc's condition can be obtained by the introduction of a contrast medium, perabrodil, into the disc with subsequent radiography (*Lindblom* 1948), and this procedure is of considerable value. It reveals rupture of the annnulus and cavities in the disc.

In this clinic we have so far confined ourselves to the use of bone grafting to include both the disc with radiographic evidence of changes and the disc which gave rise to pain at the puncture investigation even though the radiograph was negative. We hope that the above investigation will lead to a better understanding of lumbar pain.

SUMMARY

In 16 cases of relapsing low back pain a transdural puncture of one or both of the two lowest lumbar discs produced pain identical with the patient's spontaneous pain. Pain occurred either at the moment of puncture or when the intra-discal pressure was increased by introducing normal saline under pressure. It rapidly disappeared, and the Lasègue sign was either markedly reduced or abolished, with the injection of ½ cc. of 1 % novocain into the disc.

RESUME

Dans 16 cas de douleurs récidivantes dans la région lombo-sacrale, une ponction transdurale pratiquée dans l'un ou dans

les deux disques intervertébraux lombaires inférieurs a provoqué des douleurs identiques aux douleurs spontanément ressenties par le malade. La douleur apparut soit au moment de la ponction, soit lorsque la pression intradiscale s'est trouvée augmentée par l'introduction sous pression d'une solution saline normale. Elle disparut rapidement et le signe de Lasègue a été sensiblement réduit ou même aboli par l'injection dans le disque de 0,5 cm3 de novocaïne à 1 %.

ZUSAMMENFASSUNG

In 16 Fällen von rezidivierenden Schmerzen in der Lumbosakralgegend verursachte eine transdurale Punktion eines oder beider untersten Lumbaldisci einen Schmerz von gleicher Art wie der spontane Schmerz des Patienten. Der Schmerz trat auf entweder in dem Augenblick der Punktion oder, wenn der intradiscale Druck durch Einspritzung physiologischer Kochsalzlösung unter Druck erhöht wurde. Er verschwand rasch, und das Lasège'sche Zeichen wurde entweder merkbar herabgesetzt oder aufgehoben, wenn man ½ ccm einer 1%igen Novocainlösung in den Discus injizierte.

LITERATURE

Friberg: Acta Orthopaedica Scand. XVII. 224. 1948.
Lindblom: Acta Orthopaedica Scand. XVII. 231. 1948.
Unander-Scharin: Acta Orthopaedica Scand. XVIII. 125. 1948.