INTERVERTEBRAL DISKS—DANDY

CONCEALED RUPTURED INTERVERTEBRAL DISKS

A FLEA FOR THE ELIMINATION OF CONTRAST MEDIUM IN DIAGNOSIS

WALTER E. DANDY, M.D.
Baltimore

In 1929 1 reported the first 2 cases of ruptured intervertebral disk in which operation was performed during the preceding year. I recognized that the trauma was relatively slight and with minor strains the symptoms flared up anew after a quiescent period. Both of these disks were localized by injections of iodized oil which disclosed block in the subarachnoid space. Until recently it was assumed that the lesion might explain many cases of sciatica. Both of these patients have since remained well. In a little more than a decade this has become the most frequent lesion encountered and surgically treated. MIXTER 2 went a step further and localized the lesion before the protruding disk had produced a total block in the spinal canal. This diagnosis was made by a localized filling defect in the solid mass of iodized oil (5 cc.) injected into the spinal canal. Until recently it has continued to be the routine method of detecting these little localized protrusions. However, the fact that iodized oil is a permanent deposit in the subarachnoid space (unless removed subsequently) and passes freely into all the fluid containing spaces in the cranial chamber has remained a matter of serious concern, even though there is no absolute proof that it does actual harm. The roentgenograms are enough to deter one from its use if it could possibly be avoided; particularly if no disk was found.

In 1937 REICHERT 3 first substituted air for iodized oil as a contrast medium and in 1939 reported 4 cases with excellent diagnostic results. He, however, still retained iodized oil as a check in the doubtful cases. This method was quickly adopted by many others and is used either exclusively (Love) or with iodized oil subsequently when in doubt. Air shadows are by no means so striking as iodized oil shadows, but with excellent plates and the highest skill in their interpretation they can be almost as satisfactory.

The next great diagnostic advance was made by SEINEN. 5 He reported 16 cases that were diagnosed without any contrast medium whatever, solely by history and neurologic examinations. And among these were 4 cases in which iodized oil had been injected by others and failed to disclose a disk. Spruill 6 stated that many of the disks could be diagnosed on clinical

2. The remarkable antiseptic of this lesion by J. E. Giebhardt (The Lumbosacral Articulation, 13th. M. & S. J. 164:563 (March 24) 1913) has never received the credit it deserves.
7. Spruill, R. O., in discussion on Love.
studies alone. Love and Walsh observed that without contrast mediums the diagnostic error was less than 
0.5 per cent.

One of the most important disclosures in this diagnostic field has been the very high incidence of protruding disks at the fourth and fifth lumbar interspaces. Love in 1938 found 87 per cent in these two disks. In 1940 two papers appeared in the same issue of the Archives of Surgery by Love and Walsh and by Spurling and Grantham, in which both of which 96 per cent of all the lesions were found at the fourth and fifth lumbar disks and they were largely divided between these two locations. With such a selective localization of this lesion, contrast mediums are hardly necessary in the diagnosis.

Three important surgical advances have contributed greatly to the patient's welfare: (1) The substitution of a unilateral approach for the previously used bilateral removal of one or more lumbar tumors; (2) April 6, 1939 and Love; (3) Both Semmes and Love still further reduced the amount of bone removed by cutting away only the edges of the laminae contiguous to the disk and thus maintaining the integrity of the laminal arch; and finally (4) Love removed many of the disks without sacrificing any bone. Ample room is usually obtained between the laminae after removing the ligamentum flavum.

My purposes in this communication are twofold: (1) to enter a plea for the elimination of all forms of contrast mediums for localization of vertebral disks and (2) to present observations on a "concealed" type of ruptured intervertebral disk that cannot be disclosed by intraspinal injections.

The reasons for avoiding spinal injections of any kind are that (1) they are unnecessary, (2) they may be misleading, (3) they add to the patient's discomfort and finally, (4) the permanent deposit of iodized oil in the brain and spinal cord is avoided. In other words, the diagnosis of a ruptured disk and its location can be much better made solely by the history and examination, and by so doing one relieves the patient of discomfort and possible after-effects. Not even a lumbar puncture is necessary.

Since it has now been demonstrated that over 96 per cent of all lumbar vertebral disks are at the fourth and fifth lumbar spaces and since the unilateral approach is adequate to find the lesion whether it is at the fourth or the fifth disk, it only remains to make the diagnosis of a lumbar vertebral disk in order to disclose and remove it. During the past eight months I have removed 37 vertebral disks; 29 of the patients had no spinal injection of any kind and a disk was found in each. Two had had iodized oil injections elsewhere (I was operated on) with negative findings. In 6 of the 37 cases I had injected iodized oil (1.5 cc), in 3 of which there were no positive findings and in 3 the protection showed distinctly. It is now clear that in none of these cases was the iodized oil needed, and in 5 of them the operation would not have been made had the iodized oil been depended on for the diagnosis. At the present time the iodized oil test would not be made in any of these cases.

How can the diagnosis of a ruptured vertebral disk be made with assurance? The diagnosis is made on low midline lumbar backache plus pain down the back of one or both legs, the pain is intensified by coughing and sneezing, and the pain must be recurring and not continuous. When this simple story is obtained there is no other lesion that need be considered. There may or may not be limitation of the achilles reflex or sensory or motor loss in the distribution of the fourth or fifth lumbar or first sacral nerve.

The history of trauma, which is always the cause, may be difficult to elicit and need not be obtained. The injury is usually a minor one, such as a heavy lift, a wrench or a sudden movement. I can recall having seen a protruding disk after a severe back injury. The history of recurring pain is essential to the diagnosis and in the differential diagnosis from psychogenic backaches, which are always present.

There isn't any positive way by which the differentiation between ruptures of the fourth and fifth disks can be made with certainty before operation. A diminished achilles reflex suggests that the lesion is at the fourth, though with this finding it may still be at the fifth disk. (Spurling thinks it is evidence of a fifth disk rather than the fourth.) But the operative exposure permits exploration of both disks after removal of both ligamentums flavum if necessary. Semmes operates under local anesthesia and says that pressure with the forceps on the ligamentum flavum over the disk will induce the original pain, whereas pressure on the other will not. This may well be a decided advance.

In none of the 29 cases in which operation was performed without contrast mediums in the spinal canal has even a lumbar puncture been done. The presence of increased globulin in the cerebrospinal fluid has been regarded as an important diagnostic sign of ruptured disk, but I regard the clinical story so indicative of this lesion that I prefer not to subject the patient to the discomfort of a lumbar puncture. Roentgenograms of the spine are rarely helpful in diagnosis. Only once have I seen roentgenograms of value, and in that case a corner of the bone was chipped off and dislocated posteriorly.

Can the diagnosis of a ruptured disk always be made unequivocally? The answer is no, but the percentage of error should be very small. During the same period of seven months I have performed four negative explorations. All of these were pure explorations, in three of which iodized oil had been injected and gave negative results. In 2 of these cases I felt certain that there was no disk because the pain was continuous, but in both the diagnosis of a ruptured vertebral disk had been made elsewhere and I consented to explore the region to clear the atmosphere. The other 2 with negative iodized oil injections were patients of Dr. George E. Bennett; in both of them I still thought a disk was present but found none. I am not sure that these may have been examples of the "concealed" disks that have since been found and will now be discussed.

"CONCEALED DISKS"

A concealed disk doubtless explains many negative explorations. There are ten of them in this series (28 per cent), eight of these in the past two months. The disk bulges so slightly that it would never be disclosed by iodized oil or air injections into the spinal canal...
and will be found at operation only by a careful inspection beneath the dura. The protrusion has been at or just to the midline beneath the cord in 5 and to the side in 4. They have been found to the emerging spinal nerve by fairly firm adhesions. The spinal ligament over the involved disk is definitely thicker than normal. The slight protrusion is distinctly softer to touch than a normal disk and gives a definite sense of fluctuation to the forceps. When the covering ligament is incised a large sequestrum of cartilage does not protrude, but with almost no pressure the forceps sinks deeply into the intervertebral space—the certain test of a defective disk (the forceps cannot sink into a normal disk). As the forceps is withdrawn a soft mushy brownish material clings to the blades, and with a sure cut the disk is obtained and can be obtained from the cavity in the depths of the disk. At times small pieces of cartilage can be obtained in this way, but the material is reddish brown instead of the nearly white sequestrum that obtains in the protruding elevated disk with a sequestrum. When placed under the microscope it is seen that the material contains remains of cartilage cells but in a much more disintegrated matrix than in the fairly normal looking cartilaginous sequestrum in the protruding disks. There are no signs of inflammatory process in the gross or under the microscope.

From time to time in the past I have encountered this type of disk, i.e., without a well defined sequestrum. The results following the opening of these flat disks have been as good as when a large sequestrum has been removed, probably because the incision provides a vent for the subsequent gradual escape of the contained injured disk. I am confident that the same material is present in the depths of the disk, even when a large sequestem is found, and that the opening of the cavity is essential for a cure. Always the forceps will fall without pressure into this central cavity. Three of these concealed disks had had iodized oil (one elsewhere) with negative results, and one had been operated on in another hospital with negative findings. The symptoms of these concealed disks are precisely like those of the protruding ones; they cause root pains because they are adherent to the nerve and not from mechanical pressure on them.

The disclosure of this concealed type of disk is an additional reason for giving up iodized oil, air or other tests. They can't possibly show the lesion, and with negative evidence the patient may well be deprived of operative care and passed along as neurotic.

The question has repeatedly been asked: Has not the diagnosis and treatment of ruptured intervertebral disks been greatly overdone and are not the findings at operation often so equivocal as to be merely a cloak for the operator's mistake? There is no question that many mistakes have been made and are still being made; that is natural for a field in its infancy. At the present time I am confident that with a knowledge of the "concealed" disks the percentage of error in the hands of skilled neurosurgeons will be very small. And I am confident that instead of being overdone the surface has only been scratched; that the overwhelming percentage of cases with recurring attacks of low back pain plus sciatica in one or both legs will be found to be vertebral disks. Love, who has done so much to develop this field of surgery, has had over 1,000 cases. There are, of course, many cases of constant pain that are due to vertebral disks, and most of them are of psychogenic origin; they will fail to give exacerbation of pain on coughing or sneezing—a sign that I regard as pathognomonic of a disk or possibly a tumor. Doubtless there are some disks also among the constant backaches, even when there is no increase of pain on coughing or sneezing. These cases for the present must be classified separately. It is largely from this group that the negative spinal injections and operative exposures have been made and have cast some discredit on the whole subject. While it is worthwhile to call a few facts from this large group, the diagnostic and operative efforts will be avoided by the most discriminating surgeons and the efforts confined to those cases that show reasons for doubting the psychologic diagnosis. But if cases in this group are to be culled, most of the spinal cases of sufficient doubt further diagnostic efforts are to be made, my very strong feeling is that a unilateral exploration of the fourth and fifth disk areas is much preferable to intraspinal injections. The former exhausts the diagnostic possibilities, the latter, if negative, still do not exclude this lesion.

One other type of lesion must always be considered in the differential diagnosis, namely tumors of the spinal cord. Love has told me that this is his main reason for using air injections. It is true that occasional disks may be located at the third lumbar interspace, or even higher in the thoracic or cervical regions, and occasionally there may be two disks at different levels. However, the symptoms are sufficiently different to make one doubt the typical lesion at the fourth and fifth disks. At the third lumbar disk the pain will be in the front of the thigh instead of the back of the leg. And with higher disks the symptoms will scarcely be different from those of a tumor; most of them are found when tumors are suspected. It is only with the typical story of a disk at the fourth or fifth (and again these are 96 per cent of the total) that I eliminate the intraspinous diagnostic test. For the occasional case to be decided I still prefer a small injection of iodized oil (usually 1 cc.), which is carefully studied under the fluoroscope. Although I dislike iodized oil it still remains a necessary test in localizing tumors of the spinal canal. Air shadows are never so good, and iodized oil remains and can be restudied. With use of the fluoroscope the small amount of iodized oil is just as serviceable as the large quantities that fill the entire lumbar canal.

Many writers advise spinal fusion following removal of a ruptured disk, sometimes most routinely, others largely in industrial cases in which heavy work must be resumed. I have never felt this to be advisable. So far I have not had a recurrence, and in 500 cases Love reported only 1 per cent of recurrence. Where compensation is a factor a fusion will not diminish the complaints, and in cases with hard labor ahead a rest of three months is probably adequate protection.

**SUMMARY**

1. The overwhelming percentage of vertebral disks can be diagnosed and localized by the history and examination alone, and all accessory diagnostic tests (even lumbar punctures) can and should be avoided.
2. "Concealed" vertebral disks doubtless explain many of the negative explorations for this lesion.
3. If the diagnosis is questionable, an exploration of the region is preferable to spinal injections of air or iodized oil.

Johns Hopkins Hospital.