

OPERATIVE RESULTS IN INTERVERTEBRAL DISKS*

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PRIOR TO 1930, pain in the lumbosacral region radiating down the leg was commonly termed sciatica or sciatic neuritis. With rest in bed, heat, leg-traction and other conservative methods, many patients recovered satisfactorily. Gradually the pain subsided, they resumed their original occupation or changed to lighter work, and, on the whole, did not do too badly.

The discovery that a sudden twisting injury to the lower spine could rupture the intervertebral disk, protrude it posteriorly, and, by stretching the underlying dura and compressing adjacent nerves, produce this low-back pain sciatic syndrome, cleared up at once the obscure etiology of many of these cases. Consequently, surgical removal of the disk was promptly suggested and widely heralded as the most certain means of assuring rapid and complete relief. Although the pain accompanying a ruptured disk can vary from decided discomfort to extreme distress, the condition of itself never resulted in a fatality. To advise surgery under these conditions, even when the operative procedure is as safe and simple as that required in the removal of a disk, brings up the definite question as to the expediency of operative intervention. With even the simplest surgery, unfortunate accidents can, and have, occurred. Following operative removal of the disk, will the patient be relieved of his discomfort so that he can return to work? What are the chances of failure to relieve the pain, or of an increase of disability, following surgery? It is high time that more emphasis be laid upon follow-up results after operation, than upon diagnostic methods and surgical technic.

While the literature is replete with information dealing with clinical signs, diagnostic methods and operative technic, but little is said about results.

A review of the literature reveals relatively few summaries of post-operative results. Verbrugghen¹ records 83 per cent successful in 75 cases. Shinnors and Hamby² in 87 cases claim 50 per cent cured and 50 per cent with some residual pain in back or legs. Poppen³ reports 65 per cent of 400 cases completely relieved, 35 per cent improved, although in 90 per cent of this latter group the sciatic pain was checked. In 60 per cent of his cases postoperatively, heavy lifting brought on low back discomfort. Jelsma⁴ describes 90 per cent good results in 150 cases operated upon. Botterell and Keith,⁵ and Gross⁶ in handling military personnel were able to return 60 per cent and 70 per cent, respectively, to full duty. McKenzie and Botterell⁷ in 57 cases report 48 excellent and nine fair results. Barr and Mixter⁸ showed 77 per cent complete relief. In Camp and Love's⁹ series, 66 per cent of 50 cases showed a highly satisfactory result. Craig and Walsh¹⁰ differenti-

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ate their results in compensation and noncompensation cases, a highly important point. In noncompensation cases, in 83.3 per cent results were satisfactory as against 59.1 per cent in the other group. Adson¹¹ in making the same separation rated 90 per cent of his noncompensation group as satisfactory, the percentage falling to 77 per cent in the compensation cases. Keegan and Finlayson¹² show, roughly, 75 per cent satisfactory and 25 per cent poor results. Smith and Deery¹³ in 70 cases record 34.3 per cent excellent and 45.9 per cent good results. So it can be seen that while, by and large, the results are fairly successful, nevertheless, the surgical removal of a ruptured disk does not necessarily result in complete relief of pain.

Pain produced by a ruptured disk has two components, the pain in the back and the pain in the leg. Back pain is the initial complaint followed by pain radiating down one leg. Leg pain in the sciatic distribution leads to the suspicion or certainty of a ruptured disk. Pain in the back is due to pressure on, or rupture of, the posterior vertebral ligaments. Pain down the leg is caused by the protrusion of the disk against the adjacent lumbar nerve roots. These two pains are different components of the same progressive picture, and both are important in its recognition. Why does the disk rupture? Trauma, a twisting wrench of the lumbar vertebra, is a commonplace finding in many histories. But in other instances, a no more serious injury than rolling out of bed has been noted. Does the disk rupture because of some structural disability of the back and is the low back pain the earliest clinical evidence of such weakness? This point, I believe, is very important, because while by removal of the disk the leg pain is almost always relieved, the pain in the back may remain and produce discomfort and disability.

It is necessary to state here that, while we are convinced that these two pain components exist and for different reasons, as outlined, we have had no experience with fusion as a means for relief of the back pain following improvement or relief of the leg pain by removal of the disk. It is hoped that the indications for, and results of, fusion will be one of the points brought out in the discussion.

This paper deals solely with the results following surgical removal of an abnormal intervertebral disk in 200 cases. The follow-up period varies from 6.5 to 1.5 years, with an average of just over three years. No case operated upon since January 1st, 1945, has been included, so that sufficient time has elapsed to determine with some accuracy the final result. These 200 cases represent replies to a questionnaire sent out to 275 cases. In addition to the questionnaire, some 150 cases reported in person.

In reviewing these 200 cases, attention was centered solely on one group of facts; what was the patient's condition prior to surgical intervention and to what extent was he benefited by the operative procedure. Preoperatively, 72, or roughly 35 per cent, were suffering so much back and leg pain that they were bedridden; 104, or 55 per cent, were unable to work and 24, or 10

per cent were working, although under considerable distress. As a result of surgical procedures, the following results were noted. One hundred and twenty-seven cases, or roughly 63 per cent, were completely relieved of all pain; 58, or 29 per cent, were improved and 15, or 8 per cent, were unimproved or worse. Since the type of work which these patients were performing when the injury to the back occurred, and especially the occupation they must resume postoperatively, and the amount of strain to which the lumbosacral area will be subjected is of critical importance in estimating the ultimate outcome, these figures were further broken down. Among these 200 cases, 98 were laborers: miners, farmers, shipbuilders, nurses, and 102 were nonlaborers: clerks, executives, professional men, housewives. Interestingly enough, the division between laborers and nonlaborers is nearly equal. Hard labor, of itself, does not seem to be a predisposing cause for ruptured disk. In the group of 98 laborers, 57 were completely cured, 57 per cent, 37 were working with some disability or had changed to lighter work, 37 per cent, and four were unimproved, 4 per cent. Among 102 nonlaborers, 69 were entirely relieved, 68 per cent, 20 improved, 20 per cent, and 13 unimproved, 12 per cent.

What is the effect of the degree of protrusion of the disk; complete rupture, simple protrusion or the so-called hidden disk, upon the operative results? A definition of what is meant by these three varieties of disk is indicated. Frequently a disk is exposed which has actually commenced to extrude itself into the canal, so that without incision of the annulus it may be seized and withdrawn, or the nerve may be humped over it and retraction of the nerve to either side is followed by an immediate greater or smaller amount of protrusion. This is our conception of a completely ruptured disk. Secondly, a protruded disk represents a situation where the annulus is obviously protruded posteriorly by the disk, and when once the annulus is opened, prompt spontaneous emergence of the disk occurs. Lastly, a hidden disk produces little or no protrusion of the annulus, although the overlying spinous process shows an increased mobility, the adjacent root is slightly swollen, and palpation over the annulus reveals some relaxation. Incision of the annulus and curettage of the disk suggests that softening and degeneration have occurred.

In this series of 200 cases, 49 had a cleanly ruptured disk; 26 laborers, 23 nonlaborers. Twenty, ten laborers and ten nonlaborers, were bedridden by the pain; 23, 13 laborers and ten nonlaborers, were unable to work and six, three from each group, were working with some disability. Forty-two myelograms were carried out in this group and all showed definite evidence of the presence of a disk. Following removal of the disk, 39, 80 per cent, 20 laborers and 19 nonlaborers, are completely relieved; nine, six laborers and three nonlaborers, are completely relieved of leg pain, 18 per cent; but have in eight cases occasional slight, and in one, moderately severe back pain, while only a single patient is entirely unimproved, 2 per cent. In an average follow-up of 3.6 years, a single case has had recurrence of pain.

One hundred thirty-one patients had protrusion of the disk, 65 laborers and 66 nonlaborers. Forty-seven, 21 laborers and 26 nonlaborers were bedridden. Sixty-nine, 36 laborers and 33 nonlaborers, were unable to work, and 15, eight laborers and seven nonlaborers were working with some disability. Following removal of the disk, 77, 35 laborers and 42 nonlaborers, were entirely relieved of pain, 59 per cent; 44, 28 laborers and 16 nonlaborers were completely relieved of their leg pain, 34 per cent, but 18 of the 28 laborers had shifted to lighter work because of renewed back pain, and six of the 16 nonlaborers had occasional periods of lumbosacral discomfort. Ten patients, three laborers and seven nonlaborers, were unimproved, 7 per cent. In an average follow-up of this group of 3.5 years, five patients, three laborers and two nonlaborers, have suffered a recurrence of pain similar to their original attacks.

Twenty patients had "hidden" disks, eight laborers and 12 nonlaborers. Six, two laborers and four nonlaborers, were bedridden, 12, six of each group, were unable to work and two nonlaborers were working with some disability. Following surgical intervention, 11, three laborers and eight nonlaborers, were completely relieved, 58 per cent; four, three laborers and one nonlaborer, had occasional disability, 21 per cent; and five, two laborers and three nonlaborers, were not relieved, 21 per cent. In an average follow-up of four years, two nonlaborers returned with definite evidence of a recurrence.

Broadly speaking, our figures seem to confirm the impression gained from clinical experience that the greater the amount of preoperative pain, the better the final result. It is also interesting to note that of the 17 failures, nine had had but one attack of pain prior to operation. At present, no patient suspected of having a ruptured disk is considered for operation unless he has had two attacks or more of pain and unless the pain is severe at the time he presents himself in clinic. To operate upon a patient who has had his attack and whose pain is definitely receding is unwise. All these persons will have some distress for a longer or shorter period postoperatively. If they have had a great deal of pain preoperatively, this postoperative readjustment period means little to them. Their major pain is relieved and the mild postoperative pain is readily accepted. But if the preoperative pain is mild, particularly if the surgeon has been unwise enough to promise complete relief, then this postoperative pain discourages them; they feel the operation has been a failure and the final result is much less satisfactory.

In the course of this review, two other groups of cases were encountered, 29 patients operated upon for disk in whom no disk was found, and 44 cases in whom, who although clinically, and in 33 further confirmed by myelography, an intervertebral disk seemed unquestionably present, for various reasons no operative procedure was carried out. In the operated unverified group of 29, 17 were laborers and 12 nonlaborers. Nine were bedridden, 17 unable to work and three were working with difficulty. Following operative exploration without removal of a disk, 14, ten laborers and four nonlaborers, were entirely relieved, 48 per cent, eight were working with some disability

or changed to lighter work, 28 per cent, and seven were unimproved, 28 per cent. These figures parallel very closely the "hidden disk" group, into which category it seems quite possible that many of these cases might well fall. The average follow-up was four years, and none, as far as is known, has had a recurrence. The disk suspects unoperated comprise 44 cases, 21 laborers and 23 nonlaborers. Thirteen, four laborers and nine nonlaborers, were bedridden; 15, ten laborers and five nonlaborers were unable to work, and 16, seven laborers and nine nonlaborers were working with disability. Under conservative treatment only: ten, three laborers and seven nonlaborers were completely cured, 23 per cent; 18, ten laborers and eight nonlaborers, were improved sufficiently to work at lighter jobs, 41 per cent; nine comfortably and nine with occasional mild pain, and 15, ten laborers and five nonlaborers, were unimproved, 36 per cent. Three of these last patients were operated upon elsewhere some time within the four-year average follow-up for this group.

That in all of the patients in this nonoperated group, a recurrence, or severe increase in pain, can occur at any time, if they are unlucky enough to twist or wrench their backs, is of course admitted. Removal of the disk may then be carried out. Although this is a relatively small group of cases, that recovery has occurred under conservative treatment alone should be remembered.

As a result of this review of the results of the surgical removal of a ruptured disk, we see no reason to change the conservative attitude we have adopted in the past years. Pantopaque myelography should always precede operation to show the size and position of the disk and whether more than one exists. Curiously enough, we have never seen a double disk, although Dandy¹³ has stated that they are not uncommon. If myelography shows a large disk, if the pain is severe, and if the patient has had previous attacks, surgical removal of the disk is indicated. But surgery is not, in our opinion, the only treatment for this condition. The question as to whether surgery is expedient should always be considered. Many of these patients will recover with rest, leg traction, a back brace, and other nonoperative methods. Nature will care for many of these sufferers exactly as was the case prior to 1930. It seems presumptuous of the surgeon to interfere until he has given nature every chance. The results from surgical treatment do not seem sufficiently good to warrant it.

REFERENCES

- ¹ Verbrugghen, A. H.: *Herniated Nucleus Pulposus: A Report of 75 Cases Examined and Operated*. *Dis. Nerv. Syst.*, **4**, 165, 1943.
- ² Shinnars, B. M., and Hamby, W. B.: *The Results of Surgical Removal of Protruded Lumbar Intervertebral Disks*. *J. Neurosurgery*, **1**, 117-122, March, 1944.
- ³ Poppen, J. L.: *The Herniated Intervertebral Disk: An Analysis of 400 Verified Cases*. *New Eng. Jour. Med.*, **232**, 211-215, February 22, 1945.
- ⁴ Jelsma, F.: *Clinical Analysis of 1,000 Consecutive Cases of Low Back Pain*. *South. Med. Jour.*, **37**, 372-78, July, 1944.

- ⁵ Botterell, E. H., Keith, W. S., and Stewart, O. W.: Results of Surgical Treatment of Sciatica Due to Herniation of Intervertebral Disk in Canadian Soldiers Overseas. *Canadian M. A. J.*, **51**, 210-214, September, 1944.
- ⁶ Gross, S. W.: Protrusions of the Intervertebral Disks in Military Practice. *Trans. Amer. Neurol. Assoc.*, **69**, 119-123, 1943.
- ⁷ McKenzie, K. G., and Botterell, E. H.: The Common Neurologic Syndromes Produced by Pressure from Extrusion of an Intervertebral Disk. *Canad. Med. Assoc. Jour.*, **46**, 424, May, 1942.
- ⁸ Barr, J. S., and Mixter, W. J.: Sciatic Pain in Low-back Derangements: Its Incidence, Significance and Treatment: Symposium; Posterior Protrusion of the Lumbar Intervertebral Disk. *J. Bone and Joint Surg.*, **23**, 444, April, 1941.
- ⁹ Love, J. G., and Camp, J. D.: Root Pain Resulting from Intraspinous Protrusion of Intervertebral Disks: Diagnosis and Surgical Treatment. *J. Bone and Joint Surg.*, **19**, 776, July, 1937.
- ¹⁰ Craig, W. McK., and Walsh, M. N.: The Present Status of the Protruded Disk Syndrome. Read before the meeting of the International Congress of Neurologic Surgeons, Copenhagen, Denmark. August 21-25, 1939.
- ¹¹ Adson, A. W.: Technic of Removal of Protrusions of Intervertebral Disks. *Am. Acad. Orthop. Surg. Lect.*, **111**, 120, 1943.
- ¹² Keegan, J. J., and Finlayson, A. L.: Low Back and Sciatic Pain Caused by Intervertebral Disk Herniation. *Nebraska Med. Jour.*, **25**, 179, May, 1940.
- ¹³ Smith, A. DeF., Deery, E. M., and Hagman, G. L.: Herniation of Nucleus Pulposus: A Study of 100 Cases Treated by Operation. *J. Bone and Joint Surg.*, **26**, 821-828, October, 1944.
- ¹⁴ Dandy, W. E.: The Treatment of Recurring Attacks of Low Backache without Sciatica. *J. A. M. A.*, **125**, 1175-78, August 26, 1944.

DISCUSSION.—DR. WILLIAM JASON MIXTER, Boston, Mass.: In the first place, I should like to thank Doctor Grant for bringing up this subject at this time and for giving us a very keen evaluation of his results, and for asking certain questions which, at the present time, I do not think we are able to answer. So far as I know there has been no complete study made of the results on a large group of cases of intervertebral disk, carrying out the criteria he has asked for. I think we are all trying to carry that out at the present time, and hope the answer will be forthcoming. We may be able to answer that question at the meeting of the Orthopedic Association next June, when the problem is to come up again. I think we must depend to a considerable extent on the Army and Navy for evaluation of the problem of ruptured intervertebral disk. The enlisted man has been a very unsatisfactory patient upon whom to do surgery.

There are one or two points to mention. Doctor Grant says this operation is done for relief of pain and that no fatalities have occurred from letting patients go. Fatalities do occasionally occur from letting patients go, because they get an acute transverse lesion which results in death from sepsis unless relieved. Patients have paralysis and foot drop if the lesion is allowed to persist for any length of time, and the foot drop does not come back.

I cannot answer the question about fusion. We are looking up these cases at the present time, and we have in Boston a more or less parallel series and may be able to answer some of the questions. My own impression is that patients who have to do heavy work, laborious work, postoperatively, and where there is definite and abnormal mobility demonstrable at the time of operation, probably should have fusion done. Doctor Grant's criteria for operation I believe are accurate and I would subscribe to them. I would also subscribe to the dictum not to operate upon patients who are recovering from an acute attack and are pretty well. They are better operated upon in an acute attack. I believe that real ruptured disks with extrusion are the ones in