OBSERVATIONS ON THE MANAGEMENT OF FAILED SPINAL OPERATIONS

H. V. CROCK, MELBOURNE, AUSTRALIA

From St Vincent’s Hospital, Melbourne

A system is presented for the analysis of failure after spinal operations: 1) Outright failure; 2) temporary relief; 3) failure in spondylolisthesis; and 4) infections. With this system it is possible to trace the causes of failure and to correct some of them. When they are used as a guide before operation, the recommendations made should help to prevent many failures.

Patients with serious spinal problems are often given dire warnings about surgical operations, not only from non-medical sources but even from some specialist surgeons. In a review article on intervertebral disc prolapse, Taylor and Akeson (1971) wrote: “Surgery has long since been shown to be far from the ideal solution”. Reviews of various types of spinal operations usually refer to a hard core of up to 20 per cent of poor results. In some specific instances such as Stauffer and Coventry’s (1972) review of anterior lumbar fusion operations carried out at the Mayo Clinic, results may be so poor that any useful role for a particular operation is placed in serious doubt.

Against such a background, problems in the management of failed spinal operations present a sobering spectacle. The aim of this paper is to present a rational approach to them and so to sound a note of confidence and hope which may help to dispel the gloom that so often confounds the unfortunate patient and depresses his physician. This can be a rewarding field of surgery because many patients will be found to have readily correctable lesions even after prolonged periods of disability.

THE PSYCHOLOGY OF FAILURES

With rare exceptions psychological disturbances will be found in these patients. The surgeon should remember that chronic pain adversely affects a patient’s mental state, rendering him in varying degrees depressed, anxious and aggressive—features of behaviour which are reversible if the cause of pain can be discovered and corrected. Drug addiction sometimes causes added difficulties, though it may not contra-indicate further operation. A few patients will insist on operation after operation, often seeking many opinions and submitting to multiple procedures at the hands of different surgeons. They form a rare and tragic group for whom further operation may only lead to suicide, though many survive to end in financial ruin.

Psychological assessment along the lines suggested by Wiltse and Rocchio (1975) has been found useful, and in the present context such testing assumes even greater importance. Formal psychiatric treatment may also be required.

The analysis of individual cases of failed spinal operations may be facilitated by using the following classification: 1) Outright failure: This group comprises patients who show no improvement or who become worse after the first operation. 2) Temporary relief: These patients may be free of symptoms for months or years.

Paper read at the 108th Anniversary Meeting of the Texas Medical Association, San Antonio, Texas, United States of America, in May 1975.

H. V. Crock, M.D., F.R.C.S., F.R.A.C.S., Alcaston House, Suite 11, 5th Floor, 2 Collins Street, Melbourne 3000, Australia.
3) Failures in spondylolisthesis: These patients are considered separately because of special features of the pathological anatomy in spondylolisthesis. 4) Infection.

OUTRIGHT FAILURE

Failure is usually related to wrong diagnosis. Some pain and discomfort are to be expected after any spinal operation. Pain protracted over weeks may follow some operations in which adherent root sleeves have been tediously separated from disc tissue, yet a successful outcome can be predicted. Such special circumstances excluded, patients in this group can usually be identified soon after operation. They complain of pain which is more severe than is normally to be expected. Those with infections will have elevated temperatures and altered blood counts.

The questions to be determined are simply these: Is the failure due to an unrecognised condition? Is it due to wrong diagnosis of the spinal lesion? Or finally, is it due to technical failure?

Unrecognised conditions

Investigations should begin as soon as possible, but several months may elapse before the diagnosis can be established. For example, a carcinoma involving the apex of the lung may be the cause of neck pain and brachial neuralgia persisting after anterior cervical fusion. Operation for lumbar spondylolisthesis may fail because the true cause of pain is a secondary prostatic carcinoma.

Rarely, infection after operation may be caused by tuberculosis or gonorrhoea.

Primary tumours in the spinal canal are relatively rare. They are usually diagnosed before operation by clinical examination and by myelography. However, in cases of failure the possibility of such lesions should be considered.

Error in the diagnosis of the spinal condition and technical error

Three questions must be answered: 1) What was the primary diagnosis? 2) What were the operative findings? and 3) What was the nature of the operation?

Failure after operation for disc prolapse—Persistence of severe pain is unusual if the diagnosis of disc prolapse has been confirmed at operation. If a considerable amount of fragmented and desiccated disc material has been removed, it is likely that a further fragment has been displaced beneath the root sleeve after operation, or that a migrating sequestrated fragment has not been removed.

If a pre-operative diagnosis of disc prolapse was made but no disc prolapse was found at the time of operation, it is likely that the intervertebral space at the wrong level has been explored (Fig. 1).

Most failures occur when no frank prolapse is found. The diagnosis of internal disruption of the disc should have been established by discography before operation. Failure after operation for internal disruption of the disc—If this diagnosis has been established by discography and disc excision and interbody fusion have been done, early failure may indicate that the operation was at the wrong level. In the neck particularly, levels should be identified by radiographs taken during operation. The injection of methylene blue at the time of discography is an unreliable method of identifying the level of an affected disc. Even in the lumbar spine, levels may be wrongly identified, especially if there are anomalies such as sacralisation.
Degenerative change thirty years after removal of intervertebral disc at L.4–5 level in a patient now aged 61 years. Note the interlaminar calcification. Figure 8 shows the extent of laminectomy done for decompression.

Chemical discitis in a woman aged 32. Figure 9—Discograph shows posterior disruption at the level L.2–3, with normal disc at level L.3–4. The patient killed herself six months after anterior intervertebral fusion. Figure 10—Photograph of thin sagittal section of the lumbar spine taken at necropsy. At the level L.2–3 union of the graft is incomplete. There is erosion of the lower end-plate of the body of the third vertebra with reactive changes in an excavated area of the body, from chemical discitis. Figure 11—Section of the same specimen after arterial injection. Note the disc remnants infiltrating the grafted area at L.2–3 in the centre of the picture. On the right tufted vessels abut against invading disc tissue. Centrally the graft is vascularised. Note the reactive changes around the lesion in the lower part of the third vertebra.

If there is any doubt about identification, radiological examination should be done before anaesthesia is discontinued.

Other causes of failure
Stenosis of the spinal canal or of a nerve root canal must be excluded as an underlying cause of failure. The possibility that the symptoms are those of “claudication” of the cauda equina must be borne in mind. Under such circumstances myelography is essential. Figures 2 to 5 show spinal stenosis in the case of a man previously operated upon at the lumbo-sacral level for suspected disc prolapse. Myelography was not done before operation. Although the plain radiographs indicate that the
disc spaces are well preserved, the pedicles are short and the laminae and facets are so oriented as to raise the suspicion of stenosis.

TEMPORARY RELIEF
Initial relief of pain after operation and periods of freedom lasting weeks or months are followed by recurrence of disabling pain. The largest number of cases fall into this category.

Failure after operation for disc prolapse—Recurrence is usually caused by recurrent prolapse at the level operated on, especially if a large volume of disc material was removed at the original operation, or by a fresh prolapse at another level.

Recurrent but contralateral sciatica occurs after asymmetrical settling of the vertebrae when several grams of disc material have been removed at the initial operation. Radiographs show collapse of one side of the intervertebral space. Recurrence of pain is caused by a fresh prolapse of disc material or by stenosis of the nerve root canal following deformation due to the reduction in intervertebral disc height.

The commonest cause of late recurrence of symptoms after initial successful excision of a disc prolapse is stenosis of the spinal and root canals secondary to de-
generative changes (Figs. 6 to 8). There may be ectopic ossification or calcification in the remnants of ligamentum flavum at the site of exploration.

Another cause of late recurrence, often associated with secondary canal stenosis but contributing to the overall problem, is the presence of a meningocele caused by damage to the dural sac at operation.

Failures after operation for internal disc disruption—If plate and body in the area of the nucleus pulposus occurs on either side of the disc leading to gross narrowing of the intervertebral space. Histological examination of specimens removed at operation shows inflammatory changes with plasma cell infiltration. Cultures are sterile. Injection of steroid into the disc usually controls the pain and promotes healing.

Non-union of grafts occurs in a few single-level interbody fusions (Figs. 12 and 13). Replacement of the anterior graft is easy in the case of the neck, but in the lumbar region the increased hazard of deep venous thrombosis may indicate operation by the posterior route.

Grafts of cancellous bone have two disadvantages: they are rapidly revascularised but are prone to infiltration by any disc remnants (Fig. 11) with subsequent
resorption (Figs. 14 and 15); secondly, even though union occurs, loss of disc height may follow settling of the graft into the vertebral bodies. Stenosis of the nerve root canal follows and may cause recurrence of pain in both lower limbs (Figs. 16 and 17). Block or dowel grafts cut from the anterior half of the iliac crest (Fig. 18) provide grafts which are rapidly revascularised, usually maintain height and always resist infiltration by disc remnants.

Heterogenous grafts may fail to incorporate, particularly if inadequately seated (Fig. 19).

After successful interbody fusion there is often atrophy of the ligamentum flavum: in the neck this atrophic ligament tends to adhere to the dural sac and root sleeves.

After cervical spinal fusion at several levels, movement at the level above the fusion may be excessive and may lead to premature disc degeneration. Before this, the excessive movements may aggravate other continuing causes of persisting root irritation, such as canal stenosis or adhesion of the ligamentum flavum to the dural sac. If symptoms have persisted unchanged after fusion, laminectomy at several levels with excision of the atrophic adherent ligamentum over the fused segment produces relief (Figs. 20 and 21).

Failure after operation for isolated disc resorption—This condition, in which one lumbar disc space becomes narrowed to a height of three to four millimetres, may occur naturally with no inflammatory basis. It may develop after partial excision of a disc or after chymopapain injections. Symptoms usually recur or persist after a second exploration of the disc space with hemilaminectomy and removal of more disc material (Figs. 22 and 23). Bilateral decompression of root sleeves is required. This involves excision of the inner and superior margins of the superior facet on the lower side of the affected level, together with the ligamentum flavum (Crock 1970). If two adjacent spaces require decompression, then partial facetectomy and laminar arch excision are necessary, leaving a regular defect in the roof of the spinal canal, bounded on each side by the smooth edges of the pars interarticularis of the lamina (Fig. 24).

Failure after posterior spinal fusion—Pseudarthrosis, spondylosis in the laminal arch above the fused segment, and secondary stenosis of the spinal canal, are well recognised causes of failure, but inaccurate placing of the graft so that a piece of it extends beyond the intended level (Figs. 25 and 26) can also cause recurrence of pain by acting as an irritant of the facet joint system at the mobile segment above the graft. Excision of the prolongation together with bilateral nerve root canal decompression at the mobile segment usually brings relief.

Failure after operation for spondylolisthesis

The role of the laminal pseudarthroses as a cause of root irritation in spondylolisthesis was stressed by Gill and White (1963). Simple removal of the loose fragment of the lamina and inferior facet, even when combined with posterior spinal fusion, may fail to relieve the leg pain. The pseudarthroses are immediate posterior relations of the emerging root sleeves (Figs. 27 to 30). Each pseudarthrosis has two faces, one on the laminal side, and one on the proximal portion of the pars interarticularis, which is continuous with the adjacent pedicle. In order to decompress the related root canal adequately, this proximal face must be removed (Figs. 31 and 32).

Other causes of failure after operation for spondylolisthesis may be unrecognised associated stenosis of the spinal canal, or a disc lesion at an adjacent level, or progressive vertebral slipping. Late failure may be due to prolapse of a disc at a level above that of the fusion.

Infection

Infection is usually eradicated if it is recognised early and treated by reopening of the wound, by free drainage, and by antibiotics. Under such circumstances the wound may be closed after seven to ten days.

The management of chronic infection is more difficult. In the case of infection after posterior fusion radical
excision of the graft and sinus tracks is essential. The exposed dural sac will become covered with granulation tissue in the course of several weeks. If appropriate antibiotics are given, secondary infection should not occur, even in the presence of a small cerebro-spinal fluid fistula.

**IMPORTANT DIAGNOSTIC AIDS**

Tomography can provide extremely useful information, not only on the state of union of grafts, but also on the extent of bone removal. Positive and negative contrast myelography, and radiculography, are important in the demonstration of deformity of the theca or root pouches.

Lumbar discography is important in cases of failed laminectomy for suspected disc lesions and in some cases of spondylolisthesis, to determine the exact level and extent of spinal fusion which may be required. Axial tomography may well be of great value in assessing stenosis of the spinal and root canals.

This work was supported in part by a grant from Mr A. D. McLean, to whom I express sincere thanks.

**REFERENCES**


