THE LONG-TERM RESULTS OF FUSION IN SITU FOR SEVERE SPONDYLOLISTHESIS

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The long-term results of 17 patients who had had fusion in situ for severe lumbosacral spondylolisthesis are reported. The average follow-up was 14 years with a range of 7 to 20 years. The average age at operation was 16 years. At follow-up seven patients had occasional backache but only one patient had changed his job and no patient had lost any time off work in the previous year. Nine patients felt that their deformity had been improved and all but one patient still rated the results as excellent up to 20 years after the operation. Although all the patients had persistent foreshortening of the trunk only two patients were aware of any cosmetic deformity. There had been no significant increase in forward slip since the previous follow-up examination five years after the operation. There were no late complications nor significant degenerative changes in the lumbar spine.

It is concluded that although fusion in situ does little to improve cosmesis very few patients complain about their appearance and that it is a safe and reliable method of treatment for severe spondylolisthesis which has stood the test of time.

Although Kilian first described spondylolisthesis in 1854 it was Neugebauer in 1888 who recognised the congenital defect of the pars interarticularis as a cause. Meyerding in 1932 confirmed this finding and suggested posterior fusion as the ideal form of treatment for severe, symptomatic spondylolisthesis.

In 1963 Newman stressed the danger of attempted reduction by traction before fusion; he preferred fusion in situ. In the 1960s most authors agreed that posterior or posterolateral intertransverse fusion was the treatment of choice for children with severe symptoms (Watkins 1953; Wiltse 1961). In 1971 Dandy and Shannon reviewed 46 children with severe spondylolisthesis and confirmed that fusion in situ was a safe and reliable method of treatment, although stabilisation was not complete for up to two years after the operation. In the same year Harrington and Tullos published the results of the first series of patients treated by open reduction with instrumentation and posterolateral spinal fusion. In the series of nine patients there was one case of cauda equina syndrome as a complication. In 1979 Boxall et al. reported 10 patients undergoing several different methods of reduction before fusion. Although internal fixation with Harrington instrumentation resulted in the maximal amount of correction this reduction was not maintained and three patients had major complications. An increased thoracic lordosis was a disturbing complication and they concluded that “improving appearance as one of the primary indications for reduction has not been studied extensively and needs clarification”. In the same year Bradford (1979) and McPhee and O'Brien (1979) reported the results of the first groups of patients treated by a combined anterior and posterior approach. These methods involved preliminary halo-femoral traction followed by posterolateral fusion with removal of the loose lamina and then anterior interbody fusion; in some cases further traction was needed before anterior fusion. McPhee and O'Brien reported one temporary bilateral neurapraxia of the fifth lumbar nerve roots and one complete loss of reduction. Bradford had complications in six of his 10 patients, three with weakness of the fifth lumbar nerve root, two with foot drop and one with loss of correction and delayed union of the anterior fusion. More recently DeWald et al. (1981) have published a series of 14 patients treated by reduction using two Harrington distraction rods and posterolateral fusion followed by anterior lumbosacral fusion; three patients developed transient hypo-aesthesia and one patient developed a cauda equina syndrome which necessitated removal of the rods and the second stage of the procedure had to be abandoned. The reasons given for the preference of these major two-stage operations are the continued slippage after fusion in situ (Bosworth et al. 1955; Laurent and Österman 1976; Boxall et al. 1979); the rate of pseudarthrosis, variously quoted from 19.5 to 40 per cent (Turner and Bianco 1971; Laurent and Österman 1976; Boxall et al. 1979); and the failure of fusion in situ to correct cosmetic deformity with persistence of an abnormal posture and gait (Boxall et al. 1979; Bradford 1979).

Very few of the published series have been followed up for more than five years and it was therefore decided...
to review personally as many patients as possible from a series published by Dandy and Shannon in 1971.

PATIENTS AND METHOD

This study was based on the patients who had been under the care of Mr P. H. Newman at the Royal National Orthopaedic Hospital over a period of 23 years. The series included 12 patients from the group of 27 patients reviewed by Dandy and Shannon in 1971 and a further five patients who had been operated on since then.

All patients were reviewed personally. There were five male and 12 female patients with an average age at the time of operation of 16 years, range 13 to 24 years. The follow-up ranged from 7 to 20 years with a mean of 14 years.

All the patients initially presented with low back pain of gradual onset, which was associated with stiffness in 11 patients. Six patients also had neurological symptoms and signs of weakness or paraesthesia or both. On initial examination, all patients had typical deformities of severe spondylolisthesis (Figs 1 and 7): lumbar lordosis and loss of pelvic tilt, a palpable step at the lumbosacral level and foreshortening of the trunk. Movements of the back, especially flexion, were restricted in 13 patients (Fig. 3) and straight leg raising was limited in nine patients.

Radiographs revealed an average slip of 77.6 per cent before operation with a range of 45 to 120 per cent, and an average sacral inclination of 38 degrees (Fig. 5).

OPERATIVE TECHNIQUE

The operative treatment consisted of posterior or posterolateral intertransverse fusion through either a J-shaped or transverse incision. After operation the first five patients treated in this series were immobilised in a plaster bed for 10 to 12 weeks and then in a Gauvain-type brace for a further 12 weeks. The period of immobilisation in a plaster bed was reduced to four to six weeks for the next nine cases but these patients wore a brace for up to 20 weeks. The most recent three cases had three weeks of bed rest followed by 18 to 20 weeks in a Gauvain brace. The average time taken for patients to return to work or school was three and a half months. There were no major complications, with only one case of a wound breaking down, one case of postoperative retention of urine and one pressure sore.

Figure 1—Photograph of a girl with typical deformities of severe spondylolisthesis. Figure 2—The patient 14 years after fusion in situ.

Figure 3—Photograph of boy with spondylolisthesis before operation showing limitation of flexion. Figure 4—Photograph taken 11 years after operation to show increased flexion.

Figure 5—Before operation. Figure 6—Nineteen years after fusion in situ.
RESULTS

The patients were examined clinically and questioned about their symptoms and type of occupation. Seven patients had occasional backache, one with pain radiating to the leg and seven patients had occasional stiffness. Two patients complained of sensory changes in the legs but both of these had had similar symptoms before operation. Flexion of the spine was greatly increased with 16 of the 17 patients being able to touch their ankles with their fingertips (Fig. 4). The average straight leg raising was 80 degrees. Four patients had minimal neurological signs, two having been present before the operation. Four patients also had tender scars, two at the site of fusion and two at the donor site. All patients had persistent foreshortening of the trunk, 14 had a palpable step at the lumbosacral level, 11 had increased lordosis, and four had a minimal scoliosis (Figs 2 and 8).

Nine patients considered that their physical deformity had been improved by the operation, four felt that it had remained the same and four felt that it had been made worse. However, only two patients were conscious of their cosmetic appearance. Radiographs of the spine showed that there had been no significant increase in forward slip or inclination of the sacrum in any of the patients since the last examination five years after the operation (Figs 5 and 6). There were no obvious pseudarthroses in the series but two patients had minimal degenerative changes above the level of the fusion; both these patients were asymptomatic.

In the group of 12 women, there had been eight pregnancies; delivery was normal in six and by elective caesarian section in two.

At review eight of the patients were employed in sedentary work, eight in light manual work and one in heavy manual work. Only one patient had had to change his job from heavy manual to sedentary work after the operation. However, no patient had lost any time off work in the year before the review.

Sixteen of the 17 patients rated the overall results as excellent up to 20 years after the operation.

DISCUSSION

Fusion as a method of treatment for severe spondylolisthesis was first suggested by Meyering in 1932. Posterior fusion in situ remained the standard treatment for severe slip (over 50 per cent) for many years, although a few surgeons preferred the anterior approach (Burns 1933; Hodgson and Wong 1968). The maximal period of follow-up in any of the series published recently has been six years. This study would thus appear to be the first long-term follow-up of fusion in situ for severe spondylolisthesis and has shown several interesting features. Although the operation is not intended to improve cosmesis, very few patients complain about their appearance in the long term and indeed the appearance of many patients is improved by relief of hamstring tightness and correction of sciatic scoliosis.

Fusion in situ has been criticised in several papers because of the continued slip after operation (Bosworth et al. 1955; Laurent and Österman 1976; Bradford 1979). However, this study confirms the finding of Dandy and Shannon (1971) that the amount of slip, which averaged only nine per cent in this series, occurs in the first two years after the operation and that no further slip occurs after that. We have found no significant degenerative changes in the lumbar spine above the level of the fusion.

Despite the presence of neurological signs in six patients at presentation, none of these patients had severe enough symptoms to require decompression at the time of operation or subsequently.

Fusion in situ has been confirmed as a safe and reliable procedure. There were no serious early or late complications and the unreduced severe slip does not appear to preclude normal pregnancy or delivery. Our current management for a severe slip consists of posterolateral fusion using a transverse skin incision and vertical incisions in the fascia. Patients are mobilised as soon as they regain control of their backs, which is often within five days, and are discharged after 10 days. They are encouraged to wear a Gauvin-type brace for three to six months, mainly to discourage excessive sporting activity.

In contrast, the typical management of reduction and fusion may involve traction followed by posterior decompression and then fusion, with or without instrumentation. Often a further period of traction precedes the anterior fusion, followed by immobilisation in a plaster spica for three months. Most authors using instrumentation recommend its removal at a later date, involving another operation. The recent papers advocating this form of treatment have each reported one or two serious complications, for example, the cauda equina syndrome (Harrington and Tullos 1971; Bradford 1979;
DeWald et al. 1981). Thus the child is put through the trauma of two major operations with three months or more in hospital and a risk of serious complications, all for a slightly improved cosmetic result.

The conclusion of this study is that very few patients are aware or complain about their cosmetic appearance in the long term and that therefore fusion in situ is a safe and reliable method for the treatment of spondylolisthesis which has stood the test of time without any resultant late complications or significant degenerative changes in the lumbar spine above the level of the fusion. This long-term study has also confirmed that decompression of nerve roots at the time of the operation is unnecessary despite the presence of neurological signs in six patients.

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REFERENCES