REDUCTION AND STABILISATION OF SEVERE SPONDYLOLISTHESIS

A REPORT OF THREE CASES

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A modification of a previously reported one-stage technique for reduction and stabilisation of severe spondylolisthesis using a posterior route is described. Reduction is obtained by inserting Harrington rods to lift L5 vertically out of the pelvis and two double-threaded screws to pull it backwards. After reduction the rods are taken away and stabilisation achieved by means of screws and a sacral bar. With this modified technique lumbar vertebrae above L5 are never immobilised, compared with the previous method where the retention of the Harrington rods resulted in more lumbar vertebrae being immobilised than was necessary for fusion.

Bone is resected from the sacrum and the fifth lumbar vertebra to avoid too much tension on the nerve roots. Bone grafts are not needed and lumbosacral fusion is achieved within six months due to close contact between the raw bone of the vertebral bodies. Three patients have been treated with this modified technique; there was no relapse neither during the period when the metallic fixation was in situ nor after its removal.

A new operative technique for the reduction of severe spondylolisthesis has previously been published in this journal (Sijbrandij 1981); this report described the reduction and fusion of spondylolisthesis in two patients using a posterior route in a one-staged operation. Harrington rods and specially designed double-threaded screws were used to exert a controlled force on the displaced vertebra in two perpendicular directions. In both cases fusion was successful and redisplacement did not occur. However, a major disadvantage of using Harrington rods is that after the operation they immobilise more lumbar segments than is necessary to obtain lumbosacral fusion. We have therefore modified our technique and in this article describe its use in three patients.

MODIFIED OPERATIVE TECHNIQUE

As described previously, Harrington rods are used to elongate the shortened spine by axial traction, which lifts the fifth lumbar vertebra out of the pelvis. To reduce the anterior displacement of the slipped vertebral body, two double-threaded screws are inserted into the body of the vertebra, taking care to avoid the dural sac and its branches. This combination of axial and anteroposterior forces reduces the slipped vertebra. After reduction the rods are taken away and fixation is carried out by means of a Zielke sacral bar (Figs 1 to 3). With this combination a stable fixation between the reduced L5 vertebra and the sacrum can be achieved without immobilising the adjacent lumbar vertebrae. Bone grafts are not needed.

CLINICAL MATERIAL

Three patients suffering from spondylolisthesis with severe displacement were treated using the modified operative technique. One girl aged 19 years had a 75 per cent slip (and a one centimetre ptosis) of L5 over the sacrum which was corrected to 15 per cent; before operation she had been treated with a brace. A man aged 20 years, who had previously undergone a laminectomy, had a slip of 55 per cent (without ptosis) completely reduced (Figs 4 to 6). Similarly, a boy of 16 years whose fifth lumbar vertebra had slipped by 50 per cent (0.5 centimetres ptosis) was completely corrected after operation; previously he had been treated by physiotherapy. The metallic implant was removed 8 to 10 months after operative reduction in all the patients. Neither before nor after removal of the implant was any redislocation of the reduced vertebra observed.

DISCUSSION

In severe spondylolisthesis (Grade III or more) there is a tendency for the slip to progress. The radiographic sign in these cases is resorption of bone and rounding off of the upper anterior surface of the sacrum and of the lower posterior part of the body of L5 (Fig. 1). In a 50 per cent slip the area of contact between L5 and the sacrum is reduced to 38 per cent and in a 75 per cent slip it is reduced to 17 per cent (Fig. 7). These factors result in poor support of L5 by the sacrum and consequently contribute to increase of the slip. Patients with this amount of dislocation develop a bad posture, disruption

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Diagrams illustrating reduction and fixation of severe spondylolisthesis of L5 (80 per cent slip). Figure 1—There is rounding off of the body of L5 and the sacrum. Figure 2—Distraction with Harrington rods, resection of bone from L5 and the sacrum, and reduction of L5 with screws. Figure 3—Fixation of L5 with screws and a sacral bar after removal of Harrington instrumentation.

![Fig. 1](image1.png)

![Fig. 2](image2.png)

![Fig. 3](image3.png)

A man aged 20 years with spondylolisthesis (55 per cent slip) underwent operative reduction and fusion of L5 in 1980. One year before he had had a laminectomy which resulted in a lesion of the roots L5 and S on the right side; a dropped right foot and a painful and unstable back. Figure 4—Myelograph and radiograph of the lumbosacral spine 11 days before reduction and fixation. Figure 5—Three days after operation. Figure 6—Four and a half months after operation.

![Fig. 4](image4.png)

![Fig. 5](image5.png)

![Fig. 6](image6.png)

Contact area (shaded) between sacrum and L5 with different degrees of slip in spondylolisthesis.
after reduction and posterior spondylodesis and we have observed it after anterior intercorporeal arthrodesis in a girl aged 12 years during the 12 years after operation (Figs 8 to 10).

Boxall et al. (1979) collected 34 cases in which spinal fusion, with or without reduction, for severe spondylolisthesis had been carried out. In spite of fusion of the spondylolisthesis they observed progressive slip of L5 in nine of the 34 cases.

These facts illustrate that both after anterior and posterior lumbosacral fusion progression of the slip or reslip can occur. In all these anterior and posterior lumbosacral fusions autogenous bone grafting is carried out. Evidently, during the phase of creeping substitution of these grafts, deformation of the grafted bone mass can occur. Doubtless the deformation of the sacrum and of the body of L5 (Fig. 1) also contributes to further slip or reslip.

In our method interposition of bone grafts between L5 and the sacrum is not necessary, lumbosacral fusion being achieved within six months due to close contact between the raw bone of the L5 and S1 bodies. The area of contact between the sacrum and L5 is more or less perpendicular to the axis of the lumbosacral column after the operation due to the resection of bone (Fig. 2). In the postoperative period stable internal fixation protects the reduced vertebra (Fig. 3). Without any doubt these are factors which have prevented reslipping.

Another advantage of our modified technique for reducing and stabilising spondylolisthesis in a one-stage operation is that the posterior route enables the surgeon to decompress the nerve roots and to control neural structures during the whole procedure; enough bone from the lower part of the body of L5 and from the upper part of the sacrum must be resected to avoid too much tension on the neural structures.

Reduction of severe spondylolisthesis is a major operative procedure which, in our opinion, should be undertaken only in Grade III and IV spondylolisthesis and in spondylolisthesis. When there is less displacement arthrodesis in situ gives excellent results and therefore reduction in these patients is not justified.

REFERENCES

