

# REDUCTION AND STABILIZATION OF SPONDYLOLYSIS AND SPONDYLOLISTHESIS WITH ALICI SPINAL SYSTEM

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51 patients who were treated with Alici Spinal Instrumentation for spondylolysis (n:9) and spondylolisthesis (42) between 1989-1991 were reviewed. There were 33 females and 18 males whose ages ranged between 16 and 66 years (av. 41.3 years). Level of involvement was L3-4 in one, L4-5 in 24, L5-S1 in 26 patients. Etiology was as follows: 23 spondylolytic, 9 congenital, 12 degenerative and 7 traumatic. There were 28 grade 1, 10 grade 2, 2 grade 3 and 2 grade 4 slips (Meyerding). 18 patients had associated degenerative disc disease. The duration of symptoms, excluding degenerative disc disease. The duration of symptoms, excluding the traumatic cases, were less than 5 years in 29, 5-10 years in 8, more than ten years in 7 patients. All patients had pain at presentation 19 patients had neurologic findings. Indications for surgery were as follows: 1. Unremitting pain, 2. Neurological findings, 3. Increase in the degree of the slip, 4. Failure of conservative therapy. The length of follow-up was av. 17.6 months (range, 6-30 months). The vertebra at the level of slip, one above and one below were stabilized by means of transpedicular screws and rods, and fusion was done. Postop. X-ray analysis revealed full reduction in 22, 50-75 per cent in 14, 25-50 percent in 4, and no reduction in 2 cases. 3 patients had postop. infection which resolved with treatment and did not necessitate removal of instruments. At the last follow-up, 8 patients had pain severe enough to take analgesics. No improvement of the neurological status was noted in 10 patients.

Most patients who have spondylolysis or grade 1 spondylolisthesis do not need surgical treatment (15). However, for patients who have persistent pain that is unresponsive to conservative measures, operative intervention seems to be indicated (23, 24, 27, 29, 32).

Operative treatment has been recommended for the severe, symptomatic spondylolisthesis of more than 50 per cent of slippage (Grade 3 and 4). The operative treatment in these cases continues to pose a therapeutic challenge.

Options include posterior arthrodesis in situ, with or without decompression (5, 10, 12, 18), posterior interbody arthrodesis (4, 9), and reduction of the spondylolisthesis, with associated arthrodesis (12, 16, 19, 26).

Several authors have advocated combining anterior and posterior approaches (7) to decompress the neural structures, place the fifth lumbar vertebra in a more anatomical relationship to the sacrum, and position bone grafts under favorable conditions for healing (14, 17).

Recently, newer systems for posterior instrumentation to reduce spondylolisthesis by single stage posterior procedures have been introduced (1, 3, 10, 13, 28).

In this study we report the results of reduction and stabilization of spondylolysis and spondylolisthesis

with Alici Spinal System with associated posterior fusion.

## MATERIALS and METHODS

The records of fifty-one patients who were available for follow-up and who were treated with Alici Spinal Instrumentation for spondylolysis (n:9) and spondylolisthesis (n:42) at the Department of Orthopedics and Traumatology, Dokuz Eylül University Hospital between 1989-1991 were reviewed. Thirty-three of the patients were female and eighteen were male. The ages at the time of operation ranged from sixteen to sixty-six years (average age, 41.3 years). Aetiologic classification was as follows: 23 spondylolytic, 9 congenital, 12 degenerative and 7 traumatic.

All patients had severe low back pain. Twenty-two of these had associated sciatica. Nineteen patients had neurologic findings. Except the traumatic cases, the symptoms had persisted for less than five years in 29, for five to ten years in 8, and for more than ten years in 7 patients. All had what was considered an adequate trial of conservative treatment, including different combinations of wearing a lumbosacral brace, rest, administration of nonsteroidal anti inflammatory drugs, exercise and physical therapy.

Plain anteroposterior, lateral and oblique roentgenograms were obtained for all patients. Level of involvement was L3-4 in 1, L4-5 in 24, L5-S1 in 26 patients. Meyerding's classification was used to measure

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the percentage of slippage: There were 28 grade 1, 10 grade 2, 2 grade 3 and one grade 4 slips. Computerized tomography scans were obtained in thirty-six patients. They revealed herniated nucleus pulposus in eighteen patients (3 at same level, 15 one space above).

Indications for surgery were as follows: 1. Unremitting pain, 2. Neurologic findings, 3. Increase in the degree of slip, 4. Failure of conservative therapy.

#### Operative Technique:

A midline incision is made. The paraspinal muscles are dissected from the vertebrae that are to be instrumented and included in the arthrodesis. If there is stenosis in the spinal canal and/or the lamina is very unstable, then total laminectomy is performed. The spinal canal is checked. The disc is removed when a large herniation is present. The transpedicular screws are inserted through the slipped vertebra, the one above and one below. After the rods are applied, distraction is applied. The reason for inserting the screws also through the slipped vertebra is that, as distraction is applied the vertebra is pulled posteriorly and thus reduced. The vertebrae are decorticated from the tips of their transverse processes to the tip of the spinous process and posterior fusion is done.

The operation time was average two hours and forty-five minutes. Average blood loss was three units.

#### RESULTS

Immediate postoperative radiographs revealed full reduction in 22, 50-75 % reduction in 14, 25-50 % reduction in 4 and no reduction in 2 cases.

The duration of follow-up ranged from six to thirty months (Average 17.6 months). At the latest follow-up pain was severe enough to take analgesics.

No improvement of the neurologic status was noted in ten of nineteen patients.

Radiographs at last follow-up revealed that fusion was achieved in all cases. No loss of reduction was seen.

Three patients had early postoperative infection which resolved with treatment, and did not necessitate removal of the instruments. Two other patients had late infection. The instruments were removed after a year from the operation. Despite infection solid fusion was seen in these two patients and infection resolved after removal of the instruments. There were no failure of the instruments.

#### DISCUSSION

The majority of patients who have radiographic findings of spondylolysis or of grade 1 spondylolisthesis do not need surgical treatment (15). However, operative intervention seems to be indicated in those who have persistent pain despite an adequate trial of conservative treatment (23, 27, 29, 32).

Buck's method of direct repair of the defect of the pars interarticularis using bone grafting and internal fixation with screws has been reported to give satisfactory results for spondylolysis and low grade spondylolisthesis (11, 24, 25, 30, 31). This method is only indicated in young patients and probably when the gap in the neural arch is less than three or four millimeters wide. Recently, the indications have been extended to patients with a gap of as much as ten millimeters (24, 30). We do not have experience with this technique. The above-mentioned indications were present in only a few of our patients. Our patients with spondylolysis were mostly of the degenerative type, so decompression was needed. We performed stabilization and posterior fusion in all patients with spondylolysis. Comparative studies are needed to decide which procedure works better.

The main debate related to the operative treatment of severe spondylolisthesis is on reduction. Some authors state that the mainstay of operative treatment of spondylolisthesis is posterior in situ arthrodesis, with extension to the fourth lumbar vertebra if the slippage is more than 50 per cent (5, 23, 32). With this approach, symptomatic relief has been reported in 75 per cent or more of patients (5, 22, 29). Nachemson and Wiltse (21) stated that there is considerable question if reduction should ever be attempted by any but a very few on a semiresearch basis because in situ fusion works so well. They also stated that there can be little doubt that reduction is never indicated when the listhesis is less than 25 per cent and hardly ever when less than 50 per cent. Furthermore, some experts have considered attempts at reduction to be dangerous and have stressed the high probability that slippage will recur after a successful reduction (12, 21).

It has been reported that additional slippage may occur after an in situ posterior or posterolateral fusion (20). Steffee and Sitkowski (28) also stress the fact that many high grade displacements continue to slip forward after what appears to be a good posterior and/or bilateral facet fusion.

The proponents of reduction state that reduction restores the normal biomechanics of the lumbar spine,

facilitates arthrodesis, reverses or relieves neurologic abnormalities and pain, and improves the patients appearance, in other words cosmesis (19, 22, 8). bradford's views on the matter are worth mentioning (6). He states that besides improving the biomechanical orientation and facilitating arthrodesis, reduction has three more major advantages. It allows decompression of the neural elements by foraminotomy. This relieves any laminar impingement on neural tissue on the fourth lumbar through first sacral segments that may have been caused by the slip. It allows correction of the lumbosacral kyphosis, resulting in spontaneous correction of thoracic lordosis and lumbar hyperlordosis. Thus causes of back pain are eliminated. Finally, the restoration of alignment in the sagittal plane allows the patient to stand fully upright with the knees and hips extended. Steffee (28) shares similar views.

We agree with Bradford and Steffee. Although they recommend the above mentioned advantages and thus reduction for Grade 3 and Grade 4 slips, we also attempted reduction for Grade 1 and Grade 2 slips. Our instrumentation has several advantages that leads us to adopt this approach. Reduction is not achieved by distraction alone. By means of the pedicular screws at the slipped vertebra, direct backward force is applied to this vertebra. This also prevents the possible loss of reduction. Another advantage of the system is that it allows gradual distraction and reduction. It should be stated that, we do not utilize fluoroscopy to verify a complete reduction. A complete reduction was not attempted.

Although there is no scientific evidence, reduction of low grade slips may also be beneficial biomechanically. All the advantages mentioned for reduction of severe slips therotically seems to apply for low grade slips. Certainly long term comparative studies are needed.

Our short term results show that the Alici Instrumentation is effective and successful in the treatment of spondylolisthesis and spondylolisthesis. It ensures solid fusion. Due to the instrumentation it seems that loss of reduction will not be a problem in the long term. Patient satisfaction was high, but long standing neurologic abnormalities may not resolve completely.

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