Treatment for spondylolysis and spondylolisthesis in children

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ABSTRACT

Purpose. To review outcome of 44 children who underwent conservative or surgical treatment for spondylolysis or spondylolisthesis.

Methods. Records of 25 male and 19 female children aged 5 to 14 (mean, 10.2) years who underwent conservative (n=39) or surgical (n=5) treatment for spondylolysis (n=19) or spondylolisthesis (n=25) were reviewed. Conservative treatment involved application of a thoracolumbosacral orthotic brace for all day except bedtime until symptoms resolved and then physiotherapy including exercises to strengthen the abdominal and back muscles and stretching exercises of the hamstrings and hip flexors. Surgery (instrumented posterolateral fusion [n=4] or Wiltse posterolateral fusion [n=1]) with allografts was indicated in patients with refractory pain (n=2) or nerve root irritation (n=1) and in patients with iatrogenic spondylolisthesis (n=2), followed by application of the brace for 3 months and then physiotherapy. Outcome was assessed using the Seitsalo scoring system.

Results. The mean follow-up period was 6.5 (range, 3–10) years. No patient developed any postoperative complication. Outcome was excellent in 35 patients, good in 8, and fair in one. All 5 patients who underwent posterolateral fusion for refractory spondylolisthesis achieved good outcome. In 11 patients with spondylolysis, the pars defect healed. None of the spondylolysis progressed to spondylolisthesis. All displacements remained stable, without any progression.

Conclusion. Conservative treatment is effective for most patients with spondylolysis or spondylolisthesis. Instrumented posterolateral fusion is indicated in patients with persistent symptoms and for iatrogenic cases.

Key words: braces; physical therapy modalities; spondylolisthesis; spondylolysis

INTRODUCTION

Spondylolysis and spondylolisthesis are common
causes of low back pain in children. Spondylolysis is a unilateral or bilateral defect of the pars interarticularis. Its incidence has been reported to be 4.4% in children aged <6 years and 6% to 11% in adults. The incidence increases in children participating in sporting activities with repetitive hyperextension of the trunk such as gymnastics and weightlifting. It is classified into 5 types: dysplastic, isthmic, degenerative, post-traumatic, and pathological. A sixth type was added to include spondylolisthesis in children who had undergone laminectomy for rhizotomy. The first 2 types are the most common types of spondylolysis and spondylolisthesis in children. The dysplastic type refers to congenital abnormalities of the lumbosacral articulation, including maloriented and hypoplastic facet joints and sacral insufficiency. The isthmic type refers to a defect in the pars interarticularis commonly a result of a stress fracture or an acute fracture. Spondylolisthesis is the forward translation of one vertebra relative to the next caudal segment. Grading of spondylolisthesis is based on the amount of forward translation on a standing lateral radiograph. No displacement is grade 0; up to 25% displacement is grade I; 25 to 50% displacement is grade II; 50 to 75% displacement is grade III; and 75 to 100% displacement is grade IV.

In terms of the natural history of spondylolysis and spondylolisthesis, unilateral pars defects are not associated with further slips or disability, and bilateral pars defects follow a clinical course similar to that of the general population. Only a small percentage of patients develop symptomatic progression. Most symptomatic patients can be treated conservatively, but there is no consensus for the optimal method. Conservative treatment of bracing and physiotherapy remains controversial. This study reviewed the outcome for 44 children who underwent conservative or surgical treatment for spondylolysis or spondylolisthesis.

MATERIALS AND METHODS

Records of 25 male and 19 female children aged 5 to 14 (mean, 10.2) years who underwent conservative (n=39) or surgical (n=5) treatment for spondylolysis (n=19) or spondylolisthesis (n=25) in our hospital between 1993 and 2011 were reviewed. 11 male and 8 female children (mean age, 10.7 years) with spondylolysis of the isthmic (n=17) or dysplastic (n=2) type of the L5 (n=15), L4 (n=3) or L3 (n=1) vertebra underwent conservative treatment. Technetium-99m bone scanning of the lesions showed increased isotope uptake (‘hot’ lesions) in 9 patients and decreased isotope uptake (‘cold’ lesions) in 10 patients.

14 male and 11 female children (mean age, 9.8 years) with spondylolisthesis of the isthmic (n=21), dysplastic (n=2), or iatrogenic (n=2) type of the L5/S1 (n=24) or L4 (n=1) vertebra underwent conservative (n=20) or surgical (n=5) treatment. Technetium-99m bone scanning of the lesions showed hot lesions in 10 patients and cold lesions in 13 patients; the remaining 2 iatrogenic cases occurred intra-operatively following removal of an aneurysmal bone cyst. Displacement was grade 1 in 22 patients and grade II in 3 patients.

Initial management consisted of analgesia and bed rest, followed by application of a thoracolumbosacral orthotic brace for all day except bedtime (6 months for hot lesions, and about 6 weeks for cold lesions) until symptoms resolved, and then physiotherapy including exercises to strengthen the abdominal and back muscles and stretching exercises of the hamstrings and hip flexors. Surgery (instrumented posterolateral fusion [n=4] or Wiltse posterolateral fusion [n=1]) with allografts was indicated in patients with refractory pain (n=2) or nerve root irritation (n=1) and in patients with iatrogenic spondylolisthesis (n=2), followed by application of the brace for 3 months and then physiotherapy.

Outcome was assessed using the Seitsalo scoring system, taking into consideration the presence of pain and the loss of function in activities of daily life and sports. Outcome was considered excellent when patients had full function and no pain, good when patients had full function and occasional pain, fair when patients had loss of function and occasional pain, and poor when patients had loss of function and persistent pain.

RESULTS

The mean follow-up period was 6.5 (range, 3–10) years. No patient developed any postoperative complication. According to the Seitsalo scoring system, outcome was excellent in 35 patients, good in 8, and fair in one. All 5 patients who underwent posterolateral fusion for refractory spondylolisthesis achieved good outcome. In 11 patients with spondylolysis, the pars defect healed. None of the spondylolysis progressed to spondylolisthesis. All displacements remained stable, without any progression.
DISCUSSION

Most patients with spondylolysis or spondylolisthesis can be successfully treated by conservative means.6,14–16 In a meta-analysis of 665 conservatively managed patients, 84% achieve good outcome after one year.12 The use of a thoracolumbosacral orthotic brace for 6 to 12 weeks,1,2 or up to 6 months17,18 is recommended. However, patients may still achieve satisfactory outcome without the use of a brace.13,19,20 Patients treated with or without a brace have been reported to achieve comparable outcome in a meta-analysis.12

Patients with spondylolysis or spondylolisthesis may present with tight hamstrings and fixed flexion of the hips and knees.2 Physiotherapy should therefore include abdominal strengthening, stabilisation of the back muscles, and stretching of the hip flexors and the hamstrings.2,3 Stressing the lumbar spine in hyperextension should be avoided.2,3 Abdominal and back exercises alleviate pain and functional disability symptoms more than general exercise such as walking or swimming.21

Surgery is indicated for patients with persistent symptoms or slip progression.2,5,21 Instrumented posterolateral fusion is the gold standard and achieves a high fusion rate and good outcome in paediatric patients,5 but in adult patients the outcome remains controversial.22 In children with symptomatic high-grade spondylolisthesis, instrumented posterolateral fusion is preferred because of a high chance of slip progression and persistent symptoms, as well as the ability to correct the lumbosacral kyphotic deformity and restore the sagittal malalignment with subsequent improvement in spinal biomechanics and the fusion rate.5,21,23 Nonetheless, it is associated with an increased risk of neurological complications.5,24 Direct repair of the pars defect with segmental wire fixation is a viable option in carefully selected patients who fail conservative management, with slip <25%, without disc degeneration or nerve root irritation5,22; 90% to 100% patients achieve fusion and excellent outcome.25,26

According to the Scoliosis Research Society, the rate of major complications in paediatric patients who underwent surgery for isthmic or dysplastic spondylolisthesis is 10.4%.24 The complication rate increases to 14.4% when the slip is not reduced, compared with 7.9% when the slip is reduced.24 Because of the high rate of complications, some surgeons advise against surgical management for high-grade spondylolisthesis.21,27

Limitations of this study were its retrospective nature and the absence of patients with high slippage.

CONCLUSION

Conservative treatment is effective for most patients with spondylolysis or spondylolisthesis. Instrumented posterolateral fusion is indicated in patients with persistent symptoms and for iatrogenic cases.

DISCLOSURE

No conflicts of interest were declared by the authors.

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