



## A REVIEW STUDY ON SPONDYLOLYSIS IN ATHLETES

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### ABSTRACT

Lumber spondylolysis is a unilateral or bilateral defect of the interarticularis, an isthmus of bone connecting the superior and inferior facet surfaces in the lumbar spine at a given level. Spondylolysis is common in young athletes participating in sports, those requiring repetitive hyperextension movements. Majority of young athletes are able to return to full sport participation following accurate diagnosis and conservative management, including a structured treatment program. Surgical intervention for isolated pars injuries is seldom necessary. A progressive physical therapy (PT) program is an important component of recovery after sustaining an acute pars fracture. However, there is a paucity of literature detailing PT programs specific to spondylolysis. This study is providing an overview of the epidemiology, natural history, radiographic evaluation, and management of pars fractures in young athletes

**Keywords:** Spondylolysis, Physical therapy, Athletes and Sports.

### INTRODUCTION

Spondylolysis in other term Spinal Arthritis or Spine Osteoarthritis is a unilateral or bilateral defect of the interarticularis, an isthmus of bone connecting the superior and inferior facet surfaces in the spine at a given level. This defect may either be an acute fracture or a chronic osseous disruption with sclerotic borders (C. H. Crawford, C. G. T. Ledonio, R. S. Bess et al.,). Condition, which has an incidence of 3.10% in the general population, exists on a continuum ranging from stress fractures to spondylolisthesis. Those caring for pediatric and young adult patients participating in sports will often encounter spondylolysis which typically presents as low back pain with specific activity (i.e., lumbar extension/rotation during throwing, lumbar hyperextension, and loading during back handspring). Majority of young athletes are able to return to full sport participation following accurate diagnosis and conservative management, including a structured treatment program. Therefore, surgical intervention for isolated injuries is seldom necessary. A progressive physical therapy (PT) program is an important component of recovery after sustaining an acute fracture. However, there is a paucity of literature PT programs specific to spondylolysis. Here, we go through an overview of the epidemiology, natural history, radiographic evaluation, and management of fractures in young athletes. Additionally, the study focus on nonoperative management, providing a detailed description of a physiotherapy program for this population that was developed at a spine center within an academic medical center. Participation in sports, particularly sports involving repetitive hyperextension and axial loading of the spine, leads young athletes to fractures. Common examples include baseball, gymnastics, football, tennis, and weightlifting. The incidence of lumbar spondylolysis in the general population is 3.10%. In a radiographic study using computed tomography (CT) in 532 patients aged eight or younger presenting with general lumbar complaints, was diagnosed in 4.7% of the children. The prevalence of lumbar spondylolysis in 153 pediatric patients, defined as younger than 19 years, who presented to an orthopedic clinic with low back pain for greater than two weeks was 39.7%. All positive diagnoses of spondylolysis had a history of athletic participation (F Omid-Kashani 2014). A similar study also found spondylolysis rates as high as 30% among 1025 adolescent athletes presenting to a sports medicine clinic for low back pain. Thus, there is a significantly higher incidence and prevalence of spondylolysis among young athletes than those in the general pediatric population (Sara Goetzinger et al., 2020). A review of the natural history of lumbar spondylolysis by the Scoliosis Research Society;



Evidence-Based Medicine Committee (SRS EBMC) found that unilateral pars fractures typically heal normally, especially among acute fractures. However, cases with bilateral and/or chronic pars fractures commonly progress to spondylolisthesis with rates as high as 43.74%. Several studies have radio graphically documented slip progression in populations with spondylolysis and spondylolisthesis, reporting a decreased rate of slip progression after age 20.

### **RADIOGRAPHIC DIAGNOSIS**

The definitive diagnosis of spondylolysis cannot be made with physical examination alone and, therefore, requires imaging for diagnosis. Various studies have evaluated one modality in comparison to a control; however, there is no absolute gold standard for radiographic diagnosis. Typically, plain films x-rays are used for initial diagnosis as they are inexpensive and relatively low in radiation dosage. Although four-view plain film x-rays, which include oblique views, can be helpful in diagnosis of spondylolysis, the sensitivity is comparable to two-view films.

Four-view x-rays, two-view films involve one-half the radiation dosage and nearly two-thirds the cost. Advanced imaging modalities can be more sensitive than plain film x-rays in the diagnosis of spondylolysis. In comparing MRI with CT, where CT is used as the gold standard for evaluation, the sensitivity of MRI was 83%. Two studies have compared CT to single-proton emission CT (SPECT) as the gold standard; they demonstrate the sensitivity of CT is 85%. Lastly, comparing MRI to SPECT, where SPECT was the control gold standard, the sensitivity of MRI is 80%.

### **SURGICAL TREATMENT**

Degeneration of the lumbar spine is described as lumbar spondylosis or degenerative disc disease and may lead to spinal stenosis (narrowing of the spinal canal), vertebral instability and/or misalignment, which may be associated with back pain and/or leg symptoms. This review considers the available evidence on the procedures of spinal decompression (widening the spinal canal or laminectomy), nerve root decompression (of one or more individual nerves) and fusion of adjacent vertebrae. There is moderate evidence that instrumentation can increase the fusion rate, but any improvement in clinical outcomes is probably marginal. The effectiveness of intra-discal electrotherapy (IDET) remains unproven. Only preliminary results are available on disc replacement and it is not possible to draw any conclusions on this subject.

### **NON SURGICAL MANAGEMENT OF SPONDYLOLYSIS**

PT participation after the diagnosis of spondylolysis in young athletes is an important component of recovery in order to re-establish strength, provide education, and reintroduce patients back to sports activity. In this population, ample evidence exists to support the development of core-strengthening exercises, specifically activating and isolating the transverse abdominis (TA), internal oblique (IO), and multifidi to structurally stabilize the lumbar segments. These deep abdominal muscles (TA and IO) and lumbar multifidus are particularly relevant in the management of patients with low back pain and/or lumbar instability because of their impact on increasing intra-abdominal pressure as well as their contraction resulting in tension placed on the thoracolumbar fascia and lumbar vertebrae, thereby increasing lumbar stiffness. Recommendations related to the parameters of PT intervention after spondylolysis diagnosis (i.e., stage of recovery to initiate, frequency, and duration) vary significantly, resulting in a lack of standardization of post-injury rehabilitation programs. The timing of therapy initiation discussed in the literature spans from early within the diagnostic process to waiting until complete fracture healing.

### **CONCLUSION**

Stress injuries and fractures to the lumbar pars interarticularis are common sports-related injuries among young athletes. After diagnosis, an individualized PT rehabilitation program including education, activity modification, and a progressive course of specific exercise will lead to symptom resolution and return to athletic participation in the vast majority of young athletes. Surgery for direct pars repair is rarely necessary; however, it has high success rates when



required in refractory patients. A standardized non-operative treatment algorithm for pediatric spondylolysis is outlined above.

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