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Spinal Problems in Children Part III: Adolescents

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In the third and final part of this series dealing with spinal problems in children we consider the problems of children in the adolescent years, the 11 to 17 year age group. During this period of life, the still developing spine is rapidly gaining strength through increasing bone density and progressive ossification which is resulting in the closure of more epiphyseal centers. The adolescent will go through phases of rapid growth where height might increase by six inches in as many months. This rapid growth phase, known as the "adolescent growth spurt," is associated more with growth of the lower extremities than it is with growth of the spine. Growth of the spine remains fairly constant during adolescence, growing at about the same rate from the age of five years onwards. The adolescent phase is also a time when body structures are subjected to increasing trauma, through sporting activities, increasing body weight and increased velocity of movement. The effect of these changes can be to amplify any inherent spinal weaknesses which are already in existence, such as spondylolysis, spondylolisthesis or facet tropism.

Facet Tropism

Facet tropism can generally be classified as an overuse syndrome associated with hyperextension sporting activities. It is a condition which is characterized by a variation between the angulation of the facet joint facings between the left and right sides of the same vertebral segment and is a most frequent cause of back pain in athletic teenagers. The condition appears to be exacerbated by any sport such as basketball or volleyball which can cause sudden forceful hyperextension of the lumbar spine. In this condition, the loss of bony stabilization of the facet joints is thought to predispose to consequent stretching and irritation of the ligamentous capsules. The resulting inflammation of the capsular ligaments is thought to be responsible for the onset of symptoms, mainly pain with movement. Treatment involves specific exercises to strengthen the lumbar musculature and thereby provide additional support. Exercises which involve hyperextension of the lumbar spine, beyond the neutral position, should be avoided as they will tend to aggravate the patient’s problem. The problem usually resolves in early adult life, but may return again in the third or fourth decade

as the patient’s muscle tone undergoes that all too common phase called "deconditioning."

Spondylolysis

Spondylolysis is a condition in which there is interruption of the pars interarticularis. Recent research authors have identified stress fracture as the likely cause of this condition. Radiographic examination of hundreds of fetal and newborn spines reveals no evidence of pars separation with the youngest recorded case of spondylolysis being in a four month old infant. Hence, this condition can be more correctly classified as an acquired rather than as a congenital disorder. About 90 percent of spondylolysis cases involve the L-5 vertebra. The most common cause of this condition is thought to be associated with athletic activities which involve hyperextension of the lumbar spine, such as diving, gymnastics, weightlifting and pole vaulting. Wrestling and football have also been implicated by some authors in the etiology of this condition. Other authors point to the repetitive trauma associated with early attempts at walking as a possible cause. The most common stage for detection of this condition is after five years of age. Lower back pain can be a presenting symptom for spondylolysis if the traumatic event was a recent one. However, most commonly this condition is encountered incidentally without symptomatic evidence of back pain, therefore suggesting ununited stress fracture as the more correct diagnosis. If detected in its earliest stage, spondylolysis should be treated with several weeks of bed-rest and relative immobilization.

Spondylolisthesis

Spondylolisthesis is a condition where there is anterior movement of a vertebra upon the spinal structure immediately below.

Spondylolisthesis has three predisposing factors:

1. traumatic defect in the pars interarticularis of the neural arch, known as spondylolysis, 2. congenital malformation, especially elongation of the articular processes, and 3. degeneration of the posterior facet joints.

Of these three, spondylolysis is the most common cause of spondylolisthesis in children. In spondylolysis, there is loss of bony continuity between the superior and inferior articulating processes with the deficiency being bridged by fibrous tissue. If this fibrous tissue stretches or gives way, the consequent vertebral displacement may give rise to spondylolisthesis. In some patients the anterior movement of the affected vertebra can cause a spinal stenosis. Spondylolisthesis is most often symptomless in children. Diagnosis is

by x-ray, demonstrating the anterior vertebral slippage. A spondylolisthesis is more likely to progress (e.g. from grade 1 to grade 2) during an adolescent growth spurt. It is for this reason that any child identified with this problem should be carefully supervised in sports which involve excessive axial loading of the spinal column, such as weight lifting and football, during that critical phase of growth. This is not to say that such sports are contraindicated during all of the adolescent period, but rather the restrictions may be reserved for those months during which a characteristic rapid growth spurt is occurring, since it is during this time that the spinal structures are at their weakest. Once the adolescent growth phase is completed, further slippage of a spondylolisthesis, with less than a Myerding grade 2 classification, is unlikely.

Adolescent Scoliosis

Adolescent scoliosis is defined as a spinal curvature presenting at or about the onset of puberty and before maturity (10-25 years), more commonly in females. Progression most frequently occurs in the age range 12 - 16 years and can be especially rapid during a growth spurt, when the outer or convex side of the spine will grow more rapidly than the inner or concave side. Once spinal growth has ceased further progression is unlikely. Radiological assessment should be made initially to identify the etiology, site, magnitude and flexibility of the curve, also for assessment of bone maturity, monitoring progression or regression and to aid in developing a treatment plan. Subsequent evaluation should be made at 3 to 4 month intervals during the growing period, as determined by non-closure of the iliac epiphysis, to evaluate the efficacy of any selected treatment plan. Curvatures of less than 20 degrees can be conservatively managed with spinal manipulation, soft tissue therapy and exercise. Any curvature which progresses to more than 20 degrees during the growth period should be evaluated for possible bracing.

Ankylosing spondylitis

Ankylosing spondylitis is a chronic inflammatory disorder of unknown cause which affects predominantly young males. It is a relatively common cause disorder causing lower back pain in this group of patients and may occur at any time from as early as 15 years up until the mid 30s. Although the initial symptoms may be confined to pain and stiffness around the lower back and sacroiliac joints, other areas of the axial skeleton may be involved such as the shoulders, hips, knees and heels. The earliest radiographic evidence for the presence of this disorder can be seen in the sacro-iliac joint margins where loss of cortical articular bone produces a pseudo-widening of the articulation. Subsequently, the bilateral, symmetric appearance of sclerosis on the iliac margins of the joint will appear. Frequently, this is the first stage when diagnosis of

this condition is made. Later progression to higher spinal areas, most commonly appears first at the thoraco-lumbar area. Further progression to costovertebral ankylosis, with its classic "bamboo spine appearance, can contribute to diminished chest expansion. Useful laboratory tests include the human locus antigen, HLA-B27, which is present in approximately 90 percent of cases and negative RA Latex, typing this form of arthritis as sero-negative. Once this condition has been diagnosed, the treatment involves pain control, careful joint manipulation to maintain mobility and an exercise program to maintain flexibility.

Scheuermann's disease

Scheuermann's disease is a disorder which primarily affects the adolescent thoracic spine producing pain and cosmetic deformity. The cause of this condition is unknown, however recent studies have implicated spinal end-plate fractures during the adolescent growth period as a likely causative factor. The average age at onset of Scheuermann's disease is between 13 and 17 years of age. The problem is most commonly confined to the mid and lower thoracic areas with symptoms which include pain in the thoracic spine, easy fatigue and postural deformity. Postural changes can exhibit exaggerated mid-thoracic kyphosis, cervical and lumbar lordosis and anterior pelvic tilt. X-ray findings most commonly occur at the T8/9 region and include anterior vertebral body wedging, loss of disc height and irregularity of the vertebral end-plates. Since the clinical manifestations of this condition can be highly variable, it is not unusual for the initial diagnosis to be made incidentally later in life on a routine lateral thoracic x-ray view.

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