Dynamic Chiropractic

PEDIATRICS

# Children and Scoliosis

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Scoliosis is defined as "any lateral deviation of the spine from the mid-sagittal plane."[1] While there are many causes for scoliosis, children and adolescents with scoliosis who present to chiropractors usually fall into three categories. Successful treatment is dependent upon differentiating the underlying cause of the spinal curvature. In most children, the scoliotic spine is not symptomatic; the spinal curvature is first noticed either by a parent who becomes concerned about a child's posture, or during a screening examination, usually at school. The importance of a good evaluation and early treatment is to prevent progression and worsening of the curvature. Children with all three major causes of scoliosis should have a careful evaluation of the lower extremities as part of their spinal examination to determine associated or contributing components to the spinal deviation.

1. Structural vs. Nonstructural Scoliosis

A structural scoliosis is defined as a spinal curvature that does not correct during recumbent, lateral flexion radiographs. The two most common causes of a structural scoliosis are congenital and idiopathic. A nonstructural scoliosis can be reduced when lying down, and will correct with recumbent lateral flexion. This type of spinal curvature is sometimes called a "functional curve," and is often secondary to a leg length discrepancy.

2. Congenital Scoliosis

Of the three major etiologies of scoliosis, this is the least common. Congenital scoliosis develops secondary to a bony anomaly of the sacrum, vertebrae or ribs. These are often defects of formation or segmentation, resulting in wedged, blocked, or hemi-vertebrae. In some cases, the abnormality will require corrective surgery. In many children, a heel lift or shoe buildup can provide sufficient structural support, and help to maintain a balanced spine.

When a congenital spinal anomaly is discovered, it's important to remember that there are usually multiple affected areas. For instance, it is more common to have multiple bony abnormalities than just a single level. Nonosseous and extraspinal deformities are also often present. These may include the cartilaginous and connective tissues, and even genitourinary or cardiovascular abnormalities. Clubfoot, a congenitally dislocated hip, or an anatomically short leg often will contribute to the spinal imbalance.

3. Idiopathic Scoliosis

Idiopathic scoliosis can be progressive, worsening significantly during periods of rapid growth. In the more severe cases, bracing, or possibly surgery, may be necessary to prevent substantial deformity.[2] After skeletal maturity, most curvatures progress only slowly, if at all. Recent scientific research has focused on hormonal and neurological causes for idiopathic scoliosis, with some promising early results, but no definitive conclusions.

Hormonal Influences

The pineal gland appears to have some influence on the development of a balanced spine, at least in chickens and rats. Surgical removal of the pineal gland in young chickens,[3] and more recently in bipedal rats,[4] produced spinal curvatures that are very similar to human idiopathic scoliosis, including vertebral rotation and rib humps. In the recent study on rats, the investigators found that providing a source of melatonin prevented the development of scoliosis in pinealectomized rats. They theorize that "melatonin may facilitate the fine neuromuscular coordination needed to maintain the 24 stacked vertebrae in balance."

While some studies have found that human patients with progressive scoliosis do have lower levels of melatonin, other investigations have not been able to establish a direct correlation. Injections of 5-hydroxytryptophan (a precursor to serotonin) into pinealectomized chickens prevented the development of scoliosis in most of them.[5] These researchers report that "...normal spine growth requires a precise and delicate balance of equilibrium and postural tone. The results of our current study and those we have reported previously imply that both melatonin and serotonin, and appropriately balanced use of both, are required for normal spine growth..." Does this imply that nutritional support may be an answer?

Coordination and Gait

Numerous studies over the years have shown that humans with scoliosis have various defects in muscle coordination and standing balance. The source of these difficulties with fine motor control is unknown, and many theories have been developed and then discarded. The gait of children with scoliosis has been found to be somewhat abnormal, but there is controversy about whether this causes a curvature to develop or is simply a result of walking with a curved spine.

A recent study using sophisticated measuring devices and advanced computer analysis found a significant difference in gait between normal subjects and those with scoliosis.[6] This was most noticeable in the medial-lateral component of gait, indicating problems with pronation and supination control. They observed that the "...differences between the scoliosis and the control group, together with previously reported abnormalities of torsion in the tibia and femur and the hypothesis of pelvic rotation, suggests these are primary mechanisms of the cause of idiopathic scoliosis."

These researchers believe that gait asymmetry could very well be the underlying cause of the balance and coordination problems that result in a curved spine. They conclude: "Patients with scoliosis exhibit balance problems during the stance phase of gait and have significant asymmetry in the frequency characteristics. These findings could be a primary effect that contributes to the medial-lateral deformity of the spine and its initiation and progression."

Nonstructural Scoliosis

When a child's lateral spinal curvature reduces significantly during recumbency, and side-bending is relatively symmetrical, a biomechanical imbalance must be considered. The causes include postural habits, muscle imbalances, pelvic and spinal misalignments and subluxations, and leg length discrepancies. These are all very responsive to conservative care, as long as the underlying source of the imbalance has been identified.

Pelvic and Spinal Imbalances

Muscular imbalances and recurrent subluxations may develop secondary to a child's postural habits. Asymmetrical development of musculature used frequently in a sport can also be the source

of a nonstructural scoliosis. These curves are usually mild, and will correct rapidly with education, corrective exercises and chiropractic treatment.

Leg Length Difference

A discrepancy in leg length during growth will cause a tilted sacral base, with a lumbar curvature. Once again, the scoliosis is usually mild, but the underlying cause should be identified and corrected in order to allow balanced spinal growth. If there is an anatomical difference in the length of the legs, a heel lift (or sole lift, in some cases) should be supplied. A functional short leg is due to an asymmetry in alignment, most commonly excessive pronation and/or lack of development of an arch of one foot. It is very important to recognize the functional short leg, since providing a heel lift instead of an orthotic is likely to perpetuate any associated sacroiliac subluxations.[7] There is little reliable information on the radiographs to differentiate these conditions. A pelvic tilt, a lower sacral base, and a femur head discrepancy seen on an x-ray of a child with a lumbar scoliosis indicates a lower extremity source, but not whether it is an anatomical or a functional short leg. A good clinical postural exam with lower extremity screening (including shoe wear patterns) can help make this determination.

Orthotic Support

All three major causes of scoliosis in children have been related to lower extremity asymmetries. Placing a child with a lateral curvature in custom-made orthotics provides an appropriate chance for developing a balanced spine, supports the chiropractic adjustments, and contributes to structural balance. If a heel lift is considered, a preferred method is to provide orthotics with an adjustable lift. This allows for increases or decreases that may be needed due to bone growth and lengthening. Of course, the orthotics themselves will need to be replaced as the child's feet grow.

Conclusion

A child with a scoliosis must receive a careful spinal examination to determine the cause of the lateral curvature. In all cases, an assessment of the alignments and lengths of the lower extremities must be included. Accurate, standing x-ray films are also necessary; first, to measure the amount of lateral deviation, rotation, and angulation of vertebrae; second, to determine the spinal maturity (and risk of progression); and finally, to rule out any leg length inequality. In many cases, custom-fitted orthotics (sometimes with added heel lifts) are needed for long-term results.

When conservative treatment of idiopathic scoliosis is indicated, nutritional support for the pineal gland should be considered. Perhaps most importantly, the neurological system needs to be checked thoroughly, and any interferences and sources of incoordination eliminated. Exercises to develop fine control of balance and posture, as well as gait training, may be helpful. Custom-fitted orthotics should be provided early in treatment of all patients with scoliosis to improve bilateral balance and gait symmetry.

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