

Rapid, Spontaneous Resolution of Adolescent Idiopathic Scoliosis

Jacob Moser¹ • Abigail Bourland¹ • Richard Byrd, MD²

Abstract

Adolescent idiopathic scoliosis (AIS) is defined as a more than 10-degree lateral curve of the skeletal spine seen on standing radiograph in children aged 11 to 18 years with unknown etiology. Treatment of AIS is determined by the patient's Cobb angle and skeletal maturity. Treatment options include observation, exercise therapy, bracing, and surgery, with surgery being the only proven treatment to correct scoliosis. We present a case of a 13-year-old boy with AIS with a left thoracolumbar curve of 23.7-degrees that resolved spontaneously in less than 4 months with exercise and physical therapy.

Key words: adolescent idiopathic scoliosis, scoliosis, spinal curvature

Idiopathic scoliosis in adolescents is a relatively common spine deformity of unknown etiology. Although mild curvatures tend to fully resolve over time, more significant curves rarely do so. We present a case of moderate scoliosis (23.7-degree left thoracolumbar) that resolved spontaneously in less than 4 months, with exercise and physical therapy as the sole treatment modalities.

Case Presentation

A 13-year-old, right-handed, adolescent

male presented to his pediatrician for his annual health maintenance examination with no chief complaint. His medical history was significant for moderate persistent asthma well-controlled with inhaled fluticasone-salmeterol. He is a year-round student-athlete, and he does not report significant pain.

On physical examination, a 6-degree left lumbar rib hump (on Adam's forward bend test) was found using a Scoliometer™. Asymmetry of the back while standing was observed (**Figure 1**).

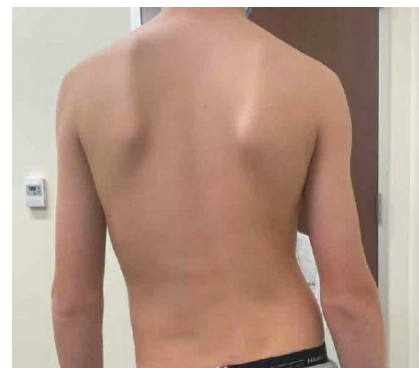


Figure 1. Asymmetry of back in standing position at time of diagnosis.

AFFILIATIONS:

¹Medical Student, Texas A&M College of Medicine, Bryan, TX

²Pediatrician, Kelsey-Seybold Clinic, Houston, TX

CITATION:

Moser J, Bourland A, Byrd R. Rapid spontaneous resolution of adolescent idiopathic scoliosis. *Consultant*. Published online July 11, 2022. doi:10.25270/con.2022.07.00007

Received October 8, 2021; accepted October 25, 2021.

DISCLOSURES:

The authors report no relevant financial relationships. Written informed consent for use of the images contained in this article was obtained from both the patient and his parent.

CORRESPONDENCE:

Richard Byrd, MD, Kelsey-Seybold Clinic, 7010 Highway 6, Missouri City, TX 77459 (Richard.byrd@kelsey-seybold.com)

Diagnostic testing

A standing posteroanterior scoliosis radiograph demonstrated a left thoracolumbar curve from T6-L3 with a Cobb angle of 23.7 degrees and a Risser grade of 0. A lateral spine showed no evidence of spondylolisthesis. A concomitant left hand/wrist film showed a bone age of 13 years, equivalent to his chronological age (**Figures 2A-2C**).

He was referred to a pediatric orthopedic surgeon and scoliosis specialist. There the patient reported a 2-week history

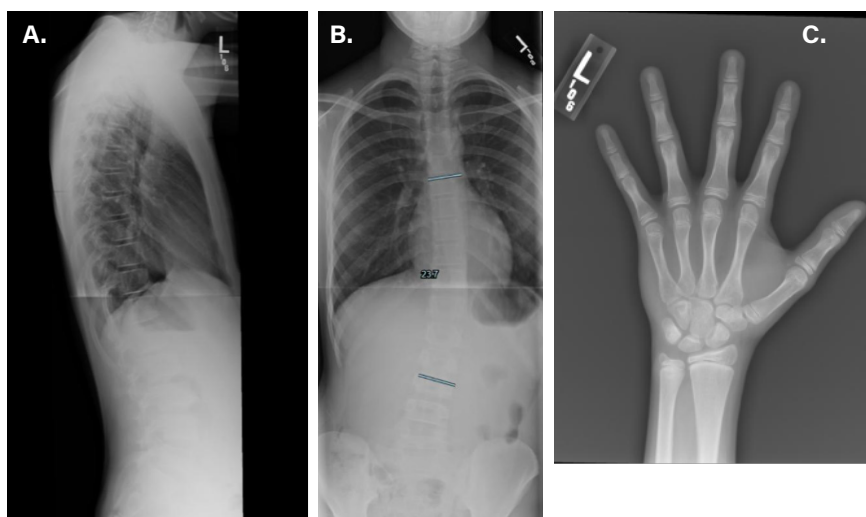


Figure 2. (A): lateral spine; (B): PA spine with Cobb angle measurement; (C): left hand/wrist for bone age.

of back pain, localized to the paraspinal musculature. The pain affected his ability to play sports and run. Upon this second physical examination, he was noted to have a level pelvis and shoulders, a mild left truncal shift, and a left lumbar prominence on forward bend testing. There were no abnormal neurologic findings. The diagnosis of adolescent idiopathic scoliosis (AIS) was confirmed. Observation and bracing were discussed as treatment options. The patient and his family decided on observation with physical therapy and close follow-up.

Discussion

Scoliosis is a 3-dimensional spine deformity defined as a 10-degree or greater lateral curvature found on a standing radiograph. AIS is a classification of scoliosis for children aged 11 to 18 years without a known etiology.¹ While there are secondary causes of spinal deformity that can present with “red flag” symptoms, including severe pain and abnormal neurologic examination,² AIS is a multifactorial condition, again, with no known etiology. Theoretical possibilities are many and include abnormal expression of mesenchymal stem cells and gene polymorphism of both vitamin D and growth hormone receptors, but there is no strong evidence supporting any

specific etiology.³

In a study with 2242 children screened for scoliosis, 1.8% of the children had idiopathic scoliosis (greater than 10 degrees), and 0.4% (0.5% of girls and 0.3% of boys) needed active treatment.⁴ Other studies have shown an annual prevalence of AIS between 0.47% and 5.2%.³ Female adolescents are at increased risk of AIS, with an annual prevalence of 1.5:1 to 3:1 compared with male adolescents,¹ as well as a much higher chance of developing severe scoliosis necessitating treatment.⁵ A total of 90% of thoracic curves are convex to the right.

Patients with AIS can present with symptoms that arise from truncal asymmetry. Signs of truncal asymmetry include poor posture with shoulder asymmetry, leaning to one side with their arm often brushing past their ipsilateral leg, and shirts that fit unevenly. Pain, neurologic dysfunction, or alternate curvatures (eg, left thoracic) are less likely and can indicate a secondary etiology, requiring further work up.⁶

Screening for scoliosis is by visual inspection and Adam’s forward bend test.⁷ Using a Scoliometer, an instrument similar to a carpenter’s level, the angle of trunk rotation (ATR) can be measured by placing the device perpendicular to the spine, with the patient in the forward bend position.

The ATR value helps clinicians determine the need for imaging.⁶ Byrd uses an ATR value of 6 to 7 degrees as a threshold for imaging.

A standing, full length posteroanterior and lateral view of the spine is required to diagnose scoliosis. This allows full visualization of the spine to determine the Cobb angle, a measurement to accurately determine the curvature of the spine. The clinician first determines the 2 most rotated vertebrae above and below the apex of the curve. The Cobb angle is the angle at which the lines through the horizontal borders of both vertebrae intersect. If the angle is 10 degrees or greater with an unknown etiology in a patient aged 11 to 18 years, a diagnosis of AIS is confirmed. Imaging is also needed to determine the skeletal development of the patient, and this can be done from the Risser grade on the original full length posteroanterior spine radiograph. The Risser sign gives a progressive score of skeletal maturity (0-5) based on the degree of ossification of the iliac crest. Another method of determining skeletal maturity is to obtain a left hand/wrist bone age radiograph. A patient’s skeletal maturity will help determine what treatment is needed, as adolescents who are skeletally immature will need more aggressive observation and treatment than mature patients with the same Cobb angle value.⁷

Factors associated with worsening progression of the curvature include female sex, prepubescence/greater growth potential (as seen with younger bone age or lower Risser grade), and having a thoracic curve. Factors that do not significantly contribute to worsening curve progression are a family history of scoliosis, abnormal body mass index, kyphosis, and lordosis.⁸ In a review of 123 skeletally immature patients with AIS (mean age, 14 years), the average curve measured 33 degrees (range 10-49 degrees) at the time of diagnosis and progressed to 49 degrees (range 12-97 degrees) at skeletal maturity when no treatment was provided.⁸ The most common report of adult patients with



Figure 3. Posteroanterior of spine 3 months after initial diagnosis.

untreated scoliosis is disfigurement. Other possible symptoms are mild back pain, functional impairment, and degenerative lumbar disc changes.⁹ Respiratory compromise from restrictive lung diseases can develop with severe curvature.⁷ Life-threatening pulmonary dysfunction is not likely to occur until the scoliotic curve is 100 degrees or greater.²

The patient's Cobb angle and skeletal maturity determine what treatments are needed. There are four main treatment options: observation, exercise therapy, bracing, and surgery. Other factors influencing treatment options are rate of curvature progression seen on repeat radiographs and the patient's or parent's



Figure 4. Resolution of asymmetry 10 months after initial diagnosis.

preference. Bracing does not correct scoliosis but can prevent the significant progression in some patients, decreasing the need for surgery.⁹ Surgery is the only treatment proven to correct scoliosis. Posterior spinal fusion surgery is reserved for children with Cobb angles of 50 degrees and greater and for some skeletally immature children with Cobb angles between 40 and 50 degrees. Recent advancements in scoliosis surgery include the use of magnetic controlled growth rods that can be adjusted as the child continues to grow, reducing the need for additional surgery.¹⁰

Exercise therapy is often combined with all three treatment options, and there are scoliosis-specific exercises performed with a therapeutic aim of reducing the deformity.⁹ While some studies show stabilization and even reduction of curve magnitude, there is a lack of high-quality evidence to recommend these exercises. But there is also no evidence against these therapies, stemming from a lack of randomized controlled trials.¹¹ Aside from surgery, resolution or significant improvement of a spinal curvature is not expected.¹²

Patient outcome

After 3 months of physical therapy and working with an athletic trainer who emphasized stretching and back core

strengthening, the patient had resolution of his pain. At his 4-month follow-up with the scoliosis specialist, he was found to have a level pelvis, a mildly elevated left shoulder, and no significant truncal shift or lumbar or thoracic prominence. There was very mild waist asymmetry and no abnormal neurologic findings. Repeat imaging at this time showed resolution of the left thoracolumbar curve with no evidence of scoliosis and only mild spinal asymmetry (**Figure 3**).

During a follow-up visit with his pediatrician 8 months after diagnosis, he had grown 7 cm taller. At 10 months after diagnosis, he had a negative test result on the Adam's forward bend test and no asymmetry of his back while standing was observed (**Figure 4**).

Conclusion

AIS is a spinal skeletal deformity seen in children aged 11 to 18 years that can lead to back pain, disfigurement, and functional impairment if left untreated. Currently, surgical repair of the curved spine is the only known treatment proven to correct AIS. Our case report suggests exercise and physical therapy are possible options for improvement and even resolution of moderate curves in AIS.

REFERENCES

1. Jada A, Mackel CE, Hwang SW, et al. Evaluation and management of adolescent idiopathic scoliosis: a review. *Neurosurg Focus*. 2017;43(4):E2. doi:10.3171/2017.7.FOCUS17297
2. Reamy BV, Slakey JB. Adolescent idiopathic scoliosis: review and current concepts. *Am Fam Physician*. 2011;64(1):111-116.
3. Peng Yue, Wang S-R, Qiu G-X, Zhang J-G, Zhuang Q-Y. Research progress on the etiology and pathogenesis of adolescent idiopathic scoliosis. *Chin Med J*. 2020;133(4):483-493. doi:10.1097/CM9.0000000000000652
4. Yawn BP, Yawn RA, Hodge D, et al. A population-based study of school scoliosis screening. *JAMA*. 1999;282:1427-1432. doi:10.1001/jama.282.15.1427
5. Weinstein SL, Dolan LA, Wright JG, Dobbs

- MB. Effects of bracing in adolescents with idiopathic scoliosis. *N Engl J Med*. 2013;369(16):1512-1521. doi:10.1056/NEJMoa1307337
6. Horne JP, Flannery R, Usman S. Adolescent idiopathic scoliosis: diagnosis and management. *Am Fam Physician*. 2014;89(3):193-198.
 7. Hresko MT. Clinical practice. Idiopathic scoliosis in adolescents. *N Engl J Med*. 2013;368(9):834-841. doi:10.1056/NEJMcp1209063
 8. Bunnell WP. The natural history of idiopathic scoliosis before skeletal maturity. *Spine (Phila Pa 1976)*. 1986;11(8):773-776. doi:10.1097/00007632-198610000-00003
 9. Schiller J, Thakur NE, Berson CPM. Brace management in adolescent idiopathic scoliosis. *Clin Orthop Rel Res*. 2010;468(3):670-678. doi:10.1007/s11999-009-0884-9
 10. Tsirikos AI, Roberts SB. Magnetic controlled growth rods in the treatment of scoliosis: safety, efficacy and patient selection. *Med Devices (Auckl)*. 2020;13:75-85. doi:10.2147/MDER.S198176
 11. Romano M, Minozzi S, Bettany-Saltikov J, et al. Exercises for adolescent idiopathic scoliosis. *Cochrane Database Syst Reviews*. 2012;2012(8):CD007837. doi:10.1002/14651858.CD007837.pub2
 12. Modi HN, Suh S-W, Yang J-H, Hong J-Y, Venkatesh KP, Muzaffar N. Spontaneous regression of curve in immature idiopathic scoliosis - does spinal column play a role to balance? An observation with literature review. *J Orthop Surg Research*. 2010;5(80). doi:10.1186/1749-799X-5-80