

Idiopathic Scoliosis: A Case Report

Pampa De¹, P K Mandal², Sourin Bhuniya³

Abstract

Introduction: Scoliosis is defined as a lateral curvature of spine greater than 10 degrees as measured by the Cobb method. Idiopathic scoliosis is the most common form of scoliosis and adolescent idiopathic scoliosis is the commonest presentation which is detected after 10 years but prior to skeletal maturity. The treatment depends on the measurement of Cobb's angle and subsequent exercises, bracing and surgery.

Case report: A 13 years girl presented with idiopathic scoliosis, pes cavus and hand knee gait which incapacitated her ambulation. Her spine radiograph revealed thoracic scoliosis with apex T8. She was given Boston brace with corrective exercises for scoliosis both in and out brace and a pair of floor reaction AFO's with modifications in footplate for pes cavus. There was significant improvement in the gait and posture of the girl and she started going to school after a few months.

Conclusion: Conservative management in the form of bracing can prevent curve progression and floor reaction AFO's can indirectly affect the remote body segments and improve gait and posture.

Key words: Scoliosis; polypropylene brace, polypropylene floor reaction AFO's, Cobb's angle.

Introduction:

Scoliosis can be defined as a lateral curvature of the spine greater than 10 degrees as measured by the Cobb's method. Idiopathic scoliosis, termed as such because of the unknown cause or aetiology of the deformity, is the most common form of scoliosis. The diagnosis is usually made by exclusion after a negative examination for paralytic, neurological, and miscellaneous causes. The type of idiopathic scoliosis is defined by the age of onset- less than 3 years (infantile), 10 years to skeletal maturity (adolescent) and after skeletal maturity(adult). The term early onset scoliosis has been used to reflect the presence of scoliosis prior to 5 years of age and late onset scoliosis applies to scoliosis detected after age 5 and commonly occurs just before puberty¹.

Case Report:

A female aged 13 years presented with weakness of trunk muscles for 2 years and problems with feet. Her antenatal and developmental history was uneventful. She had home delivery, immediate birth cry, no history of jaundice, convulsion, etc. Her developmental milestones were normal. She was able to sit at 6 months and could crawl at 7 months and stand at 1 year and walk at 1 year 3 months.

In the past she was admitted to the same institute 3 years back with weakness of lower limbs and deformities of feet and ankle. She then walked with bilateral pes cavus and forefoot adduction. She had wasting of all group of muscles of both upper and lower limbs and jerks were diminished. The involvement was bilateral and symmetrical. Her electromyogram (EMG) and nerve conduction velocity (NCV) of all the four limbs were normal. She was advised range of motion exercises, strengthening of limb muscles and a pair of surgical shoes with medial iron and lateral T strap and metatarsal bar for correction of forefoot adduction and cavus respectively.

Physical examination revealed generalised wasting of limbs, more so in bilateral quadriceps. However, motor strength was 4/5 in upper limbs and lower limbs except the hip extensors, which were 3 plus bilaterally and

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the plantar flexors were 3/5 bilaterally. The upper and lower trunk muscles were 4 minus in strength. Tone and reflexes were diminished in both upper and lower limbs but sensation was normal. There was tightness of bilateral tendoachilles, bilateral short rectus femoris, bilateral pes cavus and she bore weight on lateral border of feet. Her spine revealed a thoracic structural scoliosis with apex at T8, convexity to right and drooping of left shoulder. (Fig1). She walked with lordosis of back, hands on bilateral knees usually, and bilateral pes cavus feet with weight bearing on lateral border She could squat normally. (Fig2)

Investigations revealed a normal haemogram, serum electrolytes, EMG and NCV. CPK level was 32.2 (normal range 24-70 U/l). Radiograph of whole spine revealed thoracic scoliosis with convexity to right, and apex at T8 The Cobb's angle was 30 degrees. (Fig3).

She was managed conservatively with range of motion exercises of all joints of upper and lower limbs, stretching of bilateral hip flexors, tendoachilles, prone lying with sand bags on hips to stretch the hip flexors, strengthening of muscles of upper and lower limbs. Keeping her hand knee gait in mind she was given bilateral floor reaction orthoses and was trained to ambulate in parallel bars (Fig 4). For her thoracic scoliosis she was given moulded TLSO (boston) brace (Fig 5).

She was advised the following exercises for thoracic scoliosis²:

1. Active control of spinal movement by verbal reinforcement, tactile reinforcement and visual reinforcement (in front of a mirror).
2. Axial extension (cervical retraction).
3. Scapular retraction.
4. Posterior pelvic tilt and neutral spine.
5. Breathing in and lifting the rib cage while standing with back against the wall.
6. Stretching:
 - (a) Self stretching of the lumbar erector spinae muscles and tissues posterior to the spine. The patient grasps round the thighs to avoid compression of the knee joints.
 - (b) Stretching of the lumbar spine - in quadruped position patient performs a posterior pelvic tilt

without rounding the thorax and then moves the buttocks back over the feet for a greater stretch.

- (c) Self stretching of the soft tissues anterior to the lumbar spine and hip joints with the patient prone (using a press up), and standing and extending the spine back with hands on hips.

7. Techniques to increase lateral flexibility in spine:

- (a) Self stretching - Stretching the tight structures on the concave side of the curve inside lying with a rolled towel at the apex of the convexity.
- (b) Heel sitting and stretching the hypomobile structures on the concave side by having the patient reach the arms overhead and then walk the hands towards the convex side.
- (c) Side lying over the edge of a table placing a rolled towel under the apex of the convexity and stretch hypomobile structures on the concave side.

8. Breathing exercises³:

- (a) Deep breathing exercises, supine- Breathe in through nose and out through mouth.
- (b) Isolated segmental breathing for the area of greatest deformity in lying down position.
- (c) Adding resistance to segmental breathing by use of sandbags or elastic straps and to maintain segmental expansion while sitting.
- (d) Resistance exercises to segmental breathing while upright and walking.
- (e) Resistance exercises to segmental breathing carrying weights in hands for resistance while upright.

9. In brace exercises³:

Set 1:

- (a) Posterior pelvic tilt with knees flexed.
- (b) Posterior pelvic tilt with knees straight.
- (c) Posterior pelvic tilt with alternate leg lifts (knee to chest positions).
- (d) Posterior pelvic tilt in prone position and gluteal pinching (tighten the buttock muscles).
- (e) Arm flinging while sitting-sitting erect.
- (f) Posterior pevic tilt in standing position and

walking away holding the tilt.

(e) Breathing exercises.

Set 2:

(a) Leg lifts–double.

(b) Bridging–lying on back with knees bent, arms at sides and posterior pelvic tilt lifting hips so that body and thighs become a straight line.

(c) Back extension– chin clears the floor.

(d) Arm circling –sitting.

(e) Arm flinging standing.

(f) Breathing exercises.

Set 3:

(a) Sit- up – arms at sides.

(b) Bridging on elbows.

(c) Back extension–chin and upper chest clear the floor.

(d) Knee push ups.

(e) Knees to chest – sitting.

(f) Arm circling– standing with feet apart.

(g) Breathing exercises.

Set 4:

(a) Sit-up – arms across chest.

(b) Bridging – on hands.

(c) Back extension –lying face down,chin clears the floor.

(d) Knee push ups to heel sitting.

(e) Knee raises– standing.

(f) Correct posture and chest expansion– standing erect, knees relaxed, arms at sides, doing pelvic tilt, inhaling deeply and expanding flattened side of rib cage, breathing regularly while maintaining this position and practising holding this position while walking for three minutes out of every hour; 10 times during the day.

(g) Breathing exercises.

Set 5:

(a) Sit-up– hands behind head.

(b) Back extension– hands behind head.

(c) Full push up.

(d) Standing and walking with weights– assuming

correct standing posture with pelvic tilt, carrying equal amounts of weight in either hand while walking and maintaining good posture for three minutes two times daily.

(e) Breathing exercises.

Discussion:

Scoliosis is lateral curvature with rotation of spine. Scoliosis is measured by antero–posterior (AP) x-rays of spine by Cobb's method and is known as Cobb's angle. The curves less than 20 degrees are observed for progression. Curves between 20 and 40 degrees need braces to prevent progression and correction of deformity. Generally curves more than 40 degrees need surgical correction. Significant scoliosis is curves of more than 10 degrees Cobb's angle. Idiopathic scoliosis is more common among adolescent girls⁴.

Adam's bend test⁵: The patient is asked to bend down. If there is scoliosis an asymmetry can easily be observed (Fig 6).

Measuring Cobb's angle: AP views of the spine is taken (Fig 3). The upper and lower end vertebrae are marked by looking at the symmetrical intervertebral spaces above and below. Lines are drawn in an x-ray film extending the upper border of the upper end vertebra and the lower border of the lower end vertebra. Perpendiculars are drawn to these lines. The angle subtended by these perpendiculars is the Cobb's angle⁴.

Risser's sign: At the age of skeletal maturity, the crescent shaped apophysis of the iliac crest completely fuses with the iliac crest. From the age of twelve years the apophysis starts fusing from lateral to medial and depending on lateral one-fourth, two-fourths, three-fourths or complete fusion, the Risser grading is done as Risser 1,2,3,4.4

Risk of progression depends on Cobb's angle and Risser's grading. Low risk (5 to 15%), moderate risk (15 to 40%), high risk (40 to 70%) and very high risk means 70 to 90% chance of progression.

Generally, curves less than 30° at bone maturity are unlikely to progress. Curves measuring 30° to 50° progress at an average of 10° to 15° over a lifetime. Curves more than 50° at maturity progress steadily at a rate of 1° per year.

In most patients, life threatening effects on pulmonary function do not occur until the scoliosis curve is 100 degrees or greater.

Social isolation, limited job opportunities and lower marriage rates are more significant than cardio-respiratory problems. Only 10% cases need surgery.

Aim of treatment is to prevent progression of curve during growth spurt. An effective brace prevents progression in most cases. Prognosis depends on the site of the curve (higher the curve, worse the prognosis) and the age of onset of scoliosis (earlier the onset worse the prognosis).

The present case was a 13 years old girl with deformities of back and feet. Clearly, she had a late onset scoliosis and her curve was in the thoracic region apex being at T8. In the adolescents this is the commonest of all patterns. The presentation of a lateral curve, a prominent scapula, a drooped shoulder or rarely the breast (on the concave side) is noticed to protrude because the underlying ribs are rotated forward on this side. Even when the onset is delayed until the early teens, the curve can progress with a rapidity as it occurred with the present case. The asymmetry of the back musculature (weak on the concave side and strong on the convex side) led to moderate trunk muscle weakness that landed up in severe lordosis with a flexed hip to support the weak trunk on knees with a hand knee gait although she had a good strength in her quadriceps. Fig 7 shows how flexed hip displaces the vector anterior to the area of foot support. Excessive trunk hyperextension (center) and knee flexion (right) are postures used to recover standing balance⁵. Children are more susceptible because their growing tissue accommodates the abnormal stresses. Asymmetrical forces discourage new growth on compressed side while inducing overgrowth contralaterally. The floor reaction ankle foot orthoses work on the principle of plantar flexion knee extension couple⁶. These help the weak plantar flexors and shift the ground reaction force anterior to the knee and hip joints thus preventing the hip flexion moment and the hand knee gait⁷. These devices when made of polypropylene can fully accept the entire weight of the patient without deformation⁸. Also they can indirectly affect remote body segments which can be used therapeutically⁹. It also improved the

severe lordotic posture and the gait. The pes cavus was attended by modifications such as metatarsal pad and soft insole of the foot plate of the FRO's¹⁰. Study by Belabbassi have shown association of pes and kaced¹¹ cavus with idiopathic scoliosis and have shown that percentage of cavus foot was higher in healthy children than in patients with moderate scoliosis curves. The skeletal maturity was estimated by the iliac apophyses and the secondary sexual characters. The present case had her iliac apophysis just appearing at the lateral one fourth of the iliac crest and she had a lot of years to go for attaining maturity, she was given under arm moulded TLSO (Boston brace). Spinal braces are effective in preventing progression of the curve¹². She was advised to wear the brace for 23 hours a day¹³. But wearing for at least 16 hours a day was the minimum time required keeping comfort and compliance into consideration as part time use of braces have shown the same results as full time wear¹⁴. She was also given in brace exercises.

She continued to wear the brace for 2 months and came for follow-up when she was independent in her daily activities, was going to fifth standard in school and was asymptomatic. But unfortunately after that she lost the follow-up and we are unable to monitor the curve progression.

Conclusions:

1. Adolescent idiopathic scoliosis can be effectively treated conservatively if detected sufficiently early.
2. Wearing a spinal brace for 16 hours gives the same results as in those who wear it for 23 hours a day.
3. Conservative management can correct the deformity or at least prevent the progression of deformity.
4. Excessive trunk hyperextension and knee flexion are postures used to recover standing balance in hip flexor tightness.
5. Floor reaction AFO's may indirectly affect remote body segments and this characteristic can be used therapeutically.



Fig 1 - Scoliosis with Convexity to Right and Drooping of Left Shoulder



Fig 2 - Walking with Hands on knees and Bilateral Pes cavus feet



Fig 3 - Straight X-ray showing Thoracic Scoliosis with Cobb's angle



Fig 4 - Bilateral Floor Reaction Orthoses



Fig 5 - Moulded TLSO (Boston) Brace.



Fig 6 - Adam's Bend test



Fig 7 - Flexed Hip Displaces the vector Anterior to the Area of foot support

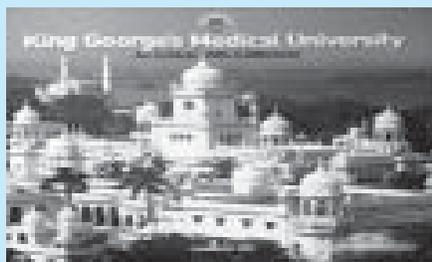
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