Original Article

Efficacy of Polypropylene Braces in the Management of Adolescent Idiopathic Scoliosis in Girls

Sreekala VK[1], Sujith KR[2]

Abstract

Scoliosis is lateral curvature of the spine. Adolescent Idiopathic scoliosis occurs in 2% of adolescent girls and 0.5% of adolescent boys without any obvious cause.

A polypropylene spinal brace worn for more than 16 hours a day has been shown to be effective in preventing progression of the curvature in all the cases in this study. The study group of patients are adolescent girls with scoliosis of 20 to 50 Cobb's angle. They are all given polypropylene spinal braces with pulling straps to correct the curvature. They were all doing moderate physical activity for half an hour a day (swimming).

Key words: **Scoliosis, polypropylene brace, Cobb's angle.**

Introduction:

Scoliosis is measured in anteroposterior/ postero-anterior x-rays of spines by Cobb's method and is known as Cobb's angle. The curves less than 20 are observed for progression. Curves between 20 and 40 need braces to prevent progression or correction of the deformity. Generally, curves more than 40 need surgical correction. Different types of materials are used in different centres for making the braces. In curves between 20 and 40 bracing is very effective. Mild curves usually do not progress. Curves more than 50 progress, in spite of bracing.

The method of measuring the angle of curvature is shown in Fig 1.

Author's affiliations:

[1] *MBBS, DPMR, MS (Gen. Surgery), DNB (PMR), MNAMS, Professor& Head**

[2] *Senior Resident***

* Dept of Physical Medicine & Rehabilitation Govt Medical College, Kottayam, Kerala

**PMR, Govt Medical College, Thiruvananthapuram

Cite as:

Sreekala VK, Sujith KR. Efficacy of polypropylene braces in the management of adolescent idiopathic scoliosis in girls. *IJPMR December* 2014; **Vol 25(4):** 94-8.

Correspondence:

VK Sreekala, Professor& Head, Dept of PMR
Govt Medical College, Kottayam, Kerala. Phone: 09447270028
Email: drvksreekala@gmail.com

Received on 03/07/2014, Accepted on 22/12/2014

A reduction in Cobb's angle following intervention is observed.

Objectives:

1. To study the efficacy of polypropylene spinal braces in correcting the deformity in adolescent idiopathic scoliosis in girls.
2. To assess the effect of duration of wearing the brace in correction of the deformity.

Materials and Methods:

Subjects are selected from among the patients attending the OPD of Physical Medicine and Rehabilitation, Medical College, Thiruvananthapuram. They were evaluated clinically and radiologically .

- Cobb's angle was measured accurately and recorded. Spinal braces made of polypropylene were given to all the selected subjects (Fig 2). They were advised to use the braces 23 hours a day regularly. But they were using it for varying duration (Table 1). Two girls who were using it for less than 16 hours a day were found to progress. Those who wore the braces for less than 16 hours a day were excluded from the study. Others were reviewed every 3 months. There were 24 of them. X-ray was repeated and Cobb's angle measured. All were given moderate physical activity (swimming) for half an hour a day.

The observations were analysed.

Funding agency: State Commissionerate for Persons with Disability, Kerala.

Inclusion criteria:

1. Girls with idiopathic scoliosis between the ages of 11 and 16 years when detected.
2. Curves between 20° and 40° Cobb's angle when first detected.
3. Girls with curves between 40° and 50° not willing for surgery after explaining the prognosis to responsible caregivers.

Exclusion criteria:

1. Those girls with cardiorespiratory problems / neurological deficits.
2. Girls with connective tissue disorders like Marfan's syndrome and Ehler Danlos syndrome.
3. Those wearing braces for a period of less than 16 hours a day were excluded at the end of the study before analysis.
4. Those with curves less than 20° and those with more than 50°.

Observations:

1. Most girls were 12 to 14 years when first detected (Fig 3).
2. Most of them had a dorsolumbar curve (77.3%) (Fig 4).
3. Majority had a right primary curve (68.2%) (Fig 5).
4. Risser's sign 2 was seen in 63.6% and 31.8% had Risser's sign 3 (Fig 6).
5. Those who wear the brace for 16 to 23 hours have the same outcome.
6. None had progression of the curve while under study
7. 40% had a reduction in Cobb's angle of 4 to 10.
8. Those with 20 to 40 Cobb's angle get a significant reduction. (Figs 7 & 8).
9. Those with more than 40 curve remained unchanged; but no progression was observed while under study.

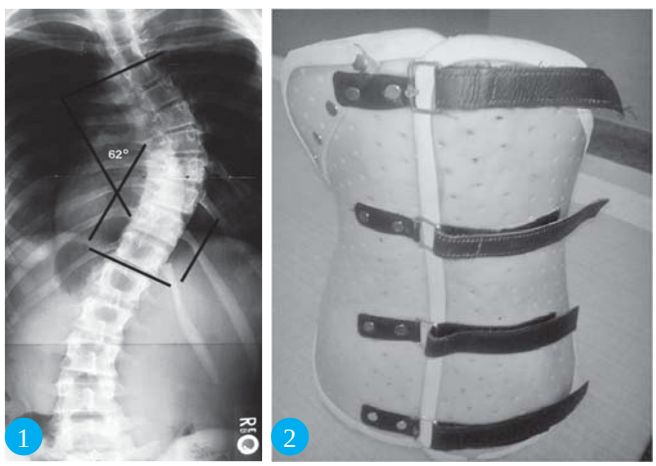


Fig 1- *Method of Measuring Angle of Curvature;*
Fig 2- *Spinal Braces*

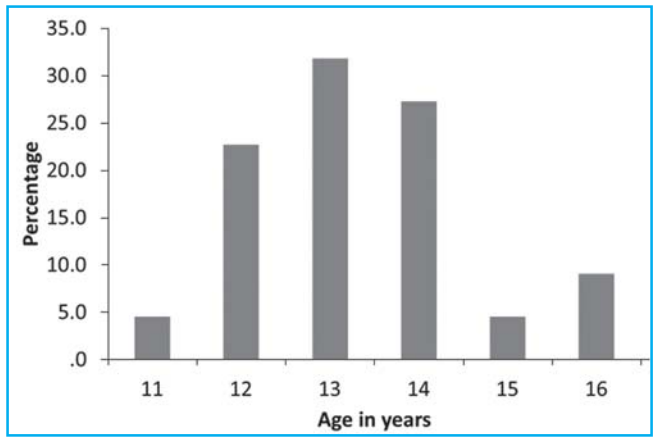


Fig 3- *Age Dirtribution*

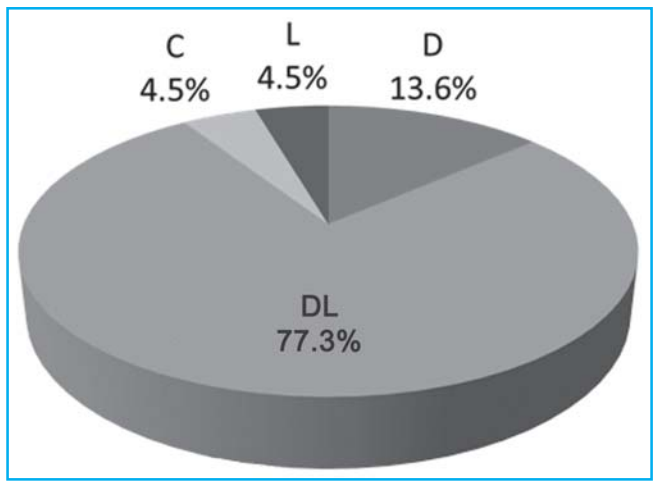


Fig 4- *Level of Curve*

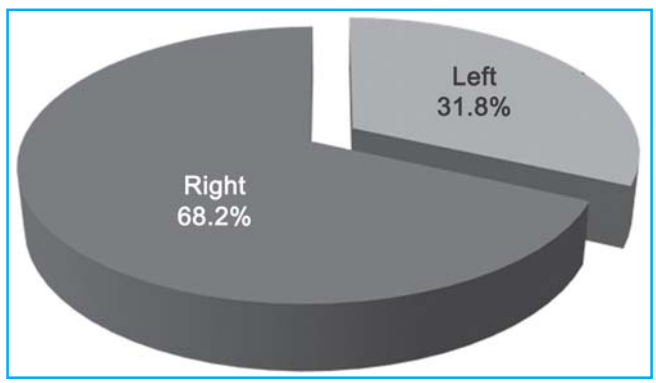


Fig 5- *Side of Curve*

Review of Literature:

1. Most spinal braces are effective in preventing progression of the curve[1].
2. Most studies insist on wearing the brace for 23 hours a day[2].
3. Significant correlation is seen between growth rate (height) and progression of the curve[3].
4. Very few studies have reported reduction in Cobb's angle i.e. improvement in the curve[4].

Discussion:

Scoliosis is lateral curvature with rotation of the spine. Significant scoliosis is curves of more than 10° Cobb's angle. Idiopathic scoliosis means curvatures of spines with no obvious cause. It is more common among adolescent girls.

Adam's bend test: Ask the patient to bend down. If there is scoliosis an asymmetry can easily be observed (Fig 9). It can be measured with a Scoliometer (Fig 10).

Measuring Cobb's angle: PA view of the spines is taken initially and repeated every 3 months (Table 2 & Fig 11).

The upper and lower end vertebrae are marked by looking at the intervertebral spaces above and below. The vertebra with a symmetrical IVD space above is taken as the upper end vertebra that with a symmetrical IVD space below is taken as the lower end vertebra. Lines are drawn in the 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 angle.

Risser's sign: An x-ray of the pelvis showing the apophysis of iliac crest is essential. At the age of skeletal maturity, the crescent shaped apophysis of the iliac crest completely fuses with the iliac crest. From the age of 12 years the apophysis starts fusing from lateral to medial and depending on lateral one-fourth, two-fourths, three-

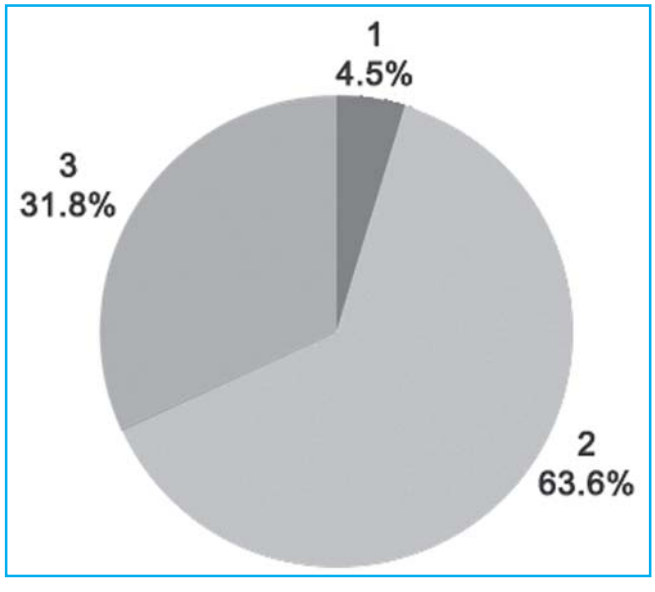


Fig 6- *Risser's Sign*

Table 1: *Duration in Hours for Braces Used*

Measurement	Duration in hours
Mean	18.86
SD	3.270
Minimum	12.0
Q1	16.0
Medium	18.0
Q3	22.3
Maximum	23.0

Table 2: *Follow-up*

Measurement	3 months	6 months	9 months	12 months
Mean	40.59	39.05	36.14	32.82
SD	7.998	7.853	6.916	8.110
Minimum	24.0	24.0	24.0	20.0
Q1	34.5	34.5	31.5	26.0
Medium	42.0	40.0	38.0	34.0
Q3	48.0	45.0	40.0	40.0
Maximum	50.0	50.0	48.0	45.0

Table 3: *Comparison of Cobb's Angle at Different Follow-up*

Measurement	3 months	6 months	9 months	12 months
Mean	40.59	39.05	36.14	32.82
SD	7.998	7.853	6.916	8.110
F	84.957			
P	P<0.001			

Table 4: *Cobb's Angle and Risser's Grading*

Cobb's angle	Risser's sign	Grading
10 to 19°	2 to 4	Low
10 to 19°	0 to 1	Moderate
20 to 29°	2 to 4	Low to Moderate
20 to 29°	0 to 1	High
>29°	2 to 4	High
>29°	0 to 1	Very High

fourths or complete fusion, the Risser grading is done as Risser 1, 2, 3 or 4.

Risk of progression depends on Cobb's angle and Risser grading.

Low risk means 5 to 15% chance of progression. Moderate risk means 15 to 40% chance of progression. High risk means 40 to 70% chance of progression. Very High risk means 70 to 90% chances.

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 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.

For curves more than 50 surgery is the best option.

The present study is a longitudinal descriptive study with four follow-ups in 12 months.

A polypropylene spinal brace costs anything between Rs. Ten thousand and fifteen thousand. The cost of a few, could be met with the fund from State Commissionerate for persons with disabilities

Suggestions:

1. School students of 9 to 16 yrs age group can be screened for early detection of scoliosis along with routine medical check up. Adam's bend test can be used as the single screening test. A scoliometer if available can be used for screening.
2. Those who are suspected to have scoliosis can be subjected to further investigations like x-ray.
3. Adolescent girls and their mothers should be made aware of such a condition so that they will take care. If detected sufficiently early conservative management is enough to correct the deformity or prevent progression. Awareness to mothers of adolescent girls can be given through residents' associations among other health awareness programmes. Awareness to school girls can be given through school health programmes.

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.

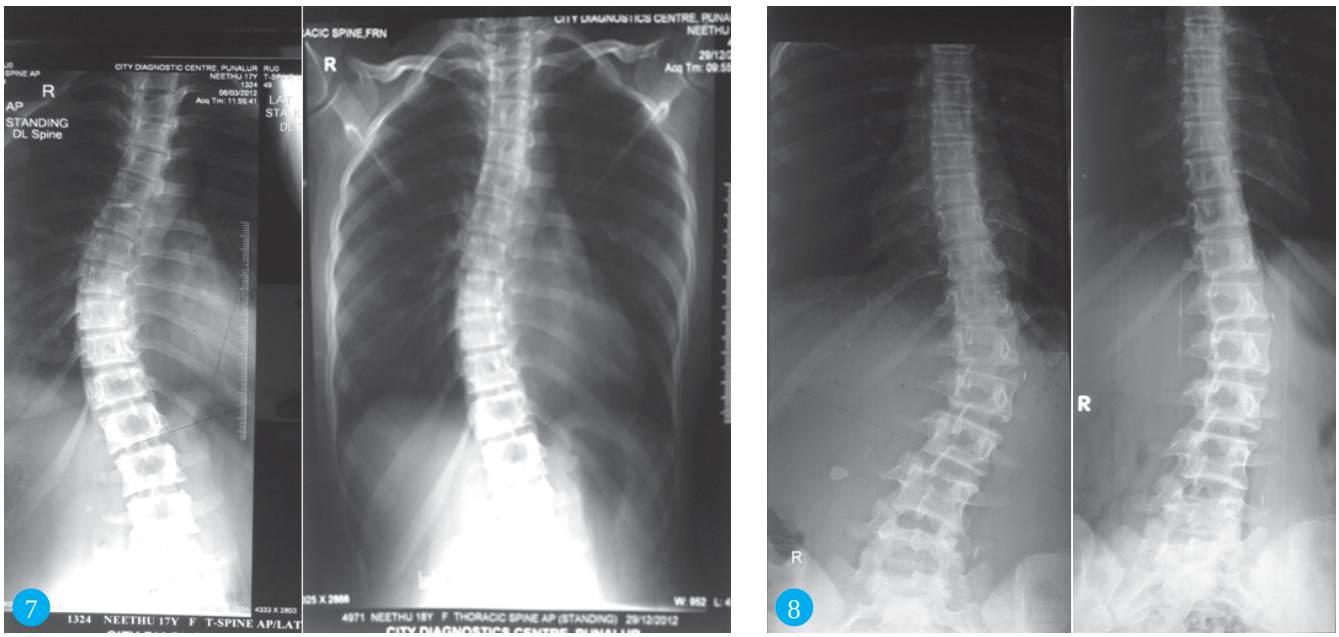


Fig 7 & 8- *Cobb's Angle with Significant Reduction*

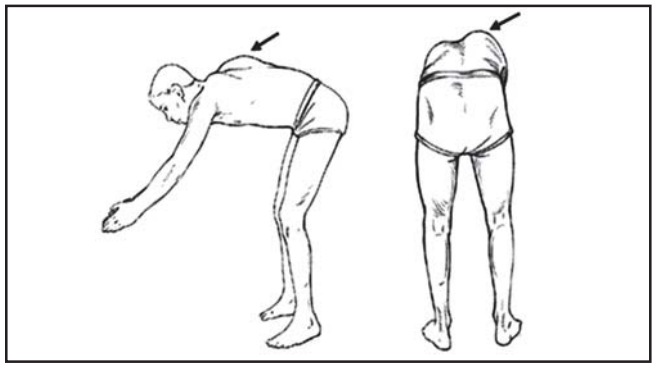


Fig 9- *Adam's Bend Test*

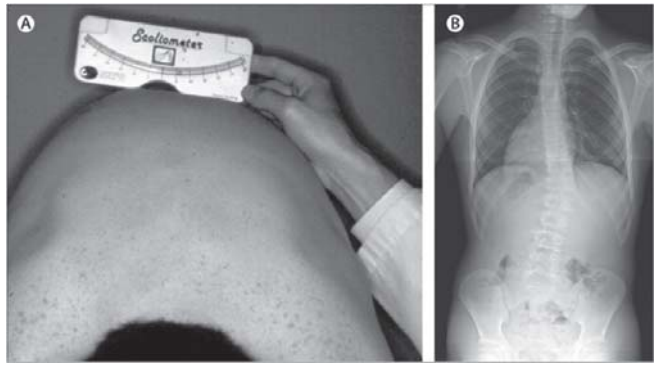
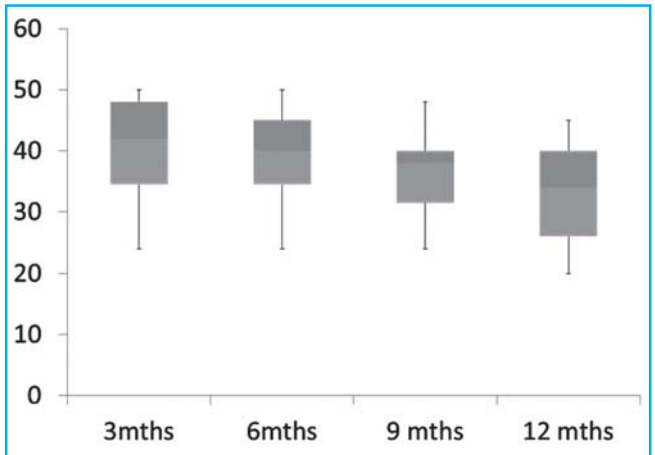


Fig 10- *To Measure with Scoliometer*



- Box plot diagram describing Cobb's angle at 3 , 6, 9 and 12months
- Lower and upper end of the whisker in each box represents minimum and maximum Cobb's angle respectively. Lower border of the blue coloured box represents 25th percentile and the upper border of the brown coloured box represents the 75th percentile.

Fig 11- *Cobb's Angle at Various Follow-up*

3. Conservative management can correct the deformity or at least prevent progression of the deformity.
4. Studies with larger sample size and comparative studies with other types of braces are necessary to arrive at further conclusions like which material is best for spinal braces in scoliosis. The controversy regarding duration of wearing a brace can also be resolved with a larger study for longer duration.

References:

1. Kane WJ. Scoliosis prevalence - a call for a statement of terms. *Clin Orthop* 1997; **126:** 43-6.
2. Miller NH. Causes and natural history of adolescent idiopathic scoliosis. *Orthop Clin North Am* 1999; **30:** 343-52.
3. Lonstein. IE. Adolescent idiopathic scoliosis. *Lancet* 1994; **34:** 1407-12.
4. Roach JW. Adolescent idiopathic scoliosis. *Orthop Clin North Am* 1999; **30:** 353-65.