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Research study

Management

Improvement of curvature and deformity in a sample of patients with Idiopathic Scoliosis with specific exercises

SG Lee[1*]

Abstract

Introduction

There is a great variety of exercises for scoliosis offered worldwide many of them with little benefit for the patient. We distinguish between unspecific and specific exercises. Specific physiotherapy may have a significant influence on many signs and symptoms of a scoliosis. This, however has up to now only been proven for theSchrothmethod and in part for theScoliologic,Best Practice' program as well. The purpose of this study was to investigate the amount of corrections possible with respect to the spinal curvature and trunk deformity.

Materials and methods

This is a prospective short-term cohort study. 60 patients with idiopathic scoliosis regularly treated at our department with the Scoliologic 'Best Practice' program have been followed up prospectively for at least two months. Average age was 16 years (11 – 19 years), average Cobb angle thoracic was 23.5° (6 – 56°), lumbar 21.2° (6 - 52°). Average ATR (Angle of trunk rotation) thoracic was 8° (3 – 18°) and lumbar 7.9° (2 – 17°).

Results

The follow-up period was 2,9months. During this time the average thoracic Cobb angle decreased from 23.5° to 18.2° (-5.3°; $p < 0,05$). Lumbar Cobb angle decreased from 21.2° to 15.7° (-5.5°; $p < 0.01$). Thoracic ATR decreased from 8° to 5.6° (- 2.4°; $p < 0.01$) while lumbar ATR decreased from 7.9° to 5.7°(- 2.2°; $p < 0.01$). The subset of patients with Cobb angles exceeding 30° experienced a correction of more than 9° ($p < 0.01$).

Conclusion

The Scoliologic ,Best Practice' program is highly effective with respect to improvements of spinal curves and trunk deformity.

Curvatures exceeding 30° show better results than smaller curvatures. The out-patient Scoliologic ,Best Practice' program seems to provide better results than intensive in-patient rehabilitation using the old Schroth standard still in use today. In phases of little growth or in the outgrown patient this program can be used as the sole form of treatment. In phases of high growth velocity bracing is indicated primarily. Here this program is used as an adjunct to bracing regularly.

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Introduction

Scoliosis is defined as a three-dimensional deformity of the spine and trunk with a lateral deformity coupled to a certain amount of spinal torsion and a disturbance of the sagittal profile.[1,2]

Treatment indications for scoliosis are usually dependent on the magnitude of the curvature at presentation and the maturity of the patient[2].

- Treatment of scoliosis historically consists of:
- Observation in mild curvatures during growth
- Physiotherapy in moderate curvatures during growth and exceeding 35° after growth
- Brace treatment in curvatures exceeding 20° during growth
- Spinal fusion surgery

There is a great variety of exercises for scoliosis offered worldwide many of them with little benefit for the patient. We may distinguish between unspecific and specific exercises. Unspecific exercises are not based on a systematic three-dimensional correction of the scoliotic curve (e.g. Yoga, Dobomed, SEAS), while specific exercises are based on a systematic three-dimensional correction according to the individual pattern of curvature (e.g. Side-Shift, Schroth, Scoliologic®).[3]

Physiotherapy may have an influence on the scoliosic curve as measured in the x-ray4but little evidence exists that physiotherapy may have a beneficial influence on curve progression during growth.[5,6,7]

Physiotherapy may have a significant influence on many signs and symptoms of a scoliosis.[8-17] This, however has up to now mainly been proven for the in-patient Schroth method and for the out-patient Scoliologic® 'Best Practice' program as well.

Signs and symptoms which have been improved are vital capacity, cardiopulmonary performance, right cardiac strain, muscular imbalance, quality of life, the self-concepts of scoliosis patients and pain.[8,9,10,11,12,13,14,15,16,17] Therefore we may regard specific physiotherapy in the treatment of patients with scoliosis as worthwhile endeavor.

Historically the Schroth program was performed in the environment of an in-patient setting lasting several weeks,[18]while the new Scoliologic® program as developed recently by Weiss[19]has been shown to be even more effective with reduced treatment times and in the out-patient mode.[16,17]

Since 2011 the original Schroth based Scoliologic® program[16,17,19] is also applied in South Korea. We have recognized during the follow-up of our patients that improvements of Cobb angle[20] and ATR21(Scoliometer) have

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been achieved. The purpose of this study was to investigate the amount of corrections possible with respect to the spinal curvature[20] and trunk deformity[21]and to compare our results as achieved in an out-patient setting with results from othercentres.

Materials and methods

This work conforms to the values laid down in the Declaration of Helsinki (1964). The protocol of this study has been approved by the relevant ethical committee related to our institution in which it was performed. All subjects gave full informed consent to participate in this study.

This is a prospective short-term cohort study. 49 female and 11 male patients with idiopathic scoliosis regularly treated at our department between April 2013 and September 2013 have been followed up prospectively for at least two months. We have included all patients treated during this time in order to avoid any bias.

Average age was 16 years (11 – 19 years), average Cobb angle thoracic was 23.5° (6 – 56°), lumbar 21.2° (6 - 52°). Average ATR (Scoliometer® degree) thoracic was 8° (3 – 18°) and lumbar 7.9° (2 – 17°).

18 girls were less than14 years old thus having a risk for being progressive.

29 of the patients had single thoracic curves, 32 had a double major curve pattern and 9 had a single lumbar / thoracolumbar pattern of curvature.

We have provided4sessions/ week of the Scoliologic program lasting 2 hrs each in order to correct the patients Activities of Daily Living (ADL). Cobb angles and ATR before treatment have been compared to Cobb angles and ATR after the period of treatment with the help of the student's t-Test.

The exercises from the Scoliologic program can be subdivided into

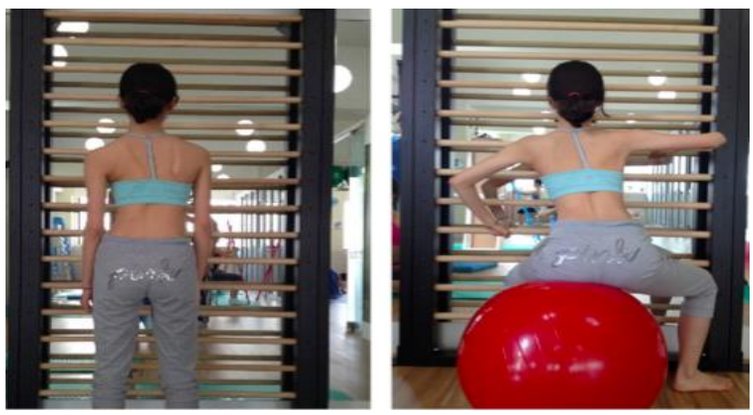

Figure 1: Patient with a major thoracic curve in normal relaxed position (left) and on the right while performing the '50 x Exercise' from the Scoliologic® program.23.

Figure 2: Patient with a major thoracic curve in normal relaxed position (left) and on the right while performing the 'Door Handle' Exercise (modified) from the Scoliologic® program.

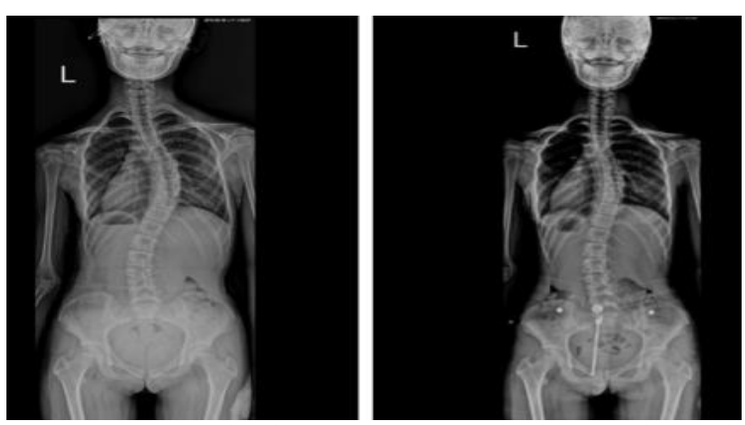

Figure 3: patient with a thoracic curve pattern left before and right after the exercise program.

- Physio-logic exercises for the correction of the sagittal profile
- ADL in standing, sitting and walking for the correction of the frontal plane
- 3D made easy (easy 3D specific correction exercises)
- New Power Schroth (advanced 3D specific correction exercises)

These exercises (Figure1 and Figure2) are described in literature[3,22] in more detail.

Results

The follow-up period was 2,9 months. During this time the average thoracic Cobb angle decreased from 23.5° to 18.2°(-5.3°;p < 0,05). Lumbar Cobb

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angle decreased from 21.2° to 15.7° (-5.5°;p < 0,01).

Thoracic ATR decreased from 8° to 5.6° (- 2.4°;p < 0,01) while lumbar ATR decreased from 7.9° to 5.7°(2.2°; p < 0,01).

Few curvatures were unchanged (+/- 5°). During the observation period without brace treatment no patient had an increase of curvature angle. The average improvements were exceeding 5° both thoracic as well as lumbar and therefore are exceeding the technical error.

15 patients presented with a Cobb angle exceeding 30°. So it was interesting to test this sub group separately with respect to changes in the Cobb angles of the major curves. 14 of the 15 had a major thoracic and one had a major lumbar curve.

Average Cobb angle of the major curve in this subset of patients was 42.3°, after the period of treatment 33° (-9.3°; p < 0,01).

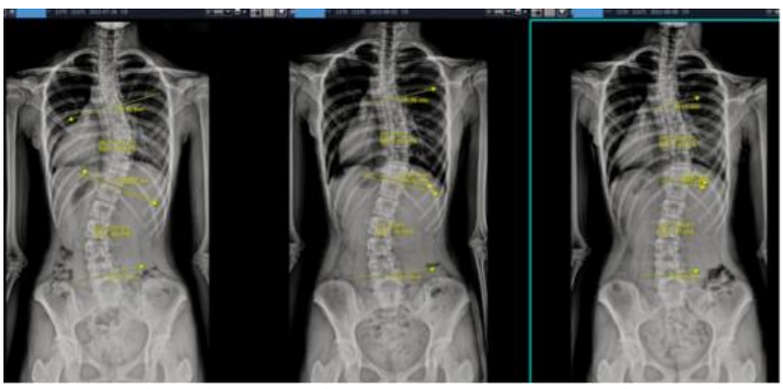

Figure 4: patient with a thoracic curve pattern left before, middle during and right after the exercise program.

Figure 5: Vast progression in a patient with right thoracic Idiopathic Scoliosis from 22 to 42° within three weeks. Immediate bracing was necessary leading to a reasonable in-brace correction using the Chêneau Gensingen brace® according to Dr. Weiss (with kind permission LAP).[23].

Discussion

18 patients (11 – 13 years of age) had a bracing indication. Just five of these patients had been braced with body jacket & Boston braces. Braces were omitted during the time of treatment.

5 of the patients wore their brace during the follow-up period with the exception of the time during the physical exercises.

Significant, in part high significant improvements have been achieved with respect to spinal curvature (Cobb angle) and trunk deformity (ATR) after out-patient physiotherapy according to the Scoliologic® 'Best Practice' standard (Figure 3).

Therefore the application of this program has to be regarded as indicated in patients with spinal deformities. The results attained in previous studies[16,17,19] with respect to the clinical signs and symptoms of scoliosis have been proven to be repeatable. However radiological evaluations of this program have been undertaken for the first time within this study.

We have found one other study with a short-term pre- / post design.[4] In this paper 107 patients had been investigated with an average curvature of 43°. That sample had been treated as in-patients for an intensive program of rehabilitation according to the Schroth method for four to six weeks. Average Cobb angle after treatment was 39°.

This sample had bigger curves at average than the sample from this study, however it was well comparable to the subset of patients exhibiting curvatures of more than 30° (average Cobb angle 42.3°). While the in-patient sample from 1992[4] the improvement was 4° (p< 0,05), the improvement in our subset was 9.3° (p< 0.01). So the out-patient program we provide seems to have far better results than the specific in-patient program in Weiss' sample from 1992[4](Figure 4).

The Otmanet al. sample from Turkey[9] testing out-patient Schroth therapy gained similar results after 6 months of treatment as we have gained in 3 months' time. However after 12 months the Otmanet al. sample had improved further more.

It is interesting to see that with the cutting edge development of the Schroth program (Scoliologic® 'Best Practice' program) it is possible to improve the big curvatures clearly better than the smaller ones. The thoracic angles of the whole sample from this study improved on a p – level of < 0.05, while in the subset of patients with angles exceeding 30° (14 of the 15

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were thoracic curves) improved on a p – level of < 0.01.
Therefore we have to regard the program used in this study as highly effective with respect to its impact on curve and deformity. However no claims should be made for the long-term effects of this program in patients with a clear indication for bracing.[6]

During the phases of growth of high velocity in short time huge improvements are possible when high corrective braces are used while at the same time 20 – 30° of progression within a few weeks may happen (Figure5) if these patients stay unbraced.[23]

Although the subset of patients with an indication for bracing experienced clinical and radiological improvements (patients with symmetric braces or patients without a brace as well), at this stage the author would not make any claims based on these observations.

The observation time is too short and the subset of patients with a bracing indication is too small to provide enough evidence to challenge bracing.

Conclusion

- TheScoliologic® 'Best Practice' program is highly effective with respect to improvements of spinal curves and trunk deformity.

- Curvatures exceeding 30° show better results than smaller curvatures.

- The out-patient Scoliologic® 'Best Practice' program seems to provide better results than intensive in-patient rehabilitation using the old Schroth standard still in use today.

- In phases of little growth or in the outgrown patient this program can be used as the sole form of treatment.

- In phases of high growth velocity bracing is indicated primarily. Here this program is used as an adjunct to bracing regularly.

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