Guidelines for Physical Therapy Program with Schrot's Exercises for Adolescent with Scoliosis or Other Spinal Deformities

Elizabeta Popova Ramova[1]*, Anastasika Poposka[2] and Leonid Ramov[3]

1   Department for Physiotherapist Education, University St. Clement Ohridski, Bitola, R. Macedonia
2   Department of Orthopedics, University SS. Kiril and Methodius, Skopje, R. Macedonia
3   Department of Medicine, University Goce Delcev, Stip, R. Macedonia

*Corresponding author:
Elizabeta Popova Ramova

✉ elizabeta.ramova@uklo.edu.mk

Department for Physiotherapist Education, University St. Clement Ohridski, Bitola, R. Macedonia.

Tel: 00389-70-370-864

Abstract

Introduction: Scoliosis is a complex structural deformity of the spine, in which there is an abnormal curvature of the vertebral column on all 3 spatial axes and chest as well as a disturbance of the sagittal profile. The primary aim of medical management of scoliosis is to stop curvature progression. The aim of our research was to evaluate the effect of Schrot`s exercises by adolescents on reduction of scoliosis curve and testing the possibility of our management plane in health system.

Materials and methods: There were treating 40 children in average 13 years old, and average of curve before treatment 24° with Schrot`s exercises one year. Treatment was following clinically and with X-ray picture, and its effect done with score.

Results: The reduction of curve was from 24° to 15°, the total score of positive effect was significant.

Discussion: We always have problem to organize exercises for patient with same spine deformity. The second problem of this treatment is, that every scoliosis patients have own natural history of curve, and effects of treatments are not same by each child.

Conclusion: Conservative treatment with exercises could be effective for scoliosis and it depends of natural history of curve. Schroth exercises treated spine tri dimensional and did not need special equipment, only specific education for diagnosis and evaluation of deformity and course for specific method of treatment.

Keywords: Spine deformity; Exercise treatment

Introduction

Scoliosis is a complex structural deformity of the spine, in which there is an abnormal curvature of the vertebral column on all 3 spatial axes and chest as well as a disturbance of the sagittal profile [1]. The condition manifests with a lateral curvature on the frontal plane, an alteration of the curvature often causing inversion on the sagittal plane and vertebral rotation on the axial plane [2,3]. In Adolescent Idiopathic Scoliosis (AIS) recognizable cause has not been found. The prevalence of AIS, when as a curvature greater than 10° according to Cobb, is 2% to 3%. The prevalence of curvatures greater than 20° is between 0.3% and 0.5%, while curvatures greater than 40° Cobb are found in less than 0.1% of the population [4,5].

The anatomical level of the deformity has received attention from clinicians as a basis for scoliosis classification. Systems designed for conservative management include the classification by Lehnert-Schrot [6] (functional three curve and functional four curve scoliosis) and by Rigo (brace construction and application) [7].

The primary aim of medical management of scoliosis is to stop curvature progression [8]. Improvement of pulmonary function and treatment of pain are also of major importance. The first of three modes of conservative scoliosis management are based on physical therapy, including Method Lyonaise [9], Side Shift [10],

Dobosiewicz [11], Schroth and others [6]. Physical therapy for scoliosis is not just general exercises but rather one of the cited methods designed to address the particular nuances of spinal deformity and application of such methods requires therapists and clinicians specifically trained and certified in those scoliosis specific conservative intervention methods [12,13].

Weinstein concludes that treatment decisions should be individualized, considering the probability of curve progression, based on curve magnitude, skeletal maturity, patient age and sexual maturity [5]. The choice of therapeutic options should be made by a clinician specialized in spinal diseased on the basis of information from history taking, objective and diagnostic procedures [14].

Conservative management of scoliosis including special protocol with personal data (age, sex, sexual maturity, esthetic problems, pain, data of first examination), Clinical tests for spine, trunk surface methods for back asymmetry, X-ray picture, and measurements of vital capacity.

The aim of our research was to evaluate the effect of Schrot`s exercises by adolescents on reduction of scoliosis curve and testing the possibility of our management plane in health system.

Materials and Methods

The work has been performed in four distinct parts:

1. Collecting the adolescents with AIS from ambulance for Physical therapy and rehabilitation, with permission of parents for examination, and treatment only with exercises in period of one year.

2. Participation in treatment with X-ray picture before (curve >10°) and after one year of treatment,

3. Clinical tests, photo pictures and trunk surface measurements five time during the following up.

4. Participation of each adolescent every three months, 10 days in educational curse for exercises by Schrot.

Part 1

Each patient was examining and treating with exercises regulated on health care system and with participation of 10$ for one course of 10 days. Parents had subscribed permission for treatment of child. Collection of data is consisting of: age, sex, date of firs menarche, time of first detecting of deformity, previously treatment, pain localization, psychological assessment of child and parents collaboration with therapist. Including criteria were: only treatment with exercises, and size of cure before treatment in range of 10-45 degrees.

Part 2

Each child has made X-ray picture before treatment, in standing position of whole spine in frontal and sagittal plane. The size of curve was measured on standard way with Cobb, and the Risser sign was collected also on standard way. The children who did not make picture one year after continual treatment were excluding in final collection of data [15].

Part 3

The parents were inviting to bring their child for checking condition and treatment by phone. Clinical examination of upper arm, scapula and back asymmetry were noting in protocol, and make pictures in standing position of whole body in anterior, posterior and profile side. We have used special designed surface measurement of trunk asymmetry of distances with anatomical points [16].

Part 4

Program of exercises was performing 10 days, two weeks, with daily participation of 30 minutes. It is having an educational and motivation role. The next period until the new checking they made it`s at home with control of their parents. The program of exercises is consisting of group symmetrical exercises for correction and elongation of spine in sagittal plane, and individual asymmetrical exercises designed individually.

Evaluation of effect of treatment was done with compare of Cobb angle from X-ray picture and clinical measurement of trunk asymmetry. The size of curve was definite like no change, reduction or progression for deformity in frontal and sagittal plane. Clinical asymmetry was definite like no change, reduction or progression of differences in measurements. We have used T-test statistical method with significance $p<0.01$. Scoring was made in follow way: progression- 0-point, stagnation-1 point, reduction 10% to 20%, 2 point, 21% to 30%, 3 points, 31% to 40%, 4 points, 41% to 50%, 5 points, and for reduction more than 50%, 6 points. Maximal score is 240 points and means more of 50% is reduction of primary curve size, and min-0 points mean progression of curve by all treated adolescents.

Results

During a period of two years were treated 200 adolescents, in frame of proposals. In the end of project only 40 were collaborating and made control X-ray picture. The average was 13 years, and average of curve before treatment was 24°, after treatment 15°. The male: female was 1:2. The most frequent scoliosis was thoracic lumbar duplex 35% and thoracic lumbar simplex 27.5%, and maturity levels (Risser=0-5). Frequentation of curve size of scoliosis, kyphosis and lumbar lordosis before and after treatment is shown in **Table 1**.

The most frequent scoliosis before treatment is with size of 11°-20°, 16 (40%), after treatment with size >10°, 24 (60%). The frequentation of hyper thoracic kyphosis before treatment is 34 (85%) after treatment 31 (78%). Hyper lumbar lordosis had 33 (83%) after treatment 25(62%). Frequentation of reduction of curve by size, in percent is shown in **Table 2**.

The scoliosis greatest reduction of more than 50%, have 23 (58%), Thoracic hyper kyphosis 20 (50%) and lumbar lordosis 19 (48%). Most of adolescents had size of scoliosis curve between >10° to 20°, 22 (55%) and by them reduction of curve is 50% from the size before treatment. The score from assessment of effect of treatment with exercises is shown in **Table 3**.

Table 1 Size of curve in sagittal and frontal plane.

Size of curve	Scoliosis	Thoracic kyphosis	Lumbar lordosis
Before/after	Before/after	Before/after	Before/after
10°	6/24	-	-
11°-20°	16/11	2/0	2/0
21°-30°	11/2	4/9	5/15
>30°	7/3	-	-
31°-40°	-	12/23	6/12
41°-50°	-	15/7	16/9
51°-60°	-	7/1	9/4
61°-70°	-	-	2/0
Total	40/40	-	-
T, $p<0.01$	T=1.25	T=0.35	T=1.1
	$p>0.01$	$p>0.01$	$p>0.01$

Table 2 Frequentation of reduction of curve in percent after treatment.

Reduction in %	Scoliosis	Thoracic kyphosis	Lumbar lordosis
10-20	2	6	1
21-30	1	1	2
31-40	1	4	2
41-50	8	0	2
>50	23	20	19
Stagnation	3	8	12
Progression >5°	2	1	2

Table 3 Scoring of effect of treatment with Schrot exercises.

Reduction of curve in %	Frequentation	Points
10-20	2	18
21-30	1	3
31-40	1	4
41-50	8	40
>50	23	138
Stagnation	3	3
Progression >5°	2	0
Total	40	206
% from total score 240	-	86
T, $P<0.01$	-	T=11.43 $P<0.01$

Discussion

Experts in conservative treatment (SOSORT members) give importance to a wide range of outcome criteria, in which clinical and radiographic issues have the lowest importance. Today, research recommendation should be made to develop valid, reliable and possibly low-cost instruments to evaluate condition of patient with spine deformity with or without treatment [14-16].

References

1   Stokes IAF (2003) Die Biomechanik des Rumpfes InWirbelsälendeformitäten Konservatives Management. Pflaum. pp. 59-77.

2   Weinstein SL (1986) Idiopathic scoliosis. Natural History Spine 11: 780-783.

We have use same important criteria for systematic analyze of our population of adolescents. The 75% of patients were female and it is with correlation of that scoliosis is more frequent by females. The thoracic lumbar duplex scoliosis is 35%, and it is also same with consulted studies were this was most frequent.

The natural history of scoliosis is reweaving like condition of progression, stagnation and reduction of curves. There are standards established together with clinical test and measure of Cobb angle many years before from Scoliosis associations worldwide [17-19]. We have used three clinical tests, 1) upper arm, 2) Adams bending test and 3) Test by Mathias. Those tests are qualitative conclusions but not measurable instrument. They have high impact of false positive or negative results. In one study like ours to test effect of exercises on AIS only X-ray pictures is significant method to evaluate curve size [20].

During the period of education and treatment the patients were following up in period after three months with clinical measurements of position of scapula and Lorence's triangle, with clinical measurement of asymmetry. Those clinical measurement were showing reduction of asymmetry from clinical measurement parallel with reduction of curve measured from X-ray picture. This method helps us to follow patient in short time intervals, to control them are they use exercises at home or not. Measure of clinical trunk back asymmetry was using in many consulted studies but with special equipment [21-23]. The technical possibility is developing continually, and software give new dimension of following up, but they are useable for hospitals and clinics. Our method can be used in every day practice during treatment with exercises, for both therapist and doctors.

We always have problem to organize exercises for patient with same scoliosis curve. Treatment needs individual application, but evaluation could be standardized [23].

Schrot`s exercises have a history of more than 60 years practice, since 1927 in Germany [6]. They were practiced in our country for the first time in 2000 year. Exercise program for spine deformity from its detection to treatment and evaluation is involve in High Medical School in Bitola, at physiotherapist education [24].

Conclusion

Conservative treatment with exercises could be effective for scoliosis and it depends of natural history of curve. Schroth exercises treated spine in three planes and did not need special equipment, only specific education for diagnosis and evaluation of spine deformity for doctors, physiotherapist educate to treated, child with Schroth Method, motivation of children for treatment with support of parents.

3   Weinstein SL, Dolan LA, Spratt KF (2003) Health and function of patients with untreated idiopathic scoliosis:a 50-year natural history study. Jama 289: 559-567.

4   Winter RB (1995) Classification and Terminology. In: Moe`s textbook of scoliosis and other spinal deformities. (2nd edn). Philadelphia Saunders, USA. pp. 39-43.

5   Lehrnet-Schrot C (2000): Drei dimensionale Skoliose behandlung. (6th edn). Urban/Fischer, München, Germany.

6   Rigo M (2004) Intra observer reliability of a new classification correlating with brace treatment. Pediatric Rehabilitation 7: 63.

7   Landauer F, Wimmer C (2003) The rapieziel der Korsett behandlung bei idiopatischer Adolescenten skoliose. MOT 123: 33-7.

8   Mollon G, Rodot JC (1986) Scoliosis structural esmineures and kinesitherapie Etude statistique comparative des results. Kinesi therapie Scientifique 244: 47-56.

9   Weiss HR, Negrini S, Hawes MC (2005) Physical exercises in the treatment of idiopathic scoliosis at risk of brace treatment-SOSORT Consensus paper 2005. Scoliosis 11: 1-6.

10 Negrini S, Antoninni GI, Carabalona R (2003) Physical exercises as a treatment for AISA systematic review. Pediatric Rehabilitation 6: 227-235.

11 Negrini S, Grivas TB, Kotwicki T (2006) Why do we treat adolescent idiopathic scoliosis? What we want to obtain and to avoid for our patients. SOSORT 2005 Consensus paper. Scoliosis 10: 1-4.

12 Alanay A, Cil A, Berk H (2005) Reliability and validity of adapted Turkish version of scoliosis research society-22 (SRS-22) questionnaire. Spine 30: 2464-2468.

13 Weiss HR, Negrini S, Rigo M (2006) Indications for conservative management of scoliosis (guidelines). Scoliosis 1: 5.

14 Ramova EP, Poposka A, Iazovic M, Ramov L (2013) Evaluation of scoliosis deviation with clinical measurements during physical therapy. Maced J Med Sci 6: 31-36.

15 Negrini S, Aulisa L, Ferraro C (2005) Italian guidelines on rehabilitation treatment of adolescent with scoliosis or other spinal deformities. Eura Medicophys 41: 183-201.

16 Bunnell WP (1993) Outcome of spinal screening. Spine 18: 1572-1580.

17 Aulisa L, Butolini F, Tranquilli Leali P (1981) La scoliosis: la diagnosi precocemediante screening nellescuole. Atti del ConvengoSMariadella Pieta, Roma, Italy. pp. 1-26.

18 Goldberg CJ, Dowling FE, Fogarty EE (1995) School scoliosis screening and United States preventive services task force an examination of long-term results. Spine 20: 1368-1374.

19 Kotwicki T, Negrini S, Grivas T (2009) Methodology of evaluation of morphology of the spine and the trunk in idiopatic scoliosis and other spinal deformities-6th SOSORT consensus paper. Scoliosis 4: 26.

20 Grol R, Grimshaw J (2003) From best evidence to best practice: Effective implementation of change in patient` care. Lancet 362: 1225-1230.

21 Sechidis L, Tsioukas V, Patias P (2000) An automatic process for the extraction of the 3D model of a human back for scoliosis treatment. International Archives of Photogrammetry and Remote Sensing 33: 113-118.

22 Patias P, Stylianidis E, Pateraki M (2006) 3D digital photogrammetric reconstructions for scoliosis screening. Proceedings of the ISPRS Com V Symposium, Dresden, Germany, The International Archives of the Photogrammetry, Remote Sensing and Spatial Information Sciences. XXXVI (Part 5).

23 Duong L, Mac-Thiong JM, Labelle H (2009) Real time noninvasive assessment of external trunk geometry during surgical correction of adolescent idiopathic scoliosis. Scoliosis 4: 5.

24 Popova Ramova E, Poposka A, Ramov L (2013) School screening for spine deformity with clinical test and spine mouse device. Jokull J 7: 97-105.