Original Article

EFFECT OF TRUNK ROTATION EXERCISE ON SCOLIOSIS IN POST- POLIO RESIDUAL PARALYSIS

Jibi Paul.
MPT, Physiotherapy Lecturer, KPJ Healthcare University College, Malaysia.

ABSTRACT

Background: This study conducted to find out the effectiveness of trunk flexion rotation, extension rotation and combined flexion rotation & extension rotation exercises in reduction of scoliosis. Twenty five male scoliotic subjects secondary to post-polio residual paralysis were selected for the study as per the inclusion and exclusion criteria.
Method: Materials used for the study were Rontgenograph, Protractor, Pencil and Scale to evaluate the Cobb's angle. Purposive random sampling method used to select the subjects in three groups for the study. Each group A, B and C performed trunk flexion rotation, extension rotation and combined flexion rotation and extension rotation exercises respectively. Subjects performed exercise regularly twice a day for five months under the supervision of the researcher. The subjects did exercise for one hour with one minute rest in between each movement. Cobb's angle was measured before and after the treatment program for each subject.
Results: The calculated t' value of group A, B and C were 11.00, 9.00 and 10.95 respectively at 5% level and $P < 0.0001$ for all groups, there for it was significant in reduction of angle of scoliosis among post- polio residual paralysis. The comparative study found that there was no significant difference in reduction of scoliosis among the groups.
Conclusion: Based on the statistical analysis performed it could conclude that all the groups undergone trunk rotation exercises have improvement in terms of reduction of scoliosis but there was no much difference between the groups on reduction of scoliosis.

KEYWORDS: Poliomyelitis; Residual paralysis; Scoliosis; Cobb's angle; Trunk rotation exercise.

Address for correspondence: Mr.Jibi Paul, MPT, Physiotherapy Lecturer, School of Health Sciences, KPJ Healthcare University College, Kota Seriemas, Nilai, Negeri Sembilan, Malaysia-71800, HP: +60107803740.
Email: jibipaul74@gmail.com

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INTRODUCTION

Poliomyelitis is almost eradicated in the developed world. Poliomyelitis used to be an epidemic and endemic throughout the world. The residual effect of polio is due to destruction of the anterior horn cells of the spinal cord and the brain stem. This causes a lower motor neuron type of paralysis with flaccid paralysis and normal sensation.[1] There has been considerable anticipation that the virus could be eliminated worldwide. There is some suggestion that the reappearance in the Western world is because of mutation into the virulent form of the attenuated virus used during vaccination. Those who have been enthusiastic about the possibility of eliminating the virus have used the model of the small pox virus. However, there is reason to doubt that the model is not appropriate given the differences in the virus's effects. In polio late manifestations that occur many years after the initial poliomyelitis infection.[2] Social factors play an important role in the effort to eliminate the polio virus. Many rehabilitative centers are located in different villages of each country to treat the paralytic post-polio population provided with specified handicapped school[3-7] Scoliosis is associated

with functional changes specially walking difficulty, changes in pelvic alignment is very common.[8] Spinal corrections with plate fixation can correct the posture of scoliotic patients. [9, 10, 11, 12, 13, 14]

Scoliosis can also occur with a paralytic or muscoskeletal disorder. The Milwaukee brace and the Boston brace are two types of braces that are most commonly used to correct the scoliosis. Curves of greater than 45 degrees normally require some type of surgery. [15] Poliomyelitis, cerebral palsy, and muscular dystrophy can all cause scoliosis. The curvatures of the spine seen with neuromuscular disorders are typically long, single curves.[1] Scoliosis is one of the common spinal deformities in post polio residual paralysis. Lateral curvature of the spinal vertebrae can see at the level of lumbar and thoraco- lumbar level of vertebral column. Scoliosis can be with c' shaped curve or S' shaped curve according to the severity of angle of scoliosis. The degree of scoliosis can be measured using Cobb's angle recommended by scoliosis research society (SRS). Scoliosis is defined as a lateral spinal curvature with a Cobb's angle of 10° or more using the categories defined by the Scoliosis Research Society in 1969.

Screening of scoliosis at the earliest is important for prevention and correction of the deformity.[3, 16, 17, 18, 15, 16, 19] Many research studies have proved physiotherapy rehabilitation can reduce scoliosis by regular exercise program. [20, 21, 8, 22, 23, 24, 7] Exercise program with spinal braces would be more effective in reduction of scoliosis. [25]

Purpose of the study: The purpose of the research was to know the effectiveness of specific exercise programs like trunk flexion rotation, extension rotation and combined flexion rotation and extension rotation exercises in reduction of scoliosis. This study also aimed to compare and find out the best method of exercise to reduce scoliosis among post polio residual paralysis.

Objectives: To find out the effect of trunk flexion rotation, extension rotation exercise and combined flexion rotation and extension rotation exercises on reduction of scoliosis. Also to compare and find out the best method of exercise on reduction scoliosis among post polio residual paralysis.

MATERIALS AND METHODS

Study design: The study was an experimental design as multi-variant pre test post test study.

Population: The sample population of 25 scoliotic students were selected on the basis of inclusion and exclusion criteria and subjected for X-ray study.

Sampling: Purposive random sampling method used in the study for selection of 25 male scoliotic subjects secondary to post polio residual paralysis

Study setting: Nehru memorial physically handicapped school, Komarapalayam, T.N., India

Randomization and allocation of treatment: All the subjects were randomly divided unequally in to group A, B and c by lottery method and allocated trunk flexion rotation, extension rotation and combined flexion rotation and extension rotation exercises respectively.

Tools used: Roentgenogram/X-ray used to measure Cobb's angle to find out the degree of scoliosis

Materials used: Roentgenograph, X-ray lobby, Protractor, Assessment form (Appendix I)

Inclusion criteria:

Diagnosed functional scoliosis secondary to poliomyelitis with a minimum duration of 08 years

All male subjects with age group of 13 ± 5 years

Subjects with weakness of trunk muscles with unilateral lower limb paralysis

Subjects with Cobb's angle less than 30 degree

Subjects with right /left lumbar and thoraco-lumbar scoliosis

Exclusion criteria:

Subjects with scoliosis combined with kyphosis

Subjects with cardiopulmonary insufficiency

Subjects with soft tissue contracture at trunk and lower extremities

Parameter: Cobb's angle measured from all 25 subjects before and after the intervention of exercise program. Cobb's angle is a recommended tool to determine the degree of scoliosis by scoliosis research society. [26, 19]

Intervention of treatment: Each group performed exercises for 60 minutes with adequ-

-ate interval of rest and twice daily for five (05) months.

Techniques:

Flexion rotation exercise: The subjects in group A' Performed this exercise. This exercise performed in straight supine lying position. The subjects were asked to hold both hands together during flexion rotation of trunk and head towards right side. The hands reach to the right knee for a right scoliosis subjects.

Fig. 1: Flexion rotation exercise.

Fig. 2: Extension rotation exercise.

Extension rotation exercise: The subjects in group B' Performed this exercise. This exercise performed in straight prone lying position. The subjects were asked to hold both hands in the back during extension rotation of trunk and head to the left side. Do lumbar extension until chest raised from the table and rotate the trunk, head and shoulder to the left side. The right elbow stretch towards the left hip for a right scoliosis subjects.

Combined flexion rotation and extension rotation exercise: The subjects in group C' were asked to perform both flexion rotation and extension rotation exercise for a total of 60 minutes.

Statistical Analysis: Paired t' test used to determine the significance in reduction of scoliosis in each group A, B and C.

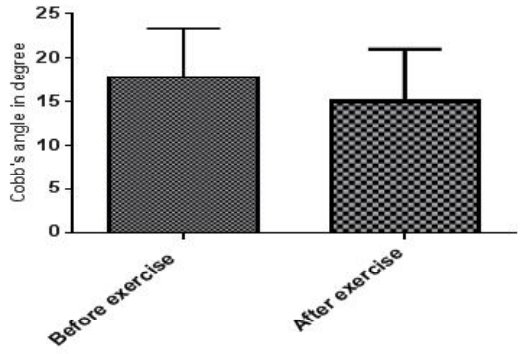
Analysis of Variance (ANOVA) used to compare the difference between the groups in reduction of scoliosis. P< 0.05 is considered as significance of the study.

Data Analysis and interpretation:

Compared the Cobb's angle in pre-treatment 17.75 ±1.97 (Mean ± SEM) and post-treatment 15.00 ± 2.10(Mean ± SEM) could found a reduction of Cobb's angle 2.75 ±0.25 (Mean ± SEM) in Group A; a significant effect found in reduction of angle of scoliosis with t value11.00 df = 7 and P value < 0.0001****

Pre- treatment cobb's angle (Mean ± SEM)	Post- treatment cobb's angle (Mean ± SEM)	Reduction in angle of scoliosis (Mean± SEM)	T value	P-Value
17.75 ±1.97	15.00 ±2.10	2.75 ±0.25	11.00 df = 7	< 0.0001

Table 1: Comparison of pre and post values of Group A, a significant effect found in reduction of angle of scoliosis.

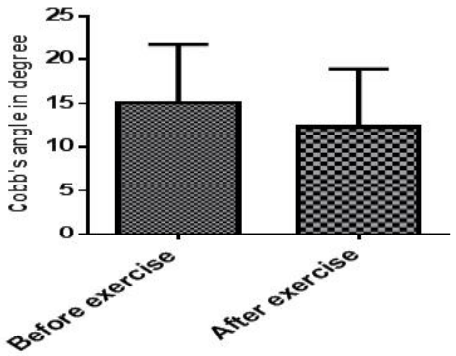


Graph 1: Comparison of pre and post values of Group A, a significant effect found in reduction of degree of Cobb's angle of scoliosis after the exercise**.**

Compared the Cobb's angle in pre-treatment 15.10 ±2.09 (Mean ± SEM) and post-treatment 12.40 ± 2.07(Mean ± SEM) could found a reduction of Cobb's angle 2.7 ±0.3 (Mean ± SEM) in Group B, a significant effect found in reduction of angle of scoliosis with t value 9.00 df = 9 and P value < 0.0001****

Pre- treatment cobb's angle (Mean ± SEM)	Post- treatment cobb's angle (Mean ± SEM)	Reduction in angle of scoliosis (Mean± SEM)	T value	P-Value
15.10 ± 2.09	12.40 ± 2.07	2.7 ± 0.3	9.00 df =9	< 0.0001

Table 2: Comparison of pre and post values of Group B, a significant difference found in the effect of reduction of angle of scoliosis.

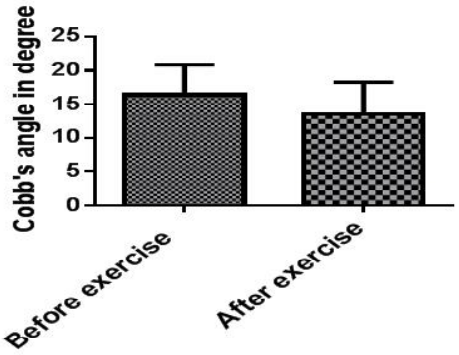


Graph 2: Comparison of pre and post values of Group B, a significant difference found in reduction of angle of scoliosis after the exercise.

Compared the Cobb's angle in pre-treatment 16.43 ± 1.69 (Mean ± SEM) and post-treatment 13.57 ± 1.78 (Mean ± SEM) could found a reduction of Cobb's angle 2.86 ±0.26 (Mean ± SEM) in Group C; a significant effect found in reduction of angle of scoliosis with t value 10.95 df = 6 and P value < 0.0001****

Pre- treatment cobb's angle (Mean ± SEM)	Post- treatment cobb's angle (Mean ± SEM)	Reduction in angle of scoliosis (Mean± SEM)	T value	P-Value
16.43 ±1.69	13.57 ±1.78	2.86 ±0.26	10.95,df=6	< 0.0001

Table 3: Comparison of pre and post values of Group C, a significant difference found in the effect of reduction of angle of scoliosis.

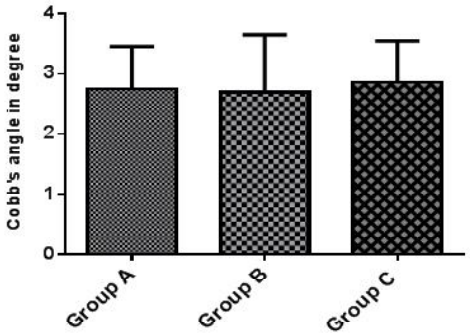


Graph 3: Comparison of pre and post values of Group C, a significant effect found in reduction of degree of Cobb's angle of scoliosis after the exercise.

Compared the Cobb's angle between post-treatment values of Group A, 2.20 ± 0.42^{NS} (Mean ± SEM), Group B, 2.70. ± 0.30^{NS} (Mean ± SEM) and Group C, 2.0 ± 0.47^{NS} (Mean ± SEM) found no significant reduction of Cobb's angle among the groups.

Group A. Post treatment Cobb's angle (Mean ±SEM)	Group B. Post treatment Cobb's angle (Mean ±SEM)	Group C. Post treatment Cobb's angle (Mean ±SEM)
2.20 ± 0.42^{NS}	2.70 ± 0.30^{NS}	2.00 ± 0.47^{NS}

Table 4: Comparison of post values of Group A, B and C, no significant difference found between the groups, which indicate that the effect of treatment is similar in all groups.



Graph 6: Comparison of post values of Group A, B and C, no significant difference found between the groups on reduction of Cobb's angle of scoliosis.

RESULTS

The group A with flexion rotation exercise, Group B with extension rotation exercise and Group C with combined flexion rotation and extension rotation exercises shown in reduction of scoliosis. The calculated t' value of group A, B and C were 11.00, 9.00 and 10.95 respectively at 5% level and P < 0.0001 for all groups, there for it was significant in reduction of angle of scoliosis among post- polio residual paralysis. The comparative study between the groups A, B and C found that there was no significant reduction of Cobb's angle of scoliosis, which indicates that the effect of treatment is similar in all the groups.

DISCUSSION

In this study the specified trunk rotation exercises could reduce the angle of scoliosis among post- polio residual paralysis even though there was no significant difference in reduction of scoliosis by combined flexion rotation and extension rotation exercise among the subjects. There are different studies proved the effect of spinal exercise on reduction of scoliosis. Physical exercise specifically the spinal exercises demonstrates the real need among those individuals who focus in the field of scoliosis rehabilitation. Nachemson et al (1982) found progression in 25% of the cases of scoliotic

patients between 10 and 12 years of age and with Cobb angles below 19°. In patients with a curvature angle between 20° and 29° progression was found in 60% of cases, and in patients with more than 30° progression was found in 90-100% of the cases. [27, 25] If Physical exercise administered correctly, can prevent a worsening of the curve and sometimes can result in not having to brace the patient.[16, 28]Another important message that results from this review is the need to use specific exercises for scoliosis chosen according to strong scientific sources.

Using ''usual physiotherapy'' often based on older outdated theories may lead to mistakes in the treatment of patients. Publications using unsound methodology and interventions can suggest that physical exercise in general are not effective, while in reality appropriate scientifically based physical exercise appear to be efficacious.[29] Schroth inpatient evolved to outpatient intervention and with the further development and need for a patient focused approach some techniques have incorporated with 86 Fusco et al. A cognitive-behavioural approach and patients are empowered to develop their own individual treatment protocol via experiential learning (integrated scoliosis rehabilitation). The goal in these newer techniques is for the patient and professionals to work together as a team. These new techniques aim to stimulate a new direction of research that constantly reflects, evaluates, and alters practice and does not simply accept the previous ideas and concepts.

Recommendation:

Further studies could be conducted by combining the exercises with orthotic support which may attribute better improvement in reduction of scoliosis. Trunk rotation exercise can be conducted among scoliotic subjects other than paralytic poliomyelitis to find the effect on reduction of scoliosis.

CONCLUSION

Trunk rotation exercise is effective in reduction of angle of scoliosis among post- polio residual paralysis. However there would be no significant difference in reduction of scoliosis by combined flexion rotation and extension rotation exercise among the subjects.

It could see that the combined exercise program by group C produced slight more improvement in mean values of reduction of angle of scoliosis when compared with the mean values of other two groups A and B, performed flexion rotation and extension rotation exercises respectively.

Conflicts of Interest: None

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