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RESEARCH ARTICLE

COMPARISON OF ORTHOPEDIC SURGERY AND PHYSICAL THERAPY IN FUNCTIONAL MOTOR OUTCOME IN SPASTIC DIPLEGIA

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ABSTRACT

Purpose: To compare the effectiveness of orthopedic surgery and physical therapy on functional motor outcome in spastic diplegia. **Method:** The study was undertaken on two groups – “Orthopedic Surgical Group” and “Physical Therapy Group”. 30 spastic diplegic children were selected from Surat city. A detailed explanation regarding the study was given to them. Children were taken on the basis of GMFCS level III and IV. The GMFM scale was used as an outcome measure. The children were given clear instructions and sufficient time to perform actively. Best appropriate score was given and score were recorded. **Results:** From the statistical analysis, it can be inferred that there is no difference between the two groups while taking into account all the five components of the GMFM scale (p value > 0.05). But the mean difference is positive. Only there is a statistical variation in the “crawling & kneeling” dimension (p value < 0.05). **Conclusion:** On comparing all the five dimensions of GMFM scale, there is no difference between orthopedic surgery and physical therapy in improving functional motor outcome in spastic diplegia. But when individual subgroups are compared we have found that in “crawling & kneeling” dimension, physical therapy group is more effective than orthopedic surgery.

INTRODUCTION

Cerebral palsy (CP) describes "a group of permanent disorders of the development of movement and posture, causing activity limitation that is attributed to non progressive disturbances that occurred in the developing fetal or infant brain. The motor disorders of cerebral palsy are often accompanied by disturbances of sensation, perception, cognition, communication, and behavior, by epilepsy, and by secondary musculoskeletal problems." Physical therapy (PT) plays a central role in managing the condition; it focuses on function, movement, and optimal use of the child's potential. It uses physical approaches to promote, maintain and restore physical, psychological and social well-being.¹ Despite new and effective means of managing spasticity, most children with spastic diplegic cerebral palsy will develop progressive musculoskeletal deformities as they grow. These include fixed contractures of the two joint muscles and a range of bony deformities, collectively referred to as 'lever arm disease'. These secondary deformities result in progressive loss of function in most children and many will benefit from correction by orthopedic surgery.

Correction of fixed contractures of muscle-tendon units in spastic diplegia is achieved by muscle-tendon recession or fractional lengthening.² Lower extremity musculotendinous surgery is standard treatment for ambulatory children with deformities such as joint contractures and bony torsions resulting from cerebral palsy (CP). The objectives of surgical management in CP are to improve function, decrease discomfort, and prevent disabling structural changes. The assumption is that by improving gait, function in general will improve.³ Muscle tendon lengthening surgery has played a central role in the treatment of deformity caused by cerebral palsy. It has been demonstrated in numerous studies that muscle tendon surgery will increase passive and active joint motion and alter limb alignment in gait.⁴ Gross motor functional outcome (GMFM) has been found to be valid and reliable tool that is widely used in clinical work and research involving children with CP. The GMFM is frequently used to evaluate the effects of various interventions in children with CP, such as intensive physiotherapy, botulinum toxin treatment and orthopedic surgery. There are two subdivisions of GMFM scale rated as GMFM-88 and GMFM-66. Russell et al have demonstrated the reliability and validity of GMFM-66 in their study. By providing a hierarchical structure and interval scaling, the GMFM-66 can provide a better understanding of motor development for children with CP than the 88 item.⁵

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Aim of the study: To compare the effectiveness of orthopedic surgery and physical therapy on functional motor outcome in spastic diplegia.

Significance: To recommend effective interventional strategy in spastic diplegia clinically.

METHODOLOGY

Study design: Comparative Study

Subjects: 30 spastic diplegic children

Inclusion Criteria:

- Children with spastic diplegia.
- Age between 4 to 12 years.
- Both male and female were included.
- Any orthopedic intervention (muscle lengthening, tenotomy, muscle tendon release).
- Post operative children undergoing physical therapy for minimum of 1 year.
- Children undergoing physical therapy for minimum of 3 years.
- Children falling under GMFCS level III and IV.
- Children using assistive devices.

Exclusion Criteria

- Children with neurological conditions other than spastic diplegia.
- Children with ataxic, athetoid cerebral palsy.
- Children with recent fractures.
- Children who are not co-operative.
- Children with frequent seizures.
- Children with upper limb orthopedic surgeries.
- Children who are not actively participating in physical therapy.

The study was undertaken on two groups – orthopedic surgical group and physical therapy group. 30 spastic diplegic children (15= orthopedic and 15= physical therapy) were selected from different hospitals, clinics, handicapped and special schools and rehabilitation centers from Surat city. Parents/guardian/OPD in charge of the children gave informed consent before participation. A detailed explanation regarding the study was given to them. Children were taken on the basis of GMFCS level III and IV. The GMFM scale was used as an outcome measure. The tester participating in the study had the practice of implementing the scale on cerebral palsy children other than the study group. The children of the study group were taken to a distraction free environment individually. Clear instructions were given to the child before application of the different stages of the scale. Child was given sufficient time to perform actively (Figure 1). Best appropriate score was given to the child. The scores, thus given were recorded.

RESULTS

Data analysis was done using the SPSS software (version 18.0). Descriptive analysis was used to calculate mean and standard deviation. Results were considered significant at $p < 0.05$ and confidence interval of 95%.

Table 1 shows the descriptive statistics of both groups. Table 2 shows the descriptive statistics of individual components of GMFM scale. It can be seen from the table 1 that the mean average for Physical Therapy group is greater by 4.5 points. In other words for both the groups the mean average is different. “Lying and rolling” component is excluded from further analysis, as there is nothing to analyze and compare. Mann Whitney test was used for the individual components. From the above table (3) that the p-value for sitting is greater than 0.05 and p value for crawling and kneeling is lesser or equal to 0. Thus there is a minor difference between both the groups statistically for crawling and kneeling component. From the equality of variance test (i.e. from Levene’s test p-value (=0.986) > Level of significance (=0.005) that is the variance of both the group is equal. The student t test for independent samples was used for standing, walking, running and jumping component. The p value for Standing is 0.261 and p value for Walking, Running and Jumping is 0.383 which is greater than 0.05. Hence there is no difference between the two groups for both components. When the total score were compared the p value is 0.251 which suggest that there is no difference between the two groups statistically.

DISCUSSION

In this study, we have compared the effectiveness of orthopedic surgery and physical therapy to see functional motor outcome in spastic diplegia. GMFM scale is used as an outcome measure. From statistical analysis, it has been concluded that there is no statistical difference between the orthopedic surgical and physical therapy group. But there is difference in mean between both the groups which suggest that physical therapy group is better than orthopedic surgical group. The reason for no difference between the two groups may be due to variation in age groups, the type of physical therapy and the type of surgeries done. The study done by George Edwin et al³ concluded that there was a significant improvement in the orthopedic group as compared to the physical therapy group. The study suggested that with increasing age there is variation in strength to mass ratio which gets corrected by the surgery, whereby the physical therapy group lags these corrections undergoing only physical therapy. On comparing the individual sub groups, there was no difference found in the lying & rolling, sitting dimension between both the groups because the children are spastic diplegic in whom lower limb is more affected as compared to upper limb and no challenging task is being given and the children are well supported. In standing, walking, running and jumping dimension, the difference is not seen because with surgery, gait parameter can be improved so as to help them to perform the task and in physical therapy spasticity gives stability across the joints so as to propel forward during all activity.⁶ In subgroup “crawling and kneeling” dimension the physical therapy group is better than orthopedic surgical group. The reason can be because of surgery there is reduction in spasticity required for stability across the joints. Hence in the weight bearing position like kneeling and crawling, the joints remains unstable. Moreover there is reduction in muscle power by grade I after surgery. Also there is change in muscle length tension relationship after surgery. Hence enough tension is not generated in the muscle (which are mostly antigravity muscle like hamstring and tendo Achilles) to maintain the posture and in order to propel body forward during crawling. Whereas in physical therapy group spasticity helps them in giving stability across the joints.

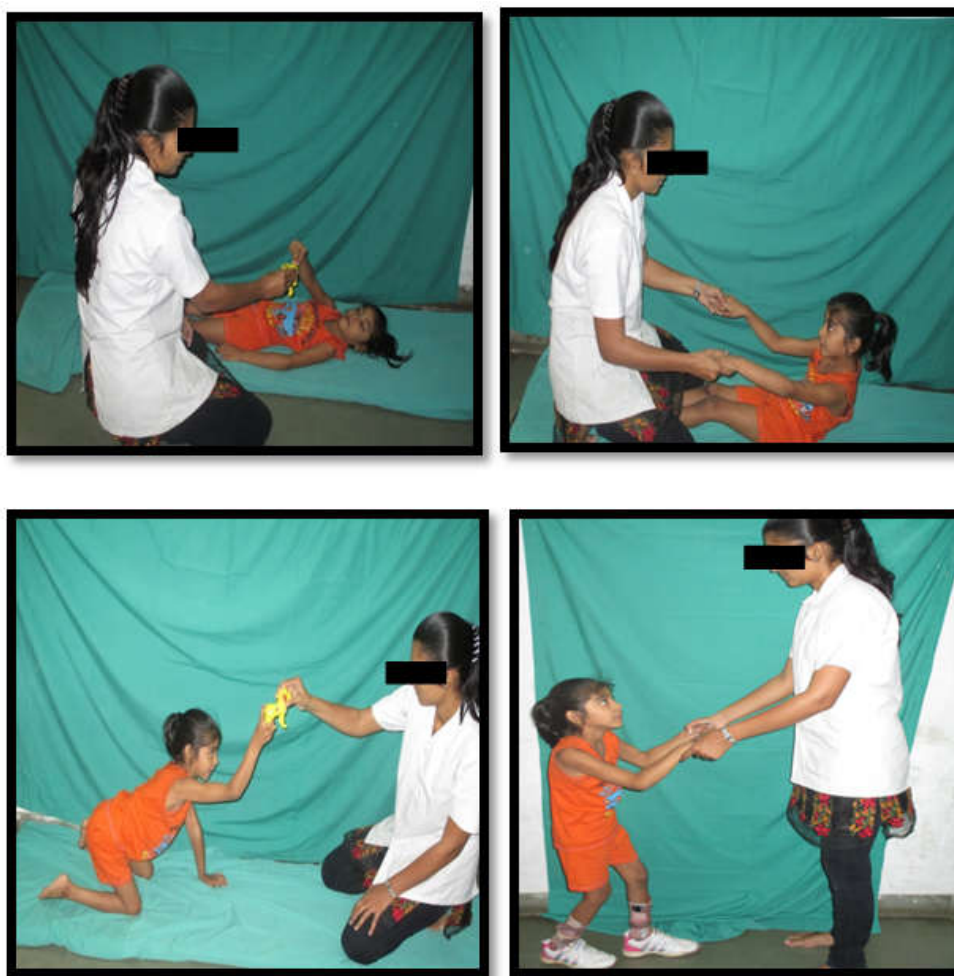


Figure 1. Performance of child in different components of GMFM scale

Table 1: Descriptive statistics of both groups

Group Name	Minimum	Maximum	Mean	Std. Deviation
Physical Therapy Group	67.77	97.77	87.61	10.87
Orthopedic Surgical Group	59.85	96.55	82.91	11.11

Table 2. Descriptive statistics of individual components of GMGM scale

Group Name	Physical Therapy group		Orthopedic Surgical group	
	Mean	Std. Deviation	Mean	Std. Deviation
Lying and Rolling	100.00	0.00	100.00	0.00
Sitting	99.70	1.14	98.51	1.99
Crawling and Kneeling	98.00	3.51	95.11	3.75
Standing	73.16	23.01	63.07	25.11
Walking, Running and Jumping	67.22	27.94	57.87	29.79

Table 3. Mann Whitney test for sitting, crawling and kneeling

Position	Physical therapy group		Orthopedic surgical group		P value
	Mean Rank	Sum of Ranks	Mean Rank	Sum of Ranks	
Sitting	17.93	269	13.07	196	>0.05
Crawling and kneeling	18.60	279	12.40	186	≤ 0.05

Hence the children performed well. Also in some children surgical procedure may not be warranted at all hence other forms of therapy such as strength training is required. As with orthopedic surgical group recurrent joint deformity is potential problem.

Limitations

- No baseline GMFM score was available for both the groups.
- The type of physical therapy rendered to the groups is not specified.
- The type of surgeries done is not uniform.

Conclusion

On comparing all the five dimensions of GMFM scale, there is no difference between orthopedic surgery and physical therapy in improving functional motor outcome in spastic diplegia. But when individual subgroups are compared, in “crawling & kneeling” dimension, physical therapy group shows improvement than orthopedic surgical group.

Future recommendation

Further research can be done with randomized controlled trial (RCT) with large sample size and uniform physical therapy and surgeries with baseline GMFM scores.

Abbreviation: CP- Cerebral palsy, GMFM- Gross Motor Functional scale, GMFCS- Gross Motor Functional Classification System

REFERENCES

- Anttila H, Autti-Rämö I, Suoranta J, Mäkelä M, Malmivaara A. 2008. Effectiveness of physical therapy interventions for children with cerebral palsy: a systematic review. *BMC pediatrics*. Dec; 8(1):1-0.
- Graham HK, Selber P. 2003. Musculoskeletal aspects of cerebral palsy. *The Journal of bone and joint surgery. British volume*. Mar; 85(2):157-66.
- Gorton III GE, Abel MF, Oeffinger DJ, Bagley A, Rogers SP, Damiano D, Romness M, Tytkowski C. 2009. A prospective cohort study of the effects of lower extremity orthopaedic surgery on outcome measures in ambulatory children with cerebral palsy. *Journal of pediatric orthopedics*. Dec; 29(8):903.
- Abel MF, Damiano DL, McLaughlin JF, Song KM, Graubert CS, Bjornson KF. 1998. Comparison of functional outcomes from orthopedic and neurosurgical interventions in spastic diplegia. *Neurosurgical focus*. Jan 1; 4(1):E5.
- Russell DJ, Avery LM, Rosenbaum PL, Raina PS, Walter SD, Palisano RJ. 2000. Improved scaling of the gross motor function measure for children with cerebral palsy: evidence of reliability and validity. *Physical therapy*. Sep 1; 80(9):873-85.
- Kondo I, Hosokawa K, Iwata M, Oda A, Nomura T, Ikeda K, Asagai Y, Kohzaki T, Nishimura H. 2004. Effectiveness of selective muscle-release surgery for children with cerebral palsy: longitudinal and stratified analysis. *Developmental Medicine & Child Neurology*. Aug; 46(8):540-7.
