

Effect of Flexible Wrist Hand Splint on Grip Strength in a Child with Hemiplegic Cerebral Palsy: A Case Study

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ABSTRACT

Background: Orthoses and splints are commonly used to improve hypertonicity of children with cerebral palsy, to prevent the spastic muscle shortening and deformities, to protect the involved extremity, positioning, immobilization, and to support motor control functions such as grip, pinch and release of objects.

Case Description and Methods: A 9-year-old boy diagnosed with Right Hemiplegic CP was fitted with a prefabricated Neoprene splint to observe the effectiveness on grip strength. The pre- and post-grip strength was measured in two-week interval.

Findings and Outcomes: The grip strength of the child was 4.6 kg before two weeks but after using the splint the grip strength has increased to 5.2 kg as per DIGITAL HAND DYNAMOMETER.

Conclusion: This case study concludes that the use of prefabricated neoprene splint giving significant improvement in grip strength in children with cerebral palsy.

Clinical relevance: This case report gives an objective prescription of flexible wrist hand splint for improving grip strength in children with hemiplegic CP.

Keywords: Hemiplegic CP, Prefabricated Neoprene splint, Grip Strength.

INTRODUCTION

Cerebral palsy (CP) is defined as a clinical syndrome characterized by a persistent disorder of posture or movement due to a non-progressive disorder of the immature brain [1]. The prevalence of CP is 2 to 2.5 per 1,000 live births [2] and its incidence may be increasing secondary to improved care in neonatal intensive care units and improved survival of low birth-weight infants. [3] There are significant functional limitations in 80% of the upper limbs of individuals with hemiplegic or quadriplegic CP. Orthoses and splints are commonly

used to improve hypertonicity of children with cerebral palsy, to prevent the spastic muscle shortening and deformities, to protect the involved extremity, positioning, immobilization, and to support motor control functions such as grip, pinch and release of objects. Common static and dynamic splints which respectively provide complete joint immobilization and appropriate position with slight movement. Dynamic splints permit controlled voluntary movements and may prohibit muscle shortening while activate antagonist force in order to resist spastic muscles.

NEED OF THE CASE STUDY

Former studies advocate the use of dynamic orthoses in children with cerebral palsy however there are a few studies on appraising the effect of prefabricated Neoprene orthoses on the hand function and skills of children with cerebral palsy. Compared to other materials used to fabricate splints, neoprene is softer. The functional position of the splint used in this study not only maintains the hand in functional position during rest but also can be used to maintain the position during functional and therapeutic activities. Hence this study attempts to evaluate the effects of prefabricated neoprene orthosis on grip strength in children with hemiplegic cerebral palsy.

MATERIALS AND METHODS

A 9-year-old Boy with Right side hemiplegic CP reported to OPD was first

screened and the parents of the child was explained about the study procedure. The informed consent was obtained prior to their participation in study. Firstly, the participant was assessed and evaluated. It was advised for therapy programme & to use splint. In this case study a digital handheld dynamometer (fig:1) was used to measure the grip strength. As orthotic intervention, a prefabricated Neoprene splint (fig:2) has been used. It covers two third of the forearm & elongated distally to metacarpophalangeal joints while the thumb is free. This prefabricated splint has a volar thermoplastic bar so as to provide 20° wrist extensions. During the assessment of strength, the child was advised to grip the dynamometer with thumb facing the fingers and fingers alongside each other and data was recorded (Fig – 3 & 4)



Fig 1 -DIGITAL HAND DYNAMOMETER



Fig – 2 - PREFABRICATED NEOPRENE SPLINT



Fig 3 – Grip Strength without Splint



Fig 4 - Grip Strength with Splint

RESULT

Result of this case report was analyzed with comparison of pre and posttest with grip

strength. The grip strength of the child was 4.6 kg before two weeks but after using the splint the grip strength has increased to 5.2

kg as per DIGITAL HAND DYNAMOMETER (Table - 1).

Grip Strength	Without orthosis	After using orthosis
KG	4.2	5.2

Table - 1

DISCUSSION

Grip strength is an important indicator and can be considered as a prognostic factor for hand function. The intent of this study was to compare the grip strength function of infantile hemiplegic CP associated with splint and therapy programme and the subjects with CP only associated with therapy. The result found out from this study that there is significant improvement in grip strength of the subjects with CP associated with splint. A study comparing the grip strength of persons with CP and able bodied found that the persons with CP had grip strength of 228N whereas able bodied had 505N. This shows that people with CP had grip strength less than half of that of able-bodied persons. The similar results have been observed by P.N. Barroso et al 2011 examined the hand movements of children with cerebral palsy during functional tests and compares the childrens' performance with and without the aid of an orthosis that provides wrist extension and thumb abduction in 32 subjects. The orthosis improved the range of motion of the trapeziometacarpal joint, muscle strength and manual ability.^[4-8]

CONCLUSION

Finally, this case report concludes that the use of prefabricated neoprene splint giving significant improvement in grip strength in children with cerebral palsy. No doubt the continuous therapy programme will re-educate and re-strengthen the muscles involved and eventually improve the grip strength function but adding the use of a positional static functional wrist hand orthosis will further add on the improvement of hand grip strength.

Declaration by Authors

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