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Effect of Physiotherapy and Submalleolar Orthosis in a 20-Month-Old Premature Child with Delayed Motor Development Associated with Hypotonia, Knee Hyperextention and Foot Pronation: A Case Study

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Abstract

Background: Premature children commonly experience delayed motor development due to hypotonia, muscle weakness, and poor postural control. These impairments may lead to functional limitations such as difficulty in crawling, standing, walking, and maintaining balance. Foot pronation and knee hyperextension are frequently observed during weight-bearing activities. Early physiotherapy intervention along with orthotic support may help improve motor development and functional independence.

Objective: To evaluate the effect of physiotherapy combined with submalleolar orthosis (SMO) in improving motor milestones, muscle strength, balance, and functional activities in a premature child with delayed motor development.

Case Description: A 20-month-old premature female child with a history of neonatal hypoxia and delayed motor milestones was referred for physiotherapy management. On assessment, generalized hypotonia, bilateral foot pronation, knee hyperextension, poor standing balance, and muscle strength below Grade 3 were observed. The child was unable to crawl, stand, or walk independently.

Intervention: A structured physiotherapy rehabilitation program was planned according to the child's functional needs. Treatment included play-based activities, milestone-oriented training, balance exercises, gait training, crawling practice, stair-climbing activities, and strengthening exercises for core and lower limb muscles, especially the quadriceps (VMO). Progressive resistance training using loop bands and weight cuffs was later introduced. Submalleolar orthosis (SMO) was provided to improve foot alignment and stability during weight-bearing activities.

Outcome Measures: Outcome measures included assessment of motor milestones, muscle strength, balance, knee control, foot alignment, and activity level before and after intervention.

Results: Gradual improvement was observed following regular physiotherapy sessions. The child achieved independent crawling within two weeks and independent standing after approximately two and a half months. Walking was initiated shortly afterward, followed by stair-climbing activities. Muscle strength improved from below Grade 3 to Grade 4. Standing balance, postural control, activity level, and confidence also improved significantly, while knee hyperextension and foot pronation were reduced with SMO support.

Conclusion: Physiotherapy combined with submalleolar orthosis was effective in improving motor development, balance, muscle strength, posture, and functional independence in this premature child with hypotonia and delayed motor development. Early rehabilitation intervention may play an important role in achieving functional milestones and improving quality of life in similar pediatric cases.

Keywords: Hypotonia, Delayed motor development, Physiotherapy, SMO, Pediatric rehabilitation

Introduction

Delayed motor development is commonly seen in premature children, especially in those with a history of birth complications or hypoxia. Reduced muscle tone and weakness may affect postural control, balance, and functional activities. Children with hypotonia often develop compensatory patterns such as knee hyperextension and foot pronation during standing and walking. Early physiotherapy management plays an important role in improving motor development, muscle strength, and functional independence.

Case Description

A 20-month-old girl child was recommended for physiotherapy due to delayed motor milestones. The child was born premature at 7 months and had a history of hypoxia after birth, and she stay in hospital for a month.. On physiotherapy assessment we can find out generalized hypotonia due to this bilateral foot pronation and knee hyperextension is present during weight-bearing activities. Muscle strength was below Grade 3 initially, and balance during standing activities was poor and wasn't achieved motor milestone like crawling, standing , walking and stairs climbing independently.

Intervention

When I assessed the child, I planned a physiotherapy program according to the child's functional need. Initially I started with some playful activities to improve her participation in therapy and encourage her movement. These activities are like functional reach, catching ball, kicking ball, reaching towards object and other play-based activities.

I also focus on strengthening exercises of lower limb and core muscle. especially focus on quadriceps muscle (VMO) and then other lower limb muscle. Initially I did all this strengthening passively later on she did all exercises itself.

From beginning to end of session I continuously practiced milestone-oriented activities like crawling , balance training, strengthening exercises, gait training, and stair-climbing practice. Activities were performed in a playful and improve participation.

Gradually, I progressed the treatment by increasing difficulty level of activities and introduce to new variations, I also use loop band and weight cuff in strengthening activities to improve muscle strength.

During assessment I observed knee hypertension and foot pronation , then I prescribed Sub-malleolar orthosis (SMO) to improve weight bearing and better stability during standing and walking activities and improve foot alignment .

Parameter	Pre-Intervention	Post-Intervention
Motor Milestones	Delayed	Achieved
Muscle Strength	< Grade 3	Grade 4
Balance	Poor	Improved
Knee Control	Hyperextension	Reduced
Foot Alignment	Pronation	Improved with SMO
Activity Level	Low	More Active

Results

Gradual improvement was observed after the regular physiotherapy treatment . She started crawling within two weeks of regular PT. slowly her standing balance also improve day by day and independent standing was achieved after two and a half months of session after 2-3 day she initiate walking.. Stair-climbing activities were initiated after one month of walking . Muscle strength improved to Grade 4, and the child became more active and fearless.

Discussion

In this case ,the child's postural control and motor skills were developed with the help of regular physiotherapy . Balance training, gait training and strengthening exercises is help to achieve milestone in delayed development child . The sub- malleolar orthosis also proved added support for stability and maintain alignment during standing and other weight bearing activities.early management is helpful to improve independence and participation in activity of daily living.

Conclusion

Physiotherapy treatment is combine with SMO was effective in improving motor development, balance, muscle strength, and functional independence in this child with hypotonia and delayed development . Early management may help improve functions in similar cases .

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