



## Review Articles

# Management of Cerebral Palsy: A Literature Review from a Physiatric Perspective

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### Abstract

To examine the literature on cerebral palsy (CP), as it is related to rehabilitation treatment and exercises, more than 40 articles related to CP were selected from different national and international journals and then it was reviewed. Cerebral Palsy is a disabling disease of the children and this condition is life long for that child. So rehabilitative measurement is necessary for proper daily living activities of the patient with CP. There is improvement of the condition with the help of some medicines, physical therapy, braces, strength training and surgery. But this review points out the need for more carefully designed studies of CP to see the beneficial effects of rehabilitation measures.

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### Introduction

Cerebral palsy is a static lesion to a developing nervous system that primarily affects motor function.<sup>1</sup> It is evident that children with CP are indeed weak<sup>2</sup>, the strength is directly related to motor function<sup>2,3</sup> and that isotonic and isokinetic strengthening exercise program can result in functional improvement. Aggressive physical and rehabilitative therapy and selected rehabilitation surgery for correction of deformity and contracture of lower limbs is particularly effective in whom brain damage is moderate.<sup>4</sup> The incidence of CP has remained constant in recent decades at 2-3 per 1000 live birth, although the epidemiological profile has started to include more children with

spastic CP and fewer with extrapyramidal disorders<sup>5,6</sup>. The proportion of type of CP is experimentally 80% spastic (pyramidal disorders), 10% pure athetoid and 10% ataxic, these latter two being extrapyramidal<sup>7</sup>. Cerebral palsy is found in every country and about one in every three hundred babies born will have or will develop cerebral palsy<sup>8</sup>.

### Materials and methods

Our main objectives of this review was to find out the effectiveness of Physiatric intervention on CP. Methodology in this review was applied partly according to the principles of meta-analysis of Paul G et al.<sup>9</sup> First, appropriate publications were chosen and this process was

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open for the searching investigators. For this purpose, Medline search for all available trials dealing with CP were performed. Standard articles reporting original research on the modalities of interest were identified. The bibliographies of the recent articles and the reviews were used to identify additional relevant articles. Abstracts and unpublished articles (e.g. degree dissertation) were not examined. Then the literatures (about 40 in number) were reviewed for methodological standards.

## Results and discussion

### Base line disease data

Based on a qualitative review of base line disease data, it appeared that most of the CP patients are spastic in type<sup>4, 7, 8, 10</sup>. In fact, research findings that are accumulated indicate that children with CP are indeed weak; the strength is directly related to motor function.<sup>1-3</sup> A number of treatment modalities are needed to improve the functional status of the patient with spastic CP, physical and occupational therapy, orthoses, orthopaedic surgery (tendon lengthening), neurosurgery (Rhizotomy) and neuroinhibitory drugs.<sup>11</sup>

### Strength training

Documented positive outcome from strengthening programs includes an increased capacity to walk faster.<sup>2, 12</sup> Short-term strength-training programs demonstrate positive functional outcomes for children with spastic CP across diagnostic categories and a wide spectrum of involvement in ambulatory population.<sup>2</sup> In a study Damino DL et al. showed that in the diplegic CP there is significant improvement after strength training that was the strength did increase by 69% in the targeted muscle after training<sup>2</sup>. Improvements after strength training are particularly evident in gait function. Muscle strength has already been shown to be highly correlated with gait velocity in adults recovering from strokes and is more highly related to functional status than other clinical symptoms such as spasticity in those patients<sup>13</sup>.

### Orthotic management

Orthotic management in CP is also important. Splints are widely used to prevent fixed deformity, to facilitate improved patterns of movement and to hold position after corrective surgery<sup>10</sup>. In the short term (1-2 years) they are certainly useful, but whether they have a long-term effect on the development of muscle contracture is controversial. If they are used, they require careful supervision and adjustment and should be removed intermittently for exercises<sup>10</sup>. However, little objective data about the effects of orthotic devices exists. The fixed ankle-foot orthosis (AFO) crosses the ankle joint and controls equinus directly by preventing or severely limiting ankle plantar flexion throughout the gait cycle. The supra malleolar orthosis (SMO) does not restrict ankle motion, but it has been theorized that the SMOs improves ankle motion through control of the foot and diminution of the extensor reflex<sup>14</sup>. In a study, it is found that SMOs do not provide effective control of dynamic equinus in children with CP. But AFOs exert positive effects on ankle motion and may improve energy efficiency, appears to have a limited influence or more global functional measures such as gait velocity and stride length<sup>15</sup>.

### Botulinum toxin type A

Botulinum toxin type A has been used in the management of CP for the past 10 years. A considerable amount of information has now been gathered from studies around the world, to support its use for this indication<sup>16-20</sup>. However, there are factors unique to CP management, which make this indication more difficult to define and specify than other indications. Appropriate use of Botulinum toxin A as therapy for cerebral palsy depend on a sound understanding of its pathology and clinical manifestation, especially gait disorders<sup>16</sup>. The potentials and established indications for the use of Botulinum toxin A, as said by Boyd R et al. in children with CP include<sup>16</sup>.

1. Calf injection for dynamic equinus.
2. Hamstring injection for crouch gait.
3. Injection of the adductors and hamstrings in severely involved children to improve seating.
4. As a diagnostic measure before surgery, e.g. injection of tibialis posterior.
5. As a management of focal limb dystonia.
6. As an analgesic agent to reduce pain and spasm in the peri-operative period.

#### Contra-indications to use botulinum toxin A:

1. Fixed myostatic contracture: If the contracture is predominantly dynamic with mild to moderate fixed component, injection followed by casting 2 weeks later may be appropriate<sup>16</sup>.
2. Bony torsional mal-alignment: Children with an increased femoral neck anteversion ( $>30^\circ$ ) will usually require surgery and it can be impossible to achieve improvement in alignment and gait by muscle injection alone<sup>16</sup>.

Botulinum toxin type A has been shown to be a safe and effective treatment for focal or segmental muscle over activity including spasticity<sup>19,20</sup>. But clinical benefit usually lasts for approximately 12 weeks, though in some patients the duration of effect may be longer<sup>21</sup>. On the other hand therapeutic exercises such as strengthening and facilitation of the opposing and neighbouring muscle groups is important<sup>22</sup>. Once spasticity is decreased, stretching and flexibility exercises for the spastic agonists may begin where indicated. Some of the physiotherapeutic modalities can be much to reduce (e.g. heat, ice, ultrasound, electrical stimuli) spasticity for musculoskeletal indications such as contracture of for pain management<sup>22</sup>.

#### Surgery for the CP Patients

In some case of CP surgery may be needed for rehabilitation of the patients. The indications for surgery are:<sup>10</sup>

1. A spastic deformity that cannot be controlled by conservative measures.

2. Fixed deformity that interferes with function.

3. Secondary complications such as bony deformities, dislocation of the hip and joint instability.<sup>10</sup>

Patients with hemiplegia respond well to both conservative and operative treatment and all of them should eventually be able to walk unaided. Those with diplegia are more difficult to manage but most of them will eventually be able to walk. Patients with total body involvement have a poor prognosis for walking, yet even in this group surgery may be needed to improve spinal stability to enable the patient to sit and to facilitate perineal hygiene by providing adequate hip abduction<sup>10</sup>. In a study Wangjam K B et al found that there is good improvement (52.94%) of spastic CP after EMG guided tibial neurectomy in reduction of gastro-soleus spasticity<sup>23</sup>. Timing is crucial for surgery. Surgery should be done at the age of minimum 4 years when the matured gait pattern gets established in the subject.

#### Conclusion

CP is a disabling disease but it is static. So careful and proper rehabilitation measures may improve the functional condition of the patient. But results of the review indicate that multidisciplinary approach is needed for proper rehabilitation of the patient and more carefully designed studies of CP should be taken to see the more beneficial effects of rehabilitation measures.

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