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## Highlights

# A matter of timing - At what age should multilevel surgery be performed in cerebral palsy patients?

Sophia Julia Häfner\*

University of Copenhagen, BRIC Biotech Research & Innovation Centre, Anders Lund Group, Copenhagen, Denmark

## ABSTRACT

### Keywords:

Cerebral palsy  
Pregnancy weight  
Box and blocks test  
Postgraduate training  
Melatonin

A rather eventful decade draws to a close, but before the year concludes, we learn in this issue of the *Biomedical Journal* about the correlation of age with the improvement of motor functions in cerebral palsy patients after myofascial release surgery, and the impact on health and life quality of excessive weight during pregnancy. Moreover, we learn about differences in dexterity test norms between populations, and gain some insight into the latest improvements to the challenging medical study program in Taiwan. Finally, we attend an interesting discussion between experts of the field regarding the use of melatonin to protect the brains of preterm infants.

## Spotlight on original articles

### *A matter of timing - at what age should multilevel surgery be performed in cerebral palsy patients?*

During spring this year, a nine-year-old boy suffering from cerebral palsy completed a marathon to raise money for a hospital and a school by walking up and down a road for 70 days, cheered on by his neighbours and quickly gaining fame on social networks.<sup>1</sup>

Cerebral palsy (CP) stands for a broad range of conditions caused by non-progressive perturbations of the developing foetal or early postnatal brain, leading to permanent disturbances of posture and movement, often paralleled by cognition or communication disorders [1]. The most common causes are premature birth and labour complications, such as oxygen deprivation, and the incidence fairly high, ranging from 2 to 3 per 1000 live births on the global scale [2].

No cure exists to date, thus efforts have focused on prevention and treatment of brain injury during pregnancy or in preterm infants, as well as on early disease management by strengthening neurological functions and musculoskeletal development [1].

Although the initial damage affects the brain, most clinical symptoms occur at the level of the peripheral neuromuscular system. Muscle contractures are one of the main complications, due to shorter muscles, longer and fewer sarcomeres, and extracellular matrix hypertrophy, leading usually to movement disorders, dystonia, and/or spasticity.

Physiotherapy is a central pillar of CP management, centred on the training of motor skills and coordination [1]. Complementary therapy approaches include special garments, yoga, and different types of massage, such as myofascial release [3].

However, the problems caused by the insufficient growth of muscles compared to long bones - such as bone torsion, spine deformity, or hip displacement – sometimes necessitate

\* Corresponding author. University of Copenhagen, BRIC Biotech Research & Innovation Centre, Anders Lund Group, Ole Maaløes Vej 5, 2200 Copenhagen, Denmark.

E-mail address: [sophia.hafner@bric.ku.dk](mailto:sophia.hafner@bric.ku.dk).

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<sup>1</sup> <https://www.theguardian.com/uk-news/2020/may/31/ginormous-challenge-boy-with-cerebral-palsy-completes-marathon>.  
<https://doi.org/10.1016/j.bj.2020.12.001>

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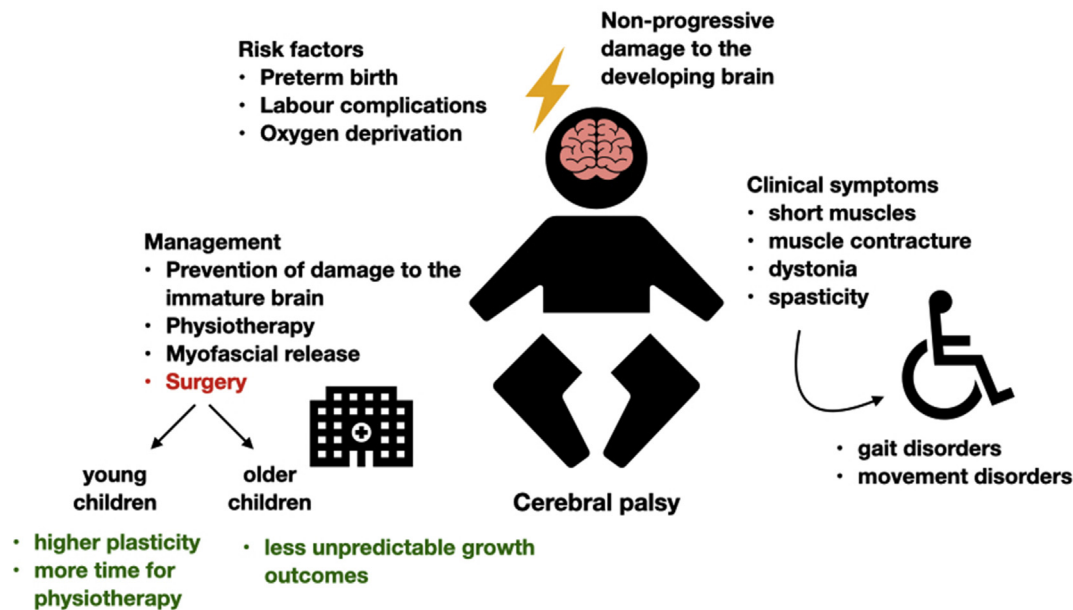


Fig. 1 Causes, symptoms, and management of cerebral palsy in children. Although the damage usually resides at the level of the central nervous system, the clinical symptoms are motion and gait disorders due to shortened and stiff muscles. Surgery is used to lengthen the muscle-tendon unit, yet it is unclear at what age it should be performed to optimise the outcome, as younger subjects have better chances to adapt to alterations, but might also respond in an unpredictable manner to the intervention.

more drastic measures in the form of surgery aiming at the lengthening of the contracted muscle-tendon unit. A recent meta-analysis of multilevel surgery (MLS) in children with spastic CP found no significant effect on gross motor function, but an improvement of gait [2].

Moreover, previous studies reported that surgery had better outcomes when performed in older children [4,5]. One likely explanation would be that it is difficult to predict the disproportional growth rates of muscles and bones, and thus that the risk of over- or under-correction is higher in younger patients with a higher range of upcoming growth [Fig. 1].

Alternatively, as Chang et al. point out in their article in this issue of the *Biomedical Journal*, this finding is biased by the fact that children receiving surgery at a later age quite likely display a less severe form of the disorder compared to those requiring surgical interventions early in life, besides the already large spectrum and diversity of disease severity [6].

In order to assess the impact of age on the surgical benefit based on comparable starting conditions, Chang et al. examined children suffering from CP and a knee flexion gait disorder before and up to 6 months after bilateral soft tissue release surgery. The authors compared two groups: patients younger or older than 10 years old.

According to the analysis, the older children displayed a higher motion limitation score before surgery and less amelioration of the Gross Motor Function measure (GMFM) and physical capacity, potentially linked to the greater developmental plasticity and/or availability for physical therapy of younger children [6]. As these findings contrast

with earlier studies, they prompt physicians and parents to re-evaluate the ideal timing of surgery in CP patients.

## Also in this issue

### Original articles

#### *The burden of excessive weight during pregnancy*

The prevalence of obesity remains on the rise in industrial nations, despite the even faster increasing amount of evidence that the condition entails countless secondary health problems, including an apparent connection with the severity of COVID19 [7,8]. Here, Liang et al. conducted an observational study on health and quality of life parameters during the pregnancy course of women with body mass indexes ranging from underweight to obese [9].

In accordance with other studies, the authors come to the conclusion that overweight or obese women are more prone to adverse maternal and foetal outcomes. This includes a greater reduction in quality of life during pregnancy in the form of a higher incidence of urinary incontinence, for example.

#### *Think outside the box*

Assessing manual dexterity is as important to assess the competence of dental students [10] than to determine the damage caused by diseases such as multiple sclerosis [11] or Parkinson's disease [12]. However, this requires the use of standardised and robust tests, as well as the possibility to

compare the measurements to a valid norm [13]. The “Box and Block Test” (BBT), consisting in the simple task of moving as many tiny wooden cubes from one compartment to another in a limited amount of time, fulfils without doubt the two first requirements. However, it has become evident that the only official norm, based on American test subjects, is not valid for all geographic regions.

In order to put in place an accurate norm for Taiwanese individuals, Li et al. performed the BBT on a statistically significant number of healthy right-handed Taiwanese adults [14]. Aside the slightly better performance by females, the authors confirmed lower average scores compared to the American norms.

They further elaborate on a few interesting hypotheses likely to explain the observed discrepancy.

*Scrubs – evaluating medical postgraduate programs in Taiwan*  
Earning a medical degree has the reputation to be among the hardest academic studies – with good reason, because aside from ingesting massive amounts of theoretical knowledge and learning to master delicate practical procedures, the students must in addition acquire decent communication skills, as well as the psychological sensitiveness required to deal with frequently distressed subjects [15].

To smoothen the transition from theory to practice, Taiwan implemented a postgraduate training program, which is about to be extended from one to two years [16].

On these grounds, the Chang Gung Memorial Hospital is testing training programs specialising students towards different branches, and Hsu et al. decided to subject trainees from three sections to a test encompassing all core competencies [17].

Based on slight differences revealed by the results, the authors advocate for an all-encompassing general medical training during the first year and specialised schooling during the second in order to avoid any bias in the acquisition of key expertise.

## Letters

*To melatonin...*

In June, the *Biomedical Journal* published a special issue centred on the latest state of the art regarding neurocritical care in children [18], featuring a review by Lien et al. dedicated to the monitoring and treatment options aiming to protect the immature brain of preterm infants [19]. In their letter, Vahdani et al. carefully temper some hopes associated with the anti-inflammatory and anti-oxidant potentials of the hormone melatonin, mainly known for its regulation of the sleep–wake cycle, by pointing out possible risk factors [20].

*... or not to melatonin?*

In response to the abovementioned letter [20] Reyin Lien, author of the original review about neurocritical care after preterm birth [14], agrees with Vahdani et al. regarding the need for further clinical trials to assess the potential usefulness of melatonin in protecting the immature brain. Nonetheless, the author emphasises some promising properties and clinical trial results of the molecule [21].

## Conflicts of interest

The author declares no conflict of interests.

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To Jan Schley, my wonderful proof-reader.

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