

Early Diagnosis and Treatment of Cerebral Palsy in Children with a History of Preterm Birth

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KEYWORDS

• Cerebral palsy • Preterm • Neuroimaging • Early intervention

KEY POINTS

- Preterm children are at increased risk of cerebral palsy compared with term-born infants.
- Early diagnosis of cerebral palsy is possible within the first 6 months of life using a combination of clinical history, neuroimaging, and physical examination.
- Infants with cerebral palsy should be referred for cerebral palsy-specific early intervention, which includes task-specific training, environmental enrichment, and parental support.
- Infants with cerebral palsy should be screened for comorbidities including pain, epilepsy, sleep disorders, visual impairment, and hearing impairments to maximize outcomes.

INTRODUCTION

Cerebral palsy (CP) is a heterogeneous motor impairment seen in infants born across all gestational ages (GAs) but is more common in infants born preterm.^{1,2} By definition CP is an umbrella term to describe “a group of permanent disorders of the development of movement and posture, causing activity limitation, that are attributed to non-progressive disturbances that occurred in the developing fetal or infant brain.”³ The

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incidence of CP in the general population varies throughout the world at a rate of 0.1% to 0.2% of live births in developed countries and is slightly higher in developing countries, with the risk of CP increasing with decreasing GA.^{4,5} The prevalence of CP in a meta-analysis of 19 studies, with CP expressed by GA, is reported to be 14.6% (95% confidence interval [CI], 12.5–17.0) in extremely preterm children (born 22–27 weeks' gestation), 6.2% (95% CI, 4.9%–7.8%) in very preterm children (born 28–31 weeks' gestation), and 0.7% in the moderate to late preterm (32–36 weeks' gestation) compared with 0.11% (95% CI, 0.09–0.14) in term-born children.⁶ Prematurity is a major risk factor for CP; in Australia between 1993 and 2009, a total of 43% of children with CP were born preterm.⁷ Although it is clear that children born preterm are at an increased risk of CP, the biologic basis for the associations is unclear and likely to be multifactorial.⁸ The preterm brain is particularly vulnerable because it is exposed to the extra-uterine environment during critical periods of brain development, and thus at risk of alterations in the “normal” trajectory of brain development.^{1,9} However, there are other pathologic processes related to preterm birth and CP, and in many cases it is likely that there are several causal pathways involved, including genetics, early delivery, and pregnancy complications.^{1,8} This article discusses evidence related to the risk factors for CP in children born preterm, making a diagnosis of CP and, importantly, early treatment and intervention to optimize outcomes for the preterm child with CP and their family.

DIAGNOSIS OF CEREBRAL PALSY

Recent clinical practice guidelines recommend that the diagnosis of CP or high risk of CP can be made within the first 6 months postterm age.¹⁰ Traditionally diagnosis has been made much later, between the ages of 12 and 42 months, with many clinicians adopting a “wait and see” approach.² However, late diagnosis results in delayed referral to early intervention (EI) and can lead to increase in parent anxiety and grief.¹⁰ The diagnosis of CP is based on clinical presentation rather than a single diagnostic tool. It is recommended that a combination of clinical history, neuroimaging, and standardized motor/neurologic assessments is used to make an early, accurate diagnosis of CP.¹⁰

CLINICAL HISTORY IN CHILDREN BORN PRETERM WITH CEREBRAL PALSY

Although the exact causal pathways for an individual with CP are often unknown, there are many factors associated with an increased risk of CP (**Table 1**).¹¹ The risk factors for CP differ for children born preterm compared with full-term children and include brain injury,¹¹ lower GA,¹² small for GA,¹² infection, chorioamnionitis,¹³ multiple births, male sex,¹¹ postnatal corticosteroids,¹⁴ and early surgery.¹⁵ There are several perinatal interventions that aim to prevent CP in children born preterm.¹⁶ These neuroprotective interventions had been introduced into obstetric and neonatal care over the past decade and have had already had an impact on reducing the rates of CP.¹⁷ Magnesium sulfate given to women at risk of preterm birth for neuroprotection of their fetus reduces the rate of CP,¹⁸ and methylxanthine (caffeine) therapy used to prevent apnea of prematurity and thus reduce hypoxemia and bradycardia has also been shown to reduce rates of CP in infants born very preterm.¹⁹ There is an urgent need for further randomized controlled trials of interventions addressing risk factors for CP in the antenatal and postnatal period.¹⁶

NEUROIMAGING AND CEREBRAL PALSY IN PRETERM CHILDREN

Given that brain injury is the best prognostic factor for CP in preterm children,¹¹ neuroimaging and visualization of the preterm infant's brain play a pivotal role in early

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