

Hip Surveillance in Children with Cerebral Palsy

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KEYWORDS

• Hip displacement • Hip surveillance • Children • Cerebral palsy

KEY POINTS

- Hip displacement is seen in more than one-third of children with cerebral palsy, with a higher prevalence in children who do not ambulate.
- Hip displacement in this population is typically progressive, leading to hip subluxation and ultimately dislocation.
- Because early stage of hip displacement can be silent, hip surveillance programs have been recommended for early diagnosis and treatment of hip disorders.
- Treatment of hip disorders depends on the degree of dysplasia, functional status of the patient, and patient age. Surgical treatment options include preventive, reconstructive, and salvage procedures.
- The implementation of hip surveillance programs has resulted in a decrease in the number of salvage procedures in children with cerebral palsy.

INTRODUCTION

Cerebral palsy (CP) refers to a heterogeneous group of conditions that leads to a disorder of motor function, movement, and posture. It affects the developing and immature brain, resulting in a permanent and nonprogressive dysfunction of the central nervous system. Despite the presence of a static and nonprogressive encephalopathy, the musculoskeletal involvement in children with CP is typically progressive. Approximately 1 in 323 children are affected with CP, making it one of the most common motor disabilities of childhood.^{1,2} The primary motor abnormalities of CP are often accompanied by other symptoms, such as musculoskeletal abnormalities, intellectual disability, seizure disorders, and communication and behavioral difficulties. Of the

musculoskeletal abnormalities seen in CP, hip disorders are among the most common abnormalities (second most common after foot and ankle abnormalities), affecting almost one-third of children with CP, with an increased prevalence in patients that have a higher level of involvement (Higher Growth Motor Function Classification System [GMFCS] level). Hip disorders in children with CP cover a wide spectrum of pathology ranging from the hip at risk, to subluxated hips, dislocated hips, and dislocated hips with degenerative arthritis and pain. Progression of hip disorders in children with CP can lead to significant pain and problems with gait, sitting, and hygiene.^{3,4} By understanding the pathophysiology, natural history, and outcomes of hip surveillance programs, one can better develop methods to prevent, manage, and treat hip disorders in children with CP.

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This review article provides an overview of the natural history, pathophysiology, physical examination, and radiographic evaluation of hip disorders. It then focuses on the current literature and analyzes the current evidence regarding the hip at risk, outcomes of existing hip surveillance programs, and guidelines and protocols that have been established to diagnose, manage, and treat hip disorders in children with CP.

EPIDEMIOLOGY AND NATURAL HISTORY

Children with CP are at an increased risk for hip displacement and dislocation, with the greatest risk in children with the most severe forms of CP.^{5,6} Current estimates of hip dysplasia in children with CP is approximately 35%, with the prevalence of hip subluxation estimated to be between 25% and 60% and the prevalence of dislocation to be 10% to 15%.^{3,6-10} The incidence of hip subluxation and dislocation is known to increase with worsening disease severity as defined by the GMFCS level¹¹; of note, hip displacement was observed in less than 5% of independent ambulators, whereas it was observed in more than 60% of children with no walking capacity.¹² Additionally, the prognosis and incidence of hip disorders is correlated with the ability of a child to pull to standing by 3 years of age; children with the ability to pull to standing have a lower incidence of hip disorders and a better prognosis.^{5,13}

Understanding the natural history of hip dysplasia in CP is crucial, because it provides a framework for intervention and prevention. Studies have demonstrated that hip displacement is more frequent in quadriplegia than in diplegia, with a progression in migration

percentage (MP) found to be 4 times as great in children with quadriplegic CP than in children with diplegic CP. Spasticity was also observed to be a critical etiologic factor for hip displacement; more frequent hip displacement occurs in children with GMFCS levels of IV or V with spastic CP compared with children with dyskinetic forms of CP.^{5,14}

In general, the progression of hip dysplasia is gradual, and it usually occurs over a period of several years (Fig. 1). It tends to be a permanent process; once a hip begins to subluxate, it frequently requires treatment to correct. Hips that have a migration index of greater than 50% will not reduce spontaneously and one-third of those will progress to dislocation.³

Many children with a dysplastic hip progressing to dislocation will develop a painful hip by early adulthood; as hip displacement progresses, the articular cartilage of the femoral head degenerates secondary to pressures from the surrounding soft tissues. Pain from hip dysplasia occurs primarily from dislocated hips, because hips that are subluxated were noted to be only slightly more painful than reduced hips.

In terms of the onset of hip dysplasia in children with CP, subluxation frequently occurs before the age of 5 years, with the mean age of dislocation occurring around the age of 6 to 7 years. Children with CP are at greatest risk of hip dislocation between 4 and 12 years of age.^{5,14}

PATHOPHYSIOLOGY AND ANATOMY

Most children with CP have an anatomically normal hip at birth.¹⁵ However, secondary to the natural history of spastic CP, as described

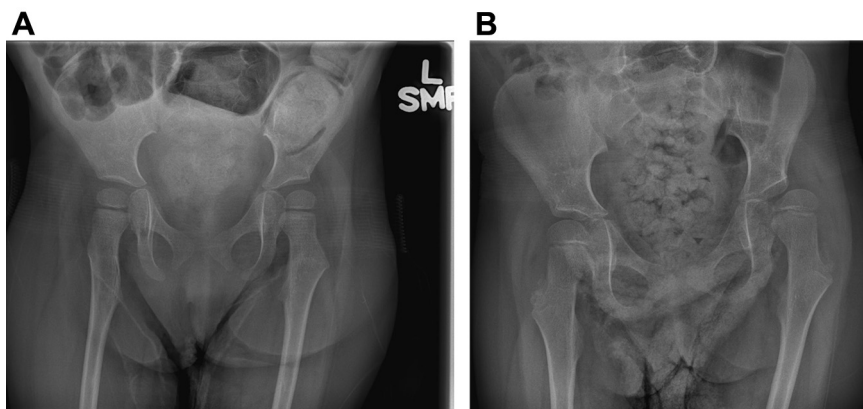


Fig. 1. Progression of hip displacement in a child with Growth Motor Function Classification System level V cerebral palsy. (A) Pelvis radiograph at 3 years of age showing both femoral heads well covered under the acetabulum. (B) Pelvis radiograph at 5 years of age showing left hip subluxation.

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