

Hip Displacement in Cerebral Palsy The Influence of Motor Type and Functional Level

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Hip displacement is a common problem in children with cerebral palsy (CP) which progresses from silent subluxation to symptomatic dislocation when left untreated. Since early surgical intervention has been shown to decrease late treatment failures, identifying children with "hips at risk" is important and needs to be based on an in-depth understanding of the incidence and natural history of hip displacement as it relates to disease severity. As such, this study was initiated to determine the true incidence of hip displacement within the whole CP population in the state of Victoria, Australia.

An inception cohort of 374 children with cerebral palsy born between January 1990 and December 1992 was established using the Victorian Cerebral Palsy Register. This register demonstrates a prevalence rate comparable to other CP registers worldwide and contains demographic details regarding children residing in the Australian state of Victoria who have a confirmed diagnosis of cerebral palsy. Patients were grouped according to motor type, topo-

graphic pattern, and Gross Motor Function Classification System (GMFCS) level. The GMFCS is a five-level ordinal grading system based on the assessment of self initiated movement with emphasis on function during sitting and walking. Children in GMFCS level I have a near normal level of gross motor function and children in level II walk independently but have limitations in activities such as running or jumping. Children in level III require assistive devices to walk and children in level IV have minimal walking ability, depending mainly on wheelchairs for mobility. In GMFCS level V, children lack head control, cannot walk and are dependant for all aspects of care. Unlike the classification of motor type and topographic pattern, the GMFCS has been confirmed in a number of studies to be a valid, reliable, stable, and clinically relevant method for the classification and prediction of motor function in children with cerebral palsy between the ages of 2 to 12 years. The primary outcome measure in this study was the presence of hip displacement, defined as subluxation of one or both hips with

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a Reimer's Migration Percentage of greater than 30 percent, including dislocation, and/or a history of surgical intervention. Subsequently, the incidence and risk of hip displacement for each subtype within the two classifications were determined.

Three hundred and seventy-four children were identified from the Register. Nine patients, with no recorded evidence of hip displacement, died before the age of six years and were excluded from the study. A further 26 patients were excluded due to inadequate records and sixteen more were lost to follow-up. This left 323 patient records available for analysis, 86 percent of the original birth cohort. The overall rate of hip displacement was 35.3 percent. Eighty-six percent of patients were of spastic motor type with hemiplegic, diplegic, and quadriplegic patterns demonstrating incidence rates of 1%, 19.2%, and 82.5%, respectively. Dystonic, hypotonic, and mixed motor types had a 33 to 44 percent incidence of hip displacement. Ataxic patients showed no evidence of hip displacement. When grouped according to the GMFCS, the incidence rates for levels I to V were 0%, 15.1%, 41.3%, 69.2%, and 89.7%, respectively. The relationship between GMFCS level and hip displacement was essentially linear with the incidence of hip disease increasing in direct proportion to severity. When compared to GMFCS level II, the relative risk of hip displacement for levels III, IV, and V showed statistically significant

differences with values of 2.7 ($p < 0.01$), 4.6 ($p < 0.001$), and 5.9 ($p < 0.001$), respectively.

Identifying the subset of CP patients that demonstrates an increased risk of hip displacement is essential in planning hip surveillance programs and providing early surgical interventions where needed. The incidence of hip displacement was highest in GMFCS levels IV and V (spastic quadriplegics). The combination of severe bilateral spasticity and immobility may be the factors responsible for the very high incidence of hip displacement in these children. By contrast, GMFCS levels I and II (spastic hemiplegia, mild diplegia), have a low risk of hip displacement. Their relatively normal muscle tone and high level of activity seem to be protective against hip disease. There was a steadily increasing risk of hip displacement with increasing neurological severity in this cohort. This study confirms the high incidence of hip displacement in children with CP and the direct relationship to functional level. This is the first population-based study of hip disease in children with cerebral palsy in which the incidence has been studied according to disease severity using the GMFCS. Our findings provide clinicians with an appreciation of the relative risk of hip displacement for the individual child with cerebral palsy. In addition, we provide information on the number of cases of hip displacement expected, which can be used as a guide to the resources required for population screening and a targeted surgical program.