Evaluation of hip containment procedure for the management of hip migration in non ambulatory children with spastic cerebral palsy

Thesis
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Karim Elhusseiny

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List of abbreviations

AI : Acetabular index

MP : Migration percentage

BTX : Botox

CNS : Central nervous system

CP : Cerebral palsy

GMFCS : Growth motor function classification system

CPCHILD: Caregiver Priorities and Child Health Index of Life with Disabilities

LL : Lower limb

UL : Upper limb

VDRO : Varus derotation osteotomy

SEMLS: Single Event Multilevel Surgery

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Introduction

Cerebral palsy is a group of permanent motor disorders caused by a non-progressive insult to the growing brain, leading to motor dysfunction that may or may not be associated with sensory and intellectual impairment.[1]

Hip subluxation and ultimate dislocation is a major source of disability in children and adults with cerebral palsy. The prevalence of hip dysplasia in children with cerebral palsy has been reported to be as high as 27%, with the incidence increasing in those with more severe involvement.[1]

The dislocated hip has been associated with pain, pelvic obliquity, poor sitting balance, scoliosis and difficulty in perineal care, posing serious problems to caregivers.

The goal of treatment and indication of surgery is to reduce a dislocation of the hip and maintain the reduction, and as a result reduce the pain, improve perineal care, prevent progression of hip deformity (coxa valga or adduction), reduce the incidence of fractures of the femoral shaft, improve the sitting balance, and maintain or improve the activity status.

Surgical treatment for displaced femoral head includes wide range of procedures, but only three main categories: soft tissue release, proximal femoral osteotomy and pelvic osteotomy.

In this study, a single event multilevel surgery (SEMLS) in the form of reduction of migrated hip with release of the adductor muscles till an acceptable range of abduction is achieved starting with adductor longus, brevis, and gracilis, accompanied by bony procedures that include a proximal femoral varus derotation osteotomy, and san diego pelvic osteotomy (modified dega) to improve the femoral head coverage.

Hip abduction range, Growth motor function classification score (GMFCS), migration percentage, and acetabular index are the clinical and radiological indices used to detect the effectiveness of the procedure, with functional evaluation using Caregiver Priorities and Child Health Index of Life with Disabilities (CPCHILD) Questionnaire.

Aim of the Work

The aim of this exploratory prospective study is to evaluate the effectiveness of hip reduction combined with multilevel orthopedic surgery together with functional evaluation using (CPCHILD) Questionnaire for management of hip dislocation in non-ambulatory (GMFCS level IV and V) patients with spastic cerebral palsy.

Review of literature

Cerebral palsy (CP) describes 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. The motor disorders of cerebral Palsy are often accompanied by disturbances of sensation, Perception, cognition, communication, and behavior by epilepsy, and by secondary musculoskeletal problems.(1)

CP is the result of an insult to growing brains up to 2 years post–natal. Therefore the spinal cord and the innervated muscles are structurally and biologically normal.

The brain affection is fixed, irreversible, and non-progressive. So, progressive neurodegenerative disorders are excluded from the definition.[1]

Epidemiology and demographics

CP is more prevalent in more socio-economic deprived communities. Prevalence of cerebral palsy in Europe is about 2 per 1000 live births. The incidence is slightly higher in males than in females with a M: F ratio of 1.33:1. [2] compared to 3.1 per 1000 children in low income countries. Preterm birth is a major risk factor of cerebral palsy in high income countries, accounting for a third to a half of all cases, that is much less in developing countries accounting for only 2 % of children with cerebral palsy. This proportion may be an indicator of high mortality among preterm infants in low income countries. [3]

The majority of patients with CP have spasticity, 25-80% have additional impairments. Large percentage has a kind of cognitive impairment; the prevalence varies with the type of CP and increases when epilepsy is present. Epilepsy is present in 20-40%, most common among hemi- and quadriplegics, Sensibility of the hands is impaired in about the half. Up to 80% have at least some impairment of speech. Low visual acuity is reported in almost three quarters of all children. Half of all children have gastrointestinal and feeding problems.[4]

Aetiology

In most cases of cerebral palsy, only risk factors can be identified and not specific causes.[5]

Cerebral palsy is not solely the result of prematurity, as 60 % to 65% of affected children were born at full term.[6]

A higher risk of having cerebral palsy child exists with low birth weight. Incidence is 90 per 1,000 in children less than 1,500 grams at birth compared to 3 per 1,000 in children weighing more than 2,500 grams and appropriate for gestational age.

Low birth weight for gestational age and prematurity are commonly associated with the development of spastic diplegia.[7] The availability of neonatal intensive care units and high technology diagnostic procedures has led to the increased survival of premature infants, in some of whom cerebral palsy becomes apparent. Fertility treatments,

including in vitro fertilization, have also increased the number of premature children being delivered.[8]

Risk factors include:

(I)Prenatal period:

Infection, drug or alcohol abuse, epilepsy, hyperthyroidism.[9] Also severe toxemia, incompetent cervix and third-trimester bleeding.[10] Genetic abnormalities, teratologic agents, or congenital malformations of the child's brain may play a causative role.[11]

Pre-eclampsia is associated with increased risk of cerebral palsy in term infants, but this risk does not seem to exist in preterm infants, as pre eclampsia may lead to a release of catecholamines in preterms which accelerates fetal maturation. Maternal trauma during pregnancy has been implicated as a possible cause of cerebral palsy. The rate of cerebral palsy was increased in children whose mothers received thyroid hormone or estrogen in pregnancy.

Evidence has recently emerged that intrauterine exposure to infection, particularly chorioamnionitis, in the later stages of pregnancy and during labour, is a strong risk factor for cerebral palsy.[8]