

WELCOME

CP Hip Symposium

*Freeman Miller
Kirk Dabney
AI duPont Hospital for Children
Wilmington , DE*

This is a Follow up Meeting

First International Meeting for CP Hip

Liverpool April 2010

Organized by Dr. Alfie Bass and Jay Sampath

This current meeting is to follow up and try to expand the discussion to a wider audience and continue the interest momentum in treatment and research

Meeting Goals

- 1. To hear status of current research*
- 2. Active discussion of research*
- 3. Discuss terminology related to CP Hip*
- 4. Identify research goals*
- 5. Identify research strategies*

History of CP hip concern

Surgical Treatment in CP

- 1. First CP deformity - Ankle*
- 2. Adducted dislocated hip (adductor lengthening and varus osteotomy)*

DDH treatment

1960s and 70s - great interest in DDH

Developed screening, harness treatment

Indications for surgical treatment

Pelvic Osteotomies - Salter, Pemberton

Dega - first report in 1932, most common in Eastern Europe

DDH Treatment

1960s through 1980s

Development of many Salvage procedure

Cairi, Triple (Steele and Sutherland)

Colona and periacetabular

Neurologic Hip VS DDH

Most Surgeons developing DDH procedures seemed to have little interest in the CP or Myleo Hips

Salter would specifically say his procedure has no role in CP or Myleo

There was no understanding of the differences between pathologies

Modern CP Hip Treatment

Dr. Mercer Rang promoted the concept of the differences in pathologies

Took the DDH screening concept and developed CP hip screening, heavily promoted it to therapist in Ontario

With Jurgen Reimers worked out the importance of x-ray measures

Modern CP hip treatment

In the 1980s understanding of the importance of acetabular deformity

Led to the independent Development

Osteotomies to provide posterior lateral acetabular coverage

Dega's Osteotomy was discovered or reinvented, by DDH trained surgeons

CP Hip Management TODAY

Terminology

What is the correct name:

CP Hip Disease, Dysplasia

Spastic Hip Disease , Dysplasia

Neuromuscular Hip Disease, Dysplasia

Natural History

Terminology - Staging

Prevention - the phase in the process when addressing the etiology can prevent the secondary deformities

Reconstruction - Stage when the hip joint deformity can be corrected to have a long-term functioning hip joint

Salvage - Palliation - cannot save hip

HIP DISPLACEMENT AND QUALITY OF LIFE IN SEVERE CEREBRAL PALSY

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Introduction: Hip displacement (HD) is the second most common musculoskeletal deformity affecting children with Cerebral Palsy (CP). The primary aim of this study was to investigate the relationship between HD in individuals with severe CP, and caregiver-reported level of comfort associated with daily activity, positioning and overall quality of life (QoL), as described in the Caregiver Priorities and Child Health Index of Life with Disabilities (CPCHILD). The secondary aim was to identify differences in these outcomes in comparing surgical and non-surgical management for HD.

Methodology: In this cross-sectional study 25 participants (50 hips) from an eligible total of 57 non-ambulant children with CP [Gross Motor Functional Classification System, (GMFCS) levels IV and V], born between 1988-1998 were recruited from a state-based population registry. Parents/caregivers completed the CCHILD questionnaire. A blinded assessment of hip Migration Percentage (MP) and a morphological hip classification was made for each hip from the most recent radiograph. Statistical analysis included linear modeling and Pearson correlations.

Results: Mean age was 15.2 years (SD 3.0; range 10.1-20.9 years), 68% were male; at GMFCS level IV (28%) and V (72%). Neither severity of HD nor GMFCS level had any significant effect on comfort or QoL scores. Significant positive correlation was found between comfort and both positioning (correlation = 0.532, $p < 0.01$) and QoL (correlation = 0.712, $p < 0.01$) but no significant correlation between positioning and QoL was noted (correlation = 0.31, $p = 0.13$). Prior hip surgery was found to have a significant effect on positioning ($p = 0.014$) and approached significance for comfort level ($p = 0.057$).

Discussion: Hip surgery has a positive effect on at least positioning. QoL scores are not affected by the severity of hip displacement or undertaking reconstructive hip surgery. Further evaluation in larger cohort-based populations is indicated to describe the factors relevant to pain and QoL in these individuals.

RADIOGRAPHIC HIP DISORDERS AND ASSOCIATED COMPLICATIONS IN SEVERE CEREBRAL PALSY

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Introduction

The objective of our research was to determine whether there is a relationship between subluxation of the hip, as seen on an X-ray of the pelvis, on one hand, and certain problems such as handling problems, seating problems and complications (decubitus ulcers, fractures and contractures), on the other hand, in patients with severe CP.

Methodology

We conducted a cross-sectional study on the relationship between radiologically assessed disorders of the femoral head (migration and deformity) and handling problems, seating problems and complications (decubitus ulcers, fractures and contractures) in a group of 160 adult patients (age ≥ 16 years) with severe tetraspastic CP.

Results

No significant difference was found in mean MP or level of deformity of the femoral head between patients with or without handling problems.

A clear relationship was found between migration and deformity of the femoral head, on the one hand, and the use of a special seat in the wheelchair, on the other hand.

The mean MP was significantly higher in patients with hip adduction contractures as compared to patient without contractures. The prevalence of hip adduction contractures increased if the level of hip deformity increased.

Discussion

Hip deformity and migration are associated with the need of a special molded seat and abduction contractures of the hip, but not with handling problems. It is therefore recommended that these orthopedic abnormalities are prevented or treated as they develop.

References

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A CLASSIFICATION SYSTEM FOR HIP DISEASE IN CEREBRAL PALSY: RATIONALE AND RELIABILITY

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Introduction: Hip displacement affects approximately one-third of children with cerebral palsy (CP). Numerous radiological indices are available to measure hip displacement in children with CP; however, there is no grading system assessing hip status in broad categorical terms. The purpose of this study was to develop a categorical, radiographic classification of hip morphology based on qualitative indices and measurement of the key continuous variable, the migration percentage (MP) of Reimers.

Methodology: Radiographs from a subgroup of 154 adolescents with CP born between January 1990 and December 1992 were analyzed. Gross morphological indices included: (1) integrity of Shenton's arch; (2) shape of the femoral head; (3) shape of the acetabulum; and (4) pelvic obliquity. A classification system was developed utilizing six broad grades anchored at the extremes, with Grade I representing normal hip development and normal radiographic indices and Grade VI signifying complete hip dislocation treated with salvage surgical intervention.

Results: A total of 134 patients (52 female and 82 male) and 268 hips were included for review. Average age of the cohort was 16.4 years (SD 1.4 years, range 14 to 19 years). According to GMFCS, 29 adolescents were classified at level I, 25 at level II, 27 at level III, 24 at level IV and 29 at level V. The agreement between estimated hip grade and true hip grade based on MP was almost perfect, with a Kappa coefficient of 0.96 (95% CI 0.93-0.98). The inter- and intra-rater reliability was assessed using intraclass correlation coefficients (ICC) and was found to be excellent, with ICCs ranging from 0.88 to 0.94.

Discussion: The cerebral palsy hip classification is valid and reliable; and in the future, this classification can be used in studies describing the natural history of hip displacement in cerebral palsy, in outcome studies and for communication between clinicians.

A NEW MEASURE OF RADIOLOGICAL SEVERITY OF THE FEMORAL HEAD IN CEREBRAL PALSY: VALIDITY and RELIABILITY IN A POPULATION COHORT.

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Background: Reimers Migration Percentage provides the best measure of hip displacement in children with CP. This has guided clinical decision making and surveillance. A limitation is the inability to measure orientation of the femoral head which may influence the need for reconstructive rather than preventative surgery.

Objective: To evaluate the validity and reliability of alignment of the upper femoral epiphysis with the pelvis.

Design: Prospective population based cohort study.

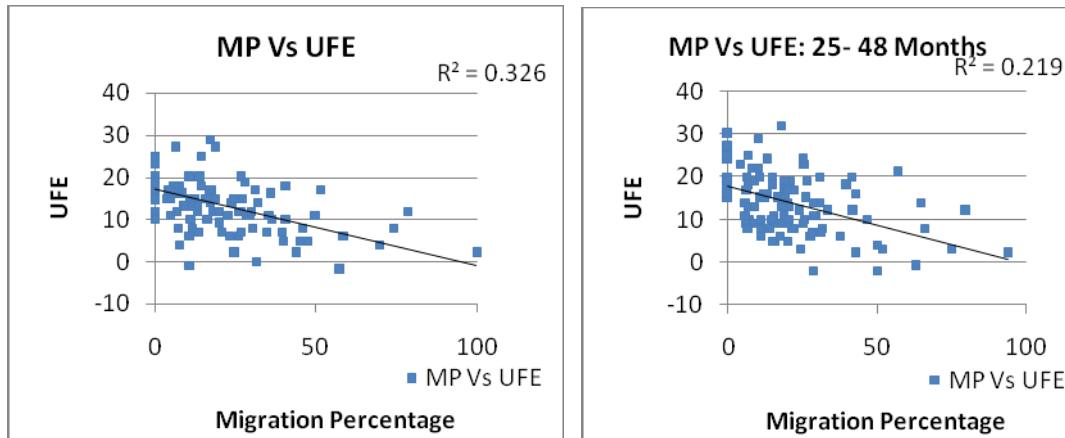
Participants: 112 children with CP (224 hips) from all GMFCS levels were entered including 58 (≤ 24 months) and 54 (25 – 48 months).

Main Outcome Measures: AP Pelvic radiographs were evaluated independently for marked hip displacement ($MP \geq 30\%$) and a novel measure of upper femoral epiphysis alignment compared to pelvic tilt (Hilgenreiners line). For reliability 40 images (80 hips) were measured 2 weeks apart. Concurrent validity was assessed for correlation between MP and the novel measure.

Results: Reliability of displaced hip ($MP \geq 30\%$), showed substantial agreement between raters in 95.2% cases, non-weighted Kappa of 0.80 (CI 0.68 – 0.91) with no sig. diff. according to side of hip or age. For the novel measure test-retest reliability was high (ICCs 0.93, 0.85). Inter-rater reliability was higher in session 1 than 2 (ICC's 0.94, 0.87). There was a moderate correlation between MP and the new measure (Table 1, figure 1).

Table 1: Results of Migration Percentage & novel measure on the same hips

Age		MP: Mean (SD)	Novel Measure: Mean (SD)			MP & Novel
mths	N (Hips)		All Hips	Displaced	Non-Displaced	Correlation
24	58 (116)	17.2 (19.5)	14.0 (6.5)	8.5 (5.3)	15.5 (6.0)	-0.572
25-48	54 (108)	21.7 (18.1)	13.9 (7.1)	9.6 (6.7)	15.1 (6.7)	-0.469



Conclusion: Our new measure of alignment of the upper femoral epiphysis with the pelvis demonstrates a moderate correlation with hip displacement. Both measures have strong reliability. The novel measure provides information about increasing dysplasia of the femoral head that may require reconstructive rather than preventive surgery.

Acknowledgements: National Health and Medical Research Council for Project grant (368500) and Career Development Award (RB).

A POPULATION BASED STUDY OF HIP DISEASE IN CEREBRAL PALSY: UTILIZATION OF THE CEREBRAL PALSY HIP CLASSIFICATION

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Introduction: The purpose of this study was to report the long-term effect of hip surgery on the incidence of hip displacement using a newly validated Cerebral Palsy (CP) hip classification.

Methodology: Retrospectively, a sub-group of 100 children who underwent surgery for hip displacement were identified from a large-population based cohort of children born with CP between January 1990 and December 1992. These children were followed to skeletal maturity and closure of their tri-radiate cartilage. All patients returned at maturity for clinical and radiographic examination, while caregivers completed the disease specific quality of life assessments. Patients were grouped according to motor disorder, topographical distribution and GMFCS. Radiographs were independently graded according to CP hip classification scheme to ensure reliability. Surgical "*Failures*" were defined as CP Grade \geq IV.

Results: 97 children and 194 hips were available for final review. According to GMFCS, greater than half the children were GMFCS IV and V (67/94, 67%), 12 were II and 18 were III. Fifteen hips were dislocated or had salvage surgery for dislocation (15/194, 7.7%) at time of skeletal maturity. The majority of hips were graded Grade II and III (149/194, 76.8%). A total of 39 (39/194, 20%) hips were classified as surgical failure with 95% (37/39) hips occurring in GMFCS IV and V children.

Discussion: Using the CP hip classification scheme, the natural history and outcome of 100 children with CP at skeletal maturity have been described. Despite hip surveillance and surgical intervention GMFCS IV and V children are at the greatest risk for surgical failure at skeletal maturity. Where the majority of failures were associated with either no hip surveillance and/or index surgery at a non-specialist centre. In contrast, hip surveillance and index surgery at a specialist tertiary centre was associated with a very high probability of a successful outcome.

ORIENTATION AND CAPACITY OF DYSPLASTIC ACETABULUM IN CEREBRAL PALSY – ALTERNATIVE METHOD OF MORPHOLOGICAL EVALUATION

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The 3D measurement of hip acetabular antropometric parameters has not discussed enough in the literature. It may affect the decisions concerning surgical treatment of hip dislocation in children with developmental acetabular dysplasia. The goal of this study is to present a new method to determine the orientation, capacity and sphericity of acetabulum.

Material and methods. Three materials were used: pelvic bone, computer model from CT images of cerebral palsy patients with unilateral hip joint dislocation, and a polyethylene acetabular cup for hip joint implantation. Equipments include a 3D scanners (Reverse Engineering techniques), Rapid Prototyping machines and CAD systems were used for 3D imaging analysis. The methods consist of three basic steps: 1. Obtaining a computer model, 2. Determining the reference planes, 3. Determining the acetabular capacity and orientation. The Acetabular Paragon Factor (APF) calculated on the basis of surface area/volume ratio was introduce for assessing the acetabular sphericity.

Results. The designed method has been verified and the measuring error assessed by means of a control measurement of an element with known geometry (polyethylene acetabular cup) and a measurement of a natural object with normal anatomy. The described method was applied to evaluate configuration and capacity of the acetabulum in a patient with spastic hip dislocation, based on a computer model of the pelvis in the CT imaging technique.

Conclusion. The designed method of anthropometrical assessment of hip joint acetabular capacity, sphericity and spatial orientation is a useful diagnostic tool both for normal and dislocated hip joints in children with cerebral palsy.

THE DEVELOPMENT OF AUSTRALIAN STANDARDS OF CARE FOR HIP SURVEILLANCE IN CHILDREN WITH CEREBRAL PALSY: HOW DID WE REACH CONSENSUS?

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Introduction: Hip Surveillance for children with cerebral palsy (CP) has been conducted in Australia since the mid 1990s, yet there was variation in age of commencement, frequency of review and criteria for discharge. Draft guidelines were developed with Gross Motor Function Classification System (GMFCS)¹ underpinning the surveillance protocol². The objective of our study was to gain consensus on guidelines to inform the development of standards of care for hip surveillance in CP.

Method: A national working party was formed and NMHRC Guidelines for establishing guidelines followed. Draft guidelines were developed using published evidence, augmented by expert opinion where published evidence was not available. Consensus was obtained from Australasian clinicians working in the area of hip management in children with CP.

Consultation was sought in three separate formats:

- Direct mailout to a wider corresponding working party.
- Survey at Australasian Conference
- Survey to selected professions missing from the previous survey respondents

Results: One hundred and twenty-four participants responded to the survey. There was 100% agreement on the need for standardised guidelines and 96% agreement for use of GMFCS levels being the best way to classify children for hip surveillance. Consensus with each statement was defined as greater than 80% agreement.

Table: Percentage agreement with Guidelines (Two Most Experienced Groups)

	GMFCS I	GMFCS II	GMFCS III	GMFCS IV	GMFCS V	WGH
Commencement of surveillance	90.6%*	95%*	89%*	87.5%*	81.25%*	87.5%*
Frequency of Surveillance	78%	95%*	86%*	89%*	82.8%*	82.8%*
Age at Discharge	79.6%	84.3%*	90.6%*	86%*	84.3%*	89%*

* Consensus

Conclusion: Consensus was reached across all areas, with the exception of GMFCS I. The guidelines were drafted into “The Consensus Statement on Hip surveillance for Children with Cerebral Palsy: Australian Standards of Care”³ and endorsed by the Australasian Academy of Cerebral Palsy and Developmental Medicine with a review process established.

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CPUP – SWEDISH NATIONAL HEALTH CARE QUALITY PROGRAMME FOR PREVENTION OF HIP DISLOCATION AND SEVERE CONTRACTURES IN CEREBRAL PALSY

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Introduction

Children with cerebral palsy (CP) often have an increased muscle tone, muscle weakness and muscle imbalance. For this reason, they are at an increased risk of developing muscle contracture, hip dislocation and scoliosis. Hip dislocation in CP results in significant morbidity in terms of pain, contractures, sitting/standing/walking problems, fractures, skin ulceration and problems with perineal care, pelvic obliquity and scoliosis.

The first report indicating that hip dislocation in CP is preventable was published fifty years ago. On the basis of this knowledge, CPUP, a cerebral palsy register and a health care programme for children with CP, was established in southern Sweden in 1994. All children with CP, who were born in the area since 1992 were included. The main goal of the programme is to prevent hip dislocation and severe contractures. Other aims of the programme are to describe the course of functioning and development in CP, to evaluate treatment methods and increase cooperation between health care professionals.

CPUP - The CP Follow-Up Programme

The health care programme includes a continuing standardized follow-up of each child in terms of an assessment form. The child's local physiotherapist and occupational therapist fill in the form twice a year until the child is aged six and thereafter once a year. The assessment form includes the following: the CP-subtype, the gross motor function (GMFCS5), the manual ability (MACS4), measurements of passive range of motion, clinical findings, use of orthoses and other treatments. The results are all computerized, and the local health care team receives a report showing the child's development over time. The programme also includes a standardized radiographic follow-up of the children's hips and spine. All reports are administered via Internet since January 2007.

The information collected from the different reports and from the radiographic examinations gives a detailed picture of the child's development over time. With this information, it is possible to detect deterioration in gross or fine motor function, range of motion, degree of hip displacement, degree of scoliosis etc at an early stage. This is the prerequisite for early intervention to prevent the development of severe contracture, hip dislocation and severe scoliosis.

Over the last few years the participation in CPUP has been spread all over Sweden as well as in the rest of Scandinavia. All counties of Sweden now participate in the programme and in Norway, two counties corresponding to half the population, are also participants of the programme. There are plans of introducing CPUP in Denmark later this year.

CPUP was appointed by The National Board of Health and Welfare as a National Health Care Quality Register in 2005.

Results

In Southern Sweden (counties Skåne and Blekinge), children born 1992 and later (included in CPUP) are compared with children born 1990-91 (representing the time before CPUP).

Hip dislocation- No child following the prevention program has developed hip dislocation. Before CPUP, 10% of the children developed hip dislocation¹.

Contractures- The number of children with severe contractures has been reduced with 70%². The number of children with windswept deformity has been reduced, as well as the severity of the deformity³.

Scoliosis- The number of children with severe scoliosis have been reduced with 60%.

Discussion

Initially, children with CP have no skeletal, joint or muscle disease. The development of hip dislocation and severe contractures should be regarded as a complication to the cerebral palsy, and should be prevented.

For early detection and treatment in a population, a cerebral palsy register and standardized follow-up programme is needed. The main challenge of the follow-up programme is to identify all children with CP in the population at an early stage. The programme has been developed in collaboration with local multi-disciplinary team members such as neuropediatricians, physiotherapists, occupational therapists and orthotists and all interventions have the support of both the local team as well as the orthopaedic and hand surgeons.

It is of utmost importance that a child with CP is involved in an organisation with routines and capacity of early treatment and with competence to offer the best method of treatment. The many treatment options available make it very important that there is a good cooperation between all specialists. CPUP acts as the base for this co-operation

Conclusion

With a cerebral palsy register, identifying all children with CP in a population, in combination with a screening programme it seems possible to prevent or reduce the development of severe contractures, hip dislocation and scoliosis in children with CP.

www.cpup.se

STATE WIDE HIP SURVEILLANCE OF CHILDREN AND ADOLESCENTS WITH CEREBRAL PALSY: FIVE YEAR OUTCOME

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Introduction

Systematic hip surveillance was introduced in Queensland (population 4.4 million) in 2005 with the commencement of a state-wide program. Demographic estimates (2-2.5/1000 live births)^{1,2} indicate expected recruitment of 1600 to 2000 if all children with cerebral palsy (CP) to age 16 were recruited. Current recruitment indicates between 70-88% uptake. This paper reports five year outcomes of this program.

Methodology:

Recruitment to the program was coordinated by a tertiary health service across Queensland. This program initially adhered to guidelines similar to the “Consensus Statement on Hip Surveillance for Children with Cerebral Palsy: Australian Standards of Care”³ which were endorsed and fully implemented in 2008. Efforts have been made to recruit all children with CP from Queensland. Analysis of the clinical data to examine relationships of GMFCS, Reimer’s migration percentage (MP)>30%, and progression to surgery was undertaken.

Results:

To date 1416 children have been registered. From this group 187 have been excluded due to: loss to follow-up, withdrawal, relocation, or diagnosis not CP. Of the remaining 1229, 693 are male. Table one demonstrates GMFCS breakdown and percentage of each GMFCS group with one or more hip MP>30%.

Table One

	I	II	III	IV	V	Total (& average %)
Number pts	426	290	134	177	202	1229
Number<30	421	268	86	89	102	966
Number > 30	5	22	48	88	100	263
% of Group >30	1%	8%	36%	50%	50%	21%

From GMFCS IV and V 72 children have been referred for orthopaedic surgery

Discussion:

State-wide surveillance program implementing the Standards of Care³ has been successful in correctly identifying children at risk of hip displacement, fast tracking children at high risk to orthopaedic treatment and discharging those at minimal risk. The data is demographically similar to other CP populations and data of MP> 30% is consistent with earlier studies⁴

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RISK OF HIP DISPLACEMENT IN YOUNG CHILDREN FOLLOWING ACQUIRED BRAIN INJURY

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Introduction: Children with acquired brain injury (ABI) appear to be at risk of hip displacement. There is limited literature on Hip Surveillance for this group and no reported data on the relative risk of displacement compared to children with cerebral palsy (CP). This paper aims to investigate risk of hip displacement for young children with ABI.

Methods: A retrospective analysis of state-wide paediatric rehabilitation databases for children with ABI and/or CP was undertaken to identify children who acquired their brain injury between the ages of 6 weeks and 3 years. Review of records to: confirm age at injury; classify mobility status post injury; and identify hip status was performed. Children were classified to functional mobility groups: independently ambulant (equiv. GMFCS I & II), partially ambulant (GMFCS III) and non ambulant (GMFCS IV&V). Median months between brain injury and identification of hip problem were analysed. The primary outcome was hip displacement by Reimers migration percentage (MP)> 30% in one or both hips.

Results: 1807 children with ABI were identified with 160 meeting the age requirements and only 32 children (20 males) with radiological information. Three children have since deceased. Of the *independent ambulators* (n=9) and *partial ambulators* (n=3) none had MP >30% and none progressed to hip surgery. For *non-ambulators* (n=20) 90% (n=18) had a MP>30% with 11 having peak MP> 50%. Five of the 11 children had dislocated hip/s. Nine non-ambulant children (45%) were referred for bony hip surgery. The median time from initial injury to an MP>30% was 24 months.

Conclusion: The risk of hip displacement in children who acquire an early brain injury and are /remain non ambulant has been identified, highlighting the need for frequent hip surveillance following brain injury. Prospective surveillance of an ABI population wide cohort is required to confirm incidence and relative risk.

RELATIVE RISK OF MARKED HIP DISPLACEMENT ACCORDING TO FUNCTIONAL LEVEL IN YOUNG CHILDREN WITH CEREBRAL PALSY.

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Background: The relationship between Gross Motor Function Classification Level and the incidence of hip displacement has been demonstrated in adolescents with CP at skeletal maturity and this has guided recommendations for hip surveillance.

Objective: To evaluate the relationship between GMFCS and the incidence of marked hip displacement in younger children with CP.

Design: Prospective population based cohort study.

Participants: Participants were entered into two birth cohorts. 170 children (110 males) were assessed at a mean age of 29.7 ±4.0 months (range 24.0 to 36.0 months).

Main Outcome Measures: GMFCS level was calculated from Gross Motor Function Measure (GMFM) data by two independent raters. Pelvic radiographs were evaluated for marked hip displacement (MP≥30% in either hip) by one experienced rater. Relative risk was assessed by GMFCS level, with 95%CI calculated.

Results: Distribution of GMFCS were representative of a population based sample (I=67, II=27, III=23, IV=27, V=26); of these 31 children (18.2%) were found to have MP≥30%. The incidence of marked hip displacement was lowest with GMFCS II and highest with GMFCS III and V. There was no significant relationship between GMFCS and MP≥30%: GMFCS level I=10.4%, CI 5.2-20.0% (RR=0.6, CI 0.3-1.2), II=7.4%, CI 2.1-23.4% (RR=0.4, CI 0.1-1.6), III=30.4%, CI 15.6-50.9% (RR=1.7, CI 0.8-3.3), IV=25.9%, CI 13.2-44.7% (RR=1.4, CI 0.7-2.9), and V=30.8%, CI 16.5-50.0% (RR=1.7, CI 0.9-3.3).

Conclusion: Between 24 and 36 months c.a., marked hip displacement was present in a proportion of the children at all functional levels and there was no significant relationship between GMFCS and the incidence of hip displacement. While GMFCS is useful for risk stratification in older children with CP, it should be used cautiously in preschool children. These data has important implications for early hip surveillance, when early detection and prediction of outcome need to be guided by prospective longitudinal cohorts followed from infancy to adolescence.

Acknowledgements: National Health and Medical Research Council for Project grant (368500) and Career Development Award (RB)

SOFT TISSUE RELEASES TO TREAT HIP SUBLUXATION IN PATIENTS WITH CEREBRAL PALSY: A 10 YEAR FOLLOW-UP REVIEW*

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Objective: To evaluate the long-term outcome of 65 children with cerebral palsy (CP) who underwent soft tissue releases to treat hip subluxation.

Materials and Methods: Open adductor and psoas releases were done on 129 hips, by the senior author, from 1988 through 1991. Nineteen children had spastic diplegic pattern of involvement and 46 had spastic quadriplegic pattern of involvement. The mean age at surgery was 4.4 years (range, 1.9-8.5). Surgery was indicated following a standardized protocol that included Reimers migration index (MI) over 25 % and hip abduction under 30 degrees. Mean follow-up was 10.1 years (range, 8-13 years). To evaluate the outcomes, hips were grouped by preoperative MI: normal, <25% (24); mild, 25-39% (71); moderate, 40-59% (27); and severe, \geq 60% (7). One year follow-up MI, ambulatory status, and age at surgery were also evaluated as potential factors influencing outcome.

Results: Hip outcomes were graded by MI: good, under 25% (67); fair, 25-39% (18); and poor, \geq 40% (44). Patients were classified according to the worst hip. Thirty patients had good results, 11 fair, and 24 poor. The mean preoperative MI was 34.2%, and the mean migration index at final follow-up was 18.4%. Nineteen patients underwent bony reconstructive procedures, and ten patients had repeat soft tissue releases.

Conclusions: Adductor and psoas releases were effective in the long term prevention of hip dislocation in 67% of children. Two factors related to a favorable outcome included MI at one year follow-up and the ambulatory status. There was no difference between patients' outcome based on age and preoperative MI in the ranges studied.

*Soft-tissue releases to treat spastic hip subluxation in children with cerebral palsy.
JBJS 2005, 87-A (4) 832-841

The exposition of this retrospective review will be completed by an updated review of the literature.

SURVIVORSHIP ANALYSIS OF ADDUCTOR SURGERY TO PREVENT HIP DISPLACEMENT IN CHILDREN WITH CEREBRAL PALSY

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Introduction: The purpose of this study was to evaluate the outcomes of hip adductor surgery in preventing hip displacement for children with cerebral palsy (CP). This long-term review correlates success of hip adductor surgery with the Gross Motor Function Classification System (GMFCS).

Methodology: A retrospective review was performed on all children with CP who underwent index hip adductor surgery between January 1994 and December 2004 at one tertiary level paediatric hospital. Included patients had hip migration percentages (MP) greater than 30% prior to adductor surgery and were followed up for a minimum 12 months postoperatively. Time from index surgery to additional surgery was measured. Kaplan Meier survivorship analysis was performed with "Failure" defined as need for additional surgical procedures, including revision adductor surgery, pelvic or femoral osteotomy and salvage surgery. Odds ratios were calculated for gender, MP, age at primary surgery, GMFCS level, and surgeon experience.

Results: Three hundred and thirty children underwent hip adductor surgery. Greater than half of the children in the study were GMFCS level IV and V (73%, 242/330). The average age at time of index surgery was 4.2 years. The mean MP at time of index surgery 43.2%, and mean length of post-operative follow-up was 7.1 years. "Success" of adductor surgery occurred if no subsequent surgeries were required. One hundred and six children (32%) did not require further surgery; 31 children were GMFCS level II (94%), 27 level III (49%), 28 level IV (27%), and 20 level V (14%).

Discussion: GMFCS classification is the primary predictor of success or failure of hip adductor surgery in patients with CP. These results illustrate the paradox of hip adductor surgery for children with cerebral palsy - the children who are most affected and need the surgery most do the worst.

BOTULINUM TOXIN TYPE-A IN PREVENTION OF HIP DISLOCATION ON CHILDREN WITH CEREBRAL PALSY

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INTRODUCTION: Early developmental brain damage leads to disturbances in muscular balance around the hip joint, ultimately causing instability. This study aimed to investigate the use of botulinum toxin type-A for the treatment of unstable hips in paediatric spastic cerebral palsy.

MATERIALS AND METHODS: 109 unstable hips, defined as a migration percentage index $\geq 20\%$ and $\leq 33\%$ and subluxated $>33\%$, in 60 non-walking children with bilateral spastic cerebral palsy (27 females, 33 males; mean age 4 years 8 months) were included. Patients were randomised to Group A (botulinum toxin type-A plus physiotherapy) (54 hips) or Group B (physiotherapy alone) (55 hips). Bilateral intramuscular botulinum toxin type A injections were administered 3-monthly to adductor, hamstring and psoas muscles. Any changes in hip stability were assessed using migration percentage index change.

RESULTS: Mean follow-up was 23 months. Mean migration percentage values at pre- and post-study were 37% and 30% ($p < 0.00001$) (Group A) and 33% and 35% (Group B), respectively. Mean progression was -7% (Group A) and +1% (Group B) ($p < 0.00001$). There was no statistical difference in observed parameters between groups for initial MP values between 20%-33% and over 50%.

DISCUSSION: Botulinum toxin type-A is ineffective as a method of preventing hip stability deterioration in children with spastic cerebral palsy suffering from severe hip subluxation or at the initial stages of spastic hip disease. There is only slight improvement observed in the group of moderate hip joint instability before botulinum toxin – A treatment, with MP values from 34% to 50%.

FUNCTIONAL BENEFITS OF EARLY ADDUCTOR AND ILIOPSOAS RELEASE IN CHILDREN WITH CEREBRAL PALSY

Michael Sussman, MD

Adductor/Iliopsoas spasticity are common problems in children with Cerebral Palsy. The influence of the dysphasic and over-active adductor and psoas has been well defined in terms of their influence on hip stability and progressive hip dysplasia in children with spastic Cerebral Palsy. Although recognized, less well defined, is the influence of these adductors on function.

A scissor type of gait pattern is exceedingly common in children as they begin to develop assisted to independent gait with spastic Cerebral Palsy. With stabilization of the foot and ankle in the AFO this pattern may diminish somewhat, but in some children is persistent and impairs their ability to progress. One must, of course, distinguish scissoring due to adductor spasticity from apparent scissoring due to internally rotated positioning of the femur. In those children who do have adductor and psoas spasticity early release of these adductors may allow marked improvement in gait pattern, increased sitting stability, and allow for a enhanced development of gross motor skills. Unfortunately, this has been quite hard to document. Children at this age are not capable of being studied by standard gait analysis techniques and controlled studies of patients who do and do not undergo these type of releases has not been done. In spit of this, the gains following early judicious adductor release can be extremely robust and it should be recognized by the Cerebral Palsy treatment community that this intervention can be extremely valuable for the child between the ages of 2 and 5 who is developing a stable gait but who is limited by their adductor spasticity.

SYSTEMATIC REVIEW OF ACETABULAR OSTEOTOMY FOR HIP SUBLUXATION AND DISLOCATION IN CEREBRAL PALSY: THE PRELIMINARY REPORT

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Background: Hip subluxation or dislocation is a common complication in patients with cerebral palsy.

The prevalence of subluxation and dislocation ranges from 3 percent(2) to 27 percent(4). Untreated dislocation of the hip is associated with pelvic obliquity, decubitus ulcer, scoliosis, sitting problems, and problems with hygiene care(1;3;4).

Many authors use different techniques to correct the acetabular deformities in these patients. The aim of this study was to review all literatures describe types of acetabular osteotomy and outcomes in cerebral palsy with hip subluxation and dislocation in last 20 years (from 1990- 2010)

Methods: Two authors independently searched from The Cochrane Library, Pubmed, Ovid, CINAHL, Science direct, Trip database, Scopus, specific orthopedic journals, abstracts/papers from conferences and meetings, and reference lists of articles were searched from 1990 to June 2010. Two authors independently assessed methodological quality and extracted data by using a standardized data extraction form.

Results: Twenty-six of 6,805 articles were included. There were 603 patients with 734 hips and 50% were boys. Dislocation and subluxation were diagnosed in 38% and 62% of the patients, respectively. Most of the patients were spastic quadriplegia (72%). The most common use technique was unicortical pelvic osteotomy (Dega, San-Diego) (47%). The second most common was complete bicortical pelvic osteotomy (Salter, Steel, Triple) (25%). Mean age of surgery was 10.17 ± 2.62 years (range, 5.2 – 15.0 years). The average time of follow up was 6.66 ± 3.57 years (range, 3.0 – 16.7 years). Eighty-nine percent of patients with pain before surgery had no pain after the procedures. Mean of the Migration

percentage of Reimer was decreased from 70.3% pre-operatively to 11.9% post-operatively. The center edge angle of Wiberg changed from -17.2 degrees to 29.3 degrees after surgery. Re-subluxation was the most common complication in these studies, found in 7% (53 from 734 procedures).

Conclusions: The most common pelvic osteotomy used to treat hip subluxation or dislocation in cerebral palsy patients from 1990 – 2010 literatures is unicortical technique (Dega, Sa-Diego). The Reimer's migration percentage was decreased from 70.3% to 11.9%.

COMPARISON BETWEEN EARLY AND LATE RESULTS OF OPEN REDUCTION AND DEROTATION-VARUS FEMORAL OSTEOTOMY COMBINED WITH DEGA PELVIC OSTEOTOMY IN THE TREATMENT OF SPASTIC HIP DISLOCATION

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Purpose: To present and compare early and late results of spastic hip dislocation treatment.

Material: A group of 77 patients (109 hip joints) with hip joint dislocation (WM>80%) are divided into two groups. Group 1: observation < 3 years (mean 2.2 years), 64 hip joints (47 patients). Group 2: observation > 3 years (mean 4.8 years), 45 hip joints (30 patients).

Method: Evaluations include the clinical examination of hip joint range of motion (ROM) and analysis of hip A-P view X-Ray pre-operation and at latest follow-up. Femoral head and acetabulum relationship was evaluated by Acetabular Index (AI), Reimers migration index (RM).

Results: In the first group, AI improved from 32.2° to 22.2°, RM improved from 98.9% to 15.9%. In the second group, AI improved from 28.9° to 19.4°. In the ROM evaluation of first group, flexion contracture of the hip joint (thomas test) decreased from 21.1° to 10.7°, abduction increased from 19.5° to 29.9°, popliteal angle decreased from 52.0° to 34.2°. In the second group, changes are similar: flexion contracture of the hip joint (thomas test) decreased from 24.6° to 12.6°, abduction increased from 17.3° to 26.1°, popliteal angle increased from 61.4° to 40.7°.

Conclusion: Open reduction of the hip joint combined with derotation-varus femoral osteotomy and Dega osteotomy is very effective treatment of spastic hip joint dislocation. The most sensitive radiological parameter for changes in the femoral head coverage were RM and AI.

A COMPARISON OF SURGICALLY TREATED AND UNTREATED UNSTABLE HIPS IN CEREBRAL PALSY

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Introduction

Dislocation of the hip is a common joint deformity in the child with cerebral palsy (CP) who cannot walk. Surgical prevention and correction of this deformity is based on the premise that a dislocated hip compromises perineal care and sitting function and that it may be painful^{1, 2, 3}.

The purpose of this study was to investigate differences in these parameters between individuals with CP who had undergone hip surgery, and those with untreated unstable hips in a long term follow-up.

Methodology

Forty surgically treated non ambulatory individuals with CP aged 8-26 yrs (median 16.5 yrs) were assessed. Length of follow up was 5-11 years (mean 8.5 yrs, SD 1.74). Surgery had involved adductor releases, iliopsoas release or transfer, anterior branch obturator neurectomy, and femoral derotation osteotomy if there was severe subluxation or dislocation. A Chiari osteotomy was added in 10 cases and 21 had hamstring releases. The surgical group was compared to a random sample of untreated persons with CP who had unstable hips, matched for age and mobility status. All hips were radiologically evaluated. A functional CP hip assessment was devised which included evaluation of sitting function, perineal care and pain on movement of the hip.

Results

Surgery had resulted in a significant difference in hip status at follow-up ($p < 0.001$). Perineal care was significantly easier in the operated group ($p < 0.001$). There were no significant differences in sitting function (including level of ability and postural symmetry). There was less pain on movement of the hip in the treated group but the difference between groups was not significant.

Discussion

Facilitation of perineal care may be an indication for surgery but not improvement of sitting function. Surgery did not guarantee a painless hip in the long term.

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LONG-TERM FOLLOW-UP OF ONE-STAGE CORRECTION OF THE DISLOCATED AND SUBLUXED HIP JOINT IN CEREBRAL PALSY

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Introduction: Severe hip subluxation and dislocation is common in cerebral palsy, despite screening and preventive surgery. Hip displacement may result in pain, fixed deformity and loss of function. This prospective study reports the outcome of one stage hip reconstruction including soft tissue releases, open reduction, femoral shortening derotation osteotomy and a modified Dega pelvic osteotomy. Reconstruction was offered to all patients, irrespective of the shape of the femoral head or cartilage loss seen radiographically.

Methodology: From 1988-2002 307 hips in 215 patients were reconstructed. One patient (1 hip) was lost to follow up which was a mean of 7.2 years (0.0 – 28.8 yrs). The majority of patients had tetraparetic cerebral palsy (187) and were GMFCS IV and V. In the early part of the series, an iliopsoas transfer (Mustard) was performed to augment hip stability. In the later part of the series, this was replaced by iliopsoas release.

Results: The average migration index was corrected from 70% to 13%. The prevalence of pain was reduced from 84% to 5%. Persisting pain correlated with hip re-dislocation (14%) and osteoarthritis (3%). Iliopsoas release was more effective than iliopsoas transfer in maintaining hip stability. Function was improved in 34 patients (less severely affected) and deteriorated in 33 (more severely affected) patients. A stiff hip was present in 1.3% (4 cases) of all hips.

Discussion: This correction of all hip deformities in one stage is effective in reducing pain and regaining joint mobility, in the majority of patients. A positive effect on patient's function was seen less severely affected patients but this was not statistically significant. Hip reconstruction was effective in reducing pain and maintaining or improving function, in the majority of patients, despite pre-operative femoral head deformities and loss of cartilage. Better tools are required to measure function and care-giver burden, in severely involved patients with CP, undergoing hip reconstruction.

SURGERY FOR HIP DISPLACEMENT AND GAIT DYSFUNCTION IN TYPE IV SPASTIC HEMIPLEGIA

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Introduction: We have utilized unilateral multilevel surgery for the simultaneous correction of hip displacement and gait improvement, in children with Type IV hemiplegia. The aim of this study is to report the outcome using the Movement Analysis Profile (MAP) and the Gait Profile Score (GPS) in combination with radiological analysis using the CP hip classification system. We hypothesized that unilateral, multilevel orthopaedic surgery would be effective in improving gait and hip development.

Methodology: 11 children (all GMFCS level II, 6 boys/5 girls, mean age 11.1 ± 2.7 years at time of surgery) with type IV hemiplegia were included in this retrospective study. All patients had a Proximal Femoral Derotation Osteotomy (PFDRO) and multiple soft tissue releases and tendon transfers, between 1999 and 2006 at a tertiary care institution. From the 3D gait data the MAP and GPS were calculated, at baseline and 1 year after surgery. Centre edge angle (Wiberg), acetabular angle (Sharp), pelvic obliquity, and the CP hip classification system were assessed preoperatively, at 1 and 6 years post-operatively. The significance level was set at $\alpha=0.05$.

Results: There was a statistically significant improvement in the MAP for pelvic rotation, hip rotation, foot progression and the overall GPS. However, hip development was unsatisfactory with the majority of hips achieving Grade III or worse according to the CP hip classification system. Only two hips (one with PFDRO+Dega, one mild at baseline) were Grade II. The centre edge angle showed a significant improvement but acetabular angle and pelvic obliquity did not.

Discussion: Gait problems, including the transverse plane, can be corrected effectively by unilateral multilevel surgery including PFDRO in children with hemiplegia. However, hip development may be unsatisfactory despite PFDRO, without the addition of a pelvic osteotomy. Persisting pelvic obliquity may be the principal factor associated with poor hip development. Although no hips are currently symptomatic, long term function is a concern.

INFLUENCE OF CORRECTION OF UNILATERAL HIP SUBLUXATION ON THE CONTRALATERAL HIP IN CEREBRAL PALSY

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Purpose: It is unclear whether unilateral bony surgery and musculotendinous release is the most appropriate approach in cases where the contralateral hip is well seated. The purpose of this study is to describe the fate of the original and the contralateral hip of severely involved patients with cerebral palsy, GMFCS III to V, with unilateral hip subluxation or dislocation treated by unilateral femoral osteotomy with or without pelvic osteotomy along with unilateral or bilateral soft tissue release when the contralateral hip was well seated. All patients were followed to skeletal maturity.

Methods: A continuous group of GMFCS III to V cerebral palsy patients with unilateral hip subluxation or dislocation underwent soft tissue release (adductor and iliopsoas) and unilateral intertrochanteric varus, rotation and shortening osteotomy with or without pelvic osteotomy were included. All patients were clinically and radiologically followed from the time of presentation until skeletal maturity.

Results: Twenty-seven children and adolescents with GMFCS level III, IV and V met the inclusion criteria. Two patients (7.4%) were GMFCS III, 5 (18.5%) were GMFCS IV and twenty (74.1%) GMFCS V. The male: female ratio was almost 1 (13 boys and 14 girls). At the time of chart and radiograph review, the average age of this patient group was 20.4 years (range: 14 to 25 years). Twelve patients (44%) required subsequent bony surgical management of the contralateral hip for subluxation or dislocation after the index procedure. Initially, in all cases there was pelvic obliquity with the operative side higher, which reversed in cases where the contralateral hip deteriorated, and did not reverse when the contralateral hip remained stable. Nine of them were treated with femoral varus osteotomy alone and three underwent a combination of femoral and pelvic osteotomy. Three of these twelve (25%) patients had revision of the first hip as well as bony correction of the contralateral hip. Age at surgery did not appear to have a significant effect on maintaining reduction or in preventing the contralateral hip to deteriorate.

Conclusion: The rates of recurrence of the original hip as well as contralateral hip subluxation and dislocation following unilateral bony surgery in GMFCS III to V spastic patients are higher than those of other previous series. However, in this series, patients were followed until skeletal maturity. It is prudent to warn families of the possibility of long term subluxation or dislocation of the original hip as well as development of the hip dysplasia requiring surgery on the contralateral side. Consideration should be given to adductor and iliopsoas release and bony surgery on the contralateral side in a GMFCS level III to V child undergoing surgery for hip displacement, even when the hip appears radiologically normal. If unilateral bony surgery is performed, close radiological follow-up of both hips is recommended. It also appears that unilateral hip surgery alters the forces maintaining pelvic alignment, which can lead to destabilization of the contralateral hip. Other factors which alter pelvic alignment, such as spinal fusion to the pelvis, may also lead to hip displacement.

Level of evidence: Case series. Level IV

DETERMINANTS OF HIP PAIN IN ADULT PATIENTS WITH SEVERE CEREBRAL PALSY

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Introduction

The aim of this study was to investigate the relationship between radiographic results for the femoral head (migration, deformity, osteoarthritis) and pain in a group of patients with severe CP.

Methodology

A cross-sectional study to investigate the relationship between radiographic results (migration, deformity and osteoarthritis) of the femoral head and pain in 160 patients with severe tetraspastic CP. Pain assessed with the CP Pain Assessment Instrument (PAICP), based on the Faces Pain Scale (FPS). The ability to use the PAICP (vision, ability to recognize and select) and the mental level of the patients was assessed in advance with the Columbia Mental Maturity Scale (CMMS).

Results

The radiographs were subdivided, on the basis of the maximal migration percentage, into four groups. In 20 cases the radiograph showed an abnormal configuration of femur and pelvis, inhibiting calculation of the migration percentage. On those radiographs the femoral head was either absent, totally disintegrated, impossible to identify or there was direct aberrant contact between parts of the femur and the pelvis.

The relationship between pain and the amount of luxation of the femur head was significant. Migration and deformity of the femur head were significantly interrelated. Pain increased with the quantity of asymmetry. The abnormal configuration was strongly associated with pain.

Discussion

Several patients had undergone bony surgery to reduce the femoral head or to reduce pain with unsuccessful result: 20 of 160 patients had an abnormal configuration of femur and pelvis, which was associated with (residual) pain. Only distal resection of the femoral head at the level of the minor trochanter was found to have no association with pain.

The results of the present study suggest that deformity, asymmetry and migration of the femoral head should ideally be prevented or treated, but the question that rises is how and at what price?

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PAINFUL CHRONICALLY DISLOCATED AND SUBLUXATED HIPS IN CEREBRAL PALSY – SALVAGE PROCEDURES

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Introduction - The purpose of this study was to evaluate 19 painful dislocated hips in patients with spastic Cerebral Palsy, treated with hip arthrodesis and internal fixation.

Patients and Methods – 19 patients, all spastic Cerebral Palsy. The mean age at the surgical procedure was 17 years and five months (min 10+11 and max 30+8). 11 tetraplegics, 5 diplegics, 2 diplegics plus athetosis, 1 hemiplegic. Functionally : 4 community ambulators, 2 household and 13 non-ambulators. 6 patients had previous procedures done before the arthrodesis. The main surgical indications were pain and impossibility or failure to reconstruct the hip joint. The mean follow-up period was of 11 years and one month. Four patients needed revision, with change implant and bone graft.

Results – All patients showed bone union and pain relief, postural improvement in all but two patients. In these two cases the hip arthrodesis ended up transformed in Castle procedure due to difficulties in positioning and/or worsening of the spine deformity.

Hip arthrodesis is another reasonable option in treating painful spastic subluxated and dislocated hips in Cerebral Palsy especially if it is unilateral and a patient who has walking ability.

Another salvage procedure to these severe cases of hip pain and deformity is the total hip arthroplasty. In one patient the hip arthrodesis was replaced by a hip arthroplasty and another patient had a primary hip arthroplasty.

PALLIATIVE HIP SURGERY IN SEVERE CEREBRAL PALSY: A SYSTEMATIC REVIEW

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Introduction

Several methods have been described to offer relief in patients in which the hip disorder causes complications, aiming to resolve pain, improving sitting comfort and reduce nursing problems. Palliative surgery, obviously only performed when there are no other options, can be successful, but is very intrusive for these severely disabled patients. About the choice of the type of surgery there is no consensus yet.

Methodology

We performed a systematic review about the value and complications of palliative surgery on hips in patients with CP and GMFCS classification V. An extensive literature research was conducted by 2 independent searchers, with the Keywords and mesh terms Cerebral palsy, Surgery/operative surgical procedures, Hip, Hip (sub)luxation/dislocation and Tendons/surgery. The methodological quality of the selected articles was assessed using a list of criteria, used by Steultjens et alⁱ. This list is a modified list from van Tulder et al, to assess uncontrolled studiesⁱⁱ (no RCT or CCT).

Results

The literature search resulted in 224 articles. These articles included all studies concerning Cerebral palsy, hip and surgical procedures. Based on the inclusion criteria, 8 articles were selected. All 8 articles passed the methodological quality assessment. Most articles (6) were on the subject of resection of the femoral head.

Discussion

Our review reveals that the Castle procedure is the most preferable method to treat these patients. This procedure is to be preferred above the McCarthy procedure. The Castle procedure has a higher success rate concerning pain (90-100% versus 13-53%), a higher rate of improving seating problems (100% versus 80%), and very low rate of proximal migration of the femur (5% versus 17-28%). Also the rate of postoperative PeriArticular Ossification (PAO) is lower in patients treated with the Castle technique (0-57% in a slight amount versus 30-62%).

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THE PEDIATRIC LCP HIP PLATE FOR FIXATION OF PROXIMAL FEMORAL OSTEOTOMY IN CEREBRAL PALSY AND SEVERE OSTEOPOROSIS

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Introduction: The majority of CP patients with severe hip displacement are GMFCS IV and V. They are non-ambulant and may have severe medical co-morbidities including nutritional impairment, osteopenia and a high risk of insufficiency fractures. Severe osteoporosis may lead to technical difficulties and hardware failure after proximal femoral osteotomy with a conventional blade plate.

Methodology: Fifty-three proximal femoral osteotomies, alone or as part of a more complex surgical intervention, were performed in 28 patients (17 boys / 11 girls, age at surgery average 10.4 years, 3 – 19 years). All children suffered from CP (24 quadriplegics, 2 diplegics, and 2 hemiplegics) with GMFCS levels: 3x III, 3x IV, and 22x V. This cohort was compared with a historical (conventional AO blade plate) one (38 patients with 53 operative interventions, 24 girls / 14 boys, age at surgery average 9.8 years, 3 – 18.5 years, GMFCS levels: 4x III, 5x IV, and 29x V; 34 quadriplegics, 3 diplegics, and 1 hemiplegic).

Results: The amount of varus and derotation was similar in both operative groups. Operations with the conventional AO blade plate were 17.2 minutes shorter on average and the blood loss was 45.6 ml less on average. Radiologically 19.6% of the patients had signs of complete consolidation with the LCP Hip Plate 6 weeks after surgery (vs. 91.1% of the patients of the historical cohort, $p < 0.001$) but all osteotomies in both groups were completely consolidated by 12 weeks. In the LCP cohort in 3 patients (10.7%) full weight bearing was allowed immediately after the operation.

Discussion: Both implants, the Pediatric LCP Hip Plate and the conventional AO blade plate, produce similar results regarding fixation and correction of the neck-shaft angle. The consolidation rate 6 weeks postoperatively using the LCP plate is lower than with the conventional blade plate, whereas equivalent healing at 3 months was found.

FIXATION OF VARUS DEROTATION OSTEOTOMIES WITH A LOCKING HIP PLATE – PRIMARY RESULTS

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Introduction: Varus derotation osteotomy (VDRO) is the procedure of choice for the treatment of spastic hip disease. In the recent years, a new locking hip plate (LHP) (Synthes USA) was developed for the fixation of VDRO's. The aim of this study is to report our primary results using this plate.

Methodology: 8 patients underwent VDRO's using the LHP in the last 18 months. The GMFCS score was 2 in 2 patients, 4 in 2 patients and 5 in 4 patients. Six patients underwent bilateral procedures and 2 patients underwent unilateral procedures. The operating time, blood loss, length of stay (LOS) and time to union were measured and compared to 25 patients operated using blade plates.

Results: The operating time went down from 2.5 hours/side to 1.5 hours/side, similar to the blade plates. The mean blood loss was 300 cc compared to 400 in the VDRO group. The mean LOS was 4.5 days compared to 7.5 in the VDRO group. All the patients returned to weight bearing after 3 weeks and all the osteotomies were fully united in 3 months.

Discussion: LHP provide a better fixation with improved stability following VDRO. The technique is simple but is associated with a steep learning curve. The faster time to union allows faster mobilization and weight bearing. We recommend the LHP for fixation of VDRO's due to spastic hip disease.

HIP AT RISK: PERCUTANEOUS OSTEOTOMY OF THE FEMORAL NECK

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Introduction

Hip at risk is characterized on radiographs by a break in the Shenton's line, an increased migration index of Reimers(MP) (the percentage of the horizontal diameter of the capital femoral epiphysis that lies lateral to the vertical tangent to the lateral osseous rim of the acetabulum), and later by an increase in the acetabular angle.

The natural history of these patients beginning with the untreated hip is to develop pelvic obliquity, scoliosis, pain, decubiti, hygiene problems, breathing problems and death. Operative treatment is necessary if the hip is unstable in order to prevent progressive deformity.

Hip instability is more frequent in children with spastic quadriplegia, pelvic obliquity, and windswept hips but it can occur, although less commonly, in diplegic or hemiplegic patients.

The aim of this research is to show the results of the percutaneous varus and derotational osteotomy of the femoral neck and to highlight the **advantages** of this experience in relation to the same procedure performed by open surgery.

Materials and Methods

This is a retrospective study of patients with severe cerebral palsy with hip at risk (MP > 40%) who were treated with percutaneous varus and derotational osteotomy of the femoral neck between 2005 to 2009 at the Vilela Children Hospital in Rosario, Argentina. Fifteen patients (23 hips) were available for a retrospective chart and x-ray review - eight bilateral and seven unilateral, all of them with hip at risk (5 girls, 10 boys) but with a normal acetabular angle.

The average age at surgery was 13 years (the oldest 16 years and the youngest 9 years) with an average follow-up of 3.5 years.

We evaluated pre and postoperative migration index of Reimers, and Range of Motion (ROM). We also evaluated time of hospitalization, time until osteotomy healing, and pain (patient satisfaction with pain treatment after surgery: with analgesic we used, opioids vs. Nonsteroidal Anti-inflammatory Drugs (NSAIDs)).

Technique

Through a medial incision we performed adductor longus and gracilis tenotomy and Psoas tenotomy at the lesser trochanter.

The bony surgery was performed by placing two Schanz screws in the femoral neck and then two more were placed distally, with the angulation between the proximal and the distal screws having the same angulation as the desired degree of derotation.

Once the external fixator was in the correct place we performed the osteotomy through a small incision of 10 mm, guided by fluoroscopy, at the level of the lesser trochanter with a Shannon No. 44 drill of 2 mm. of diameter powered by an Osada Surgical Handpiece System. Then, we corrected both the anteversion and the coxa valga, and finally we locked the system. We used an Osteoline external fixator that has a great versatility since it can rotate up to 100° in all directions.

Results

The average migration percentage preoperative was 55% and postoperative 15%, average hip abduction pre 15° and post 44°.

The average ROM abduction of the hips was pre: 25° and post: 47°; and hip flexion pre 30° and post 6°.

The shortest time of hospitalization was 48 hours and the longest was 96 hours.

The average osteotomy healing time was 66 days.

We used no opioids, only Nonsteroidal Anti-inflammatory Drugs (NSAIDs), for postoperative pain care.

After the bone was healed, we removed the external fixator with neuroleptic anesthesia and outpatient surgery.

The only complication we had was one recurrent subluxation, no fractures, no deep infections, no pseudoarthrosis, no scars, no deaths.

Discussion

The results of this preliminary report -MIGRATION INDEX, ROM and even the complications- are similar to other publications about hip reconstruction in C.P. We found other subtle advantages with this procedure, primarily the ability to use less intravenous analgesia and no use of opioids because there was less postoperative pain. This also led to less time of hospitalization; faster bone healing; ambulatory surgery for removing the fixator.

So, to sum up, we would like to say that we are excited with this procedure and further we will report long-time outcomes.

A DECISION TREE FOR MONITORING HIP DISORDERS IN SPASTIC CEREBRAL PALSY AND ITS CONSEQUENCES FOR INTERVENTION

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Introduction

On a poster we present a decision tree for the monitoring of hip disorders in cerebral palsy and its consequences for intervention.

Methodology

The algorithm is based on the GMFCS classification.

Intervention measures are based on our own research and a review of international literature on the indication and results of tenotomies and bony surgery.

This review will be published separately.

Results

Not applicable

Discussion

Not applicable