



Original Article

Hip dislocation in cerebral palsy: evolution of the contralateral side after reconstructive surgery[☆]



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ABSTRACT

Objective: To evaluate the progression of the contralateral hip after unilateral reconstruction of hip dislocation in patients classified as GMFCS IV–V; and to identify potential prognostic factors for their evolution.

Methods: This was a retrospective study on 17 patients with spastic cerebral palsy, who were classified on the GMFCS scale (Gross Motor Functional Classification System) as degrees IV and V, and who underwent unilateral reconstruction surgery to treat hip dislocation (adductor release, femoral varus osteotomy and acetabuloplasty). The minimum postoperative follow-up was 30 months. The clinical parameters evaluated were sex, age at time of surgery, length of follow-up after surgery and range of abduction. The treatment parameters were use/nonuse of femoral shortening, application of botulinum toxin and any previous muscle releases. The radiographic parameters were Reimer's extrusion index (REI), acetabular angle (AA) and the continuity of Shenton's line.

Results: Among the 17 patients evaluated, eight presented dislocation (group I) and nine did not (group II). Group I comprised three males and five females; group II comprised one male and eight females. The mean age at the time of surgery among the group I patients was 62 months and the mean follow-up was 62 months. In group II, these were 98 and 83 months, respectively. There was a trend in which patients of greater age did not evolve with contralateral dislocation. Among the nine patients with the combination of REI < 30% and AA < 25°, only one presented dislocation during the follow-up. Contralateral subluxation occurred within the first two years after the surgery.

Conclusion: Hips presenting REI < 30° and AA < 25° do not tend to evolve to subluxation and can be kept under observation. Preoperative clinical and radiographic measurements alone are not useful for indicating the natural evolution of non-operated hips. The critical period for subluxation is the first two years after surgery.

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Luxação do quadril na paralisia cerebral: a evolução do lado contralateral após cirurgia reconstrutiva

R E S U M O

Palavras-chave:

Luxação do quadril/etiologia
Luxação do quadril/patologia
Luxação do quadril/cirurgia
Paralisia cerebral
Resultado do tratamento

Objetivo: Avaliar a evolução do quadril contralateral após a reconstrução unilateral de luxação de quadril em pacientes classificados como GMFCS IV-V e identificar possíveis fatores prognósticos da evolução.

Métodos: Estudo retrospectivo de 17 pacientes portadores de paralisia cerebral espástica, classificados pela escala GMFCS (Gross Motor Functional Classification System) em graus IV e V, submetidos a cirurgia de reconstrução unilateral de luxação de quadril (liberação de adutores, osteotomia varizante femoral e acetabuloplastia). O seguimento pós-operatório mínimo foi de 30 meses. Foram avaliados parâmetros clínicos (sexo, idade na ocasião do procedimento cirúrgico, tempo de seguimento após a cirurgia e amplitude de abdução), de tratamento (a feitura ou não de encurtamento femoral, aplicação de toxina botulínica e se houve procedimentos musculares prévios) e radiográficos (índice de extrusão de Reimers [IR], ângulo acetabular [AC] e continuidade do arco de Shenton [AS]).

Resultados: Dos 17 pacientes avaliados, oito deslocaram (grupo I) e nove não (grupo II). O grupo I contava com três pacientes do sexo masculino e cinco do feminino; grupo II apresentou um paciente do sexo masculino e oito do feminino. A média de idade no momento da cirurgia dos pacientes do grupo I foi de 62 meses e o tempo de seguimento médio foi de 62 meses. No grupo II foram de 98 e 83 meses, respectivamente. Houve tendência dos pacientes operados com maior idade não evoluírem com luxação contralateral. Dos nove pacientes que apresentavam a combinação de IR < 30% e AC < 25°, apenas um apresentou luxação no seguimento. A subluxação contralateral ocorre nos dois primeiros anos de pós-operatório.

Conclusão: Quadris que apresentam um IR < 30° e AC < 25° não tendem a evoluir para subluxação e podem ser mantidos em observação. Medidas clínicas e radiográficas isoladas no pré-operatório não foram úteis para indicar a evolução natural do quadril não operado. O período crítico para subluxação são os dois primeiros anos do pós-operatório.

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Introduction

Hip dislocation or subluxation in non-ambulatory patients with spastic cerebral palsy can lead to pain, difficulties to perform perineal hygiene, pressure ulcers, lower limb fractures, and loss of balance to sit, especially in unilateral or asymmetric cases.^{1,2} Prevention and early treatment are recommended.^{2,3} In cases of subluxation/dislocation, reconstructive surgery is indicated, usually consisting of femoral varus osteotomy, with or without acetabuloplasty and soft tissue release.⁴⁻⁶

In unilateral dislocations, there is controversy regarding treatment for the contralateral hip. Some studies indicate bilateral reconstruction due to the risk of progression to subluxation and the asymmetry that may result from unilateral reconstruction.⁷ Conversely, performing surgery in a normal hip increases the operative time and bleeding, and may lead to complications.⁸

This study aimed to assess the evolution of the contralateral hip after unilateral reconstructive procedure with varus osteotomy of the proximal femur and Dega transiliac osteotomy (with or without the release of soft tissue) and the possible factors associated with the development (or not) of subluxation.

Material and methods

This was a retrospective study based on the analysis of charts of non-ambulatory patients with spastic cerebral palsy and functionally classified by the Gross Motor Functional Classification System (GMFCS) as levels IV and V. Patients underwent unilateral hip reconstruction surgery due to dislocation or subluxation in this hospital, from March 1999 to April 2009. This study was approved by the Research Ethics Committee of this department.

For inclusion in the study, patients with cerebral palsy needed to have undergone unilateral hip reconstruction surgery (varus osteotomy of the femur, Dega transiliac osteotomy with or without soft tissue release), and present a minimum follow-up period of 30 months and clinical and radiographic documentation to enable analysis in three time-points: at the time of surgery (immediate pre- and post-operative periods), approximately two years after surgery, and at last follow-up visit.

Clinical parameters evaluated were: sex, previous surgery or botulinum toxin application, age at surgery, follow-up time after surgery, and abduction at the three time-points. Regarding the procedure, it was assessed whether femoral shortening associated with varus osteotomy was performed.

Radiographic evaluation was done on the anteroposterior pelvic incidence and consisted of femoral head migration percentage (Reimer's extrusion index [RI]), acetabular angle (AC), and Shenton's line (SL) continuity.

To evaluate the associated factors, patients were divided into two groups: those who showed progression of the RI in the contralateral hip (group I), and those who did not present such progression (group II). Progression was considered when RI was 40% in the last follow-up.

Statistical analysis was performed with tests selected based on the type of variable studied.

Results

Seventeen patients met the inclusion criteria. Eight evolved with contralateral hip subluxation (group I), while nine did not (group II).

Group I had three males and five females; group II had one male and eight females (non-significant difference).

The mean age at time of surgery in group I was 62 months (28–110) and mean follow-up time was 62 months (31–125). Group II had mean age at time of surgery of 98 months (64–159) and mean follow-up time of 83 months (32–150). These differences were not significant.

Regarding interventions prior to the reconstructive procedure, three patients from group I and two from group II had already undergone botulinum toxin application in adductor and/or flexor muscles. Previous soft tissue release surgery was observed in two (25%) patients from group I and in four (44%) from group II. Femoral shortening during reconstructive procedure was performed in five (63%) patients from group I and in seven (78%) from group II. These differences were not significant.

In the immediate postoperative period, 50% (4/8) of the X-rays from group I showed SL discontinuity; in turn, this finding was observed in 33% of cases in group II (non-significant difference). In the second evaluation (two years after surgery), SL discontinuity was observed in 100% (8/8) of patients from group I and in 22% (2/9) of those from group II. This difference was statistically significant.

Mean abduction in group I was 28° in the immediate preoperative period, 36° in the assessment at two years postoperative, and 24° on the last visit. In group II, these values were 27°, 36°, and 34°, respectively. There was no statistical difference between groups.

Mean AC in group I was 23°, 26°, and 29° at the three above mentioned periods. Group II showed 18°, 15°, and 17°, respectively. These differences were not significant. RI in the immediate postoperative period, two years after surgery, and at the last visit was 34%, 68%, and 84%, respectively, in group I; it was 20%, 17%, and 13% in group II. The difference in the last two evaluations was significant. Combining the data from RI and AC, we observed that, out of nine hips that presented RI < 30 and AC < 25 in the immediate postoperative period, only one evolved to contralateral subluxation ($p < 0.05$).

Discussion

Hip subluxation or dislocation in non-ambulatory patients with spastic cerebral may cause pain, difficulty in positioning

and hygiene, and contribute to the development of scoliosis and contractures in the lower limbs.⁹ Therefore, when diagnosed in skeletally immature patients, surgical reconstruction is indicated. In this institution, the adductor muscles are released (and usually, the iliopsoas muscles), and femoral varus osteotomy and Dega acetabuloplasty are performed.⁴⁻⁶ When unilateral, some authors recommend soft tissue procedure and varus osteotomy in the contralateral hip. This indication would be justified by the increased risk of subluxation and the possible asymmetry as a result of the unilateral procedure, which would cause difficulties in positioning and would change the spinal alignment.⁷

The risk of impairment of the contralateral side ranges from 4% to 75%. Noonan et al.⁷ studied 35 patients, 33 non-ambulatory, who underwent unilateral surgery. Of these, 26 (74.3%) developed subluxation. They recommended that the procedure should be performed bilaterally, especially if some degree of acetabular dysplasia is observed. Despite believing that the bilateral bone procedure is justified, Carr and Gage¹⁰ found only 20% of progression to subluxation. Park et al.⁸ developed a decision analysis model with data from the literature and concluded that the bilateral procedure has superior outcomes.

In the present study, approximately half of the patients developed contralateral subluxation. The authors understand that this finding does not make a prophylactic procedure mandatory for all patients, as it is a major procedure with some risks. This study also aimed to identify factors associated with the occurrence (or not) of contralateral subluxation. As hip dislocation is known to be associated with patients with more severe impairment, this study only included non-ambulatory patients (GMFCS IV or V).^{11,12}

Surgery in younger patients may be associated with increased risk for development of contralateral subluxation.^{9,12} Although no significant associations were observed, there was a tendency for hip contralateral subluxation in operated patients under 8 years of age (62; ±25 months).

Individually, none of the measures – either clinical or radiological, in the immediate pre- and post-operative periods – was able to indicate the evolution of the contralateral hip in the present study. The most significant finding was that hips that showed RI < 30 associated with AC < 25° had lower probability of future dislocation. This finding somewhat corroborates those by Noonan et al., who observed that hips with dysplastic changes were at higher risk for subluxation.⁷

An important factor is that the hips that developed subluxation presented it within the first two years of the procedure. Therefore, the contralateral hip should be closely monitored in this postoperative period in case of unilateral surgery.

The present study had some limitations. In addition to the retrospective design, the mean follow-up period was 73 months, and not all patients had reached skeletal maturity at the last assessment. The multitude of surgeons who performed these procedures over the ten years of the study may have affected the results. The small sample size also decreases the statistical strength of the various factors studied.

Conclusion

The study suggests that prophylactic surgery in the contralateral hip is not justified for all patients, especially in those older than 8 years of age with RI < 30% and AC < 25°. Contralateral subluxation occurs in the first two postoperative years; parents should be advised about this risk, and patients should be closely monitored during this time.

Conflicts of interest

The authors declare no conflicts of interest.

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