Original Article

REDISLOCATION FOLLOWING OPERATIONS TO REDUCE HIP OR TREATING DYSPLASIA IN DEVELOPMENTAL DYSPLASIA OF THE HIP

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ABSTRACT

Objectives: To investigate the incidence and the causes of redislocation after different operative corrections of the developmental dysplasia of the hip and its relations to age of the patients.

Methodology: It was a prospective observational study during five year period between July 2000 to August 2005. Forty seven patients were admitted for corrective operation of the developmental dysplasia of the hip and a total of 59 hip surgeries have been done in our centre at Razi hospital, Ahwaz Jondishapour University of Medical Sciences, Iran.The rate and causes of redislocation in relation to the type of operation and age of these patients was recorded and analysis of the data was done by T-test and the P-values of less than 0.005 considered as a significant difference.

***Results*:** Nine out of 59 operations redislocated after beginning of weight bearing. It included mostly in those who had adductor tenotomy, femoral shortening, derotation and Salter innominate osteotomy ($P<0.05$).

***Conclusion*:** We conclude that if Salter innominate osteotomy is necessary after open reduction and femoral shortening in patients with developmental dysplasia of the hip, it is better not to perform femoral derotation.

KEY WORDS: Redislocation, dysplasia, Salter innominate osteotomy, femoral shortening.

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INTRODUCTION

Developmental dysplasia of hip (DDH) can be corrected by several surgical approaches including simple adductor tenotomy and close reduction, and innominate bone osteotomies. Selecting the type of surgery depends on patient's age. The older patients require more aggressive and extensive surgeries. Redislocation is a major complication after these surgeries.

As the patients grow older more difficult operations become necessary and especially beyond 18 months of age, innominate osteotomy is often essential.[1] Innominate osteotomy can be performed with open reduction at one stage or else in another session after

Table-I: Sex and number of the patients, number of operations and side of involvement

Sex of the patients	*No. of patients*	*No. of operations*	*Bilateral involvement*	*Right side involvement*	*Left side involvement*
Female	42	53	11	12	19
Male	5	6	1	3	1

concentric hip reduction.[2] In older children, concentric hip reduction often requires femoral shortening and derotation. Redislocation is a serious post operative complication.

We aimed at investigating and comparing the incidence of redislocation after these approaches with relation to the age of the patients.

METHODOLOGY

This prospective observational study was performed in Razi hospital in Ahwaz, Iran from July 2000 to August 2007.All admitted DDH patients who underwent operations for hip reduction or treating dysplasia were studied and the correlation between the type of operations and rate of redislocation was recorded and analyzed. There were 42 girls and 5 boys with the mean age of 33 months (7 to 96 months).

The indication for surgery was failure of the conservative treatment or late diagnosis. The operations were performed according to the age of the patients and were from adductor tenotomy and close reduction in patients with mean age of 6.8 months to adductor tenotomy, open reduction, femoral shortening, derotation, and Salter innominate osteotomy in patients with mean age of 34.7 months, and also 2 adductor tenotomy, open reduction, and Chiari osteotomy in patients with mean age of 92 months. The number of redislocations and the age of the patients at the time of redislocation and the relation between these data were analyzed according to T-test and the P- values less than 0.05 considered significant difference.

RESULTS

In all 59 operations were performed on 47 patients (42 girls and 5 boys). Girls had 11 bilateral, 12 right side and 19 left side hip dislocations and boys had one bilateral, three right side and one left side dislocation. (Table-I)

The type of operations were 7 adductor tenotomy + close reductions, 12 adductor tenotomy +open reductions, 20 adductor tenotomy + open reduction + Salter innominate osteotomies and also 18 adductor tenotomy + open reduction + femoral shortening + derotation + Salter innominate osteotomies and 2 adductor tenotomy + open reduction + Chiari.(Table-II)

Nine out of 53 operated hips redislocated after primary operation and 5 of them were in fourth group (adductor tenotomy+open reduction+femoral shortening + derotation + Salter innominate osteotomy), two hips were in group two (adductor tenotomy+open reduction), 1 in group 3 (adductor tenotomy+open reduction+Salter innominate osteotomy) and one in group one (adductor tenotomy+close reduction) (Table-III)

In patients with redislocation in first group, redislocation was diagnosed just after operation and was treated with removal of the cast. We repeated close reduction and hip spica casting.

Table-II: Type and number of operations, age, and number of the patients

Group No.	*Type of operations*	*Mean age (Months)*	*No. of the patients*
1	AT + CR	6.8	7
2	AT + OR	19.3	12
3	AT + OR + SIO	22.8	20
4	AT + FS+ OR + DR + SIO	34.7	18
5	AT + OR + Chiari	102	2

AT=Adductor Tenotomy, CR=Close Reduction, OR=Open Reduction,
SIO=Salter Innominate Osteotomy, FS=Femoral Shortening , DR=Derotation

Table-III: Groups of redislocated hips and the number of redislocaions

Group	*No. of redislocations*
1= (AT+CR)	1
2= (AT+OR)	2
3= (AT+OR+SIO)	1
4= (AT+FS+OR+DR+SIO)	5

AT=Adductor Tenotomy, CR=Close Reduction, OR=Open Reduction, SIO=Salter Innominate Osteotomy, FS=Femoral Shortening, DR=Derotation

In two patients who were redislocated in the second group, one of them had been treated by open reduction and capsulorrhaphy. For the second patient, according to the age of the patient (17 months), an open reduction and Salter Innominate Osteotomy were performed at the age of 19 months.

From two patients who were redislocated in the third group,one of them had been treated by repeat closed reduction and hip spica casting under general anesthesia. While the other patient was subsequently treated by open reduction and capsulorrhaphy. At the time of surgery stability of reduction was ensured by placing a pin from greater trochanter through the femoral head and acetabulum. (The pin was removed after 3 weeks).

Repeated open reduction and capsulorrhaphy was performed for all of the patients who redislocated in group four but, the hip again became redislocated with beginning of weight bearing (Fig.I) in three patients and in other two, concentric reduction could be achieved after derotation of the femoral head.

DISCUSSION

Innominate osteotomy is not required in patients younger than 18 months of age. They are usually treated by open or closed reduction but, pelvic osteotomies are an integral part of treatment in developmental dysplasia of the hip after 18 months.[3]

In our patients, 19 were in groups 1 and 2 who needed adductor tenotomy and close or open reduction. In these patients, three joints redislocated and were treated successfully by close or open reduction.

Table-IV: Comparison between age of the patients with redislocation and patients without redislocation

Mean age of the patients with redislocation	45.6 months
Mean age of the patients without redislocation	27.8 months

After the age of 18 months, innominate or other types of osteotomies are often necessary during open reduction.[4] In this study, out technique was to achieve concentric hip reduction and do Salter innominate osteotomy in one stage. In this technique all of the pelvifemoral muscles are cut or tenotomized and femoral shortening is performed if necessary to achieve concentric hip reduction before Salter innominate osteotomy. The role of Salter osteotomy is redirection of the acetabulum and the reduced hip becomes more stable with capsulorrhaphy and Salter osteotomy.[5]

In the present study, Salter innominate osteotomy was performed in 38 (81%) of the patients and femoral shortening was done prior to this osteotomy in 20 (53%) while femoral shortening and derotation was done to achieve concentric hip reduction before Salter osteotomy in 18 patients (47%). The amount of derotation was between 30 to 60 degrees. In group 3, one (5%) hip and in group 4, five hips (27.7%) became redislocated.

Fig-1: patient with redislocation after femoral derotation and SIO

We were searching for the causes of redislocation in our operated patients and were trying to find common factors among them. The first factor was the age of the patients. As shown in Table-IV, the mean age of the patients with redislocation was higher than the patients without redislocation (45.6 vs 27.8 months) (P<0.05). Comparing our results with relevant studies shows that our results are compatible with the results of Macnicol and Bertol[6] who in a study of 188 salter osteotomies in 139 hips with DDH observed the best results in the children under the age of 30 months and Barette et al[7] who in 68 Salter innominate osteotomies performed in 54 patients found the best results in children under 4 years of age although, Tukenmez and Tezeren[8] in a study of 53 girls and 8 boys with DDH who underwent open reduction and Salter innominate osteotomy divided the patients into two groups: younger than 3 years (46 hips) and 3 years and older (33 hips) and concluded that the clinical and the radiological results and complication rates were not significantly different in two groups.

The other important factor was the technique of the operation which was similar in all of our patients because all of them were operated by two surgeons with the same technique with relatively high rate of success (9 redislocation in 59 operations) although in study of Chidambaram et al[9], inadequate exposure and failure to release the obstructing soft tissue around the hip and the bony factors, in study of Kershaw et al[10] and Wenger et al[11], inadequate inferior capsular release, and inadequate capsulorrhaphy, and in study of Kamath and Bennet[12], technical failure, and also in study of Schonecker et al.[13] use of skeletal traction prior to surgery were the causes of redislocation in the patients who were operated for DDH.

A common factor in the patients with redislocation in the fourth group was performing Salter innominate osteotomy along with femoral shortening and derotation. This group has the most amount of patients with redislocation (P<0.05), although uncorrected femoral anteversion is the cause of redislocation according to Wang et al[14], good results have been reported by some authors,[15-16] and combining derotational femoral shortening osteotomy with open reduction to reduce the incidence of redislocation in DDH was first used for older children[17], but, the combination of the Salter innominate osteotomy with femoral derotation makes the posterior wall of the acetabulum uncovered and the risk of the posterior dislocation increases by the combination of these two operations.[18]

CONCLUSION

The result of our study emphasizes the importance of earlier treatment in patients with developmental dysplasia of the hip owing to the better results in younger children. Although the process of dysplasia does not stop with open reduction, but, after reduction of a dislocated hip, the acetabulum begins to remodel in response to the pressure exerted by the femoral head. As most of the dislocations were in the patients who had undergone simultaneous Salter innominate osteotomy and femoral derotation, authors suggest that in DDH patients who need Salter innominate osteotomy it is better not to perform femoral derotation.

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