EFFECT OF WALKING OF THE CHILD INDEPENDENTLY ON THE DEVELOPMENTAL DYSPLASIA OF THE HIP

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ABSTRACT

Background

In developmental dysplasia of the hip a number of pathological changes develop, some of them perhaps reflecting a primary dysplasia of the acetabulum and / or the proximal femur, but most of them are results of adaptation to persistent instability and abnormal joint loading. After weight bearing commences, these changes are intensified. Most children begin to walk independently near their 1st year birthday; some do not walk until 18 month of age. At this age group the classical treatment of a dislocated hip is closed reduction with spica cast then abduction splint. Re-displacement is one of the complications of the treatment of developmental dysplasia of the hip.

Objective

The aim is to assess the effect of independent walking of a child on the future treatment of a missed dislocated hip whether it increases the risk of failure of treatment by re-displacement of the hip or not.

Patients and Methods

This study included those children who had missed dislocation or subluxation of the hip and they were at the expected period of beginning of walking independently (age 12-18 months). They were 87 patients with 131 dislocated or subluxated hips. Patients were divided into five groups: Group 1: still not walking independently, Group 2: walking independently for less than 1 month, Group 3: walking for 1-2 months, Group 4: walking for 2-3 months and Group 5: walking for more than 3 months.

Results

Most of patients in Group 1 had bilateral developmental dysplasia of the hip (DDH) (63.3%) and also in Group 5 (80%), while in Group 2, 3 and 4 the DDH were more common in one side (75%, 71.4% and 72.7% respectively). From the total number of patients who had been included in this study, 21 hips out of 131 showed signs of re-displacement with an incidence of failure of 16 %. There were 3 hips in Group 1, 1 hip in Group 2, 4 hips in Group 3, 6 hips in Group 4 and 7 hips in Group 5.

Conclusion

Walking of a child independently is associated with an increased risk of failure of closed reduction in patients having developmental dysplasia of the hip between the age of 12-18 months specially after 2 months from walking.

Keywords: *Walking, Developmental dysplasia of the hip, Re-displacement*

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INTRODUCTION

Developmental dysplasia of the hip (DDH) is a term used to describe abnormalities of the paediatric hip and comprises a spectrum of disorders including acetabular dysplasia without displacement " shallow acetabulum ", subluxation (partial dislocation) and complete dislocation of the femoral head from the true acetabulum [1, 2, 3].

In case of DDH and at birth the hip is probably normal in shape but the capsule is often stretched and redundant. During infancy a number of changes develop, some of them perhaps reflecting a primary dysplasia of the acetabulum and / or the proximal femur, but most of them from adaptation to persistent instability and abnormal joint loading.[1]

After weight-bearing commences, these changes are intensified. The pressure of the femoral head against the iliac bone induces a false socket to form above the shallow acetabulum and the surrounding muscles become adaptively shortened [1, 2].

The ideal is to diagnose every case at birth as the treatment is less complicated and more rewarding, but some cases are missed and the diagnosis delayed till the age of walking [1, 4].

Most children begin to walk independently near their 1st year birthday; some do not walk until 18 month of age [5]. During this period (beginning of walking independently) the treatment of missed DDH is to do closed reduction of the hip by manipulation under general anesthesia then holding the reduction by spica cast.

Failure of reduction or redislocation is one of the common complications of DDH [1]. Severin's classification is useful for follow up results after reduction of a dislocated hip for detection of re-displacement (Table 1) [6, 7].

Aim of this study is to assess the effect of walking of a child independently on the future treatment of a missed DDH and whether it increases the risk of failure of the treatment and re-displacement of the hip or not.

Table 1. Severin's classification for DDH [6, 7]

Grade
I. Normal
II. Mild – moderate deformity of femoral head or neck or acetabulum
III. Dysplastic but without subluxation
VI. Subluxation
V. Femoral head articulate with a secondary acetabulum in the upper part of primary acetabulum
VI. Redislocation

PATIENTS AND METHODS

This study included those children who had missed DDH and they were at the expected period for the beginning of walking independently.

The inclusion criteria were children with an age ranging from 12-18 months old and had dislocation or subluxation that need reduction of one or both hips. The exclusion criteria were children with acetabular dysplasia without displacement of the femoral head (that can be treated by splint) or those children who had neuromuscular disorders as cerebral palsy or meningo-myelocele with paraplegia (as they cannot walk independently or delay for walking very lately).

Patients were seen, treated and followed up at the Orthopaedic department of Emergency Teaching Hospital, Early Detection of Childhood Disability Center (EDCD center) and private clinics at Duhok city between the periods extended from November 2011 to July 2014.They were 87 patients with 131 dislocated or subluxated hips.

The patient had been divided into five groups: Group 1 were those children who had missed DDH and still not walking independently, Group 2 were those who had DDH and walking independently for less than 1 month, Group 3 were those who had DDH and walking

independently for about 1-2 months, Group 4 were those who had DDH and walking independently for about 2-3 months, Group 5 were those who had DDH and walking independently for more than 3 months [8].

Each patient was been treated by percutaneous hip adductor tenotomy with closed reduction of the dislocated or subluxated hip by manipulation under general anesthesia then holding the reduction by spica cast from the nipple level to just above the ankles with the hips in flexion position about 95 degrees and abduction about 45 degrees. The reduction was confirmed clinically and radiologically and at frequent intervals during follow up. This spica cast maintained for about 9-12 weeks then removed and an abduction splint applied for about 3-6 months with gradual weaning off the splint. Then the splint is removed and the child was left free for movement and walking with follow up for about 6-12 months.

Re-displacement of the hip was considered to be positive when closed reduction of the hip by manipulation under general anesthesia failed, redislocation of the hip within the spica cast during follow up, redislocation after removal of spica with wear of abduction splint, or after removal of splint and walking. Re-displacement of the hip was considered to be positive when x-ray showed disturbance of Shenton's line, subluxation or dislocation of femoral head (i.e..Severin type 4, 5 or 6).

Those patients who showed signs of redisplacement were treated later on surgically by open reduction of the hip with bony osteotomies.

The data were documented in a special table and analyzed statistically by Windows Statistical Package for Social Sciences (SPSS version 17) software program. Results were presented as frequencies & percentages. P value was identified by using paired Student T-test. P value of equal or less than 0.05 was regarded as statistically significant.

RESULTS

The number of patients which have been included in this study were 87 cases with 131 dislocated or subluxated hips. Fifty nine females and 28 males. Forty three patients had unilateral DDH and 44 patients were bilateral.

Most of the patients in Group 1 (who were still not walking) had bilateral DDH (63.3%) and also in Group 5 (80%), while in Group 2, 3 and 4 the DDH were more common in one side (75%, 71.4% and 72.7% respectively), table 2 and 3.

From the total number of patients who had been included in this study, 21 hips out of 131 showed signs of re-displacement with an incidence of failure of 16 %. There were 3 hips in Group 1, 1 hip in Group 2, 4 hips in Group 3, 6 hips in Group 4 and 7 hips in Group 5 as shown in table 4, figure 1, 2).

Table 2. Summery of cases (number of patients).

Group	Number of patients with unilateral DDH	Number of patients with bilateral DDH	Total number of patients
Group 1	18 (36.7%)	31 (63.3%)	49 (100%)
Group 2	6 (75%)	2 (25%)	8 (100%)
Group 3	10 (71.4%)	4 (28.6%)	14 (100%)
Group 4	8 (72.7%)	3 (27.8%)	11 (100%)
Group 5	1 (20%)	4 (80%)	5 (100%)
Total	**43**	**44**	**87**

Table 3. Percentage of each group.

Group	Number of patients	Percentage of each group
Group 1	49	56.3%
Group 2	8	9.2%
Group 3	14	16.1%
Group 4	11	12.6%
Group 5	5	5.8%
Total	**87**	**100%**

Table 4. Summery of hips with incidence of relapse.

Group	Number of hips	Number and incidence of redisplacement	t-test	P-value
Group 1	80	3 (3.75%)	21.638	0.000
Group 2	10	1 (10%)	4.000	0.003
Group 3	18	4 (22.2%)	2.755	0.014
Group 4	14	6 (42.9%)	0.520	0.612
Group 5	9	7 (77.8%)	-1.890	0.097
Total	**131**	**21 (16%)**		

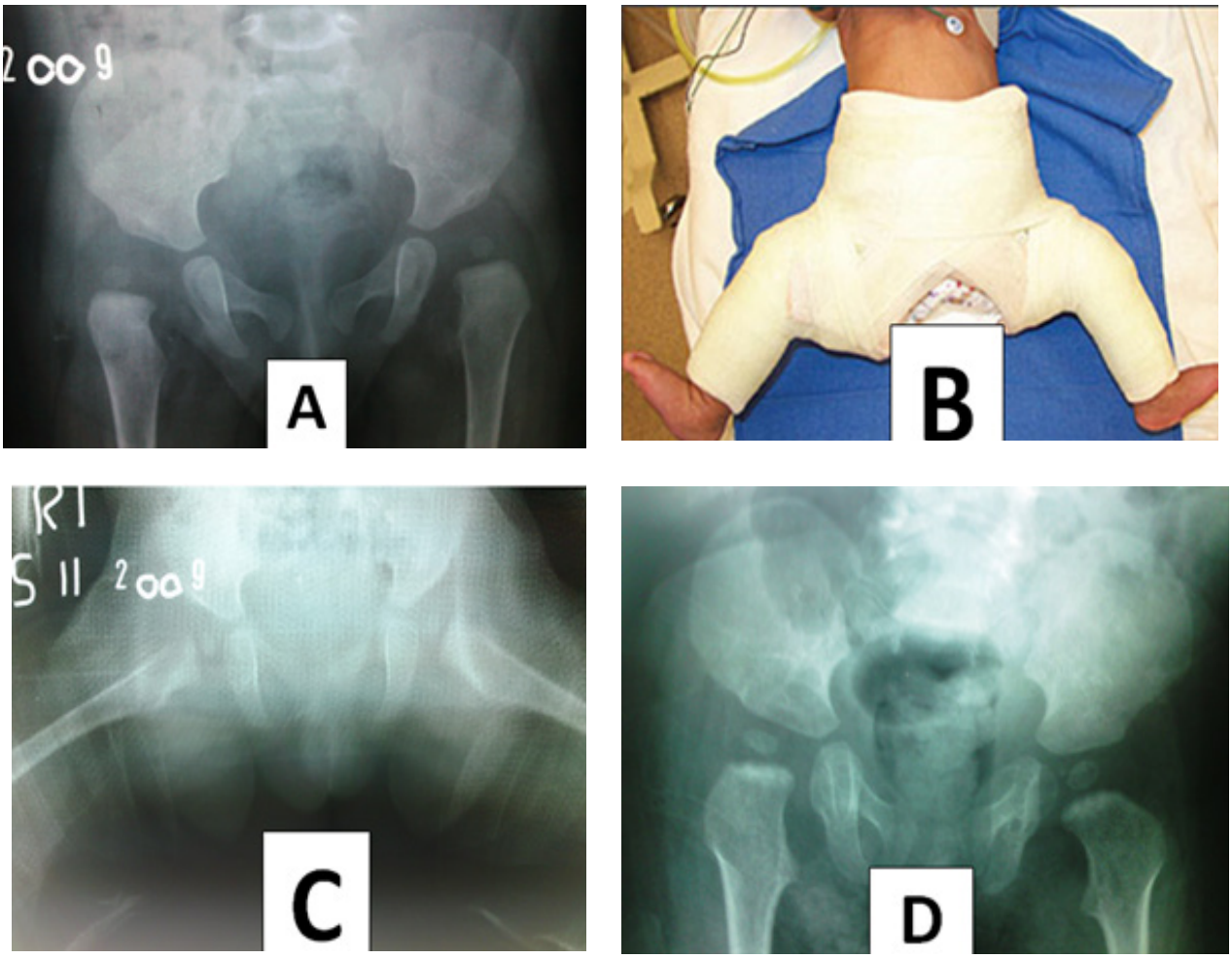

Figure 1. Patient with bilateral DDH before treatment "A", treatment by spica cast "B", "C", re-displacement of right hip after treatment "D".

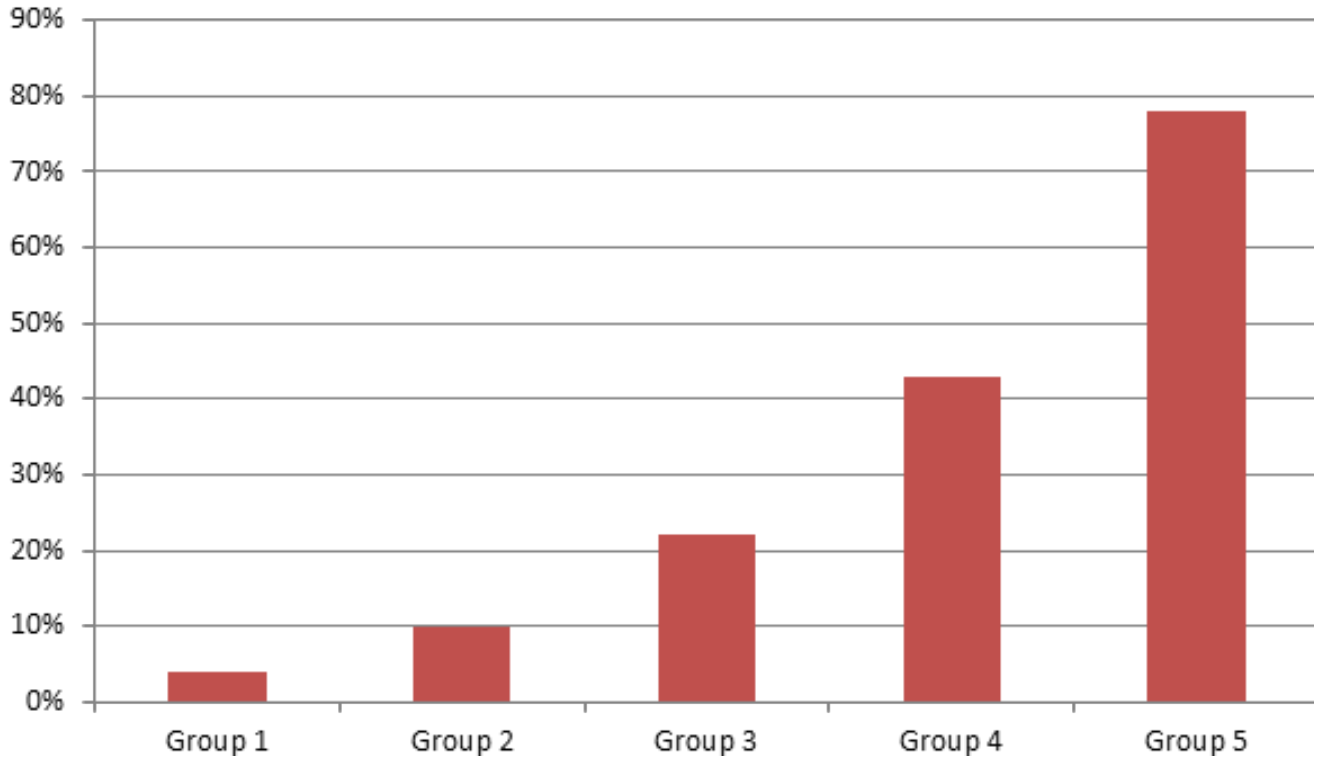

Figure 2. Incidence of redislocation.

DISCUSSION

DDH is a common problem in Duhok governorate which is located in the north of Iraq. Most of its people are Kurds from the Aryan descent. In spite of advances of medical services in this governorate in the last few years, there are still a lot of cases of missed DDH specially from rural areas. Some of these children brought to the Orthopaedic department, the EDCD center or private clinics either because of delayed walking or start walking abnormally with a limp. So a good number of patients with DDH at this age group is noticed, specially between 12-18 months of age. Some of these children still not walking independently and the others do.

Most of patients which had have included in this study were those who were still not walking independently after their 1st year birthday (i.e. Group 1). They were 49 patients (56.3%). Most of them had bilateral DDH (31 patient with 62 hips). The cause of presentation of these patients was the worry of the parents about the delay of walking of their children. Kerry et al. [9] also describe that most common clinical features of their patients' presentation were delayed walking and limping. But Kamath et al. [10] describe the median age of walking for children with DDH was 1 month later than in the control group which was clinically insignificant, as all walked within the normal time limits and they concluded that children with DDH do not present as late walkers. While those patients who had been presented because of abnormal walking (i,e. Group 2 to 5) were 38 cases and most of them (25 patients) had unilateral DDH as the limping of the child was noticed easily by the family except in Group 5 in whom the bilateral cases (80%) were more than the unilateral cases because the limping of the child was not noticed easily by the family.

In the results of this study, there were 16% (21 out of 131 hips) incidence of failure of treatment for DDH by closed reduction. On reviewing literatures, Murray et al. [11] reported 36% failure rate in which they defined the failure as when the hip is unable to be concentrically reduced with sufficient stability at the time of closed reduction or when the acetabulum failed to develop sufficiently after closed reduction, and a secondary surgery was required after cast removal. Others, like DeRosa et al. [12] reported 91% success rate (i.e. 9% failure rate), while Kahle et al. [13] reported 43% failure rate, Quinn et al. [14] 42%, Zionts et al. [15] 25% and Kothari et al. [16] 27.5%. In comparison with

these literatures the results of this study is considered comparable.

It can be noticed from the results of table 4 that there is a gradual increase in the incidence of re-displacement from Group 1 (still non walking group) to Group 2 and till Group 5. These results indicate that walking increases the risk of failure of closed reduction for cases of missed DDH. This can be explained by the exaggeration of the pathological changes around the dislocated hip specially the muscles that become more powerful after independent walking. Also the capsule which may develop an hour glass deformity by the effect of iliopsoas tendon. Also the limbus becomes inverted by the pressure effect of the head of femur. However, these results are statistically significant only in Group 4 and 5; that's to say that after 2 month from walking the risk of failure of conservative treatment of DDH in this age group by closed method is significant which should be taken in consideration and should be explained to the parents and better to switch to surgical treatment [16].

Lloyd-Roberts et al. [17] mentioned that walking increases the risk of redislocation of hip but without any numbers and any details. Noritake et al. [18] thought that in a hip which is dislocated at an age when walking has already started, the development of the acetabulum later on may be unsatisfactory. Some literatures found that the age at time of closed reduction (before 12th month and after 18th month) to be statistically significant [16], and others discussed risk factors of failure but they depended mainly on the radiographic terms as acetabular index, pelvic width, triradiate cartilage width, height of dislocation, size of ossific nucleus, abduction angle in the spica cast, Tönnis grade, and Severin grade [19].

In conclusion, walking of a child independently is associated with an increased risk of failure of closed reduction for patients having DDH between ages 12-18 months especially after 2 month from walking of the child independently.

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