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ORIGINAL RESEARCH

Comparison of Clinical and Radiological Outcomes of open Reduction Using the Anterior and Medial Approaches for the Management of Developmental Dysplasia of the Hip

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ABSTRACT

Background: To compare clinical and radiological outcomes of open reduction using the anterior and medial approaches for the management of developmental dysplasia of the Hip.

Material and Methods: Forty children aged<24 months of both genders were divided into 2 groups. Each group comprised of 20 patients. Group I was treated with anterior approach open reduction and group II with medial approach open reduction. Parameters such as side, range of motion, muscle strength, acetabular index (AI) and center–edge angle (CEA) was done.

Results: There were 12 male and 8 female patients in group I and 11 males and 9 females in group II. The mean age at surgery 16.4 months in group I and 13.2 months in group II. Unilateral cases were 7 in group I and 6 in group II. Bilateral in 13 in group I and 14 in group II. Flexion (degree) was 121.3 and 122.5, internal rotation (degree) was 38.4 and 43.2, external rotation (degree) was 33.2 and 33.0, abduction (degree) was 30.2 and 29.4, adduction (degree) was 25.4 and 23.1, muscle strength flexor was 121.4 N and 103.6 N, abductor strength was 99.4 Nand 86.2 N in group I and II respectively. Acetabular index (AI) in group I was 40.6 degree and in group II was 41.3 degree. Center–edge angle (CEA) was 33.4 degree in group I and 30.6 degree in group II.

Conclusion: Both anterior approach open reduction and medial approach open reduction for the management of developmental dysplasia of the hip found to be equally effective.

Keywords: Developmental Dysplasia of the Hip, Center–Edge Angle, Acetabular Index.

INTRODUCTION

Any abnormality in the shape, size and orientation of the femoral head, acetabulum or both is referred to as hip dysplasia. It has been seen that the majority of abnormalities arise as a result of maldevelopment of the acetabulum. The femoral head is involved secondarily as a

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result of non-physiological biomechanics from the anteverted acetabulum or as a result of treatment.[1]

The exact incidence of DDH is difficult to determine because of a discrepancy in definition of the condition, type of examination used and different levels of skills of clinicians.[2] The incidence ranges from as low as 1 per 1,000 to as high as 34 per 1,000. Higher incidences are reported when ultrasonography is also used in addition to clinical examination. Risk factors include first born status, female sex, positive family history, breech presentation and oligohydramnios.[3,4]

The etiology of DDH is multi factorial.[5] There are a number of predisposing factors that lead to the development of DDH, including ligament laxity, breech presentation, postnatal positioning and primary acetabular dysplasia.[6] The main goal of primary treatment for developmental dysplasia of the hip (DDH) is to achieve a concentric stable reduction to facilitate proper femoral head and acetabulum development and to prevent avascular necrosis of the femoral head (AVN) and need for further corrective surgery (FCS), including acetabular and/or femoral osteotomy as well as re-surgery for subluxation or dislocation.[7] We performed this study to compare clinical and radiological outcomes of open reduction using the anterior and medial approaches for the management of developmental dysplasia of the Hip.

MATERIAL & METHODS

After considering the utility of the study and obtaining approval from ethical review committee, we selected forty children aged<24 months of both genders. Parents' consent was obtained before starting the study.

Data such as name, age, gender etc. was recorded. Patients were divided into 2 groups. Each group comprised of 20 patients. Group I was treated with anterior approach open reduction and group II with medial approach open reduction. Parameters such as side, range of motion, muscle strength, acetabular index (AI) and center–edge angle (CEA) was done. The results were compiled and subjected for statistical analysis using Mann Whitney U test. P value less than 0.05 was set significant.

RESULTS

Table I Patients distribution

Groups	Group I	Group II
M:F	12:8	11:9

There were 12 male and 8 females patients in group I and 11 males and 9 females in group II (Table I).

Table II Assessment of parameters

Parameters	Group I	Group II	P value
Mean age at surgery (month)	16.4	13.2	0.05
Unilateral	7	6	0.74
bilateral	13	14	
Flexion (degree)	121.3	122.5	0.92
Internal rotation (degree)	38.4	43.2	0.81
External rotation (degree)	33.2	33.0	0.91
Abduction (degree)	30.2	29.4	0.85
Adduction (degree)	25.4	23.1	0.21

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Muscle strength Flexor	121.4	103.6	0.05
Abductor	99.4	86.2	0.04

The mean age at surgery was 16.4 months in group I and 13.2 months in group II. Unilateral cases were 7 in group I and 6 in group II. Bilateral in 13 in group I and 14 in group II. Flexion (degree) was 121.3 and 122.5, internal rotation (degree) was 38.4 and 43.2, external rotation (degree) was 33.2 and 33.0, abduction (degree) was 30.2 and 29.4, adduction (degree) was 25.4 and 23.1, muscle strength flexor was 121.4 N and 103.6 N, abductor strength was 99.4 Nand 86.2 N in group I and II respectively. The difference was significant (P< 0.05) (Table II).

Table III Radiological assessment

Radiological assessment	Group I	Group II	P value
Acetabular index (AI) (degree)	40.6	41.3	0.14
Center–edge angle (CEA) (degree)	33.4	30.6	0.56

Acetabular index (AI) in group I was 40.6 degree and in group II was 41.3 degree. Center–edge angle (CEA) was 33.4 degree in group I and 30.6 degree in group II. The difference was significant (P< 0.05) (Table III).

DISCUSSION

The most common surgical approaches for open reduction are medial approach open reduction and anterior approach open reduction.[8] Both approaches can directly address hindrances in concentric reduction, including the iliopsoas, transverse acetabular ligament, ligamentum teres, neolimbus, pulvinar, and acetabulum.[9,10] However, as compared with the anterior open reduction (AOR), despite its advantage of less blood loss, medial open reduction (MOR) provides no access for capsular plication and pelvic osteotomy.[11] We performed this study to compare clinical and radiological outcomes of open reduction using the anterior and medial approaches for the management of developmental dysplasia of the hip.

Our results showed that there were 12 male and 8 females patients in group I and 11 males and 9 females in group II. Ergin et al[12] compared clinical and radiographic outcomes of surgical treatment using either AOR or MOR in children with DDH aged<24 months and to evaluate the procedure-inherent risks of avascular necrosis of the femoral head (AVN) and need for further corrective surgery (FCS). 61 children who underwent surgical treatment for DDH were categorized into two groups: AOR (31 hips of 28 patients) and MOR (39 hips of 33 patients). The mean age was 17±5.85 (range 7–24) months in group AOR and 13±5.31 (range 6–24) months in group MOR. The mean follow-up was 118±41.2 (range 24–192) months and 132±36.7 (range 24–209) months in group AOR and MOR. Regarding McKay's clinical criteria, both groups exhibited similar results (p=0.761). No significant differences were observed between the groups in both the center–edge–angle (p=0.112) and the Severin score (p=0.275). The AVN rate was 32% in the AOR group and 20% in the MOR group (p=0.264). The FCS rate was 22% in the AOR group and 12% in the MOR group (p=0.464).

Our results showed that the mean age at surgery 16.4 months in group I and 13.2 months in group II. Unilateral cases were 7 in group I and 6 in group II. Bilateral in 13 in group I and 14 in group II. Flexion (degree) was 121.3 and 122.5, internal rotation (degree) was 38.4 and 43.2, external rotation (degree) was 33.2 and 33.0, abduction (degree) was 30.2 and 29.4, adduction (degree) was 25.4 and 23.1, muscle strength flexor was 121.4 N and 103.6 N, abductor strength was 99.4 Nand 86.2 N in group I and II respectively. Gardner et al[13] determined the long-term prevalence of AVN following MOR, evaluate hip development

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after MOR, and identify predictors of AVN and radiographic outcome at skeletal maturity after MOR. 60 patients (70 hips) who underwent MOR with a mean follow-up of 10.83 years (5.23–16.74) was conducted. AVN was recorded according to Bucholz and Ogden classification and radiographic outcome based on Severin grading. AVN and hip morphology related to length of follow-up were evaluated. The rate of clinically significant AVN (types 2–4) following MOR was 32.9 % with type 2 accounting for 82.6 % of these cases. While early acetabular development was satisfactory, long-term outcome was unsatisfactory in 26 % of cases with AVN (vs 8.7 % of cases without AVN). A higher rate of AVN was identified when hips were immobilized in ≥60° of abduction postoperatively. A higher rate of poor Severin outcome was identified in hips with AVN.

Our results showed that Acetabular index (AI) in group I was 40.6 degree and in group II was 41.3 degree. Center–edge angle (CEA) was 33.4 degree in group I and 30.6 degree in group II. Bulut et al[14] found that the AVN rate was lower in the medial approach (6%, 3/47 hips) than that in the anterior approach (30%, 4/13 hips) in children aged < 24 months.

CONCLUSION

Both anterior approach open reduction and medial approach open reduction for the management of developmental dysplasia of the hip found to be equally effective.

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