ORIGINAL ARTICLE

SHORT-TERM OUTCOMES OF OPEN REDUCTION OF DEVELOPMENT DYSPLASIA OF THE HIP BY MEDIAL APPROACH: OUR EXPERIENCE AT KHYBER TEACHING HOSPITAL PESHAWAR

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ABSTRACT

Objective: Our study aimed to determine the short-term outcome of open reduction by medial approach in terms of function, joint reduction, and avascular necrosis.

Material & Methods: This was a Descriptive study approved by the institutional review board. We performed open reduction by medial approach in 24 hips in children less than 18 months of age. We followed them for a mean of 32 months ± 10.5 months. The average age of surgery was 9.7 months ± 3.5 months.

Results: Out of 24 hips, 22 were successfully reduced and two hips required revision surgery for post-operative redislocation of the hip joint. Avascular necrosis was noted in three hips and functionally classified according to McKay criteria 22 hips showed excellent one hip good, and one hip fair outcome.

Conclusion: We concluded that the medial approach is effective and reliable in achieving good short-term outcomes. It is safe and easy with a low rate of complications performed in children less than 18 months of age.

Keywords: development dysplasia of hip joint, DDH, medial approach, open reduction, short-term follow-up, Avascular necrosis..

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INTRODUCTION

Developmental dysplasia is a spectrum of many overlapping conditions ranging from occult dysplasia to dislocated hip.[1] The hallmark of DDH is acetabular dysplasia which is the abnormality in size, shape, and orientation.[2] The incidence which depends on various factors like gender, race, diagnostic criteria, etc. is between 1.5 and 20%.[3] b Treatment of DDH depends upon age and the goal is to achieve and maintain concentric reduction of the femoral head into the acetabulum. The prognosis is best when treatment is started very early. This has been achieved in developed countries through awareness, Improved training, increased surveillance, and quicker access to pediatric orthopedic surgeons. But in developing countries like Pakistan, the diagnosis is often delayed due to few specialized pediatric orthopedic surgeons, Specialized centers, and a lack of fellowships programs.[4] If the age is less than six months, the Pavlick harness is used. It is monitored by ultrasonography. After six months close reduction with arthrography and hip spica in human position is the procedure of choice. When close reduction fails open reduction is needed which is performed either by an anteromedial or anterolateral approach. Anterolateral is an excellent approach that gives good functional and radiological outcomes in neglected DDH.[5] The anteromedial approach for surgical treatment was first described by Ludloff in 1908, later on, modified by Ferguson and Weinstein, and Ponseti.[6] It is performed in infants between 6-18 months. Open reduction by the medial approach has many advantages including lesser tissue dissection, lower blood loss, shorter surgical duration, and bilateral applicability.

But it has disadvantages too like the inability to evaluate the pathological changes in superior acetabulum and difficulty in capsuloraphy.[7] A long follow-up study showed that if surgery through a medial approach is performed at an appropriate age can give good results in terms of good joint congruity and encourage ideal maturity of the joint.[8] The incidence of Avascular necrosis(AVN) of the femoral head in the medial approach ranges from 0% to 67% is the concern. The medial femoral circumflex artery may be injured during capsulotomy.[(9)] In this study we have evaluated the short-term outcomes of Ludloff's medial approach for an open reduction in terms of the acetabular index and

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concentric reduction and potential complications like AVN of the femoral head. the objective of the current study was to determine the short-term outcomes of open reduction by medial approach for developmental dysplasia of the hip in children less than 18 months of age.

MATERIAL & METHODS

This was a descriptive study. After taking ethical approval from the review board, data collection started with informed consent from the patients treated in Khyber teaching hospital by a single surgeon who specialized in pediatric orthopedic surgery. Data were collected for 6 months duration from April 2021 to December 2021.

The sampling technique was nonprobability consecutive and children below 18 years were selected. Syndromic patients and previously failed surgery for DDH were excluded. Short-term outcomes are defined as an assessment after at least 18 months of follow-up. Those patients who had to follow up for less than 18 months were also excluded from the study. The incidence of DDH is variable in a different population ranging from 1.5% to 20%. In our country, as there is no screening program for at-risk children, the mean age of presentation is above 2 years as reported in previous studies.[10-12]. Therefore, our sample size was small and about 20 hips were included in the study. Data were analysed using spss 21.

We performed routine arthrography before open reduction through a medial approach. Dynamic evaluation of hip joint reduction was evaluated. If congruent hip reduction was not possible Open reduction (OR) of the hip proceeded through the Ludloff approach by 2 to 3 cm transverse incision over the adductor longus muscle. After adductor tenotomy, an intermuscular plan between the pectineus and the adductor brevis was developed. After the iliopsoas tenotomy, just proximal to the lesser trochanter, the anterior surface of the hip joint capsule was exposed. Branches of the medial circumflex artery were visible which are protected to prevent AVN. Capsulotomy with cruciate incision exposed the hip joint to all intra-articular obstacles. Excision of Ligamentum teres, transverse acetabular ligament, and pulvinar performed. Hip was reduced and stability was checked. The skin was closed and hip spica was given in a human position for 6 weeks. After the hip Spica was removed child was placed in a removable hip abduction brace for another 3 months.

RESULTS

We had 16 patients (24 hips) included in our study out of which 11 were female and 5 were male. The mean age of surgery was 9.7 months ± 3.5 months (range from 5 to 18 months). The mean follow-up was 32 months ± 10.5 months (range from 18 to 54 months). Preoperative traction was not used in any case. Out of 16 patients, we had 4 right side involvement, 4 left sides and 8 had bilateral involvement. The reduction was achieved in 22 hips. Two hips got redislocated and required 2nd reduction surgery through an anterolateral approach. Final radiographic outcome at minimum 18 months follows up of all 24 hips shows reduced hip joints marked by congruency and intact Shenton line. We lost the pre-operative data of 9 hips. Out of 15, we had seven hips of tonnis grade 4, 3 hips of grade 3, and 4 hips of grade 2 dislocation. Pre-operative mean acetabular index of 15 hips was 40.1 ± 5.6 (range 30-50) while the mean acetabular index of 24 hips post-op was 23.83 ± 6.81 (range 15 to 37). A postoperative acetabular index of more than 25 degrees was noted in 13 hips which shows hip dysplasia. Avascular necrosis(AVN) was noted in three hips(12.5%) and was classified according to Kalamchi and Mcevan criteria. According to this criteria, one hip had grade 1 AVN and the other two had grade 2 AVN. Functional outcome according to Mckay criteria shows 22 hips (87.5%) excellent outcome. One hip (4.2 %) was good and one hip (4.2 %) fair outcome. We had no hip with a poor outcome. The range of motion of the hip joint was in the normal range in 20 (83%) hips. Three hips showed up to a 10-degree decrease in range of motion and one hip had limited external rotation causing the poor functional outcome.

DISCUSSION

Advantages of the medial approach include minimal invasive technique, less blood loss, less intra-operative time, supine position and both sides can be operated on at the same time, and unnoticeable scar marks. The tight anterior capsule that is the major obstacle in reduction can be released with this approach.[13] Disadvantage of the medial approach is no excess to extra-articular obstacle for reduction that includes posterior adhesion of capsule with the ilium, torsion of the capsule, and contracture of short rotator mussels but some authors consider the main interfering factors to be intra-articular.[8, 14] If the femur head is not reduced properly it will lead to subluxation in early childhood when the patient starts walking.[8] It will need further corrective surgery to achieve better congruency.

The femur head superior subluxation may occur in a centrally reduced head if the surgery is done in an ambulatory child so a medial approach is preferred in non-ambulatory infants.[15] One of the common complications of the medial approach is AVN. The reason is that in this approach one has to dissect and protect the femoral vessel and nerve pack and then the medial circumflex artery and obturator nerve. Medial circumflex artery injury or ligation is the major culprit for post-operative AVN.[16] The incidence of avascular necrosis was 12.5% in our study which was low compared to 42% Koizumi et al[14] 20-year follow-up, 41% morcuende et al[17] means 11 years follow-up, and 35.5% sosna et al[18] mean 11 years follow up respectively. The reason for our low AVN rate is a short-term follow-up (mean 30 months).

Iyetin et all[16] reported 3.6% AVN in 41 patients treated by medial approach with a mean follow-up of 5.5 years. Some authors suggest that AVN is not caused by the surgery but by the use Pavlik harness before the surgery.[18] Hip spica in flexion abduction also increases the risk of AVN.[19] In our study we give hip spica for up to 6 weeks. The average rate of 2nd operation required for pa-

Table 1: All cases included in the study with clinical and radiological outcome.

Hip no	Age at operation (months)	Gender Male(M)Female(F) /side	Last followup (months)	Pre-operative Acetabular index	Acetabular index last followup	Functional outcome Mckay Criteria	Avascular necrosis
1	12	F / left	36	35	20	excellent	No
2	11	M / left	24	35	15	excellent	Grade 2
3	10	F / right	50	45	20	Excellent	No
4	10	F / left	50	45	35	Excellent	No
5	10	F / left	20	45	20	Excellent	No
6	5	F / right	31	40	20	Excellent	No
7	5	F / left	31	30	20	Excellent	No
8	12	M / right	36	40	15	Excellent	No
9	12	M / left	36	30	30	Excellent	Grade 1
10	10	F / right	50	50	15	Fair	Grade 2
11	10	F / right	38	40	25	Excellent	No
12	9	M / right	34		20	Excellent	No
13	9	M / left	34		20	Excellent	No
14	6	F / right	21	40	23	Excellent	No
15	6	F / left	21	45	28	Excellent	No
16	8	F / right	27		30	Excellent	No
17	9	F / left	26		35	Excellent	No
18	6	F / right	18		19	Excellent	No
19	6	F / left	18		26	Excellent	No
20	18	M / right	54	40	26	Excellent	No
21	15	F / left	42	42	37	Excellent	no
22	6	F / right	36		24	Excellent	No
23	14	F / left	30		15	Good	no
24	16	M / left	27		34	Excellent	no

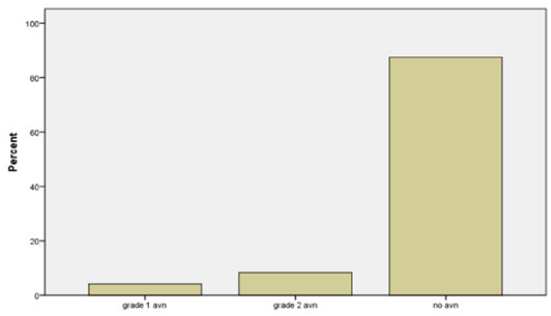

Fig 1: Percentage of Avascular necrosis according to Kalmachi and Mcevan criteria

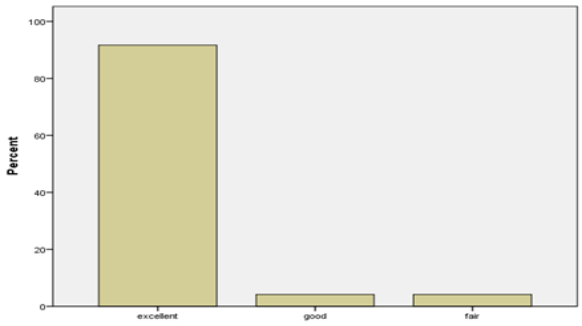

Fig 2: Percentage of Functional outcome according to Mckay criteria

tients treated by the medial approach is from 0 to 53% and the average rate of re-dislocation is from 0 to 23%.[17,18,20-22] We had two cases of re-dislocation in our study. The reason can be less expertise of the surgeon or may be due to loss of reduction in spica. We reduced them with an anterolateral approach and the patient outcome is good. The limitation of our study was that it was a single-center study with a small sample size. The follow-up period was short-term with a mean of 30 months and as the child grows the acetabulum remodels so the outcome can be assessed more accurately by long-term follow-up. The common complication of the Medial approach is late Kalamachi and Mcevan AVN type 2 which usually do not show themselves until 10 years. Long-term follow-up with a large sample size study is required to evaluate more precise outcomes of these patients.

CONCLUSION

The medial approach is a safe and easy approach to reducing hip joints in patients less than 18 months of age. The short-term outcomes are satisfactory and both hips can be addressed in one anesthesia session.

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AUTHOR'S CONTRIBUTION

Following authors have made substantial contributions to the manuscript as under

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Hayat S:	Concept, data collection, writing
Zaman Y:	Writing, review, data collection
Marwat I:	Data collection, review
Siddique A:	Data collection
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Authors agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.