

## Children with Developmental Dysplasia of Hip - Our Experience of Outcome at a Tertiary Care Centre

Mian Qaiser Ali Shah, Rizwana Bashir Kiani\*, Asrar Ahmad\*\*, Hamza Ali Malik\*\*\*, Javed Ur Rehman\*\*, Zahid Anwar\*\*

Department of Orthopedic Surgery, Pak Emirates Military Hospital/National University of Medical Sciences (NUMS), Rawalpindi Pakistan,

\*Department of Neuro-Surgery, Pak Emirates Military Hospital/National University of Medical Sciences (NUMS), Rawalpindi Pakistan,

\*\*Department of Pediatric Surgery, Pak Emirates Military Hospital/National University of Medical Sciences (NUMS), Rawalpindi Pakistan,

\*\*\*Department of General Surgery, Pak Emirates Military Hospital/National University of Medical Sciences (NUMS), Rawalpindi Pakistan

### ABSTRACT

**Objective:** To assess the operative outcome of children who underwent surgical management for developmental dysplasia hip at a tertiary care center.

**Study Design:** Case series.

**Place and Duration of Study:** Pak-Emirates Military Hospital, Rawalpindi Pakistan, from Jan to Oct 2021.

**Methodology:** This case series included 25 children who underwent triple procedure encompassing open reduction, femoral shortening and Salter's pelvic osteotomy. Post-operative analysis of the clinical outcome was done using McKay's classification and radiological assessment done using Severin's classification.

**Results:** Age of enrolled participants ranged from 02 to 07 years, mean age being  $4.3 \pm 1.45$  years, of which 8(32%) were male and 17(68%) were female. Mean pre-operative acetabular index was  $40.3 \pm 3.38$  while the mean post-operative acetabular index was  $25.1 \pm 3.10$ . On follow-up, one child had subluxation while another had complete dislocation of the hip joint.

**Conclusion:** Triple procedure with open reduction, femoral shortening and Salter's osteotomy gives satisfactory results in patients aged 2 to 7 with substantial reduction in post-operative acetabular index.

**Keywords:** Osteotomy, Single-stage, Triple procedure.

**How to Cite This Article:** Shah MQA, Kiani RB, Ahmad A, Malik HA, Rehman JU, Anwar Z. Children with Developmental Dysplasia of Hip- Our Experience of outcome at a Tertiary Care Centre. Pak Armed Forces Med J 2024; 74(5): 1236-1239. DOI: <https://doi.org/10.51253/pafmj.v74i5.8082>

This is an Open Access article distributed under the terms of the Creative Commons Attribution License (<https://creativecommons.org/licenses/by-nc/4.0/>), which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

### INTRODUCTION

Developmental dysplasia of hip (DDH) is a common congenital anatomical abnormality of the hip in which the joint remains unstable during the growth of the child, spanning over a spectrum of minimal dysplasia to complete dislocation of the hip joint.<sup>1</sup> If left untreated the condition can lead to persistent limp and pain later in life.<sup>2</sup> Persistent dislocation leads to chronic changes in the acetabulum, ligamentum teres and capsule that further reduces the chances of stable reduction.<sup>3</sup> The American Academy of Pediatrics recommends an ultrasound of the hips at 6 weeks of age and an X-Ray of the pelvis at the age of 4 months for babies with breech presentation, positive family history and female sex. Screening for DDH did not have wide acceptance due to self-resolution of the instability.<sup>4</sup> The most devastating complication is avascular necrosis of the head of femur, for which contrast enhanced MRI is useful in detecting this complication especially after closed reduction of the joint.<sup>5</sup> Guidelines for the early identification and management of DDH have been developed by

multiple associations<sup>6</sup> as the incidence of DDH varies from 0.4 to 1.8% around the globe. It is a multifactorial disease with multiple risk factors including familial, female gender, transverse presentation and oligohydramnios.<sup>7</sup> Referral in Pakistan often gets delayed due to lack of early diagnosis.<sup>8</sup> The goal of treatment is the ability to obtain a stable reduction so that in future the head of femur as well as the acetabulum attains normal growth and remodeling.<sup>9</sup> Treatment of DDH includes different types of braces, closed reduction and hip spica, open reduction and osteotomies.<sup>10</sup> As Pakistan is a developing country where most cases of DDH are diagnosed late and usually miss the window of treatment with the bracing or closed reduction, majority of the children need triple procedure with open reduction, femoral shortening and pelvic osteotomies. This study presents outcome of the children operated at a tertiary care center with triple procedure.

### METHODOLOGY

The case series was carried out from January to October 2021, at Pak-Emirates Military Hospital (PEMH), Rawalpindi Pakistan, after obtaining approval from the hospital Ethics Committee via letter (A/28/EC/385/2022).

**Correspondence:** Dr Asrar Ahmad, Department of Pediatric Surgery, Pak Emirates Military Hospital Rawalpindi Pakistan

Received: 01 Feb 2022; revision received: 20 Feb 2022; accepted: 25 Feb 2022

**Inclusion Criteria:** Patients of either gender, aged 2 to 6 years, having unilateral or bilateral DDH, were included.

**Exclusion Criteria:** Children who were previously operated and/or syndromic for arthrogryposis multiplex congenital and osteogenesis imperfect were excluded.

All patients were operated under general anaesthesia. Preoperative measurement of the supposed femoral shortening and acetabular index measurement was carried out in each case. Operative position was supine with a small sandbag under the involved hip. Pre-operative incision marking was carried out in each case as shown in Figure-1. Prophylactic antibiotics were administered. Post operatively, patients were kept in the post-operative ward, antibiotics continued, and repeat X-rays of the pelvis were done. First spica change was done six weeks later under general anaesthesia, during which stitches were removed. Kirchner wires were retained for another 6 weeks after which K-wires and spica were removed under general anaesthesia, and patient was sent to Armed Forces Institute of Rehabilitation Medicine (AFIRM) for application of abduction spica, which was worn at nighttime. Follow-up of the patients was continued on monthly basis for 3 months by clinical examination and X-Ray Examination of the hip joint as shown in Figure-2. Functional out was assessed and graded by McKay's<sup>11,12</sup> criteria while the radiological outcome was graded by Severin's<sup>13</sup> grading systems.

Data was analyzed by using Statistical Package for the Social Sciences (SPSS) version 20. Mean and standard deviations were calculated for quantitative variables like age and acetabular index.



Figure-1: Incision Marking Left Hip



Figure-2: Follow up X-Ray Right Hip

## RESULTS

A total of 25 children were operated during the study period, with age ranging from 2 to 7 years and mean age of  $4.3 \pm 1.45$  years, of which 8(32%) were male and 17(68%) were female. Mean pre-operative acetabular index was  $40.3 \pm 3.38$  while mean post-operative acetabular index was  $25.1 \pm 3.10$ . One follow-up, 1 child had subluxation while 1 other had complete dislocation of the hip joint. The post-operative outcomes on McKay's criteria showed excellent outcome in 16 cases (64%), good in 5(20%), fair in 3(12%) while poor in 1(4%) case as shown in Table-I. The radiological outcome on Severin's criteria showed normal appearance in 14(56%) cases, mild deformity of the femoral head, neck or acetabulum in 9(36%) cases, moderate deformity and complete dislocation each in only 1(4%) case, as shown in Table-II.

Table-I: McKay's Criteria

Grades	n(%)
Excellent	16(64)
Good	5(20)
Fair	3(12)
Poor	1(4)
Total	25(100)

Table-II: Severin's Criteria

Grades	n(%)
I	14(56)
II	9(36)
III	1(4)
IV	0
V	0
VI	1(4)
Total	25(100)

### DISCUSSION

Early diagnosis and treatment with a harness can maintain the normal development of the hip joint<sup>11</sup> as in the developing world, majority of the patients are diagnosed late and miss the treatment with bracing alone.<sup>12</sup> Closed reduction has the disadvantage of putting the head of femur at risk for avascular necrosis<sup>13</sup> due to which pelvic bone osteotomies are done in children older than 18 months.<sup>14,15</sup> DDH is a complex problem and even more so in places where tertiary care hospitals are few with difficult access from far flung areas hence the late presentations and delayed problems related to late DDH diagnosis, increasing the likelihood of the patient be treated with complex operations such as triple procedure.<sup>16</sup> This leads to deformities, gait problems, degeneration issues and pain during walk.<sup>17</sup> Triple procedure, as evident from the term itself, constitutes three primary operations namely open reduction, femoral shortening and pelvic innominate osteotomy. It is undertaken as it combines three operations under one umbrella and saves the patient from multiple hospital admissions and surgeries. This study was undertaken to retrospectively analyze the outcomes of triple procedure with regards to McKay's and Severin's criteria. In our study, we encountered similar results to international data available at time of study.

However, Vallamshetla *et al.*<sup>18</sup> reported Severin's classification I and II in 100% patients while McKay's criteria showed good or excellent class in 100% of patients. In Pakistan, Umer *et al.*<sup>19</sup> reported 86% good to excellent results and almost 52% Severin's class-I with age of the patients as important determinant of the final result. Ganger *et al.*<sup>20</sup> reported a good and excellent rate of 80% in a 3.5-year average follow up while Abdullah *et al.*<sup>21</sup> reported a good and excellent outcome in 88% patients. Ning *et al.*<sup>22</sup> with their large study data of 867 cases reported 80% good or excellent outcome during an average of 6.2-year follow-up. Thus, young children with DDH can safely be treated with an extensive one-stage triple procedure without increasing the risk of AVN.<sup>23</sup>

### CONCLUSION

Triple procedure with open reduction, femoral shortening and Salter's osteotomy gives satisfactory results in patients aged 2 to 7 with substantial reduction in post-operative acetabular index.

**Conflict of Interest:** None.

### Authors' Contribution

Following authors have made substantial contributions to the manuscript as under:

MQAS & RBK: Conception, study design, drafting the manuscript, approval of the final version to be published.

AA & HAM: Data acquisition, critical review, approval of the final version to be published.

JUR & ZA: Data acquisition, data analysis, data interpretation, critical review, approval of the final version to be published.

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.

### REFERENCES

1. Lee MC, Ebersson CP. Growth and development of the child's hip. *Orthop Clin N Am* 2006; 37: 119-132.
2. Kolb A, Chiari C, Schreiner M, Heisinger S, Willegger M, Retzl G, et al. Development of an electronic navigation system for elimination of examiner-dependent factors in the ultrasound screening for developmental dysplasia of the hip in newborns. *Sci Rep* 2020; 10(1): 16407. <https://doi.org/10.1038/s41598-020-73253-6>
3. Litrenta J, Masrouha K, Wasterlain A, Castaneda P. Ultrasound Evaluation of Pediatric Orthopaedic Patients. *J Am Acad Orthop Surg* 2020; 28(16): e696-e705.
4. Hauk L. Developmental Dysplasia of the Hip in Infants: A Clinical Report from the AAP on Evaluation and Referral. *Am Fam Physician* 2017; 96(3): 196-197.
5. Gornitzky AL, Georgiadis AG, Seeley MA, Horn BD, Sankar WN. Does Perfusion MRI After Closed Reduction of Developmental Dysplasia of the Hip Reduce the Incidence of Avascular Necrosis? *Clin Orthop Relat Res* 2016; 474(5): 1153-1165. <https://doi.org/10.1007/s11999-016-4712-0>
6. Schaeffer E, Lubicky J, Mulpuri K. AAOS Appropriate Use Criteria: The Management of Developmental Dysplasia of the Hip in Infants up to Six Months of Age: Intended for Use by Orthopaedic Specialists. *J Am Acad Orthop Surg* 2019; 27(8): e369-e372.
7. El-Sayed MM, Hegazy M, Abdelatif NM, ElGebeily MA, ElSobky T, Nader S. Dega osteotomy for the management of developmental dysplasia of the hip in children aged 2-8 years: results of 58 consecutive osteotomies after 13-25 years of follow-up. *J Child Orthop* 2015; 9: 191-198. <https://doi.org/10.1007/s11832-015-0654-6>
8. Shaw BA, Segal LS. Evaluation and referral for developmental dysplasia of the hip in infants. *Pediatrics* 2016; 138(6): e20163107. <https://doi.org/10.1542/peds.2016-3107>
9. Yang S, Zusman N, Lieberman E. Developmental dysplasia of the hip. *Pediatrics* 2019; 143(1): e20181147. <https://doi.org/10.1542/peds.2018-1147>
10. Madhu TS, Akula M, Scott BW, Templeton PA. Treatment of developmental dislocation of hip: does changing the hip abduction angle in the hip spica affect the rate of avascular necrosis of the femoral head? *J Pediatr Orthop B* 2013; 22(3): 184-188. <https://doi.org/10.1097/BPB.0b013e32835e3646>
11. Swarup I, Penny CL, Dodwell ER. Developmental dysplasia of the hip: an update on diagnosis and management from birth to 6 months. *Curr Opin Pediatr* 2018; 30: 84-92. <https://doi.org/10.1097/MOP.0000000000000578>
12. Murgai RR, Harris LR, Choi PD. Socioeconomic risk factors for poor outcomes of developmental dysplasia of the hip. *J Pediatr* 2019; 211: 159-163. <https://doi.org/10.1016/j.jpeds.2019.03.015>

## Developmental Dysplasia of Hip

13. Sankar WN, Gornitzky AL, Clarke NMP. Closed reduction for developmental dysplasia of the hip: early-term results from a prospective, multicenter cohort. *J Pediatr Orthop* 2019; 39: 111-118. <https://doi.org/10.1097/BPO.0000000000001164>
14. Balioglu MB, Oner A, Aykut US, Kaygusuz MA. Mid term results of Pemberton pericapsular osteotomy. *Indian J Orthop* 2015; 49(4): 418-424. <https://doi.org/10.4103/0019-5413.159654>
15. McKay DW. A comparison of the innominate and the pericapsular osteotomy in the treatment of congenital dislocation of the hip. *Clin Orthop Relat Res* 1974; (98): 124-132.
16. Severin E. Congenital dislocation of the hip; development of the joint after closed reduction. *J Bone Joint Surg Am* 1950; 32-A(3): 507-518. <https://doi.org/10.2106/00004623-195032030-00002>
17. Saqib M, Salman M, Hayat S. Developmental dysplasia of the hip in older children. *J Ayub Med Coll Abbottabad* 2019; 31(3): 433-436.
18. Vallamshetla VR, Mughal E, O'Hara JN. Congenital dislocation of the hip. A re-appraisal of the upper age limit for treatment. *J Bone Joint Surg Br* 2006; 88: 1076-1081. <https://doi.org/10.1302/0301-620X.88B8.17469>
19. Umer M, Nawaz H, Kasi P, Ahmed M. Outcome of triple procedure in older children with developmental dysplasia of hip (DDH). *JPMA* 2007; 57(12): 591-595.
20. Ganger R, Radler C, Petje G, Manner HM, Kriegs-Au G, Grill F. Treatment options for developmental dislocation of the hip after walking age. *J Pediatr Orthop B* 2005; 14(3): 139-150. <https://doi.org/10.1097/01202412-200505000-00004>
21. Abdullah EA, Razzak MY, Hussein HTK, El-Adwar KL, Youssef AA. Evaluation of the results of operative treatment of hip dysplasia in children after the walking age. *Alex J Med* 2012; 48(2): 115-122. <https://doi.org/10.1016/j.ajme.2012.02.004>
22. Ning B, Yuan Y, Yao J, Zhang S, Sun J. Analyses of outcomes of one-stage operation for treatment of late-diagnosed developmental dislocation of the hip: 864 hips followed for 3.2 to 8.9 years. *BMC Musculoskelet Disord* 2014; 15: 401. <https://doi.org/10.1186/1471-2474-15-401>
23. Bhuyan BK. Outcome of one-stage treatment of developmental dysplasia of hip in older children. *Indian J Orthop* 2012; 46: 548-555. <https://doi.org/10.4103/0019-5413.101035>

.....