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Evaluation of Surgical Management of DDH in Saudi Children in KAMC, Riyadh, Saudi Arabia

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Abstract

Background: Developmental dysplasia of the hip (DDH) is common among the pediatric population globally. In Saudi Arabia these patients end up getting treated surgically because of no screening program for this condition. Through this exploratory analysis, we intended to find the distribution of different types of surgical techniques, complications of these surgical techniques, and the age at which surgery is performed among children suffering from this condition.

Methods: This study was based on an analysis of clinical records from King Abdul Aziz medical city in Riyadh, Saudi Arabia. All patients in the specified setting diagnosed with DDH from birth till the age of fourteen between July 2007 to July 2014 were recruited for this study.

Results: Data on a total of 126 individuals was used in this analysis. We found that 84 (66.7%) children underwent open surgical mode surgery while only 42 (33.3%) children underwent closed mode surgery. We also found that 49 (38.9%) children required adductor tenotomy. Avascular necrosis was noted in 7 (5.56%) patients. Limping was the most common complication of surgical management of DDH and was reported among 33 (26.2%) patients. Stiffness was found among 27 (21.4%) patients. The average age at diagnosis was 16.8 months while the overall average age at surgery was 26.6 months.

Conclusion: This study emphasized the importance of the need for a national DDH screening program in Saudi Arabia to avoid the late presentation of these cases and consequently aggressive surgeries.

Keywords: Developmental dysplasia of the hip (DDH); Surgical management; Children; Hip dislocation; Congenital hip dislocation; Arthrography; Pelvic osteotomy; Saudi Arabia.

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1. Introduction

Developmental dysplasia of the hip (DDH) is a common disease among the pediatric population worldwide. “DDH represents a range of structural abnormalities in which the femoral head and the acetabulum are in inappropriate relation and grow abnormally” [1]. DDH was termed as congenital dysplasia of the hip. Still, it is found that the disease is not related to birth [2]. Incidence of DDH varies between 1.5 and 20 per 1000 births due to many factors. These factors include diagnostic criteria, sex, genetic, race, and population age [3,4]. If we evaluate racial factors, DDH is less in African Americans than in Caucasian Americans [5]. DDH severity ranges from joint laxity and mild subluxation to fixed dislocation.5 Five types of DDH are maldirected acetabulum, capacious acetabulum, false acetabulum, lateralized acetabulum, and femoral deformity [6].

There are well-established risk factors that might explain the pathogenesis of DDH including family history, breech presentation, estrogen, and female gender are the most common factors [5,7–9]. There is no agreement about the etiology of DDH, but the literature suggests that mechanical factors affect the position in the uterus in which expulsion of the head upward and backward is caused by abnormal pressure on the greater trochanter due to hyperflexion with adduction and external rotation [10].

Regarding the screening of DDH, the physician should do a physical examination for all newborns. They should be re-examined during well-baby clinic visits until one year of age because negative results cannot exclude DDH [2]. The examination includes Ortolani and Barlow maneuvers in neonates and infants up to 5 months, but limited abduction sign is more characteristic in older children [5]. If any suspicion arises, physicians should use ultrasonography, a sensitive tool for children from birth to 4 months of age but not before the age of two weeks. And if the child is older than four months of age, an anteroposterior pelvic radiograph can be used to confirm diagnosis [2,5,11].

Treatment of DDH is dependent on age, and there are two categories of treatment. In the early presentation (less than six months), non-surgical methods like Pavlik harness, which is a device that keeps the hip in abducted and flexed position to stabilize the hip, is indicated, while in patients older than that, surgical methods are indicated [12]. There are two types of surgeries done in DDH the first one is the open reduction, and the second one is the closed reduction; also, the choice between these methods depends on age [13]. The surgery is usually accompanied by braces and splints to give the maximum benefits from the procedure [12,13].

In a study conducted in King Khalid University Hospital, Riyadh, Kingdom of Saudi Arabia, in 2003, it was found that consanguinity, family history, and breech deliveries are the most common factors

behind DDH in KSA. In the same study, the need for a national DDH screening program was advocated [14].

Since DDH is a common presentation in Saudi Arabia and surgical management is quite common due to the lack of a screening program, through this exploratory analysis, we intended to find the distribution of different types of surgical techniques, complications of these surgical techniques, and age at which surgery is performed among children suffering from this condition.

2. Subjects and Methods

This study is retrospective hospital-based done based on the review of medical records. Data was collected and analyzed in King Abdul Aziz medical city in Riyadh, Saudi Arabia (KAMC-R), a 1000-bed specialized healthcare institution covering a wide range of secondary and tertiary care specialties. All patients diagnosed with DDH and underwent surgical management since birth up to the age of 3 years at KAMC-R were eligible to get recruited for this study. during the study period total 126 children underwent surgical treatment and all were included in the study. For this study, we included data on the eligible patients from July 2007 to July 2014. This data was extracted from the hospital's medical records. We reviewed all the files for the DDH patient. All data were collected, sorted, filtered, cleaned, and merged with particular reference to the index admission date. Co-investigators did data collection and processing of the data. For eligible patients, relevant variables were extracted from their respective clinical sources (soft and hard copy medical records and electronic databases). Data were entered into SPSS for data management and analysis. Study variables included evaluation of surgical management, age of diagnosis, age of surgery, and complications of DDH. Mean was reported for all the continuous variables, like age of first presentation and age at surgery. Frequencies with percentages were reported for all the categorical variables. We found out the distribution of different complications in different types of surgeries through cross-tabulation.

3. Results

As shown in table 1, the surgical treatment of the DDH shows that 84 (66.7%) children underwent open surgical mode while only 42 (33.3%) children underwent closed mode surgery. Out of 126 children who underwent surgical intervention to manage DDH, 49 (38.9%) required adductor tenotomy, while 77 (61.1%) were managed without adductor tenotomy. Blood transfusion requirement is quite rare in the surgical management of DDH, so only 3 (2.3%) times packed red blood cells were transfused. All of them happened in bilateral open reduction mode of surgical intervention.

Table (1) Showing details of different surgical procedures

Variable	N (%)
Type of surgery	
Close Reduction + arthrogram	42 (33.3)
Open reduction + pelvic osteotomy	67 (53.2)
Open reduction + pelvic osteotomy + femoral shortening	17 (13.5)
Adductor Tenotomy	
Yes	49 (38.9)
No	77 (61.1)
Blood transfusion	
Yes	3 (2.3)
No	123 (97.6)

As shown in table 2, avascular necrosis is noted in 7 (5.56%) patients. Only 5 of them underwent closed reduction arthrogram, and 2 underwent open reduction pelvic osteotomy. There are no avascular necrosis cases in patients who did Open reduction + pelvic osteotomy + femoral shortening. Limping is the most common complication of surgical management of DDH. A total of 33 (26.2%) patients out of 126 develop this complication with a higher percentage in open reduction pelvic osteotomy and open reduction pelvic osteotomy with femoral shortening than closed mode. Stiffness is a well-known complication, with 27 (21.4%) patients out of 126 developing this complication with a higher percentage in open reduction pelvic osteotomy and open reduction pelvic osteotomy with femoral shortening than closed mode.

Table (2) showing complications by different surgical procedures

Complication	**CR Arthrogram**	**OR Pelvic Osteotomy**	**OR Pelvic Osteotomy + FS**	**All Modes**
Avascular necrosis				
Yes	5 (11.9%)	2 (3%)	0 (0%)	7 (5.6%)
No	37 (88.1%)	65 (97%)	17 (100%)	119 (94.4%)
Limping				
Yes	1 (2.4%)	22 (32.8%)	10 (58.8%)	33 (26.2%)
No	41 (97.6%)	45 (67.2%)	7 (41.2%)	93 (73.8%)
Stiffness				
Yes	2 (4.8%)	16 (23.9%)	9 (52.9%)	27 (21.4%)
No	40 (95.2%)	51 (76.1%)	8 (47.1%)	99 (78.6%)

Figure 1 shows that the average age at diagnosis for children who underwent closed reduction is 3.1 months. In open reduction pelvic osteotomy, the average age at diagnosis is 16.8 months, while in open reduction pelvic osteotomy with femoral shortening, the average age at diagnosis is 17.4 months. The overall average age at diagnosis is 16.1 months. The average age at surgery for children who underwent closed reduction is 10.3 months. In open reduction pelvic osteotomy, this average is 27.2

months, while in open reduction pelvic osteotomy with femoral shortening, the average age at surgery is 46.2 months. The overall average age at surgery is 26.6 months.

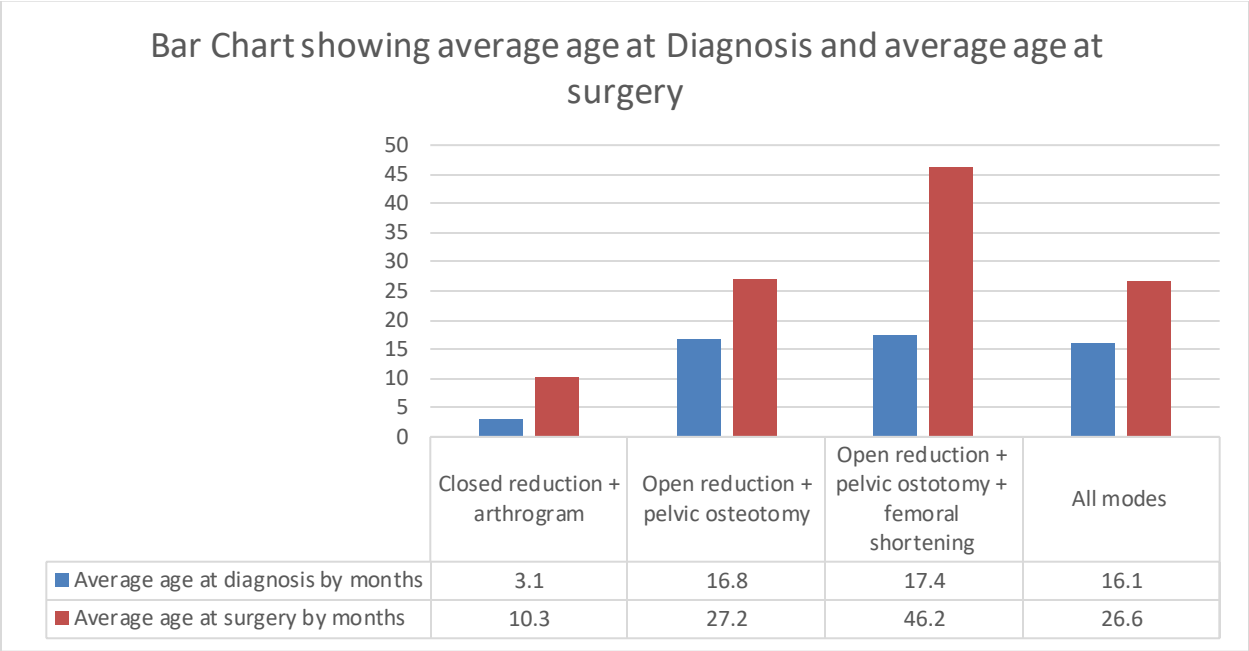

Figure (1) Showing bar chart of average age at diagnosis and the average age at surgery

4. Discussion

Findings from our study were different from findings from similar studies done in other parts of the world. As far as the mode of surgical intervention is concerned, in our study, 84 (66.7%) children underwent open surgical mode. In contrast, in a study done by Chia-Hasieh-Chang et al., in 2006 in Taiwan, the percentage of children who underwent surgical mode reached 85% [15] Authors of this study have claimed that high numbers of major surgical procedures are because of the enhanced quality of the screening program. The percentage of children suffering from this condition who received the open surgical procedure in countries like the United Kingdom, Australia, and Germany were 15%, 33%, and 34%, respectively [16–18].

Avascular necrosis is the most severe complication reported in different studies, with an incidence between 0 - 3% [19,20] We found Avascular necrosis in 5.6% of these children. Temporary limping after surgery is known as the most common complication of surgical management of DDH, with an overall rate reaching up to 55.3%, as shown in the study done by Mirdad T in Aseer [21] In our study, limping remains the most common complication but with lower rates because it is seen only in 26.2% of the children who underwent surgery.

The overall average age at which surgery was performed in our study was found to be 26.6 months. While in a study done by Chang et al., 2006 in Taiwan, they found that the average age at which surgery was performed was 20.4 months [15] In a study done by Bhuvan et al., it was found that the average age at diagnosis is 81.2 months, while in our study, the average age at diagnosis was found to be 16.1 months [22].

5. Conclusion

This study emphasized the importance of DDH as a common orthopedic disease in the pediatric age group. The result shows the effect of late presentation and the lengthy operation room lists leading to more delayed interventions and, consequently, more aggressive modes of surgery. The study also emphasized the importance of having national screening programs to help with early diagnosis and early intervention. The mainstay of the suggested screening program is a good history and documentation of the cases, sound, and comprehensive physical examination. The role of ultrasonography in diagnosing DDH is well established as ultrasound is a safe, cheap, and widely available method. Still, it is not commonly used secondary to the shortage of trained personnel, and ultrasound is an operator-dependent method requiring trained people, especially in pediatrics. Since consanguinity is so common in Saudi Arabia, the relation between consanguinity and DDH should be evaluated carefully, and families should be counseled in this regard.

6. Declarations

6.1 Conflict of Interest Statement

The authors have no conflict of interests to declare.

6.2 Funding Disclosure

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