

Research Article

Clinical and radiological evaluation of the open reduction, Dega osteotomy and derotational femoral osteotomy for management of DDH after walking age

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Abstracts

Introduction: Developmental dysplasia of the hip (DDH) is a result of altered hip joint morphology and on a worldwide basis occurs between 0.87 and 10.5 per 1000 live births. **Aim of the work:** Clinical and radiological evaluation of the open reduction, Dega osteotomy and derotational femoral osteotomy for management of DDH after walking age **Patient and Method:** A retrospective study of 17 patients diagnosed with DDH managed by open reduction, Dega osteotomy and femoral derotational osteotomy (FDO) and fixation by plate and screws. **Results:** Our study includes 13 female and 4 male patients and the age ranges from (1.5-3.7) years with mean 2.5 ± 0.7 According to McKay modified criteria 20.83% (5 hips) were rated as excellent, 70.83% (17 hips) were rated as good, 4.16% (one hip) was rated as fair, and 4.16% (one hip) was rated as poor. While the radiological results were evaluated by Severin classification included 79.2% (19 hips) were type I, 12.5% (3 hips) were type II, 4.16% (one hip) was type III, and 4.16% (one hip) was type VI. **Conclusion:** In the management of DDH after walking age we perform open reduction, Dega osteotomy and femoral derotational osteotomy.

Keywords: Developmental dysplasia of the hip, derotational femoral osteotomy

Introduction

Developmental dysplasia of the hip (DDH) is a result of altered hip joint morphology and on a worldwide basis occurs between 0.87 and 10.5 per 1000 live births^(1,2). The management of developmental dysplasia of hip aims at early diagnosis and treatment⁽³⁾. After walking age the satisfactory development cannot always be assured by non-operative treatment following closed reduction^(4,5,6) so operative treatment is the adequate treatment of this cases⁽⁷⁾.

There are a variety of described operative procedures to address acetabular dysplasia. These are logically divided into those that redirect the acetabulum and those that reshape the acetabulum augmentation procedures. Dega procedures have the advantage of producing an immediate improvement in the shape of the acetabulum⁽⁸⁾ and the increased lateral coverage does not compromise coverage posteriorly⁽⁹⁾. A derotation femoral osteotomy is performed to enhance postoperative stability of the hip.

Aim of the work

Clinical and radiological evaluation of the open reduction, Dega osteotomy and derotational femoral osteotomy for management of DDH after walking age

Patient and Method

A retrospective study of 17 patients involved (24 hips) diagnosed with DDH managed by open reduction, Dega osteotomy and femoral derotational osteotomy (FDO) and fixation by plate and screws. This study carried in the orthopedic surgery department at Minia university hospital from January 2013 to December 2017.

Inclusion criteria:

- 1) Age group: after walking age (18 months)

Exclusion criteria:

- 1) Teratologic type
 - 2) Recurrent type
- Radiological evaluation: it is depending on Severin criteria

AVN; it is depending on Bucholz - Ogden classification system

Clinical evaluation depending on Mckay criteria.

Surgical technique: At first, adductor tenotomy was performed to release muscle contractures in the adductor muscles group. Hip arthrotomy was performed using the iliofemoral approach and then the iliac crest apophysis was divided into two halves in order to gain access to the joint capsule, followed by the exposure of the hip joint for direct joint reduction. We performed proximal femoral rotational osteotomy in cases with excessive anteversion or tension on the head, especially in older age groups. This osteotomy was carried out through the proximal femoral posterolateral approach.

After appropriate femoral shortening and derotating, fixation of the osteotomy site was performed by a simple 4-hole plate. After that, iliac osteotomy by Dega method (depend upon the femoral head

size and acetabular capacity) through the previous hip approach was carried out. Open reduction of the femoral head in the acetabulum was achieved, then the joint capsule was reefed, and finally the wound closed in anatomical layers. Reduction was checked by fluoroscopy and hip spica cast applied while the operated joint immobilized in the reduced position. The spica cast was removed after 1.5 months and radiographic control study was repeated every 6months until the final visit.

Results

Our study includes 13 female and 4 male patients and the age ranges from (1.5-3.7) years with mean 2.5±0.7. 6 cases with positive Family history, while 4 cases were breech lie. The operative time ranges from 80 to 180 minutes with mean (131.66). and blood loss ranges from 150 to 300c.c with mean (200±55.2). 8 hips required blood transfusion range from 120 to 250c.c. Femoral shortening was performed in 4 cases were done where there was difficult reduction.

Table (1): Mckay scoring criteria

No. of cases (hips)	N=24
Mckay score	
Excellent	5 (20.8%)
Good	17 (70.8%)
Fair	1 (4.2%)
Poor	1 (4.2%)

According to McKay modified criteria 20.83% (5 hips) were rated as excellent, 70.83% (17 hips) were rated as good, 4.16% (one hip) was rated as fair, and 4.16% (one hip) was rated as poor table (1). While the radiological results were evaluated by Severin classification included 79.2% (19 hips) were type I, 12.5% (3 hips) were type II, 4.16% (one hip) was type III, and 4.16% (one hip) was type VI table (2).

The Preoperative acetabular index ranged from 36 to 42 mean (38.95), and Postoperative ranged from 18 to 29 mean (24.04) the Preoperative acetabular index and Postoperative acetabular index have a significance difference (P value <0.001* table (3).

The radiological union ranged from 16 – 40 weeks with mean 28.04 weeks. AVN evaluated by table (2) Severin classification Bucholz - Ogden classification system; 4.16% (one hip) was grade I, 4.16% (one hip) was grade II, 4.16% (one hip) was grade III table (3).

one case was grade III according to Bucholz Ogden classification for AVN grading while one case was (grade VI) according to Severin classification these case was managed by open reduction through the anterolateral approach and Salter osteotomy and removal of the implant in the same session, the reoperation was done after the main operation from 10 to 24 months with average 14 months.

No. of cases (hips)	N=24
Severin class	
I	19 (79.2%)
II	3 (12.5%)
III	1 (4.2%)
IV	0 (0%)
V	0 (0%)
VI	1 (4.2%)

There were 2 cases of superficial wound infection managed by daily dressing and antibiotics and only one case with deep infection managed by debridement under general anaesthesia. one case of supracondylar femoral fracture was detected after removal of the hip spica and managed by above knee cast.

Case presentation:

Female patient 1.6 years presented to our outpatient clinic with right sided DDH.



Fig. (1): Pre operative AP view X-ray on the both hips .

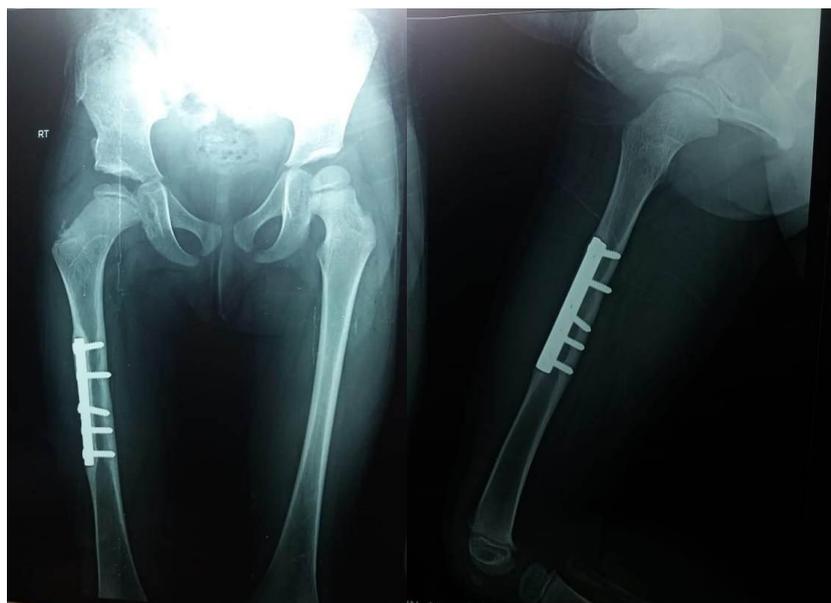


Fig. (2): AP and lateral views X -ray on the right hip after 6 months from the operation.



Fig. (3): post operative AP view X-ray on both hips after removal the plate and screws after 2 years.

Discussion

The treatment of DDH after the walking age group is usually surgical due to the fact that the pathological changes present at this age as severe contracture of the muscles, tendons and capsule around the hip, increased shallowness of the acetabulum, excessive femoral anteversion, hypertrophied inverted labrum, excessive pulvinar, maldirected acetabulum would make closed reduction very difficult and forcible that may lead to avascular necrosis of the femoral head or redislocation.

In this age group, Zionts and MacEwen⁽¹⁰⁾ found that closed reduction was associated with a high rate of avascular necrosis (23.7%) and a high incidence of secondary procedures for recurrent subluxation or persistent acetabular dysplasia. Similarly, Mardem-Bey and MacEwen⁽¹¹⁾ found that 66% of children of walking age with developmental dysplasia of the hip who had undergone closed reduction required additional surgery, compared with 33% of such patients treated with open reduction. Several types of pelvic osteotomies to stabilize the reduced hip in older children have been described. In this study we used Dega osteotomy for all cases.

Galpin et al.,⁽¹²⁾ cautioned against posterior instability with Salter osteotomy when it is combined

with derotation femoral osteotomy. Excessive femoral neck anteversion is usually present in cases of DDH but it is clinically not apparent in these patients when the hip is in a subluxed or dislocated position, but it becomes so when the hip is reduced at open reduction where the head is usually reduced and becomes stable after internally rotating the hip. This was found to be true in this study, as all hips included were found to need a femoral derotational osteotomy after reducing the femoral head in the acetabulum under vision.

In this study we found that femoral shortening was needed in 6 cases. A few investigators have evaluated the long term functional and radiographic outcome of a one-stage operation for the treatment of DDH in children after the walking age. Most of these studies used different combinations of surgical treatment without standardizing a fixed surgical protocol for treatment as well as differences in patient selection, length of followup, and classification systems. This made it difficult to compare their results with ours.

Galpin et al., in a study of 33 hips in 25 patients, 2 years of age or older treated by one-stage surgical method, they reported satisfactory results clinically in 85% of their patients and radiographically in 75%.⁽¹²⁾ Ryan et al.,⁽¹³⁾ reported their results of operative treatment of cases of DDH as follows:

seven hips had excellent results; 11 good results, four fair results and three poor results. Eleven hips had evidence of osteonecrosis. They suggested that a one-stage operative procedure consisting of open reduction, femoral shortening and pelvic osteotomy (if necessary) for previously untreated DDH in children who are three to ten years old can result in remodeling of the acetabulum and a functional hip. Nakamura et al.,⁽¹⁴⁾ reported: excellent results in five joints, good in three and fair in three.

In this study, 24 hips (91%) had good or excellent clinical results and (91.7) satisfactory radiological results at the final follow-up. Ok et al.,⁽¹⁵⁾ concluded that, if there is a high likelihood of achieving a functionally good hip joint with biological remodeling, an open reduction is a reasonable strategy for an untreated dislocation in patients, even those older than 8 years of age. In the current study one patients had redislocation of the hip. Rudolf et al.,⁽¹⁶⁾ reported 3 of 54 hips with

redislocation, Grill⁽¹⁷⁾ reported 12 of 50 hips with redislocation and resubluxation. Ruszkowski and Pucher⁽¹⁸⁾ reported one of 33 hips in 26 children with redislocation. In this study one patient had a supra condylar femoral fracture during the early period of mobilization after cast removal. Grill⁽¹⁷⁾ reported 5 of 50 hips with distal femoral fracture.

One patient in this study developed avascular necrosis of the femoral head at the time of final examination and classified as grade III according to Buchloz and Ogden. Zions and MacEwen identified major AVN in approximately 5% of their patients. Ryan et al reported 11 out of 25 hips (44%) with avascular necrosis. There is a wide variation in the incidence of AVN between different studies that may be due to different classification systems used in different periods of follow-up or different methods of both conservative and surgical treatments.

Table (3): Buchloz Ogden classification

No. of cases (hips) Bucholz Ogden	N=24
I	1(33.3%)
II	1(33.3%)
III	1(33.3%)
IV	0

Conclusion

The one stage correction procedure can be considered as a safe and effective option in cases with DDH after walking age. This procedure has the advantage of decreasing the need for subsequent surgeries in multistage procedure and eliminating the need for prolonged post-operative immobilization. it is associated with satisfactory clinical and radiological outcomes. The success rate of these surgical procedures is considered acceptable and therefore recommended.

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