

Midterm evaluation of risk factors for failed open reduction for Developmental Dysplasia of the Hip

Ahmed Gaber Mostafa¹ MD and Mohamed Ahmed Abdelkader² MD

Department of Orthopedic Surgery, Beni-Suef University, Egypt

1-Assistant Professor of Orthopedic Surgery, Faculty of Medicine, Beni-Suef University, Egypt.

2- lecturer of Orthopedic Surgery, Faculty of Medicine, Beni-Suef University, Egypt.

Corresponding author: Ahmed Gaber Mostafa, MD

Address: Beni-Suef, Egypt.

Email: ahmedga911@gmail.com

Tel : 01063198906

The Egyptian Orthopedic Journal; 2021 supplement (1), June, 56: 36-39

Abstract

Background

The primary aim of treatment of developmental dysplasia of the hip is to achieve a concentric reduction of the hip, Re-dislocation following open reduction is an important problem with a variable incidence, Risk factors for failed open reduction were not thoroughly evaluated, Frequently, the failure of a primary open reduction is due to errors in surgical technique.

Patients and Methods

12 patients with failed open reduction of developmental dysplasia of the hip underwent revision surgery, the mean age at the first operation is 17.9 m, The mean age at the second operation is 29.1 m. The mean interval between the two operations is 10.7 m. In revision surgery, all obstacles for concentric reduction were removed, and associated pelvic and femoral osteotomy was done.

Results

The mean follow up period is 22.9 m, the mean age of the patients at the end of the follow-up period is 45.m. At the final follow-up, all patients were clinically assessed by Ponseti grading. All had limb-length measurements and Trendelenburg tests performed. The radiological status of the joint was assessed using Severin grading and avascular necrosis using the criteria of Kalamchi and McEwen.

Conclusion

Risk factors for failed primary surgery for DDH mainly due to incomplete removal of the different obstacles that prevent the concentric reduction.

Keywords

Developmental, Dysplasia, Hip, Redislocation, Revision surgery.

Introduction

Developmental dysplasia of the hip refers to a wide range of developmental hip disorders ranged from a hip with mild dysplasia with concentric location and stable to a hip with severe dysplasia and dislocation[1]. The primary aim of management of dysplastic hip is a concentric reduction to obtain anatomical and function good outcome. Treatment of patients with DDH should be ideally carried out during infancy. If this was not possible, treatment has to be instituted as early as possible in childhood, preferably before the age of 4 years, to take maximum advantage of the inherent remodeling capabilities of the hip joint[2].

If the hip remains dislocated and the child grows older, secondary changes around the hip create more difficulties to closed or open reduction. Thus, children older than 18 months of age with DDH usually require additional procedures to manipulate these secondary changes in the proximal femur and acetabulum[3].

Re-dislocation following open reduction is an important problem with a variable incidence. Risk factors for failed open reduction were not thoroughly evaluated, Frequently, the failure of a primary open reduction is due to errors in surgical technique. A common finding in a re-dislocated hip following open reduction is an intact transverse acetabular ligament, the presence of a stump of the ligamentum teres, inadequate soft-tissue release, capsulorrhaphy failure, failure of concentric reduction, dysplasia of the femoral head or an insufficiently corrected femoral version, posterior displacement because of increased retroversion of the acetabulum after Salter osteotomy, and AVN. Also, severely increased anteversion of the femoral neck.[4-6].

Recently the importance of femoral osteotomy in primary open reduction when needed had increased to decrease the chance of the secondary procedure[7]. Femoral osteotomy can facilitate reduction and decrease the rate of osteonecrosis by relieving tension in the hip joint. It allows the surgeon to perform femoral

shortening and correction of femoral anteversion. Whenever excessive force is needed for hip reduction, femoral shortening should be done. The amount of shortening is determined by the amount of overlap between the femoral segments after osteotomy with the hip reduced[8].

Patients and method

Between 2016 and 2020, 12 patients with failed open reduction of developmental dysplasia of the hip underwent revision surgery in Beni-Suef Faculty of

medicine. this retrospective study included 9 females and 3 males, all dislocated hips are unilateral even in bilateral cases, 10 left hips and 2 right hips, the age at the first operation ranged from 12 - 30 months (mean 17.9 m). The age at the second operation ranged from 15 – 48 months (mean 29.1 m). The interval between the two operations ranges from 3-26 months (mean 10.7 m). (Table 1).

In the first operation all cases operated through the Bikini approach, adductor tenotomy was done in 2 hips, pelvic osteotomy (Salter or Dega osteotomy) was done in 5 hips and Derotation osteotomy of the femur was done in 3 hips.

Table 1: Patients details and results

No	Side	G	Age at 1 st OR	Associated OP	Age at final OR	Associated OP	Operative details					Age at final f/u	Pons	Trend	LLD	Sever	AVN Kal-machi
							L A B	P U L	P S	L T	T L						
1	Lt	F	18 m	-	21 M	DEGA OS+ADD TEN	+	+	+	-	+	4Y	1	-	0	2	0
2	Lt	F	14 m	-	2Y	SO+ADD TEN	-	+	-	+	+	3.5 Y	1	-	0	2	0
3	Rt	M	15 m	-	3Y	SO+FS+DR O+ADD TEN	-	+	-	-	+	5 Y	4	+	2	4	3
4	Lt	F	24 m	SO+AD D.TEN	2.5 Y	DEGA OS+DRO+FS	-	+	-	-	-	4 Y	1	-	1	2	0
5	Lt	F	18m	DRO	24 M	DEGA OS+FS	-	+	-	-	+	3 Y	1	-	0	2	0
6	Lt	F	14m	-	17M	DEGA OS	+	-	+	-	-	3 Y	1	-	0	2	0
7	Lt	M	24m	DEGA OS+DRO +ADD.T EN	3 Y	FS+DEGA OS+DRO	+	+	-	OS	-	4 Y	3	+	2	3	3
8	Lt	F	16m	DEGA OS	3.5 y	FS+DRO+ADD.TEN+DEGA OS	-	+	-	-	+	5 Y	1	-	0	2	0
9	Rt	F	24m	DRO	4Y	FS+DEGA OS+ADD TEN	-	+	-	-	+	6 Y	2	-	1	3	3
10	Lt	F	14m	DEGA OS	20M	DEGA OS+ADD TEN	-	+	-	-	+	6 Y	4	+	2	4	2
11	Lt	F	22m	DEGA OS.	3Y	DRO	-	+	-	-	-	4.5 Y	1	-	0	2	0
12	Lt	M	12m	-	15M	DEGA OS	+	+	+	-	+	4 Y	1	-	0	2	0

G gender, OP Operation, LAB Labrum limbus, PUL Pulvinar, PS Psoas tendon, LT Ligamentum teres, TL Transverse ligament; Pons Ponseti classification, Trend Trenderberg test, ADD TEN Adductor tenotomy, SO Salter osteotomy, DRO Derotation osteotomy, FS Femoral shortening, OR Open reduction, OP Operations

Details of the revision surgery

The Bikini approach was used, Psoas tendon was released in 3 hips, the scar tissue was removed from the capsule, T shape incision was done, Ligamentum teres resected in 1 hip, Transverse acetabular ligament was released in 8 hips, Pulvinar tissue was removed in 11 hips, Labrum limbus was inverted in 4 hips, it was everted by radial cuts. The acetabulum notch was

cleared, adductor tenotomy was done in 6 hips, the head was reduced. Femoral shortening was done in 6 hips, Derotation osteotomy was done in 5 hips, Salter osteotomy was done in 2 hips, Dega osteotomy was done in 9 hips.

The reduction was confirmed clinically and by intra-operative radiographs. Post-operative immobilization in a hip spica was maintained for 6–12 weeks, de-

pending on the need for secondary femoral or pelvic procedures. Followed by night abduction brace. (Fig-

ures 1,2).

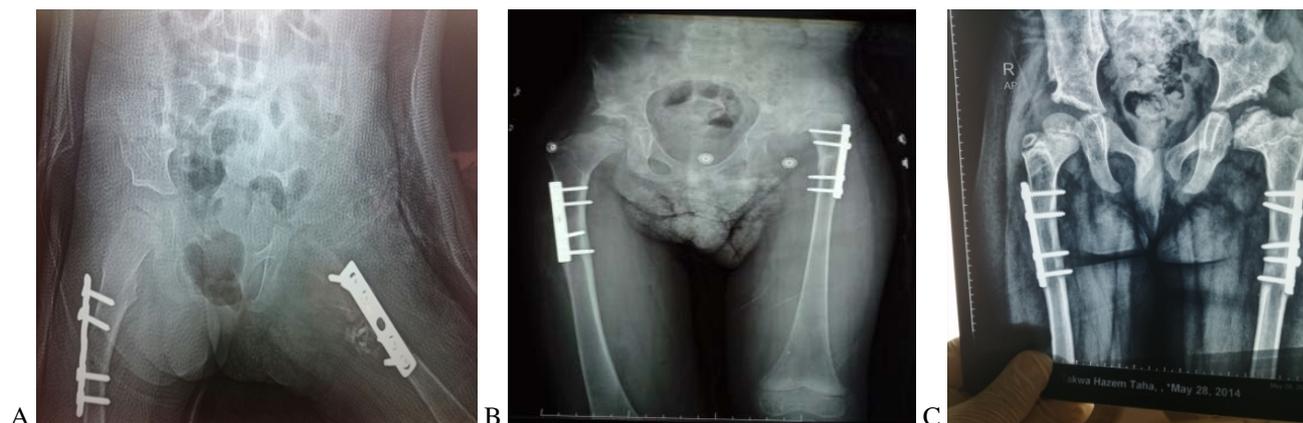


Figure 1: Case no 7 male, Bilateral DDH **A:** Rt hip corrected followed by Lt hip at 24 m old **B:** Lt hip dislocated, at 36 m revision surgery **C:** at 4 ys old good reduction with AVN



Figure 2 : Case no 8, female 1st surgery at 16 m old, **A:** Before the 2nd surgery at 3.5 ys old, **B:** follow up in the spica cast, **C:** good reduction at 4 ys old.

Results

A retrospective study was done on 12 patients with failed open reduction of developmental dysplasia of the hip underwent revision surgery between 2016 and 2020 . The follow up period ranged from 12-52 months (mean 22.9 m), the age of the patients at the end of the follow up period ranged from 36 -72 months (mean 45.m). At the final follow-up, all patients were clinically assessed by Ponseti grading (Table 2)[9]. All had limb-length measurements and Trendelenburg tests performed. The radiological status of the joint was assessed using Severin grading (Table 3)[10] and avascular necrosis using the criteria of Kalamchi and McEwen (Table 4)[11]. At final follow up, 2 patients had Ponseti grade 4 . The Trendelenburg test was positive in 3 patients, and 3 patients had a leg-length discrepancy (LLD) of 2 cm . Radiological assessment revealed a Severin grading of 3 or more in four hips. Avascular necrosis was evident in 4 hips.

Table 2: Ponsetti classification of clinical outcome

Grade	
1	Asymptomatic
2	Slight hip pain after long walks
3	Limp, free motion and no pain
4	Limp and limitation of motion, no pain
5	Limp and pain
6	Limp, limitation of motion and pain

Table 3 Severin grading of radiological outcome

Grade	
1	Normal
2	Moderate deformity of femoral head or neck or acetabulum
3	Dysplastic, not subluxed
4	Subluxed
5	Head articulating with the secondary acetabulum in the upper part of the original acetabulum
6	Dislocated
7	Arthritic

Table 4: Kalamchi classification of avascular necrosis of the femoral Head

Grade	
1	Changes affecting the ossific nucleus
2	Lateral physeal damage
3	Central physeal damage
4	Total damage to the head and physis

Discussion

Re-dislocation following surgery in DDH should always be kept as one of the important complication, the rate of re-dislocation is approximately 8% [12-13]. Revision DDH surgery is associated with high rates of osteonecrosis of the femoral head, stiffness and persistent dysplasia [14]. Lack of care during positioning for spica application during postoperative period has also been reported⁵. Bhaskar et al have shown ossification of epiphysis as a factor in preventing re-dislocation [15].

In our study revision surgery was done for 12 hips with failed primary surgery for DDH, The follow up period ranged from 12-52 months. During the revision surgery, Transverse acetabular ligament was intact in 8 hips, Labrum limbus was inverted in 4 hips, Pulvinar tissue was removed in 11 hips, Femoral shortening was done in 6 hips, Derotation osteotomy was done in 5 hips and pelvic osteotomy was done in 11 hips.

Hsieh SM, Huang SC. In 32 patients (34 hips) with DDH who underwent repeat open reduction and other procedures, concluded that the main cause of failure of the primary open reduction of DDH was technical error [16].

Chidambaram S. et al reviewed 12 hips with failed open reduction surgery for DDH, they concluded that the most common cause for redislocation was inadequate exposure and failure to release the obstructing soft tissues around the hip, other bony factors include inadequate femoral shortening or correction of the femoral version [17].

Sankar WN. et al in a study comparing 22 patients with successful open reduction for DDH with 22 who required revision open reduction and they found that the risk factors of revision surgery include abnormal femoral version, femoral dysplasia, right-sided (or bilateral) involvement, greater pelvic width, and decreased abduction in the spica cast [5].

Conclusion

Risk factors for failed primary surgery for DDH mainly due to surgical errors in the primary surgery with incomplete removal of the different obstacles that prevent the concentric reduction, femoral shortening with accurate version must be done when needed and careful follow up of the spica cast post operatively.

References

1. Furnes O, Lie SA, Espehaug B, Vollset SE, Engesaeter LB, Havelin LI. Hip disease and the prognosis of total hip replacements. A review of 53 698 primary total hip replacements reported to the Norwegian Arthroplasty Register 1987–99. *J Bone Joint Surg Br.* 2000; 83: 579–586.
2. Pekmezci M, Yazici M. Salter osteotomy: an overview. *Acta Orthop Traumatol Turc.* 2007; 41(1): 37–46.
3. Thomas SR, Wedge JH, Salter RB. Outcome at forty-five years after open reduction and innominate osteotomy for late presenting developmental dislocation of the hip. *J Bone Joint Surg Am.* 2007; 89: 2341–2350.
4. Chmielewski J, Albinana J. Failures of open reduction in developmental dislocation of the hip. *J Pediatr Orthop Part B.* 2002; 11(4): 284–9.
5. Sankar WN, Young CR, Lin AG, Crow SA, Baldwin KD, Moseley CF. Risk factors for failure after open reduction for DDH: A matched cohort analysis. *J Pediatr Orthop.* 2011; 31(3): 232–9.
6. Ganger R, Radler C, Petje G, Manner HM, Kriegs-Au G, Grill F. Treatment options for developmental dislocation of the hip after walking age. *Journal of Pediatric Orthopaedics Part B.* 2005; 14(3): 139–50.
7. Gholve PA, Flynn JM, Garner MR, Millis MB, Kim YJ. Predictors for secondary procedures in walking DDH. *J Pediatr Orthop.* 2012; 32(3): 282–9.
8. Vitale MG, Skaggs DL. Developmental dysplasia of the hip from six months to four years of age. *The Journal of the American Academy of Orthopaedic Surgeons.* 2001; 9(6): 401–11.
9. Ponseti IV (1944) Causes of failure in the treatment of congenital dislocation of the hip. *J Bone Joint Surg* 26:775–792
10. Severin E (1941) Contribution to knowledge of congenital dislocation of hip joint: late results of closed reduction and arthrographic studies of recent cases. *Acta Chir Scand* 84 (suppl 63): 1–142
11. Kalamchi A, MacEwen GD (1980) Avascular necrosis following treatment of the hip. *J Bone Joint Surg Am* 62:876–888
12. Hsieh SM, Huang SC. Treatment of developmental dysplasia of the hip after failed open reduction. *J Formos Med Assoc.* 1998; 97: 763–9.
13. McCluskey WP, Bassett GS, Mora-Garcia G, MacEwen GD (1989) Treatment of failed open reduction for congenital dislocation of the hip. *J Paediatr Orthop.* 1989; 9: 633–9.
14. Kamath SU, Bennet GC. Re-dislocation following open reduction for developmental dysplasia of the hip. *Int Orthop.* 2005; 29: 191–194
15. Bhaskar A, Desai H, Jain G. Risk factors for early redislocation after primary treatment of developmental dysplasia of the hip: Is there a protective influence of the ossific nucleus? *Indian J Orthop.* 2016; 50(5): 479–85.
16. Hsieh SM, Huang SC. Treatment of developmental dysplasia of the hip after failed open reduction. *Journal of the Formosan Medical Association = Taiwan yi zhi.* 01 Nov 1998, 97(11):763–769.
17. Chidambaram S, Abd Halim AR, Yeap JK, Ibrahim S. Revision surgery for developmental dysplasia of the hip. *The Medical Journal of Malaysia.* 01 Jul 2005, 60 Suppl C:91–98.