

# Treatment of Developmental Dysplasia of the Hip: Short and Mid-term Outcome

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## ABSTRACT

**Objective:** To review the presentation and outcome of developmental dysplasia of the hip (DDH) cases in the last 6 years. **Methodology:** We retrospectively reviewed the presentation as well as short and mid-term outcome of 17 children (18 hips) with DDH seen and treated from 2004 to 2010. Treatment was either splinting with Pavlik harness, closed or open reduction depending on age at presentation and the individual needs of each patient. **Results:** The average age at presentation was 31.1 months, and the male to female ratio was 1:4.6. Six patients (35%) presented early (less than 6 months old) while 7 patients (41%) presented between 6 -24 months. In these 2 groups splinting or closed reduction under anaesthesia was initially utilized for treatment depending on age, and open reduction was used after failure of closed reduction and for those presented late. Average age at the time of closed reduction was 11 months, and 6 years for those underwent open reduction. The average period of follow up for all patients was 29.4 months. The final outcome was successful in 12 hips (66%) in 11 patients. Ten of these presented at less than 2 years old, in the other 6 hips in which there was failure, 50% presented after 3 years of age. **Conclusion:** Late presentation of DDH is still common in Malaysia, which necessitates more complex management and more frequent occurrences of unfavourable results.

### Key Words:

*Developmental Dysplasia of the Hip, DDH*

## INTRODUCTION

Reported incidence of developmental dysplasia of the hip (DDH) in Malaysia varies from 0.7/1,000 to 12.2/1,000 live births according to available publications<sup>1,2</sup>. Despite efforts to identify and treat all cases of DDH soon after birth, initial presentation after the age of 6 months or later is still quite common. Modality of treatment and rate of success differ according to age at diagnosis. The Pavlik harness is the standard treatment for children presenting within the first few months of birth, but more extensive surgical intervention is required for children presenting at older than six months<sup>3,4,5</sup>.

In many developed countries, effective screening of DDH and increased awareness has reduced the number of children with late presentation<sup>6</sup>. However, late presentation long after the age at which babies learn to walk remains very common in developing countries and is frequently reported in developed countries<sup>7,8,9</sup>. As there are few recent publications on the incidence and epidemiology of DDH, we decided to conduct this retrospective review of children treated for this condition at a single institution.

## MATERIALS AND METHODS

We retrospectively reviewed the records of all DDH patients presented to University of Malaysia Specialist Centre from 2004 to 2010. Patients with teratological, paralytic, septic, or secondary dislocation were excluded. We reviewed the medical records of all patients including radiographs taken at presentation, after treatment and on latest follow up. In a few patients, additional information was obtained by follow-up phone contact.

All patients presented prior to the age of 4 months were initially treated by splinting with Pavlik harness (PH). Those presenting at age 5 months to 2 years were treated by closed reduction under general anaesthesia and hip spica casting (CRHS). Open reduction and hip spica casting application (ORHS) was performed via a modified anterolateral (Smith-Petersen) approach if CRHS failed to reduce the hip or if results were unstable or needed a high degree of abduction beyond the safe zone. Proximal femoral osteotomy was sometimes combined with pelvic osteotomy for hips in which OR alone was not enough to gain concentric and stable reduction or that needed excessive degrees of internal rotation; this is the usual finding in children presenting at older than two years of age. After closed or open reduction, hips were immobilized in a bilateral spica cast with the hips in 60 to 80 degree flexion and approximately 60 to 80 degree abduction based on the safe zone assessed during surgery. The hip spica was changed after four to six weeks with the patient under general anaesthesia. Immobilization was maintained for an average of three months. All patients were followed up at the clinic.

Table I: Summary of patient information and treatment outcome

NO.	INITIAL	AGE PRES #	SEX	SIDE	TREAT 1	TREAT 2	FU #	LIMP	LLD	ABD	AI/ (CEA)	AVN	REDUCTION @
1	LCK	0M	M	L	PV	-	48	N	N	N	20	N	R
2	RAS	0M	F	R/L	PV	-	7	N	N	N	17/16	N	R
3	CCH	0M	F	R	PV	ORHS	60	Y	N	Y		N	D
4	EOY	5M	M	L	CRHS	CRHS	19	N	N	N	21	N	R
5	SAP	5M	F	L	CRHS	CRHS	31	Y	Y	Y	34	Y	S
6	KLA	5M	F	L	CRHS	ORHS	13	N	N	N	29	N	R
7	EGZY	12M	F	L	CRHS	-	43	Y	N	Y		N	S
8	TZY	12M	F	L	CRHS	-	14	N	Y	N	30	N	R
9	LXY	16M	F	L	ORHS	-	48	N	N	N	17	N	R
10	NA	16M	F	L	CRHS	-	26	N	N	N	22	N	R
11	TXW	18M	F	R	CRHS	ORHS	12	N	Y	N	45	N	R
12	CYG	19M	F	L	CRHS	-	8	N	N	N	23	N	R
13	LSH	20M	M	L	ORHS	-	52	N	N	N	35	N	R
14	CLT	5Y	F	R	ORHS (FO)*	-	15	N	N	N	19	N	R
15	HJX	6Y	F	L	ORHS (FO)	-	18	Y	Y	Y		N	D
16	ELS	9Y	F	R	ORHS (FO)*	-	48	Y	Y	Y	(-10)	N	S
17	SMY	13Y	F	R	ORHS(FO,PO)	-	38	Y	Y	Y	(35)	N	S

- # Measurement in months (M) or years (Y)
- \* Previously treated elsewhere with open reduction
- AGE PRES Age at presentation in months(M) and years (Y)
- TREAT 1 Initial treatment in this institution
- TREAT 2 Subsequent treatment in this institution
- FU Follow up period
- LIMP Limping
- LLD Limb length discrepancy
- ABD Limited abduction
- AI / CEA Acetabular index / (Center edge angle)
- AVN Avascular necrosis
- @ R: Concentricly reduced; S: Subluxated; D: Dislocated
- FO Femoral Osteotomy
- PO Pelvic Osteotomy

Additional procedures were indicated when residual subluxation or frank dislocation were noted after treatment. At the final evaluation, the clinical and radiological findings were reviewed. Persistent dislocation or subluxation at this stage was considered to be treatment failure. Clinical assessment included analysis of gait (limping), limb length discrepancy (LLD), the range of hip motion especially abduction, presence of avascular necrosis (AVN), acetabular index (AI) and centre-edge angle (CEA) based on most recent radiological imaging.

**RESULTS**

Twenty-three children were diagnosed with DDH during the study period. The families of five of these children decided to seek treatment in other (public) hospitals while one child from overseas returned home for further management after surgery. Seventeen children (14 girls and 3 boys) were included for evaluation in the study (one child had bilateral hip involvement). There were 12 left and 6 right hips. Ten children were the first child in the family. The average age at time of presentation for treatment was 31.1 months; 3 children presented before 4 months, 10 presented between 5 to 24 months, and 4 at more than 2 years old. (Table I).

A PH was used for patients presenting at 4 months of age or younger. Three children who presented soon after birth and

were treated with a PH; one needed further intervention with CRHS at 8 months of age and then ORHS at 15 months. CRHS was performed as initial treatment for 8 children who presented after the age of 5 months (presentation was at an average age of 11.1 months; range 5-19 months). CRHS treatment failed in 4 patients, of whom 2 eventually required repeat CRHS, while 2 underwent ORHS. ORHS was utilized as the first procedure for 6 patients at an average age of 6 years (range 16 months to 13 years). Two of these patients had previous treatment elsewhere at an earlier age (both underwent surgery, most probably ORHS) but subsequently defaulted treatment. Concomitant femoral or acetabular procedures were required in 4 patients, 3 of whom needed only femoral osteotomy and femoral and Chiari pelvic osteotomy for one patient.

Average follow-up for all children was 29.4 months (range 7 months to 5 years) following surgery. Twelve hips in 11 patients (66%) achieved concentric reduction with minimal or no physical abnormalities (average acetabular index (AI) of 25.5°; range 16 – 45 degrees). There were 6 hips with subluxated or dislocated hip at last review. Three out of 4 children who presented after 2 years fell in this group.

The first two cases suffered re-dislocation (after being operated at 6 and 9 years of age by open reduction and femoral osteotomy). A third case developed avascular necrosis of the femoral head (after 2 attempts of closed reduction under

general anaesthesia at 5 and 11 months). The fourth ended with subluxation after a single attempt of CRHS at 12 months of age. The fifth case was treated initially with a PH then underwent CR at 8 months followed by open reduction at 15 months but unfortunately the hip subluxated again. The last case presented at 13 years old and underwent a salvage procedure (femoral and pelvic Chiari osteotomy).

## DISCUSSION

Of the 17 children seeking treatment, 14 (82.4%) presented after age of 4 months. This late presentation is a problem also faced by orthopaedic surgeons in other developing countries<sup>9,10</sup>. There are no other reports of delayed presentation in Malaysia for comparison, but it is reasonable to believe that this is a common problem. Although 2 cases had received earlier treatment elsewhere, the parents decided to default treatment obtained elsewhere following failure of initial treatment; they then decided to continue further management at the author's institution. This also reflects the ignorance or lack of information about the condition of DDH. This condition occurs more commonly in females and predominantly involves the left side as reported in the literature<sup>1,2,6,11</sup>.

Treatment options that utilized are similar to recommendations seen in the literature although there is more variability in treatment types for those at an older age<sup>3,4,5</sup>. Splinting with a Pavlik harness was used in patients with reducible dislocations who presented during the first few months of life. After the age of 5 months, we generally offered CRHS and utilized open reduction if close reduction was not achieved under anaesthesia. Open reduction with or without femoral or/and pelvic osteotomy was performed in patients older than 2 years old regardless of the operative finding.

The overall success rate at the last follow up was 66% (12 hips in 11 patients). Variable success rates have been reported in the literature<sup>3,5,12</sup>. CRHS was performed initially for 8 hips in patients with an average age of 11 months

(range, 5-19 months) and the procedure failed in 4 hips (50%). In two patients, CRHS was repeated, while in the other 2, we performed ORHS. One child who underwent 2 CRHS procedures developed avascular necrosis. Failure of CR has been reported to be between 21-58% with avascular necrosis at a rate of 5.9-12%; these results are closely related to the age of presentation<sup>5,12</sup>. In the present study, the rate of success for CR approximated reports in the literature. Therefore, we recommend that physicians should be open to considering open reduction for patients especially those who presented at a later age.

In the present study, the rate of open reduction performed as part of initial DDH management was 35% (6) for patients at an average age of 6 years of age. Of these, 50% (3 patients) had successful reduction. The results of OR for DDH in the literature are variable, thus considering the number and the age of patients in the present study, our results are comparable to other studies<sup>5,12,13</sup>. Successful stable reduction was obtained in 66% of patients with an average AI of 25.5° (range 16 to 45°) at final evaluation. Ten of these children presented at an age below 2 years, an age related outcome similar to reports in other DDH studies<sup>3,5,12,13</sup>.

The most important limitation in this study is the small number of cases during the study period. Since there is no national screening program for DDH in Malaysia, there does not exist reliable data on the incidence of DDH; there are only 2 prospective studies reporting on DDH in live births (published in 1973 and 1989), and these were based on a single hospital<sup>1,2</sup>. Based on the age pattern of presentation in this study, we expect that there are many individuals with DDH in which the parents never seek treatment.

## CONCLUSIONS

Late presentation of DDH is still common in developing countries. This problem necessitates more complicated management and a larger economic burden on the community. The outcomes of DDH management are related to age of the patient at presentation.

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