

Surgical Treatment of Congenital Hip Dislocation After the Age of Three Years by Open Reduction and Femoral Varus Derotation Osteotomy

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Abstract

During the period from 1985 to 1991, 24 dislocated hips in 16 patients all above the age of 3 years were treated surgically in the New Children Hospital and Kasr El-Aini Hospital Cairo University. All patients had been treated by open reduction and femoral varus derotation osteotomy. The average age at operation was 4.5 years. The follow up period ranged from 1.5 to 6.5 years with an average 3.5 years. According to the radiographic classification system of Severin, there were 12 hips rated as grade I, 6 grade II, 4 grade III and 2 hips as grade IV. Clinically, 16 hips were excellent, 4 hips rated as good, 2 fair and 2 poor, following Mc Kays criteria of clinical grading. Avascular necrosis developed in 3 out of the 24 hips. The follow up period was not long enough to predict the ultimate fate of many of these hips. However we are encouraged by the generally good radiographic results.

Introduction

CONGENITAL dislocation of the hip (CDH) is one of the commonest congenital deformities of the locomotor system. There are significant difference in the incidence of CDH among various racial and

ethnic populations.

The diagnosis of this condition must be vigorously sought during the first day of life if we are to avoid major surgery at too late a date and possibly life long disability of these patients.

Although there has been an increased emphasis on the detection of CDH in the newborn nursery, it is not always possible to make the diagnosis shortly after birth and patients with this problem are still seen for the first time after the child has started to walk [1].

CDH in older age group is difficult to treat because of adaptive shortening of the extra-articular soft tissues, acetabular dysplasia, capsular constriction, increased femoral anteversion and fixed inversion of the limb. The possibility of obtaining a satisfactory closed reduction diminishes after the child has started to walk [2].

Many surgical procedures have been described for delayed treatment of CDH. The therapeutic options for these patients included open reduction and capsulorrhaphy alone or in conjunction with acetabular redirection procedures, femoral derotational and or varus osteotomies or a combined acetabular and femoral procedures.

This paper presents our experience in treating 24 hips in 16 patients with CDH presented after the age of 3 years. All have been treated by open reduction, capsulorrhaphy and femoral derotational osteotomy.

Material and Methods

The material of this series comprised 24 hips in 16 patients with CDH. All had been seen and surgically treated in the

New Children Hospital and Kasr El-Aini Hospital, Cairo University in the period between 1985 to 1991.

Patients with neurological disorder, identifiable syndromes or teratogenic hip dislocations were not included in this study.

From the 16 patients, 8 were unilateral and 8 bilateral. There were 13 girls and 3 boys. Thirteen hips were dislocated in on the left side and 11 on the right side. The average age at operation was 4.5 ys. range (3-9 years).

The follow up period ranged from 1.5 to 6.5 years with an average 3.5 years.

All patients were assessed clinically and radiologically pre-operatively.

Physical examination included gait, hip range of motion, lower limb length discrepancy, hip abduction strength and the presence or absence of trendelenberg sign.

Radiological examination included anteroposterior and abduction internal rotation view where the initial status of the hip, the center-edge angle, the acetabular index, the neck shaft angle and the adequacy of reduction were assessed.

CT-scan was used to complement conventional radiographs of the hip.

All patients were subjected to adductor tenotomy and skin traction for 2-3 weeks prior to surgery.

At surgery all patients had an open reduction through an anterior approach.

Through a separate lateral approach, the proximal end of the femur was exposed and a transverse osteotomy was made in the subtrochanteric region below the lesser trochanter. The proximal fragment was fixed in the corrected position and then derotation was achieved by externally rotating the distal fragment in relation to the proximal fragment.

The osteotomy was fixed with 3.5 dynamic compression plate that was removed after bony union.

In 4 patients femoral shortening was performed where 2-3 cm was resected at the osteotomy site.

In cases of bilateral involvement, the other hip was approached 3 weeks after the first operation.

After treatment, a hip spica cast was applied for 6 weeks, postoperatively and then an abduction brace for another 6 weeks.

Surgical Findings :

In all patients the most frequent observation was a tight transverse acetabular ligament and inferior capsule that blocked reduction until released.

The limbus was rolled over the rim of the acetabulum along its posterior and superior borders. It was not excised in any case but radial incisions were made to allow easy reduction.

In most cases the iliopsoas tendon compresses the capsule creating a narrow

isthmus. Lengthening of the tendon was performed to facilitate lowering of the femoral head.

It was necessary to excise the ligamentum teres which was usually elongated and enlarged.

The acetabulum was filled with fibrofatty tissue interfering with optimum seating of the femoral head. We used to curette it down to the articular cartilage.

Operative Complications :

- There were no intraoperative or postoperative complications.
- No deaths or deep wound infections.
- All patients were happy with the cosmetic appearance of surgical scars.

Results

The shortest follow up period was 1.5 years and the longest was 6.5 years. Patients were examined clinically and radiologically at the follow up visits.

The clinical results (Table 1) were assessed by using a modification of the McKay's criteria [3] who classified their results into 4 grades: Excellent, good, fair and poor accordingly our final clinical evaluation were: 16 of the hips were rated as excellent and 4 as good.

Two hips had a significant limb and +ve Trendelenberg

Redislocation occurred in 2 hips which required subsequent Salter osteotomy.

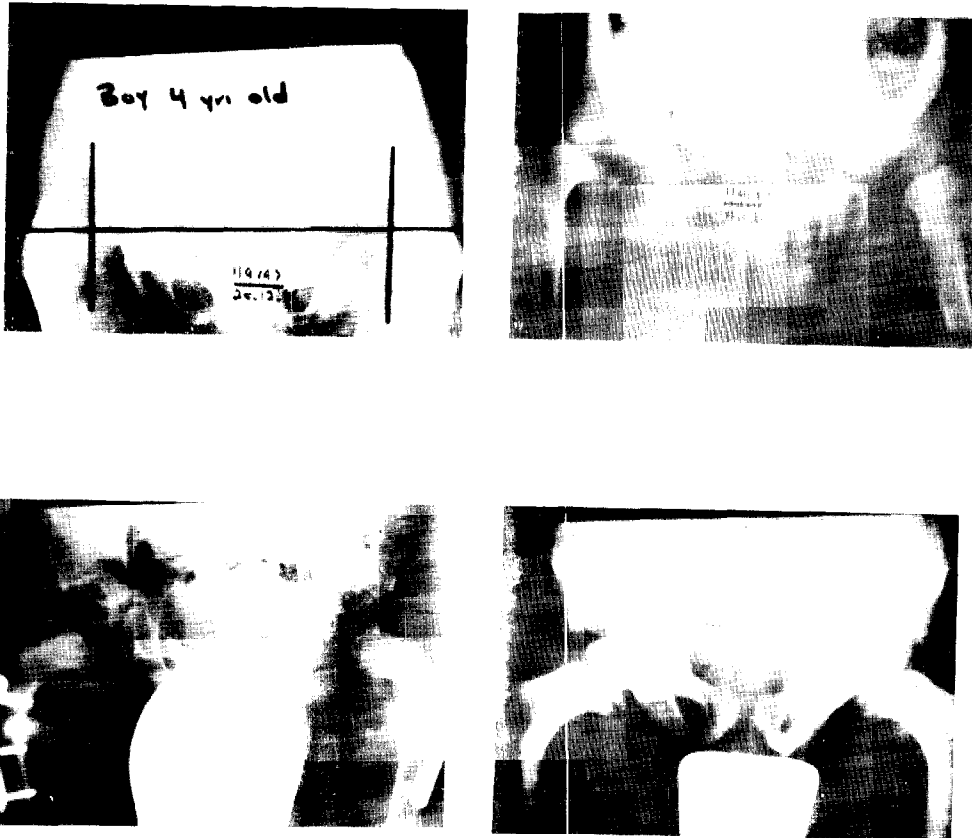


Fig. 1:

- a & b: Radiograph showing bilateral DH in 4 years female
- c: Open reduction and derotation varus osteotomy was performed on both sides with six weeks apart.
- d: After 3,5 years follow up. Clinical results were good on both sides and grade II radiological Severin's grade.

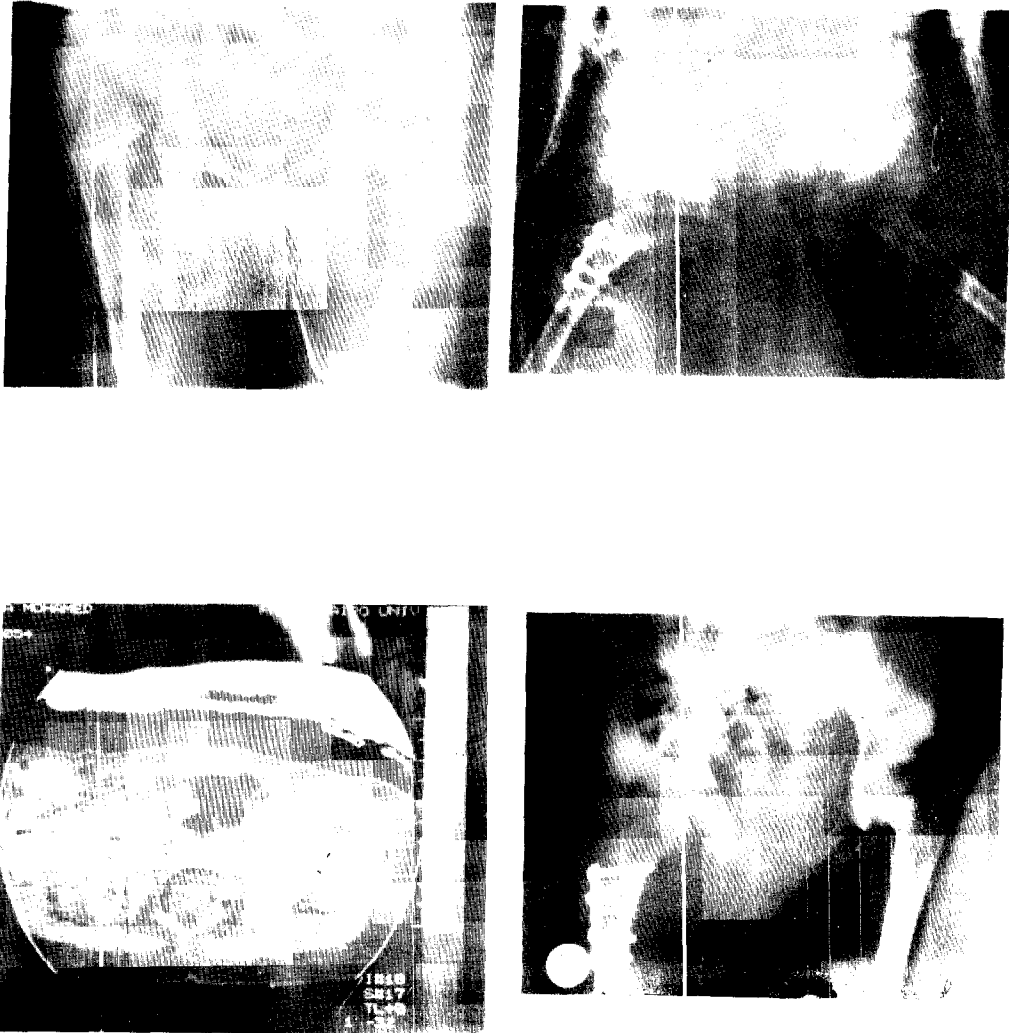


Fig. 2:
a: AP radiograph of 6 years old female with right CDH.
b: Immediate post-operative radiograph.
c: CT scan showing adequate reduction.
d: Six months follow-up.

Table (1): Clinical Results

| Clinical Evaluation | No. of hips |
|---------------------|-------------|
| Excellent | 16 |
| Good | 4 |
| Fair | 2 |
| Poor | 2 |

Table (2): Radiological Grading.

| Radiologic Grading | No. of hips |
|--------------------|-------------|
| Grade I | 12 |
| Grade II | 6 |
| Grade III | 4 |
| Grade IV | - |
| Grade V | - |
| Grade VI | 2 |

Radiological Evaluation:

Radiologic assessment was made by using Severin's criteria [4] :

Grade I: Normal hip CE angle > 15

Grade II: Mild deformity of head or neck. Hip deeply and concentrically reduced. CE angle as grade I.

Grade III: Moderate deformity CE angle 10-15

Grade IV: Subluxation

Grade V: Head articulating with a secondary acetabulum in the upper part of the original acetabulum

Grade VI: Redislocation

At the final review, 12 of the hips (50%) were rated as Severin grade 1, 6 (25%) were grade 11.4 hips grade 111 and 2 as grade VI.

Avascular Necrosis (AVN):

By the criteria of Salter [5]. There were 3 hips (12.5%) with signs of avascular necrosis.

Acetabular Index:

The preoperative acetabular indices ranged from 30 to 55 degrees with an average 40 degrees.

On the last examination, the acetabular indices ranged from 15 to 30° (average 20°).

CE Angle :

Pre-operatively, the center-edge angle was either very small or even of negative value. The average CE angle on the final follow up was 22 degrees (ranged from 12-30°).

Neck-Shaft Angle :

The mean pre-operative neck-shaft angle was 147(130-160°) at the final radiologic review the mean neck-shaft angle was 15 (range 95-125°).

Discussion

The management of older children with congenital hip dislocation, delayed either because of late presentation or by previous and unsuccessful surgery, remains difficult and controversial.

There are three main problems connected with high dislocation in older children; lowering of the femoral head, reduction and centering of the head in the acetabulum and covering the head with a broad acetabular roof to assume stability.

The pre-operative traction is mainly intended to avoid avascular necrosis of the femoral head. Those who advocate the use of traction disagree whether skin or skeletal traction should be employed and whether traction at home or at hospital is preferable. There is also controversy regarding the amount of weight, the direction of pull and the duration of traction.

In our series we made a compromise, limiting traction time to three weeks and employing adductor tenotomy.

Skeletal traction as advocated by Buchanan et al. [6] was used once in a nine years old girl with high unilateral dislocation.

Somerville [7] found that the inverted limbus reduces the size of the acetabulum so that any attempt to force a reduction may cause considerable compression of the femoral head. He advised complete excision of the limbus to allow easy

reduction.

In our series, the limbus was not excised in any case, only radial cuts were made if it was inverted to allow reduction without pressure. Excision of the limbus may be a major factor in the early loss of reduction and the high rate of osteoarthritic changes [8].

Many authors considered that varus rotational femoral osteotomy will influence acetabular development most powerfully when it is performed early in life.

Lloyd-Roberts [9] believed that four years appear to be the critical age after which femoral osteotomy alone can not be relied on to stimulate normal acetabular development. He reported satisfactory acetabular development in nine out of eleven patients (over 3 years), five of which had acetabular angles of 21° or less.

Tonnis [10] believed that only up to the age of two years should femoral osteotomy be used alone, above this age he advised combining acetabuloplasty with femoral osteotomy. Also Salte [5] recommended that innominate osteotomy should be performed for dislocation under the age of six years.

In this series the preoperative acetabular angle ranged from $30-55^\circ$ with an average of 40° , at the final follow up the acetabular angle ranged from 15 to 30° (average 25°) which indicated a satisfactory acetabular development.

Gibson and Benson [8] defined an acetabular angle greater than 27° as indication for poor results.

Two cases in our series had poor results, both were above 7 years old and were redislocated because of shallow acetabulum and required Salter Osteotomy.

Correction of femoral neck anteversion by derotational osteotomy after including a varus component helped to maintain a concentric reduction and restoring the biological stimulus that encourage the acetabulum to develop normally during further growth. Failure to maintain congruity is the only significant hazard likely to affect the results.

Avascular necrosis remains a significant complication of the treatment of CDH. It is important that any method of treatment should minimize the incidence of AVN.

In our series avascular necrosis developed in 3 hips (12.5%). Their average age at operation was 6.5 years.

Gage and Winter [11] found a positive correlation between the incidence of AVN and increasing age, inadequate pre-reduction traction and extreme positions of immobilization.

Powell et al. [21] reported 22% incidence of AVN in 18 hips having open reduction with femoral osteotomy and reported higher rate (46.7%) in patients having open reduction with Salter's Oste-

otomy.

Ashley et al [13] recommended femoral shortening in older children, we did femoral shortening in 4 patients. It has significantly fewer long term complications, it decreases tension, facilitate reduction and avoid AVN.

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