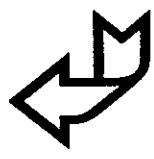
RESULTS



RESULTS

The overall radiographic results were classified as satisfactory (excellent or good) in 30 hips (91%) and as unsatisfactory in 3 hips (9%). Clinically, 29 hips (88%) had an excellent or good result and 4 hips (12%) had fair result.

The age distribution of the patients at the time of operation is shown in Diagram (1).

The age at follow-up was from 2 years and 6 months to 10 years, with a mean of 5 years. These patients were followed for a mean of 2.3 years (range 10 months to 4 years and 8 months). The Kirschner wire was removed between 6 weeks to one year from the date of the operation (mean 4.2 months). However, it was not removed yet in Case (17).

RADIOGRAPHIC RESULTS:

Of the 33 hips, 16 hips (49%) had an excellent result, 14 hips (42%) had a good result, 2 hips (6%) had a fair result and only one hip (3%) had a poor result.

Of the 16 hips which were 4 years old or more at follow-up, 9 hips (56%) were classified as Group I, 6 hips (38%) as Group II, and one hip (6%) as Group III according to the Severin classification. The mean CE angle of these cases was 30° (range 15-50°). Immediately postoperatively, it was 25.5° (range 20-32°).

The Shenton line was broken in two cases at the last follow-up.

Eccentric position of the ossific nucleus of the femoral head was evident in 4 hips (12%). The position persisted during follow-up till the last follow-up in all cases, except one case (Case no. 3), which showed normal position after 4 years from the operation.

The acetabular index immediately postoperatively ranged from 18-34° (mean 24°). At the last follow-up, it improved to a mean of 18° (range 8-32°). The average improvement in acetabular index from preoperative to the last follow up was therefore 17°.

The difference between the immediate postoperative and last follow-up acetabular index was statistically significant ($P < 0.01$) using the Student 't' test.

SIDE OF THE OPERATION AND RESULTS:

The operation was done on the left side in 13 cases, on the right side in 10 cases and bilaterally in 5 cases. The relationship between the side of the operation and the results is shown in Tables (5) and (6).

TABLE (5)

RADIOLOGICAL RESULTS AND SIDE OF THE OPERATION

Side of operation	Number of hips operated upon	Radiological results			
		Excellent	Good	Fair	Poor
Left	13	6	6	-	1
Right	10	4	5	1	-
Bilateral	10	7	2	1	-

TABLE (6)

CLINICAL RESULTS AND SIDE OF THE OPERATION

Side of operation	Number of hips operated upon	Clinical results			
		Excellent	Good	Fair	Poor
Left	13	11	1	1	-
Right	10	5	3	2	-
Bilateral	10	7	2	1	-

RESULTS AND PREVIOUS TREATMENT:

The patients were grouped preoperatively according to previous treatment:

Group I:

Patients who received no previous treatment (28 hips).

Group II:

Patients who received previous treatment (5 hips).

The correlation between the results and previous treatment is shown in Tables (7) and (8).

Excellent and good radiographic results were found in 27 (96%) out of 28 hips with no previous treatment. In Group II, 3 hips (60%) were classified as good or excellent results.

TABLE (7)

RADIOLOGICAL RESULTS AND PREVIOUS TREATMENT

Previous treatment	Number of hips	Radiological results			
		Excellent	Good	Fair	Poor
None	28	15	12	-	1
Closed reduction & derotation osteotomy ...	1	1	-	-	-
Open reduction ...	3	-	2	1	-
Open reduction & derotation osteotomy ...	1	-	-	1	-
TOTAL (of cases who received previous treatment)	*5*	*1*	*2*	*2*	-

TABLE (8)

CLINICAL RESULTS AND PREVIOUS TREATMENT

Previous treatment	Number of hips	Clinical results			
		Excellent	Good	Fair	Poor
None	28	21	4	3	-
Closed reduction & derotation osteotomy ...	1	1	-	-	-
Open reduction ...	3	1	2	-	-
Open reduction & derotation osteotomy ...	1	-	-	1	-
TOTAL (of cases who received previous treatment)	5	2	2	1	-

AGE AT OPERATION AND RESULTS:

The age of the patient at operation was less than 4 years old for 27 hips (82%). The relationships between the results and age at operation (below or above 4 years old) are shown in Tables (9) to (11).

TABLE (9)

RADIOLOGICAL RESULTS IN THE TWO AGE GROUPS

Age group	Number of hips	Radiological results			
		Excellent	Good	Fair	Poor
<4 years old	27	15	10	1	1
>4 years old	6	1	4	1	-

TABLE (10)

CLINICAL RESULTS IN THE TWO AGE GROUPS

Age group	Number of hips	Clinical results			
		Excellent	Good	Fair	Poor
<4 years old	27	22	4	1	-
≥4 years old	6	1	2	3	-

TABLE (11)

RADIOLOGICAL RESULTS ACCORDING TO SEVERIN

Age group	Number of hips	Class (Severin classification)					
		I	II	III	IV	V	VI
<4 years old	10	8	2	-	-	-	-
≥4 years old	6	1	4	1	-	-	-

In patients younger than 4 years old at operation, fair and poor radiographic results comprised 7% of hips, while they were 17% in older patients. According to Severin, there was only one Class I hip in Group II (17%). However, 8 hips (80%) were classified as Class I from patients who were less than 4 years old at operation. Clinically, 26 hips (96%) of the younger group were classified as an excellent or good result, whereas 3 hips (50%) of the older group were classified as an excellent or good result.

The difference of the acetabular index between the two age groups at the last follow-up was statistically insignificant ($P > 0.05$).

PREOPERATIVE ACETABULAR INDEX AND RESULTS:

Preoperatively, the acetabular index was less than 35° in 18 hips (55%), between 35° and 40° in 12 hips (36%), and more than 40° in 3 hips (9%). The results in those three groups are discussed in Tables (12) and (13).

TABLE (12)

PREOPERATIVE ACETABULAR INDEX AND RADIOGRAPHIC RESULTS

Acetabular index	Number of hips operated upon	Radiographic results			
		Excellent	Good	Fair	Poor
<35°	18	9	9	-	-
35-40°	12	7	3	2	-
>40°	3	1	1	-	1

TABLE (13)

PREOPERATIVE ACETABULAR INDEX AND CLINICAL RESULTS

Acetabular index	Number of hips operated upon	Clinical results			
		Excellent	Good	Fair	Poor
<35°	18	12	4	2	-
35-40°	12	10	1	1	-
>40°	3	1	1	1	-

Excellent and good radiographic results were found in 100% of cases with preoperative acetabular index less than 35°, 83% of cases with acetabular index between 35° and 40°, and 67% when the acetabular index was more than 40°.

The difference between the acetabular index at the last follow-up between patients with preoperative acetabular index below 35° and those between 35 and 40° was statistically insignificant ($P > 0.05$).

FINDINGS DURING OPEN REDUCTION:

There was round ligament hypertrophy in 23 hips (70%) which needed excision. The limbus was excised in one case (case no. 32) because it was blocking concentric reduction. The transverse acetabular ligament was enlarged and filling the inferior part of the acetabulum in two cases, and required incision.

ADDITIONAL PROCEDURES AND RESULTS:

An additional procedure (shelf in 3 cases and femoral shortening varus osteotomy in 3 cases) was performed in 6 hips (18%), concomitant with open reduction and Salter osteotomy. Results of these cases, with or without additional procedures, are shown in Tables (14) and (15).

TABLE (14)

ADDITIONAL PROCEDURES AND RADIOGRAPHIC RESULTS

Additional procedure	Number of hips	Radiographic results			
		Excellent	Good	Fair	Poor
None	27	13	11	2	1
Shelf	3	2	1	-	-
Femur shortening & varus derotation osteotomy	3	1	2	-	-

TABLE (15)

ADDITIONAL PROCEDURES AND CLINICAL RESULTS

Additional procedure	Number of hips	Clinical results			
		Excellent	Good	Fair	Poor
None	27	20	4	3	-
Shelf	3	2	1	-	-
Femur shortening & varus derotation osteotomy	3	1	1	1	-

There was no fair or poor radiographic results in the cases which required concomitant additional procedures. Clinically, 24 hips (89%) had excellent or good results in cases with open reduction and Salter osteotomy alone, while 5 hips (83%) had excellent or good results among cases which required additional procedures.

SUBSEQUENT PROCEDURES:

Four subsequent procedures were required: A repeat open reduction and varus derotation femoral osteotomy for redislocation diagnosed 7 months after the operation, and varus derotation femoral osteotomy for 3 cases to correct the increased valgus and antetorsion of the femoral neck, which led to progressive subluxation. The operations were respectively performed 7 months, one year and 6 months, 3 years and 1.5 months, and 10.5 months postoperatively.

Eccentric position of the ossific nucleus of the femoral head was evident in the three cases which had varus derotation femoral osteotomy. One of these cases had the same procedure concomitant with the primary procedure.

RELATION BETWEEN CLINICAL AND RADIOLOGICAL RESULTS:

The clinical results were the same or - in some cases - better than the radiological results, except in two cases (6%), as shown in Table (16).

TABLE (16)

CORRELATION BETWEEN RADIOLOGIC AND CLINICAL RESULTS

Clinical results	Radiological results: Excellent Number	%	Good Number	%	Fair Number	%	Poor Number	%
Excellent	16	100	7	50	0	-	0	-
Good	-	-	5	36	1	50	0	-
Fair	-	-	2	14	1	50	1	100
Poor	-	-	0	-	0	-	0	-
Total	16	100	14	100	2	100	1	100

COMPLICATIONS:

There was no cases of infection or sciatic nerve palsy reported.

There was only one case of redislocation (3%), which was treated by revision of the open reduction and varus derotation femoral osteotomy. Radiological examination 3 months post-operatively revealed collapse of the graft.

Avascular necrosis of the femoral head was evident in 4 cases (12%) postoperatively. Contralateral avascular necrosis occurred in one of these cases (case no. 11). Bilateral fragmentation of the ossific nucleus of the femoral head was the evidence of avascular necrosis.

Coxa magna developed in one case (case no. 2), and coxa vara in another case (case no. 32), but they were considered as signs of avascular necrosis.

The mean age at operation for the cases which developed avascular necrosis was 5.4 years (range one year 4 months to 8 years), while it was 2.3 years (range one year 4 months to 7 years) for cases with no avascular necrosis.

Clinically, 3 of 4 cases had good results, and one case had a poor result. Three cases had been classified as Class II and one case as Class III Severin classification.