3-1969

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Slipped Capital Femoral Epiphysis

(Follow-up Study)

C. Leslie Mitchell, M.D.*

Epiphyseolysis, or slipping of the capital femoral epiphysis, remains a controversial problem from the standpoint of etiology and treatment. This report is limited to results of treatment of severely slipped epiphyses at the Henry Ford Hospital from 1937 to 1967. The surgical technique and postoperative care are described. Of a total of 137 hips treated surgically in this period, 38 were severe, requiring transcervical osteotomy and internal fixation. The follow-up results of these 38 cases are reported.

The problem of satisfactorily treating the severely slipped capital femoral epiphysis has been universally experienced by orthopaedic surgeons for many years. No one therapeutic method has proven to be uniformly successful. This report is on our experience with open reduction and transcervical osteotomy on cases of severe slipping of the capital femoral epiphysis performed in the period 1937 to 1967 with follow-up results.

It has been evident to all observers that the result in untreated cases of severe slipping of the epiphysis are deplorable. These hips without treatment invariably result in pain and limitation of motion due to the development of degenerative arthritis. This is due to a lack of reciprocal relationship between the femoral head and acetabulum.

In an attempt to improve the neck — head — acetabulum relationship, a number of procedures have been recommended and performed by many surgeons over the years. In general, these procedures have consisted of forceful manipulation, persuasive reduction by traction, transcervical osteotomy, osteoplasty, and subtrochanteric osteotomy.

The serious complications that had accompanied the original procedures of forceful manipulation and transcervical osteotomy were avascular necrosis of the femoral head and/or loss of the joint space due to cartilaginous destruction. As a result, today these two methods of treatment have been largely abandoned in most centers.

Ideally, transcervical osteotomy with correction at the site of deformity would appear to be the most logical surgical approach to the problem. However, as has been reported by many observers, this procedure can compromise the circulation to

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the femoral head with resulting avascular necrosis. Martin in 1948 reported 25% poor results, Badgley et al. in 1948 — 34%, Hall in 1957 — 37% and Wilson and co-workers in 1965, reviewing 251 cases in the world's literature, reported 35% poor results.

On the other hand, Compere reported in 1950 gratifying results in 18 of 20 patients with severe slipping of the capital femoral epiphysis treated by wedge transcervical osteotomy. In his paper he emphasized that great care be used to avoid injury to the posterior capsular attachment and retinacular vessels. Also, he emphasized that the epiphysis be placed in a valgus position with relation to the femoral neck.

Our experience with transcervical osteotomy performed in 38 hips in 38 children from 1937 to 1967 is reported here. We make no claim that this is the ideal method of treating these cases. A long term follow-up investigation would be of value in assessing results. Because our early results were encouraging and somewhat at variance with those of other centers, the author decided to continue with the procedure despite admonitions and the poor results being reported by many authors in the world's literature.

None of our analyzed cases was less than one year post-surgery; the longest follow-up was 25 years. Cuneiform osteostomy was performed only in those cases presenting severe slipping of one-third or more of the diameter of the head — posteriorly, inferiorly, or both.

Surgical Procedure

In all cases, the surgical approach was by an anterior Smith-Peterson incision (Fig. 1). After opening the hip capsule by a T-shaped incision in this procedure, the thigh is adducted and internally rotated to bring into view the prominence, anteriorly and superiorly, of the juxta-epiphyseal portion of the neck. Often it is difficult to obtain visualization of the head because of its displacement posteriorly and inferiorly. A cuneiform osteotomy is then performed — with the base about one-half inch in width and including the prominence. Two wide osteotomes are used — one at each osteotomy site — and they are carefully driven across the neck of the femur so that they converge about one-quarter inch from the inferior posterior cortex of the neck. This wedge-shaped segment is then removed. Often it is found to include a small portion of the epiphyseal plate at the superior portion of the base of the wedge. However, no attempt is made to remove the entire epiphyseal plate. The thigh is then brought into abduction, easily fracturing the inferior cortex, and the wedge is closed. This brings the neck into good approximation with the head. Occasionally it is necessary to gently pry the head into improved position with the neck to assure good valgus relationship.

A second incision is then made over the greater trochanter and two Venable (Vitallium) screws are inserted, transfixing the head and neck in their corrected position. X-rays are taken during this phase of the operation to insure good positioning of the screws. Tri-flanged Smith-Peterson nails were used originally but later were
Slipped Femoral Epiphysis

Figure 1
Exposure of hip illustrating the use of two wide osteotomes in performing the cuneiform osteotomy at the juxta-epiphyseal junction.

discontinued because of the difficulty of insertion and danger of displacement of the capital epiphysis.

Postoperative care consists simply of bed rest — usually without traction — for seven to ten days, followed by ambulation with crutches. No weight bearing is permitted on the operated side until progress x-rays show satisfactory healing, which usually takes three months. Crutches may then be discarded and full weight bearing permitted. The patient is placed on a restricted program of activity until approximately one year has elapsed from the time of surgery.

Classifying Results
To classify the results in this series, Shepherd’s method of assessing the results of arthroplasties was adapted with modifications for much younger patients. Consideration was given to range of motion, pain on motion, functional activity, and the patient’s own assessment. X-ray evaluation of the long term result was patterned after the method described by Hall. In each test (that is: pain, movement, functional activity, patient’s assessment, and x-ray), the results were recorded as excellent, good, fair, or poor, depending upon these pre-established criteria. The total result of final classification of each case corresponded to the lowest grade received in any of the tests. Thus a patient might have an excellent or good clinical result only to be classified as fair or poor on the basis of the radiographic test.
Mitchell
Figure 2
PROXIMAL FEMORAL EPIPHYSEOLYSIS

Total no. of patients 1937-1967 114
Bilateral 23
Total no. of hips treated surgically 137
Metallic transfixion in situ 94
Open reduction with metallic fixation 38
Subtrochanteric osteotomy 4
Heyman procedure 1

Figure 3
PROXIMAL FEMORAL EPIPHYSEOLYSIS

Severe with open reduction 38
Males (age range 12-17) 28
Females (age range 10-14) 10
Right - 20 Left - 18
White - 33 Negro - 5
1938 - 1947 12
1948 - 1957 16
1958 - 1967 10

Figure 4
PROXIMAL FEMORAL EPIPHYSEOLYSIS

FOLLOW-UP
1 - 23 years. Average 8 years 2 months

RESULTS

Excellent 27 87%
Good 6
Fair 1
Poor 4
Slipped Femoral Epiphysis

In the 30 year period from 1937 to 1967, 114 children with proximal femoral epiphyseolysis were treated surgically at the Henry Ford Hospital. Twenty-three were operated upon for bilateral pathology — giving a total of 137 hips operated upon. Of these hips, 94 were mild cases and required only metallic fixation in situ. Thirty-eight patients had severe slips requiring open reduction, cuneiform osteotomy, and metallic fixation. Subtrochanteric osteotomy was performed in four cases, and in one case a Heyman procedure was carried out (Fig. 2).

Of the 38 cuneiform osteotomies there were 28 males, age range 12 to 17, and 10 females, age range 10 to 14. There were 20 right hips and 18 left. Thirty-three of the “severe” hips were in Caucasians and five were in Negroes. The number of operations carried out in the three decades is shown in Fig. 3.

A careful follow-up study is shown in Fig. 4. The “poor” results in four were based on the x-ray appearance. All were males ranging in age from 12 to 17. There were no infections, and no good explanation is forthcoming as to why the results in these cases were poor.

In several cases where there was bilateral involvement, we noted that the side with the cuneiform osteotomy resulted in a better hip radiographically than the hip which was nailed in situ (Figs. 5, 6, 7).

Only one case in our series (D.L.: Figs. 20, 21) definitely resulted from severe trauma. This 13-year-old girl had a complete posterior dislocation of the capital epiphysis. When immediate surgery was carried out, the epiphysis was found to be completely detached from the neck. The head was replaced and fixed with Venable screws. X-rays three years later revealed some evidence of avascular necrosis although clinically the girl was still symptom free. This case is not included in the series of 38 because of the different nature of her problem.

Summary

A follow-up survey (1-25 years) has been presented of cuneiform osteotomies of the femoral neck performed on 38 hips for severe slipping of the upper femoral epiphysis. A description of the operative procedure and indications for surgery has been outlined. The results of treatment have been analyzed, using both clinical and x-ray evaluation. 87% of cases followed were found by clinical and x-ray examination to have satisfactory results (good or excellent). Five cases (13%) were fair to poor.

It is concluded that cuneiform osteotomy of the femoral neck for severe slipping of the proximal femoral epiphysis, properly selected and judiciously performed, can produce good long term results in a gratifyingly high percentage of cases.
Mitchell

REFERENCES


X-rays of representative cases

Figure 5

Figure 6
Slipped Femoral Epiphysis

Figure 7

Figure 8
Same patient as Fig. 7. Postoperative 1961. AP view. Rated excellent. At right, Lateral view. Rated excellent.
Figure 10


Figure 11

Same patient as Figure 10. Postoperative 1961. Left hip rated fair. Right hip untreated; rated poor. At right, lateral projection.

Figure 12
Slipped Femoral Epiphysis

Figure 13

Figure 14

Figure 15
