

Traumatic dislocation of the hip with separation of the capital epiphysis

5 adolescent patients with 3–9 years of follow-up

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ABSTRACT – We reviewed 5 cases of type I epiphyseal fracture with dislocation of the femoral head from the acetabulum in adolescent patients. All children had an open reduction and screw fixation. In all cases, the femoral head developed avascular necrosis. The clinical result after a mean of 3–9 years' follow-up was good according to the Merle d'Aubigné-Postel scale. Despite necrosis, 2 heads developed spherically after treatment: one which had a primary physeal resection and fixation, the other after an autogenous bone graft in the screw track following removal of the screw.

Fracture-dislocations of the hip in children are uncommon. Type I fracture (transepiphyseal separation with or without dislocation of the femoral head from the acetabulum), according to the Delbet and Colonna classification (Colonna 1929) is the rarest fracture of the hip in children, affecting about 10% of cases (Ingram and Bachinsky 1953). In patients less than 3 years old, the trochantero-cervico-cephalic vessels provide adequate perfusion of the epiphysis and the outcome is good (Touzet et al. 1979, Mass et al. 1980, Jerre and Karlson 1997). On the other hand, avascular necrosis is a common complication, especially with dislocation of the femoral head from the acetabulum during adolescence; it seriously affects the long-term result (Ingram and Bachinsky 1953, Ratliff 1962, Canale and Bourland 1977, Fiddian and Grace 1983, Hughes and Beaty 1994).

We report 5 type I injuries with dislocation of the femoral head (Figure 1).

Patients and methods

During the period 1970–1995, 5 children (4 boys) were treated for a type I fracture-dislocation of the hip (Colonna 1929). They were retrospectively reviewed. Clinical and radiographic examinations were done at the last follow-up. The clinical results were rated according to the Merle d'Aubigné-Postel (1970) scale where 18 is the maximal score. Femoral head morphology, joint congruity and evidence of arthrosis with narrowing of the joint space were evaluated.

All the patients had been involved in a severe road traffic accident. Their age at injury was 12–14 years. Epiphyseal separation of Salter-Harris type I occurred in 4 cases and type II in 1 case (Salter and Harris 1963). The epiphysis was displaced posteriorly in 4 cases and antero-medially in 1 case. A fracture separation of the femoral epiphysis occurred during attempted closed reduction under anesthesia of a posterior dislocation (case 3). 2 children (cases 1 and 5) had complete palsy of the sciatic nerve.

All patients underwent an open reduction and internal fixation of the epiphysis with 1 or 2 screws. In 1 case, the physeal plate was resected by curettage within the first 6 hours of the injury. A posterior approach was used in the 4 cases with the posterior dislocation. An antero-lateral

Figure 1. Fracture dislocation of the capital femoral epiphysis of the left hip (case 1).

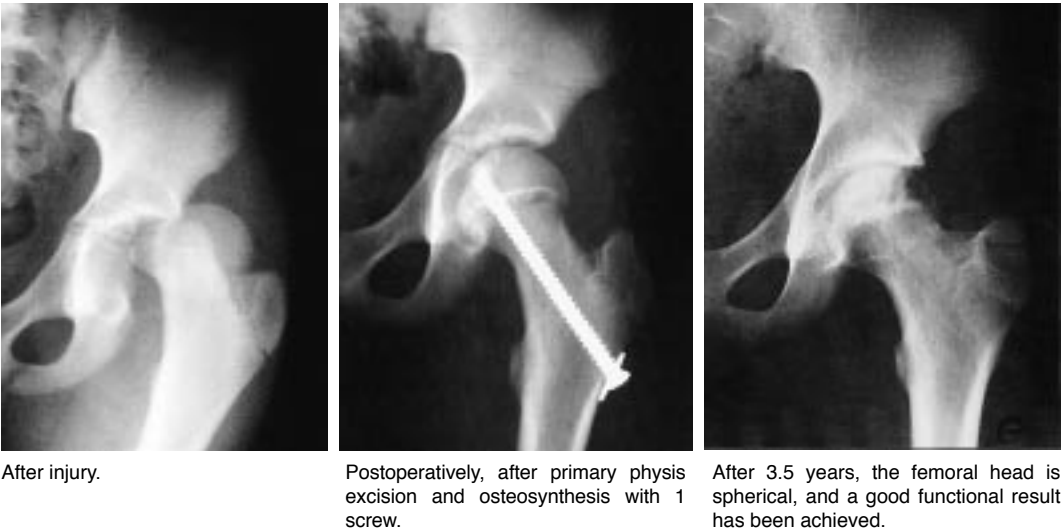


Table 1. Cases of fracture of the femoral neck with dislocation of the acetabulum

Case	Sex	Age (yr)	Salter and Harris	Location	Treatment	No weight bearing (mo)	Complication	Secondary treatment
1	F	12	I	P	1 screw + physeal plate excision	6	–	
2	M	14	I	P	2 screws	6	–	
3	M	13	I	P	2 screws	18	–	
4	M	14	II	A	2 screws	18	Screw penetration	Removal after 1 year
5	M	14	I	P	2 screws	18	Screw penetration	Removal + bone grafting after 1 year

P posterior, A anterior

approach was used for the anterior dislocation as well as a medial adductor approach to cover the femoral epiphysis. The surgical report noted a fully separated epiphysis in all cases and a completely compromised blood supply with total interruption of the lateral epiphyseal and ligamentum teres arteries. A contusion of the sciatic nerve without disruption was reported in the 2 children with a nerve injury. A sciatic nerve release was performed in these cases.

Postoperatively, skin traction and bed rest were used for 4 weeks in 5 cases. Traction was followed by no weight bearing on crutches for 6 months in 2 cases and for 18 months in 3 (Table 1).

Results

The 4 patients who underwent open reduction and screw internal fixation had physeal closure within 3 months of injury. The findings at early isotope scanning were consistent, with a total interruption of the blood supply to the femoral head in all the cases. Avascular necrosis was seen on plain radiographs within 6 months of the injury with epiphysis condensation. Flattening occurred after mean 8 (6–12) months. 2 of these children had intraarticular screw penetration, the screws were removed and, in 1 case (5), a cancellous bone grafting was done through the screw hole (Figure 2 and Table 2).

Figure 2. Fracture dislocation of the capital femoral epiphysis of the right hip (case 5).



A. After injury.



B. Posterior dislocation of the epiphysis.



C. Screw penetration due to avascular necrosis 1 year after injury.



D. 5 years after screw removal and autologous bone graft. Good functional result.

Table 2. Results of treatment of fracture of the femoral neck with dislocation of the acetabulum. Fusion of the physis and necrosis of the femoral head occurred in all cases

Case	Shape of femoral head	Motion at last review			Pain at last review	MAP at last review	Follow-up (yr)
		F/E	Abd/Add	ER/IR			
1	Spherical	130/0	40/30	40/30	No	18	3.5
2	Flattened	110/0	30/15	30/20	Occasionally	15	5.5
3	Flattened	110/0	40/15	40/5	Occasionally	17	5.0
4	Flattened	130/0	30/10	40/10	Occasionally	17	9.0
5	Spherical	120/0	40/40	40/20	Occasionally	17	5.0

MAP Merle d'Aubigné-Postel scale, F flexion, E extension, Abd abduction, Add adduction, ER external rotation, IR internal rotation.

The patients were reviewed after mean 5.5 (3.5–9) years. The Merle d'Aubigné-Postel (1970) scale rating was between 15 and 17 points, which is a good outcome. Limb shortening was mean 1.5 (1–2) cm. The femoral head was spherical in the 2 children (cases 1 and 5) (Figures 1 and 2) who had had a primary physeal excision and bone grafting during screw removal, respectively. Both patients had no joint space narrowing despite initial avascular necrosis, but 1 (case 5) had osteophytes on the lower part of the head. The other 3 hips were flattened due to avascular collapse and had evidence of early arthrosis with narrowing of the joint space. Notwithstanding the radiographic appearance, clinical function at this time was good. The 2 patients with sciatic nerve palsies had full nerve recovery within 1 year of the injury.

Discussion

Type I fractures of the capital femoral epiphysis (transepiphyseal separations with or without dislocation) are infrequent injuries in children and adolescents and are always caused by severe trauma. High rates of complications (avascular necrosis, premature closure of the physis, non-union) and a poor outcome are reported in all series (Ingram and Bachinsky 1953, Ratliff 1962, Canale and Bourland 1977, Fiddian and Grace 1983), despite early open reduction and fixation.

Notwithstanding radiographic evidence of early arthrosis, the clinical outcome in our patients with a non-spherical head remained good with a painless hip and satisfactory range of motion.

Damage to the epiphyseal blood supply at the time of the injury seems to be the main factor in the development of avascular necrosis. Ng and Cole (1996) suggested that kinking and tamponade of the vessels did not contribute significantly to the development of avascular necrosis in this type of fracture. They believe that the necrosis was due to immediate, irreversible changes in the blood supply of the femoral head at the time of injury.

In our patients, despite epiphyseal avascular necrosis, 2 heads developed spherically (Figures 1 and 2) after treatment. When we removed the physis at the time of fixation (case 1), avascular collapse of the femoral head did not occur. Likewise, no further collapse was seen after cancellous bone grafting with screw removal (case 5). Physeal excision seemed to be a satisfactory approach in adolescents. The physis is already damaged and can act as an anatomical barrier to revascularization by the metaphyseal vessels. A secondary bone graft when removing the screw may also have provided mechanical support during revascularization and remodeling of the avascular head.

No competing interests declared.

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