Distal femoral physiolysis in renal osteodystrophy

Successful nonoperative treatment of 3 cases followed for 5 years

Bart A Swierstra[1], Ad F M Diepstraten[1] and Bert J vd Heyden[2]

Slippage of 5 distal femoral epiphyses in 3 children with renal osteodystrophy was successfully treated without operation. During optimal medical treatment and plaster immobilization of the knee, remodelling took place by reorientation of the growth plate.

[1]Department of Orthopedics, Sophia Children's Hospital, University Hospital, Rotterdam and [2]Department of Pediatrics, Juliana Children's Hospital, The Hague, The Netherlands
Correspondence: Dr. Bart A Swierstra, Department of Orthopedics, University Hospital, Dr. Molewaterplein 40, NL-3015 GD Rotterdam, The Netherlands. Tel +31-10 4639222. Fax -10 4635305
Submitted 92-07-19. Accepted 92-08-29

Case 1

A boy was born April 1983 with severe renal insufficiency (serum creatinine 340 μmol/L) due to obstructive urethral valves. After birth he underwent bilateral uretero-cutaneostomy. Since November 1984, treatment included dihydrotachysterol, calcium supplements and phosphate binding because of renal osteodystrophy. His psychomotor development had been normal when in January 1985 he refused to walk and restricted his mobility to crawling. Physical and radiographic examinations revealed a severe dorsal slippage of the distal femoral epiphyses bilaterally (Figure 1). Treatment was initiated by plaster immobilization from groins to ankles, in combination with intensified medical treatment. Later similar plastic orthoses were applied. Remodelling of the distal femoral physes was radiographically visible within a few months. In August 1986 the external immobilization was discontinued because the positions of the epiphyses were normal in relation to the knee joints, although some anterolateral bowing of the distal femurs still existed. Continuous ambulatory peritoneal dialysis started in December 1988, and a successful renal transplantation was performed in December 1990. At 6-year follow-up he had a mild renal functional impairment (serum creatinine 83 μmol/L). There were no signs of renal osteodystrophy. The function of the knees was normal, and radiographs showed a normal alignment of the knees and the femora.

Case 2

A girl born November 1983 had severe renal functional impairment due to renal dysplasia (serum creatinine 398 μmol/L). Medical treatment included dihydrotachysterol, calcium supplements and phosphate binding. On presentation in September 1985 she did not walk, only crawled. Physical and radiographic examination showed dorsal slippage of both distal femoral epiphyses. Treatment was initiated by plaster cast immobilization from groins to ankles, later followed by similar plastic orthoses. In November 1985 varus deformity had developed as well. After intensified medical treatment, radiographic signs of physeal remodelling were seen. In August 1986 radiographs showed a normal position of the distal femoral epiphyses, with slight anterolateral bowing of the diaphyses; external immobilization was discontinued. In November 1986, without preceding dialysis, she was successfully transplanted. At 6-year follow-up she had a good renal function (serum creatinine 61 μmol/L). There were no signs of renal osteodystrophy. Both knees were clinically and radiographically normal.

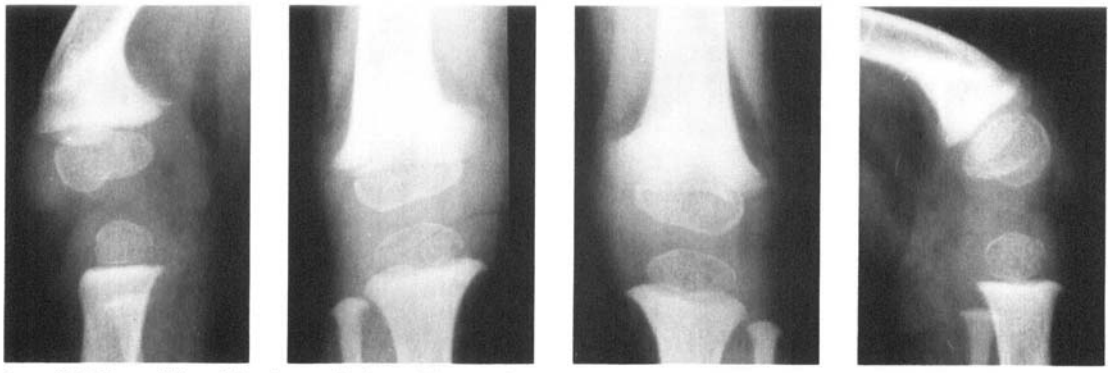
Case 3

A boy born July 1983 had renal dysplasia with severe insufficiency at birth (serum creatinine 340 μmol/L). Treatment with dihydrotachysterol, calcium supplements and phosphate binding was started in August 1983. In January 1986 he presented with limping and varus deformity of the right knee. Radiographs showed a medially slipped distal femoral epiphysis. The leg

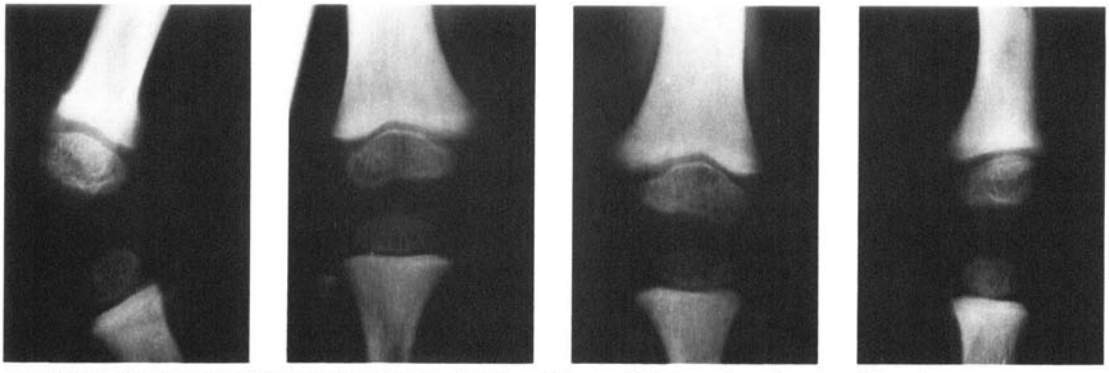
Copyright © Acta Orthopaedica Scandinavica *1993. ISSN 0001-6470. Printed in Sweden – all rights reserved.*

Case 1.

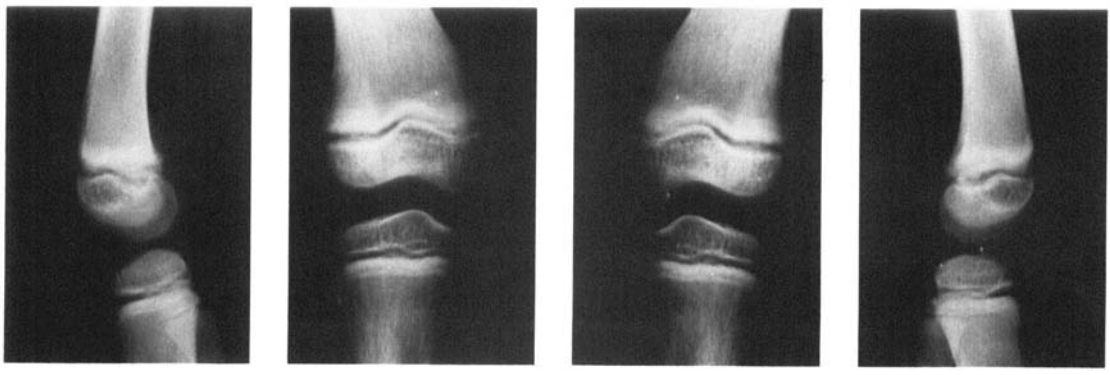
January 1985. Dorsal slippage of bilateral distal femoral epiphyses.



June 1985. Remodelling of the physes after immobilization of the knee.



August 1986. Slight anterolateral bowing, but normal orientation of the growth plate on discontinuation of the orthoses.



was splinted with an orthosis. The distal femoral physis remodelled within 6 months. The orthosis was discontinued in October 1986. In April 1987 continuous ambulatory peritoneal dialysis was started. Afterwards he twice underwent renal transplantation; the second transplantation was performed in December 1987. Since then the renal function has been good. There were no signs of renal osteodystrophy. At 5-year follow-up he had symmetrical, slight valgus knees, but was otherwise radiographically normal and with normal function.

Discussion

Physiolysis is one of the skeletal complications of renal failure. The pattern of physeal involvement seems to be partly age-related, with slippage of the distal femoral epiphysis mainly in preschool children (Mehls et al. 1980). Cattell et al. (1971) showed an example of operative treatment of this rare condition with an angulation osteotomy and staple fixation. However, non-operative treatment is preferable to surgical intervention, not least because of the different underlying metabolic and anatomic abnormalities. The described successful non-operative treatment of epiphyseal slippage of the distal femur depends probably on two factors. Firstly, optimal medical treatment must be given to normalize metabolic disorders as well as possible (Mehls et al. 1980). The delayed success in Case 2 illustrates the importance of this factor well. Secondly, deforming forces must be avoided, and correcting forces must be stimulated. The concept of spontaneous correction of angular deformity by reorientation of the growth plate has been described by Pauwels (1980). By immobilization of the knees the child is forced to stand, or to sit, but crawling is prevented. By standing, the growth plate is eccentrically responsive to pressure changes, and will, through selective growth in different regions, attempt to reorient perpendicular to the major reaction forces across the physis. Slipped epiphyses of the lower extremity lend themselves well to this treatment.

References

Cattell H S, Levin S, Kopits S, Lyne E D. Reconstructive surgery in children with azotemic osteodystrophy. J Bone Joint Surg (Am) 1971; 53 (2): 216–28.

Mehls O, Ritz E, Kreusser W, Krempien B. Renal osteodystrophy in uraemic children. Clin Endocrinol Metab 1980; 9 (1): 151–76.

Pauwels F. Biomechanics of the locomotor apparatus: contributions on the functional anatomy of the locomotor apparatus. Springer Verlag, New York 1980.