



14, 2, 2001 4

The Journal of the Korean Society of Fractures  
Vol.14, No.2, April, 2001

.

.

&lt; &gt;

:

: 1997 4 1999 4 4-10 18 19

, 6.7 , 1 , 1 2 3.0mm

, 2 , 6-8

, 10-12

: 10.9 , -7mm 6mm (

1.1mm ) , 10mm

1

:

:

2가 50

Tel : (053) 420 - 5630

Fax : (053) 422 - 6605

가

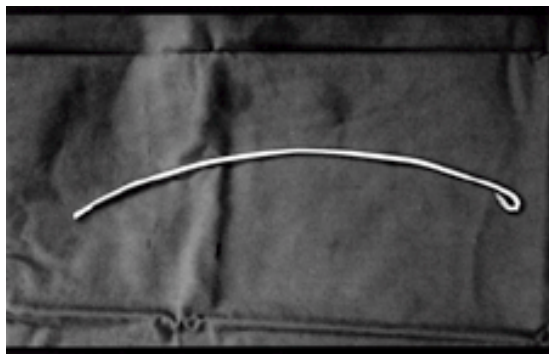
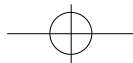
가

가

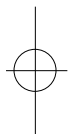
,

,

:



**Fig 1.** The 3.0mm flexible nail with modified ends.

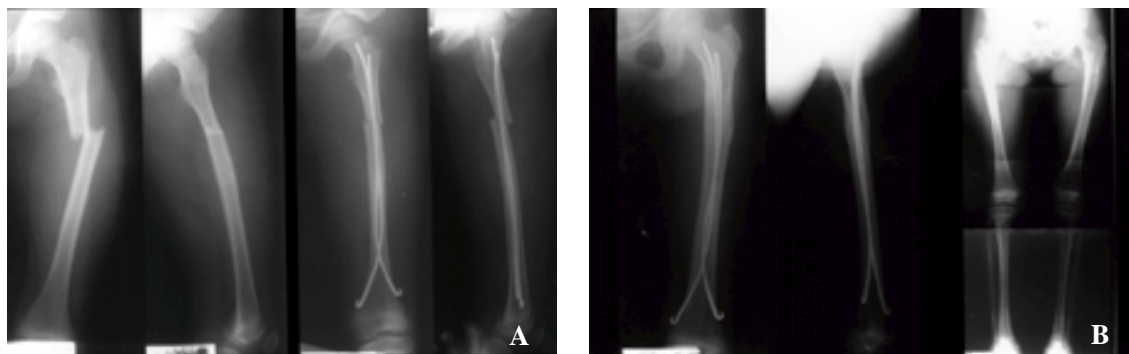


, ,  
가 . 10  
가 ,  
10  
가  
8).  
가

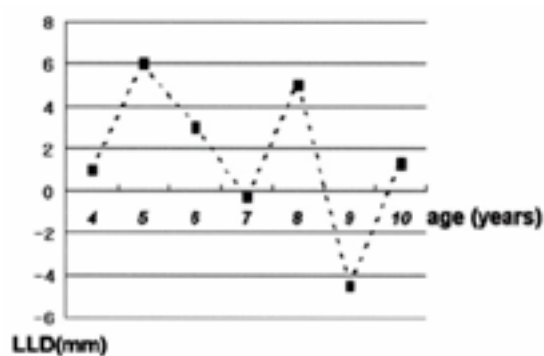
3.0mm (Fig 1)  
가 1  
10  
(distraction gap)

1997 4 1999 4 ,  
18 19  
6.7 (4 -10 ) , 11 7 ,  
1  
가 14 , 4 , 6-8  
9 , 9 , 10-12  
1 , 9 ,  
10  
5-10  
7 ,  
3 , , 1 ,  
7 .

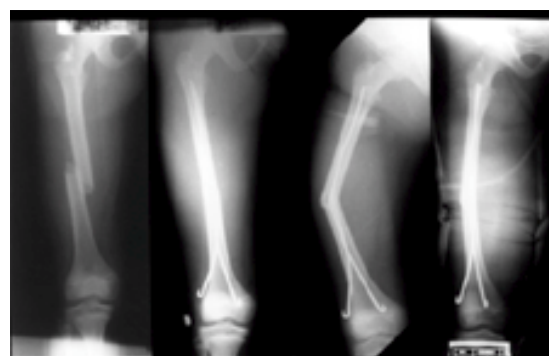
가  
가  
3cm  
3cm , 1/4 inch



**Fig 2.** The 9 year-old girl who had proximal femoral fracture, was treated by flexible intramedullary nailing with retrograde method(Fig 2-a). Good reduction was achieved at operation, and the union without malalignment was gained at 11 weeks. The long reconstruction film shows the minimal leg length discrepancy after 18 months(Fig 2-b).



**Fig 3.** The figure of the relationship between the age and LLD(leg length discrepancy) shows little important significance. The pointed marks are the mean value of LLD at the age.



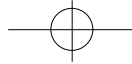
**Fig 4.** The mid-shaft fracture was stabilized with 2 flexible nails, but the severe rigidity made the breakage of the nail. The hip spica cast with correction of angulation was done for this patient.

10.9 , 10 , 5mm 3 , 10mm , , 가 (Fig 3).

(Fig 2).

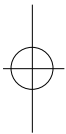
가 1 (Fig 4), 1 ( 120 , 0 )

14 , 7mm 6mm , 1.1mm .



14), Ligier 13)

가

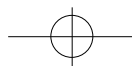




5), , ,  
가 .

## REFERENCES

- 1) **Aronson J, and Tursky EA.** External fixation of femur fractures in children. *J Pediatr Orthop* 12, 157-163, 1992.
- 2) **Blasier RD, Aronson J, and Tursky EA.** External fixation of pediatric femur fractures. *J Pediatr Orthop* 17, 342-346, 1997.
- 3) **Carey TP, and Galpin RD.** Flexible intramedullary nail fixation of pediatric femoral fractures. *Clin Orthop* 332, 110-118, 1996.
- 4) **Choi CW, Na SG, Kwon JU, Song JM, Yang MS and Park MS.** A Clinical Comparison between Conservative Treatment and Intramedullary Nailing after Closed Reduction in the Treatment of Femoral Shaft Fractures of Children. *J of Korean Orthop Assoc.* 26, 797-802, 1996.
- 5) **Clement DA, and Colton CL.** Overgrowth of the femur after fracture in childhood. An increased effect in boys. *J Bone Joint Surg* 68-B, 534-536, 1986.
- 6) **Corry IS, and Nicol RO.** Limb length after fracture of the femoral shaft in children. *J Pediatr Orthop*, 15, 217-219, 1995.
- 7) **Ferguson J, and Nicol RO.** Early spica treatment of pediatric femoral shaft fractures. *J Pediatr Orthop*, 20, 189-192, 2000.
- 8) **Greene WB.** Displaced fractures of the femoral shaft in children. Unique features and therapeutic options. *Clin Orthop*, 353, 86-96, 1998.
- 9) **Hedequist D, Starr AJ, Wilson P, and Walker J.** Early versus delayed stabilization of pediatric femur fractures: analysis of 387 patients. *J Orthop Trauma*, 13, 490-493, 1999.
- 10) **Heinrich SD, Drvaric DM, Darr K, and MacEwen GD.** The operative stabilization of pediatric diaphyseal femur fractures with flexible intramedullary nails: a prospective analysis. *J Pediatr Orthop*, 14, 501-507, 1994.
- 11) **Hull JB, Sanderson PL, Rickman M, Bell MJ, and Saleh M.** External fixation of children's fractures: use of the Orthofix Dynamic Axial Fixator. *J Pediatr Orthop B*, 6, 203-206, 1997.
- 12) **Illgen R 2nd, Rodgers WB, Hresko MT, Waters PM, Zurakowski D, and Kasser JR.** Femur fractures in children: treatment with early sitting spica casting. *J Pediatr Orthop*, 18, 481-487, 1998.
- 13) **Ligier JN, Metaizeau JP, Prevot J, and Lascombes P.** Elastic stable intramedullary nailing of femoral shaft fractures in children. *J Bone Joint Surg* 70-B, 74-77, 1988.
- 14) **Linhart WE, and Roposch A.** Elastic stable intramedullary nailing for unstable femoral fractures in children: preliminary results of a new method.. *J Trauma*, 47, 372-378, 1999.
- 15) **Mann DC, Weddington J, and Davenport K.** Closed Ender nailing of femoral shaft fractures in adolescents. *J Pediatr Orthop*, 6, 651-655, 1986.
- 16) **Mazda K, Khairouni A, Pennecot GF, and Bensahel H.** Closed flexible intramedullary nailing of the femoral shaft fractures in children. *J Pediatr Orthop B*, 6, 198-202, 1997.
- 17) **Miner T, and Carroll KL.** Outcomes of external fixation of pediatric femoral shaft fractures. *J Pediatr Orthop*, 20, 405-410, 2000.
- 18) **Moon MS, Ok IY, and Kim TH.** Overgrowth after Open Reduction of Femoral Fracture in Children. *J of Korean Orthop Assoc.* 25, 1391-1396, 1995.
- 19) **Raney EM, Ogden JA, and Grogan DP.** Premature greater trochanteric epiphysiodesis secondary to intramedullary femoral rodding. *J*



- Pediatr Orthop*, 13, 516-520, 1993.
- 20) **Skaggs DL, Leet AI, Money MD, Shaw BA, Hale JM, and Tolo VT.** Secondary fractures associated with external fixation in pediatric femur fractures. *J Pediatr Orthop* 19, 582-586, 1999.
- 21) **Stanitski CL, Monroe MT, Stanitski DF, Minster G, and Goldstein A.** Radiation exposure during skeletal traction treatment of pediatric femoral fractures. *J Pediatr Orthop*, 18, 271-272, 1998.
- 22) **Stephens MM, Hsu LC, and Leong JC.** Leg length discrepancy after femoral shaft fractures in children. Review after skeletal maturity. *J Bone Joint Surg*, 71-B, 615-618, 1989.
- 23) **Ziv I, and Rang M.** Treatment of femoral fracture in the child with head injury. *J Bone Joint Surg*, 65-B, 276-278, 1983.

### Abstract

## Retrograde Flexible Intramedullary Nailing of Pediatric Femur Fractures

**Chang-Wug Oh, Byung-Chul Park, Hyung-Jin Park**

*Department of Orthopedic Surgery, College of Medicine,  
Kyungpook National University Hospital, Taegu, Korea*

**Purpose :** This study was designed to evaluate the clinical effectiveness including bone union, leg length discrepancy, after retrograde flexible intramedullary nailing for pediatric femoral fractures.

**Material and method :** Nineteen cases (18 patients) with femur fracture at the age of 4 to 10 years (mean age 6.7) have been followed up over the minimum of one year. Under imaging intensifier, the fracture was temporarily reduced with manual traction, and 1 or 2 flexible nails were inserted at medial and lateral side of distal femur above the distal epiphysis. After two weeks of immobilization with long leg splint, joint motion was permitted. At 6-8 weeks, partial weight bearing was permitted, and at 10-12 weeks, full weight bearing was permitted.

**Results :** Time to radiologic union averaged 10.9 weeks. Limb length discrepancy ranged from 7mm of shortening to 6mm of overgrowth(mean ; 1.1mm of overgrowth), but there was no severe limb length discrepancy over 10mm. As another complications, there were one case of limited motion of knee joint and one case of broken nail.

**Conclusion :** We found that retrograde flexible intramedullary nailing is a safe, effective treatment for acute femoral shaft fractures in skeletally immature patients.

**Key Words :** Pediatric femur fractures, Retrograde flexible intramedullary nailing, Limb length discrepancy

