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6) ,

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AO 4 , Grosse-
Kempf 4 , Russel-Taylor 3 , Long Gamma
1 . 10 mm 4 , 11 mm
5 , 12 mm 3 .
6 2 6 , 13.6
3) . 10 , 2
3
1996 1 2000 1 , 9
(hook)
12 , 1 가
2 9
10
35.5 18
6 , 5 , 1 가
9 , 7.5 (5~10)
3 , Gustilo 2 2 , 3 -A 1 .
1/3 2 , 1/3 9 , 1/3 1
, Winqvist-Hansen 1 1 , 2 4 , 3
5 , 4 2 10
3 -A 1
, 1 가
3
6). 1980
10 , 3.3%
8,9,13~15)
1 가 .

12), 10 mm

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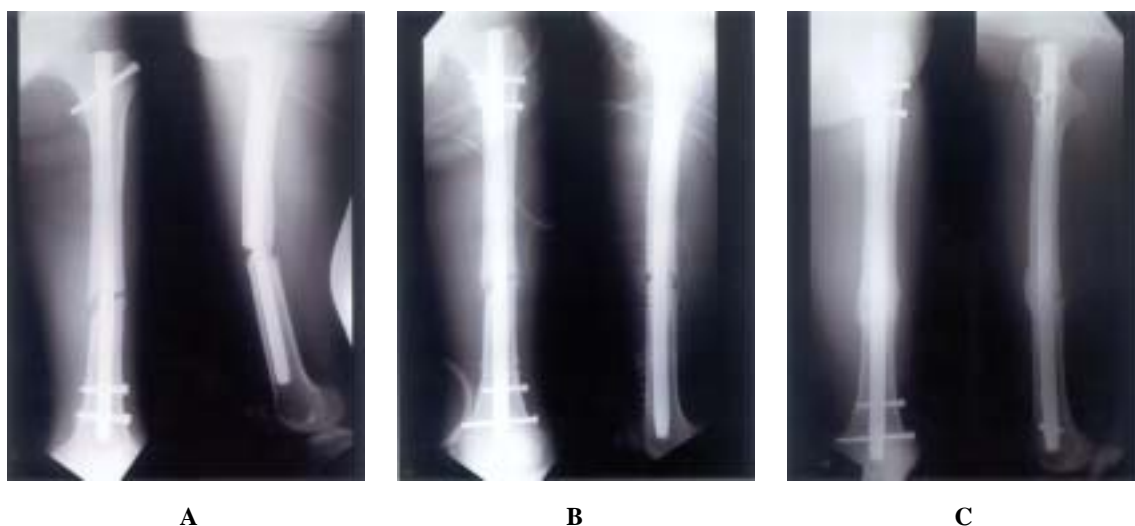


Fig. 1. A thirty-two-year-old male patient sustained midshaft fracture of left femur due to traffic accident.
1A. After 8 months, fatigue fracture of intramedullary nail developed at fracture site due to abnormal external force.
1B. Postoperative radiographs after larger diameter intramedullary nailing and autogenous iliac cancellous bone grafting.
1C. Postoperative 7 months radiograph shows complete union of fracture.



Fig. 2. A thirty-four-year-old male patient sustained femoral shaft fracture of left femur due to traffic accident.
2A. After dynamization 8 months, fatigue fracture of intramedullary nail developed at fracture site.
2B. Postoperative 8 months radiographs after larger diameter intramedullary nailing shows complete union of fracture.

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REFERENCES

- 1) **Brumback RJ, Uwagi-Ero S, Lakatos RP, Poka A, Bathon GH and Burgess AR:** Intramedullary nailing of femoral shaft fractures. Part II: fracture healing with static interlocking femoral fixation. *J Bone Joint Surg*, 70-A: 1453-1462, 1988.
- 2) **Bucholz R and Jones A:** Current concepts review. Fractures of the shaft of the femur. *J Bone Joint Surg*, 73-A: 1561-1566, 1991.
- 3) **Bucholz RW, Ross SE and Lawrence KL:** Fatigue fracture of the interlocking nail in the treatment of fractures of the distal part of the femoral shaft. *J Bone Joint Surg*, 69-A: 1391-1399, 1987.
- 4) **Fielding JW, Cochran GVG and Zickel RE:** Bio-mechanical characteristic and surgical management of subtrochanteric fracture. *Orthop Clin N Am*, 5: 629-650, 1974.
- 5) **Flanklin JL, Winquist RA, Benirschke SK and Hansen ST:** Broken intramedullary nail. *J Bone Joint Surg*, 70-A: 1463-1471, 1988.
- 6) **Jensen JS, Johanson J and Morch A:** Middle third femoral fractures treated with medullary nailing or AO compression plate. *Injury*, 8: 174-181, 1977.
- 7) **Jonson KD, Tencer AF and Sherman MC:** Biomechanical factors affecting fracture stability and femoral bursting in closed intramedullary nailing of femoral fracture with illustrative case presentations. *J Orthop Trauma*, 1: 1-11, 1987.
- 8) **Kempf I, Grosse A and Riguat P:** The treatment of noninfected pseudarthrosis of the femur and tibia with locked intramedullary nailing. *Clin Orthop*, 212: 142-154, 1986.
- 9) **Kempf I, Grosse A and Beck G:** Closed locked intramedullary nailing. Its application to comminuted fractures of the femur. *J Bone Joint Surg*, 67-A: 709-720, 1985.
- 10) **Kyung HS, Ihn JC, Park BC, Oh CW and Kim HS:** Metal failure of the internal fixation device for the treatment of the femur fracture. *J of Korean Orthop Assoc*, 34: 693-698, 1999.
- 11) **Song KJ, Kim HJ, Kim JR, Lee JH and Hwang BY:** Analysis of metal failures for the femur shaft fractures. *J of the Korean Society of Fractures*, 11-3: 501-508, 1998.
- 12) **Sotto-Hall R and Maclog NP:** Cause and treatment of angulation of femoral intramedullary nails. *Clin Orthop*, 11: 66, 1953.
- 13) **Thoresen BO, Alho A and Ekeland A:** Interlocking intramedullary nailing in femoral shaft fracture. A report of forty-eight cases. *J Bone Joint Surg*, 67-A: 1313-1320, 1985.
- 14) **White GM, Healy WL, Blumback RJ, Burgess AR and Brooker AF:** The treatment of the femoral shaft with the Booker-Wills distal locking intramedullary nail. *J Bone Joint Surg*, 68-A: 865-876, 1986.
- 15) **Wiss DA, Fleming CH, Matta JM and Clark D:** Comminuted and rotationally unstable fractures of the femur treated with an interlocking nail. *Clin Orthop*, 212: 35-47, 1986.

Abstract**Fatigue Fracture of the Interlocking Nail in the Treatment of Femoral Shaft Fractures****Jung Ryul Kim, M.D., Jin Ho Yoon, M.D.**

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Purpose: To analyze clinical and mechanical factors of the fatigue fracture of the intramedullary nail in the treatment of the femoral shaft fractures and to consider preventive methods of fatigue fracture.

Materials and Methods: We reviewed 12 patients of fatigue fractures of the intramedullary and were followed for a minimum one year. The site of fatigue fracture of the intramedullary nail was at fracture site in 10 cases, just proximal to proximal locking hole in one, and the most proximal of two distal locking holes in one. We analyzed type and diameter of broken nail, time from injury to fatigue fracture, causes of metal failure, and treatment results.

Results: Intramedullary nails which had fatigue fracture were reamed AO nail in four cases, Grosse-Kempf nail in four, Russel-Taylor nail in three, and long Gamma nail in one. Time to fracture of implant was average 13.6 months (range, 6~30 months). All cases were treated by intramedullary nailing, and additional autogenous bone grafting was done in three cases. At an average duration of follow-up of 7.5 months (range, 5 to 10 months), all of the fractures had healed.

Conclusion: To prevent fatigue fracture of intramedullary nail, closed observation for bony union, progressive weight bearing, and augmentation with autogenous bone grafting for comminuted fracture site should be needed.

Key Words: Femur, Shaft fracture, Interlocking nail, Fatigue fracture

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