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= Abstract =

The Treatment of Infected Nonunion of Femur after Open Reduction and Internal Fixation

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Infected nonunion developed after open reduction and internal fixation is one of the serious complications among the treatments of fracture of long bone. It is very difficult to eliminate the infection, to correct the deformity and defect at the same time obtaining union. All six cases were male, the average of age was 34 years old from 21 to 49. Five cases were closed fracture and one was open fracture. For the primary internal implant, five cases were plate and one was intramedullary nail. About the 6 cases of infected nonunion of femur from June, 1994 to October, 1996, we performed the following procedure : after removal of internal fixation, extensive debridement, complete sequestrectomy, firm fixation with Ilizarov external fixator, compression at fracture site and early autogenous cancellous bone graft. We obtained following results :

1. The average duration of infection was 7.8 months, average duration of bone union was 5.8 months. Average duration of follow-up was 17.5 months.
2. The average shortening of leg was 1.4cm.

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3. According to classification of Paley and Catagni, the bone results were excellent in all cases, functional results were excellent in 4 cases and fair in 2 cases.
4. In conclusion, firm fixation with Ilizarov fixator, sequestrectomy, early autogenous cancellous bone graft and compression is one of the good treatment modalities of infected nonunion of the femur.

Key Words : Femur, Infected nonunion, Bone graft, Ilizarov external fixation.

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4,13)
Ilizarov
(distraction
(internal
osteogenesis)^{6,8)}
lengthening)
(corticotomy)
(external lengthening)
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6 Ilizarov
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(Table 2).
(Fig 1) 1
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(Table 1-1,2).
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(Table 2).
(Fig 1) 1
2 vancomycin -gentamycin
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542 • / 11 3

Table 1-1. Case analysis

Case	Age	Sex	Cause	O/C ^{\$}	BC ⁺ (No [*])	Compression	Bacteria	Sensitive drug
1	38	M [#]	TA ⁺⁺	C	2	Yes	S. aureus	vancomycin, teicoplanin
2	41	M	TA	C	2	Yes	S. aureus	vancomycin, ciprobay
3	21	M	TA	O	2	Yes	S. aureus	vancomycin, teicoplanin
4	41	M	TA	C	0	Yes	S. aureus	vancomycin, ciprobay, clindamycin
5	49	M	TA	C	0	Yes	S. aureus	vancomycin, ciprobay
6	22	M	TA	C	2	Yes	S. aureus	vancomycin, ciprobay

O/C^{\$} : open or closed fracture BC⁺ : bead change M[#] : male
 TA⁺⁺ : traffic accident, No^{*} : number S. : staphylococcus

Table 1-2. Case analysis

Case	Associated injuries	Duration of F/U [*] (Month)	Limb lengthening	Bone graft
1	Rt ⁺ femur supracondylar fx, Lt [#] femur neck fx [@] , Rt calcaneus fx	19	No	Yes
2	No	15	No	Yes
3	No	12	No	No
4	No	14	No	Yes
5	Rt humerus, Lt femur neck fx	19	No	Yes
6	No	26	No	Yes

F/U^{*} : follow up Rt⁺ : right Lt[#] : left fx[@] : fracture

Table 2. Analysis of results

Case	Limb 1 shortening (cm)	Duration of infection [#] (month)	Duration of union [*] (month)	Duration of Ilizarov ⁺ (month)	No of prior procedure until union	Final ROM (degree)	Bone result	Functional result
1	1.5	6	6	6	3	full	excellent	excellent
2	1.5	11	5	5	3	0 10	excellent	fair
3	1.2	7	7	7	3	0 30	excellent	fair
4	0.9	10	6	6	1	full	excellent	excellent
5	1.5	5	5	5	1	0-130	excellent	excellent
6	1.7	8	6	6	3	full	excellent	excellent

[#] : Period from open reduction and internal fixation to beginning of the treatment of infected nonunion.

^{*} : Period from beginning of treatment of infected nonunion to obtaining of union.

⁺ : Period from applying of Ilizarov to removal.

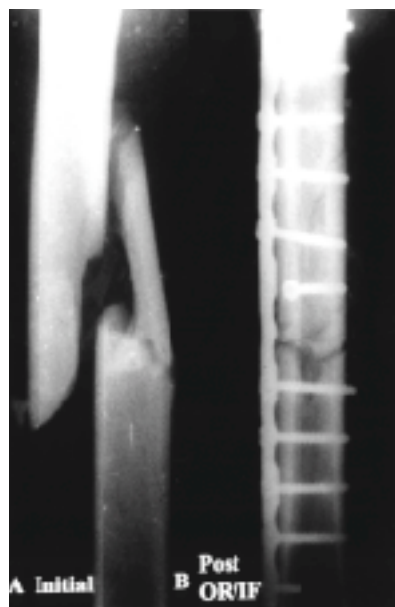


Fig 1-A. Initial radiograph shows midshaft fracture of femur.
B. Open reduction and internal fixation with LC-DCP.

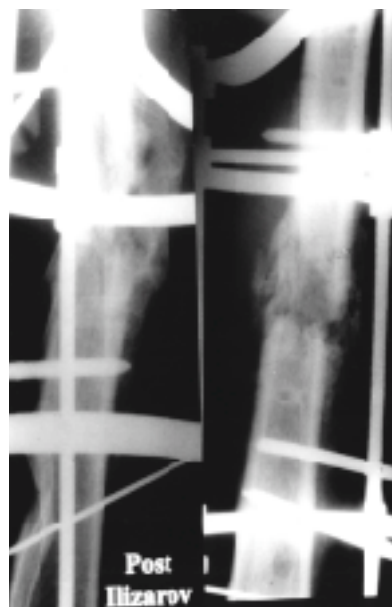


Fig 3. At 6 months after open reduction and internal fixation with plate, Ilizarov external fixator was applied with sequestrectomy, bone graft and compression.

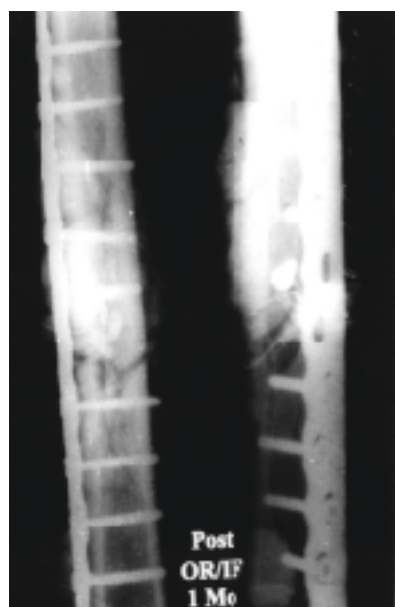


Fig 2. At 1 month after open reduction and internal fixation with plate, bone cement containing antibiotics were inserted due to infection.

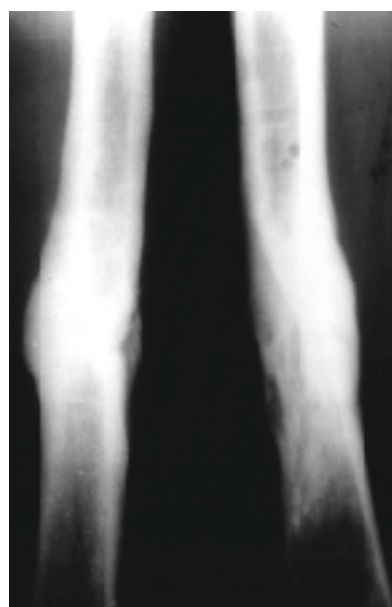
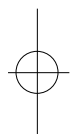


Fig 4. At 1 year after application of Ilizarov fixator, complete union was obtained without any deformities.



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