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= Abstract =

Management for Postoperative Infection of Fractures

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It is often difficult to eradicate infection and achieve bony union in postoperative infection after fracture fixation. Authors treated 14 such cases from February 1992 to February 1998, and followed up for 6 to 35 months. The purpose of this study is to review the clinical features of the postoperative infection and assess the treatment modality which influence the time required for attaining bony union and healing of infection.

The results were as follows :

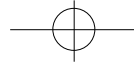
1. Primary fixation were left in place in 5 cases of stable fixation, and new external fixation and/or another fixations were required in 8 cases of unstable fixation.
2. Time required for achieving union was 4.7 months for stable primary fixation and 12.8 months for unstable primary fixation.
3. Time required for healing in infection was 3.5 months for stable primary fixation and 14.4 months for unstable primary fixation.
4. Bony union was delayed as the number of surgical procedures were increased.
5. Antibiotic cement beads were inserted for 5 cases into bony defect and dead space after curettage and sequestrectomy, and pus discharge was stopped after 8.8 weeks in average.

Key Words : Postoperative infection, Fracture

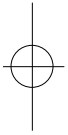
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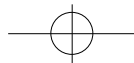
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**Table 1.** Case analysis

Case	Age/Sex	Site	Fracture type	Injury mechanism	Organism isolated	Fracture union (Mos.)	Infection healing (Mos.)
1	30/M	tibia	open	motor vehicle accident	Serratia	6	5
2	40/M	tibia	open	motor vehicle accident	undetermined	6	2
3	20/M	tibia	closed	motorcycle	Pseudo.*	2.5	6
4	75/F	tibia	closed	motor vehicle accident	Staph. [†] , Klebsiella	6	not healed
5	32/M	tibia	closed	motor vehicle accident	Enterobacter	3	1
6	34/M	femur	closed	motorcycle	Staph.	3	26
7	20/M	tibia	open	motorcycle	Staph.	32	29
8	18/M	tibia	closed	motor vehicle accident	Staph.	8	16
9	39/M	femur	open	motorcycle	Pseudo.	14	8
10	50/M	tibia	open	motorcycle	Staph.	15	12
11	53/M	tibia	open	motor vehicle accident	Staph., Proteus	11	15
12	24/M	radius, ulna	open	machinary	Staph., Serratia	13	8
13	50/M	tibia	open	motor vehicle accident	undetermined	6	1
14	56/M	calcaneus	closed	fall	Staph.	4	1

* Pseudomonas

† Staphylococcus aureus

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**Table 2.** Treatment

Case	Prior treatment	Treatment of deep infection
1	CR/EF*, OR/IF [†] with plate, ACBG [‡]	Removal of plate after bony union, curettage, irrigation
2	OR/IF with plate	Removal of plate after bony union, curettage, irrigation
3	OR/IF with plate	Soft tissue coverage, removal of plate after bony union, curettage, irrigation
4	OR/IF with plate, ACBG	Curettage, daily antibiotic mixed saline irrigation
5	CR/IF [§] with IM nail	Curettage, daily antibiotic mixed saline irrigation
6	OR/IF with plate, ACBG, xenograft	CR/EF, curettage, irrigation
7	CR/EF	Soft tissue coverage, sequestrectomy, CR/EF with Ilizarov, debridement, antibiotic cement beads, ACBG
8	OR/IF with plate, xenograft	Removal of plate, CR/EF with Ilizarov, ACBG
9	OR/IF with IM nail	Removal of IM nail, sequestrectomy, CR/EF, antibiotic cement beads, ACBG
10	CR/EF	Removal of EF, CR/EF with Ilizarov, antibiotic cement beads, ACBG
11	OR/IF with plate	Removal of plate, curettage, CR/EF with Ilizarov, soft tissue coverage, saucerization, antibiotic cement beads, ACBG, removal of Ilizarov, sequestrectomy
12	OR/IF with plates	Soft tissue coverage, removal of plates, CR/EF, OR/IF with plate, ACBG on radius, CR/IF with ACBG on ulna
13	CR/EF	Removal of EF, CR/IF with IM nail
14	CR/IF with Steinman pin	Curettage, removal of pin, antibiotic cement beads

* closed reduction/external fixation

[†] open reduction/internal fixation[‡] autogenous cancellous bone graft[§] closed reduction/internal fixation**Table 3.** Healing time according to fixation stability

Treatment	Fracture union (Mos.)	Infection healing (Mos.)
Primary fixation left intact	4.7	3.5
EF* & definite fixation	12.8	14.4
Total	9.3	10

* external fixation

Table 4. Healing time according to number of procedures

No. of procedures	Fracture union (Mos.)	Infection healing (Mos.)
1-2	4.8	7.5
2-4	7.1	8
5 or more	17.5	15



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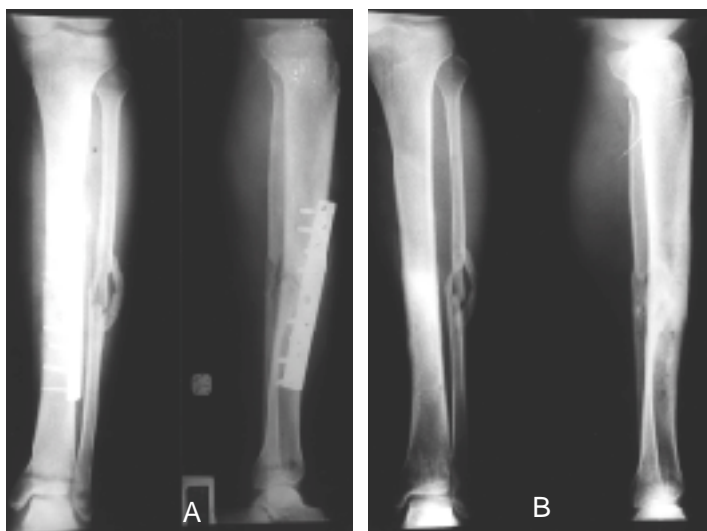


Fig 1. A 20 year-old male who sustained comminuted fracture of shaft of tibia and fibula underwent open reduction and internal fixation with plate and screws.

- A.** Plain film at 3 months after operation shows local osteolytic change and pretibial sequestrum, suggesting infected fracture.
- B.** Plate and screws were removed at 1 month after signs of fracture union and plain film at 3 months after removal shows fracture union.

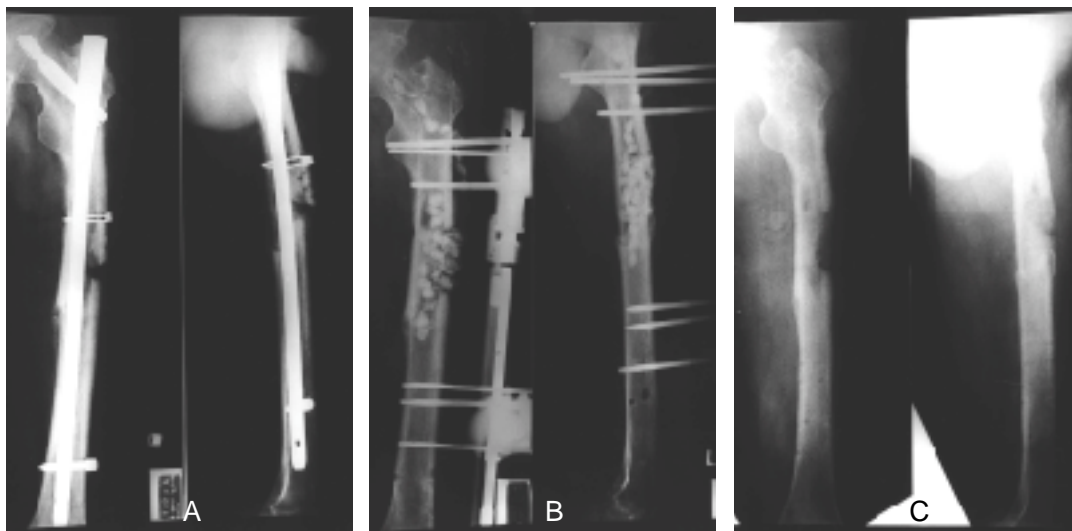
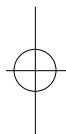


Fig 2. A 39 year-old male who sustained open, comminuted fracture of proximal shaft of femur underwent intramedullary nailing.

A. Plain film at 5 months after operation shows sequestrum, bony defect and loose intramedullary nail, suggesting infected nonunion.

B. Plain film at 2 months after sequestrectomy, closed reduction and external fixation and antibiotic beads insertion shows well-aligned fracture and cement beads in bony defect.

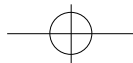
C. Plain film shows bony consolidation at 9 months after sequestrectomy, external fixation, antibiotic cement beads insertion and at 5 months after autogenous cancellous bone grafting.



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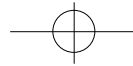
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gentamicin, Marks¹⁴⁾ oxacillin, cefazolin,
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tetracyclin Murray¹⁷⁾ chloramphenicol
cephalosporin betalactam

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gentamicin vancomycin



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