

SUPRACONDYLAR-CONDYLAR FRACTURES OF THE FEMUR *

TEH PENG HOOI
S. KRISHNAMOORTY

SUMMARY

A retrospective study of 34 patients with supracondylar-condylar fractures of the femur admitted to the Alexandra Hospital, Singapore, from January 1979 to December 1983 was carried out. These fractures were surgically treated by AO principles and fixation, and the surgery performed mainly by the two authors. Using strict criteria adopted from Schatzker of Toronto,¹ it was found that 62% of patients had excellent/good results. The importance of treating supracondylar-condylar fractures by AO principles and fixation is emphasised.

INTRODUCTION

The past decade has seen great advances in the

care and treatment of fractures. This has arisen mainly from the influence of the Swiss Association of Osteosynthesis (AO) concept of early immobilisation through stable osteosynthesis.

Few fractures have been as difficult to treat as the supracondylar-condylar fracture of the femur. The results of conservative management of these fractures are generally far from satisfactory, with problems of knee stiffness and deformity in the form of shortening and angulation. Recently such fractures have been managed surgically using the AO principles and fixation.

The purpose of this paper is to highlight the generally good results obtained by treating such fractures using AO principles and fixation.

MATERIALS AND METHOD

Patients with supracondylar-condylar fractures of the femur admitted to Alexandra Hospital, Singapore, from January 1979 to December 1983 form the basis of this retrospective study. Thirty-four patients with such injury were treated surgically with AO techniques and implants. The surgical procedures were mainly performed by the two authors. Patients had to be recalled back for assessment. There were 25 males and nine females.

The ages of these patients ranged from 10 to

Teh Peng Hooi, AM (S'pore), MBBS (S'pore)
FRCS (Edin)

Orthopaedic & Traumatic Surgery
Suite 05-05, Gleneagles Medical Centre
6, Napier Road, Singapore 1025

S. Krishnamoorthy, AM (S'pore), MBBS (S'pore)
FRACS MchOrth

Senior Orthopaedic Surgeon & Head
Department of Orthopaedic Surgery
Tan Tock Seng Hospital
Moulmein Road, Singapore 1130

*Paper presented at the Combined Meeting of the 4th Annual Scientific Congress, The Asean Orthopaedic Association and 9th Singapore Orthopaedic Meeting, 11-14 October 1984, Singapore.

90 years (Table I). Most of these fractures were due to road traffic accidents (22 patients). The rest were due to slip and fall at home or workplace (five patients), fall from heights (five patients) and direct hit from object at work (two patients). Eleven patients had multiple fractures.

Classification of the supracondylar-condylar fractures of the femur

In this series the patients were divided into four main groups: group I (12 patients) composed of fractures with mild/non-comminuted fracture with displacement not involving knee joint; group II (13 patients) included the mildly comminuted fractures with involvement of knee joint (T or Y fracture); group III (four patients) comprised comminuted fractures with or without knee joint involvement but requiring bone grafting; group IV (five patients) comprised displaced medial/lateral condylar fractures.

RESULTS

The 34 patients were assessed for the following: period of hospitalisation; period of incapacity, post-operative complications; leg length discrepancy, knee stiffness; overall results as adopted from Schatzker of Toronto.¹

TABLE I

AGE OF PATIENTS WITH SUPRACONDYLAR-CONDYLAR FRACTURES OF FEMUR

Age (years)	No. of patients
10-19	4
20-29	13
30-39	2
40-49	4
50-59	2
60-69	5
70-79	3
80-89	1
Total	34

Period of hospitalisation

There were 13 patients with comminuted fractures requiring bone grafting or fractures associated with multiple injuries. Their hospital stay ranged from 24 days to 163 days with an average stay of 55 days.

21 patients had fractures not requiring bone grafting. Their hospital stay ranged from 11 days to 52 days with an average stay of 21 days.

Period of incapacity

The period of incapacity (period when patients are on medical leave) for comminuted fractures requiring home grafting or fractures associated with multiple injuries ranged from 82 days to 479 days with an average of 203 days.

The period of incapacity of fractures not requiring bone grafting ranged from 67 days to one year five months with an average of 179 days. The patient with one year five months period of incapacity was a 45-year-old lady who sustained an open comminuted supracondylar-fracture of the left femur. Internal fixation with AO condylar plate was done on day of admission. She defaulted follow-up but returned a year later (still had not resumed work) with problem of delay union. Bone grafting was done and the fracture united about five months later. She then resumed work.

Post-operative complications

The post-operative complications arising from condylar plating/lag screw fixation were wound infection (one case), wrong placement of the condylar blade (three cases) and loosening of implant (one case). Of the seven patients with leg shortening, three had less than 1.25 cm shortening, three had shortening of 1.25 cm and 2.5 cm, and one patient had shortening of more than 2.5 cm but less than 5 cm. Problems of knee stiffness were encountered, though the majority (19 patients) had full or only loss of 10 degrees of flexion. Four patients had fix flexion deformity, four patients had loss of 20 degrees of flexion, one had less than 90 degrees

of flexion and ten patients had a flexion range of 90 degrees to 120 degrees.

Fig. 1 illustrates an example of wrong placement of the condylar blade when performing the surgical procedure. With more experience in the surgical technique this complication does not occur.

Figures 2A, B, C show loosening of the metallic implant in a patient of the present series; a 71-year-old male, he sustained a close comminuted left supracondylar fracture of the femur extending into knee joint (T-shaped) sustained as a result of a fall at home. Condylar plating and lag screws fixation was done the following day after admission to stabilise the fracture. He was discharged after three weeks in hospital. He slipped and fell at home two days after discharge and the implants became loose. He had to be reoperated but he made an excellent recovery after having to be hospitalised, this time for seven weeks. He

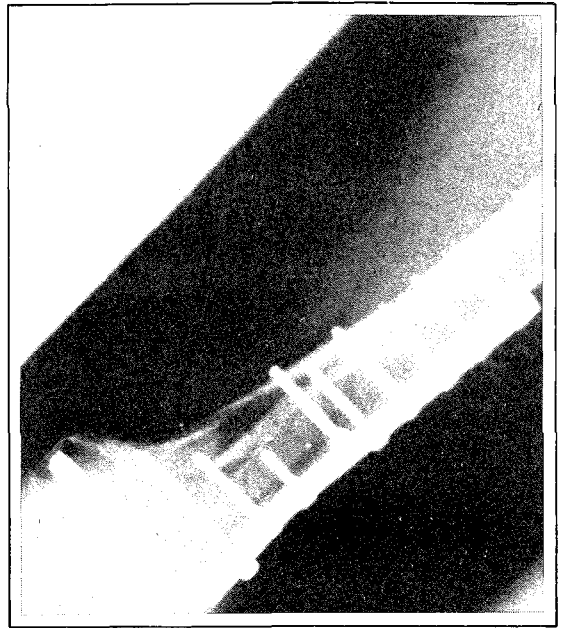


Fig. 2 (A) Condylar plating of comminuted supracondylar fracture femur.



Fig. 1 Illustration of wrong placement of condylar blade.

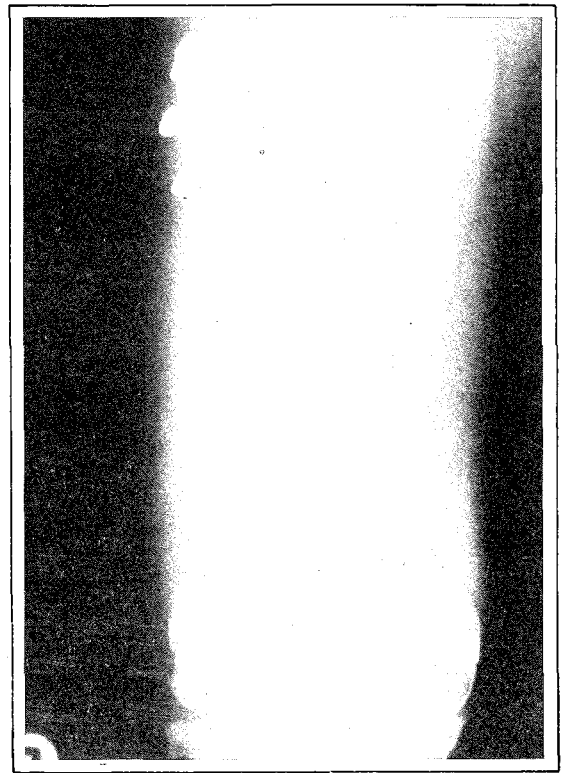


Fig. 2 (B) Loosening of the implants as a result of a fall.

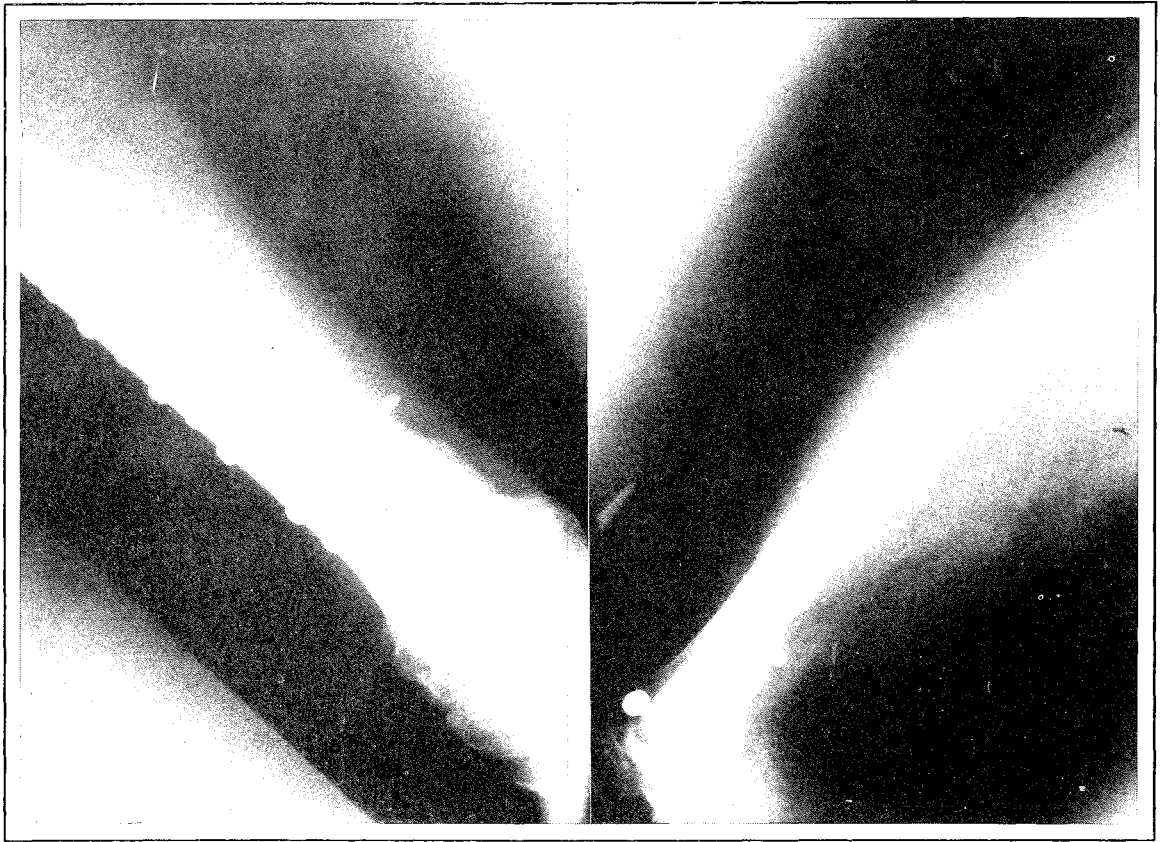


Fig. 2 (C) Reoperation with longer condylar plate and lag screws. AP and lateral views.

subsequently had full range of knee movements, no pain and no deformity.

Grading of overall results

Strict criteria was applied in the evaluation of overall results. The criteria used was adopted from Schatzker of Toronto. Results were graded as excellent, good, fair and failure.

For excellent grading, the patient had to have: full extension; no greater loss of flexion than 10 degrees; varus or valgus deformity less than 10 degrees; no pain.

A result was reduced from excellent to good if there was any of the following: a loss in length no greater than 1.25 cm; 10 degrees of valgus or varus; a loss of flexion no greater than 20 degrees; minimal pain not limiting ambulation.

As soon as the patient had two of the characteristics appearing under the good criteria (for example a loss of 20 degrees of flexion and pain) or when the range of knee movements were from 90 degrees to 120 degrees, his result was reduced to the fair category.

A poor result was any result in which there was any of the following: severe pain resulting in limited ambulation; valgus or varus deformity greater than 15 degrees; knee flexion less than 90 degrees.

Based on the above criteria, 17 patients had excellent results, four patients had good results, 12 had fair results and one had poor results. Thus 62% of patients had excellent/good results. The only poor result was that of a 26-year-old female with open comminuted supracondylar fracture of the femur extending to the knee joint.

Initially a toilet and suture was done for the wound and the fracture immobilised with tibial steinmen pin traction. A month later condylar plating and bone grafting was done. The fracture

united but with 3 cm shortening and range of knee motion of 0 to 70 degrees. Hence she was classified as a case of poor results. Table II is a summary of the patients with fair results.

TABLE II
ANALYSIS OF FAIR RESULTS

Patient's Age/Sex	Type of fracture	Surgical procedures	Range of movements (R.O.M.) knee Leg length discrepancy and knee deformity, if any
28/M	Close fracture midshaft femur and lateral condyle same femur	K nailing femur 2 cancellous screw fixation	R.O.M. : 0-90 ^o
47/M	Open comminuted supracondylar fracture (T-shaped)	Condylar plating Cancellous screw fixation	1.25 cm shortening R.O.M. : 0-130 ^o
26/M	Close T-shaped comminuted supracondylar fracture	Condylar plating Screw fixation	R.O.M. : 0-90 ^o
38/M	Open comminuted supracondylar fracture with fracture patella same side	Condylar plating Wiring patella	1 cm shortening R.O.M. : 0-110 ^o
32/M	Close (L) supracondylar fracture Open (L) Pott's fracture	Fixation of Pott's fracture. Condylar plating a few days later	R.O.M. : 0-110 ^o
68/M	Close fracture lateral condyle femur	2 cancellous screws fixation	R.O.M. : 10-100 ^o
42/M	Close comminuted supracondylar fracture	Condylar plating	R.O.M. : 0-120 ^o 3 cm shortening 12 ^o varus deformity knee
28/M	Open T-shaped comminuted supracondylar fracture	Condylar plating Screw fixation	2 cm shortening R.O.M. : 0-100 ^o
24/M	Open T-shaped supracondylar fracture with knee joint involvement	Condylar plating Screw fixation	R.O.M. : 10-90 ^o
45/F	Open comminuted supracondylar fracture	Condylar plating Bone grafting	R.O.M. : 0-130 ^o 1 cm shortening 10 ^o varus
83/F	Close supracondylar fracture	Condylar plating	R.O.M. : 20-110 ^o
22/M	Open comminuted supracondylar fracture. Multiple fractures	Delay condylar plating and bone grafting	R.O.M. : 10-90 ^o 2 cm shortening

Figures 3 A, B, C illustrate a patient with excellent results after being operated for a close comminuted supracondylar fracture (with involvement of knee joint) of the femur. This 67-year-old female recovered with full range of knee movements, no pain and no leg length discrepancy

DISCUSSION

Supracondylar-condylar fractures of the femur with articular involvement are always regarded with great concern because they are difficult to treat, cause a long absence from work, and often result in permanent disablement.

Studies by Steward *et. al.*,² in 1966 and by Neer *et. al.*,³ in 1967 have suggested that distal femoral fractures are best treated by closed methods. Steward *et. al.*, reviewed 213 distal femur fractures treated in a 20-year period. Neer

et. al., reported on a series of 110 distal femoral fractures and found that 84% of the fractures treated by closed methods, while only 52% of the fractures treated by open methods, had satisfactory results. Steward's series was no better. Only 54% obtained good to excellent results and approximately one-third of the operative cases developed non-union. Neer rightly indicated that no method of internal fixation was available which would provide sufficiently rigid fixation to eliminate post-operative splintage and permit early knee motion.

However during the last decade there has been tremendous improvements in fixation devices developed, especially the screws and angular plates designed by the AO group.

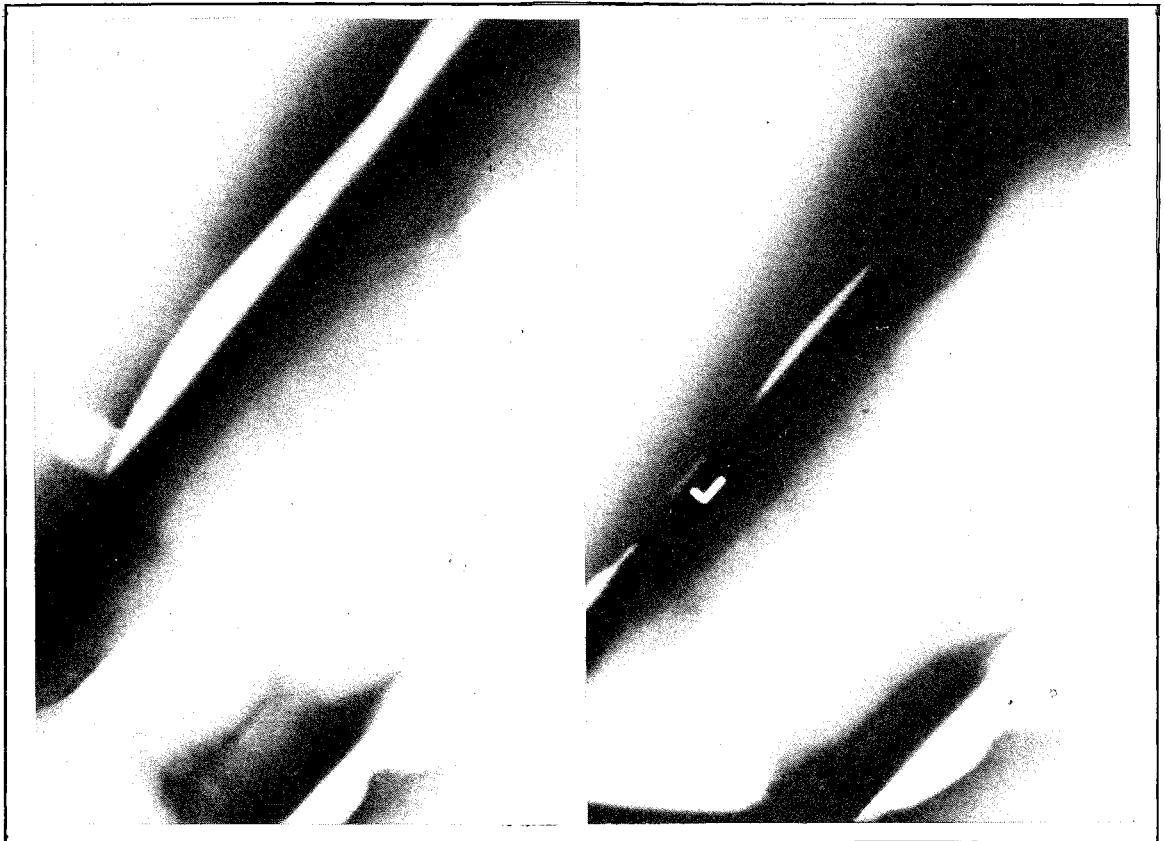


Fig. 3 (A) X-ray films of 67-year-old female with comminuted supracondylar fracture femur.

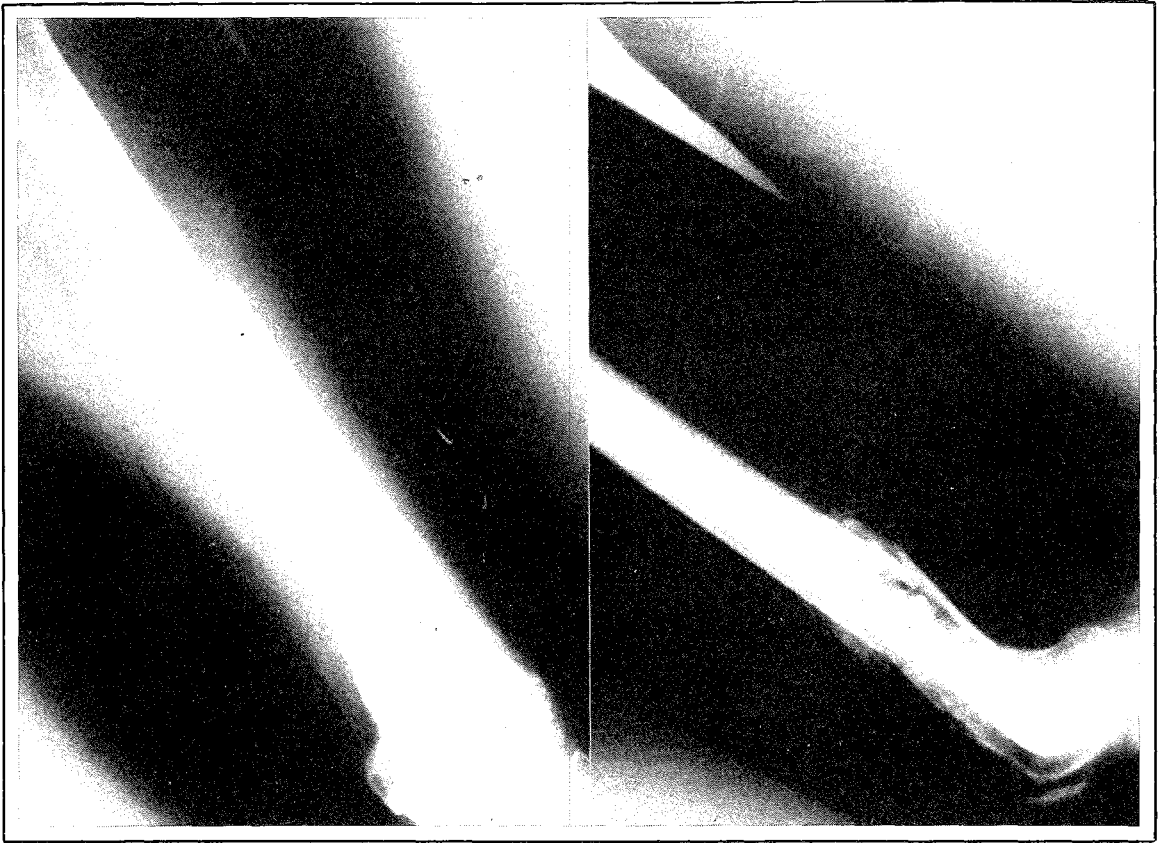


Fig. 3 (B) Post-operative film after internal fixation AP and lateral views.

In 1974, Schatzker *et. al.*, reporting on a series of supracondylar fractures, demonstrated superior results using open treatment methods. Based on their parameters of functional result, open methods gave good to excellent results in 75% of cases, while closed methods yielded good to excellent results in 32% of cases. This position was supported by Olerud,⁴ Chiron *et. al.*,⁵ Muller *et. al.*,⁶ Giies *et. al.*,⁷ Mize *et. al.*,⁸ and William Healy *et. al.*⁹

The present results support the recommendation that supracondylar-condylar fractures of the femur are best treated by open methods to achieve stable osteosynthesis. In fact, successful treatment of intra-articular fractures, especially in weight-bearing joints requires restoration and maintenance of the congruence of the two articular surfaces. Traction can hardly guarantee restora-

tion of such congruence. In principle, therefore, all intra-articular distal femoral fractures should be treated surgically.

This series of surgically treated distal femoral fractures had only one superficial wound infection which was diagnosed on the sixth post-operative day. The patient was a 24-year-old Chinese male who was a known drug addict and who sustained an open T-shaped supracondylar fracture of the femur. The infection cleared up with antibiotic therapy.

A technical error of wrong placement of the condylar blade whereby the end of the metal tends to skim the surface or just entered the knee joint is not serious and with experience in surgical techniques as described by the Swiss AO school, this complication will not occur.



Fig. 3 (C) Clinical photograph of patient showing full knee flexion and excellent result after surgery.

The ease of nursing following surgery is a boon to the patient and nursing staff which is often denied with conservative treatment. The ability to sit out of bed within two to three days of the operation is of inestimable benefit to elderly patients involved in such operation. The fixation of the fracture is often firm enough to allow very early non-weight-bearing of the leg concerned and also firm enough for partial weight-bearing in about four weeks following surgery.

CONCLUSION

AO methods of internal fixation of supracondylar-condylar fractures of the femur can produce reasonable results in most instances. 62% had excellent/good results.

It is recommended that such fractures be internally fixed with AO implants unless: there is no displacement of the fracture; the bone is very osteoporotic; the patient is a poor risk to surgery beset with medical problems.

REFERENCES

- ¹ Schatzker J, Horne G, Waddell J. The Toronto experience of the supracondylar fractures of the femur, 1966-72. *Injury* 1974; 6 : 113-128.
- ² Steward M J, Sisk T D, Wallace S L Jr. Fractures of the distal third of the femur. *J Bone and Joint Surg* 1966; 48A : 784-807.
- ³ Neer C S, Grantham S A, Shelton M L. Supracondylar fracture of the adult femur. A study of 110 cases. *J Bone and Joint Surg* 1967; 49A : 591-613.
- ⁴ Olerud S. Operative treatment of supracondylar fractures of the femur. Techniques and results in fifteen cases. *J Bone and Joint Surg* 1972; 54A : 1015-1032.
- ⁵ Chiron H S, Tremoulet J, Casey P, et. al. Fractures of the distal third of the femur treated by internal fixation. *Clinical Orthop* 1974; 100 : 160.
- ⁶ Muller M E, Allgower M, Willenegger H. *Manual of internal fixation*. New York: Springer-Verlag, 1979.
- ⁷ Giles J B, De Lee J C, Heckman J D, et. al. Supracondylar-intercondylar fractures of the femur treated with a supracondylar plate and lag screw. *J Bone and Joint Surg* 1982; 64A : 864.
- ⁸ Mize R D, Bucholz R W, Grogan D P. Surgical treatment of displaced comminuted fractures of the distal end of the femur. *J Bone and Joint Surg* 1982; 64A : 871.
- ⁹ Healy William, Brooker Andrew. Distal femoral fractures. Comparison of open and closed methods of treatment. *Clinical Orthop* 1983; 174 : 166-171.