

OPERATIVE TREATMENT OF THE INTERCONDYLAR FRACTURE OF THE FEMUR

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SYNOPSIS

Operative treatment of 28 intercondylar fractures of femur were done from 1981 to 1985. The fractures were classified according to AO Classification. Majority of the patients were old (average age of 46 years) with comminuted intercondylar fracture in 60% of cases. 64% of the fractures healed with excellent or good results. Intercondylar fractures associated with fractures involving the articular surface were found in 32% and only 44.4% of such cases yielded excellent or good results. Post-operative complications and bad prognostic factors were discussed.

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INTRODUCTION

The traditional treatment of the displaced fractures of the distal end of the femur in the past had included skeletal traction for a variable period of time followed by some form of external immobilisation(1). This closed treatment has resulted in slow recovery of the knee motion, malunion, knee instability and varus or valgus deformity of the knee. In the past, difficulty in obtaining sufficient surgical exposure to reduce all intraarticular fracture fragments anatomically and lack of a dependable system of rigid internal fixation discouraged attempts to stabilise these fractures operatively. Schatzker et al in his review of 49 supracondylar fractures treated with Swiss Association for the Study of Internal Fixation technique, rigid internal fixation has obtained 71% of good to excellent results(2). The purpose of this study is to analyse the results and complications on 28 operatively stabilised intercondylar fractures of the femur.

MATERIALS AND METHODS

28 intercondylar fractures of the femur in 27 patients were studied from January 1981 to December 1985. These fractures were treated with open reduction and internal fixation. No pathological fractures or fractures in children were included. The fracture patterns were categorised using Swiss Association for the Study of Internal Fixation (ASIF) Classification(3) (Fig 1). The patients were followed up satisfactorily for 1 1/2 year to 6 years.

The series included 21 male and 6 female. The ages ranged from 16 to 85 years with an average age of 45.9 years. 24 of the fractures (86%) were closed and 4 were open (14%). Based on ASIF Classification, the fractures were divided into unicondylar and bicondylar fracture. There were 3 unicondylar (either medial or lateral, B1 or B2) fractures with intercondylar extension, 8 fractures with intercondylar fracture involving both condyles (C1), 13 intercondylar fractures with a comminuted supracondylar component (C2) and 4 intercondylar fractures with severely comminuted condylar fracture (with or without supracondylar or shaft involvement) (C3) (table 1). The fractures were fixed with AO condylar plate, buttress plate or Lag

screws. Cancellous bone-grafting was performed in severely comminuted fractures. Lag screws fixation was done in undisplaced or minimally displaced fractures with no comminution.

EVALUATION

Kettelkamp stated that only 117° of flexion is required to have a functionally satisfactory range of motion of the knee, a lack of full extension may lead to degenerative problems in both the patellofemoral and tibiofemoral joint(4). For this reason, the evaluation system placed more emphasis on obtaining full extension of the knee and less emphasis on obtaining full flexion. No shortening should be accepted in non-comminuted fractures. Four factors were considered in the evaluation and assessment of the results, there were range of movements of the knee, degree of angulation (deformity), pain and limb shortening. The grading of the results is according to Shelbourne et al (1982)(4). "Excellent" and "Good" were considered as acceptable or satisfactory result and "Fair" and "Failure" as unacceptable or unsatisfactory (Table 2).

Open fractures were classified into 3 categories depending on the mechanism of injury, soft tissue damage and degree of skeletal involvement.

Type 1 has a puncture wound 1 cm or less in diameter, relatively clean, minimal soft tissue injury with minimal fracture comminution.

TABLE 1
AO/ASIF CLASSIFICATION OF
INTERCONDYLAR FRACTURE
OF THE FEMUR

Type	No.	%
B1	3	10.7%
B2	0	0
C1	8	28.6
C2	13	46
C3	4	14.3

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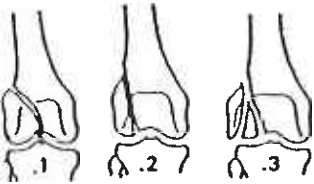
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Fig 1 AO/ASIF Classification Of Intercondylar Fracture Of Femur

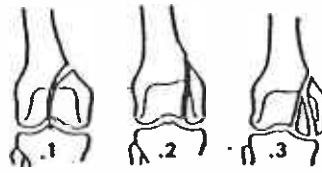
B — Unicondylar

— B1 lateral condyle



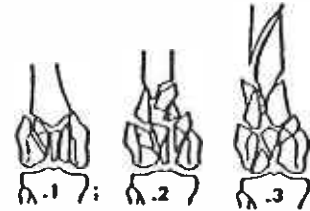
.1 with intracondylar extension
.2 with articular extension
.3 with a third articular fragment

— B2 medial condyle



.1 with Intracondylar extension
.2 with articular extension
.3 with a third articular fragment

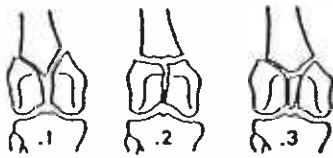
— C3 severely comminuted, condylar



.1 only
.2 and supracondylar
.3 supracondylar and diaphysis

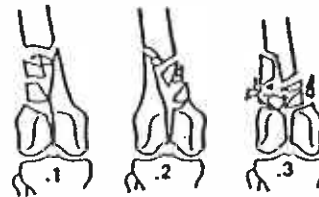
C — Bicondylar

— C1 Intercondylar



.1 simple supracondylar
.2 supracondylar with oblique extension into a condyle
.3 with a third intercondylar fragment

— C2 Intercondylar with a comminuted supracondylar component



.1 only lateral pillar
.2 only medial pillar
.3 both pillars

TABLE 2
RATING SYSTEM FOR RESULT OF FRACTURE TREATMENT

Rating	Motion (Degrees)	Angulation (Degrees)	Pain	Shortening
Satisfactory				
Excellent	Full extension Flexion > 120°	0°	None	0
Good	Full extension flexion 90°–120°	< 5°	Minimum or with weather changes. No medication required.	< 2.5
Unsatisfactory				
Fair	Loss of extension 10° Flexion : 70–90°	5–10°	Minimum, not requiring regular analgesics	
Failure	Total < 90°	>10°	Requiring daily analgesics or further surgery	>5

Type II has a laceration more than 1 cm long with moderate soft tissue damage, little fracture comminution.

Type III is one with extensive soft tissue, heavily contaminated wound with or without neurovascular injury.

RESULTS

In table 3, the results were rated as excellent in 7 (25%), good in 11 (39.2%) and fair in 6 (21.4%) with 4 (14.3%) being Failure. In other words, 64% healed with satisfactory result (excellent or good) and 36% with unsatisfactory result (fair and failure). Fracture union, judged both clinically and radiologically, occurred in all limbs. Out of the 10 cases with unacceptable results: 9 cases (90%) with closed comminuted fracture of AO/ASIF C2 or C3 categories (Table 4). One case (10%) was opened Type IIIa AO/ASIF C1 fracture.

The results of operative treatment were compared between comminuted fractures (C2 or C3 categories) and simple fractures (B or C1 categories). 91% (10 out of 11 cases) of the simple fractures healed with satisfactory result, only 9% (1 out of 11 cases) healed with unsatisfactory result (table 6). This patient was a 60 year old man admitted with Type IIIa opened C1 fracture associated with

1. Comminuted fracture of the tibia plateau involving the articular surfaces.
2. Torn anterior cruciate ligament from tibial attachment.
3. Torn anterior horn of medial meniscus.
4. Partially avulsed patellar tendon.
5. Extensively contaminating wound with extensively torn calf muscle.

The results of 17 comminuted fractures were analysed (Table 6). Most of these cases, the fractures were badly comminuted with osteoporotic bone. Despite this fact, 47% healed with satisfactory results. 9 cases (32%) were found to have associated fractures around the knee ie. patellar fractures and or tibial condylar fractures involving the articular surface. Only 44.4% of such associated fractures healed with satisfactory result (Table 7).

The complications of intercondylar fracture of the femur are shown in Table 8. Limb shortening were found in 35.7% (10 out of 28 fractures) of cases with maximal shortening of 2 cm. 80% of the limb shortening occurred in comminuted fractures and 20% in simple fractures.

When an intercondylar fracture involved the knee or quadriceps mechanism, in our experience, some loss of knee motion with tight quadriceps seems to be inevitable. One of our patients had adhesions around the knee which required arthrotomy and arthrolysis. 2 patients required quadricepsplasty for tight and fibrotic quadriceps mechanism.

DISCUSSION AND CONCLUSION

Intercondylar fracture of the femur is a difficult fracture to treat. With the development of Swiss technique of internal fixation, the treatment has been improved. In our study, majority of the patients were old (average age of 46 years) with comminuted intercondylar fractures (60%) involving the articular surfaces of the knee. Such fractures require rigid internal fixation to achieve the anatomical reduction of the fracture. In spite 64% of our fracture treated with internal fixation healed with satisfactory results (excellent or

TABLE 3

RESULTS

Rating	No.	%	Total
Satisfactory			
Excellent	7	25.0%) 64%
Good	11	39.2%	
Unsatisfactory			
Fair	6	21.4%) 36%
Failure	4	14.3%	

TABLE 4
BREAKDOWN OF 10 CASES WITH
UNSATISFACTORY RESULTS

Cases	%	Type
9	90%	Closed comminuted C2 or C3 fractures
1	10%	Opened type IIIa C1 fracture

TABLE 5
BREAKDOWN OF 18 CASES WITH
SATISFACTORY RESULTS

Cases	%	Type
8	44.4%	Comminuted C2 or C3 fractures
10	55.6%	Simple B or C1 fractures

TABLE 6
RESULTS OF OPERATIVE TREATMENT : COMPARISON OF COMMINUTED FRACTURES

Fracture Categories	Total No.	Satisfactory results		Unsatisfactory results	
		Excellent	Good	Fair	Failure
Simple fracture					
B	3	1	2	0	0
C1	8	4	3	1	
Comminuted fracture					
C2	13	2 (11.7%)	4 (23.5%)	4 (23.5%)	3 (17.6%)
C3	4	0	2 (11.7%)	1 (5.9%)	1 (5.9%)
		Satisfactory results		Unsatisfactory results	
Simple fracture		91%		9%	
Comminuted fracture		47%		53%	

TABLE 7
RESULTS OF INTERCONDYLAR FRACTURE ASSOCIATED WITH FRACTURES INVOLVING THE ARTICULAR SURFACE (FRACTURE PATELLA AND TIBIAL CONDYLAR FRACTURE)

— Total No. of fractures:	28
— With associated fractures involving the articulating surface	9 (32%)
— Satisfactory result	4 (44.4%)
— Unsatisfactory result	5 (55.5%)

TABLE 8
INTERCONDYLAR FRACTURE OF FEMUR — COMPLICATIONS

	Total No. of Cases
1 Infection — Chronic Osteomyelitis	1
2 Post-operative Knee stiffness requiring Arthrotomy & Arthrolysis	1
Quadricepsplasty due to fibrotic Quadricep mechanism	2
3 Avascular necrosis of medial femoral condyle	1
4 Limb shortening	10 (majority 2 cm) comminuted fracture (80% comminuted fracture) (20% simple fracture)
5 Lateral Collateral ligament laxity	2
Anterior cruciate ligament laxity	2

good) as compared to Schatzker et al with 71% satisfactory results. In simple fracture (B or C1 categories) with rigid fixation, most of our cases responded well (91%) whereas comminuted fractures (C2 or C3 categories) about 53% yielded unacceptable result. The result was further compromised when there was associated fracture of the patella or tibial condyles involving the articular sur-

face of the knee. In such cases, only 44.4% yielded satisfactory result. Therefore, in conclusion, the bad prognostic indicators were: Open comminuted fractures, osteoporotic bone with associated patella or tibial fractures involving the articulating surface of the knee. Open reduction with rigid internal fixation is still the treatment of choice for all cases of intercondylar fracture of the femur.

REFERENCE

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