Early Results of Treatment of Distal Femoral Fractures Using the Dynamic Condylar Screw

LAWRENCE H.B. SOH, M.D., M.B.B.S., LIANG TE-SHAN, M.D., M.B.B.S., F.R.C.S.,
SEENIAR THAMBU KASINATHAN, M.D., M.B.B.S., F.R.C.S., M.Ch. (Orth), AND
LIM SWEE LIAN, M.D., M.B.B.S., F.R.C.S. (Glas), AM.

Alexandra Hospital Singapore, Singapore

ABSTRACT : Seven patients with an average age from eighteen to seventy-five years underwent dynamic condylar screw fixation for fractures of the distal femur. The patients were followed up from 10 to 23 months and 71.4% of them had good results. Apart from one delayed union, there was neither post-operative complications nor failure of device. The average of post-operative range of motion was more than 120°.

INTRODUCTION

Fractures of the distal femur present a challenging problem to the trauma surgeon. In the past time, there had been a reluctance to treating these fractures with internal fixation [1,2,3,4]. Neer[2] and Stewart[5] recommended the closed treatment for fear of inadequate fixation, danger of infection and high incidence of non-union. The advent of cast brace[6,7] treatment added support for the use of non-operative treatment.

The difficulty with closed methods; however, was the inability to control displaced intra-articular fragments which did not reduce with manipulation or traction. Closed methods have the drawbacks of knee stiffness, prolonged hospitalisation and bed rest, that it causes badly tolerant in elder patients.

Open reduction and internal fixation have been carried out with blade plates[1,4], rush rods[8], Zickel's devices[9] and supracondylar plates[10,11]. The use of external fixators have also been suggested.

This paper presents the early results of seven patients treated with a dynamic condylar screw for fractures of the distal femur. The advantages[8,11,12] of the AO/ASIF dynamic condylar screw are that the lag screw supplies not only interfragmentary compression across the intercondylar fracture but also has a better purchase in osteopenic bones. The further advantage is that there is no necessity to "hammer in" the seating chisel as required in the AO condylar blade plate. The insertion of the seating chisel in young people can be difficult because of bone density of the distal femoral epiphysis and a danger of further fragmentation. The stability that is provided by the device allows early aggressive restoration of knee motion and muscle power.

The AO classification is used and it divides fractures into:-

Type A : Extraarticular fractures
Type B : Intraarticular but no supracondylar component
Type C : Both intraarticular and supracondylar elements

MATERIALS AND METHODS

During the period from 1987 to 1989, seven fractures of the distal femur were treated by open reduction and internal fixation with a dynamic condylar screw. Follow up periods ranged from 10-23 months. There were 4 females and 3 males in whom the ages at fracture ranged from 18 to 75 years old. There were 2 left and 5 right sided fractures. Three patients sustained fractures as a result of major trauma. Four fractures resulted from minor falls from sitting or standing positions. In two patients, radiographic evidence of osteoporosis was demonstrated. Bone stock was exceedingly poor in one elderly osteoporotic woman and adjunctive methylmethacrylate was necessary for fixation. One patient sustained an ipsilateral tibial and fibular fracture ten months prior to the injury. All fractures were closed and isolated.

Two fractures were extraarticular (Type A), two intraarticular (Type B) and three had both intraarticular and supracondylar elements (Type C) (Table 1).

Surgery was undertaken as described previously[12,14,16] Prophylactic broad spectrum antibiotics were given for 2 weeks.

Post-operatively, continuous passive motion is started after removal of drains. Weight bearing is delayed until clinical and radiological union is presented. The patient is followed up at six weeks, three months, six months and one year intervals.

Table 1
Type and mechanism of injury

Case	Occupation	AO Class	Mech of injury
M 18	Poly student	C2	High vel.
M 24	Welder	B2	High vel.
F 26	Clerk	C2	High vel.
M 36	Bus driver	A2	Low vel.
F 51	Housewife	B3	Low vel.
F 64	Housewife	C2	Low vel.
F 75	Housewife	A3	Low vel.

RESULTS

Surgical time ranged between one and a half to three hours. Six of the seven patients were discharged from the hospital within two weeks. A 75 years old female had to stay for three weeks because of social reasons. Severe osteoporosis was seen in this lady and cement augmentation was required (Fig 1A, 1B). She was lost to follow-up initially and hence, radiological union could not be determined. When she finally agreed to come for assessment, she was found to have a final range of motion of only 30°-90°.

Radiological union was seen between two and four months in all our patients except a 26 years old female who required bone grafting for delayed union three months after the first operation. There were otherwise, no post-operative complications or failure of device. Younger patients recovered quickly, were full weight bearing by 12 weeks and could walk almost any distance on direct questioning at the last assessment. Older patients with pre-existing osteoarthritis of the knee and difficulty with rehabilitation had poorer function.

Using the criteria of Schatzker and Lambert[11], we had no excellent results but 5 out of 7, or 71.4% of our patients had good results. There was one fair result and one failure (Table 2). Most ot the patients had knee motion of more than 120° which compares favourably with other series[4,8,12,13,14,15]. Morever,all patients who were previously employed could return to their previous work.

Table 2
Patient evaluation
(Schatzer + Lambert criteria)

Case	Hosp	G/C	XR union	F/ROM	Results
M 18	13 days	-	3/12	0-135°	Good
M 24	10 days	-	3/12	0-135°	Good
F 26	14 days	ABG	7/12	0-120°	Good
M 36	7 days	-	2/12	0-135°	Good
F 57	7 days	-	3/12	0-130°	Good
F 64	14 days	-	4/12	0-110°	Fair
F 75	21 days	Cement	Lost	30-90°	Failure

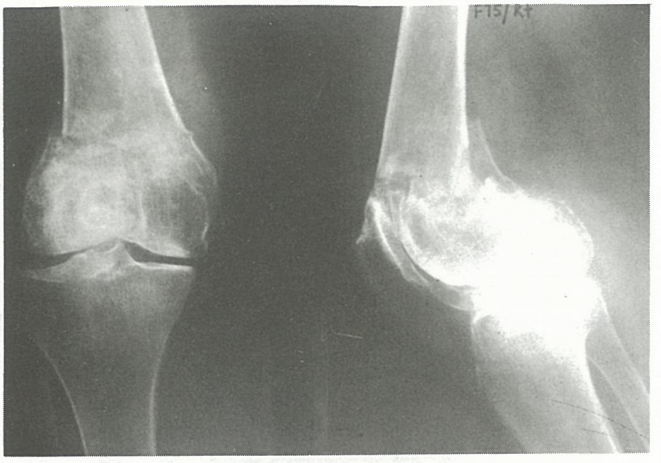

Figure 1A : Pre- operative X-ray of a 75 years old female AO Type A3 fracture

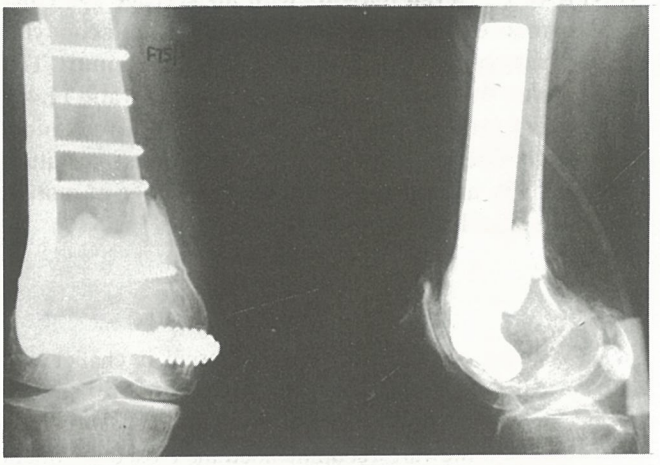

Figure 1B : Post-operative X-ray of the 75 years old female

DISCUSSION

Good results were achieved in 71.4% of patients in the present series which compares favourably with that of Schatzker and Lambert [10,11] as well as other series[4,8,14,15]. There was neither wound infection nor non-union and one delayed union was treated with autogenous bone grafting. However, the short follow-up we are unable to make a comment on any degenerative change affecting the knees in the future.

When Steward, et al[5] studied fractures of the distal femur in 213 patients for 20 years ago, the results were much better when treatment had been by closed methods with traction rather than by open reduction. Internal fixation then was achieved using blade plates. Besides, rush pins and other devices and the incidence of complications including infection, non-union and restriction of motion was high.

In additon, Neer's[2] study of 110 supracondylar fractures also concluded in 1967 that "no category of fracture at this level seemed well suited for internal fixation".

Brown and D'Arcy in 1971[1] reported on internal fixation

of supracondylar fractures in the elderly commented that poor results may relate to inadequate devices and that some restriction of knee flexion was inevitable.

An article comparing open and closed techniques published in 1974 by Schatzker et al[10] reported substantially better results with surgery if the principles of anatomic reduction and rigid fixation were achieved. Olerud[16], Johnson[13], Mize et al[14] have reported series of distal third fractures treated with the AO type condylar plate and have recommended it enthusiastically because of better results with open reduction.

Pritchett[15] studied twenty-three fractures treated with a compression screw device similar to the DCS with 74% good to excellent results and Giles et al[12] reported the advantages of the supracondylar plate and compression screw as compared with other methods of fixation.

A major problem in evaluating the results of several methods of treatment reported in several different articles is the lack of standard reporting and evaluation criteria. Some interpretation was necessary to convert statistics into a form which would permit comparison. The one common denominator in most articles was the range of knee motion, but additional features like angular deformity and pain or functional results can be used in evaluating end result categories. Laros[17] made a good attempt to correlate the results of different authors.

CONCLUSION

There has been an evolution towards an operative management of distal femoral fractures with the advent of devices capable of offering stable internal fixation. This limited study demonstrates the versatility of the dynamic condylar screw in treating distal femoral fractures with its feasibility in osteoporotic bones where a better purchase is required, and in difficult intercondylar fractures in very hard, dense cancellous bone which does not yield easily to the seating chisel of the AO condylar plate. Consequently, as such the dynamic condylar screw can complement the condylar plate as a tool in the orthopaedic surgeon's armamentarium.

REFERENCES

1. Brown A, D'Arcy JC. Internal fixation for supracondylar fractures of the femur in the elderly patient. J Bone Joint Surg (Br) 1971;53: 420-4.
2. Neer CS II, Grantham SA, Shelton ML. Supracondylar fractures of the adult femur. J Bone Joint Surg (Am) 1967;49:591-613.
3. Riggins RS, Garrick JG, Lipscomb PR. Supracondylar fractures of the femur. A survey of treatment. Clin Orthop 1972;82:33-6.
4. Shelton ML, Grantham SA, Neer II CS, Singh R. A new fixation device for supracondylar and low femoral shaft fractures. J Trauma 1974;14:821-35.
5. Steward MJ, Sisk TD, Wallace SL. Fractures of the distal third of the femur. A comparison of methods of treatment. J Bone Joint Surg (Am) 1966;48:784-807.
6. Connolly JF, Dehne E, Paso EL, Lafollette B. Closed reduction and early cast-brace ambulation in the treatment of femoral fractures. J Bone Joint Surg (Am) 1973;55:1581-99.
7. Mooney V, Nickel VL, JP Harvey Jr, Snelson R. Cast brace treatment for fractures of the distal part of the femur. J Bone Joint Surg (Am) 1970;52:1563-78.
8. Shelbourne KD, Brueckmann FR. Rush pin fixation of supracondylar and intercondylar fractures of the femur. J Bone Joint Surg (Am) 1982; 64:161-69.
9. Zickel RE, Fietti VG, Lawsing JF, Cochran GVB. A new intramedullary fixation device for the distal third of the femur. Clin Orthop 1977; 125:185-91.
10. Schatzker J, Horne G, Waddell J. The Toronto experience with the supracondylar fracture of the femur. Injury 1974;6:113-28.
11. Schatzker J, Lambert DC. Supracondylar fractures of the femur. Clin Orthop 1979;138:78-83.
12. Giles JB, Delees JC, Heckman JD. Keever JE. Supracondylar- intercondylar fractures of the femur treated with a supracondylar plate and lag screw. J Bone Joint Surg (Am) 1982;64:864-70.
13. Johnson EE. Combined direct and indirect reduction of comminuted four-part intraarticular T-type fractures of the distal femur. Clin Orthop 1988;231:154-62.
14. Mize RD, Bucholz RW, Grogan DP. Surgical treatment of displaced, comminuted fractures of the distal end of the femur-an extensile approach. J Bone Joint Surg (Am) 1982;64:871-9.
15. Pritchett JW. Supracondylar fractures of the femur. Clin Orthop 1984;184:173-7.
16. Olerud S. Operative treatment of supracondylar-condylar fractures of the femur. Techniques and results in fifteen cases. J Bone Joint Surg (Am) 1972;54:1015-32.
17. Laros GS. Supracondylar fractures of the femur:editorial comments and comparative results. Clin Orthop 1979;138:9-12.