

Radiologically Visible Surgical Error and Poor Outcome of Internal Fixation in Distal Femoral Fractures

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SUMMARY

Background. Distal femoral fractures are usually complex and difficult to treat. The surgeon must demonstrate sound judgment in interpreting the fracture pattern and must possess a basic understanding of the principles of operative fracture management as well as knowledge of the mechanics of the implants.

Material and methods. 170 patients with distal femoral fractures were operated by 10 different orthopaedic surgeons from January 2003 to August 2006 using retrograde intramedullary nail and dynamic condylar screw within the first two weeks after the trauma. All patients who were labeled as failure (as per the Criteria from Schatzker and Lambert 1979) were included in the study.

Result. 38 (22%) patients with distal femoral fractures were graded as poor results. Eleven (29%) of these 38 fractures were fixed by using retrograde intramedullary nail and 27 (71%) were treated by dynamic condylar screw. 25 (66%) poor results [6 (16 %) in the retrograde intramedullary nail group and 25 (50 %) in the dynamic condylar screw group] were in the absolute control of the operating surgeon and 13 (34%) poor results were not in the control of the operating surgeon.

Conclusion. Using any of the advised methods for operative treatment of these fractures, strict adherence to the basic principles of the fracture fixation is of paramount importance to reduce the number of complications.

BACKGROUND

Supracondylar and intercondylar fractures of the femur are usually complex and management of these fractures is fraught with a wide range of potential complications [1]. Significant advances in the patient outcome have been achieved with internal fixation compared with the historical controls of non-operative treatment [2]. Fast evolution of implants and surgical techniques has made operative treatment the standard care for these complex fractures. One implant or a surgical technique has been claimed superior over the other over a period of several years [3,4,5,6]. The surgeon must demonstrate sound judgment in interpreting the fracture pattern and must possess a basic understanding of the principles of operative fracture management as well as knowledge of the mechanics of the implants [7]. Schatzker in 1979 pointed out the common surgical errors including inaccurate reduction, medial protrusion of the blade plate, too proximal insertion of blade plate and failure to achieve interfragmental compression as contributing factors for failure of internal fixation [8].

The purpose of this study was to discuss the surgical error as a contributing factor for poor outcome in distal femoral fractures, so that more attention is paid to surgical technique, which will decrease the complication rate.

MATERIAL AND METHODS

A retrospective study was conducted in the Department of Orthopedics, Government Medical College, University of Kashmir, to determine the surgical error as a contributing factor for poor results in distal femoral fractures. 170 patients with distal femoral fractures were operated by 10 different orthopaedic surgeons from January 2003 to August 2006, using retrograde intramedullary nail and dynamic

condylar screw within the first two weeks after the trauma. 38 (22%) patients who were labeled as failure (as per the Criteria from Schatzker and Lambert 1979) were included in the study. 132 (78 %) patients who had fair, good or excellent results were excluded from the study.

Among the 38 patients having poor results, 15 were female and 23 male with an average age of 43 years (range 21 to 70 years). 21 were right- and 17 left-sided fractures. The cause of injury was a road traffic accident in 16, fall from height in 11, domestic fall in 8 and gun shot injury in three. As per the AO classification (Muller et. Al.1999), 9 were type A1, 3 – A2, 5 – A3, 7 – C1, 8 – C2, and 6 – type C3 fractures. Eleven (29%) fractures were fixed by using retrograde intramedullary nail and 27(71%) were treated by dynamic condylar screw (Tab. 1, 2).

RESULTS

Using the Criteria from Schatzker and Lambert (1979), 38 patients were labeled as poor.

Hardware prominence, insufficient cortical fixation above the fracture, improper condylar screw placement and malreduction leading to poor results were the preventable factors for poor results in patients treated with dynamic condylar screw. Among the 27 fractures treated with dynamic condylar screw, 5 patients had insufficient cortical screw fixation above the fracture which led to early implant back out and non-union. These patients needed repeat surgery with sufficient cortical fixation and bone grafting, united with poor results. 7 patients had an improperly placed condylar screw. Among these 7, two screws were medially protruding, leading to irritation of soft tissues (Fig. 1). These patients could not cooperate with the post-operative rehabilitation and united with limitation of range of motion. Two patients who had

Tab. 1. Fracture pattern: implant (n=38)

Group of AO classification	Implant RIMN number of patients n=11 (29%)	Implant DCS number of patients n=27 (71%)
A1	6	3
A2	1	2
A3	1	4
B	0	0
C1	3	4
C2	0	8
C3	0	6

RIMN - retrograde intramedullary nail
DCS - dynamic condylar screw

Tab. 2. Fracture pattern: complications (n=38)

Surgical error n=25 (66%)	
Implant RIMN	Implant DCS
4 - Nail protruding in the knee joint	7 - Less number of cortices fixed above the fracture
1 - Smaller diameter nail	5 - Improper placement of the condylar screw
1 - Mal reduction	3 - Joint incongruency
	1 - Malreduction
	3 - Failure to graft the comminuted fracture site
6	19
Other contributing factors for results (Not under the surgeons control) n=13 (34%)	
3 - Septic arthritis	2 - Deep infection
2 - Non compliance	4 - Non compliance
	2 - Preoperative joint degeneration
5	8

RIMN- retrograde intramedullary nail
DCS- dynamic condylar screw

a laterally protruding implant also could not start early range of motion exercises. In 3 patients the condylar screw was protruding into the joint (Fig. 2). Two of these patients were reoperated with proper placement of the condylar screw and in one the fracture was stabilized with Ilizarov ring fixation. One patient had malreduction with medial and anterior displacement of the distal fragment and 3 had joint incongruency (Fig. 3). Bone grafting was not done in 3 fractures with metaphyseal comminution, which led to non-union and implant breakage.

Among the 11 fractures treated by retrograde intramedullary nail (all done under image intensifier), nail protruding in the knee joint was the commonest

preventable complication, seen in 4 patients. In two patients the nails were unlocked and countersunk. Two patients refused reoperation and united with restricted motion of the knee (Fig. 4). Fracture in an obese patient was fixed using a smaller diameter nail which was broken after the patient started weight bearing. One patient had malreduction of the fractures with varus exceeding 15 degrees.

Among the other contributing factors (not under the control of surgeon), 5 patients had deep infection (2 DCS and 3 intramedullary nails), 2 had degenerative joint disease before surgery (both DCS) and 6 patients (4 DCS and 2 intramedullary nail) did not follow the hospital-advised protocol (Tab. 1, 2). The



Fig. 1. Medial protrusion of condylar screw



Fig. 2. Condylar screw protruding into knee joint



Fig. 3. Articular step after fixation

two patients with infected plates needed repeated debridements and united with stiffness and persistent pain. Septic arthritis in 3 patients after intramedullary nail led to stiffness of the knee.

DISCUSSION

Supracondylar and intercondylar fractures are always regarded with great concern because of their proximity to the knee joint and treatment difficulties. The management of these fractures is fraught with a wide range of potential complications [1]. The published series of these injuries recorded varying incidences of implant failure, non-union, malunion, infection, joint contractures and post-traumatic arthritis [2,8,10]. Success of treatment of intercondylar fractures requires restoration and maintenance of the congruence of the two articular surfaces. Operative treatment attains anatomical reduction, stable internal fixation, early range of motion, early mobilization and avoids all the complications of non-operative treatment.

Most studies in the recent past have attempted to evaluate and compare the results of condylar blade plate, dynamic condylar screw, retrograde intramedullary nail and less invasive stabilization systems as treatments for distal femoral fractures [3,4,6,8,10]. To our knowledge, there are few accounts in literature reporting surgical error as a possible cause for failure of internal fixation in distal femoral fractures. The purpose of the present paper is to report a series of operated distal femoral fractures having less satisfactory results with special reference to surgical error.



Fig. 4. RIMN protruding into the knee joint with proximal locking screw irritating the soft tissue

Edgar et.al.in 1956 [12], described a series of 47 patients with supracondylar fractures of the femur treated by internal fixation and immediate knee motion. They reported that poor results were due to errors in the surgical judgment rather than failure of the method of treatment.

Schatzker and Lambert in 1979 [8] reported 35 supracondylar fractures treated by open reduction and internal fixation using ASIF implants and instruments. 71% good to excellent results were obtained in 17 patients in whom the fixation of the fracture had been done with strict adherence to basic principles of accurate reduction and internal fixation. Only 21% good to excellent results were obtained in 18 patients in whom basic principles of fixation were not followed.

Kenneth D in 1987 [7] stated that technological improvement in implants as well as improved surgical experience have brought the surgical fixation of distal femoral fractures into the realm of respectability.

Our study reported 38 (22%) poor results in 170 distal femoral fractures treated operatively over a period of 42 months. 25 (66%) among the 38 poor results were because of poor surgical technique. Unstable fixation, improper placement of the condylar screw, wrong selection of implant (smaller diameter nail) and failure to countersink the nail resulted in poor results in our series. 13 (34%) poor results due to infection, non-compliance of the patient and pre-operative degenerative joint disease were not in the absolute control of the operating surgeon.

The accepted methods of treatment have their pros and cons and no single method of treatment can overcome all the problems associated with the man-

agement of distal femoral fractures. The use of retrograde intramedullary supracondylar nails inserted by closed technique has gained much popularity in the treatment of supracondylar fractures of the femur. The dynamic condylar screw is also an effective method of treating supracondylar and intercondylar fractures of the femur with a wide range of advantages. Distal femoral fractures should be reduced and fixed under fluoroscopic control to avoid malalignment of the fracture, improper placement of the implant and violation of the articular surface. Medial or lateral protrusion of condylar screw should be avoided to prevent soft tissue irritation and interference with range of motion exercises. Anatomical reduction of an intercondylar fracture is of paramount importance to avoid articular step and subsequent poor result. Proper selection of nail size and countersinking of the nail 2-5mm below the joint surface avoids patellar impingement and interference with range of motion exercises. All recently described sur-

gical techniques and implants (dynamic condylar screw, retrograde intramedullary nail, less invasive stabilization system, transarticular percutaneous osteosynthesis and indirect reduction and bridge plating) for distal femoral fractures have a place if done properly by well experienced surgeons. Sound judgment by the surgeon and strict adherence to the basic principles of fracture fixation will reduce the complication rate of operative treatment in distal femoral fractures.

CONCLUSIONS

1. The treatment of distal femoral fractures remains a significant surgical challenge and is fraught with a wide range of potential complications.
2. Using any of the advised methods for operative treatment of these fractures and strict adherence to the basic principles of fracture fixation are of paramount importance to reduce the number of complications.

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