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Evaluation of plate fixation of distal femoral fractures in geriatric patients

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Abstract---The surgical treatment of osteoporotic fractures is technically demanding. The poor mechanical properties of the bone make it difficult to obtain stable fixation and thus early movement. The implants and methods used to treat this fracture in the young are often ineffective in the elderly. The long-term functional consequences of fracture depend on surgical success, as much in this group of patients as in any other. Surgical results, and therefore subsequent quality of life, are impaired by the inherent difficulties of reconstructing and achieving union of fractures in the osteoporotic bone.

Keywords---distal femoral, fracture fixation, elderly patients, geriatric patients.

Introduction

4% to 6% of all femoral fractures occur in distal femur (Kregor et al., 2001). They come second in frequency after proximal femoral fractures in geriatric patients (Arneson et al., 1988) which is 10% more common than distal femoral fractures

(Martinet et al., 2000). Surgical treatment is usually mandatory to allow early rehabilitation and mobilization (Stromsoe, 2004). It is often difficult to use intramedullary fixation especially when there is osteoporosis, comminution, and intraarticular extension. Hence, the usage of surface implants like condylar screw plate, 95 angle blade plate and locking condylar plate may be more beneficial (Cornell, C.N. (2003). Nonunion and infection remain the most common complication particularly in the complex fractures patterns due to inadequate fixation stability and the compromised blood supply (Frigg et al., 2001).

Patients and Methods

Prospective case series were performed in Kasr El Ainy University and Sheben El-Kom teaching hospital. 65 years and older patients with distal femoral fractures are included in our series. Surgically unfit patients are excluded from the study. 50 patients are operated upon. All patient were done from November 2014 to May 2017 No patients were lost from follow up. Most of patients 60% had low energy trauma due to falls on the ground, most of theses injuries were single fractures. We used the AO classification to differentiate between these cases. 21 patients had type C fractures, 16 had type B and 13 had type A (Table 1). preoperatively posterior plaster slab or light skin traction were applied to all patients. Based on our hospital protocol, all patients received pharmacological prophylaxis.

Table-1: Illustrates number and percentage of cases

Type of fracture	Number of case	Percentage
Extra articular 33 A	13	26%
Partial articular 33B	16	32%
Complete articular 33 C	21	42%

Surgically, lateral approach over the distal femur was done in 36 patients with further division of iliotibial tract. In some cases when joint visualization was necessary the incision was extended distally till iliotibial tubercle. The muscle fascia was incised investing the vastus lateralis is just anterior to lateral intramuscular septum. We should take care to avoid excessive tension on the patellar tendon especially in osteoporotic patients correction of the fracture displacement was corrected using blow under the knee. We used the MIPO technique in 14 cases. We have done a small incision over the distal lateral thigh. We used this incision to introduce distal femoral plate (mostly locked) submuscularly. In complex cases. the incision was extended intra-articularly to achieve good articular reduction. To adapt and centralize the plate over the femoral shaft small proximal incision was made. We used Clamps and K-wires to reduce the fracture, with help of manual traction, satisfactory length and rotation were achieved, preliminary wires are used to secure the plate on the bone. Finally, screws fixation was done under image control. We used Lag screws optionally to reduce the fracture according to its pattern. The locking screws are inserted on either side to hold the plate firmly (Fig. 1-4).

Results

The patients were treated with continuous passive motion when able in early postoperative period. The patients were given the proper antibiotics according to the local hospital policy as well as pharmacological thromboprophylaxis. The patients were allowed for physiotherapy on the next week. Weight bearing was allowed according to every case. Patients were followed up at regular interval of 2,4,6 till 6 months and then every 3 months till 2 years. During the outpatient follow up, many factors were assessed like fracture configuration, radiographic fracture healing, the range of motion and functional knee score. The complication were also documented (Table 2).



Fig 1. : 65 year's old female with fracture left distal femur type [33-A1.3] after road traffic accident

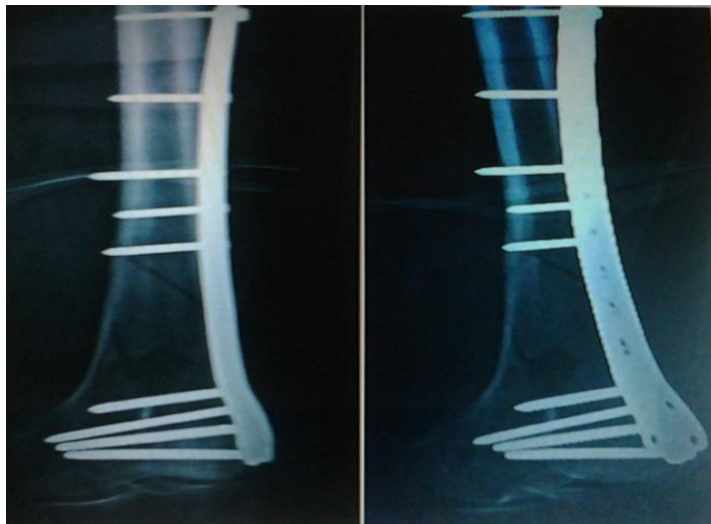


Fig 2 : Immediate post-operative X-Ray [AP and lateral view] show good reduction with 4 distal and 5 proximal screws



Fig 3. : After 3 months of the operation X-Ray [AP and lateral views] show radiological union



Fig 4: After 6 months post operative X-Ray [AP and lateral views] show progressing union

The mean age of population was 77.02(65-82) years. There was as expected a predominance of female (30 patients). In all, 34 fractures were right sided and 16 left sided. The mean time to surgery was 4 days (10 hours – 14 days). 42% of patients (21) had type C, 32% of patients (16) had type B and 26% of patients (13) had type A according to AO/OTA classification system. Fracture union is defined Radiologically by the appearance of trabeculae across the fracture site and clinically by the absence of tenderness on palpation as well as no pain on weight bearing. The mean time to achieve union was 16.5 weeks (8-24 weeks). The mean time to follow up was 6 months . The functional range at 6 months was 63.9 (40-85). Regarding the range of motion all patients achieved average knee flexion of 95

degree and no extension deficit. The mean knee score was 75.7 (50-95) and the mean functional score 63.9 (40-85) according to Knee Society Score system.

All wound healed with no infection except one case (superficial infection healed after giving good antibiotics) There were no implant loosening or cutout. All received postoperative intravenous antibiotics postoperatively for 3 days according to the local hospital policy. There were no mortalities reported. One case reported to have medial collapse and non union who treated later on with locked plate and iliac crest bone graft. Another case reported to have delayed union which completed at 9 months later on. No general complication like respiratory tract or urinary infections were reported (Table 3).

Table 2: Illustrating postoperative complication in each group of our study

Complication	Group A	Group B	Group C
General			
deep venous thrombosis	0	0	0
Urinary tract infection	0	0	0
Pressure sore	0	0	0
Chest infection	0	0	0
Death	0	0	0
Local			
Loosening of screws	0	0	1
Superficial inflammation	0	0	1
Delayed union	0	0	1
malunion	0	0	1
Stiffness	0	0	23
Pain	0	6	8

Table 3: Illustrates final outcomes

Outcome	Number of patients	Percentage [%]
Excellent	20	40%
Good	18	36%
Faire	11	22%
Failure	1	2%

Discussion

The management of supracondylar/intercondylar fractures of the distal femur in geriatric patients remains controversial. It is quite challenging to treat distal femoral fracture in such age group (Gautier and Sommer, 2008). Bone integrity, healing capability and achieving reasonable functional results are important concerns from practical point of view (Moroni et al., 2005). Locked plating and Mipo technique should be taken into consideration to cover these points. Recently, locked plate is increasingly used to treat these fractures especially in osteoporotic bones (Tejwani and Wolinsky, 2008).

We should not miss soft tissue handling to improve early and long term outcomes in trauma care (Perren, 2002). The primary goal of surgery with locked plates is to achieve union with bridging callus through relative stability which allows movement at the fracture gap. The biomechanical principle of relative stability allows a relative dynamic deformation which induces secondary callus formation (Ricci et al., 2014). Hence, a different biologic process for fracture healing depends on the technique of fixation stability (absolute or relative) (Zlowodzki et al., 2004). When Comparing locked plate fixation to other fixation techniques like IM nailing, conventional plating and DCS, it was found that it provide rigid fixation at the expense of minimal motion at fracture site (Collinge and Sanders, 2000).

When considering mipo technique, the healing potential is maximized by careful tissue handling which maintain tissue viability, as well as preserving the periosteal blood supply (Uhthoff et al., 2006). Mipo technique is a surgical technique which allows fixation of a bone fracture through smaller incisions. The position of plates in the submuscular plane reduces the iatrogenic injury to the periosteum. All lead to less surgical trauma to the tissue and so improve the clinical results (Farouk et al., 1999).

Minimally invasive methods appear to be more advantageous than open technique (Man-Kwan et al., 2005)[16]. To be more specific the minimal invasive methods improve the rate of fracture healing, by decreasing the need for bone grafting and lowering the incidence of infection (Kanabar et al., 2007). Two other studies of distal femoral fractures fixation in elderly patients were published (Doshi et al., 2018; Hoffmeier et al., 2011). In our study there was no complication of infection or general complication like pneumonia or urinary tract infection.

The complication seen in our population is delayed union (1 case) and non-union (1 case). We had no mortalities during the period of follow up. Early mobilization in presence of delayed union or nonunion can lead to plate breakage. The use of long plates theoretically increase the plate's working length and hence improve the number of cycles can withstand load until failure (An, 2002). The allowed early walking in our patients is based on the fixation principle. Because that we can allow weight bearing even in presence of delayed union without subsequent plate fixation failure. Moreover, early mobilization is important in preventing complication of prolonged recumbences such as DVT, bed sores and joint contractures.

We have had good functional outcomes at 6 months as well as satisfactory range of motion. Our patients have had average knee flexion of 95, Full extension was present in all patients and the limited flexion may be due to the pre-injury functional range of motion. Furthermore, it may be due to the limited comprehensive and compliance with physiotherapy. The delay in surgery (which was 4 days) is due to either control of medical problem or late transfer of patient from other centers. It may to some extent contribute to the limited postoperative range of motion. There was no recorded cases of malrotational alignment or limb length discrepancies.

We have had less clinical complication in our study. However there was a high prevalence of limited knee flexion due to joint stiffness present in 46% of all cases, the functional outcomes in our study were promising.

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