Original Article

DISTAL FEMUR FRACTURE FIXED WITH LOCKING PLATE

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ABSTRACT:

OBJECTIVE: To record the complications and clinical outcomes of locking plate used for the management of distal femoral fractures.

METHODOLOGY: A total of 100 cases were selected for the treatment of distal femur shaft fracture. Closed or open reduction and internal fixation of the supracondylar femoral fractures adopting supine position with the help of fluoroscope was done. Each patient was treated according to the particular type of injury, associated injuries, location of the fracture and involvement of the soft tissue. Internal fixation of the metaphyseal part of the fracture by adopting open or submuscular approach was performed. Patients mobilization was done on the basis of pattern of femur fracture and constellation of injuries. Until the signs of healing alongwith resolution of fracture lines or formation of callus, the weight bearing was delayed while the usual physical therapy was advised. The patients were followed up on a regular interval at 2, 6, 12 weeks, 6 months, 12 months and 24 months. Clinical examination was done for sensory and motor examination, knee stability, range of motion and ambulation was also performed. Radiographic examination was also done. We considered radiographic union as bridging of the fracture site at 3 cortices by callus or cortical continuity as well as obliteration of the fracture line. The delayed union was defined as missing radiographic evidence of union of fracture with continued progress towards healing at six-month time whereas varus angulation >10° at fracture healing was defined as malunion.

RESULTS: Out of a total 100 cases of distal femur fracture, mean age of the patients was 53.47±4.78, (54% were male and 46% females). Motor vehicle accidents were recorded as 38%, low energy fall was found in 37%, 8% for motorcycle accident and high energy fall, 5% had unknown mechanism of injury while 4% had sports injuries. Final healing status reveal that 90% of the cases had healing, 4% had non-union, 4% had total knee replacement while antibiotic spacer after infection total knee replacement in 1% and 1% had below knee amputation. Clinical outcome (range of motion) according to Kristensen was recorded as 3% who had <60°, 18% had 60-94°, 10% had 95-104° while 64% had >104°and 5% had unknown or not applicable.

CONCLUSION: Despite adopting modern techniques fixation of locked periarticular plating, distal femoral fractures still result in poor clinical outcome and persistent disability. Further studies are required to determine the factors which may improve outcome.
KEYWORDS: Distal Femur Fracture, locked plating, Clinical outcome

INTRODUCTION:

Distal femoral fractures are reported to be 6% of femoral fractures.[1] In young population, it is usually related to the high-energy trauma while the old aged patients are those having a low-

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energy trauma.[2] A study by Ng et al. revealed that distal femoral fractures are presenting as 29% of those with non-proximal femoral fractures while the incidence is growing up.[3] The elder population is correlated with a higher rate of morbidity and mortality.[4] Recently, it is proposed that the standard of care of distal femoral fracture may be revised by applying the similar principles applied for the proximal femoral fractures regarding early surgical and universal ortho-geriatric involvement.[5] Intramedullary nails, external fixation, plates and prosthesis are the current management strategies while fixing distal femoral fractures. In current era, among all these options, the most commonly used strategy is locking screws plates and intramedullary nailing. Locking screw plates are considered to be helpful especially in those cases having osteoporotic distal femoral fractures. The distinctive feature of locking screw plates is the resistance to varus collapse while it also has various points of fixation.[6] This study was planned to record the complications and clinical outcomes of Locking plate used for the management of distal femoral fractures.

METHODOLOGY:

The study was conducted at Aziz Fatima Hospital during March 2012 to March 2014. We included all diagnosed cases of distal femur fracture in $\geq$ 20 years of age of either gender whereas metastatic disease, intramedullary fixation, nerve function prior to injury or impaired lower extremity motor function were excluded from the study. A total of 100 cases were selected for the treatment of distal femur shaft fracture during this period.

We performed closed or open reduction and internal fixation of the supracondylar femoral fracture adopting supine position with the help of fluoroscope. Each patient was treated according to the particular type of injury, associated injuries, location of the fracture and involvement of the soft tissue. We performed internal fixation of the metaphyseal part of the fracture by adopting open or submuscular approach. The post-operative radiographs were done for each patients (AP, Lateral) to ensure the implant position and quality of reduction. Postoperative antibiotic and prophylactic deep vein thrombosis prophylaxis was done. The antibiotics were continued according to the surgeon's preference and severity of wound. Patients mobilization was done on the basis of pattern of femur fracture and constellation of injuries. Until the signs of healing along with resolution of fracture lines or formation of callus, the weight bearing was delayed while the usual physical therapy was advised.

We followed up these patients on a regular interval at 2 weeks, 6 weeks, 12 weeks, 6, 12 and 24 months. The pain was assessed with the help of visual analogue scale (VAS), while the ambulation problems required aides and limp. Clinical examination was done for sensory/motor examination, range of motion, knee stability, and ambulation was done.

Radiographic examination was also done. We considered radiographic union as bridging of site of fracture at 3 cortices by developing callus or continuity of cortical. The delayed union was defined as missing radiograph evidence of union of fracture with continued progress towards healing at six-month time whereas varus angulation >10° at fracture healing was defined as malunion. We also recorded any complications regarding healing, failure of hardware and its loosening, and revision surgery. We considered both superficial or deep infections.

RESULTS:

Out of a total 100 cases of distal femur fracture, mean age of the patients was recorded as 53.47$\pm$4.78, 54% male and 46% females. Motor vehicle accidents were recorded as 38%, low energy fall was found in 37%, 8% for motorcycle accident and high energy fall, 5% had unknown mechanism of injury while 4% had sports injuries. Final healing status revealed that 90% of the cases had healing, 4% had non-union, 4% had total knee replacement while antibiotic spacer after infection total knee replacement in 1% and 1% had below knee amputation. Clinical outcome i.e. range of motion following Kristensen criteria was recorded as 3% who had <60°, 18% had 60-94°, 10% had 95-104° while 64% had >104°and 5% had unknown or not applicable.

Table No. 1

Mechanism of injury	No. of patients	Percentage
Motor vehicle accident	38	38
High energy fall	8	8
Low energy fall	37	37
Sports	4	4
Motorcycle accident	8	8
Unknown	5	5

Table No. 2

Final healing status	No. of patients	Percentage
Healed	90	90
Non-union	4	4
Total knee replacement	4	4
Antibiotic spacer after infected total knee replacement	1	1
Below knee amputation	1	1

Table No. 3. Clinical outcome following Kristensen criteria for range of motion

Range of motion					
	<60°	60-94°	95-104°	>104 °	Unknown or not applicable
Frequency	3	18	10	64	5
Percentage	3	18	10	64	5

DISCUSSION:

There is still controversy regarding adoption of the surgical technique while managing distal femoral fractures. The methods of internal fixation are still reliant on surgeon's preference and type of fracture where intramedullary nails have comparable advantages as locking plates e.g. soft tissue protection, indirect fracture reduction, percutaneous placement, high healing rates, success in osteoporotic bone [7], Locking plates are becoming the most commonly used method for stabilizing the distal femur fractures [8]. One of the reasons may be advanced age as the osteoporotic bones for locked plates are comparable to retrograde nailing and blade plates[9]. Though, Locking plates are providing a significant better option while managing distal femoral fractures, the use of Locked plates is increasing and also a significant increase for fixation of various other fractures. Previous studies reveal that complication like slow healing, delayed union, and failure of implant are not frequently recorded while using these plate for fixation of fractures.[8,10]. Earlier data reveals lower rates of nonunion when these were compared to those managed with non-locking plates[11,12], while the recent data is evident that nonunion is recorded up to 20% [10, 13, 14]. In our study, 4% of the cases had signs of non-union. There are various reasons influencing the union rate. Higher stiffness of locking plates is found to be associated with callus formation and suppressing interfragmentary movement [10,15]. Another study revealed 19% of the cases with nonunion but the difference was insignificant for bridging span in healed cases as compared non-healed cases[21]. The recent guidelines for adequate bridge plate fixation are 3 o 4 empty holes at the level of a fracture [22]. In the current study, shorter working length was recorded in cases with non-union. Additional lag screws could not increase the rate of nonunion and also no loss of fixation was found.

Ricci suggested at least five screws proximally but these are required for proper/adequate length of plate for maintaining screw density less than 60% [23]. In this study, we followed these recommendations. More than 82% of the cases had 3 to 5 proximal screws while only 52% of the cases of proximal holes were filled

and it may be a valid reason that why we did not find any difference in these parameters for hardware failure or nonunion. Alignment of the distal femur is one of the major goal of treatment[24].

In this study more than 38% of the cases presented with open fractures while previous data revealed that open fractures were common in patients with distal femur fractures (19%–54%) [28]. The importance of preservation of soft tissue for healing of fracture was previously described. We agreed that insertion of submuscular plate decreases non union formation significantly.

Previously, the outcome was described as quality of reduction, pain and range of motion. [29-31]. Historically, various classification systems were adopted. Following these, we recorded good flexion according to Cain in 92.8% [29] while 75.7% of the cases had acceptable flexion according to Kristensen [29,30]. Pritchett criteria was more strict and following this criteria we recorded only 45.9% of the cases with excellent or good results[31]. Various factors are associated with patient outcome like increased weight and periprosthetic fractures. Further, the cases with varus mal-alignment may not present with diverse outcome, but increases the loss of fixation.

CONCLUSION:

Despite adopting recent techniques for fixation of locked plating, still the results regarding clinical outcome is not appreciable and may lead to persistent disability. Further studies are required to determine the factors which may improve outcome.

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