Original Article

Subtrochanteric Femoral Fractures Treated by Condylar Plate, A study of 56 cases

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ABSTRACT

OBJECTIVE OF THIS STUDY:
To analyze the result of A.O. condylar blade plate for the treatment of subtrochanteric fractures and to asses the union of the fractures after the definitive surgical management.
MATERIAL & METHODS: A prospective study of 56 subtrochanteric femoral fractures treated by 95° A.O condylar blade plate was conducted in Department of Orthopaedic Surgery, Liaquat University of Medical & Health Sciences Jamshoro from March 2005 to February 2008. The follow-up period ranged from 6 – 36 months (average 12 months).
Fractures were included according to Siensheimer's classification type IIA, B and C and III A & B with their subtypes. Type I, IV and V were excluded from this study. The age of the 56 patients ranged between 25 to 55 years average age 37.6 years. There were 39(69.64%) male and 17 (30.35%) female patients. Male to female ratio was 2.9: 1.
RESULTS: Total 56 patients were evaluated; excellent results were achieved in 27 (48.21%), good in 17 (30.35%), and poor in 12 (21.42%). Out of 56 patients 34 (60.71%) were type II and were distributed in subtypes as 18 (52.94%) IIA, 7 (20.58%) IIB, and 9 (26.47%) IIC. The 22 (39.28%) type III cases were distributed in subtypes as 14 (63.63%) IIIA and 8 (36.36%) IIIB. The union time ranged between 3.5 to 12 months (average time 4.6 months). The rate of non-union in this study was 12.5%. In this series 5 cases were complicated by malunion, 3 patients unacceptable varus angulation of more than 15 degree was noted, and in remaining 2 cases varus less than 15 degree was noted. Malunion rate in this study was 8.92%.
CONCLUSION: We conclude that the choice varies from place to place, and depends on fracture morphology, expertise available, and whether it is cost effective. We feel condylar plate will find its use in selected cases and certain situation for many years to come.

INTRODUCTION

The subtrochanteric region of the femur is mainly cortical due to which the area of healing as well as the vascularity is poorer, prolonging the healing time. The forces in this area are up to 1,200-pounds/square inch on the medial cortex leading to immense stresses in the area. Besides this the orientation of muscle forces in this area causes shear at the fracture site.[1] Subtrochanteric fractures comprises of 10-34%% of all hip fractures.[2]

Biomechanical studies have shown that femoral cortex in the postero-medial subtrochanteric region is subjected to highest stresses in the body as a result of high compressive and tensile forces in the medial cortex distal and lateral to the lesser trochanter respectively, internal fixation is difficult and risks a high failure rate.[3] Considering the biomechanical forces which lead displacement, open reduction and internal fixation is necessary. Conservative treatment gives only satisfactory results in 56 %of patients compared to 70-80% for operative methods.[4]

During the past 50 years the treatment of subtrochanteric fractures have evolved with improved understanding of both fracture biology and biomechanics, previously non-surgical treatment of these fractures was associated not only with significant shortening and mal rotation but also with the morbidity and mortality of prolonged immobilization.[5] Dynamic hip screw and dynamic condylar screw are commonly used to fix subtrochanteric fractures, it has been studied and concluded that, DHS and DCS are among the best fixation devices in the armamentarium for subtrochanteric fracture management.[6] During the past 30 years, there has been a near-complete elimination of non-operative treatment in adults and a corresponding increase in the operative treatment of subtrochanteric fractures.[7] There are two main types of devices to fix subtrochanteric fractures, intra-medullary devices and extra-medullary devices. Intramedullary implants are reconstruction nail, gamma nail, Russel Taylor nails and extra medullary Implants are A.O 95 angled condylar blade plate, A.O 95 degree dynamic condylar screws, Dynamic hip screws. A.O dynamic condylar screw provide strong fixation in the cancellous bone of the neck and head with considerable rotational stabil-

ity.[8] Advantages of dynamic condylar screws are easy insertion, firm fixation, increase strength and resistance to stress failure, short times of operation and hospitalization.[9] Intra-medullary devices require less surgical exposure, enable early weight bearing, achieve better proximal fixation and exert less biomechanical stresses. However they are not suitable for subtrochanteric fractures within intertrochanteric extension and are associated with technical difficulties in 63% of cases.[10] Complications of subtrochanteric fracture management are, non-union, implant failure, malunion, and wound infections. We use 95^0 condylar blade plates to stabilize subtrochanteric fractures in our set –up. This study was conducted to evaluate the results of fixation of this device in our circumstances.

Objective of the study:

To analyze the result of A.O. condylar blade plate for the treatment of subtrochanteric fractures and to asses the union of the fractures after the definitive surgical management.

MATERIAL AND METHODS

A prospective study of subtrochanteric femoral fractures treated by 95^0 A.O condylar blade plate was conducted in Department of Orthopaedic Surgery, Liaquat University of Medical & Health Sciences Jamshoro from March 2005 to February 2008. The study was under taken in 3 years with follow up of most patients ranging from 6 – 36 months (average 12 months).

Inclusion criteria for this study were according to Sienshiemer's classification type IIA, B and C and III A & B with their subtypes above the age of 25 – 55 years. Type I, IV and V were excluded from this study. All fractures were admitted through the emergency department and thorough clinical examination was done and after initial management fracture was temporary stabilized with buck's traction to relieve the pain. After emergency management fractures were classified according to the Sienshiemer's classification (1978) by thorough examination of antero-posterior and lateral radiographic views of affected side with proximal & distal joints to evaluate the missed injuries. Decision was taken regarding the internal fixation with 95^0 angle blade plate according to the fracture configuration.

Total 56 patients were evaluated by assessing functional ability, presence of pain at fracture site, complications, like nonunion, malunion. Delayed union, implant failure length of the operated limb and radiographic evidence for union.

Excellent results were characterized by full range of movements of hip and knee, union of fracture, absence of pain at fracture site, varus angulation less than 5 degree, shortening less than 1-cm. Good results were characterized by union of the fractures, absence of pain, terminally restricted movements of hip and knee. Shortening less than 2.5-cm, varus angulation of $5\text{-}15^0$. Poor results were characterized by restricted hip movements, restricted knee movements varus angulation more than 15 degree shortening more than 2.5-cm, delayed union, non union, implant failure, malunion, presence of pain at fracture site.

Union of the fractures was defined as bridging callus on two radiographic views and ability on patient to walk on injured extremity.

Preoperative Management

After the management of the patient in emergency all the patients were admitted in the department of Orthopaedic Surgery. After admission clinical tests like blood and urine examination, blood urea and sugar levels, x-rays of the chest were advised to assess the clinical status of the patient. Preoperative blood transfusions and supportive therapy was also advised to the patient for stabilization of general condition. Information and counseling was done regarding the surgical procedure to the patients and their relatives. After all required investigations fitness regarding the anesthesia was taken from the anesthesia department.

Operative Management

After all arrangements patients were put on routine lists of the operation theater for open reduction and internal fixation with 95^0 A.O condylar blade plate. Patients were operated under spinal anesthesia in supine position on ordinary operation table. Before starting operative procedure prophylactic antibiotic were used to reduce the infection rate. Usually third generation cephalosporins were used. Two grams of third generation cephalosporin were administered intravenously just before operation.

For osteosynthesis of subtrochanteric femur fractures by A.O. condylar blade plate standard lateral approach to the proximal femur was used. After all the aseptic measures, incision extending from the tip of the greater trochanter to the desired level was given along the lateral aspect of the thigh. After cutting skin, subcutaneous tissue, fascia lata, vastus lateralis muscle was split and reflected forward. By gentle atraumatic techniques of dissection, proximal femur and greater trochanter were exposed. The fibers of the vastus lateralis originating from the greater trochanter were divided just below the origin to expose the area properly neck of the femur exposed by opening the capsule of the hip joint anteriorly.

With the help of the guide wires (K- wires) one along the superior surface of the neck and other oblique at the inferior aspect of the neck was used for the correct orientation of the direction of seating chisel under the image intensifier.

After drilling into the neck in accurate direction, aiming for the blade portion of condylar blade plate was performed by seating chisel. Blade portion of the plate was inserted gently with the help of the plate holder and condylar guide. After insertion of the blade portion, plate portion fixed to the lateral proximal femoral cortex.

Usually one lag screw passed into the calcar to have secure stabilization. Larger fragments stabilized by lag screws through the plate or independently. After the fixation of the plate wounds were closed in layers over the drains. After completion of operative procedure patients shifted to ward for postoperative management.

In the post operative periodintra venous antibiotics were used for 48 hours and oral antibiotics for one week.

Postoperative Management

Post operatively patients advised to sit in the bed on next day. Exercises of the hip joint and knee joint were started as earliest possible. Straight leg raising and Quadriceps exercises were started within 2-3-days. Drains were removed after 48 hours and examination of the wounds performed. Non-weight bearing crutch ambulation started within a weak time. Stitches removed after 12-15 days. Partial weight bearing allowed according to the stability of the implant, type of the fracture, age of the patient. Usually partial weight bearing allowed after the appearance of callus on radiographs. Post- operative hospitalization period ranged between 12 days to 25 days (average 16 days).

Follow - up

Follow-up of the patient was carried out on monthly interval or one and half month interval. On each follow -up patients were thoroughly examined. Local examination of the wound, assessment of movements of hip and knee joints, examination to assess union of the fractures was performed. Follow-up radiographs were evaluated to check the progress of the union. Minimum follow up in this study was 6 months and maximum 36 months (average 12 months).

RESULTS

The age of the 56 patients ranged between 25 to 55 years average age 37.6 years. Maximum age group affected was 31-40 years group. Second maximum age group was 41-50 years. There were 39(69.64%) male and 17(30.35%) female patients. Male to female ratio was 2.9: 1.

Road traffic accidents resulted into fractures of subtrochanteric region in 36 (64.28%), 15(26.78%) sustained fracture due to fall and 5 (8.92%) patient fell from height, major cause of fracture in this study was road traffic accidents.

Out of total 56 patients type II fractures were presented by 34 (60.71%) and type III by 22 (39.28%) patients. Among 34 type II fractures 18 (52.94%) fractures were subtype IIA, 7 (20.58%) IIB, and 9 (26.47%) IIC. Among 22 type III fractures 14 (63.63%) were subtype IIIA and 8 (36.36%) IIIB according to Seinsheimer's Classification.

On the basis of parameters described excellent results were achieved in 27 (48.21%) out of 56 patients. Good results were achieved in 17 (30.35%); poor results were achieved in 12 (21.42%) cases **(Table I)**.

Forty-nine fractures united primarily. The union time ranged between 3.5 months to twelve months (average time 4.6 months) four of 56 implant failures associated with non-union and three patients had deep infection associated with non-union. The rate of non-union in this study was (12.5%). Implant failure revealed through the complain of patients & radiological evidence. Patients came with severe pain at fracture site and were unable to bear partial weight after 3 months of operation. X-ray revealed loosening of the screws. Implant was removed and revised with autogenous bone graft. Union took place in 10 - 12 months respectively. Mal-union was defined as angulation more than 15 degree. In this series five cases were complicated by malunion. In three patients unacceptable varus angulation of more than 15 degree was noted and in remaining two case varus less than 15 degree was noted. Malunion rate in this study was (8.92%).

TABLE I: OVERALL RESULTS IN 56 SUBTROCHANTERIC FEMUR FRACTURES AFTER TREATMENT

Result	Frequency	Percentage
Excellent	27	48.21
Good	17	30.35
Poor	12	21.42

DISCUSSION

Subtrochanteric femoral fractures are most difficult to treat due to high stress concentration zone. Mainly two factors are responsible for slower rate of union and complications. Subtrochanteric fractures occurs in a region of the cortical bone, where vascularity is less as a result, healing is delayed. Other factor is high biomechanical stress present in the subtrochanteric area leading to failure of fixation devices.[11]

Approximately 15% of proximal femoral fractures are subtrochanteric fractures. Mechanism of injury is different in old aged peoples and young aged patients. In old patients fractures result because of week osteo-

porotic bones, which are easily broken by minor injuries, while, young aged patient sustain fracture due to high injury.[12]

Recommended treatment of subtrochanteric fractures is operative, by open reduction and internal fixation. Main object treatment is to maintain, length, stability, alignment that is only possible by surgical treatment. Non-operative treatment is recommended in those patients in which open reduction and internal fixation is difficult. Such as old aged patient with out ambulatory status. Children, open fractures, severely comminuted fractures. Main problems associated with treatment of subtrochanteric fractures have been non union, mal union, delayed union and implant failure.[13]

Various implant devices have been used to internally fix subtrochanteric fractures. These devices may be extramedullary devices and intramedullary devices. Intramedullary devices are bio mechanically stronger than the extra medullary devices, but subtrochanteric fractures are too proximal for using standard. Locked intramedullary nails. Extramadullary devices such as A.O. condylar blade plate, dynamic hip screw and dynamic condylar screws.[14]

Anteroposterior and lateral radiographs are essential to assess theimplant size. Reliable method of reduction of fracture subtrochanteric region is indirect in which medial cortical dissection is avoided and autogenous bone graft is not performed.[15] as reported by a comparative study between two groups of patient who undergone open reduction and internal; fixation by A.O. condylar blade plate. Results were better with indirect method. If direct method is used then adherence should be to the reconstructive of medial femoral cortex. Especially in type- III and type IV comminuted fractures. However acceptable results can be achieved by A.O. condylar blade plate if medial cortical reconstruction with bone graft is used.[16]

The age of the 56 patients ranged between 25 to 55 years average age 37.6 years. Maximum age group affected was 31-40 years group. Second maximum age group was 41-50 years. Most of the patient in this study were younger aged and middle-aged group. There were 39(69.64%) male and 17(30.35%) female patients. Male to female ratio was 2.9: 1.It is evident that maximum patients are this series are of 4th or 5th decade of life.

Papagionnopouls H.D et al 1989[17] reported a series with age ranging between 26-84 year average ages 53.7 years. In 1994 Meissner A[18] reported a series of 178 Subtrohanteric fractures age ranged between 18-89 years average age 74 years. Baumagaertal 1994[19] reported a series of 24-subtrochanteric fractures age range 16-96 years average age 46 years.

There were 39(69.64%) male and 17(30.35%) female patients. Male to female ratio was 2.9: 1 in our study. Papagionnopoul's et al 1989[17] reported series of 31 fractures there were 17 male and 14 female patients male female ratio (1.2:1). Miessner A. 1994[18] in series of 178 subtrochanteric fractures 130 female (73%) and 48 (27%) male patients with male female ratio (1:2.8). Buamgaertel 1994[19] reported series of having twenty male (58.7%) and 10 female patient (41.3%) male to female ratio was (1.4:1).Is evident that male patients are more commonly affected than females in this study. In western countries females are active and they are more exposed to trauma. In our set up females are comparatively less exposed to motor vehicle trauma.

Most common mode of injury in our study was Road traffic accidents resulted into fractures of subtrochanteric region in 36 (64.28%) 15 (26.78%) sustained fracture due to fall and 5 (8.92%) patient fall from height, major cause of fracture in this study was road traffic accidents. Bajaj et al 1988[20] reported series of 38 subtrochenteric fractures 11 (28.9%) fall from tree, 10(28.9%) affected by road traffic accidents. Simple fall 8 patients (21%). Vanderchot P. et al 1995[21] reported series of 161 subtrochanteric fractures there were 114 (70.9%) admitted after simple fall, 47 (29.1%) sustained road traffic accidents.

Papagiannopoule's et al 1989[17] series of 31 fracture 21 (67.7%) sustained road traffic accident. Jekic et al 1993[22] reported a series of 63 subtrochanteric fractures 40 patients' sustained fractures due to the road traffic accidents (63.4%).

In our study most common type of fracture according to seinsheimer classification was type II, 34 (60.71%) and 18 (52.94%) fractures were subtype IIA, 7 (20.58%) IIB, 9 (26.47%) IIC; and 22 (39.28%) type III, 14 (63.63%) subtype IIIA and 8 (36.36%) IIIB. Papagionnopoules 1989[17] reported 31 fracture, five (16.1%) of type-II A four (19.2%) type-II B, one (3.2%) type-II C, ten (32.2%) type –III B, five (16.1%) type-IV, six type –V (19.3%). Bajaj 1988[20] series of 31 fracture type-II A, six (15.6%) four (10.5%) type-II B, four type –IIC (15.5%), seven type –III A, (18.4%), five type –III B, (13.1%), six type –IV (15.6%) and five (13.1%) type - V fractures.

In our series union time of the fractures ranged between 3.5 months to twelve months (average time 4.6 months) four of 56 implant failures associated with non-union and three patients had deep infection associated with non-union. The rate of non-union is this study was (12.5%). Kinast es al 1989[15] reported series of 47 fractures group –I comprising 23 patients operated by condylar plate and fracture reduced by direct method union time was 5.2 months while those fractures treated by condylar plate with indirect method of reduction union time was reduced to 4.2 month. Baumagertrel et al 1994[19] reported treatment of 24

patients by condylar plate most of the fractures were comminuted and union time was 4.2 months.

In this series five cases were complicated by malunion. In three patients unacceptable varus angulation of more than 15 degree was noted and in remaining two case varus less than 15 degree was noted. Malunion rate is this study was (8.92%).Miesnner A et al 1994[18] reported seven of 178 subtrodhanteric fractures treated by A.O. condylar plate with infection rate (2.2%). Schilickwel et al 1992[23] reported a series of 272 fractures treated by condylar blade plate with infection rate (0.8%).

Quient et al 1991[24] reported use of condylar plate in 75-subtrochanteric fractures infection rate was (0.9%). Kwasny et al 1991[25] reported as series of 125 subtrchenteric and pertrochenteric fractures treated by dynamic hip screw. Infection rate was (4%).

Papagionnopoule's 1989[17] reported 10 types – III A, fracture out of them two complicated by failure (20%). In our series we had 8 type –III A, fracture out of total 8 cases three implants failed (37.50%) in our series complication rate of implant failure is between both reports. Brien et al 1991[27] reported twenty-five patients managed by condylar plate 2 of 25 fractures were complicated by non union (8%). Wiss DA; 1992[28] presented a series of 95 subtrohanteric fracture treated by interlocking nail. Malunion rate was (6.31%).

Baumgaertel F; 1994[19] presented a series of 24 subtrochenteric fractures treated by A.O. condylar plate, malunion rate was (8.3%)

CONCLUSION

We conclude that the choice of varies from place to place, and depends on fracture morphology, expertise available, and whether it is cost effective. We feel condylar plate will find its use in selected cases and certain situation for many years to come.

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