

Functional Outcome of Old Fracture Neck of Femur Treated by Double Angle DHS with Valgus Osteotomy with Fibular Grafting

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ABSTRACT

Introduction: Old fracture neck femur fixation in young adult is still a great challenge to orthopaedics with no definite guidelines to follow with various methods of fracture fixation according to fracture biomechanics. Aim of the study was to find out the impact of valgus osteotomy and fibular grafting on chances of bone union in old fracture neck of femur and to establish a pattern of treatment in an attempt to preserve femoral head

Material and methods: 32 patients of old and neglected intracapsular femoral neck fracture were treated with valgus osteotomy with double angle DHS with strut fibular grafting. Patient were followed for an average of 2.2 years. Radiological sign of union were found in 95% of patients in an average period of 3.46 months

Result: The result was excellent in 12 patients, good in 8 patients and poor in 12 patients (according to modified harris hip score) and in 2 patients non-union, 2 patient with fulminant infection finally managed with girdle stone arthroplasty

Conclusion: The double angle DHS with valgus osteotomy with fibular grafting increase the chances of union and attained satisfactory clinical and radiologic results on follow-up.

Keywords: Double Angle DHS, Valgus Osteotomy, Fibular Graft

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MATERIAL AND METHODS

The study was carried out in the Department of Orthopaedics, SRN Hospital affiliated to MLN Medical College, Allahabad. Inclusion criteria were Patients less than 60 years of age and of either sex presenting with fracture of neck femur and Duration of injury was more than 3 weeks. 36 patients with old and neglected intracapsular fracture neck of femur with non union were operated and followed for last 3 years. There were neck resorption, Varus and shortening with rotation of limb when assessed clinically and radiologically. All were operated with valgus osteotomy and fixed with double angle DHS plate with strut fibular graft.

Out of 36 patients 4 were lost in subsequent follow up 32 patients were followed up for 2 year to 3 year with average of 2.2 years. The functional outcome was assessed on the basis of modified harris hip score.

Operation were done after preoperative assessment of the biomechanics of fracture. The surgical technics were adopted per operatively case to case, to meet the biomechanical challenges in every case.

Surgical procedure: The patients were operated under general anaesthesia or spinal anaesthesia on a fracture table under an image intensifier television control and with full aseptic precaution. 8 patients were treated first with traction where greater trochanter was migrated higher up to bring it down to proper level. Greater trochanter and lateral aspect of the shaft femur were exposed through standard vastus lateralis splitting approach.

- The level of osteotomy was planned at the level of lesser trochanter as described by Pauwell.
- A K-wire was inserted along the front of femoral neck into femoral head to indicate the anteversion of neck.

INTRODUCTION

The Old #neck femur fixation is a great challenge to orthopaedic surgeons. Complications associated with fracture neck femur (non-union and avascular necrosis) makes this injury all the more important. Femoral neck fracture is usually located intracapsularly with synovial fluid bathing the fracture site interferes with healing process. Femoral neck does not have a periosteal layer¹, hence the healing is entirely endosteal. The obliquity of the fracture line leads to shearing forces at the fracture site these factors complimenting with precarious blood supply make the non-union of fracture neck femur more frequent.^{2,3}

Incidence of avascular necrosis varies from 20% to 25%.⁴ The incidence of avascular necrosis increases in young adults because a greater force is required to break the femoral neck in this population this may also damage the most important arterial group (the lateral epiphyseal) that supplies the lateral weight bearing portion of femoral head. Valgus osteotomy converts shearing forces at the fracture site into compressive forces which enhances healing it also compensates for the limb length shortening that occur due to absorption of neck and compressive forces enhances healing while fibular grafting provide scaffold for bone in growth, increase vascularization, minimise structural collapse. Aim

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- A second K-wire was inserted laterally about 2 cm above the planned osteotomy site midway between anterior and posterior cortex and passed into femoral head. This wire is also parallel to the front of femoral neck axis as measured by the first wire and establishes the lag screw direction.
- Over 2nd guide wire ream the femoral neck and head with appropriate size triple reamer. If quality of bone is good, tapping of bone is done 1 cm less than reaming.
- Insertion of Lag Screw and Plate: Correct length of lag screw to allow compression is determined by direct measurement by using a 5mm shorter screw. Lag screw is assembled on to the insertion wrench with centering sleeve and appropriately placed under radiological control. Centering sleeves and guide wires are removed.

The osteotomy was performed with oscillating saw at the planned site and at a per operative planned angle with proximal transverse cut and distal angle cut. After making osteotomy, an appropriate size of wedge was removed, the limb was swung into abduction, then a 120° double angle Dynamic hip screw plate was applied to fix fracture and osteotomy site and plate is fixed to femoral shaft with appropriate size of 4.5 mm cortical screws. The removed bone wedge can be used as a graft at osteotomy site.

When all screws were inserted and tightened, compression was applied using hex drive compression screw. After applying a suction drain, wound closed in successive layers with standards aseptic precaution.

Fibular Graft Harvesting - After preparation of skin and surgical draping, approximately 9-10 cm long incision for single Fibular grafting and was given over posterolateral aspect of leg in its middle part. Approximately proximal 4 cm and distal 6 cm of leg were left. Fascia was cut, the muscles soleus and the peronei were retracted. During retraction gentle pressure was given to avoid injury to the peroneal nerve. Fibula was exposed sub-periosteally just short of anterior surface, 7.5 to 8.0 cm portion of Fibula was marked with holes proximally and distally. Now Fibula was removed and this harvested Fibula was kept in blood soaked sponge. Multiple drill holes were made at regular intervals on two surfaces and interosseous border was left intact. Multiple drill holes increased the chances of bony ingrowth into the head and neck and hasten early incorporation of the graft. Wound was closed in layers after leaving the suction drain inside and dressing applied. Subsequently this harvested fibula was placed just above the lag screw after proper reaming.

Post-operative period: During postoperative period the patients were observed for pain and infection. Quadriceps drill was started in immediate post operative period. Drain removed after 48 hours, stitches removed on tenth postoperative day. Non weight bearing exercises of hip started in immediate post operative period and gradual weight bearing started from four to six weeks with crutches and full weight bearing was allowed after clinical and radiological signs of union.

Follow up: Patient were followed up at 4 weeks for 1st follow up, after 3 months for 2nd follow up and then at 6th months, 9 months and 12 months and every 6 months thereafter.

STATISTICAL ANALYSIS

Microsoft office 2007 was used for the analysis. Mean and percentages were used for the analysis.

RESULTS

In the present series average patient's age were 38.68±11.44

On obliquity of fracture: Percentages of cases by pauwel's 1, 2, 3 were 13.3%, 53.3%, 33% respectively.

On displacement of fracture: Percentages of cases by garden's 1,2,3,4 were 13.3%, 20%, 53.3%, 13.2% respectively.

Preoperatively, neck shaft angle was measured over affected side which was found to an average angle of 112° (82-125°). Postoperatively it was found to be an average of 136° with a range of 118-155°. In our study blood loss was 100.00±8.77 ml.

Preoperative shortening was in the range of 0-2.5 cm, with 22 patients came under <1 cm group and 8 patients had no shortening. There was non-union in 2 case. In both mentioned cases, implant cut through occurred and implant removal was done later. Fracture union rate is found to be 95% as defined by absence of a fracture line and appearance of trabeculae across the fracture site radiographically.

Non-union occurred because of small size of wedge removed, so fracture site did not come under compression and there was also inappropriate surgical technique as lag screw prevents collapse at fracture site. This case was taken later for bipolar arthroplasty.

2 cases have limb lengthening of 1-2 cm. This was because of excessive wedge removal at the time of valgisation but it required no treatment because this degree of limb lengthening was acceptable for these 2 patients.

In our study partial weight bearing was allowed at 10.40±4.73 weeks while full weight bearing was allowed at 18.93±8.74 weeks. Osseous union time was 3.46±1.92 month. The result was excellent in 12 patients, good in 8 patients and poor in 10 patients and in 2 patients non-union, with fulminant infection finally managed with girdle stone arthroplasty

DISCUSSION

Fracture neck femur as such and neglected fracture neck femur in particular present a considerable challenge to orthopaedic surgeon as far as the union of the fracture is concerned. According to Phemister (1939)², Burneset and Boyd, the precarious blood supply, endosteal fracture healing and shearing stress at the fracture site always predispose to non-union and avascular necrosis. As reported by Rockwood CA and Green DP 1996¹⁰, early surgical intervention, anatomical reduction and rigid fixation reduces the complication rate and restore optimal function in particular patient.

Now our aim of management has shifted to achieve rapid rehabilitation and quick return of individual to pre-morbid

home and work environment as a functionally and psychologically independent unit.

The various modalities in the management of neglected fracture neck femur are: The prosthetic replacement, muscle pedicle bone grafting and Repositioning osteotomy and fixation.

The natural head must be preserved as far as possible. Hemi replacement arthroplasty leads to increased wear and tear of acetabulum due to metal bone friction. Even total hip replacement also has limited life hence replacement arthroplasty is not a good choice in young patients sustaining fracture neck femur.

Muscle pedicle bone grafting procedure is undertaken in patients with avascularity of head with impending non-union in whom there is no segmental collapse as reported by Judget et al., 1961.¹¹ This requires open reduction of the fracture which may jeopardizes the blood supply to the head. Weight bearing is delayed. Patients may develop coxavara and shortening of limb apart general complications like infection and implant failure.

It is well accepted that aim of treatment in young adults with non-union of femoral neck is preservation of femoral head. Pauwel described the biomechanics of repositioning osteotomy in fracture neck femur. After Pauwel's osteotomy, osteotomy site can be fixed with either double angle blade plate as by Muller's modification or with double angle dynamic hip screw but blade plate is associated with higher rates of suboptimal position, cut through and implant failure while dynamic hip screw gives more compression at fracture site as studied by Dopplet et al., 1980.¹³

In the present study we have evaluated the role of repositioning osteotomy and internal fixation by double angle dynamic hip screw with fibular grafting in neglected fracture neck femur in 32 patients of <60 yrs age.

Fracture site is not exposed in any case. By this study, an attempt was made to survey, evaluate and quantify the success in management of such individuals.

In this study, average patient's age were 38. 68±11. 44^{5,6}, rate of union was 95.5%^{7,8} (30 cases out of 32). This was compatible to studies conducted by Marti¹⁹ et al., 1989 in which union rate was 94% (47 out of 50 cases) and slightly greater than studies done by Cech and Weber et al. in which union rate was 87% (36 out of 41 cases). Angelen 1997¹⁴ reported 13 patients with neglected fracture neck femur treated with valgus osteotomy and achieving a union rate of 100%. This increase in union rate may be because of small sample size for study. Meyer's et al.¹² with Frangaki's reported an increase in non-union rate with increase in degree of comminution as well as with increase in exposure of fracture site.

Preoperatively, neck shaft angle of 112° (82-125°), postoperatively it becomes an average of 136° with a range of 118-155°.

The findings of present study are in agreement with previous studies as shown by Bahadur Alami and Mohd. Nazir, 2008 in which average preoperative neck shaft angle was 109° (78-125°) and it becomes 140° with a range of (125-160°)

after valgisation of femoral neck.

This valgisation has another advantage in terms of reducing shortening of limb length. But it was found to have limb lengthening of 1-2 cm in 2 cases out of 32 cases.

In this study, range of rate of union was from 13-17 weeks with an average of 14-19 weeks. This rate of union was fast in Pauwel's type I and II fracture as compared to Pauwel's type III. This is because of more angle at fracture site which leads to more shearing forces. Similar results were found in studies of R. Garg and NK Magu, 2003⁹ in which union at fracture site was seen in an average of 12.4 weeks (11-16 weeks).

Considering postoperative complication, wound infection was observed in 2 cases (9.09%). No evidence of any episode of thromboembolic complication was observed.

CONCLUSION

fracture displacement, high pauwell's angle and delayed presentation, decreases the potential for healing of fracture neck femur.¹⁵ Repositioning valgus osteotomy and internal fixation by double angle dynamic hip screw is an effective procedure in neglected fracture neck femur in young adult. This procedure is a head salvaging procedure and does not require an open anatomical reduction of the fracture. The technique removes shearing stress at the fracture site and makes it horizontal. This leads to compression at fracture site when the patients bears weight on the limb. The procedure may also be undertaken in patients with failed procedure as a last resort to salvage the head.

While fibular grafting in gives- the additional stability at the fracture site, it also function as to decompress femoral head. It also provide scaffold for bone in growth. By reaming it increases the chances of revascularisation. Subchondral placement of bone in avascular and/or osteopenic femoral heads may minimize structural collapse until revascularization takes place.

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