Clinical outcomes of muscle pedicle bone grafting (Meyer's Procedure) in cases of old displaced femur neck fractures: A Study Of 20 Cases

H Panchal, M Prabhakar, A Acharya, B Jadav, J Harshvardhan

Citation

Abstract
20 patients with neglected displaced intra-capsular femoral neck fractures were included in study. They are classified according to the staging by Garden; 5 patients were in Stage III and 15 were in Stage IV. The majority of the patients were young (average age 42.8 years). The injury operation interval was ranging from 25 days to 6 months. (Average 57.7 days). All fracture is treated with Meyer's technique. Open reduction and fixation with Cannulated Cancellous screw, muscle-pedicle bone grafting using quadratus femoris supplemented with autogenous cancellous bone grafts. During the follow up period of 6 months to 4 years (average 17.11 months), we observed union in 18 (90%) patients and one case of AVN and one failure of technique. According to the Harris Hip Score –HSS, functional improvement was noted in 16 out of 20 patients, 4 patients having poor functional outcome- HSS below 60 (26.66 %, non-survival group) were recommended alternative treatment (total hip replacement or girdle stone arthroplasty).

INTRODUCTION
Displaced Intracapsular fracture of the neck of the femur in young and middle aged person is really a challenge to the treating surgeon. Inspite of better reduction and good fixation the nonunion rate and AVN rate are very high with Garden type III and type IV fractures. In a weight bearing extremity, requires accurate reduction of fragments and satisfactory internal fixation of a fracture, if the complications like non-union and late segmental collapse are to be prevented. Hundreds of techniques devised for the treatment of this fracture can explain the futility of one or other method to achieve satisfactory results in all patients. As somebody has said “the place of the head of the femur is on the neck of the femur and not in pathology museum.” In other words, while treating the patient having this fracture, the aim should be to provide pain less, stable, mobile hip joint with viable head inside the acetabulum. Meyers tried to treat the displaced intracapsular fracture of the neck of the femur with live osteomuscular graft and internal fixation to enhance the revascularization of the proximal fragment of the fracture and reported substantial decrease in the rates of non-union and late segmental collapse. We did similar study in selected 20 cases of fracture neck femur and observed the outcomes. The principal aim was to study the results of this technique like- Union of fracture, functional outcome and the effect of procedure on AVN rate on follow up.20 patients with neglected fracture neck femur were classified according to the staging by Garden; 5 were in Stage III and 15 were in Stage IV. The majority of the patients were young (average age 42.83 years). In our series, injury operation interval is ranging from 25 days to 6 months. 12 patients were operated within one month of injury and 8 patients were operated one month after injury (Average 57.7 days). Fracture reduction, fixation and muscle-pedicle bone grafting using quadratus femoris was carried out in all patients. During the follow up of 6 months to 4 years (average 17.11 months), according to the Harris Hip Score –HSS, excellent to good score obtained in all 5 (100 %) patients in Stage III and 9 (60%) of patients in Stage IV cases. The patients having poor functional outcome- HSS below 60 (26.66 %, non-survival group) were recommended alternative treatment (total hip replacement or girdle stone arthroplasty).

MATERIALS AND METHODS
Selection criteria: All the patients were having displaced intracapsular fracture neck femur with injury operation interval between 25 days to maximum 6 months. The upper limit of the age of patient was 50 years. All patients
belonged to Stage III and IV Gardens classification. Surgical technique: General anesthesia with endotracheal intubation in all the cases. Prone position was given on the fracture table with the sacral rest turned on opposite side to prevent injury to genitals. Painting and draping of the part was completed in such a way that intra-operative roentgenograms could be taken with ease. All patients were operated by posterior approach to hip joint. Quadratus femoris muscle was exposed and isolated. Fracture site was opened and looked for posterior comminution which was noted in 17 (85%) of our patients. Open reduction of the fracture was done. The fractures were fixed with 2 or 3 cancellous screws. (One patient: was fixed with DHS). The osteomuscular graft was fixed with 1 to 3 cortical screws. (One screw in 72.2 % of cases). Cancellous bone grafting in the posterior aspect of the neck was done in all patients (grafts obtained from greater trochanter). 1-2 units of blood were required in each case.

**Figure 1**
Figure 1: Incision site

**Figure 2**
Figure 2: Exposed muscle pedicle of quadratus femoris.

**Figure 3**
Figure 3: Final fixation of fracture and Graft.

Post-operative protocol: Boot plaster was given after operation. Patients were encouraged to do static quadriceps strengthening exercise from the next day of operation. Stitches were removed at 10th day. Non weight bearing was
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continued till the radiological signs of union were appreciated, usually at about 3 months, viz. trabecular continuity, decrease in fracture line sclerosis etc. Partial weight bearing was then started till sound union occurred. Gradually full weight bearing was advised in united fractures. Follow up protocol: Routine follow up was done at 6 weeks, 3 months, 6 months and then every 6 monthly. Follow up for minimum 6 months was done to access the following results: Union: Clinical and radiological, Time taken for union, Functional assessment by Harris hip score: HSS, Complications: Early: infection, technical failure, subtrochantric fracture, lesser trochanteric fracture. Late: non union, Coxa vara, shortening, avascular necrosis of head of femur.

RESULTS

Figure 4

During study Males dominated our series, usually middle aged. Fall while walking was a common cause of fracture. Males dominated because their activities are usually outdoor and are more likely to meet with accident.

Figure 5

In our series, most of the patients were from middle age – group. (Average age 42.83 years)

Figure 6

Displaced fractures with delayed presentation were selected for the treatment by this method.
months to 4 years (average 17.11 months), according to the Harris Hip Score –HSS, satisfactory functional improvement was noted in all 5 (100 %) patients of Gardens Stage III and 60% of patients of Stage IV cases.

**Figure 10**
Figure 5: Excellent result 6 month follow-up

**Figure 11**
Table 6

<table>
<thead>
<tr>
<th>Fixation of Graft</th>
<th>No. of Cases</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>One Screw</td>
<td>15</td>
<td>75.00%</td>
</tr>
<tr>
<td>Two Screw</td>
<td>4</td>
<td>20.00%</td>
</tr>
<tr>
<td>Three Screw</td>
<td>1</td>
<td>2%</td>
</tr>
</tbody>
</table>

**Figure 12**
Table 7

<table>
<thead>
<tr>
<th>Rate of Posterior Communion</th>
<th>No. of Cases</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Posterior Communion</td>
<td>17</td>
<td>85.00%</td>
</tr>
<tr>
<td>No Communion</td>
<td>3</td>
<td>15.00%</td>
</tr>
<tr>
<td>Total</td>
<td>18</td>
<td>100%</td>
</tr>
</tbody>
</table>

The amount of posterior comminution is quite higher with high grade of fractures and thus they require more stable fixation and adjuvant cancellous bone grafting to strengthen the postero-medial cortex of femoral neck. In our series there were 85% cases with posterior comminution and we did adjuvant cancellous bone grafting from trochanter itself to fill the space. All patient shown good union except one in which implant failed.

In our series we haven't had any superficial or deep infection.

**Figure 13**
Table 8

<table>
<thead>
<tr>
<th>Infection</th>
<th>Cases</th>
</tr>
</thead>
<tbody>
<tr>
<td>Superficial Infec</td>
<td>0</td>
</tr>
<tr>
<td>Deep Infec</td>
<td>0</td>
</tr>
</tbody>
</table>

**Figure 14**
Figure 6: Healthy scar

**Figure 15**
Table 9

<table>
<thead>
<tr>
<th>Quality of Fixation</th>
<th>No. of Cases</th>
<th>Union Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Satisfactory</td>
<td>18</td>
<td>100%</td>
</tr>
<tr>
<td>Not Satisfactory</td>
<td>2</td>
<td>0%</td>
</tr>
</tbody>
</table>
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Figure 16
Figure 7: Radiological union

Figure 17
Table 10

Good fixation of fracture and graft required for union of fracture.

Figure 18
Table 11

Table 11

<table>
<thead>
<tr>
<th>Total Cases</th>
<th>Union rate</th>
<th>Non-Union rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>20</td>
<td>90.00%</td>
<td>10.00%</td>
</tr>
</tbody>
</table>

Figure 19
Figure 8: Avascular necrosis

Because of collapse, at fracture site, some shortening was present in all patients. Limb shortening up to 2 centimeters were present in 17 (85%) patients. Only one patient showed signs of AVN of femoral head at 4 years of follow up. None of the patient had infection. 5 patients developed coax vara. One patient had sub-trochanteric fracture (intra-operative while taking the graft) and the graft got fractured in one patient while elevating it.

Figure 20
Comparision with other similar series
Figure 21
Non-union rate in other similar series are as follows:

<table>
<thead>
<tr>
<th>Series</th>
<th>No. of Cases</th>
<th>Non-Union</th>
</tr>
</thead>
<tbody>
<tr>
<td>Barnes et al</td>
<td>1106</td>
<td>25 %</td>
</tr>
<tr>
<td>Pilling</td>
<td>120</td>
<td>10 %</td>
</tr>
<tr>
<td>Garden (all types of fractures)</td>
<td>456</td>
<td>21 %</td>
</tr>
<tr>
<td>Garden (only type III &amp; IV)</td>
<td>342</td>
<td>25 %</td>
</tr>
<tr>
<td>Meyers</td>
<td>136</td>
<td>11 %</td>
</tr>
<tr>
<td>Bakshi</td>
<td>113</td>
<td>11 %</td>
</tr>
</tbody>
</table>

Figure 22
Rate of late segmental collapse in different series:

<table>
<thead>
<tr>
<th>Series</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Barnes</td>
<td>21.00 %</td>
</tr>
<tr>
<td>Frangulas</td>
<td>29.00 %</td>
</tr>
<tr>
<td>Garden</td>
<td>21.01 %</td>
</tr>
<tr>
<td>Meyers with other method</td>
<td>30.00 %</td>
</tr>
<tr>
<td>Meyers with the use of live osteo-muscular graft</td>
<td>08.00 %</td>
</tr>
</tbody>
</table>

DATA ANALYSIS
The results were analyzed using the Harris Hip Score. Excellent to good results were obtained in 70% of cases in spite the union rate of 90%. Factors responsible for poor functional outcomes were poor reduction, poor fixation and complications like subtrochanteric fracture.

DISCUSSION
As compared with the results of similar series like Meyers and Bakshi, we had similar rate of 10% nonunion after such procedure. While the rate of late segmental collapse (AVN) was 8% with original Meyer series and in our series it was seen in only 1 patient after 4 years follow up. Another similar series by Delima & DD Tanna showed good functional hips in 14 patients (87.5%) out of total 16 which are identical to our series. There is a considerable controversy as to what constitutes an ununited transcervical femoral fracture with time intervals ranging from 3 weeks to 3 months. Its importance lies in the fact that fractures greater than 12 weeks old have a poor prognosis. Preoperatively only the antero-posterior radiograph of the affected hip with 15 degree of internal rotation was taken. The quadratus femoris muscle pedicle bone graft was elevated without taking ant particular care to isolate the circumflex artery. Neither the posterior approach, the isolation of the pedicle graft nor the capsular incision jeopardized the blood supply to the femoral head. Supplementary auto grafting of the posterior comminution is essential for mechanical stability and prevention of retroversion collapse. Further the likelihood of obtaining a bony union is increased when supplementary auto grafting is resorted to. The post-operative regimen was fixed and did not vary from patient to patient. Initially an attempt was made to correlate weight bearing with sign of radiographic union viz. trabecular continuity, decrease in fracture line sclerosis etc. We observed that it was difficult to interpret radiographic union in these fractures in the first 8 weeks.

AUTHORS’ CONCLUSION
We adopted the Harris hip score for the assessment of the functional outcome. In it can be clearly demonstrated that in the present series though the union rate is satisfactory, functional outcome is not extraordinary. We can improve the results by doing accurate reduction, satisfactory rigid fixation of fracture and proper fixation of the graft. Preservation of the remaining vasculature of proximal fragment while opening the hip through posterior approach is very important. Complications like infection, subtrochantric fracture must be minimized for better results. So, with the more experience in the procedure results can be improved.

References
10. Harris modified hip score Harris H. JBJS (Am). 51-A
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