

## Original Research Article

## Evaluation of treatment of fracture neck femur with fibular grafting and cancellous hip screws

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### Abstract

**Background:** The present study is an attempt to evaluate the effectiveness of the fibular graft with supplementary fixation devices (cancellous hip screw), its advantages and disadvantages in the treatment of closed fracture neck femur. **Methods**--36 patients attending the outpatient, Department of Orthopedics, District Hospital Basti, Alinagar Marg, Murlijot, Basti, Uttar Pradesh and KGMU Lucknow, and a retrospective analysis of previous cases of fracture neck femur treated by fibular grafting and cancellous hip screws. A detailed evaluation of the patient was carried out on admission paying special attention to any associated injuries and medical illness. If the condition of the patient required pre-operative build-up the fractured limb was immobilised by upper tibial pin traction (or above knee skin traction). Routine blood and urine examinations were carried out and any associated medical condition was adequately dealt with. The patient was then subjected to pre-anaesthetic check-up and posted for surgery as early as possible. **Results**--In our study, we have got satisfactory results as in 13 cases of group I and 9 cases of group II. In 2 cases of group I, the fracture united in malposition with appreciable restriction of joint motion or early avascular necrosis resulted in pain on exertion. While in 4 cases of group II fracture united in malposition with appreciable restriction of joint motion or early avascular necrosis resulted in pain on exertion. Two fractures failed to unite and in one case extensive avascular necrosis of the head resulted in severe rest pain and gross restriction of function in Group I, This figure was approximately double in group II (Five cases went in non-union and three cases showed avascular necrosis of the femoral head with gross restriction of movement and severe pain). **Conclusion:** Therefore we are concluding that fibular grafting procedures in intracapsular fractures neck femur, give good results, provided, done with meticulous technical skill. It gives good stability in cases of fracture neck femur with posterior comminution, which is so commonly seen and where metallic fixation devices are apt to lose their stability.

**Keywords:** Fibular grafting, Fracture neck femur, Cancellous hip screw, Avascular necrosis.

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### Introduction

Fracture neck of femur in young people is caused by high-energy trauma and treatment of these injuries remains nightmare for surgeons because of high incidence of avascular necrosis (AVN) of femoral head and nonunion of fracture. Due to precarious blood supply of femoral head, the incidence of AVN ranges from 0% to 67%. Non-union in femoral neck fractures have been reported in as many as 43% of the patients

and up to 59% in one series. As these fracture are intracapsular, presence of angiogenesis inhibiting factors in synovial fluid and absence of cambium layer is said to be responsible for nonunion[1-4]. Many studies have found 70% good results as compared to 39% of good results with vascularized and non-vascularized fibular grafts using Harris hip score in osteonecrosis of femoral head[4-6].

It has been seen that the results of the treatment of this fracture depends upon :

1 Extent of injury such as amount of displacement the amount of comminution and whether the circulation has been disturbed (factors beyond the control of surgeon).

2. The adequacy of reduction and type of fixation (Factor under the control of surgeon).

Replacement surgery, total or partial, is now the treatment of choice in fracture of the femoral neck in elderly patients, but the struggle to find the best treatment in relatively younger patients continues even today as relentlessly as it did half a century ago.

Despite technical and biomechanical advances in Orthopaedics and a plethora of implants having increasing degrees of stability and inertness the quest continues for an ideal fixation device providing sound union and early mobility. However inert an implant may be, it is always a foreign body and loosening at the implant-bone interface often leads to implant failure adding to the long list of woes in the treatment of these fractures[5-7].

The rationale of treatment of closed fracture neck femur with fibular graft is based upon.

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1. Decompression of the femoral head, interrupting the cycle of ischemia and interosseous hypertension.
2. Removal of necrotic bone.
- 3 Grafting of the defect with fresh cortico-cancellous bone,
4. Placement of a viable cortical bones strut to support the subchondral surface to prevent collapse,
5. Enhance the revascularization process by providing a source of mesenchymal stem cells,
6. To circumvent and alter the foreign body response

The present study is an attempt to evaluate the effectiveness of the fibular graft with supplementary fixation devices (cancellous hip screw), its advantages and disadvantages in the treatment of closed fracture neck femur.

#### Material and Methods

36 patients attending the outpatient Department of Orthopaedics and Emergency District Hospital Basti, Alinagar Marg, Basti, Uttar Pradesh and a retrospective analysis of previous cases of fracture neck femur treated by fibular grafting and cancellous hip screws. A detailed evaluation of the patient was carried out on admission paying special attention to any associated injuries and medical illness. If the condition of the patient required pre-operative build-up the fractured limb was immobilised by upper tibial pin traction (or above knee skin traction). Routine blood and urine examinations were carried out and any associated medical condition was adequately dealt with. The patient was then subjected to pre-anaesthetic check-up and posted for surgery as early as possible.

**Criteria for selection of Cases:**All patients with femoral neck fractures were selected for the study regardless of age and duration since trauma, except for-

- (a) Those unable to co-operate in the post operative programme because of psychosis, mental retardation, parkinsonism or cerebrovascular accident with residual hemiplegia and spasticity.
- (b) Unstable neighbouring skin blebs infected abrasion, burns or bed sores.
- (c) Poor anesthetic and general risk patients
- (d) Those with life expectancy of less than two years.

#### Methods

**Surgical Procedure :**Under proper aseptic precaution and adequate anesthesia closed reduction of fracture neck femur by either the Whitmann's lead batter or Flynn method was performed. Check AP and lateral radiograph were taken with a C-Arm fluoroscopic unit. In

cases in which closed reduction failed an open reduction was then performed.

**Fibular Harvest:**The donor site for fibula is preferably chosen on the contra lateral leg because of ease of operation by two separate teams. Standard Henry's posterolateral approach for the fibular shaft was utilized to expose fibula. The desired length of fibula from the mid shaft was taken out (depending on the length of guide wire inside the proximal femur) by osteotomising it with osteotome or with Giglis saw after making drill holes through it at desired ends. The wound was then closed in layers, the fresh fibular graft was then denuded of all soft tissue attachments. One end of graft was bevelled for ease of insertion into the head and neck of femur. The graft was used immediately after removal without any preservation.

**Placement of the fibular graft:**Fibular is inserted with the broadest surface in the AP plane and gentle impaction. Prior to impaction, a final cancellous plug is placed in the distal aspect of the tunnel. Final position of the graft is confirmed and the fluoroscope unit is removed.

**Follow-up:**On first follow up at four weeks, the wounds were inspected for any evidence of infection, the thigh, leg and foot were inspected for swelling and tenderness and AP and lateral radiographs of the operated hip were taken. If the condition of the patient permitted the patient was advised to perform active non weight bearing exercises of the hip and knee in the bed. On the subsequent follow up, usually after six to eight weeks the patients was again reviewed for delayed wound infection and for any swelling or tenderness. AP and lateral radiographs of the involved hip were taken and if the patient could perform active SLR without much pain, he was advised partial weight bearing on crutches for the next six weeks. Complications due to fibulectomy were not included in the criteria for result evaluation. However, swelling around the ankle and foot for a prolonged period was noticed in some of the patients.

**Observations:**Forty two cases of intra capsular fracture neck femur in patients both prospectively and retrospectively) were taken up for the study. Department of Orthopedics, District Hospital Basti, Alinagar Marg, Murlijot, Basti, Uttar Pradesh and KGMU Lucknow in all prospective cases (21 cases) Fibular grafting with cannulated cancellous hip screws fixation was done. Six of the cases were lost to follow up and therefore have been excluded from the evaluation of results. The retrospective analysis (12 cases) included cases of femoral neck fracture treated earlier by cannulated cancellous hip screws (2 parallel screws).

**Table 1: Age Incidence**

| Age (Years) | No. of Patients |
|-------------|-----------------|
| 11-20       | 6 (14.28%)      |
| 21-30       | 18 (42.88%)     |
| 31-40       | 8 (19.04%)      |
| 41-50       | 6 (14.28%)      |
| 51-60       | 4 (9.32%)       |
| Total       | 42 (100%)       |

The minimum age of the patients was 18 years while the maximum was 60 years. The mean age in this series was 28.33 years. The

incidence of the fractures was evenly distributed from the second to sixth decades with maximum incidence in the third decade.

**Table 2: Sex distribution**

| Sex    | No. of Patients. |
|--------|------------------|
| Male   | 36 (85.71%)      |
| Female | 6 (14.29%)       |
| Total  | 42(100%)         |

Strong male preponderance was found in this study

**Table 3: Side Incidence**

| Side  | No. of Patients |
|-------|-----------------|
| Right | 16 (38.09%)     |

|       |             |
|-------|-------------|
| Left  | 26 (61.91%) |
| Total | 42 (100%)   |

In the present study, left sides fractures were found to be far more common.

**Table 4: Mode of Study**

| Mode                | No. of Patients |
|---------------------|-----------------|
| Retrospective Study | 12 (28.57%)     |
| Prospective Study   | 30 (71.43%)     |
| Total               | 42 (100%)       |

**Table 5: Duration Between Trauma & Surgery**

| Duration             | No. of Patients |
|----------------------|-----------------|
| < 1 Week             | 12 (28.57%)     |
| > 1 Week - < 1 Month | 22 (52.38%)     |
| > 1 Month            | 8 (19.05%)      |
| Total                | 42 (100%)       |

In this study, 34 (80.95%) were operated within 1 month of sustaining trauma

**Table 5: Mode of Trauma**

| Age(years) | No. of Cases | Tumble    | Fall        | RTA         |
|------------|--------------|-----------|-------------|-------------|
| 11-20      | 6            | -         | 2           | 4           |
| 21-30      | 18           | -         | 4           | 14          |
| 31-40      | 8            | -         | 3           | 5           |
| 41-50      | 6            | 1         | 3           | 2           |
| 51-60      | 4            | 2         | 1           | 1           |
| Total      | 42(100%)     | 3 (7.14%) | 13 (30.95%) | 26 (61.91%) |

Road traffic accidents were responsible for most fractures below the age of 40 while trivial trauma like slipping, caused most of the fractures in the higher age group.

**Table 7: Complications**

| Complications                | Group-1    | Group-2    |
|------------------------------|------------|------------|
| Shortening                   | 6(33.33%)  | 9 (50.00%) |
| Lengthening                  | 1(5.56%)   | 3 (16.16%) |
| Coxa vara                    | 2(11.12%)  | 4 (22.22%) |
| Coxa valga                   | 1(5.56%)   | 2(11.12%)  |
| Non union                    | 2 (11.12%) | 5 (27.56%) |
| Avascular necrosis           | 2 (11.12%) | 5 (27.56%) |
| Joint stiffness              | 8(50%)     | 10(55.56%) |
| Toe drop                     | 1 (5.56%)  | 0 (0.00%)  |
| Foot and ankle edema         | 2 (11.12%) | 0 (0.00%)  |
| Breakage of graft            | 2 (11.12%) | 0 (0.00%)  |
| Infection (Superficial/Oeep) | 0(0%)      | 3 (16.66%) |

Non union, avascular necrosis, joint stiffness and shortening were the main complications encountered In one case the fracture was fixed in Coxa valga and lengthening ensued while in two cases there was coxa vara and shortening in six cases. The fibular graft

broke in two patients while foot and ankle oedema was found in two and great toe drop was seen in one patient in Group I. Infection, superficial or deep, did not occur in any case in Group I while it was seen in three cases in Group II.

**Table 8: Final Results**

| Results   | Group-1     | Group-2    |
|-----------|-------------|------------|
| Excellent | 10 (55.52%) | 5 (27.74%) |
| Good      | 3(16.68%)   | 4 (22.22%) |
| Fair      | 2 (11.12%)  | 6 (33.36%) |
| Poor      | 3 (16.68%)  | 3(16.68%)  |
| Total     | 18 (100%)   | 18 (100%)  |

In the final tally satisfactory results were obtained in 13 cases of group I and 9 cases of group II. In 2 cases of group I, the fracture united in malposition with appreciable restriction of joint motion or early avascular necrosis resulted in pain on exertion. While in 4 cases of group II fracture united in malposition with appreciable restriction of joint motion or early avascular necrosis resulted in pain on exertion. Two fractures failed to unite and in one cases extensive

avascular necrosis of the head resulted in severe rest pain and gross restriction of function in Group I. This figure was approximately double in group II (Five cases went in non-union and three cases showed avascular necrosis of the femoral head with gross restriction of movement and severe pain.

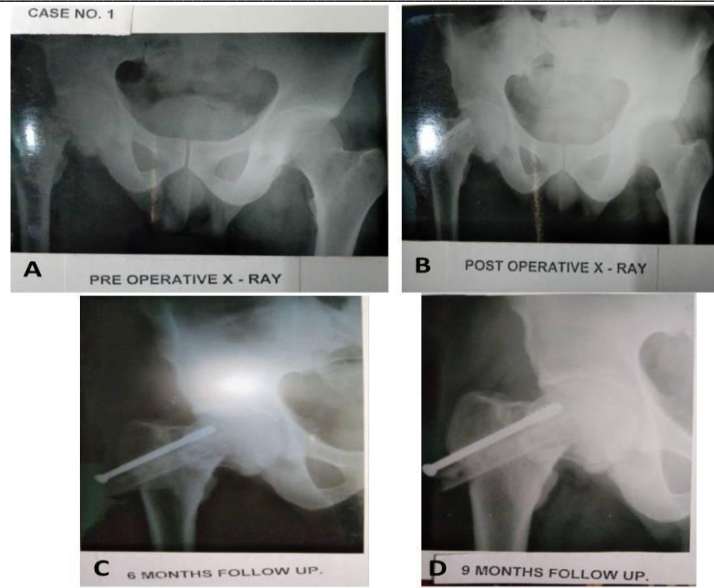


Fig 1: Case showing; A) Pre-operative X-ray, B) Post-operative X-ray; C) 6 months follow up; D) 9 months follow up



Fig 2: Case 2 showing preoperative radiograph, follow up at 3 months and 9 months

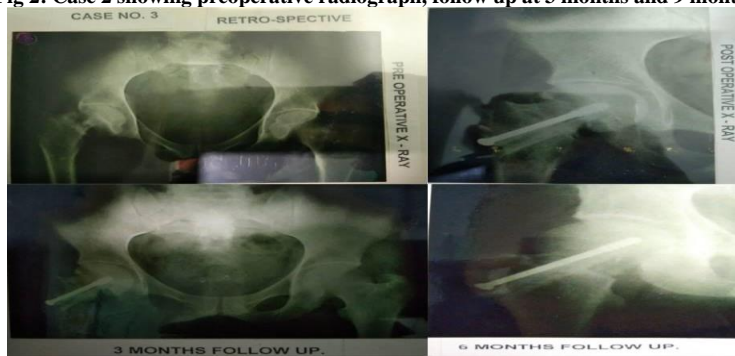


Fig 3: Case 3 showing preoperative and post-operative x ray; follow up at 3 months and 6 months

## Discussion

Intracapsular fracture neck femur was described as the unsolved fracture" by Dickson (1953) while Barnes (1964) had remarked that many surgeons regarded it as the unsolvable fracture" Till date, this fracture has remained the unquenched thirst for Orthopaedic surgeons the world over[6]. Bonfiglio and Bardenstein (1958) operated 53 patients of aseptic necrosis of femoral head with or without non union of the femoral neck by insertion of two cortical autogenous grafts and reported 75% satisfactory results. They emphasised the importance of correct placement of the grafts and avoiding early weight bearing to prevent complications. They remarked that the procedure was useful in preserving and restoring the femoral neck and viability of the femoral head through its estrogenic nature[7]. In present work, two cases went into avascular necrosis, out of which one was operated after more than six weeks of trauma One case was of Garden's Grade IV and one patient with Garden's Grade II fracture presented after eighteen months with a vascular necrosis despite early union within three months. One case presented with late AVN more than nine months after operation even though the fracture had united routinely without early complications Both had been initially fixed in coxa vara. Therefore Trueta's hypothesis that fixation in coxa vara puts undue stress on the lateral epiphyseal vessel, eventually leading to a vascular necrosis was borne out by the present findings The degree of initial displacement of the fracture undoubtedly increases the risk of avascular necrosis since almost all our cases with avascular necrosis had either Garden's Grade III or Grade IV fractures. However, no significant relation could be found between operative procedure and avascular necrosis.

Two cases failed to unite at the time of final follow up and both had Pain which hindered their daily routine. One patient with Garden's Grade V fracture was operated nine days after trauma but the reduction was not anatomical and failure possibly was due to the graft breakage. However it was noteworthy that the union between both the fibular grafts and the trochanteric site and between the single well positioned graft and The head and neck was very firm, which was confirmed on revision surgery. This caused a lot of problem during removal of the femoral head and reaming of the medullary cavity during hemiarthroplasty for avascular necrosis and painful hip.

In this study some cases are so chronic during the surgical procedure the fibular and cannulated cancellous hip screw hit each other and caused distraction at the fracture site which led to non union.

It was worth noting that fixation with fibular grafting and cannulated cancellous hip screw, no implant loosening or failure was seen in similar case reported by Thomas King (1937)[8]. Wardle (1945) and Patrick (1949), observed that fibula unites very early at its two ends with the cancellous bone of the femoral head and trochanter, thus preventing collapse of the neck while encouraging union[9,10]

Two cases of ankle edema were seen in the study which occurred in early post operative period and persisted throughout This edema was refractory to simple crepe bandaging and elevation of limb Chacha et al (1981) in their article on vascularised fibular graft gave much importance to the peroneal vessel which lies in close proximity to the fibular shaft It is quite possible that pre-operative damage to the peroneal vein which mainly drains the periankle area was responsible for the prolonged edema[11]. It was observed in the study that the age of the patient affected the quality of results inversely. Similar observations were made by Marti et al who attributed it to osteoporosis resulting in less stability and loss of reduction in the post operative physiotherapy programme[12]. In the present series, overall satisfactory results were obtained in 72.20% cases (excellent in 55.52% and good in 16.68%) with a combination of fibular graft and cancellous hip on Union of the fractures occurred in 88.88% cases but in 33.33% cases union was accompanied by complications like shortening, stiffness and mild avascular necrosis of the femoral head (fair results) in 11, 12 cases either the fracture failed to unite or

gross avascular necrosis of the head led to persistent pain and considerable stiffness (poor results).

In the present study the probably causes of higher rate of failure in Garden's Grade IV fractures were either inadequate or improper reduction or lack of proper X-ray control.

Cleveland (1959) reported overall failure rate of 20% with the use of this lag device[13]. And Clark et al stated, It was felt during the study that cases of fracture neck femur Treated by fibular grafting and cannulated cancellous screw have more chances of union and lesser functional disability in comparison to cases fracture neck femur treated only by cannulated cancellous screw fixation due to[14].

Deyerle et al (1959)[15] stressed the importance of accurate valgus reduction surgical impaction and rigid internal fixation. He further improved his pin fixation technique using a sophisticated system of 9 - 11 pins sliding through heavy side plate (1966).

## Conclusion

It is concluded from the study that:

- 1) Fibular grafting procedures in intracapsular fracture neck femur, give good results, provide done with meticulous technical skill.
- 2) It gives good stability in cases of fracture neck femur with posterior comminution, which is so commonly seen and where metallic fixation devices are apt to lose their stability.
- 3) It is useful not only in fresh fractures, but also in the old fractures where the head is viable.
- 4) The bone absorption at the metal bone interface leading to implant loosening and collapse of the neck which is so commonly found after any implant fixation is not seen in fibular grafting procedures because the fibula unites quite early at the two ends ie with head and trochanter where cancellous bone is present, thus preventing Collapse.
- 5) Fibular grafting with cannulated cancellous screw fixation gives excellent results in comparison to fixation only with cannulated cancellous hip screw.

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