

Elderly Patient with Challenging Ipsilateral Neck of Femur and Compound Segmental Femur Shaft Fracture Managed in 2 Stages: A Rare Case Report

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Abstract

Femoral fractures are very common presentations in orthopedics, but Ipsilateral femoral neck and shaft fractures are uncommon injuries, occurring in 0.8–9% of femoral shaft fractures. Segmental injuries are very rare. Appropriate management of wound and timing of definitive surgery is very important. Choice of implant depends on the type of fracture and ease of surgeon it ranges from intramedullary nails to extra-medullary plates. A single intramedullary nail or intramedullary nail plus cc screw fixation can be done. In this case, intramedullary interlock nail was used with three separate cc screws for neck of femur fracture fixation. Segmental fracture was opened and held reduced in place with encirclage wire as it was long oblique type postoperatively weight bearing started as tolerated. At 1 year follow-up there is complete union at fracture sites and abundant callus formation.

Key words: Segmental Femur Fracture, Compound Fracture, Intramedullary Nailing, Neck of Femur Fracture, Ipsilateral Fractures

INTRODUCTION

Femoral fractures are very common presentations in orthopedics, but Ipsilateral femoral neck and shaft fractures are uncommon injuries, occurring in 0.8–9% of femoral shaft fractures.^[1] Data about segmental femur fracture associated with pauwels type 3 neck of femur (NOF) fracture is very limited. In this particular case, compound diaphyseal fracture presents a difficult scenario to execute effective management plan to heal three fractures. Segmental fractures are known to have been associated with complications of nonunion at one of the fracture sites due to damage of blood supply from nutrient vessels. The hidden role of blood supply from nutrient vessel needs to be taken into consideration; fracture nearer to the nutrient foramen will undergo early healing as compared to far fracture site. The distal fracture site may undergo delayed healing or nonunion.

Vertical neck femur fracture due to intraarticular and intrasynovial location poses difficult challenging scenario for union. Segmental femur fractures are as a result of high energy trauma and involve injury to both the bone and soft tissue surrounding it. The soft tissue condition and status of blood supply to fractured segment determine the potential for healing; middle segment is more prone for devascularization.^[2] The options for management of multifragmentary femur fracture include open or closed reduction and fixation with intramedullary nailing or open reduction and plating with bone grafting as needed. Intramedullary nailing has become the most preferred method for the management of segmental femur shaft fractures, intramedullary nails provided excellent fixation for the fractures of the femur, allow knee and hip motion, including early ambulation and has least complication or nonunion rate.^[3,4] Segmental femur shaft fracture associated with distal or proximal femur fractures becomes very difficult to manage as in this case pull of iliopsoas and abductor on proximal segment and pull of gastrocnemius on distal fragment can make reduction difficult and open reduction might be needed.

There are high chances of nonunion of femur neck fracture and femoral head Avascular necrosis (AVN) when associated with femur shaft fractures, these fractures are

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Month of Submission : 10-2021
Month of Peer Review : 11-2021
Month of Acceptance : 11-2021
Month of Publishing : 12-2021

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Figure 1: (a) Plain radiograph showing segmental femur shaft fracture with total 3 fragments held together by external fixator and neck of femur fracture fixed with cc screw. (b) Plain radiograph showing AP and lateral views after removal of the fixator



Figure 2: Intra-operative image showing fixation of segmental femur fracture with encirclage wiring



Figure 3: (a and b) Post-operative plain radiographs showing fixation of fracture using intramedullary interlock nail and encirclage wire

best managed with CC screw fixation and when needed pauwels osteotomy can be done.

CASE REPORT

A 65 years old male presented with the left sided gustilo-Anderson grade 3b compound segmental femur shaft fracture with pauwels type 3 NOF fracture after a road traffic accident, Patient was having wound over the anterolateral aspect of thigh 5 × 5 cm in size with bone exposed he was initially stabilized and vitals were



Figure 4: (a-c) Post-operative radiograph at 9 months post-operative showing union at NO fracture site and union of the segmental femur fracture with abundant of callus formation at both the fracture level

normalized then patient was operated with external fixator as a part of damage control regime for compound segmental femur fracture and cc screw fixation for NOF fracture wound was managed with local debridement and then Vacuum-Assisted Closure dressing was done intraoperative tissue samples were sent and intravenous antibiotics started immediately. After the wound is healed and soft tissue condition improved, fixator was removed 2 months post injury. Definitive fixation was planned using intramedullary interlock nail and encirclage wire for segmental femur fracture and bone grafting as an additive for healing.

Patient was operated on traction table and nail was inserted from a point posterior to the positions of cc screws. Open reduction was done, fragments reduced by putting reamer of size 12 mm and encirclage wiring was done. Then, nail was inserted. The segmental femur fracture are highly unstable because one fragment can rotate or axially move over the innerly place nail. Hence, stable fixation is necessarily achieved primarily during surgery to avoid nonunion. This is usually achieved using a large diameter nail. The medullary canal is reamed using the straight reamer and all membranous tissues formed within the medulla is scraped out. This is done to get fresh restoration of endosteal blood supply which usually gets restored in 3–6 weeks. In addition, iliac crest bone graft was used for improving the healing potential drain was put and was removed on post-operative day 3. Suture removal on day 10.

In post-operative period partial weight bearing was advised as tolerated for 8 weeks, Full weight bearing started at 4 months post-operative. At 10 months post-operative, there is a complete union at fracture site with bridging callus and NOF fracture is also united. Patient has gained full range of motion at hip and knee and is currently doing well with no difficulty in performing day today activities.

There is no evidence of infection or nonunion at 1 year follow-up [Figures 1-4].

DISCUSSION

In literature, there are many reports of similar ipsilateral fractures but not about the compound segmental fractures of femur with Ipsilateral NOF fracture. The mechanism of injury is being the typical velocity dashboard injury with longitudinal force on the flexed hip and knee. The multi-fragmentary trauma in single bone suggests high velocity trauma and soft tissue devastation. Such a heavy damage to soft tissue needed to be handled by damage control orthopedics methods. Hence, the initial external fixation was an important choice. Definitive fracture management was done by open reduction of the fracture with encirclage wiring and intramedullary interlock nailing. Autologous bone grafting was done to avoid the chances of nonunion at femur shaft segmental fracture.

The presence of intraarticular NOF fracture poses a difficult challenge to unite, as it demands primary anatomical reduction and compression across the fragments as well as stable internal fixation with multiple screws. Vertical fracture line causes displacement of head fragment due to forces acting around hip. The synovial fluid washes out the hematoma as well as lack of cambium layer in periosteum are responsible for complications especially nonunion.

A single implant for fixation of both the fractures can be done using a long cephalomedullary nail with proximal screws in the femur head also. Fixation with interlock nail and cc screws (using a miss a nail technique) gives better stability to fixation as it involves fixation shaft fractures with 2 proximal and 2 distal screws and fixation of NOF fracture independently with 3 cc screws. Another approach for these types of injuries is the “rendezvous” technique using dual implants in an overlapping fashion DHS fixation for NOF fracture and a retrograde nailing system for femur shaft fracture.^[5]

A study by Jain *et al.* showed fixation of 23 cases of ipsilateral femur shaft and NOF fracture using a single implant a cephalomedullary nail gives good outcome.^[6] All the above options are available and can be used in such cases choice depends on the surgeons' comfort and ease. We use dual implant fixation using anterograde interlock nail and cc screws. In a study of 108 femur fractures by Anostopoulos *et al.* including 16 segmental fractures showed excellent results with using interlock nail for fixation.

In a meta-analysis published by Antti Alho on ipsilateral NOF fracture and femur shaft fracture they reported a total of 659 cases and compared various parameters, two-third of the patients had basicervical type of femur neck fracture and rate of AVN (3%) after fixation was also low compared to isolated femur neck fracture in literature. They also found that results were similar with single intramedullary second generation nail and interlock nail with separate cc screws fixation.^[7]

The outcome of the fixed fractures is also variable specially NOF fractures.

In a paper by Wiss *et al.* Out of total 33 patients of NOF fracture with femur shaft fractures 27 healed with primary surgery and 6 patients developed varus nonunion for which osteotomy was done later.^[8] Nonunions after the fixation can be managed with valgus osteotomy later.

Radiographic union score for tibial fractures is used to assess the union which involves defining union based on the X-ray finding in AP and LATERAL radiographs.^[9] It includes appearance of callus and visibility of original fracture line on radiographs.

CONCLUSION

The management of segmental femur fracture with ipsilateral NOF fracture is always been debated and many options are available at present. Each one is technically demanding and success depends on various factors. In this case, good results are obtained by initially stabilizing fracture with external fixator and managing the wound. Later definitive surgery was done with bone grafting as an additional element for improving biology at fracture site.

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How to cite this article: Mahajan NP, Kondewar P, Sakhare V, Sadar A, Kiran BM. Elderly Patient with Challenging Ipsilateral Neck of Femur and Compound Segmental Femur Shaft Fracture Managed in 2 Stages: A Rare Case Report. *Int J Sci Stud* 2021;9(9):1-4.

Source of Support: Nil, **Conflicts of Interest:** None declared.