



RESEARCH ARTICLE

IPSILATERAL NON-UNION FRACTURE NECK AND SHAFT OF FEMUR WITH BROKEN IMPLANT IN SITU TREATED BY ORTHO-FIX LIMB RECONSTRUCTION SYSTEM AND EXTERNAL FIXATOR WITHOUT BONE GRAFTING OR CORTICOTOMY: A CASE REPORT

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Abstract

Non-union is a well-known complication of fractures of the femoral neck. The concurrence of non-union of the femoral shaft and the femoral neck is a rare combination that will cause significant challenges during surgery. There are controversies in the literature regarding fracture fixation techniques, such as intramedullary versus extramedullary implants and single versus double implants for both fractures, especially in youthful patients. We discuss our experience in treating a juvenile patient with non-union fracture neck of femur and ipsilateral femoral shaft, and a broken implant in situ. Orthofix limb reconstruction system (LRS) is utilised for non-union fracture shaft of femur, while fracture neck of femur is provisionally stabilised by external fixator. The radiological union of the femoral neck occurred at 6 weeks and the femoral shaft at 7 months. At 9 months, the LRS was removed, and at 10 months, the patient had nearly full hip and knee range of motion. Orthofix LRS is a viable option for the treatment of ipsilateral non-union fractures of the shaft and neck of the femur, especially when infection is present or suspected.

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Introduction:-

Young patients typically sustain concomitant ipsilateral femoral shaft and neck fractures as a consequence of high-velocity trauma [1-3]. As the femoral neck fracture pattern is either undisplaced or minimally displaced, these injuries are frequently overlooked and delayed diagnoses are common in polytraumatized patients. This fracture pattern is caused by longitudinal compression force; the shaft of femur takes most of the energy before causing a vertical, marginally displaced, and easily concealed fracture neck of femur [4]. The incidence reported for delayed diagnosis of these injuries during the initial examination ranges from 19% to 50% of patients [5]. The occurrence of concomitant distracting injuries, inadequate pre-operative and intra-operative skiagram of the polytrauma patients, and the pattern of an undisplaced or minimally displaced femoral neck fracture have been linked to missed or delayed diagnoses [5,6]. This delay in diagnosis and treatment increases the likelihood of complications, such as nonunion and avascular necrosis [5].

Few techniques for the fixation of neck of femur and femoral shaft fractures have been discussed in the medical literature. (I) Initial prompt fixation with multiple cancellous screws for the femoral neck and an extra-articular retrograde intramedullary nail for the femoral shaft; (II) A cephalomedullary nail; (III) Antegrade intramedullary nailing with cancellous lag screws; (IV) Fixation of the shaft of femur with plate and fixation of neck of femur with Lag screw and (v) Dynamic hip screw for neck and retrograde nail for shaft femur. Due to a dearth of randomised

trials, it is unknown which method of fixation results in fewer complications [8]. The management of infected fracture non-unions has never been straightforward, and frequently requires a staged approach consisting of infection control measures and definitive fixation. Future risk of infection cannot be ruled out despite the measures implemented to control the infection [11]. The neck fracture results in two main complications: avascular necrosis of the femoral head and non-union of the femoral neck. Consequently, the fixation of the cervical fracture should take precedence. The osteonecrosis incidence rate is unknown, but is likely between 4% and 22%. High rates of neck union are associated with sustained anatomic reduction. The surgical fixation time is frequently determined by the patient's condition as a victim of polytrauma; however, a delay of days to weeks in the fixation of the fracture neck of femur does not appear to increase the complication rate. Any management should aim for anatomic reduction of the neck fracture and stable fixation of both fractures so the patient can be mobilized [9]. Non-union is a well-known complication of fractures of the femoral neck. In addition to the non-union of the femoral neck, the presence of an ipsilateral femoral shaft fracture with non-union will create significant complications during the operation. There are controversies regarding methods of fracture fixation, such as intramedullary versus extramedullary implant placement and single versus double implant placement for both fractures. Infected non-unions of such fractures can further confound treatment plans and have not been addressed in the literature [10].

Case Presentation:

We discuss our experience in treating a 27-year-old male patient with a non-union fracture of the femoral neck, ipsilateral non-union fracture of the femoral shaft, and a fractured implant in situ. This patient sustained a motor vehicle accident six months ago and was subsequently operated on with a dynamic hip screw and long barrel plate. After six months, the patient developed hip and thigh pain and was unable to sustain weight on the affected limb; a radiograph revealed that the implant was broken. There were no inflammatory signs, and ESR, CRP, Vitamin D, and PTH levels were normal. Implant removal and Valgus osteotomy for non-union fracture neck of femur and retrograde intramedullary nail along with bone grafting for fracture shaft of the femur was planned, but peri-operatively, there was serosanguinous collection from the femoral site, so internal fixation was averted and ortho-fix limb reconstruction system (LRS) is applied for non-union fracture shaft of the femur and the fracture neck of femur is stabilised by external fixator. After one week, alternating compression and distraction (Accordion method) was initiated at the non-union fracture shaft of the femur. Six weeks postoperatively, radiographic evidence of union was detected in the femoral neck. Four months post-operatively, the external fixator for the neck of the femur was removed and partial weight bearing was permitted. Six months post-operatively, the patient was pain-free and able to walk unassisted. Radiological union of fracture shaft of femur occurred seven months after surgery. At 9 months, the LRS was removed, and at 10 months, the patient had nearly complete range of motion in the hip and knee without any functional deficit. During rehabilitation the patient complained of instability at left knee at about 12 months post-operatively and was found to have positive anterior drawer, lachman and pivot shift test. So implant from right tibia was removed and the patient undergone magnetic resonance imaging of left knee, which showed anterior cruciate ligament injury. Anterior cruciate ligament reconstruction was done with hamstring insertion preserving autograft with femoral side fixation only with adjustable endobutton. The post-operative rehabilitation was uneventful and the patient achieved good functional outcome at twenty months follow up post second surgery.



(1).Immediate post op xray after index fracture (2).Broken implant with non union fracture neck of femur with ipsilateral non union fracture shaft of femur (3).Immediate post op xray of revision surgery



(4) 2 Months post second surgery #NOF united. (5) Fixator for NOF removed at 4 months. (6) After 9 months of second surgery #consolidated.



Functional outcome at 14 months post operation

Discussion:-

Infected non-union is the difficult task, frequently delaying definitive fixation of the fracture. The metallic implants used in fixation of fracture pose a risk of infection reactivation in the future due to the formation of biofilm [12]. In the past, infected non-union of long bones was treated with both multi-staged and single-staged procedures [13]. In order to achieve fracture union in such cases, thorough debridement, local infection control, and rigorous stabilisation are the most important principles. The non-staged procedures can be performed in a singular setting with aggressive infection control and fracture fixation. Nonetheless, additional studies are required to confirm the efficacy of non-staged management. The staged management to control the local infection first and then go for definitive fixation are time-tested and well-established techniques for managing infected non-union. [14,15] Due to the limited number of patients with ipsilateral femoral neck and shaft nonunions described in the literature, specific recommendations on the optimal choice of fixation are lacking. If an infection is suspected to be the cause of the non-union, the appropriate preoperative laboratories should be obtained (ESR, CRP, and WBC). In addition, intraoperative cultures must be obtained, and the patient must be appropriately treated after surgery. In the case of a suspected infection and a failed implant, an ipsilateral non-union fracture of the femoral shaft and neck becomes even more complicated. Due to previous inexperience and lack of evidence from the literature in coping with the concomitant non-union of the femoral neck and shaft fractures with suspected intramedullary infection, we resorted to the fundamental principles for the management of such injuries [10,11]. There was serosanguinous collection, so we decided to fix it with LRS. For the fracture neck femur, we placed isolated external fixator with two schanz pin both in neck and shaft of femur and further stabilised it by connecting with the LRS system to prevent varus collapse. We did not use bone grafts or antibiotic cements, and we began alternate compression and distraction at the femoral fracture site. The result was excellent, and fracture union occurred. On the one hand, the

current report and management technique can be useful in controlling intramedullary infection; on the other hand, they offer an uncomplicated management plan for achieving union at both femoral neck and shaft fracture sites. This case report also demonstrates the efficacy of rigid stabilisation in obtaining union in chronic non-union of the neck femur fracture, which is considered a problem fracture due to the peculiarities of its outcomes and ever-evolving fixation techniques. Somehow alternating compression and distraction also augmented the union of fracture neck and shaft of femur though more conclusive evidence will be required to accept this explanation.

Therefore, we propose that Orthofix LRS in conjunction with spanning ex fix for fracture neck of femur is a viable option for the management of ipsilateral non-union fracture shaft and neck of femur, especially in the presence or suspicion of infection.

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