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A case of multiple mal united fractures with knee infection managed with customized long femur to tibia intramedullary nailing

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ABSTRACT

Background: Infection of the knee joint after fractures associated with the joint is a serious problem. The patient presents in intense pain and is likely to undergo sepsis. Sometimes if the preferable surgery could not be performed salvage procedures are to be considered. These are done to preserve the functionality of the involved lower limb and to make the patient capable of doing his daily activities without pain. *Presentation of case*: Presenting a case of a 27 year old male with 1 year old malunited fracture mid shaft femur left side with non-union fracture mid shaft tibia left side with mal united fracture proximal tibia left side with intra operative finding of infected pus in the knee joint. The patient was managed with arthrodesis of the knee joint and fracture reduction using a customised 75cm long femur to tibia intra medullary nail. Knee arthrodesis using long intra medullary nail can be an alternative to above knee amputation in complex knee infections. This can allow the patient to perform his daily activities without having pain. Fractures involving femur and tibia of the same side with knee arthrodesis can be managed with customized long femur to tibia nail effectively.

Keywords: Femur to tibia nail, customised nail knee arthrodesis, mal united fracture femur

1. INTRODUCTION

Knee Joint infections accompanying fracture of the proximal tibia are challenging. For their management arthrodesis of the knee joint is an alternate approach to amputation of the lower limb (Knutson, 1984). For the management of complex fractures of the femur and tibia of the same limb with knee infection can be managed with a customised femur to tibia nail. This not even stabilizes the fracture but also knee arthrodesis can be achieved. Arthrodesis of the knee joint can be performed by many ways for example fixation with screws, femur to tibia plating, external fixator application and

intramedullary nailing (Talmo, 2009; Nichols, 1991). Out of these the most popularly used technique is nailing and external fixator application. The most reliable method out of these in terms of fusion rates and short time of fusion is intra medullary nail insertion (Wiedel, 2002; Damron, 1995). Long femur to tibia nails has these advantages but due to the difficulties in the procedure of insertion of the nail and risk of misalignment of the leg, modular nails and pre-contoured nails are preferred (Lai & Shen et al., 1998; Volpi et al., 2004; Waldman et al., 1999; Arroyo et al., 1997; McQueen et al., 2006).

Customised femur to tibia nails are inserted in an antegrade manner from the trochanteric region through the knee joint and up to the distal tibia (Ellingsen et al., 1994; Bargiotas et al., 2006; Crockarell et al., 2005). Knee movements of the patient are compromised but he can perform his day to day activities without pain. Above knee amputations with provision of prosthetic limbs is also an option but the prosthetics available today require more physical efforts for mobilization. Also many patients refuse amputations and demand an alternative to it therefore limb salvaging techniques like knee arthrodesis are preferred.

2. CASE REPORT

A 27 year old male presented to the OPD with 1 year old history of road traffic accident. The patient was not able to bear weight over his left lower limb since 1 year. He complained of pain and deformity over his left thigh and leg on movements. One year back the patient was diagnosed with fracture mid shaft femur left side with fracture mid shaft tibia left side with proximal tibia fracture left side. The patient did not take any medical treatment and went to quakes for treatment. For 6 months patient applied some unknown substances thinking it will heal by its own. After 2 months of resting at home pain of the patient subsided but he was not able to bear weight over the effected limb. He stayed at home for the next 6 more months and then presented to the OPD with such condition.

On examination of the left thigh he had no bony tenderness or abnormal mobility in the femur but deformity was palpable. Over the left leg, bony tenderness was present over the lateral malleolus of the tibia and over the mid shaft tibia, there was abnormal mobility present in the antero-posterior axis over the mid shaft tibia. Series of X-rays were done and the patient was diagnosed to have 1) mal united fracture mid shaft femur left side 2) mal united fracture proximal tibia left side 3) non-union fracture mid shaft tibia left side 4)segmental mal united fracture fibula left side (Figure 1).

Figure 1 Pre-operative x rays of the patient

The basic lab investigations were done and were found to be normal with normal TLC counts. Patient was planned for open reduction and internal fixation with plate osteosynthesis for fracture tibia first. Intra operatively when the knee joint was opened to fix the lateral malleolus, purulent discharge was seen from the knee joint and the basic anatomy of the joint was completely destroyed (Figure 2). Due to this incidental finding plan of the surgery was changed and arthrodesis of the knee joint had to be done. Hence the knee joint was fixed with screw and external fixation was done with extra support was provided with above knee slab application.

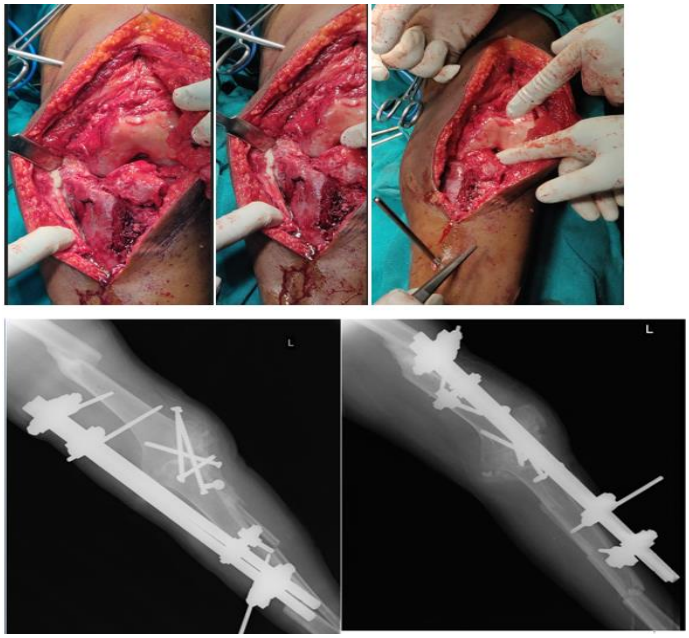

Figure 2 Intra Operative images with post OP X ray

Pus culture and sensitivity testing was done and the patient was found to have staphylococcus aureus infection. Antibiotics were started according to pus culture and sensitivity and patient was discharged on oral antibiotics for 6 weeks with external fixator and above knee slab. Patient again came back after 2 months for definitive management. X rays were done and knee arthrodesis of the knee was checked and was found to be satisfactory for the definitive management. The patient was taken to the operation theatre and external fixation was removed. After the removal of the external fixation pin sites were allowed to heal for 1 week and then patient was planned for the definitive management and the plan was to fix the mal united femur, knee and mid shaft tibia fracture with a customised femur to tibia nail. Total length of the left lower limb was taken and was found to be 75 cm, hence a customised 75cm nail was ordered.

The patient was taken supine on the OT table with a sandbag over the left buttock to elevate the left hip and under spinal anesthesia firstly an incision was made over the lateral aspect of thigh under C-arm guidance over the malunited fracture. Osteotomy was performed and the mal union was broken, after that the fracture sites were freshened and the femur was realigned to its anatomical position and held with the help of bone holding forceps. Then the screws which were used for knee arthrodesis were removed and stability of the arthrodesis was checked. Then 5cm incision was taken over the mid shaft tibia over the fracture and fracture ends were freshened and secured with bone holding forceps. Proximal part of the tibia after this a 4cm incision was made over the grater trochanter and entry in the femur was made with an awl from the pyriformis fossa and a guide wire was passed from the entry through the fracture site and up to the distal femur. Serial reaming was done. The guide wire was then removed and inserted via the knee joint into the tibial shaft up to the distal tibia and reaming of the tibia was done (Figure 3).

Figure 3 Intra OP Images of 2nd OT

A long guide wire was then introduced from the pyriformis fossa of the femur up to the distal tibia. Customised long nail was then inserted from the pyriformis fossa. Keeping the mid shaft femur fracture ends in alignment the long nail was passed through the fracture site, through the knee joint into the tibia. Then holding the tibia fracture in alignment the nail was passed through the tibia fracture site up to the distal tibia. Proximal and distal locking was achieved and final alignment was checked under C-arm. Thorough wash was given and closure of the incisions was achieved.

Figure 4 Post-operative X-Ray

The patient received injectable antibiotics for a weak and partial weight bearing was started from the next day of the surgery. Post OP patient had a total of 5cm of shortening which was corrected with shoe raise. The patient's rehabilitation was done and after a week patient was allowed full weight bearing mobilisation. After 4 months following the surgery, the patient is walking without any pain and is able to perform all his daily activities. There is no sign of infection or implant failure. The knee joint is arthrodesed and there is no pain or tenderness in any part of the affected limb on final follow up (Figure 4).

3. DISCUSSION

Functional results of knee arthrodesis in comparison to above knee amputation have been assessed by Hungerer et al., (2017). They have reported similarities in both set of patients in terms of SF12 scoring but above knee amputation provides better functional outcome. Who were eligible for microprocessor knee prosthesis application but the prosthesis available as of now are not up to the mark and require much physical effort for mobilization. Knee arthrodesis can be achieved by using different implants such as modular nails and customised femur to tibia nails. Customised long femur to tibia nails are gaining popularity amongst surgeons for knee arthrodesis in comparison to modular nails due to the fact that in case of a recurrent infection of the knee they are easily removable as compared to modular nails which are not easy to remove.

In our case it was justifiable to use a customised nail as due to the infected knee joint and the distorted anatomy of the joint, knee movements were not possible furthermore the mal united fractures of the femur and tibia were also complex to fix therefore a customised long nail from femur to tibia was helpful in reducing all the fractures simultaneously and arthrodesis of the knee joint. There was no post operative infection seen till now. In our case a 2 staged procedure was performed for knee fusion. Firstly fixation was done with screws and external fixation and then definitive fixation was achieved by customised nail. Knee arthrodesis can be done by single stage or 2 stage procedures (Friedrich et al., 2017). 2 staged procedures are more preferred in infected cases. After the

first stage of fusion it is recommended to send an aspirate from the knee for ESR and CRP to confirm that the infection has been eradicated and then definitive fixation is achieved.

According to Bargiotas et al., (2006) 2 staged procedures are more capable in eradicating the infection and great results. Benefits of customised long nail include immediate post OP weight bearing mobilization which is a great mental and emotional boost for the patient. This also reduces the surgical exposure and soft tissue dissection and damage. It was also helpful in proper aligned healing of the fractures in my patient. The patient was pain free and was completely satisfied as he was again walking on his affected limb after 1 year of pain and suffering.

4. CONCLUSION

For arthrodesis of knee in such cases customized nails can be a good option as they help in arthrodesis as well as stabilises the fractures. The surgery performed is easy and can be done by most of the orthopaedic surgeons. There was a significant limb shortening in outpatient which was easily managed with shoe raise.

Author's Contribution

All authors contributed equally to the manuscript.

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Informed Consent

Written & Oral informed consent was obtained from all individual participants included in the study. Additional informed consent was obtained from all individual participants for whom identifying information is included in this manuscript.

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Conflicts of interest

The authors declare that there are no conflicts of interests.

Data and materials availability

All data associated with this study are present in the paper.

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