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Exchange Nailing, for Atrophic Non-union of the Tibia, after Implant Breakage, Post a Non-traumatic Event

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Abstract

Introduction: The most feared complication of fracture management is non-union. Non-union can be of the following types, hypertrophic, oligotrophic, atrophic, and septic. In view of a non-union, exchange nailing is preferred and so routinely performed for non-unions and fractures of the tibia.

Case Presentation: Here, we present a case of an implant failure from an atraumatic event in a case of atrophic non-union of the tibia, which was treated by exchange nailing and bone grafting. A 22-year-old male, with a history of the left closed tibia fibula diaphysis fracture 1 year ago, underwent exchange nailing with bone grating after having an atrophic non-union with implant breakage.

Conclusion: Implant failure and non-union are caused due to a wide variety of factors. Appropriate implant selection for fracture type, reaming, fracture site compression, good reduction, and adequate and early mobilization are important factors for a satisfactory union and prevention of secondary surgeries.

Keywords: Atrophic non-union, exchange nailing, implant breakage, non-traumatic event, tibia.

Introduction

It is a well-known fact that the process of fracture healing is reliant on a plethora of factors, including the degree of comminution, fracture pattern, vascularity of the area, stability of fracture, and presence of infection, and hence, the management of long bone non-unions is a hotly debated topic [1]. The most feared complication of fracture management is non-union. Non-union can be of the following types, hypertrophic, oligotrophic, atrophic, and septic [2].

The gold standard for the treatment of tibia shaft fractures is intramedullary interlocking (IMIL) nailing [3]. It is less invasive as well as provides early functional recovery. In view of a non-union, exchange nailing, dynamization of the nail, and/or bone grafting are preferred. Thus, exchange nailing is routinely performed for non-unions and fractures of the tibia. Here, we present a case of an implant failure from an atraumatic event in a case of atrophic non-union of the tibia, which was treated by exchange nailing and bone grafting.

Case Report

We present a case of a 22-year-old male, with a history of the left closed tibia fibula diaphysis fracture 1 year ago. The patient was admitted elsewhere and there underwent IMIL nailing of the tibia. The patient was apparently alright, till 24 days before presenting to us at the clinic, and was performing daily activities without hassles, when he noticed visible deformity, pain, and difficulty in walking. The patient is a house helper, undergoing mild-to-moderate level of physical work. On examination, there was no swelling or tenderness; fracture site mobility was elicited and crepitus felt. Neurological examination revealed no neurodeficit. On radiological examination, A-P and LAT films reveled a transversely broken nail at the diaphysis along with the fracture of the middle 1/3rd of the shaft of the tibia, with a united fibula (Figs. 1 and 2). Both proximal and distal screws close to the fracture site were broken. The patient had poor bone quality. The patient's COVID-19 swab reverse transcription polymerase chain reaction was negative and HRCT revealed post-tuberculosis sequel and an old large loculated left hydro-pneumothorax with bronchopleural fistula. The pulmonary medicine department advised no acute management for the thoracic cavity.

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Figure 1: Pre-operative X-ray of the left leg (A.P).

Figure 2: Pre-operative X-ray of the left leg (Lat.).

Figure 3: Extracted implants.

Informed written consent was taken before surgery. The patient was taken for surgery and exchange nailing of the tibia with bone grafting from the ipsilateral iliac crest was done.

The entire procedure was performed under spinal plus epidural anesthesia. Tourniquet was applied and inflated and appropriate scrubbing, painting, and draping of the left lower limb were done. The incision over old the scar on the knee was taken and the jig was locked to the head of the nail. Proximal screws were removed and the proximal part of the broken nail was taken out. A ball tip guidewire was then passed over to the distal end through the nail cavity. Distal screws were removed and the distal fragment of the nail was removed with reduction and maneuvers (Fig. 3). Swabs were collected and the wound was copiously irrigated with normal saline. Reaming was done and a new nail was passed. Ipsilateral iliac crest bone graft was harvested and opening the fracture site did grafting. Edges were freshened and the graft placed. Deeper structures of the wounds were closed with 2–0 Vicryl and skin with 2–0 Ethilon.

Surgical wound site, implant breakage site, and fracture site swabs were sent for culture and sensitivity, which showed no microbial growth. The patient's leg was kept in an A/K slab for a week followed by passive and active physiotherapy thereafter (Figs. 4 and 5). Sutures were removed on post-operative day 14 and the patient was discharged. No clinical problems were observed at 2 weeks follow-up. At 3 months follow-up, the fracture is uniting (Figs. 6 and 7).

Figure 4: Post-operative X-ray of the left leg (A.P.)

Figure 5: Post-operative X-ray of the left leg (Lat.).

Figure 6: Post-operative X-ray of the left leg (A.P.) (3 months).

Discussion

A prompt and critically appropriate surgical intervention is necessary for a good outcome. In recent literature, non-union was the most prevalent complication of tibial shaft fractures and had been developed in up to 27% of patients, independent of different fixation methods such as intramedullary nailing [4]. Non-union can be of the following types, hypertrophic, oligotrophic, atrophic, and septic [2], and in the above case, we experienced an atrophic non-union. In atrophic non-union, the callus fails to form, due to bone devitalization by the trauma (open fracture and soft-tissue lesions) and/or to primary surgery (loss of periosteum in plate fixation, etc.) [5]. Atrophy may also be due to pathology or history involving vascular disorder (diabetes, smoking, and arteriopathy) and/or to fracture

Figure 7: Post-operative X-ray of the left leg (Lat.) (3 months).

Figure 8: Squatting picture at 3 months

located in the distal third of the tibia [5].

The implant used in the previous surgery may not be of a standard quality, might be defective, or might have witnessed an excessive sustained loading, leading to implant failure. Since culture swab reports from the wounds were free of contamination, microbial contamination, leading to implant failure, was ruled out.

In atrophic non-union, a stimulation technique should be associated with internal fixation: PRP, BMP, autologous graft, or an association of these methods [5].

The gold standard stimulation technique is autologous bone grafting [5] with exchange nailing [3], thus, we removed the prior intramedullary nail, reamed, and used a nail with a larger diameter. Because of the reaming process, the fracture site will be biologically activated, and a better axial and mechanical stability will be achieved [6, 7, 8]. Appropriate implant selection for the different fracture types, reaming of the medullary canal, adequate fracture site compression, good reduction of the fracture, and adequate and early mobilization are important some of the important factors for a satisfactory union. In the above case, these factors might have lead to atrophic non-union and implant failure without a traumatic event.

Conclusion

Implant failure and non-union are caused due to a wide variety of factors. Appropriate implant selection for fracture type, reaming, fracture site compression, good reduction, and adequate and early mobilization are important factors for a satisfactory union and prevention of secondary surgeries.

Declaration of patient consent: The authors certify that they have obtained all appropriate patient consent forms. In the form, the patient has given his consent for his images and other clinical information to be reported in the Journal. The patient understands that his name and initials will not be published, and due efforts will be made to conceal his identity, but anonymity cannot be guaranteed.

Conflict of Interest: NIL; **Source of Support:** NIL

References

1. Bhan K, Tyagi A, Kainth T, Gupta A, Umar M. Reamed exchange nailing in nonunion of tibial shaft fractures: A review of the current evidence. Cureus 2020;12:e9267.
2. Thomas JD, Kehoe JL. Bone Nonunion. Treasure Island, FL: StatPearls; 2020.
3. Hierholzer C, Friederichs J, Glowalla C, Woltmann A, Bühren V, von Rüden C. Reamed intramedullary exchange nailing in the operative treatment of aseptic tibial shaft nonunion. Int Orthop 2017;41:1647-53.
4. Högel F, Gerber C, Bühren V, Augat P. Reamed intramedullary nailing of diaphyseal tibial fractures: Comparison of compression and non-compression nailing. Eur J Trauma Emerg Surg 2013;39:73-7.
5. Tall M. Treatment of aseptic tibial shaft non-union without bone defect. Orthop Traumatol Surg Res 2018;104:S63-9.
6. Gómez-Barrena E, Rosset P, Lozano D, Stanovici J, Ermthaller C, Gerbhard F. Bone fracture healing: Cell therapy in delayed unions and nonunions. Bone 2015;70:93-101.

7. Tosounidis TH, Calori GM, Giannoudis PV. The use of Reamer-irrigator-aspirator in the management of long bone osteomyelitis: An update. Eur J Trauma Emerg Surg 2016;42:417-23.

8. Litrenta J, Tornetta P, Vallier H, Firoozabadi R, Leighton R, Egol K, et al. Dynamizations and exchanges: Success rates and indications. J Orthop Trauma 2015;29:569-73.

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