TURN DOWN DISTAL FEMORAL AUTOGRAFT IN PROXIMAL TIBIA DEFECT RECONSTRUCTION: A CASE REPORT

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ABSTRACT

Giant cell tumor, a benign growth with aggressive attributes with potential for both local invasion and recurrence often affects the proximal tibia with attendant bone expansion, destruction and invasion of the articular margin. I present a 42 year old woman who came in with a history of a two year old mass involving the right proximal tibia, and a week history of bleeding from an incision scar on the proximal tibia. X-ray / histopathological findings revealed an aggressive giant cell tumor with a breach of the posterior cortex of the proximal tibia. The patient was counselled for surgery, and subsequently had a resection of the entire proximal tibia in the first surgery; and a turn down autograft of the distal femur with arthrodesis of the knee joint done in the second surgery. On follow up for one year, there were no signs of tumor recurrence and patient could ambulate comfortably with a walking stick.

Conflict of interest/ Supports: Nil

Cite this article as: Obiegbu H.O. Turn Down Distal Femoral Autograft In Proximal Tibia Defect Reconstruction. - A Case Report
Afrimedic Journal 2021; 7(1): 50-58

INTRODUCTION

Giant cell tumor (GCT) represents a benign bone tumor with often aggressive attributes. It also has a potential for both local invasion and recurrence, and a low likelihood of distant metastasis[1]. It usually consists of giant osteoclast-like cells with a surrounding vascularized and hypercellular stroma[2] and accounts for 5-7% of all primary bone tumors[3]. GCT tends to occur between the age group of 20-40 years, and predominantly in the metaphyseal regions of the limb, especially around the knee joint, in the distal femur and proximal tibia[3].

GCT grows in an expansive manner, often breaching the cortex of the bone involved[3]. While the proximal tibia is a common site of occurrence of both benign and malignant tumors, it presents a challenging anatomical site for both excision and subsequent reconstruction of bone defect with a high incidence of surgical complication[4]. Although the therapeutic purpose in the management of GCT around the knee joint is reduction of its recurrence rate and recovery of joint function[5], there is still some controversy about the optimal modality of surgical treatment.

Treatment modalities of GCT around the knee joint have traditionally included curettage and bone grafting, curettage and cement filling, segmental resection and artificial prosthetic reconstruction[5, 6]. However, there is still no widely held consensus regarding the standard treatment for all patients. This challenge may be as a result of a

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variation in recurrence rates, which depends on both the clinicoradiological grade of the tumor and the modality of treatment adopted. Historically, curettage alone has been associated with a high rate of local recurrence, with rates of up to 50% reported[7]. Classification of GCT based on their clinical and radiological outcomes were described by Campanacci et al[8], with grade I lesion (latent) having a well defined margin and an intact cortex; a grade II lesion (active) having a relatively well defined margin but no radio-opaque rim, and the cortex is thinned and moderately expanded; a grade III (aggressive) having indistinct borders with associated cortical destruction. Prosser et al[9] found statistically significant higher recurrence rates in Campanacci grade III patients treated with curettage alone compared to Campanacci grade I and II. Although some authors have found poor correlation between radiography and local recurrence, most agree that clinic-radiographic grading is designed to define the extent of surgery required to completely remove the tumor[10]; with GCTs that caused more destruction such as grade III lesions more likely to require aggressive treatment.

I present a novel surgical technique of managing an aggressive GCT of the proximal tibia using a two stage procedure, which involves a complete excision of the proximal tibia as a first stage, and then subsequent defect reconstruction using a turn down autograft of the distal femur.

CASE REPORT

A 42 year old male patient presented at the outpatient department of Nnamdi Azikiwe University Teaching Hospital, Nnewi on the 15th of March, 2019 with a progressively increasing swelling of the right knee joint of 2 year duration, with an associated history of pain and inability to bear weight on the affected limb of three months duration, and repeated bleeding episodes from a residual wound at the operation site of one week duration. He had earlier an incision biopsy of the mass two months earlier and an unsuccessful curettage of the bone tumor one week prior to presentation (10th of January, 2019) in another hospital, and an unsuccessful attempt at curettage of the tumor had been done afterwards (one week prior to presentation). Histology result had revealed a GCT of the proximal tibia.

Examination revealed a midline scar, with an ulcer at the anterolateral aspect of the proximal tibia measuring 3cm x 2.5cm with an underlying bony mass involving the proximal tibia. There was no active bleeding. Radiographs revealed a proximal tibial mass with a breach of the posterior cortex, bone expansion and resorption of the subchondral bone of the tibia (fig 1). Patient was then counseled and worked up for proximal tibia excision and subsequent reconstruction of the defect. He had a two stage surgery.

At the first surgery, the tumor was accessed via a single incision extending from the anteromedial aspect of distal femur to the middle third of the tibia,

exposing the entire proximal tibia and knee joint. The popliteal vessels were mobilized via a medial approach by releasing the pes anserinus with the semimembranosus tendon, and thereafter detaching the origin of the soleus muscle at the dorsal surface of the tibia thereby skeletonizing the proximal tibia.

A circumferential dissection of the knee capsule was performed, and the cruciate, collateral and patella ligaments were all detached. An osteotomy of the tibia shaft was performed at a tumor free zone- 5cm from the distal end of the tumor (14cm from the joint line). The mobilized proximal tibia along with the tumor insitu was then excised (fig 2). The wound bed (fig 3) was irrigated and hemostasis achieved. A spacer which was constructed using a bone cement and a Steinmann's pin (fig 4) was then inserted into the defect and the wound closed over a drain. The immediate post operative condition was satisfactory; and he was then discharged home five days post surgery.

He was thereafter re-admitted for a second stage surgery one month after the first surgery. The previous scar was utilized to access the proximal tibia and distal femur. The cement spacer was removed, and the underlying bio-membrane was noted. The distal femur was then mobilized. A hemi-section of the distal femur was cut (fig 5) and the autograft turned down into the tibia defect, and stabilized with a 14-hole broad dynamic condylar plate (fig 7). Wound bed was closed over a drain. Immediate post operative condition was satisfactory. Patient developed a superficial surgical site infection which was successfully managed with anitibiotics. He was discharged home after two weeks on admission and was subsequently followed up for one year. At follow up, significant callus formation was noted at both ends of the autograft at three months (fig 8), and patient was allowed full weight bearing. At subsequent clinical visit, he was now able to ambulate with only a walking stick, with a solid arthrodesis of the knee joint.

DISCUSSION

The treatment of aggressive GCT of the proximal tibia usually involves wide en bloc resection of the tumor, followed by reconstruction of the resultant defect[11]. Several techniques exist for the reconstruction of this post excision defect, though each is not without its drawbacks.

Megaprosthesis is a common form of reconstruction post treatment of aggressive GCT around the knee joint, and the benefits include immediate stability and patient mobilization post operatively and good functional results and patient acceptance has been reported[12]. However, despite the advances in materials and implant design of mega-prostheses, these systems have a high incidence of complications. These include infection, aseptic loosening of the prosthesis and peri-prosthetic frcatures[13]. Implant survivorship is also a major issue, given the high cost of these materials.

Ercolano[14] reported implant survivorship of mega-prostheses at 60% in 5 years, and 42% in 10 years.

Bone lengthening, though used sparingly, can also be an effective modality in the management of post excision defect in the proximal tibia. In an article by Borzunor et al[15], bone transport was done in 38 patients after resection of benign tumors of the tibia with favorable outcome. However, these procedures carry a significant morbidity with the mean duration of external fixator in the study by Borzunor et al being 308.03 days. Although vascularized autografts can also be used, they often need both expertise and infrastructure which may not be readily available in some centres.

Turn down autograft of the femur for proximal tibial defect offers an alternative biologic option, often leading to arthrodesis across the knee joint. The cement spacer produces a bio-membrane on its removal further aiding formation of an arthrodesis across the knee joint. Another significant advantage is its low cost when compared to other modalities of proximal tibia defect reconstruction. After extensive literature search, this article appears to be the first describing this procedure for the treatment of GCT.

In conclusion, turn down autograft of the distal femur on a background of a bio-membrane, though novel gives a satisfactory outcome in the management of proximal tibia defect reconstruction. However, further studies would be required to evaluate its effectiveness.

Fig 1: showing pre-operative X-rays of proximal tibial mass

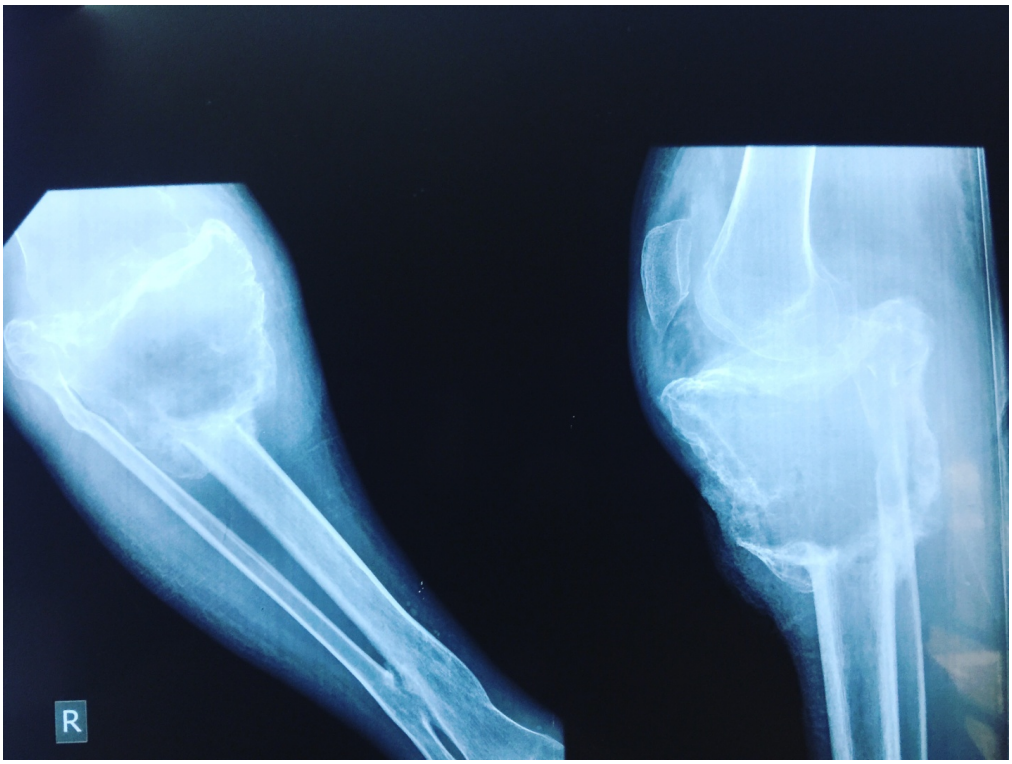


Fig 2: Mobilized proximal tibia with tumor in situ

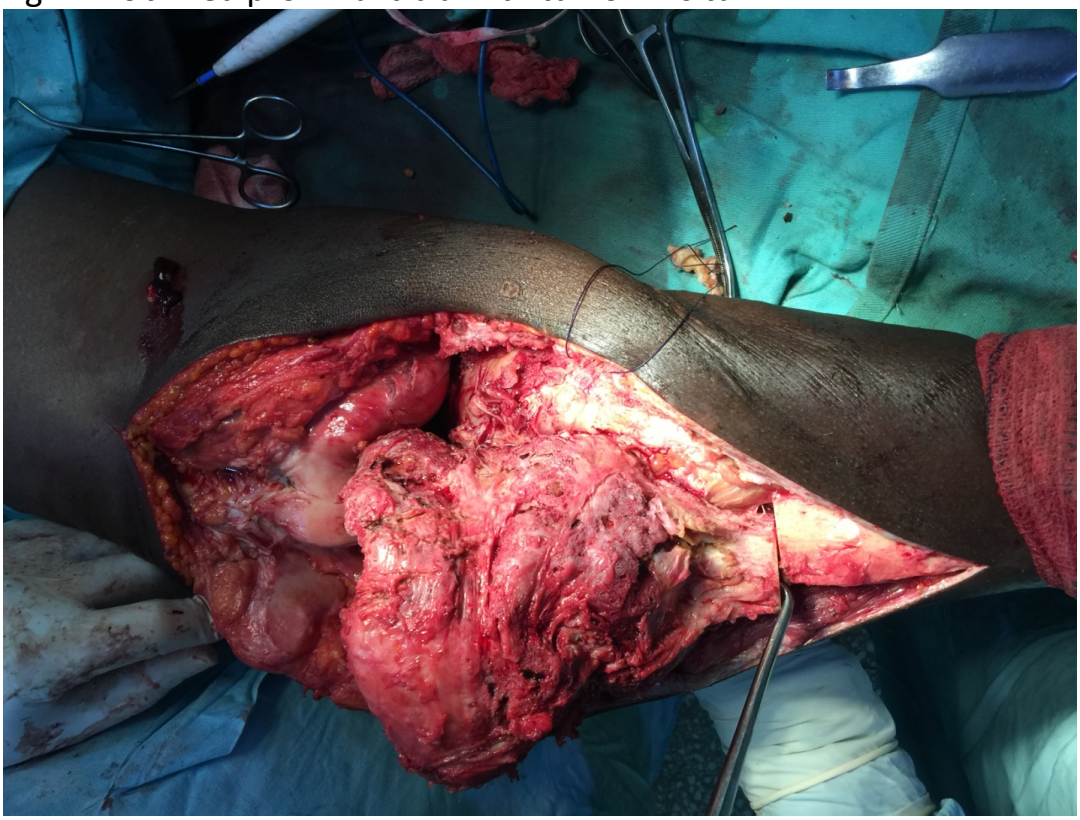


Fig 3: Showing wound bed post excision of tumor

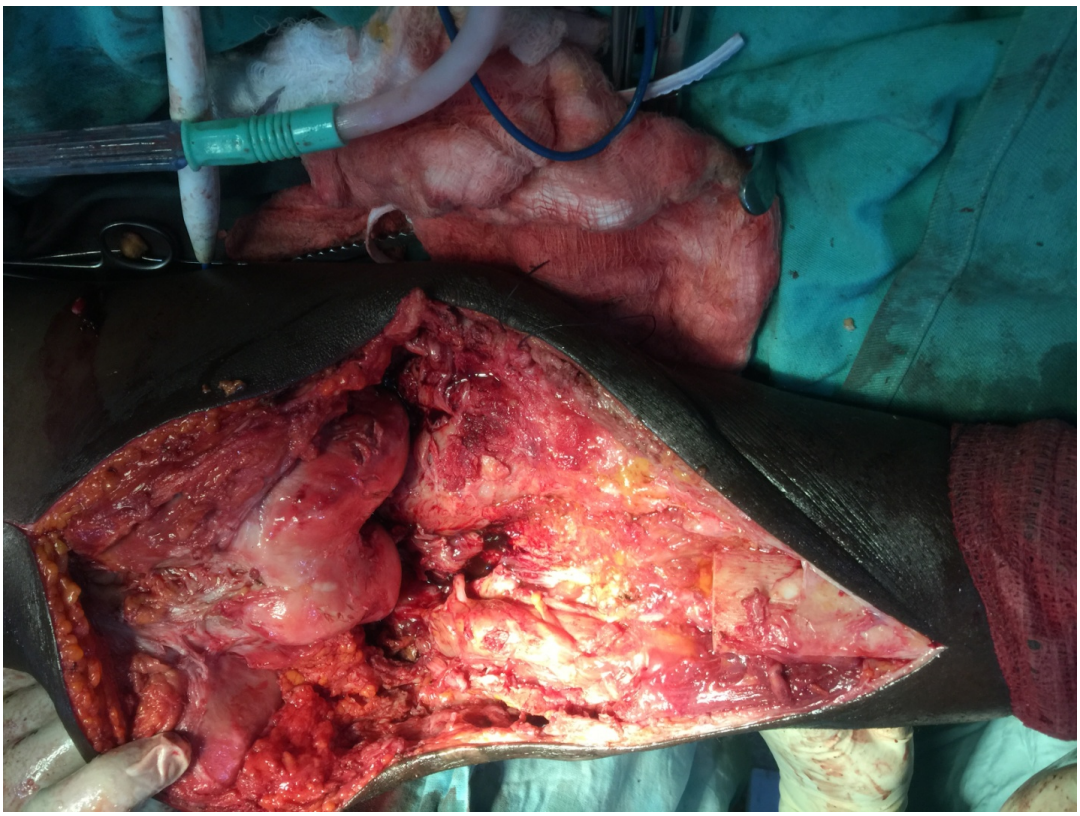


Fig 4: Spacer constructed with bone cement and Steinmann's pin

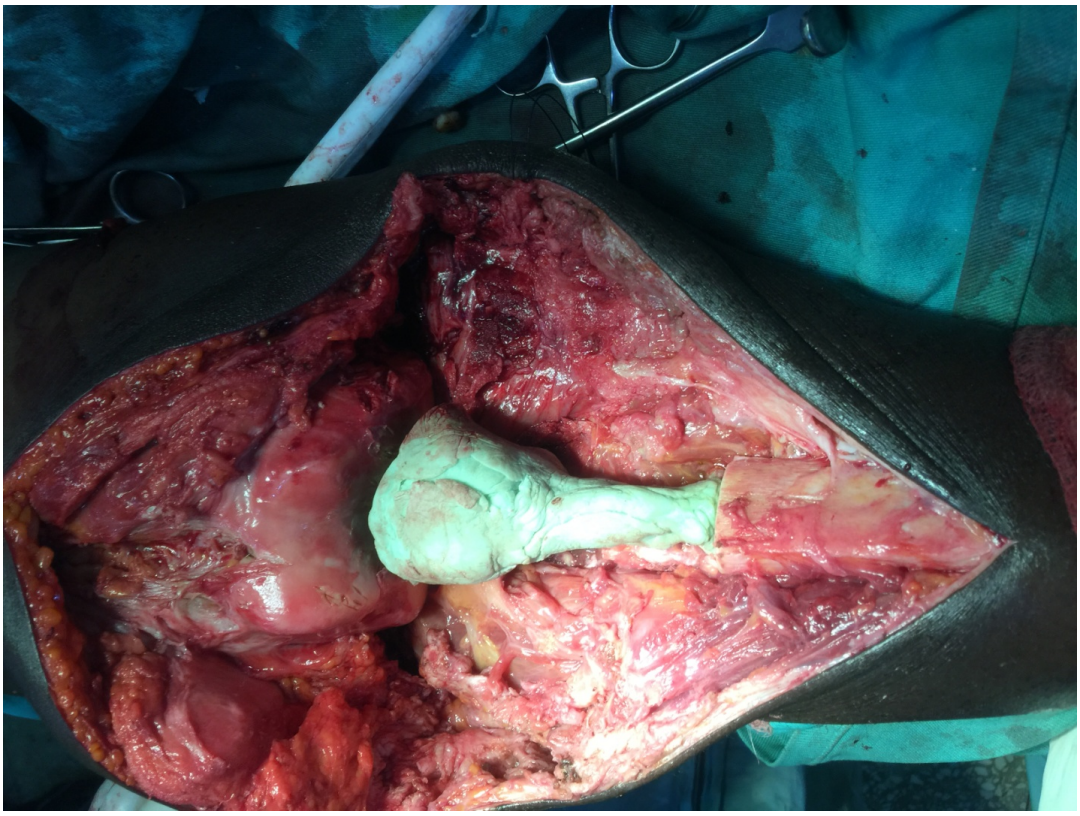


Fig 5: A hemi-section of the distal femur was mobilized

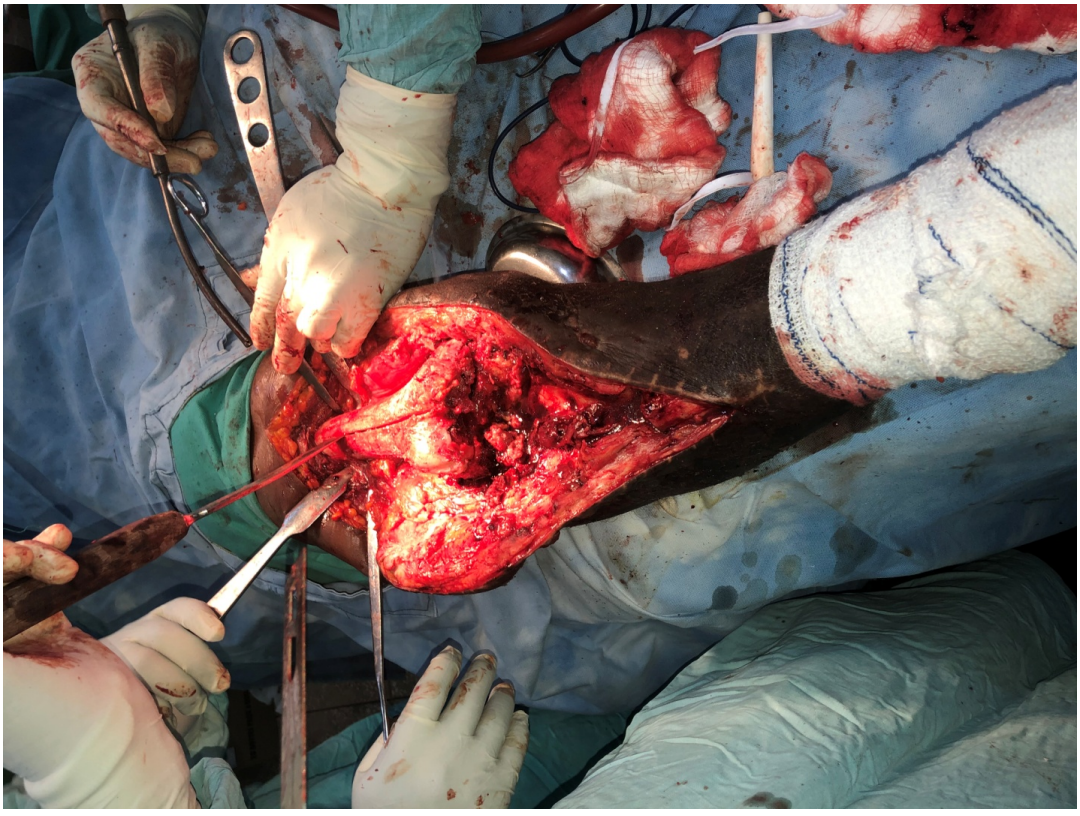


Fig 6: Mobilized distal femur was then turned down into the tibial defect

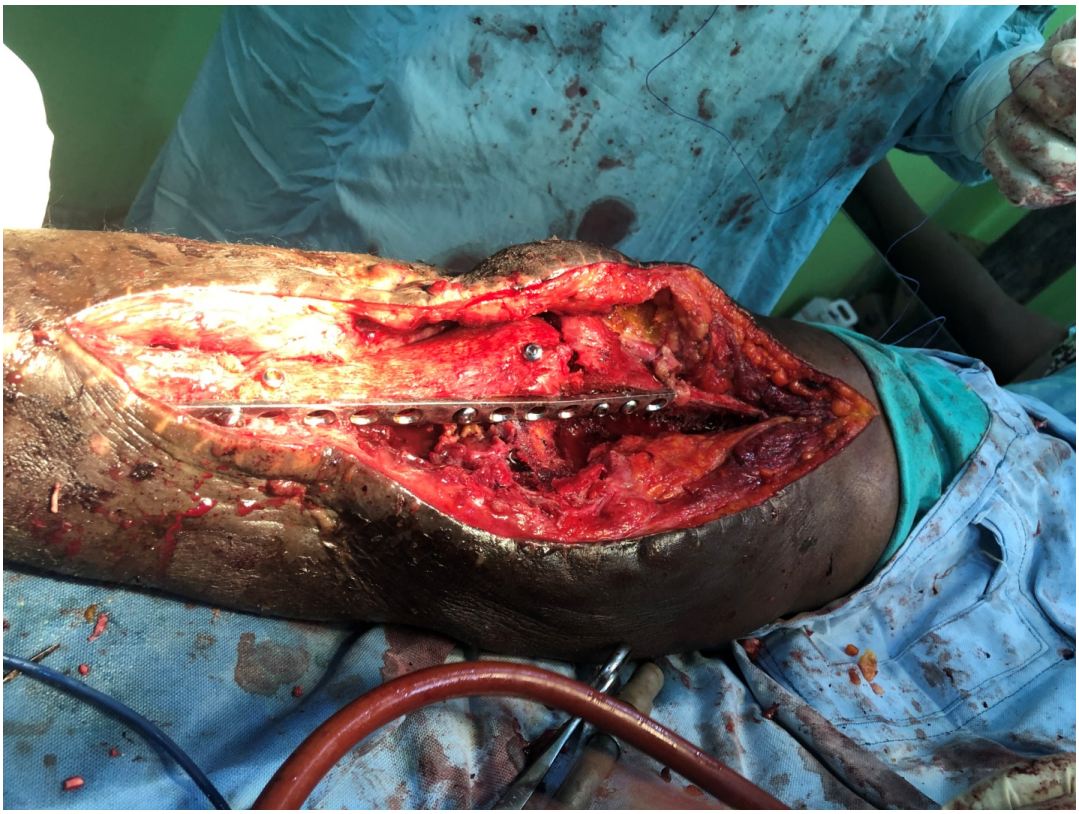
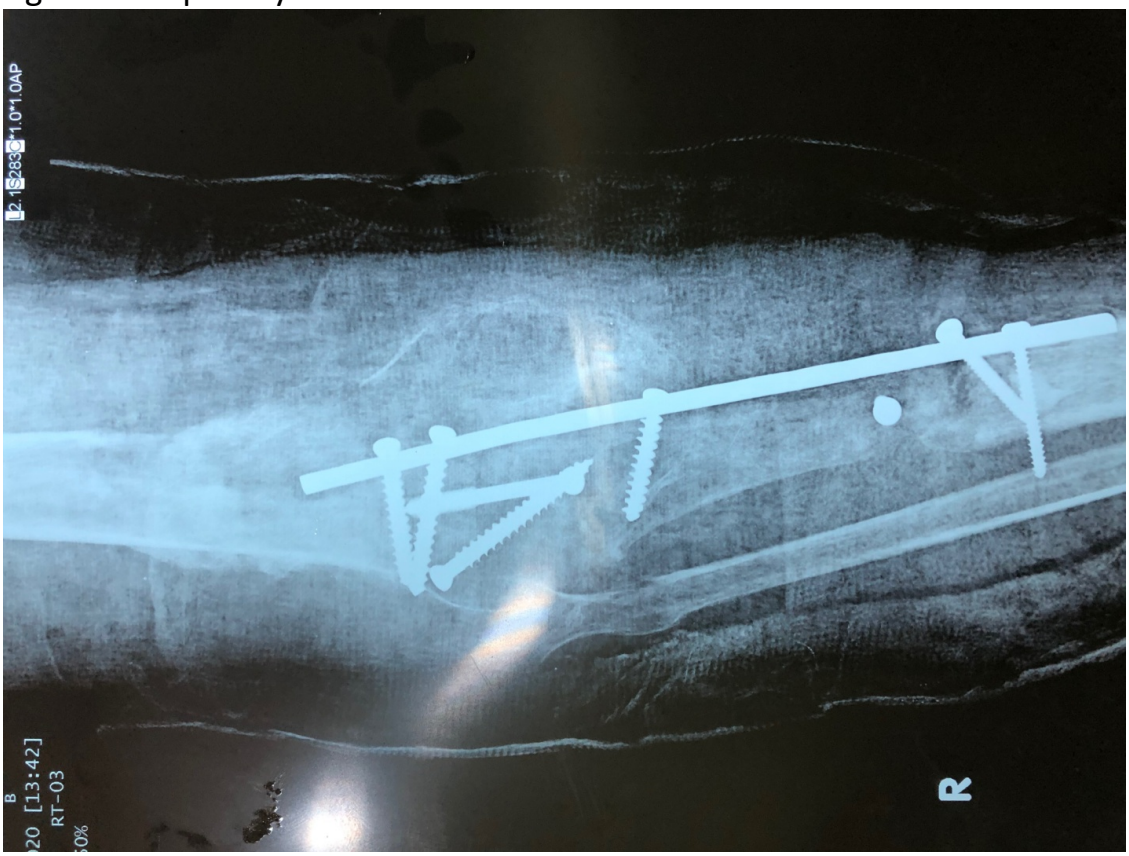


Fig 7: Post op X-rays at 3 months



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