

**Case Report**

## Bilateral Fracture Femur in a Patient with Renal Tubular Acidosis -Type 1 (Osteopetrosis Type) Plating or Nailing? A Case Report

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### Abstract

Diaphyseal Renal tubular is an uncommon medical disorder that comprises four variant types. It affects the skeletal system in different ways, most commonly osteomalacia and rarely osteopetrosis. Renal tubular acidosis with bone disease is representing a challenge to orthopaedic surgeon when facing fracture fixation which is more obvious in osteopetrotic bone disease. Our case represents bilateral femoral shaft fracture that had been fixed by two different surgeons with 2 different ways of fixation (weight bearing versus load sharing implants).

**Keywords:** Renal tubular acidosis; Fracture femur; Osteopetrosis; Plate; IM Nail

### Introduction

Renal tubular acidosis (RTA) occurs when the kidneys are unable to maintain normal acid-base homeostasis because of tubular defects in acid excretion or bicarbonate ion reabsorption [1]. RTA can happen at any age, although it is more commonly seen in adults [2]. The three major forms of RTA are distal RTA (type 1; characterized by impaired acid excretion), proximal RTA (type 2; caused by defects in reabsorption of filtered bicarbonate), and hyperkalemic RTA (type 4; caused by abnormal excretion of acid and potassium in the collecting duct). Type 3 RTA is a rare form of the disease with features of both distal and proximal RTA [1]. Untreated type 1 RTA causes children to grow more slowly and adults to develop progressive kidney disease and bone diseases [3]. The association between renal tubular acidosis (RTA) and osteopetrosis has been reported in literature [4].

### Case presentation

Female patient 33 years old, known to have type 1 Renal tubular acidosis being followed up by nephrologists, presented to us by closed fracture of right femoral shaft that had been managed by open reduction and internal fixation using a locked broad DCP (Figure 1,2) [5-8].

Two years later, patient presented with closed fracture of left femoral shaft managed by open reduction and internal fixation with locked intramedullary nail (Figure 3).

Both fractures healed completely, 18 months after plate fixation of the right femur and 8 months following nail fixation of the left femur (Figure 4,5).

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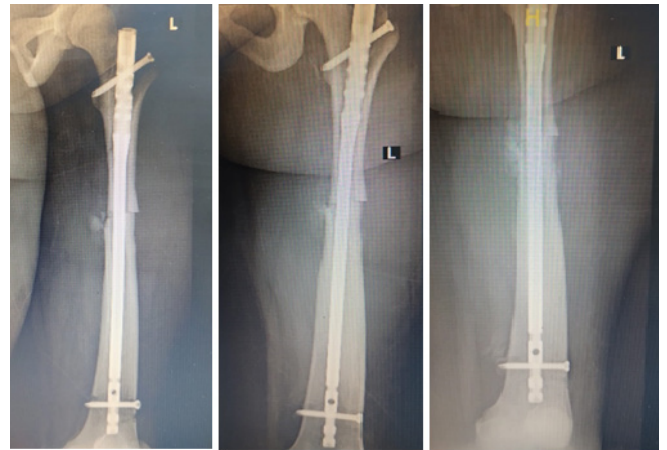
**Figure 1:** Preoperative and 3-month postoperative x rays of Right Femur.



**Figure 3:** Preoperative x-rays of the Left femur.



**Figure 2:** Serial postoperative x-rays of the Right femur at 12 Months, and 18 Months.



**Figure 4:** follow up x-rays of the Left Femur.



**Figure 5:** Final x-rays of the Left Femur showed complete fracture union after 8 months.

## Discussion

Renal tubular acidosis (RTA) comprises a group of disorders in which excretion of hydrogen ions or reabsorption of filtered HCO<sub>3</sub> is impaired, leading to chronic metabolic acidosis [9].

The most common type of RTA, Type 1 RTA or Distal RTA (dRTA), which is a rare chronic genetic disorder characterized by an inability of the distal nephron to secrete hydrogen ions in the presence of metabolic acidosis [9].

The association between renal tubular acidosis (RTA) and osteopetrosis has been reported in literature [4-8].

Our case is known RTA type 1 with osteopetrotic bony changes that can be appreciated by thick cortices, narrow medullary canals of long bones, transverse fracture patterns, acromegaly, anaemia and hearing deficit.

In our case, the right femoral shaft fracture, the first surgeon tried to fix the fracture with locked intramedullary nail as the medullary canal was not fully obliterated as in the full blown picture of marble bone disease with no medullary canal. He faced challenges in entry point to find a way to the medullary canal then he changed his decision to open reduction and internal fixation with plating (locked broad DCP).

This type of fixation was not the proper one as per the biomechanical principles of locked plate fixation of long bones being stiff and achieving absolute stability not following the rules of plate span ratio, plate screw density. Eventually full union happened after 18 months.

Chhabra et al. [10] found relatively more failure of load-bearing implants and summarized two primary factors attributed to failure regardless of treatment approach: one is the increased mechanical demands placed on implants because of the prolonged time to union, the other is the biochemical inability of osteopetrotic bone to hold the screws securely.

In the second fracture that happened 2 years later, the second surgeon planned to do locked intramedullary nail and faced complete obliteration of the medullary canal at the isthmus then he opened the fracture site and did retrograde reaming creating the medullary canal. The distal part of the femur had a near normal medullary canal. The second fracture fully united after 8 months.

## Conclusion

Renal tubular acidosis with osteopetrotic bone changes is

a challenging orthopaedic condition especially when facing long bone fracture fixation.

Although intramedullary fixation or plate fixation, both are troublesome and the fracture fixed by both techniques unites eventually, but a clear difference in time of union between both techniques is clinically observed even with open intramedullary nailing.

## Conflict of Interest:

Authors did not have any conflict of interest.

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