Treatment of Infected Tibia Non-Union Using a Novel Solid Intramedullary Nail Custom-Made for Antibiotic Impregnated Cement Coating

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INTRODUCTION

An infected non-union of the tibia is typically treated in two stages.

1

To transform an infected non-union into an aseptic non-union, with debridement, and insertion of antibiotic cement beads augmented with systemic antibiotics and primary stabilization.

2

Followed by (once the infection settles) internal fixation-with or without bone grafting to ensure stability.

Case Presentation

48/M complaints of discharge from his left leg and inability to walk since 3 months in January 2024

He had RTA on September 2023 due to which he had a distal one-third tibia and fibula shaft fracture

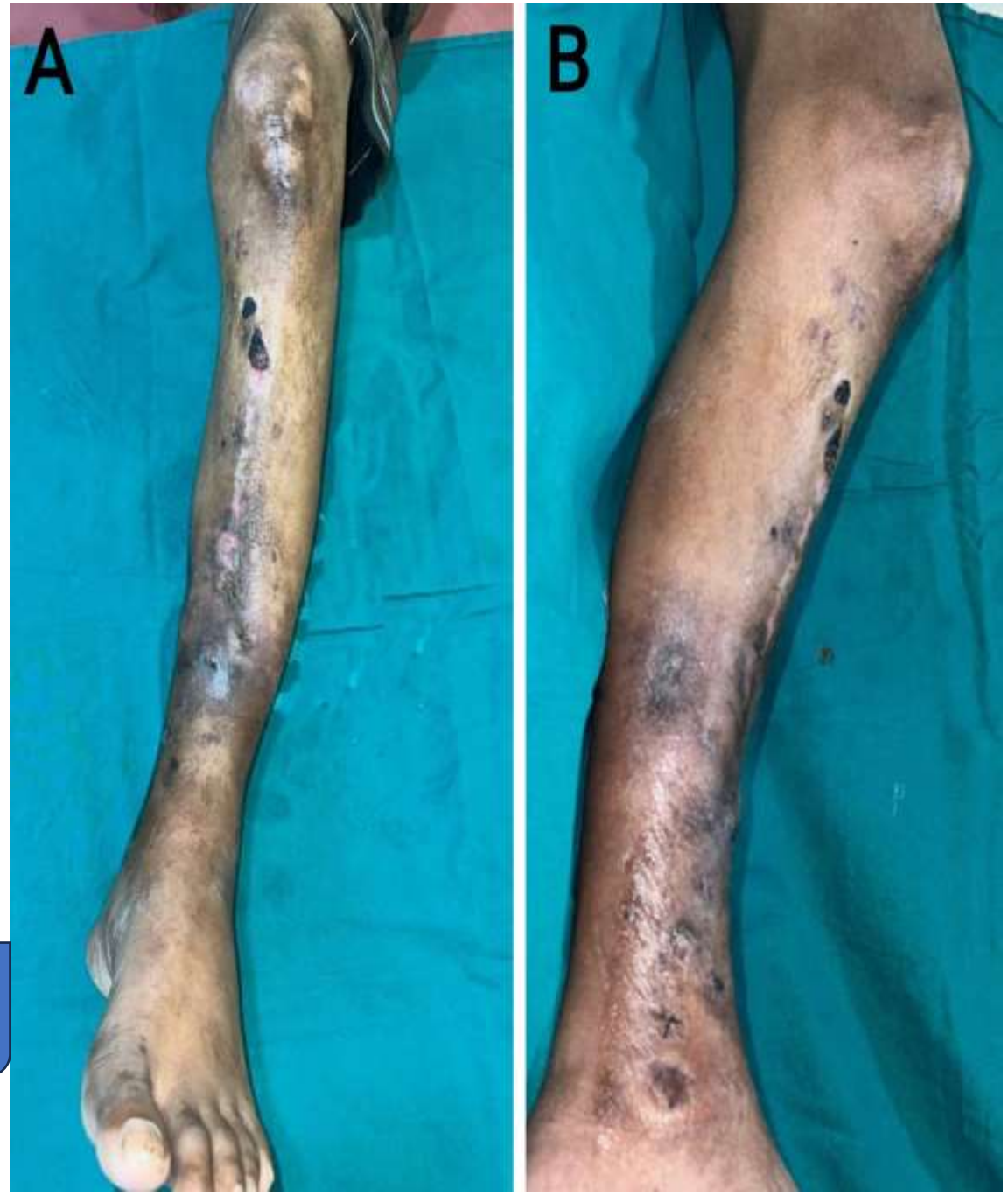
Underwent CRIF With IM nailing for left tibia shaft fracture, whereas the fibula shaft fracture was conserved.

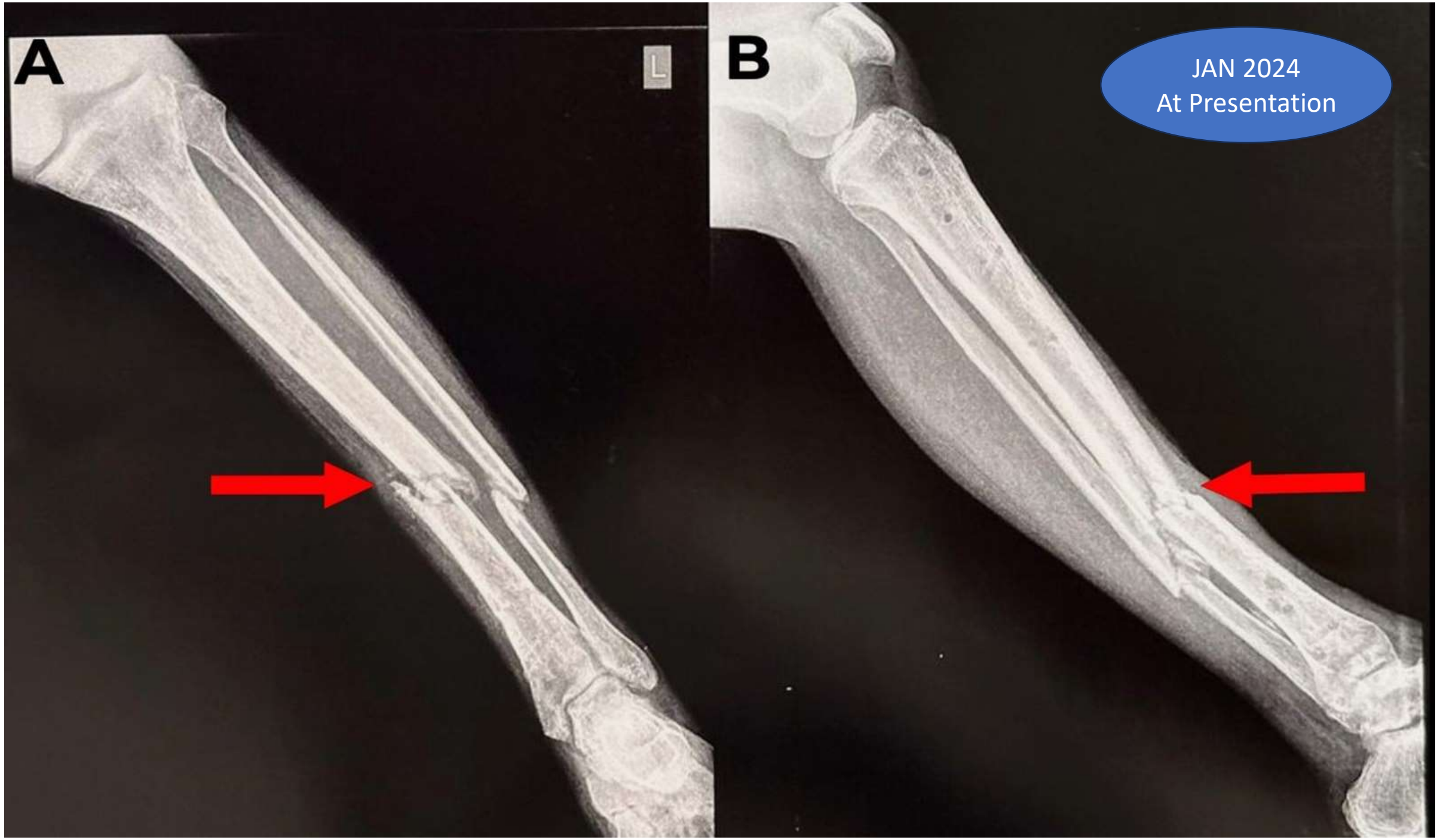
Two months post-surgery, he developed a discharging sinus

The IM nail was removed, and external fixation was done for the tibia in November 2023

MRSA was detected for which IV antibiotics were administered for a month

External fixator was removed in December 2023.

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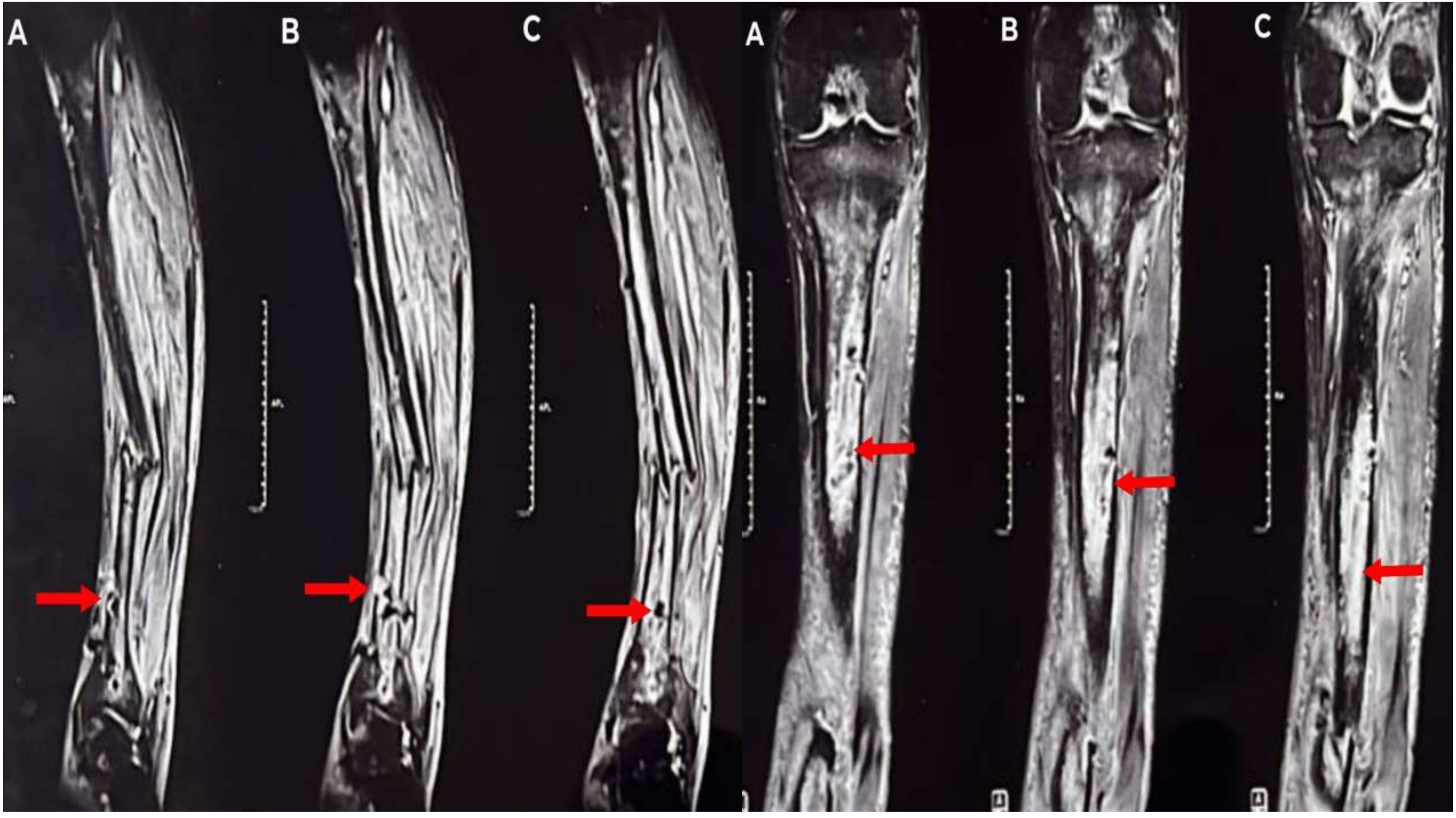
JAN 2024
At Presentation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C


A
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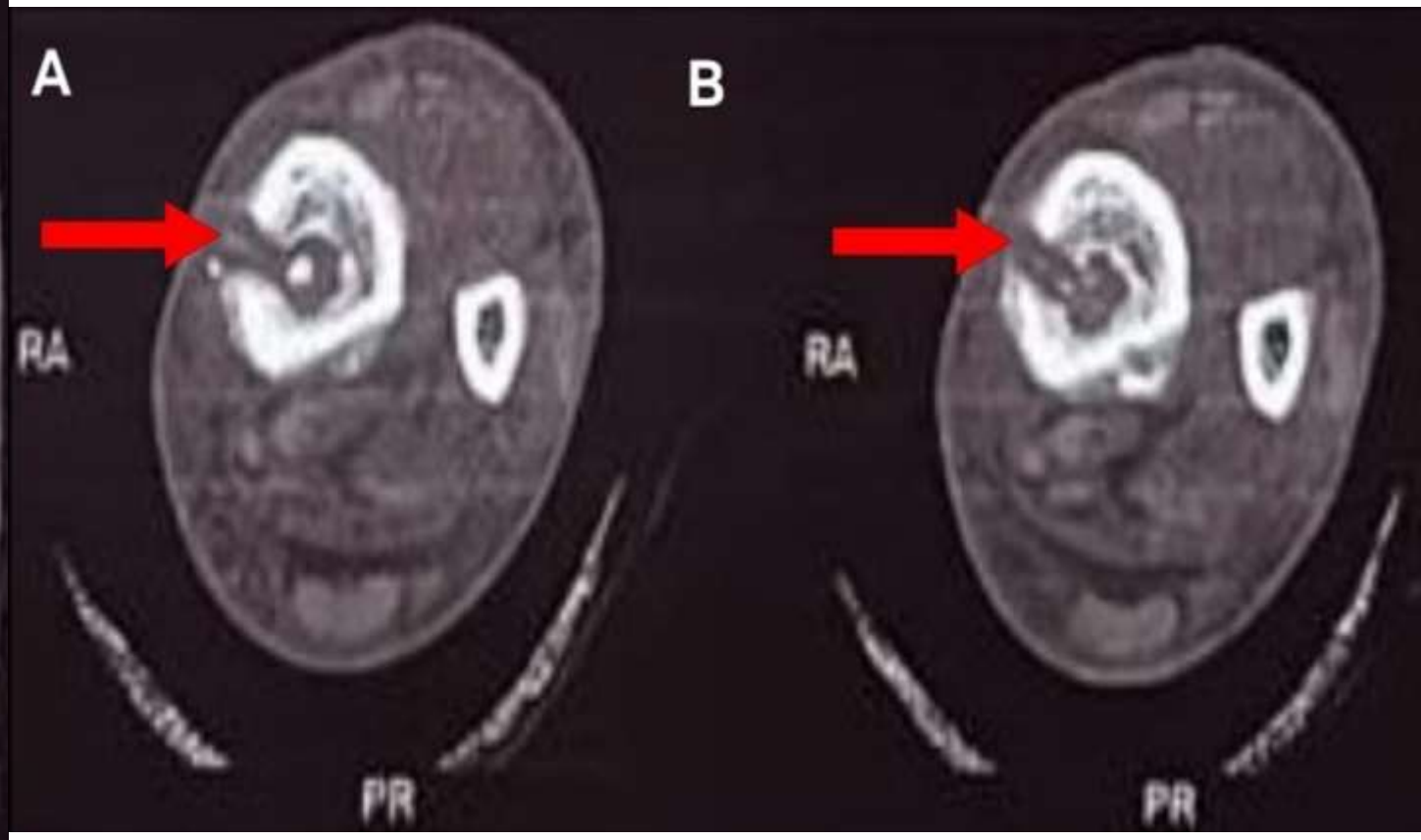

A
B
RA
RA
PR
PR

Swab Culture Report

Test : Isolation & Antimicrobial susceptibility of aerobic organisms.

Method : Manual culture / ID & AST by Vitek 2 Automated System.

Specimen : Swab :

ZN Stain : No acid fast bacilli seen.

Organism : Methicillin Resistant Staphylococcus aureus.

Antimicrobial susceptibility	MIC (µg/ml)	Interpretation
Ciprofloxacin	-	Resistant
Clindamycin	-	Susceptible
Erythromycin	-	Susceptible
Gentamicin	-	Susceptible
Vancomycin	1	Susceptible
Trimethoprim/Sulfamethoxazole	-	Susceptible
Ticoplanin	0.5	Susceptible

Comment : (Gram stain-gram positive cocci in clusters seen), Kindly correlate clinically; Take contact precaution; Cohort the patient.

<End>

End of Report

- Discharge was collected in our facility showed MRSA positive for which
- iv Vancomycin 1 gm BD X 2 weeks
- iv Linezolid 600 mg BD X 3 weeks.
- oral Linezolid X 2 weeks were given

The sinus tracts were excised, and the area was debrided. The fracture ends were freshened.

A TENS nail was coated with bone cement mixed with vancomycin and was inserted post reaming


A
L
B

Fluid Culture Report

Test : Isolation & Antimicrobial susceptibility of aerobic organisms.

Method : Manual culture / ID & AST by Vitek 2 Automated System.

Specimen : Tissue :

ZN Stain : No acid fast bacilli seen.

Organism : Pseudomonas aeruginosa.

Antimicrobial susceptibility	MIC (µg/ml)	Interpretation
Aztreonam	-	Resistant
Cefepime	32	Resistant
Ceftazidime	64	Resistant
Ceftazidime+Avibactam	16	Resistant
Ceftolozane/Tazobactam	32	Resistant
Ciprofloxacin	4	Resistant
Colistin	0.5	Intermediate
Gentamicin	16	Resistant
Imipenem	16	Resistant
Levofloxacin	8	Resistant
Meropenem	16	Resistant
Nitilmicin	32	Resistant
Piperacillin/Tazobactam	-	Resistant
Polymyxin B	1	Intermediate
Tobramycin	16	Resistant

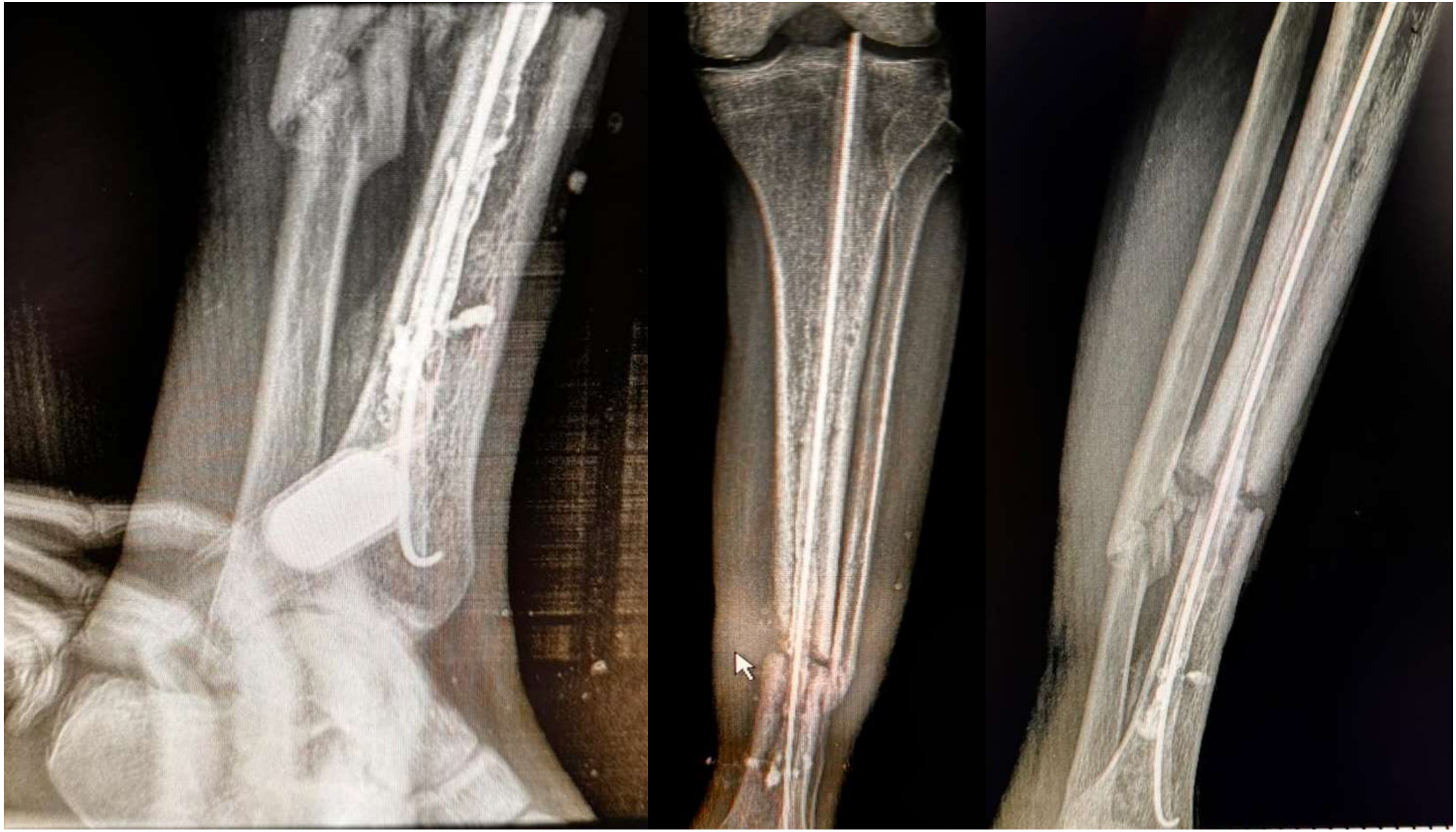
Comment : (Gram stain-gram negative bacilli seen) , .Carbapenemase MBL Producer. Pseudomonas aeruginosa is intrinsically resistant to Ampicillin,Amoxycillin/Clavulanic acid,Cefotaxime,Ceftriaxone,Tigecycline,Chloramphenicol & Co-Trimoxazole. Kindly correlate clinically , Ceftazidime Avibactam/Aztreonam Synergy negative

<End>

End of Report

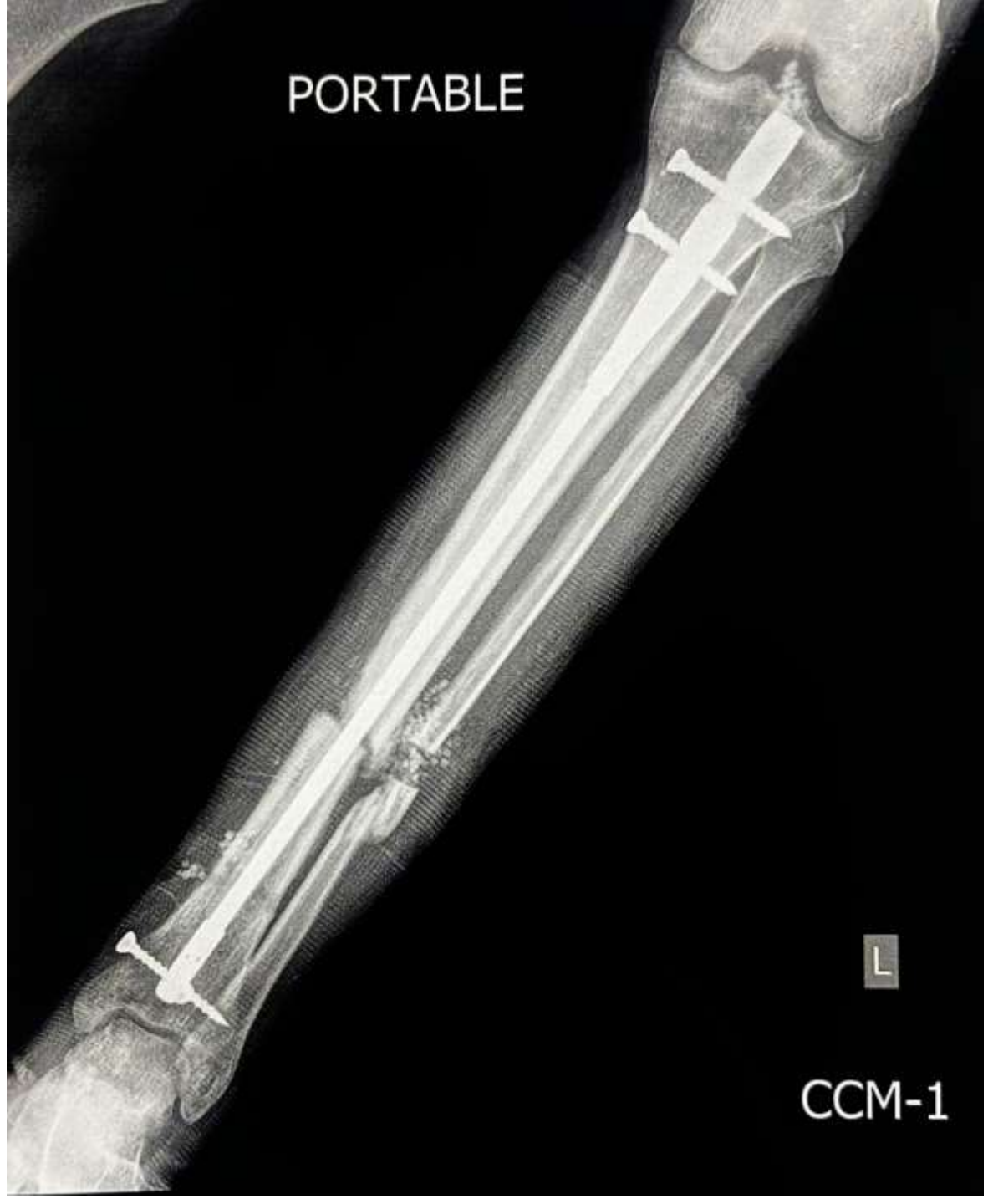
Inj.Poly B 10lakh unit loading dose f/By 7.5 lakh U BD X 2 weeks
Inj Fosfomycin 4 mg BD X 2 weeks
Oral Linizolid was given for 2 weeks

Weekly follow up – 4 repeated samples of ESR, CRP and TLC done weekly were in decreasing trend and indicated infection got under control.




A
B


A
B


PORTABLE
L
CCM-1

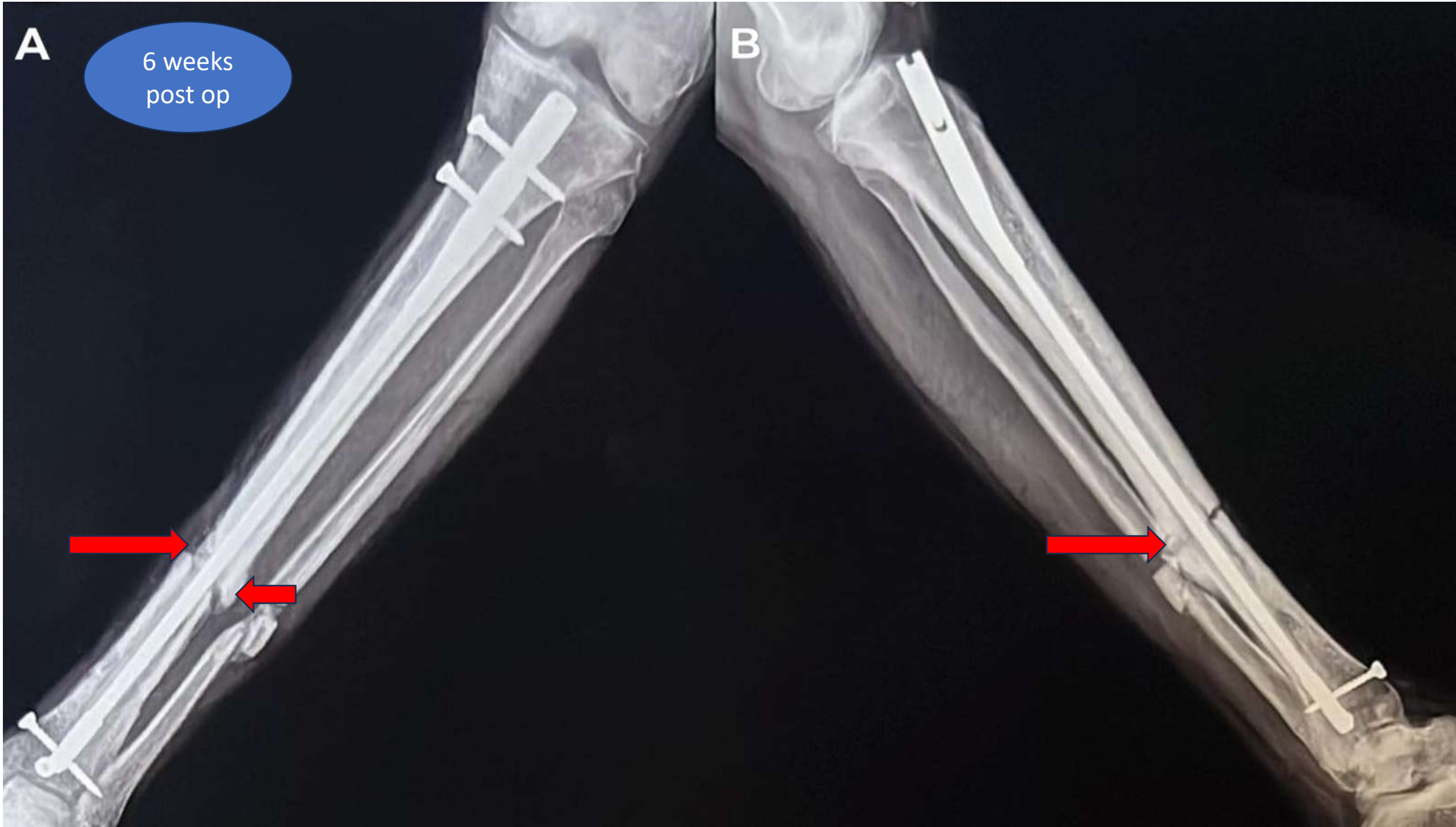
The intra-op sample report - no growth.
IV Teicoplanin 600 mg OD X 2 weeks
Fosfomycin 4 mg TDS X 2 weeks

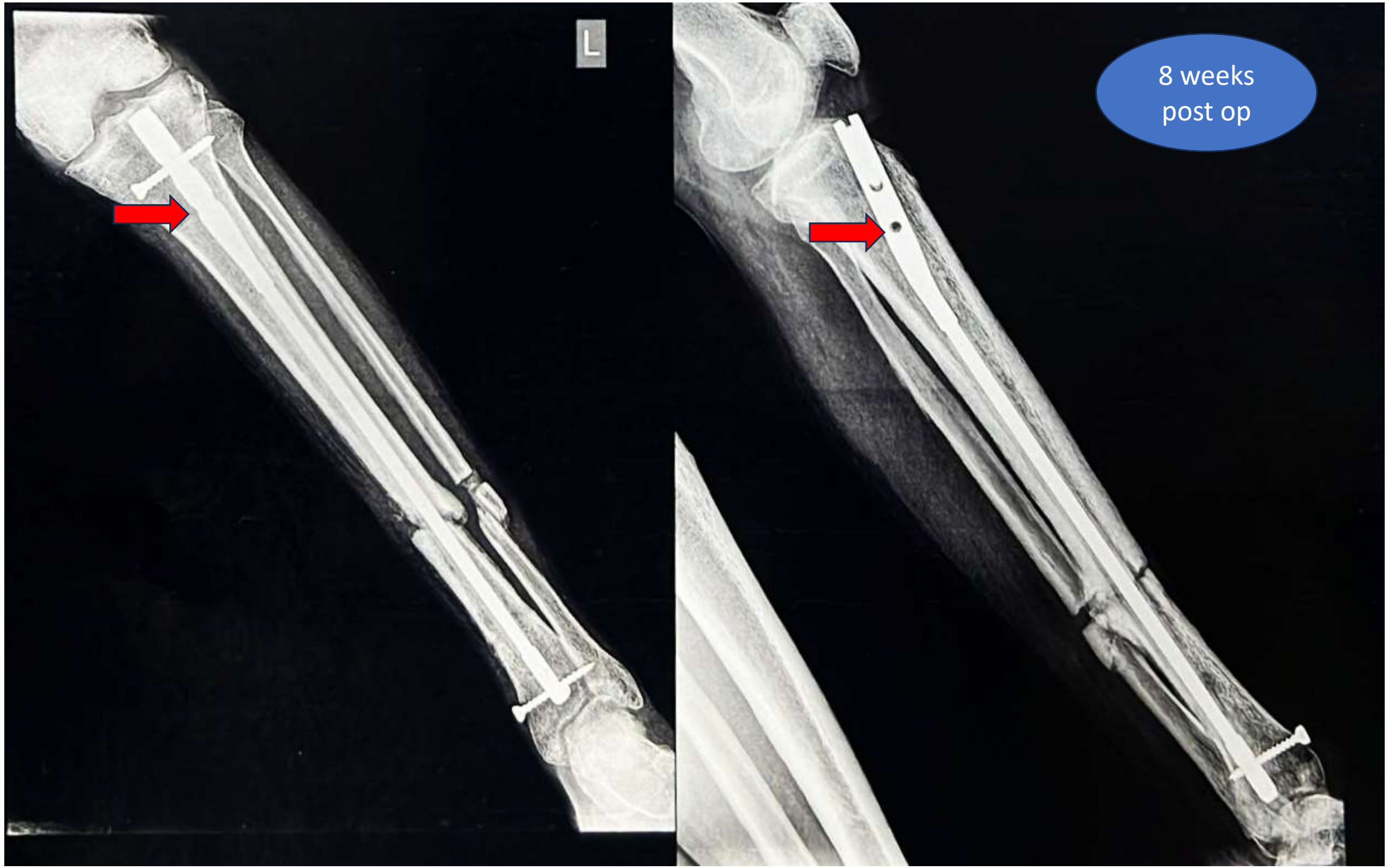
The suture removal was done two weeks post-surgery. There was no wound dehiscence.

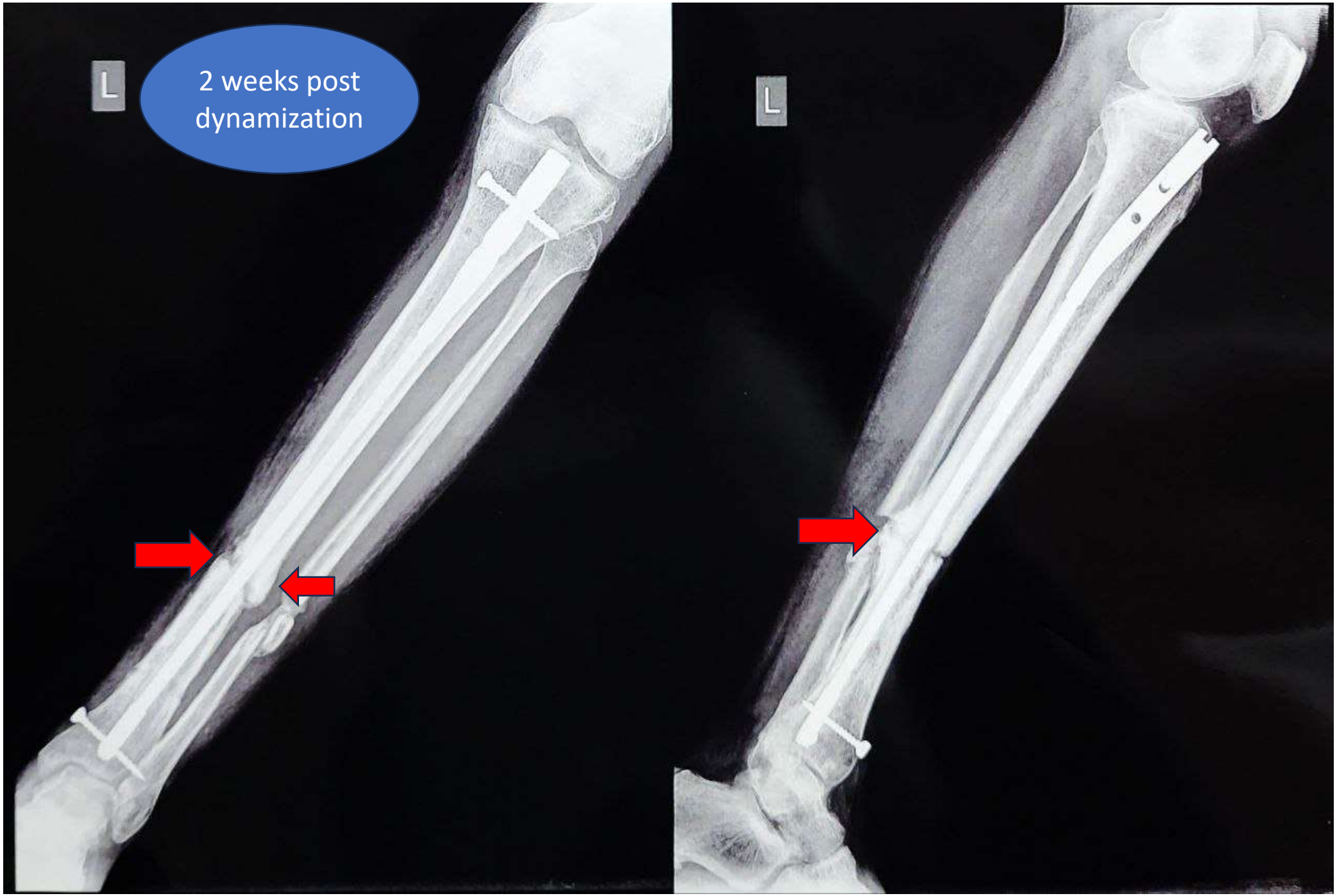
The patient was discharged on oral Linezolid for one week.

The patient had satisfactory knee flexion and full weight bearing was allowed.

The patient came for follow-up every two weeks. ESR, CRP, and WBC were analyzed every two weeks, which were within normal limits


A
6 weeks
post op
B


L
8 weeks
post op


L
2 weeks post dynamization
L

International Orthopaedics › Article

One-stage surgery for adult chronic osteomyelitis: concomitant use of antibiotic-loaded calcium sulphate and bone marrow aspirate

Original Paper | Published: 19 July 2018

Single-stage treatment of chronic localized tibial osteomyelitis with local debridement and antibiotic-loaded calcium sulfate implantation: a retrospective study of 42 patients

Chun-Hao Zhou,[#1] Ying Ren,[#2] Abdulnassir Ali,[#1] Xiang-Qing Meng,[3] Hong-An Zhang,[3] Jia Fang,[3] and Cheng-He Qin[✉3]

Comparison of the use of antibiotic-loaded calcium sulphate and wound irrigation-suction in the treatment of lower limb chronic osteomyelitis

Cheng-He Qin [1] • Hong-An Zhang [1] •
Yu-Han Chee [1] • Astuti Pitarini •
Abdulnassir Adem Ali • Show footnotes

Published: October 29, 2018 •
DOI: https://doi.org/10.1016/j.injury.2018.10.036 •

Wahl P, Guidi M, Benninger E, et al. The levels of vancomycin in the blood and the wound after the local treatment of bone and soft-tissue infection with antibiotic-loaded calcium sulphate as carrier material. *Bone Joint J.* 2017;99-B(11):1537-1544. doi:10.1302/0301-620X.99B11.BJJ-2016-0298.R3

Prophylactic external fixation and extensive bone debridement for chronic osteomyelitis

Lucian Fodor, Yehuda Ullmann, Michael Soudry, Eduard Calif, Alexander Lerner

From the Rambam Medical Center, Bruce Rappaport Faculty of Medicine, and Technion-Israel Institute of Technology, Haifa, Israel

Systematic approach to treat chronic osteomyelitis through localized drug delivery system: Bench to bed side

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Conclusions

- The method of choice of treatment for tibia non union is Illizarov(external) fixation but the patient was disinclined due to which alternate options were considered.
- An easy, affordable, and successful treatment for infected non-union of the tibia is antibiotic cement impregnated nailing.
- It has strong patient compliance and removes the problems associated with external fixators, which makes it superior to them.
- A few benefits of this approach are early weight-bearing, prevention of pin site infections, ease of use, and cost effectiveness, stabilization of the fracture, local antibiotic treatment, and the potential for accelerated rehabilitation.

- It has been discovered that solid nails are more resistant to local infection than cannulated intramedullary nails
- Thus, it appears that this solid intramedullary nail custom-made for antibiotic-impregnated cement coating is an excellent mode of local antibiotic treatment and stabilization of the fracture.
- A longer follow up and a larger sample size is required to fully comprehend its efficacy in reducing infection and fostering bone union.
- In our institute, the collaboration with Infectious Diseases Specialists and Microbiologists and continuous follow up has helped in control of the Osteomyelitis effectively

THANK YOU