

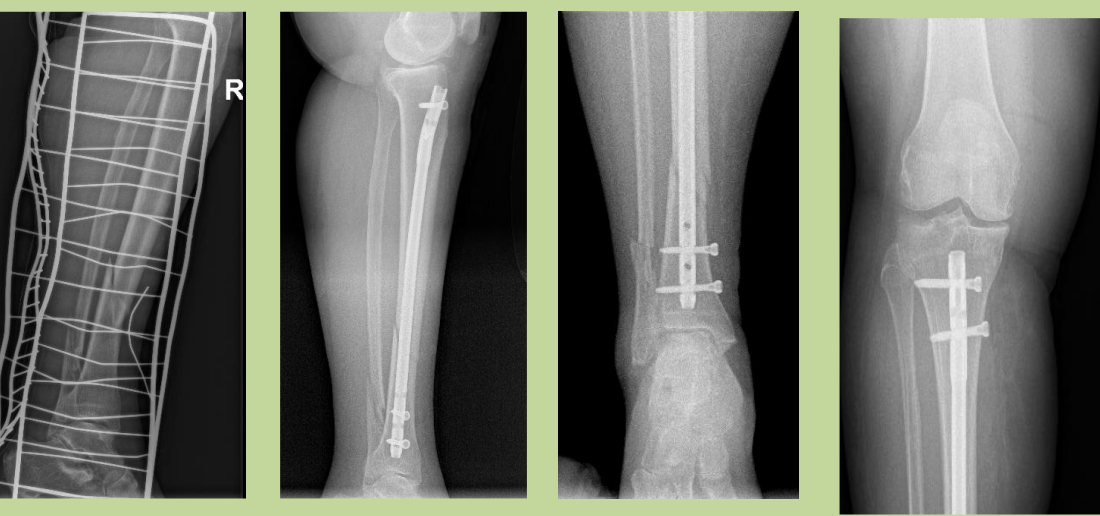
Different faces of fracture related infections (FRI) 6 case series

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2021-05-17 trauma, surgery 2021-05-19, right tibial osteosynthesis by IMN nail



F2 R2 I1*

Admitted to emergency dpr. In VUL SK 2021-08-15, leg became unusable after stepping on it. IMN nail breakage, right leg immobilised, NWB regimen recommended imperatively. Plaster of Paris immobilization for 4 months.



BIOCHEMISTRY (2022-04-28 06:23). CRP (mg/l): 135,1.

Infection after IMN nail osteosynthesis

2022-04-26 right leg swollen, inflamed, painful. Febrile t° -39°. Patient walked with just 1 crutch, FWB. VUL SK emergency dpr. visit: puncture, purulent liquid, culture, cytology exam.



CITOTOLOGY & MICROBIOLOGY EXAMS

Test	Result	Pathogen
Gram stain	Gram positive cocci in clusters	Staphylococcus aureus
Culture	Staphylococcus aureus	Staphylococcus aureus
PCR	Staphylococcus aureus	Staphylococcus aureus

Staph aureus
No DTT infection signs, no PVL toxin

Surgical treatment
Fisherman trick



Medical treatment

1 week i/v AB:
oxacillin 2g 4 t/d,
Oral nistatin 1 tab. TID

5 week oral AB:
clindamycin 600mg 3

Trauma 2020-08-21, staircaises fall. Admitted to VUL SK, right tibial diaphyseal fracture diagnosed. Same day i.e. 08-21 osteosynthesis locking DCP-LP plate m. AO.



F3 R3 I2*

FRI after plate osteosynthesis

MR Staph. Epidermidis - all 3 microbiology samples during 2020-09-02 operation Long term AB suppression trimethoprim 960mg TID



2020 08 28 second fall on the right leg at home. Admission to VUL SK, secondary dislocation. 2020-09-02 re-osteosynthesis performed

Comorbidities. Polipharmacy (6 comorbidities, allergy, former spondylodiscitis)

2015 m: L2/3 spondylodiscitis, left vertebral canal extradural lateral periphaetic abscess. Acute L2 radiculopathy in the left. Chronic rights L5-S1 radiculopathy. Lumbopathy: L4 anterolisthesis. Pain syndrome. FN III*.

PAH, III* ABP increase, HRG. Hipertensive cardiopathy (RVH)-tab. diltiazem 180 mg x 1, tab. verapamili hydrochloridi 240 mg x 1, tab. rilmenidini 1 mg x 1, tab. telmisartani/ hidrochlortiazidi 80 mg/12,5 mg x 1

Non-allergic bronchial asthma - inh. salmeteroli/fluticasoni propionatis 50 ug/500 ug -1 jp. 2 k./d.

CHD: stable II functioni class AP. Tab. ivabradini 7,5 mg x 1 HF C stage II functional class. Obesity III*.

II type DM - tab. metformini 850 mg x 2

Rheumatoid arthritis, seropositive, act. II*, X ray stage III*, FN-tab. metilprednizolon 4 mg x 2, tab. hydroxichloroquini 200 mg x 2, tab. sulfasalazini 500 mg x 2, tab. Diclophenac 150 mg x 1

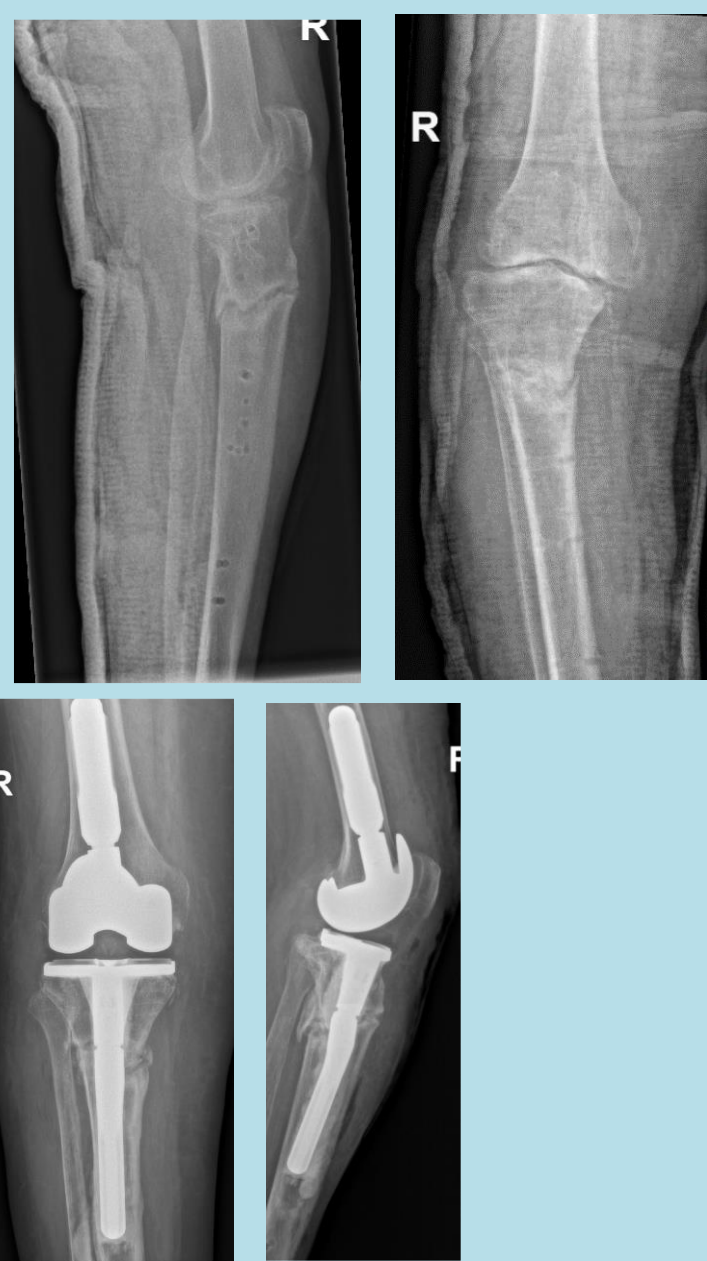
Clindamycin allergy

Anamnestic pancreatitis, complicated with sepsis

Aren't metal constructions stable?

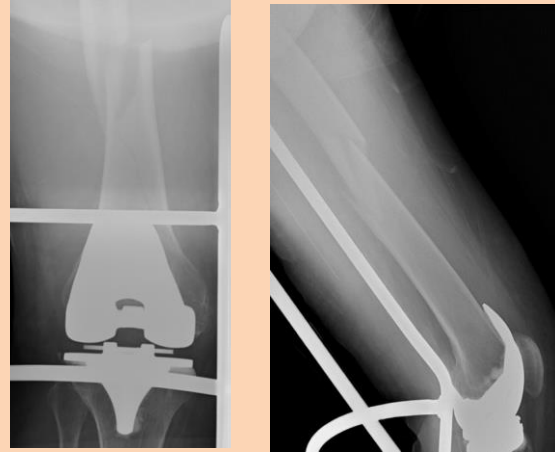


Decision was made...



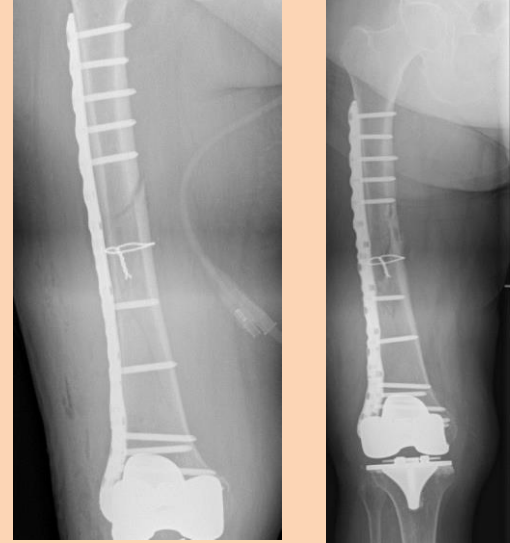
Knee EP arthroplasty LCCK

Periprosthetic fracture

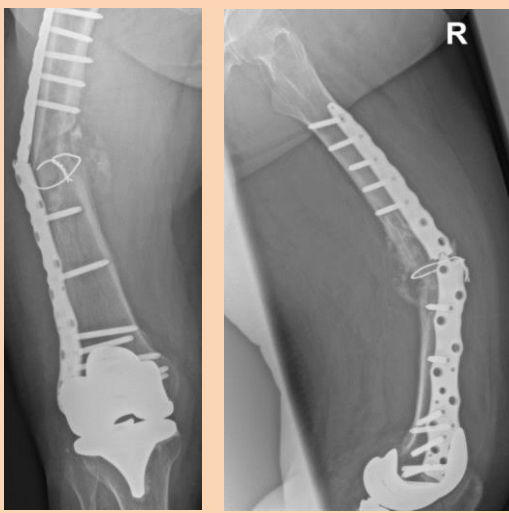


F3 R3 I1*

Periprosthetic fracture fixation
ZimmerBiomet NCB plate osteosynthesis 2022-09-19, follow up 2023-01-19



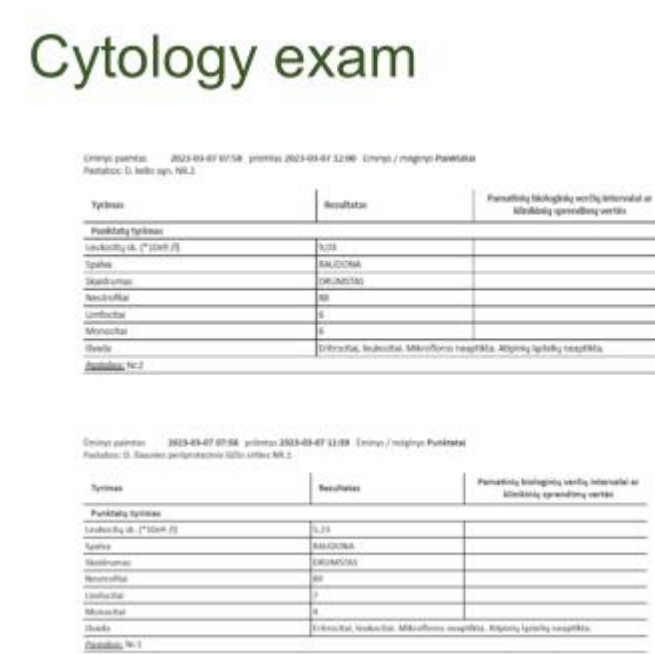
Periprosthetic fracture nonunion (breaked hardware 2023-03)



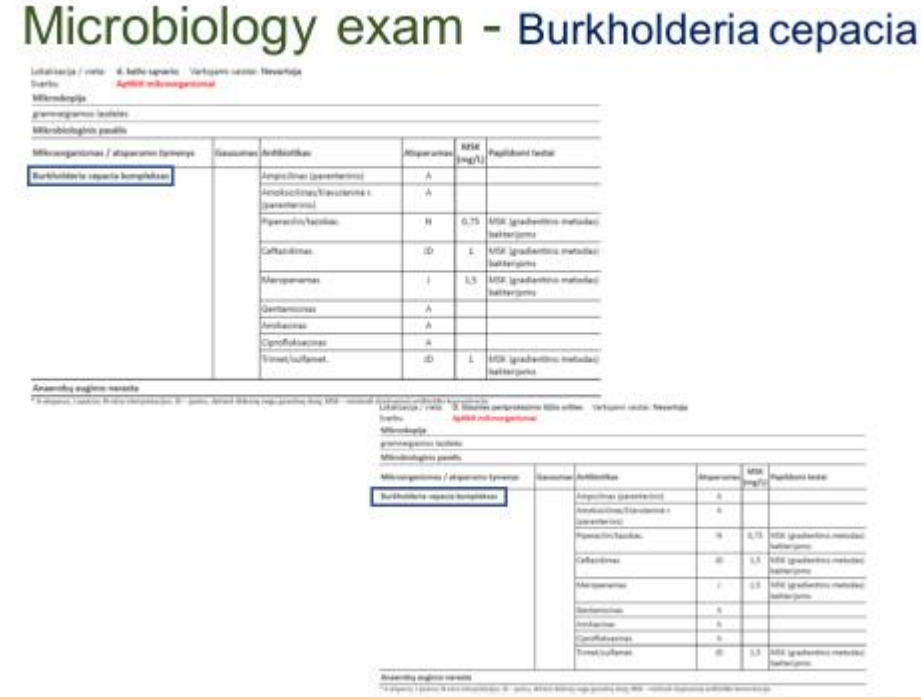
CRP 24 mg/L

2 infection sites in 1 leg–
PJI & FRI infected non-union of periprosthetic fracture

Cytology exam



Microbiology exam – Burkholderia cepacia

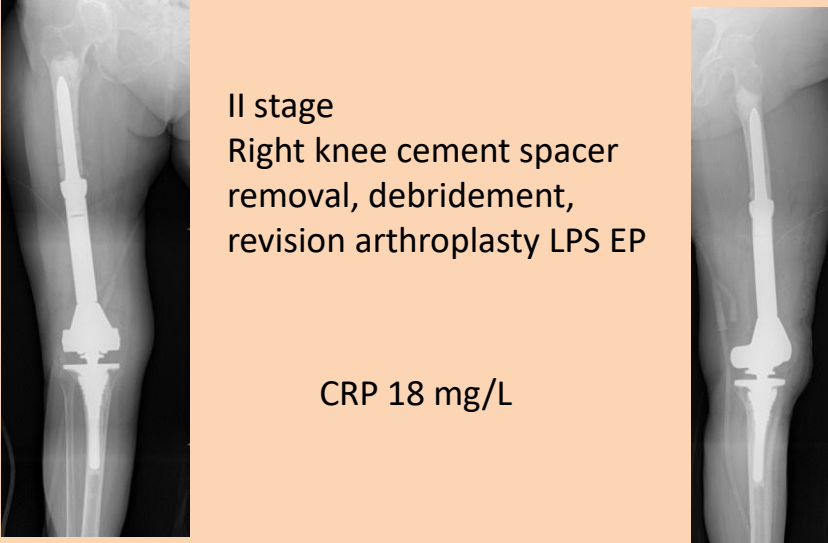


AB-therapy: 2 weeks meronem i/v, later per os sulfamethoxazol/trimetoprim 800/160mg TID

2 stage FRI and PJI treatment



I stage 2023-03-15, cement spacer & ALBC cement coated IMN nail with meropenem



II stage
Right knee cement spacer removal, debridement, revision arthroplasty LPS EP

CRP 18 mg/L

Anamnestical data

2018 m. osteosynthesis of the prox. right tibia
2019-04 hardware removal due to FRI infection
2019-11 r. knee EP arthroplasty.

2020-06-27–07-13 Right tibial skin incision due to phlegmona, cellulitis. Dgn.: abscessus reg. membri inf. dex. Erysipelas membri inf. dex. T2DM. Streptococcus C gr., suscept. penicilin and erithromicin, antibioticotherapy Penicilin 2 mln. TID

2020-07-09 d. change to Amoxiclav 1,2 g BID. Right knee pain subsided, infection signs alleviated.

2020-08-10 subfebrile fever all the month. 2020-08-12 started cefuroxim.

2020-08-14 d. Enterobacter cloacae, suscept. gentamicin, cefotaxim, piperac./tazobakt., cefuroxim, ampicil./sulbactam, amp./clavul. ac. AB therapy change to gentamycin 240 mg, once daily. Infection symptoms disappeared. WBAT, 1 ramantas, vellau 2 ramental.

Draining sinus 2020-09

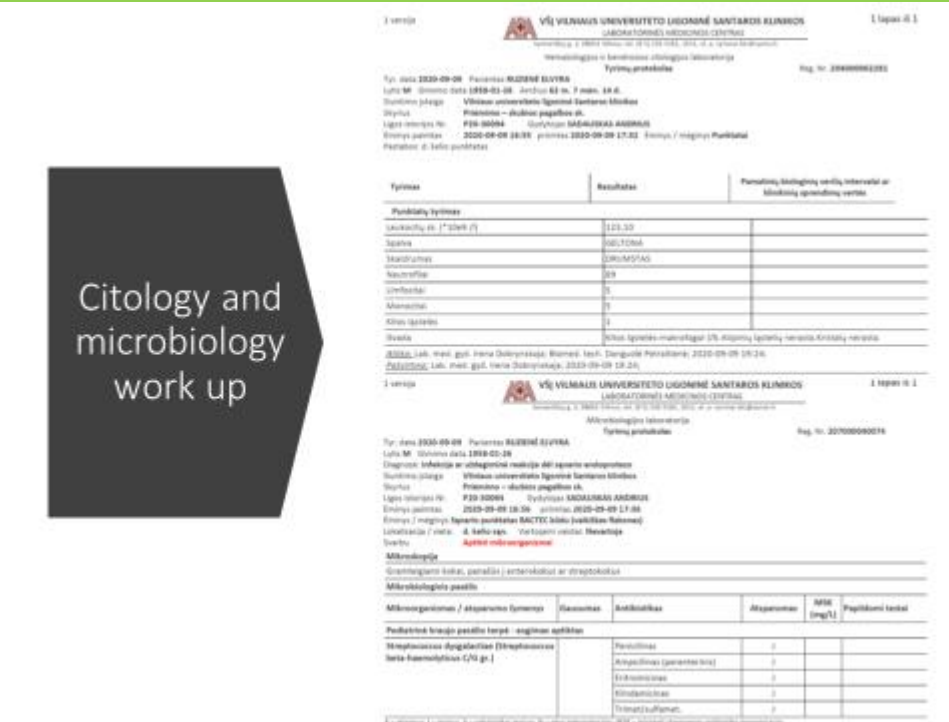


FRI infection and later developed PJI infection

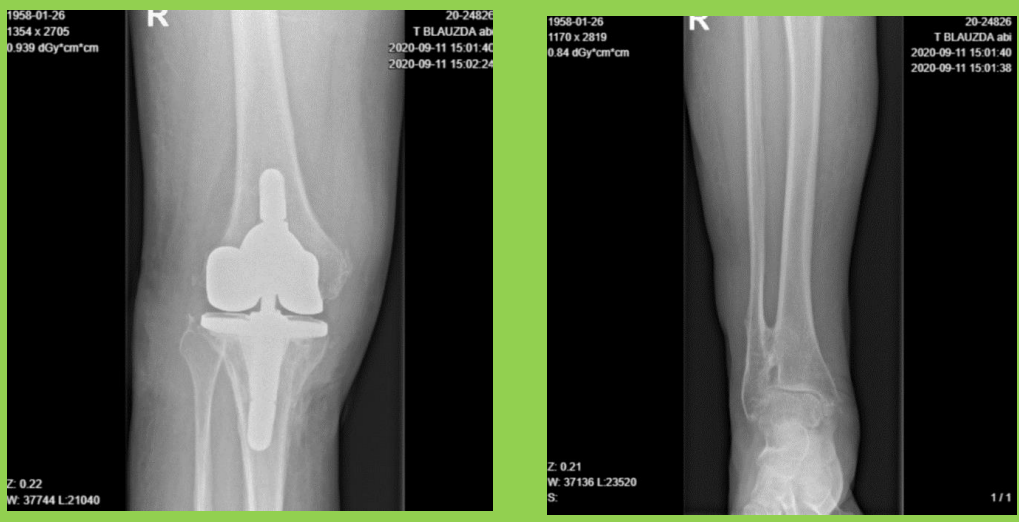
Right knee aspirate



Citology and microbiology work up



Knee X ray evaluation



Prie-operative antibiotic treatment (2020 Sept 9th – Sept 23rd)

Ampicilin 2g TID -> ampicilin 3g QID



Operative treatment (I stage)

Target description	Target description
Target description	Target description

Intra-operative photos (2020 Sept 23rd)



Postoperative follow up visits

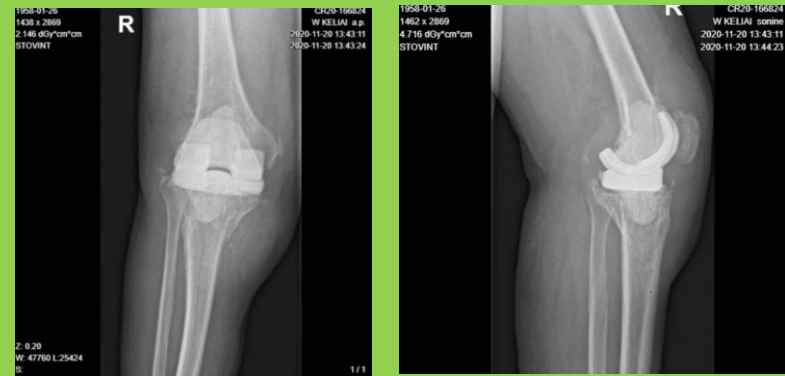
2020 Oct 5th



2020 Nov 20th

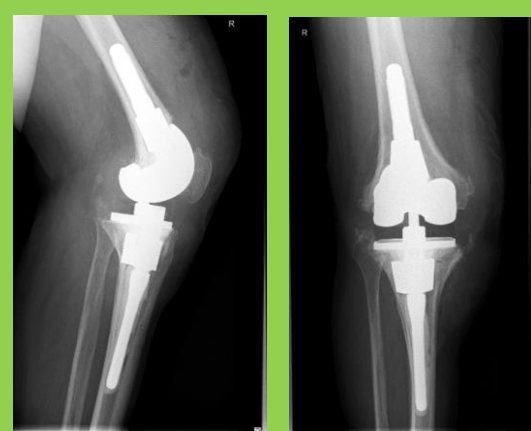


Knee X ray (VancogenX ABLC cement spacer)



2020 Nov 20th

Follow up knee X ray (2021 Oct 13th)

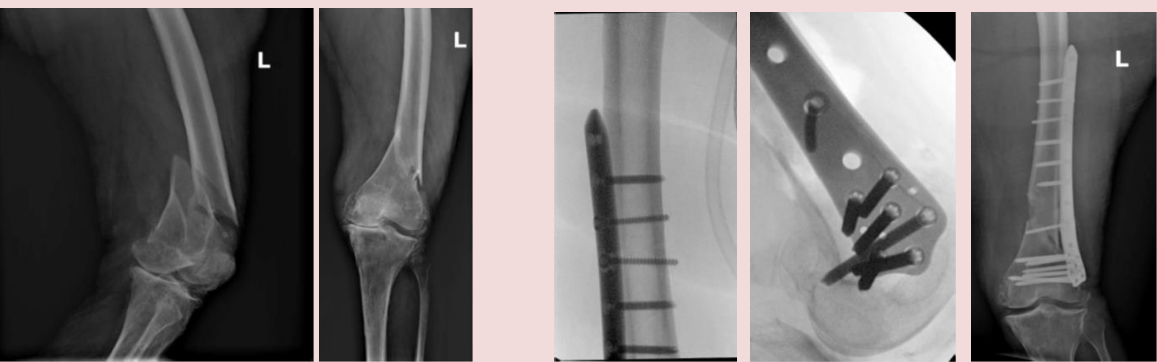


Microbiology results

AB long term supression:
amoxicilin 1 g TID for 1 year
Fluconazol 400mg OD 12 weeks

FRI infection patient who refused radical salvage operation and was treated with AB suppression w/o surgical debridement

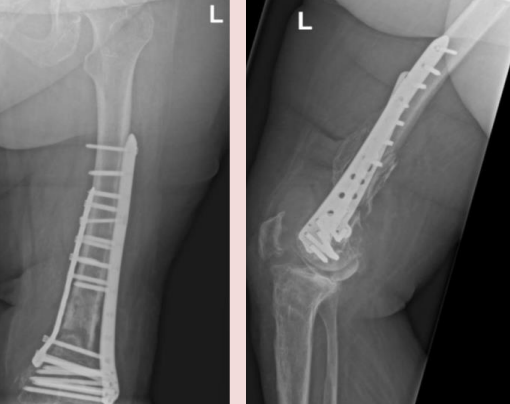
Patient was treated in cardiac surgery unit due to infective endocarditis



Fall during hospital stay in cardiac surgery unit after infectious pericarditis surgery/ fenestration (2023 March 10th)

Distal femoral 1st osteo-synthesis 1 month after the trauma (skeletal traction was applied due to ongoing cardiac infection treatment)

FRI treatment with AB suppression w/o surgical debridement



AB suppression (bisepol trimetoprim/ sulfamethoxazol 800/160mg) from August 2023 till August 2025

CRP level below 20 mg/L achieved after 1 year after start of AB suppression (Sept 2024)

During follow-up visits patient several times refused radical salvage operation

Healed fracture without hardware removal April 2026.

Sinus tract dissappeared July 2024

By the end 2025 was ambulating with crutches within the house

F2 R3 I5*

Infection after open fracture insufficient treatment

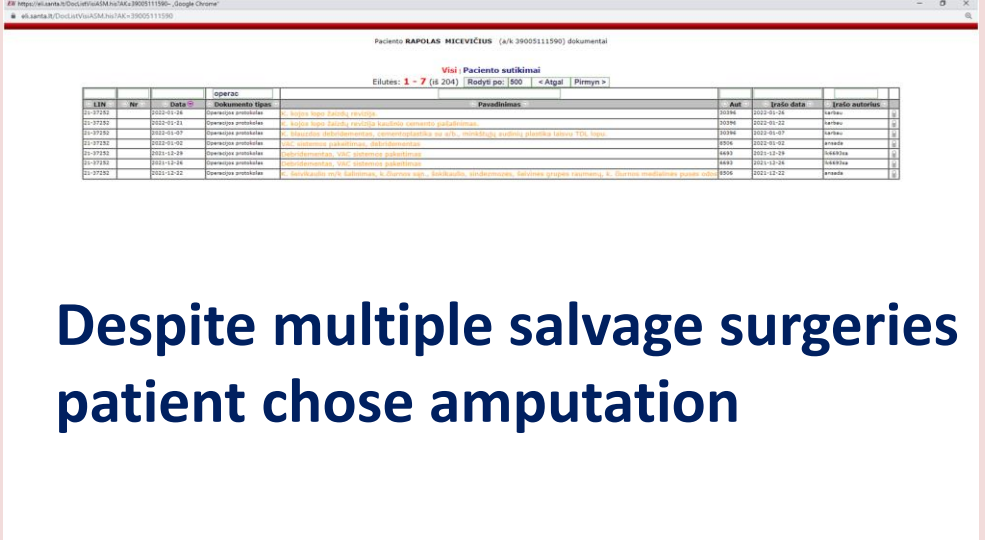
Infection after open malleolar fracture



Ex-fix osteosynthesis and MSC flap



Despite multiple salvage surgeries patient chose amputation



F3 R1 I4*

Infection can be (un)controlled ...

Management should be performed
According latest FRI & PJI treatment guidelines
Endorsed by International Societies

Red colour should be avoided

*The FRI classification – A new classification of fracture-related infections
Alt, Volker; McNally, Martin; Wouthuyzen-Bakker, Marjan; Metsemakers, Willem Jan; Marais, Leonard; Zalavras, Charalampos; Morgenstern, Mario
Published in: Injury DOI: 10.1016/j.injury.2024.111831

