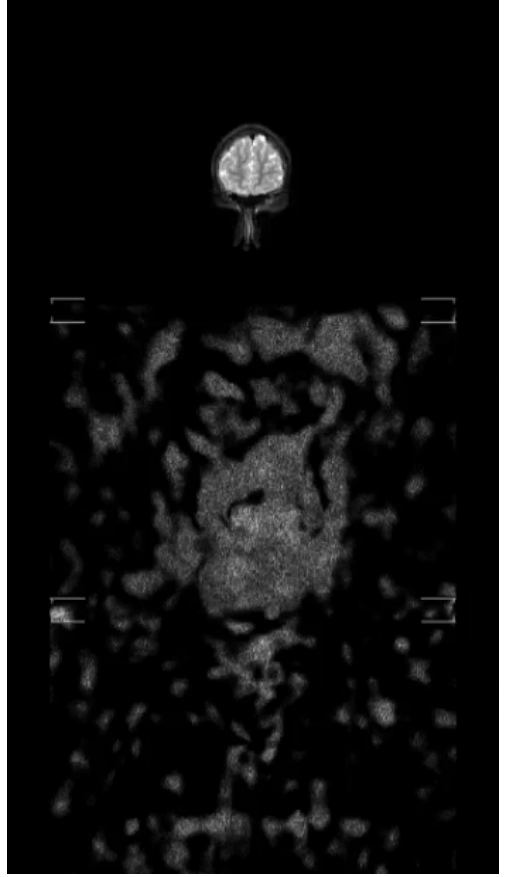
# Whole-body MRI in healthy, asymptomatic children and adolescents.

## Appearances of bone marrow that may mimic pathology.



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Whole body magnetic resonance imaging in healthy children and adolescents
Bone marrow appearances of the appendicular skeleton

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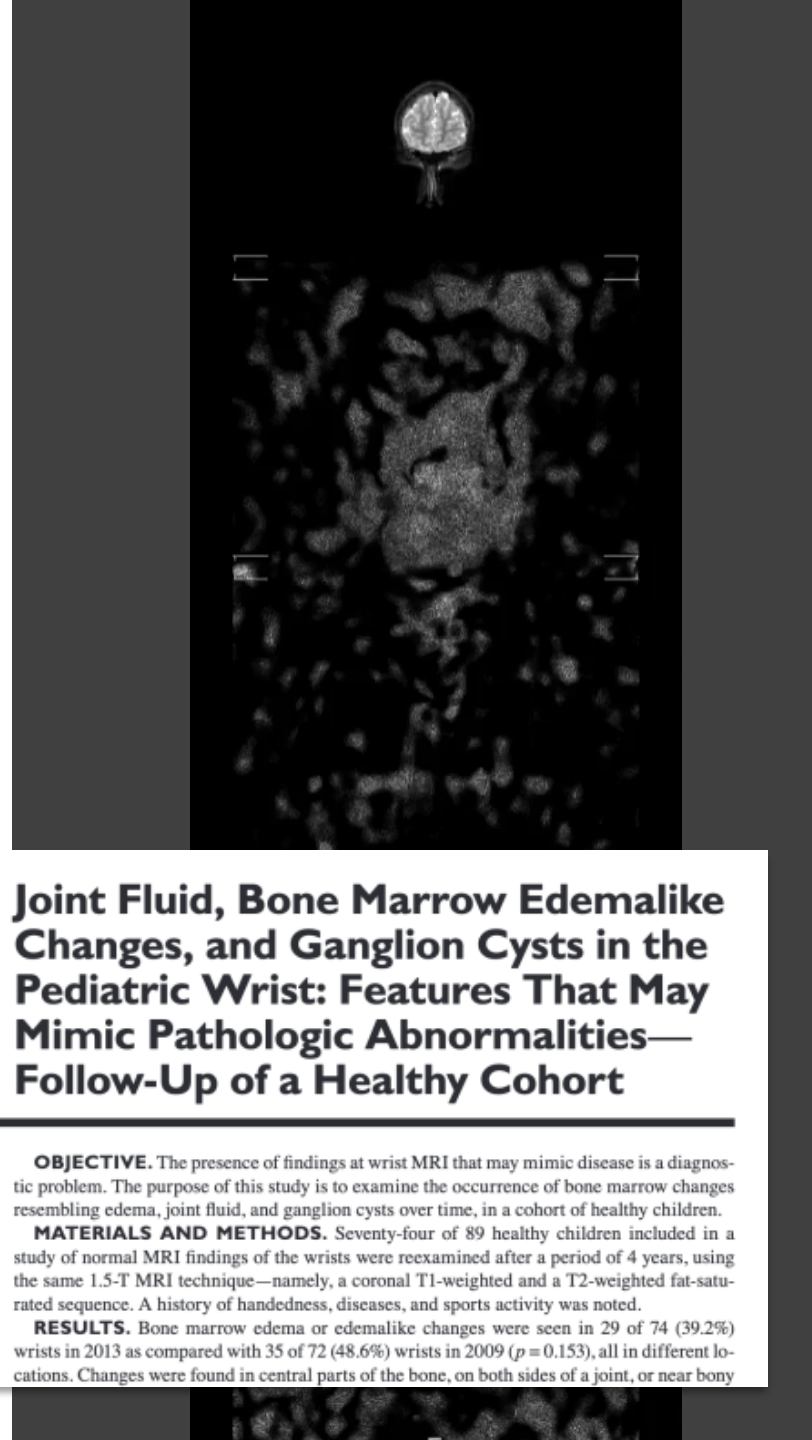
# Introduction

# Whole-body MRI

- Relatively new assessment tool and increasingly being used in the evaluation of multifocal skeletal pathology
- No standardized protocol, but fat-suppressed T2W series are most frequently used
- Depiction and characterization of diseases at an early and pre-clinical stage
- Using definitions and interpretations derived from research in adults may lead to misdiagnosis when used in children



**Joint Fluid, Bone Marrow Edemalike Changes, and Ganglion Cysts in the Pediatric Wrist: Features That May Mimic Pathologic Abnormalities—Follow-Up of a Healthy Cohort**

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Karen Rosendahl[4,5]

**OBJECTIVE.** The presence of findings at wrist MRI that may mimic disease is a diagnostic problem. The purpose of this study is to examine the occurrence of bone marrow changes resembling edema, joint fluid, and ganglion cysts over time, in a cohort of healthy children.

**MATERIALS AND METHODS.** Seventy-four of 89 healthy children included in a study of normal MRI findings of the wrists were reexamined after a period of 4 years, using the same 1.5-T MRI technique—namely, a coronal T1-weighted and a T2-weighted fat-saturated sequence. A history of handedness, diseases, and sports activity was noted.

**RESULTS.** Bone marrow edema or edemalike changes were seen in 29 of 74 (39.2%) wrists in 2013 as compared with 35 of 72 (48.6%) wrists in 2009 ($p = 0.153$), all in different locations. Changes were found in central parts of the bone, on both sides of a joint, or near bony

# Objective

To describe the appearance of bone marrow that may mimic pathology on whole-body MRI in healthy, asymptomatic volunteers aged 5-19 years.

# Materials and methods

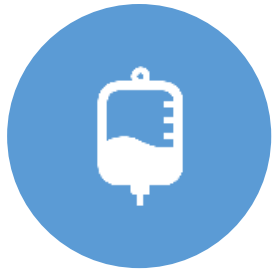

Healthy children 5-19 years
No chronic disease, no recent trauma nor illness

# WB-MRI protocol

1.5T: COR T1 TSE, T2 DIXON AND DWI (WITH RECONSTRUCTIONS AND ADC)

SCAN TIME APPR. 30-45 MINUTES

MUSIC, AUDIO BOOK, VIDEO



NO SEDATION

T1 and T2 acquired vox.size: 0.9 x 0.9 x 3.5
Cor DW ss-epi 3 x 3 x 3.5
b50 and b1000


Dräger
HUSK FILTER
Fabius MRI

Pediatric Radiology
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ORIGINAL ARTICLE

# Whole-body MRI in children aged 6–18 years. Reliability of identifying and grading high signal intensity changes within bone marrow

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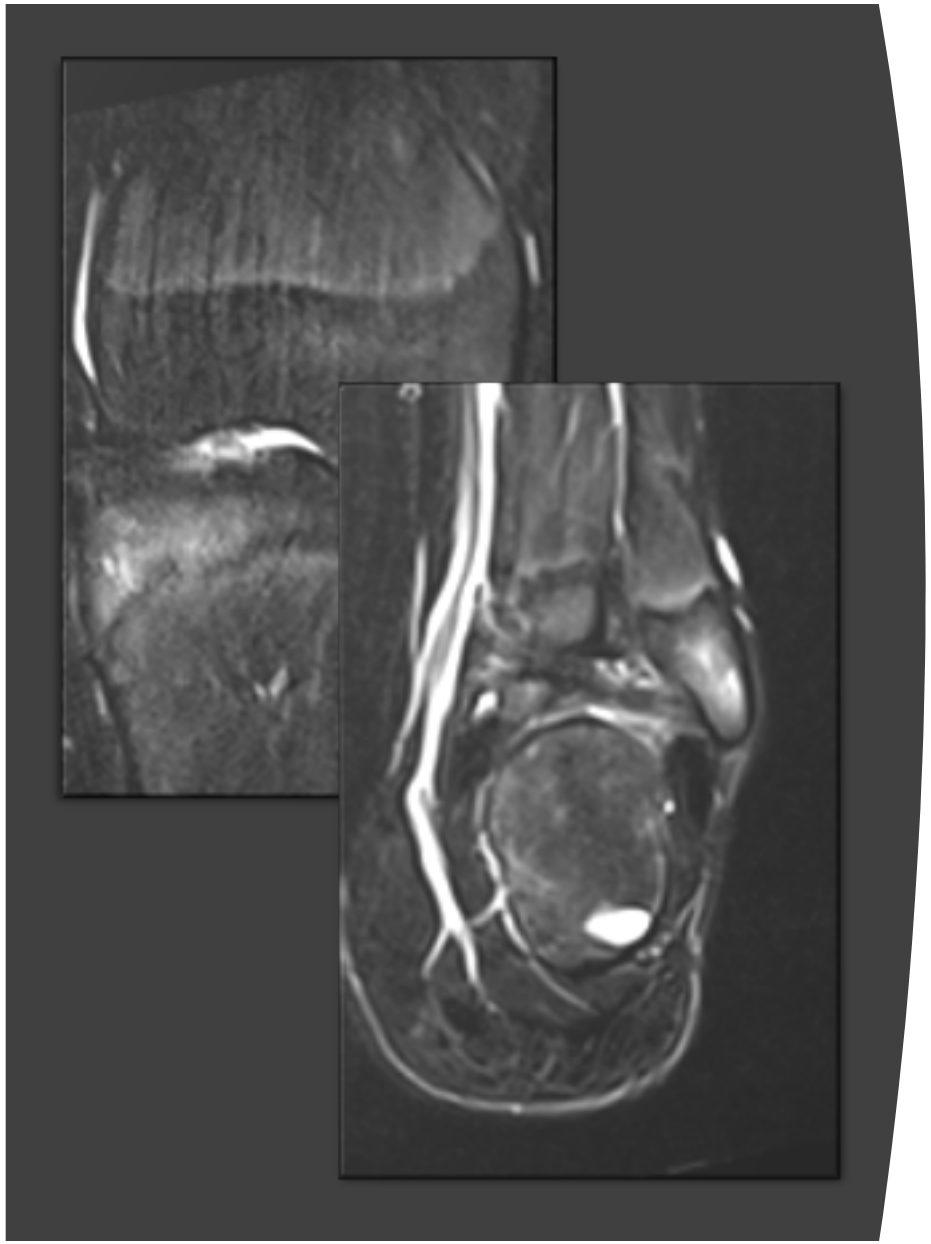
- Child specific scoring system:
  - Signal intensity (0-2)
  - Signal extension (0-4)
  - Shape (roundish, linear, both, punctuated)
  - Contour (diffuse, sharp, both)
- Signal intensity and extension showed moderate to good inter- and intraobserver reliability

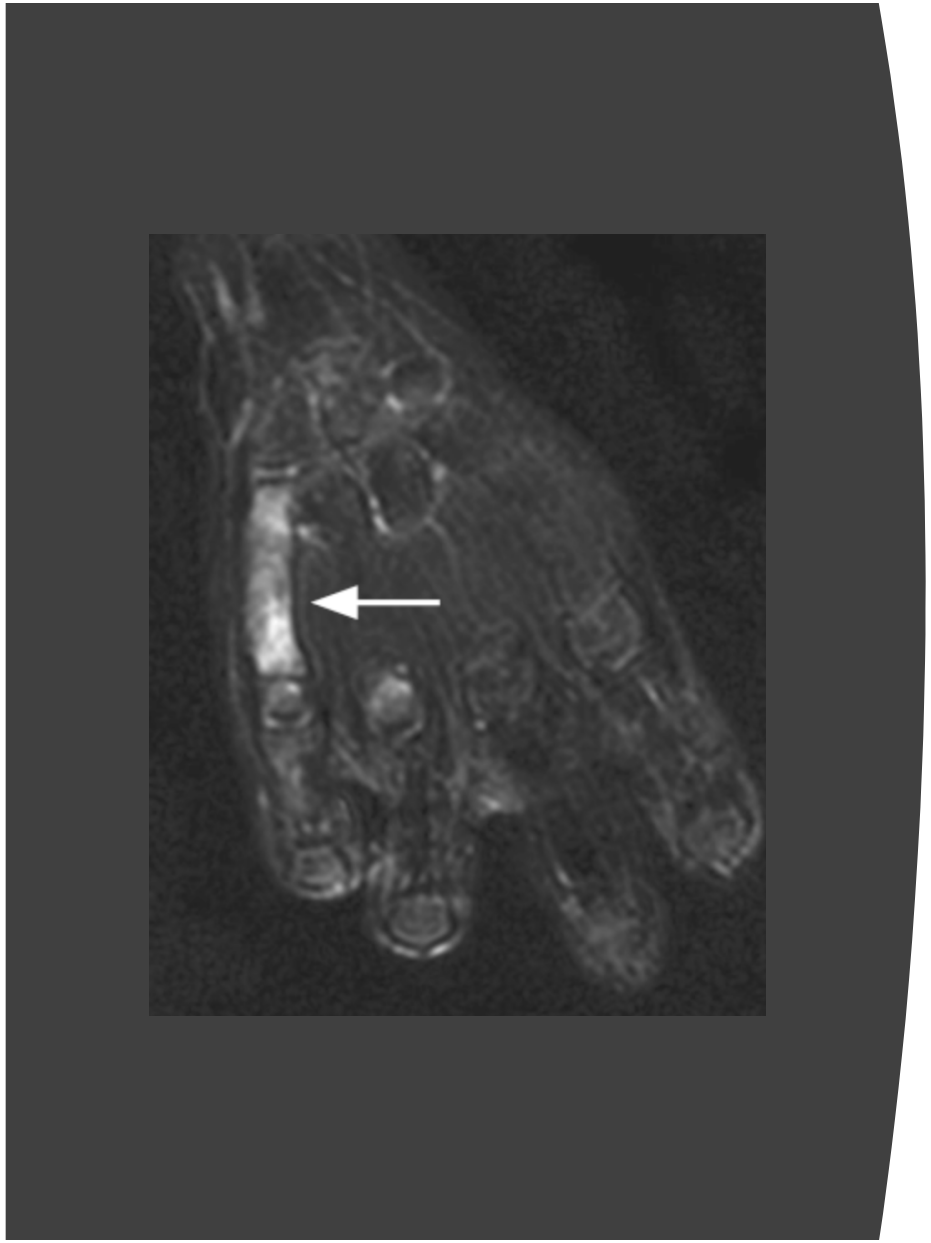


# Water-only Dixon T2W images

High signal intensity areas

Major and minor findings

- “Major findings” are more likely to cause concern in a clinical setting

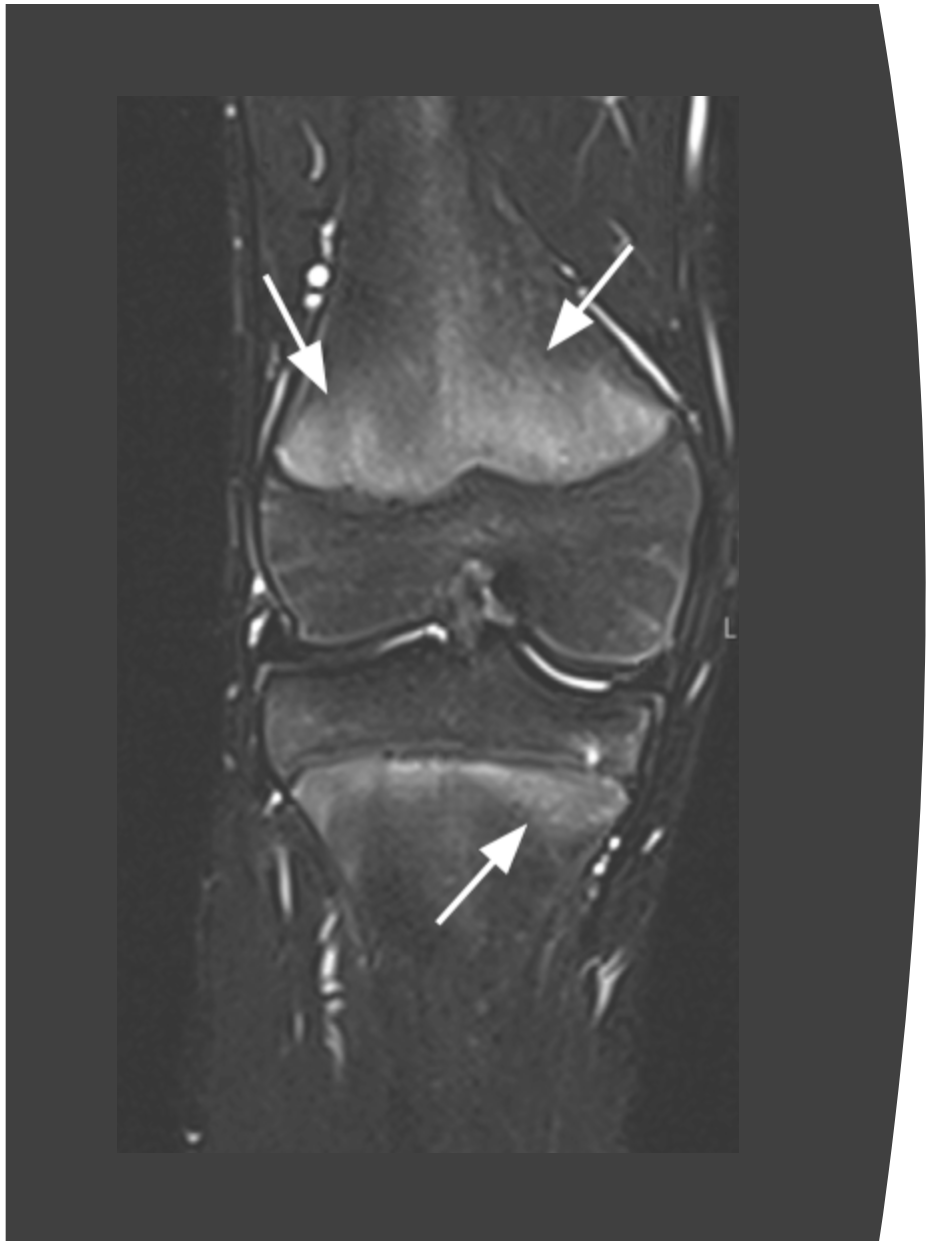


# Major findings

Signal intensity 1 and extension 3-4

OR

Signal intensity 2 and extension 2-4

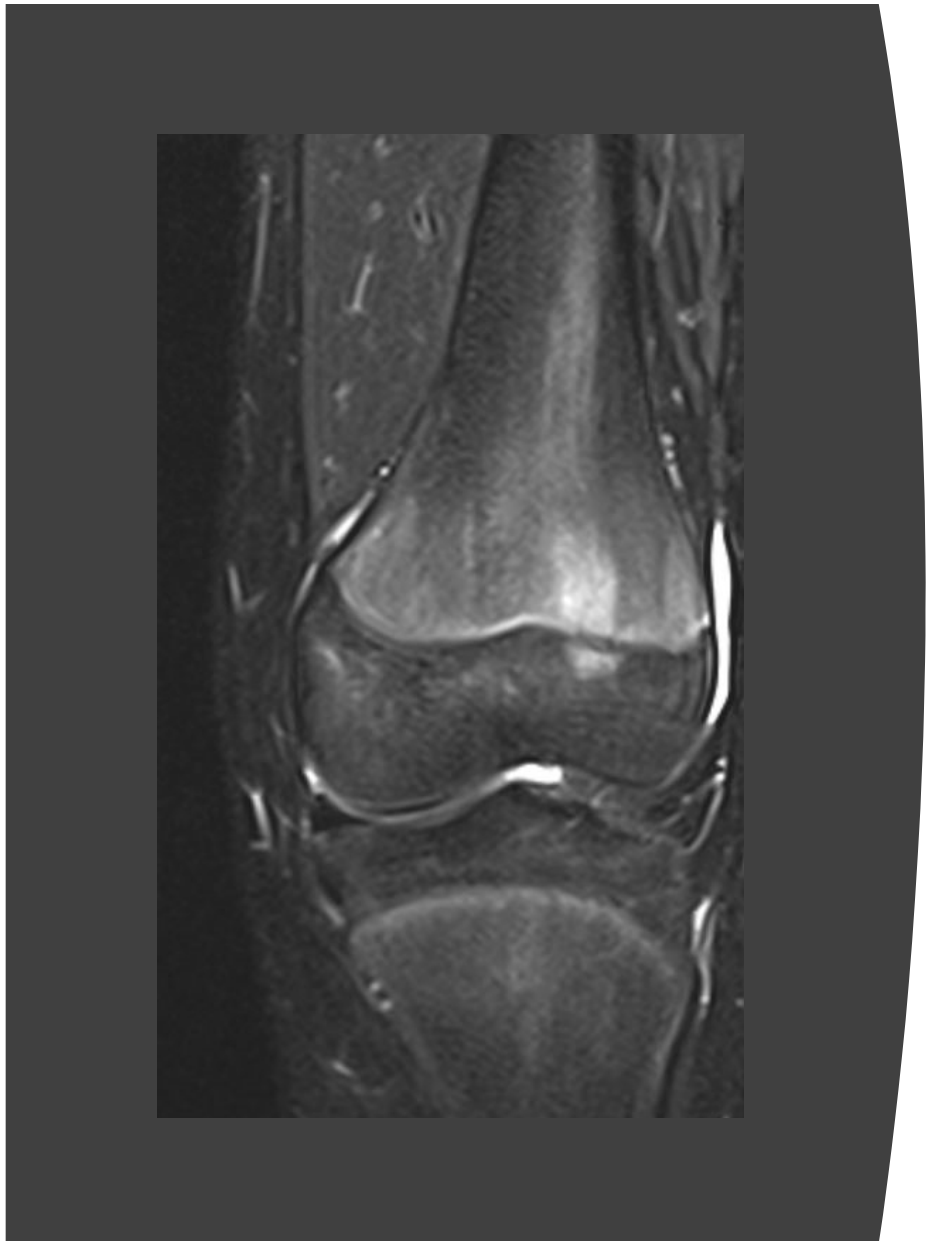


# Minor findings

Signal intensity 1 and extension < 3

OR

Signal intensity 2 and extension < 2



# Focal periphyseal edema (FOPE)

Focal high signal areas in the long bones, centered at the physis and extending into both the adjacent metaphysis and epiphysis

# Results

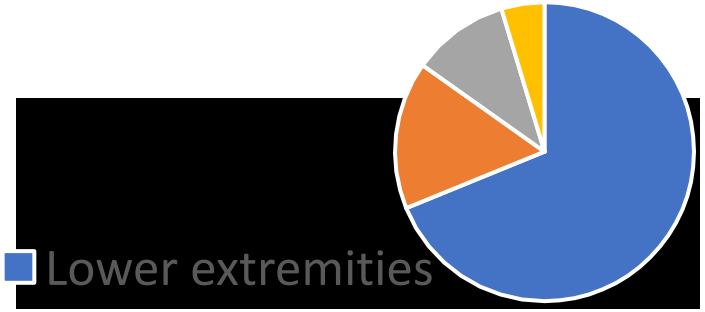
- 196 children (mean age 12 years)
- 51,5% female
- Representative sample when compared to the age-adjusted general healthy population
- 1383 focal T2W bone marrow hyperintensities
  - 494 (35,7%) “major findings”

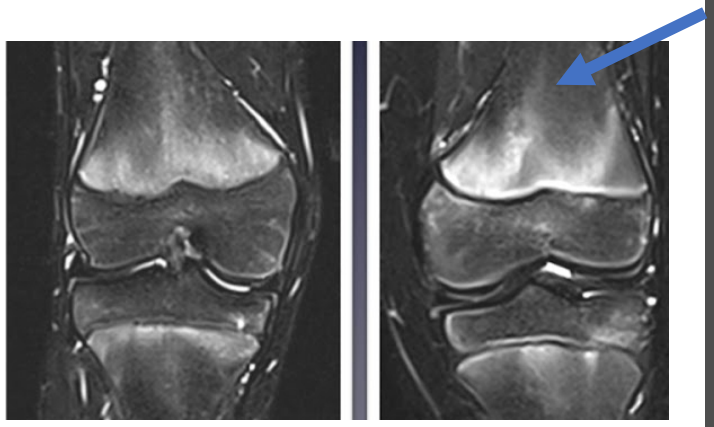
75 % had major findings

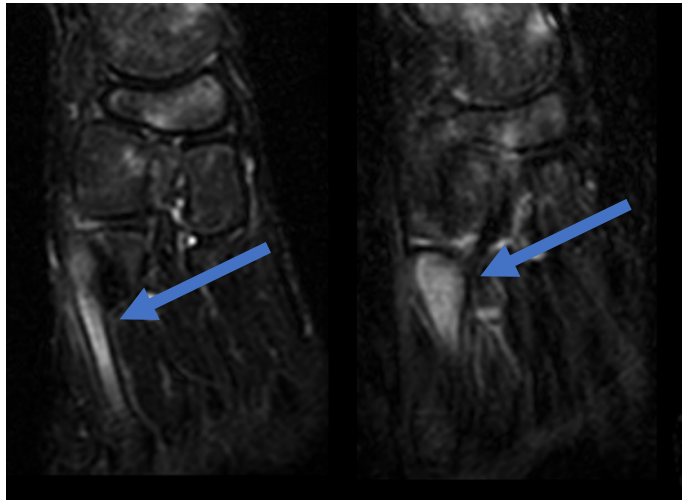
91.8 % had minor findings

40.3% had FOPE

# Location major findings

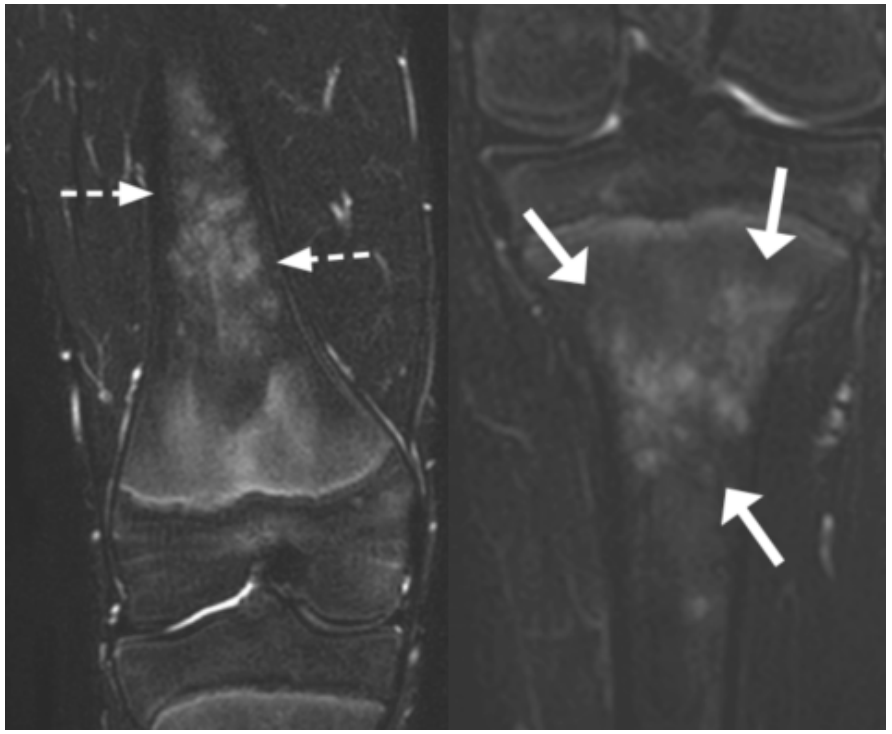


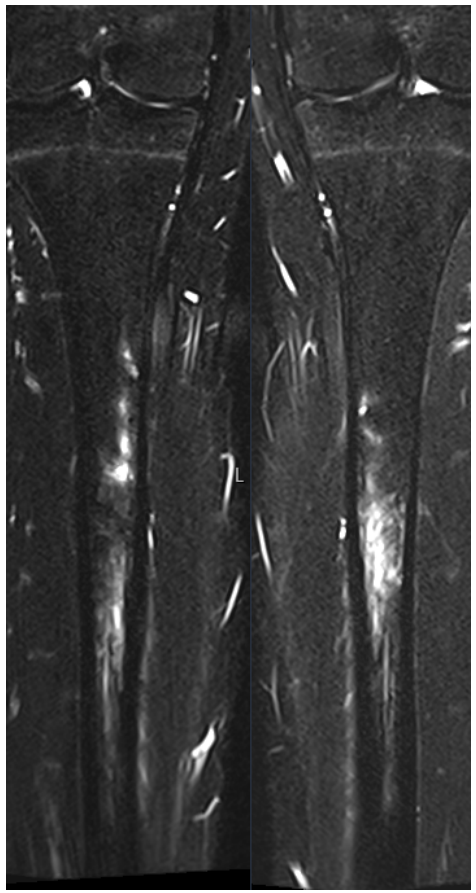


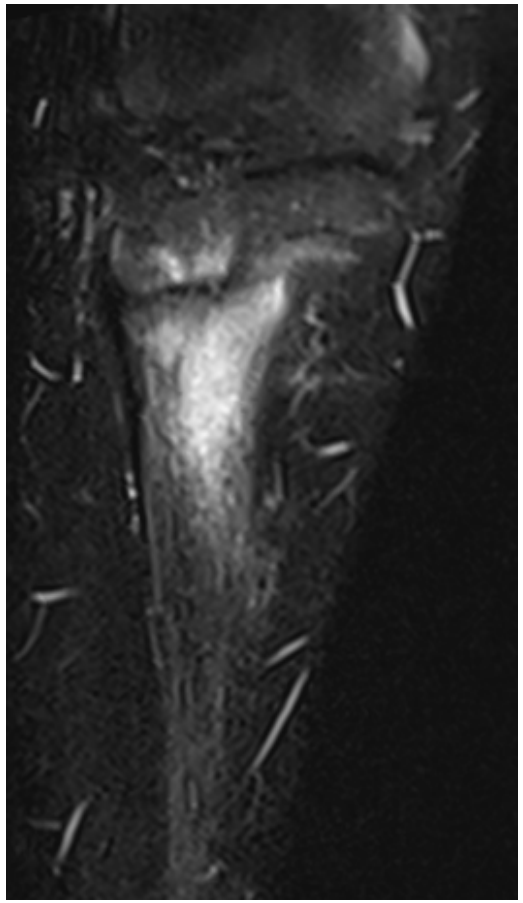
# Speckled appearance

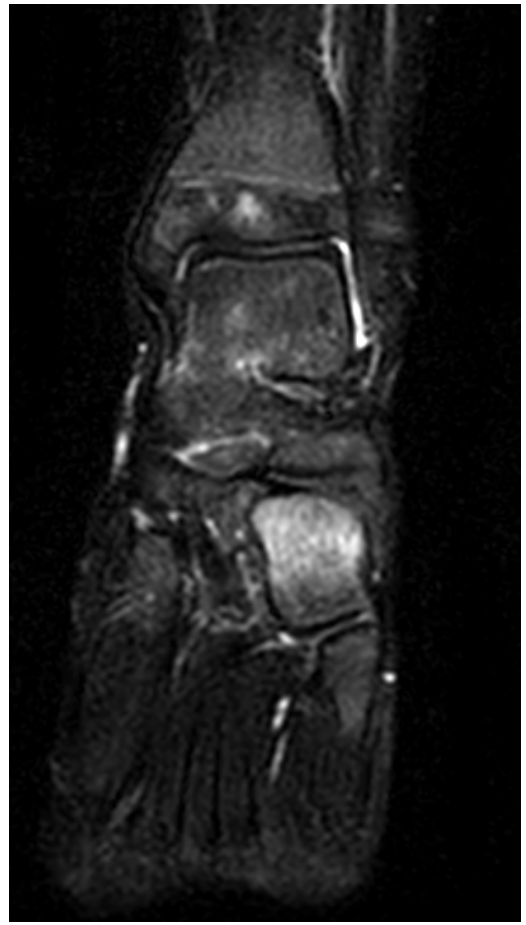
- 97 major findings (19.6%) had a speckled appearance (lower extremities)
    - Wherof 72 were symmetrically distributed in both extremities



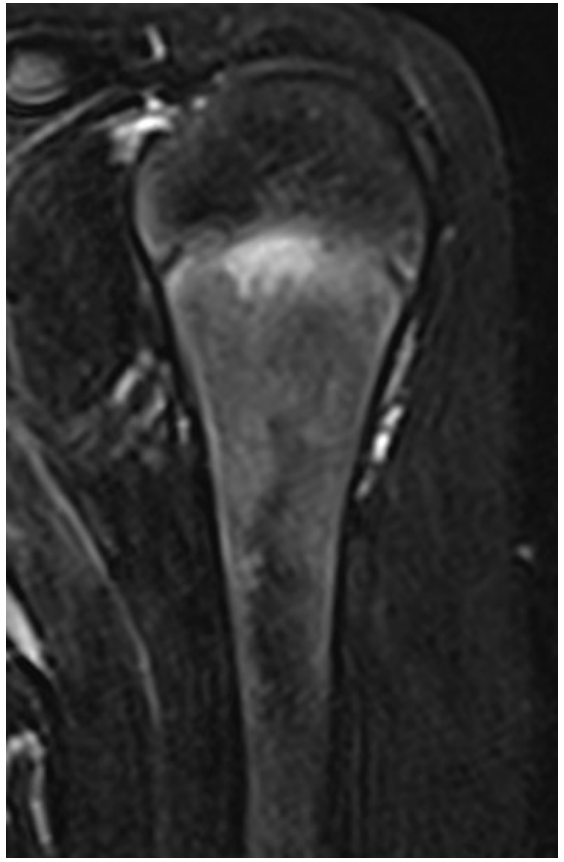
# Major findings in the lower extremities

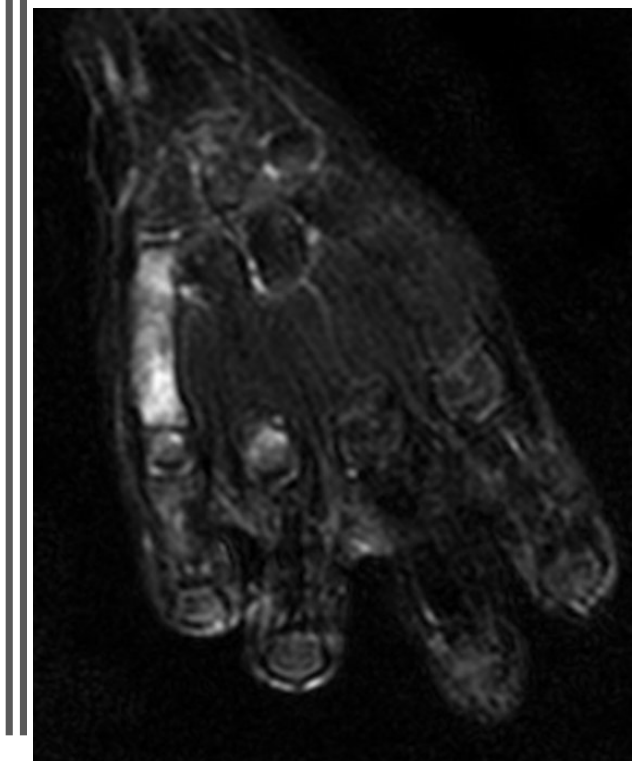


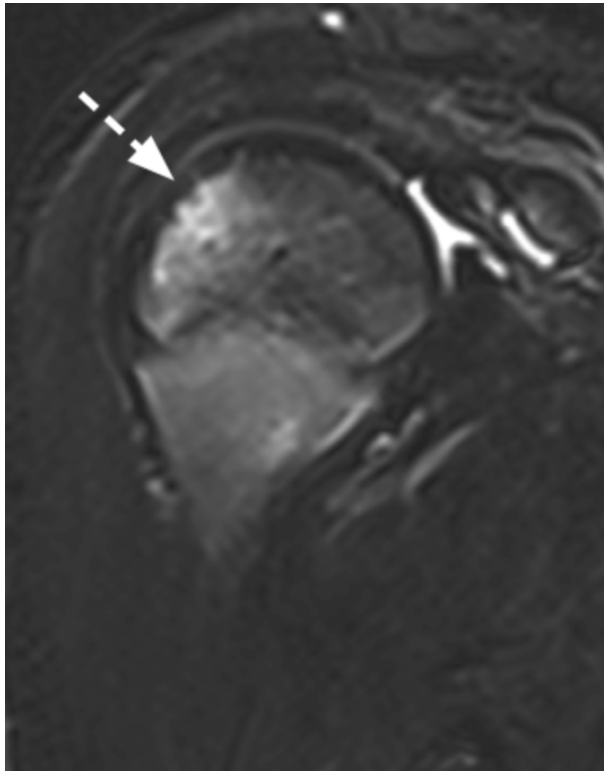


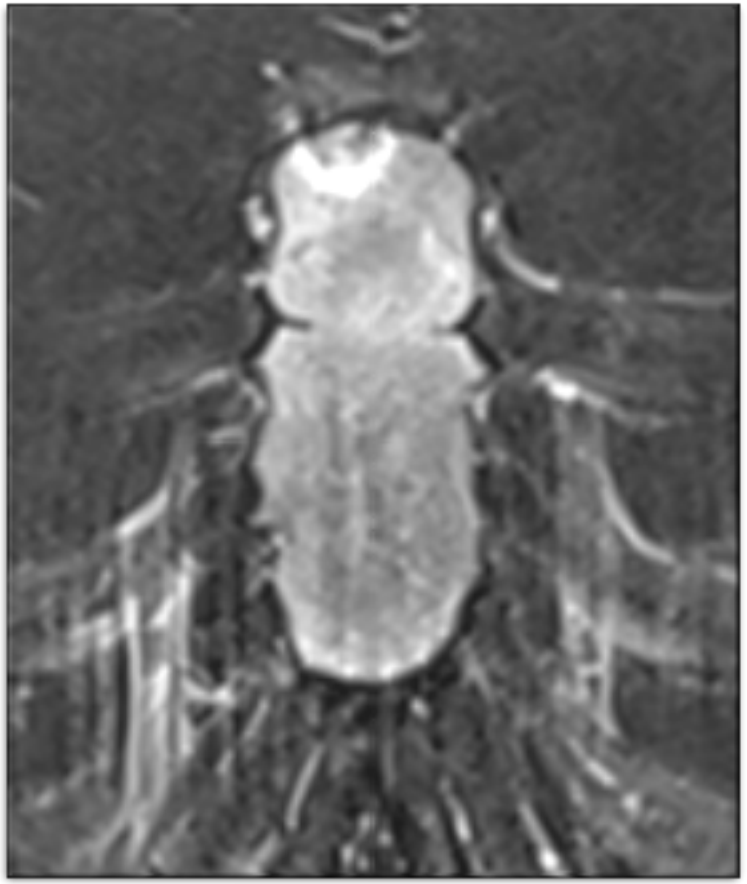


# Major findings in the upper extremities









# Major findings in the axial skeleton

# Major findings related to specific findings

N=26

Patella bipartite (N=2)

Desmoids (N=1)

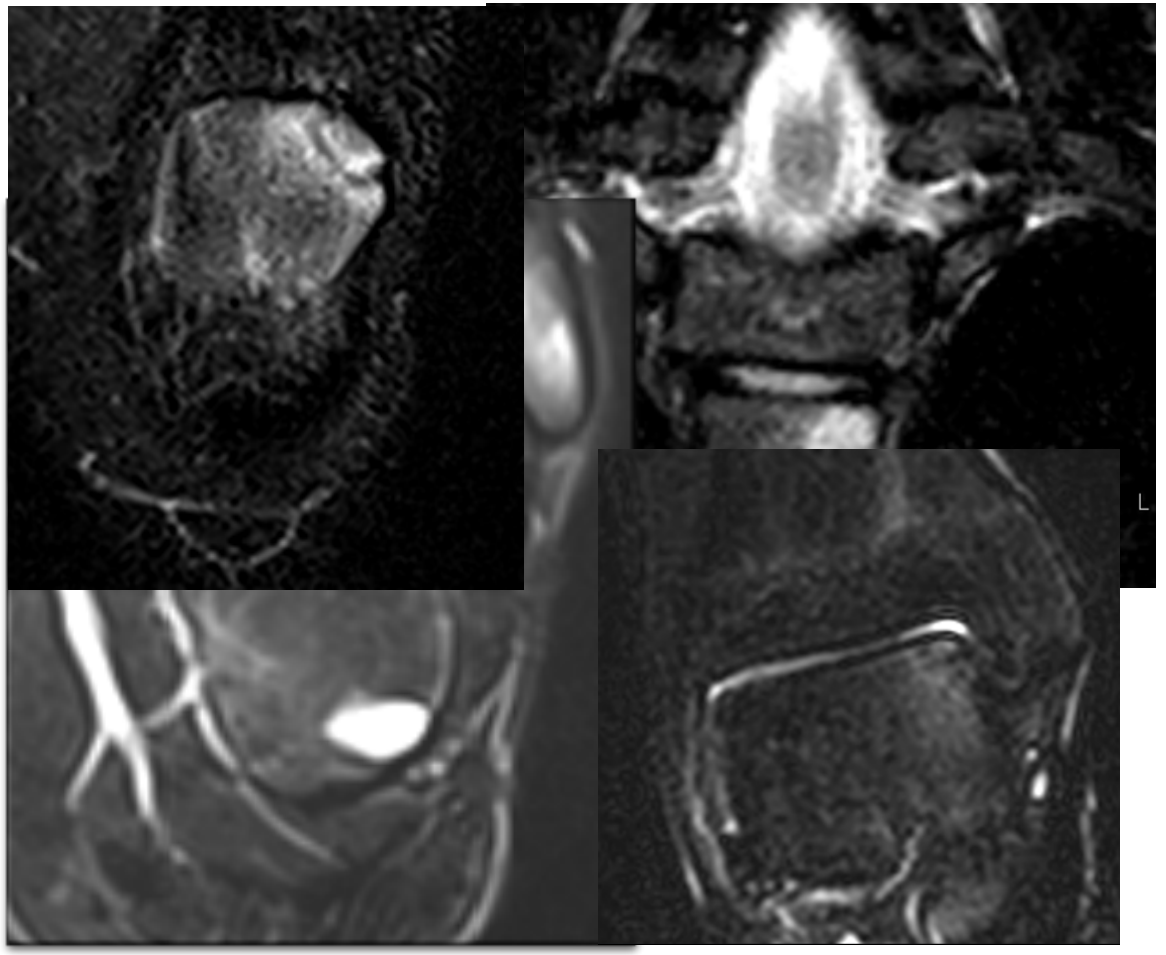
Osteochondral defects (N=3)

Fibroxanthoma (N=7)

Bone cysts (N=8)

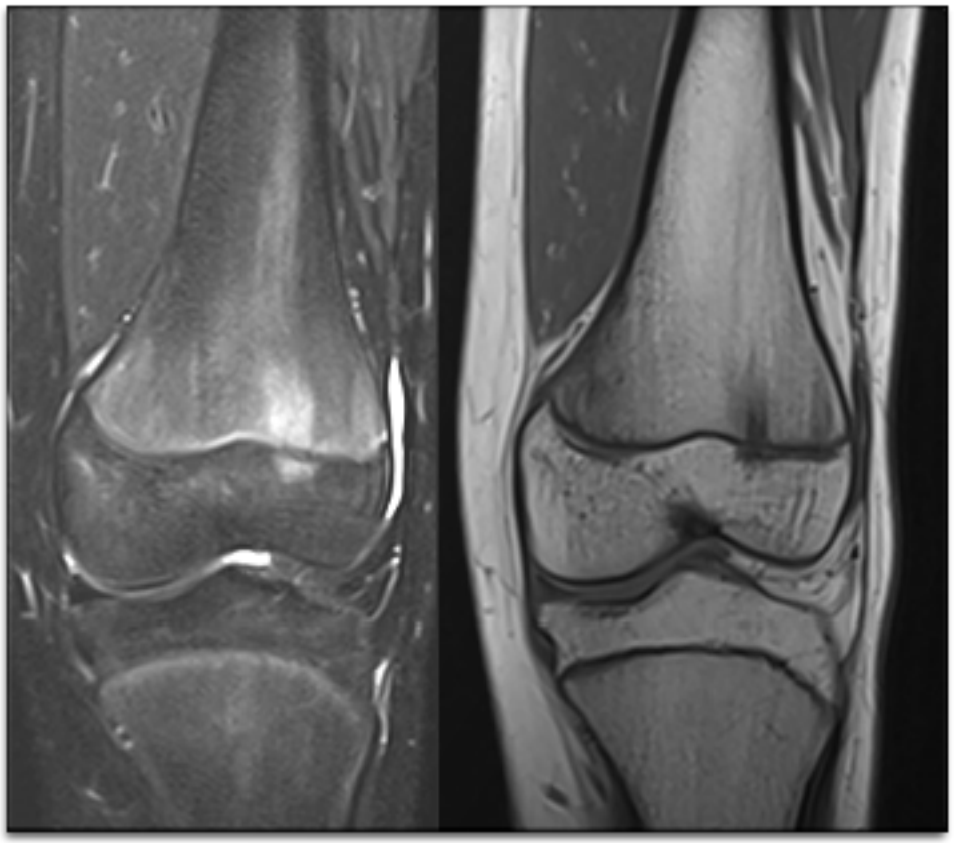
Enchondromas (N=2)

Hemangiomas (N=3)

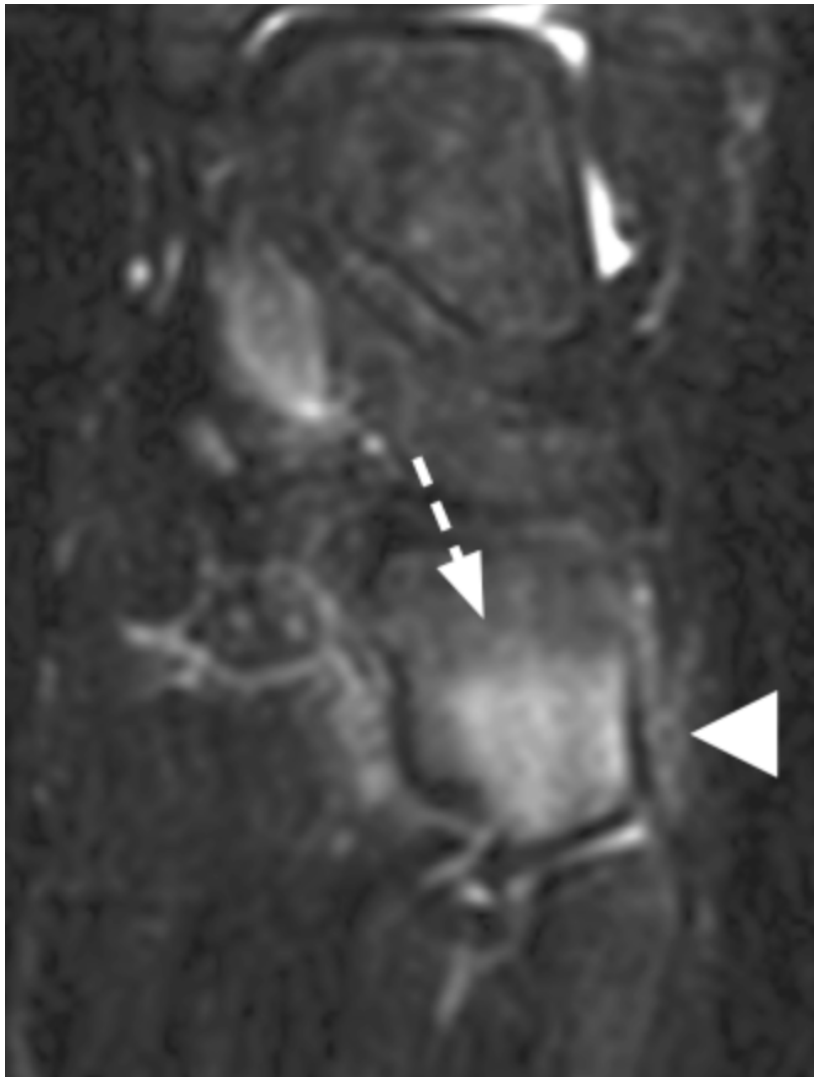


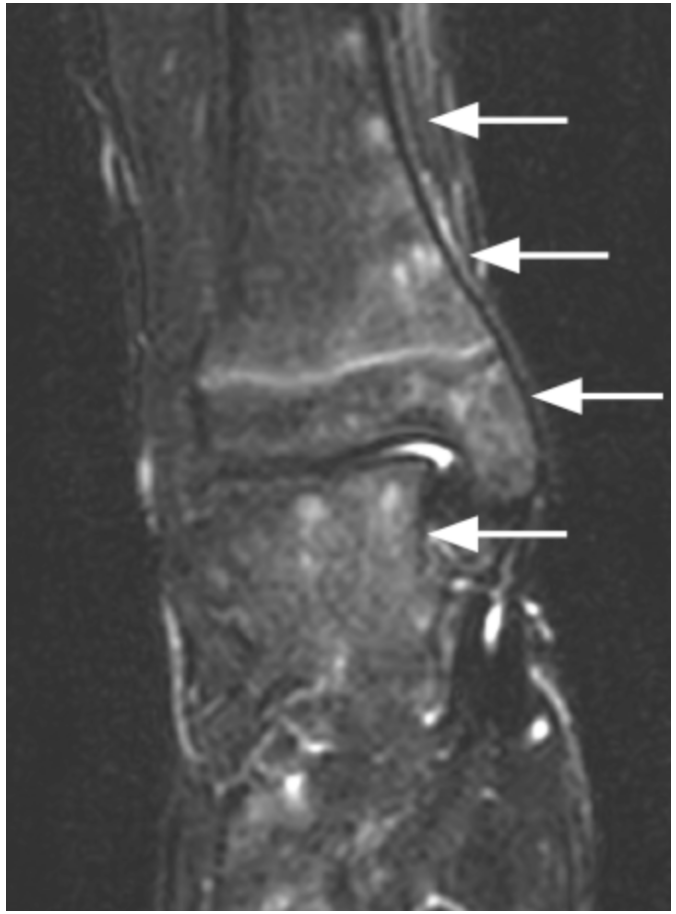
# Focal periphyseal edema (FOPE)

All age-groups



156 FOPEs in total





# High signal in the periosteum/soft tissues

Adjacent to five major lesions and two minor lesions in the extremities

# Conclusion


Areas of high signal are very common in children

3 out of 4 healthy, asymptomatic children had major findings

Appr. 40 % had at least one FOPE

Major findings were most frequently seen in the lower extremities