

Osteitis Fibrosa Cystica ("Brown Tumor") due to Primary Hyperparathyroidism:

A Rare Differential Diagnosis for Bone and Joint Pain in Adolescents

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Abstract

Bone and joint pain in children has a **broad differential** diagnosis, including inflammatory, mechanical, traumatic, neoplastic, and **metabolic** causes. Metabolic disorders like **primary hyperparathyroidism (PHPT)** or hypophosphatasia are often diagnosed late despite their clinical significance and straightforward diagnostics. **PHPT**, though rare in pediatric populations, is typically due to a **parathyroid adenoma**, which leads to excessive **parathyroid hormone (PTH)** secretion, resulting in increased osteoclast activity, bone resorption, and **skeletal demineralization**. Advanced cases may manifest as **osteitis fibrosa cystica** or **brown tumor**, a localized bone lesion characterized by osteoclast proliferation, fibrosis and hemosiderin deposition. These **lesions** may **mimic neoplastic** or cystic processes on imaging, posing a diagnostic challenge. An increased **awareness** of **metabolic bone diseases** is crucial for timely **diagnosis** and management in children with **unexplained bone and joint pain**.

Conclusion/Key Learnings

1. Consider **metabolic disorders** in differential diagnosis of atypical or **persistent joint and bone pain**.
2. Routine laboratory assessment of **calcium, phosphate, and alkaline phosphatase** levels provides a **simple, cost-effective** tool for **early detection** of metabolic bone diseases.
3. These metabolic bone markers should be part of **routine diagnostics** for early recognition and targeted management.
4. **Conventional X-Rays** are often **more informative** than MRI for **detecting skeletal changes** (e.g. demineralization, cortical alterations).
5. Always review the radiological images yourself! A **systematic second evaluation** of **external radiological imaging** by trained physicians, ideally a specialized pediatric radiologist is essential, as **subtle findings** may be overlooked or misinterpreted.

Diagnostic timeline

14 year old athletic and slim female with no chronic diseases

Since Early 2022: Diffuse knee pain, increased after strain and in the evening

1 Outpatient X-Ray of right Knee: „unremarkable“ (written report)

Outpatient Lab findings: ANA 1:1280

July 2023: First (rheumatologic) Consultation *

- No clinical signs of arthritis
- Lab findings: ANA 1:1280 (persistent, pattern: DFS70), otherwise unremarkable

2 September 2023: Outpatient MRI of right knee:

- “Bone marrow edema of both tibial and femoral epiphyses, consistent with a stress reaction, with no evidence of inflammatory or malignant changes” (written report)

October 2023: Painless swelling of back of the right hand over 4 weeks. Cracking sound and sudden pain in while doing pulls ups

Outpatient X-Ray of Hand: cystic lesion, no fracture. No further action taken by orthopedist (anamnestic report, no written report)

October 2023: Second Consultation at our center:

- Clinical findings: painless swelling of right hand, otherwise idem

November 2023: MRI of the right hand + Radiologic second evaluation
→ radiologic diagnosis brown tumor in hyperparathyroidism

December 2023: Third Consultation at our center

- Lab findings: Calcium (total) 3,58 mmol/l (2,09-2,54), Phosphate 0,78 mmol/l (0,95-1,75), Alk. Phosphatase 16,98 µkat/l (0,82-5,5), Parathormon 111 pmol/l (1,6-6,9), Beta-Crosslaps 2755

*early diagnosis possible

→ endocrinologic confirmation of diagnosis

December 2023: Thyroid sonography

- “Well-defined, oval-shaped, slightly inhomogeneous, hypoechoic, and perfused structure (2.5 x 1.6 x 1.8 cm), most likely corresponding to an enlarged parathyroid gland.”

December 2023: Hemiparathyroidectomy with an uncomplicated surgical and postoperative course

January 2024: Whole Exome Sequencing

- Variant of uncertain significance (VUS) c.195_197del, p.(Asn66del) in CDC73-Gene, associated with hyperparathyroidism

January 2024 - today: Regular follow ups

Normalization of bone metabolism parameters, substitution of Vit. D and Calcium, regredient bone pain, radiologic regression of brown tumor and osteopenia

● disease event ● outpatient diagnostics ● surgery at UKL

● consultation at Universitätsklinikum Leipzig (UKL) ● diagnostics at UKL

MRI / X-Ray of the right knee



Fig. 2

Fig. 1: X-Ray of the right knee with pronounced subperiosteal demineralization, resulting in cortical thinning. Additionally, distinct structural changes in the spongiosa suggesting osteopenia.

Fig. 2: MRI of the right knee in coronal plane (T1-weighting) with bone marrow edema of both tibial and femoral epiphyses, consistent with a stress reaction. Additionally, subtle T1 signal reduction and T2 signal increase in the metaphyses.



Fig. 1

Radiologic second evaluation

MRI / X-Ray of the right hand



Fig. 3

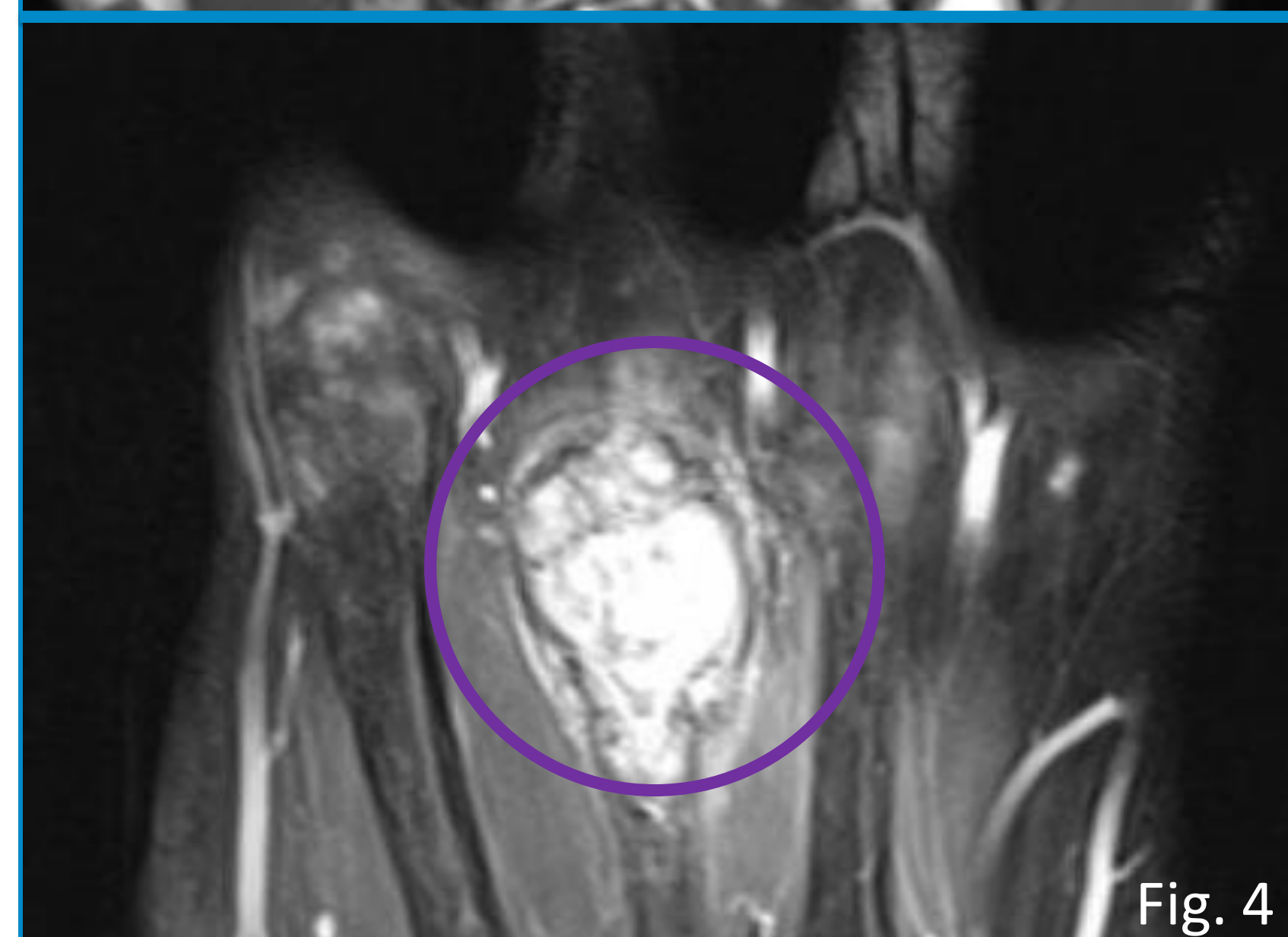


Fig. 4



Fig. 5

Fig. 3/4: MRI right Hand (at UKL in 10/2023) coronal plane, (T1/with contrast agent): „Lesion...with contrast agent-uptake is, in correlation with the X-ray images, highly suggestive of a brown tumor in hyperparathyroidism. Morphologically not distinguishable from a giant cell tumor.“

Fig. 5: X-Ray of the right Hand (external diagnostic in 10/2023). Shortened radiological report after second evaluation in December 2023: “Expansion of the dia-/metaphysis with central radiolucency and cortical thinning in the metacarpal bone III. Significant signs of osteopenia.”