

Hand-Röntgenbilder Befundung

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Rheumaworkshop USZ
2024

USZ Universitäts
Spital Zürich

ETH

Eidgenössische Technische Hochschule Zürich
Swiss Federal Institute of Technology Zürich



Universität
Zürich ^{UZH}

Disclosure

Advisory Board Aison Technologies AG

Imaging Basics



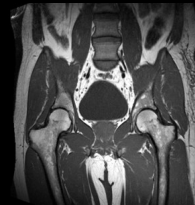
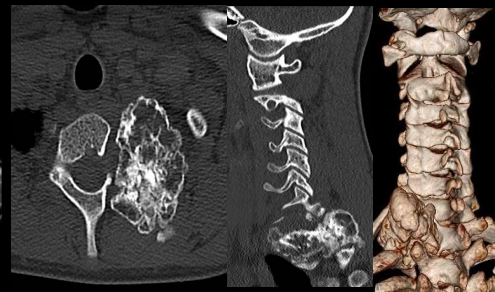
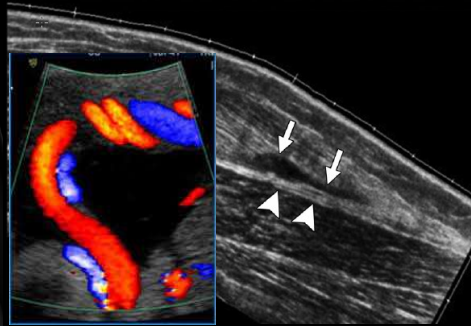
CX	US	CT	MRI
Fast Cheap High resolution	Fast Cheap	Fast Rather cheap Broad utility (3D)	Best soft tissue contrast
Planar Experience X-ray	User-dependent	soft-tissue contrast low X-ray	Slow Expensive Strong magnet



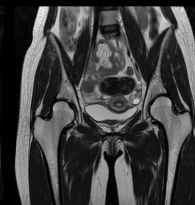
R



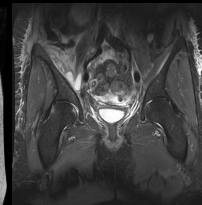
R



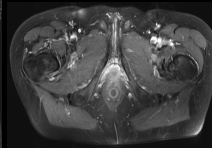
T1-weighted



T2-weighted



T2w fat-sat



T1w fat-sat pGd

Imaging Basics



„one plane is no plane“

Strahlenschutz

Merkblatt R-06-04
Diagnostische Referenzwerte (DRW) in der Projektionsradiologie

Röntgenaufnahme	Oberflächendosis am Patienteneintritt pro Einzelaufnahme [mGy]	Dosis-Flächen-Produkt [cGy x cm ²]
Thorax (pa)	0.15	15
Thorax (lateral)	0.75	60
Lendenwirbelsäule (ap oder pa)	7	235*
Lendenwirbelsäule (lateral)	10	415
Becken (ap)	3.5	250
Schädel (ap oder pa)	2.5	65
Schädel (lateral)	1.5	50

ap: antero-posterior; pa: postero-anterior

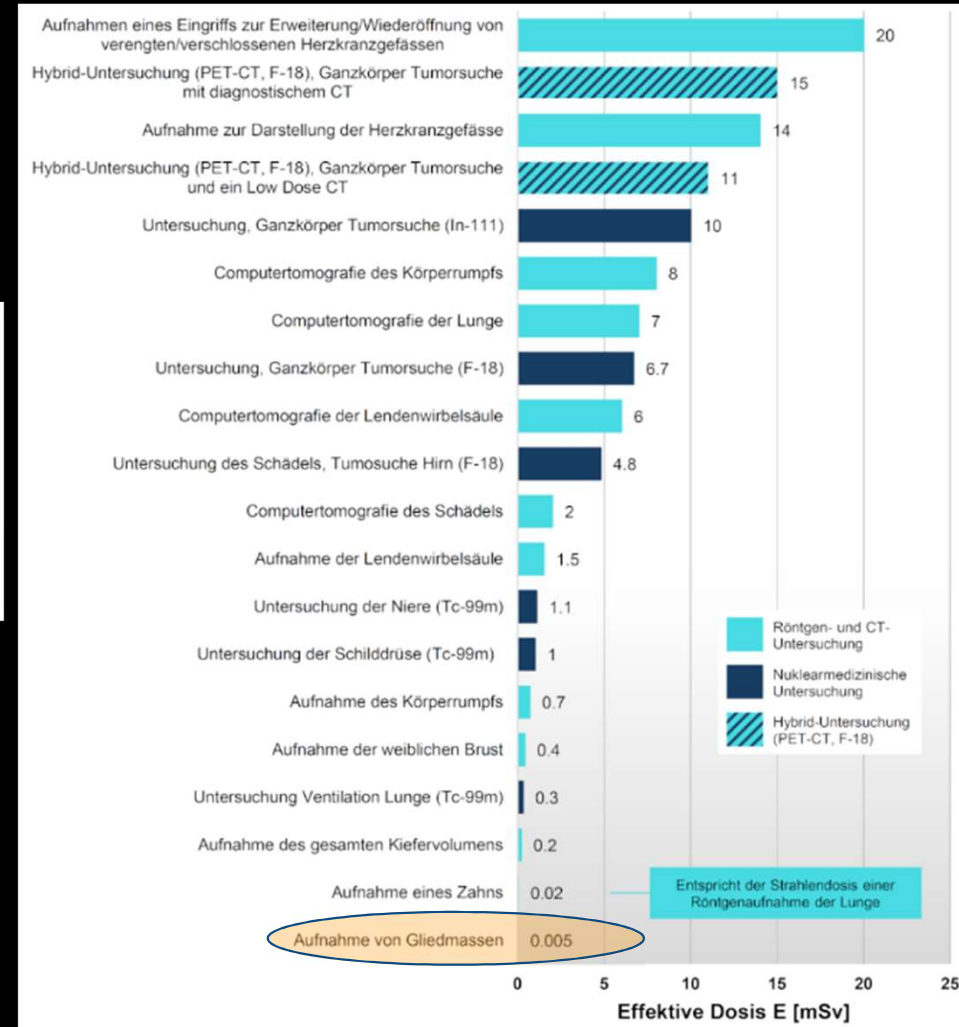
* Die DRW-Angabe für das Dosis-Flächenprodukt bezieht sich auf ein übliches Feld am Patienteneintritt von 30x15cm². Bei grösseren Strahlenfeldern (z.B. ausgeblendete Aufnahme mit Darstellung des Beckenkamms und der Hüftköpfe bei spezifischer, indizierter Fragestellung) resultieren entsprechend höhere Dosis-Flächenprodukte.

Strahlenschutz

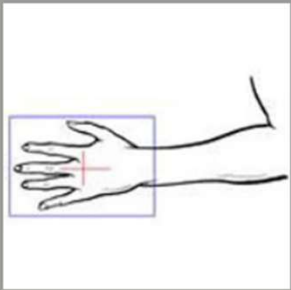
Untersuchung		Dosis [mSv]	entspricht x-mal der Strahlendosis einer Röntgenaufnahme der Lunge
R = Röntgenaufnahmen/-untersuchungen N = Nuklearmedizinische Untersuchungen			
Aufnahme von Gliedmassen	R	0.005	0.25

Interkontinentalflug*

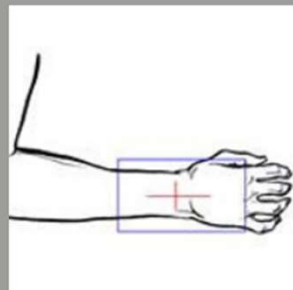
0.15 mSv



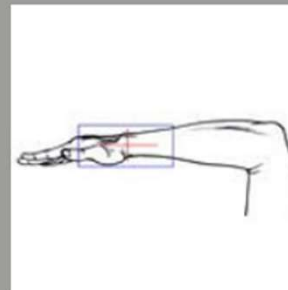
Einstelltechnik



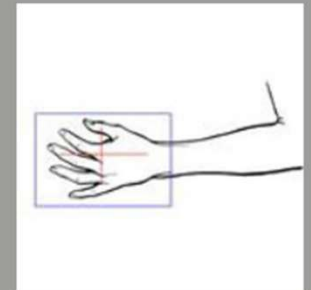
Hand dv (34)



Handgelenk dv (35)



Handgelenk lateral (36)

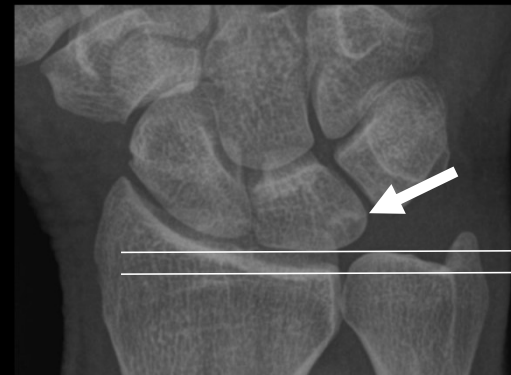


Hand schräg (38)

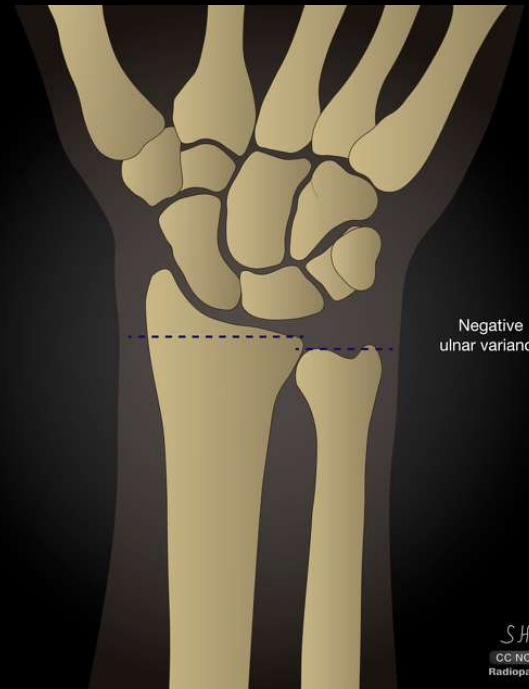
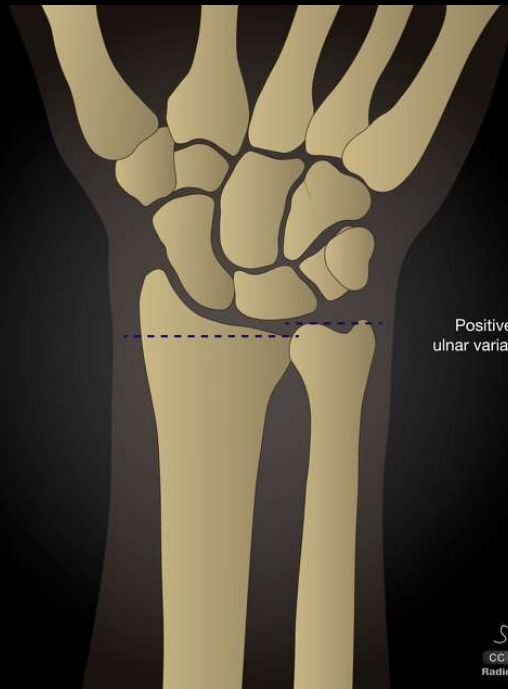
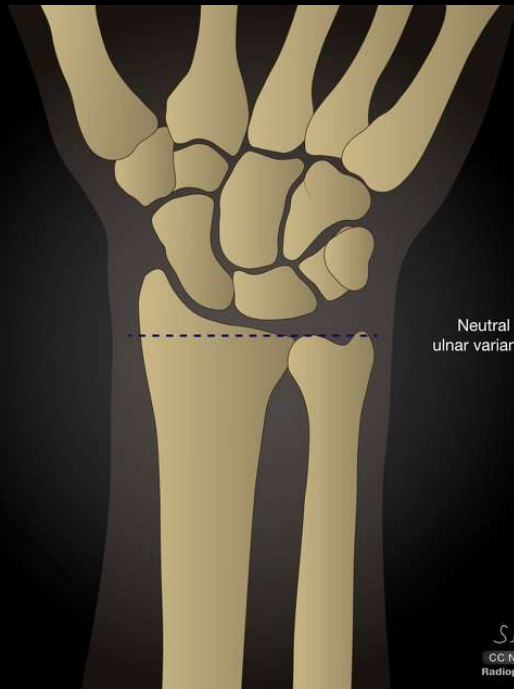
Inhalt

- **Ulnar sided wrist pain**
- **Degenerative vs. inflammatory changes**
- **Crystal arthropathies**
- **Cases and Mimickers**

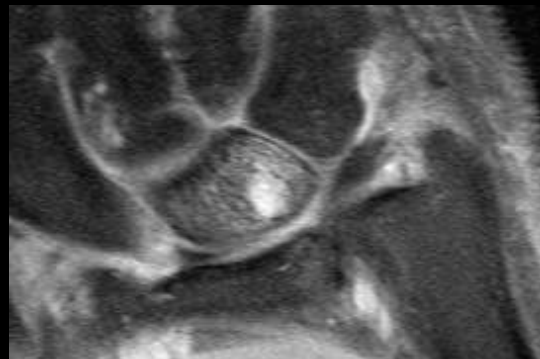
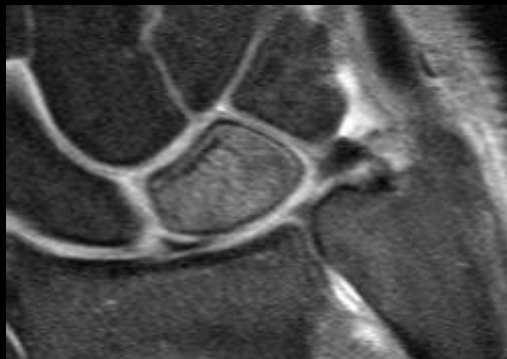
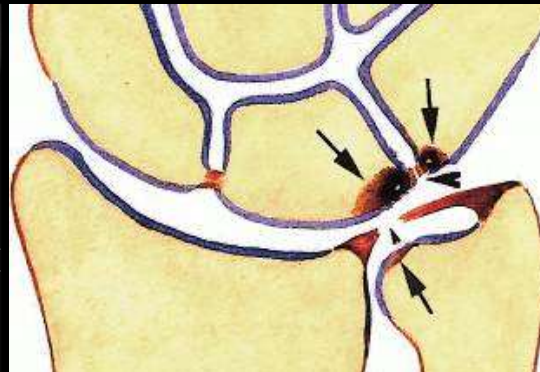
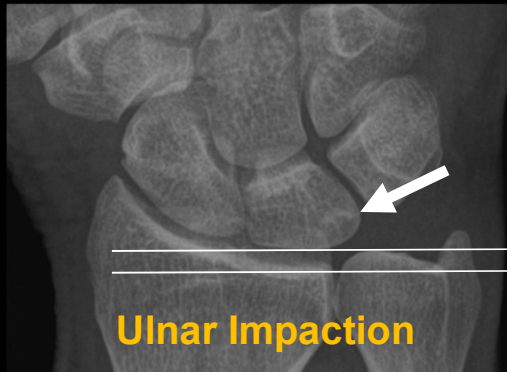
Ulnar sided wrist pain



Ulnar sided wrist pain



Ulnar sided wrist pain

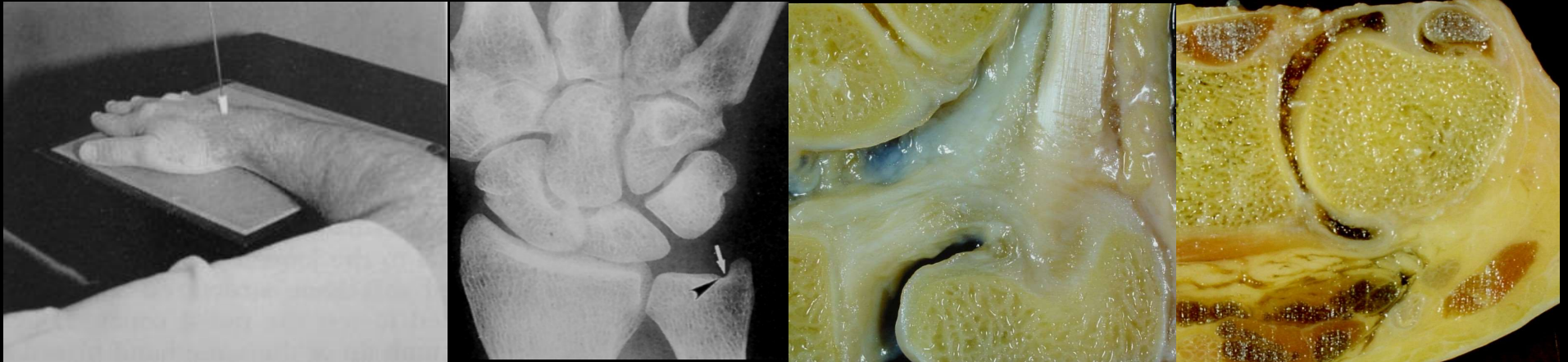


DD Lunatummalazie/Mb. Kienböck

Drawing from:
Cerezal L, del Piñal F, Abascal F, García-Valtuille R,
Pereda T, Canga A. Imaging Findings in Ulnar-sided Wrist
Impaction Syndromes RadioGraphics 2002 22: 105-121.

Ulnar sided wrist pain

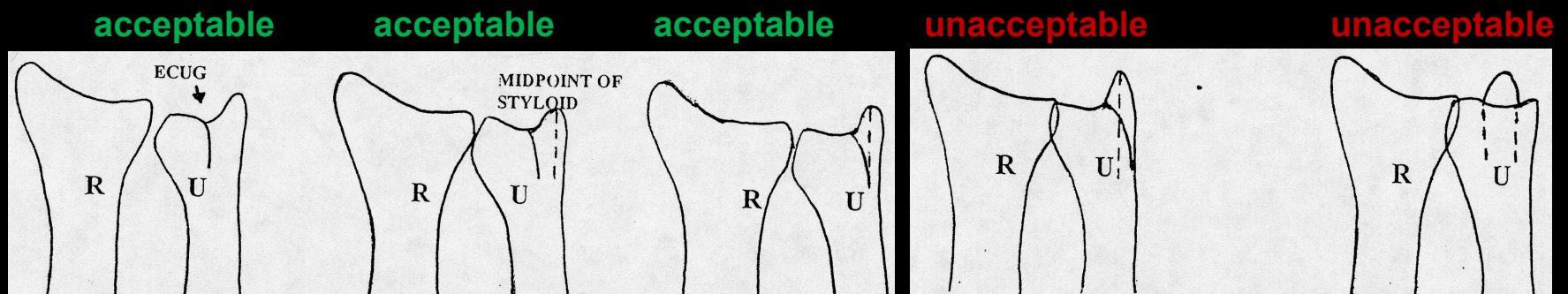
ULNAR VARIANCE with WRIST POSITIONING



Ulnar sided wrist pain



ULNAR VARIANCE with WRIST POSITIONING



Relative shortening of the ulna during supination: Range 0 - 2mm (mean 1.3mm)

Ulnar sided wrist pain



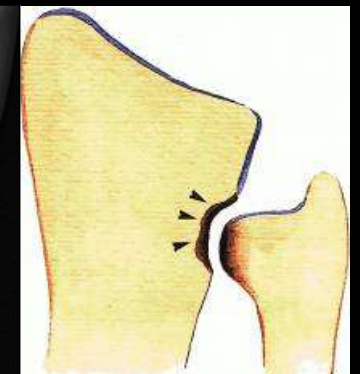
Ulnar Styloid Impaction



Ulnar Impaction



Ulnar Impingement



Hamatolunate Impaction

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Arthrose/ Osteoarthritis (OA)

- Gelenkspaltverschmälerung
- Osteophyten
- Subchondrale Sklerose
- Ganglien



Osteoarthritis (OA)

■ Kellgren-Lawrence classification

- Grade 1 =
 - discrete osteophytes
 - discrete joint space narrowing
- Grade 2 =
 - definite osteophytes
 - definite joint space narrowing
- Grade 3 =
 - moderate, multiple osteophytes
 - definite joint space narrowing
 - some sclerosis and possible deformity of bone contour
- Grade 4 =
 - large osteophytes
 - marked joint space narrowing
 - severe sclerosis, definite deformity of bone contour

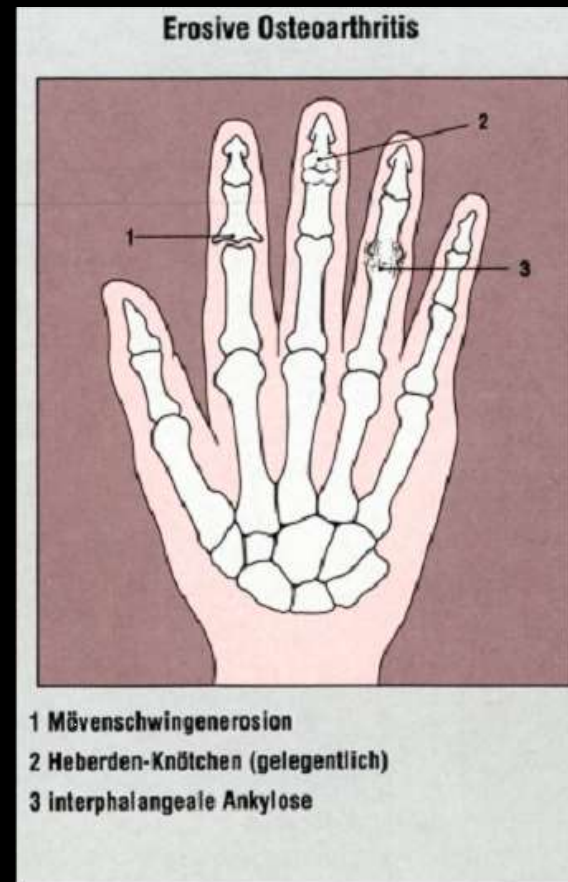
Osteoarthritis (OA)

- Normal Mineralization
- Nonuniform joint space change
- **No Erosion**
- **Subchondral Bone production**
- Osteophytes
 - Heberden (DIP)
 - Bouchard (PIP)
- Subchondral cysts
- Subluxation

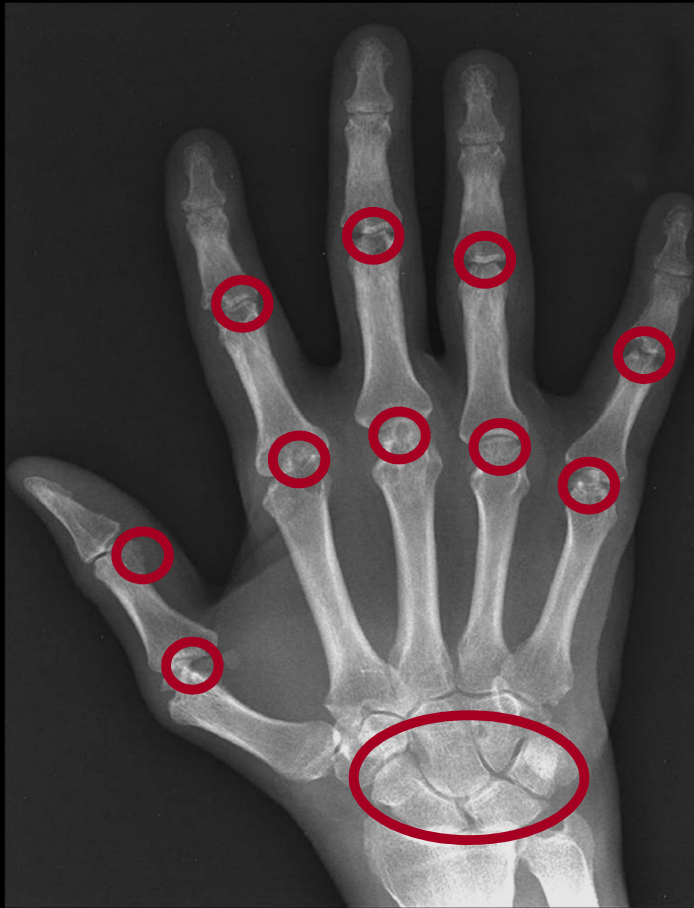


Erosive Osteoarthritis (EOA)

- Asymmetrical soft tissue around joint
- **Normal** mineralization
- **Nonuniform** loss of joint space
- **«Saw tooth»**, „sea gull“ lesions
- **Central erosions**
- Subchondral sclerosis, Osteophytes
- Symmetrical distribution



Rheumatoid arthritis (RA)

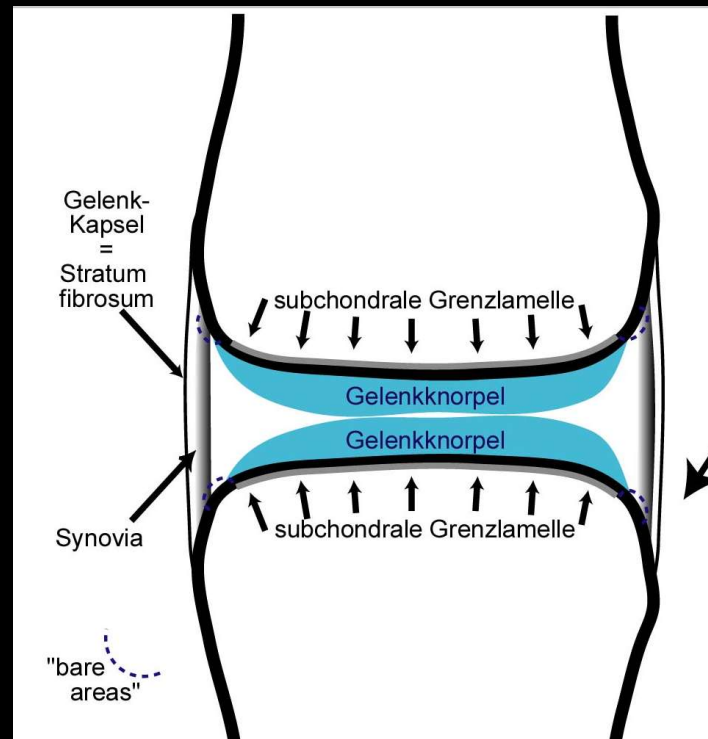


Rheumatoid arthritis (RA)

- **F > M (2-4:1)**
- **Most common: 40-60 years**
- **HLA-DR4**
- **Typical gradual onset, polyarthritis**
 - Morning stiffness
 - Arthritis of hand joints
 - Symmetric arthritis
 - Rheumatoid nodules
 - Rheumatoid factor
 - Radiographic changes

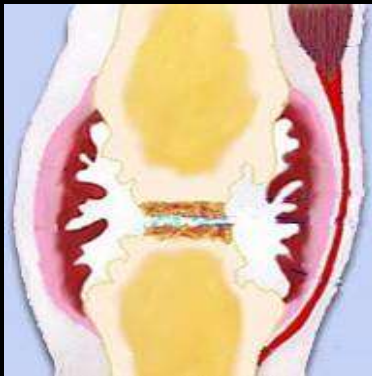
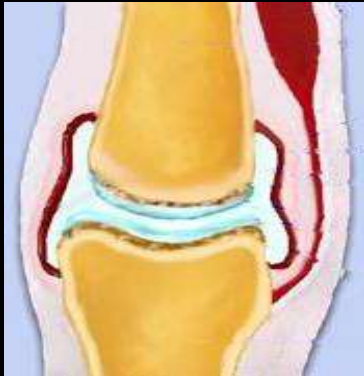
Rheumatoid arthritis (RA)

■ Joint

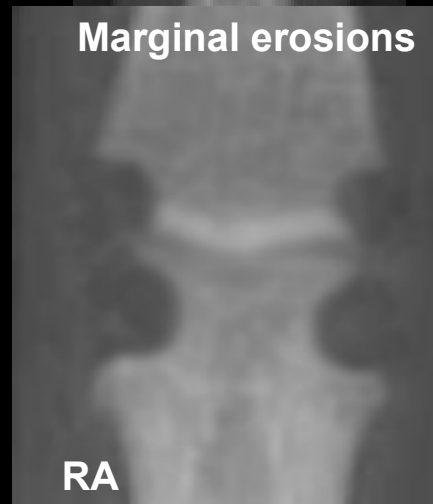


Rheumatoid arthritis – Radiographic changes

- Hand/wrist changes



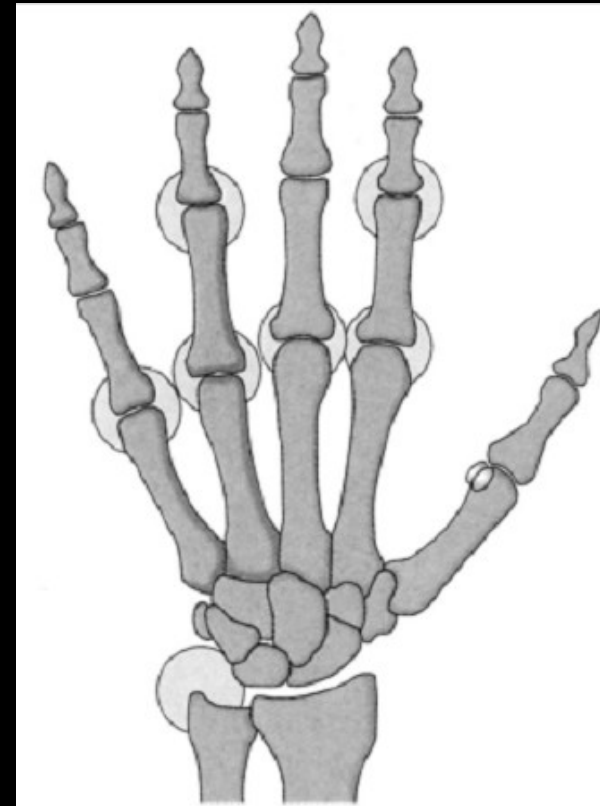
Marginal erosions



RA

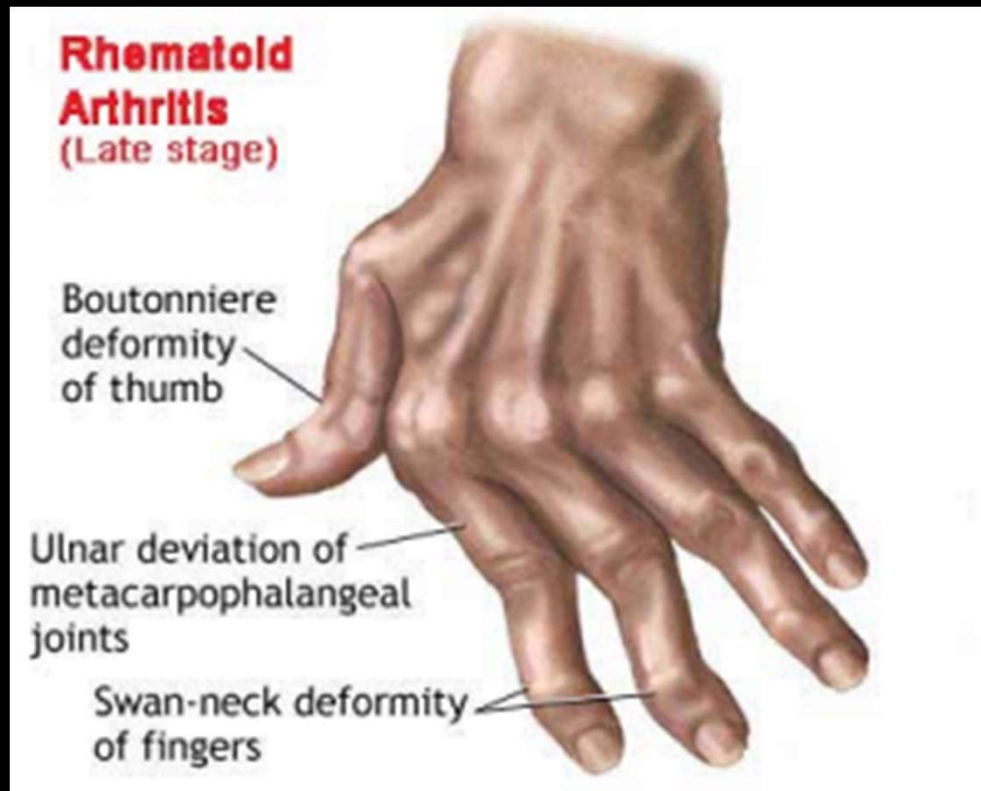
Rheumatoid arthritis – Radiographic changes

- Fusiform soft tissue swelling
- **Diffuse or juxtaarticular** osteoporosis
- **Uniform** joint space narrowing
- Aggressive **marginal erosions**
- **No** bone production
- Synovial/subchondral cysts
- Bilateral symmetrical distribution



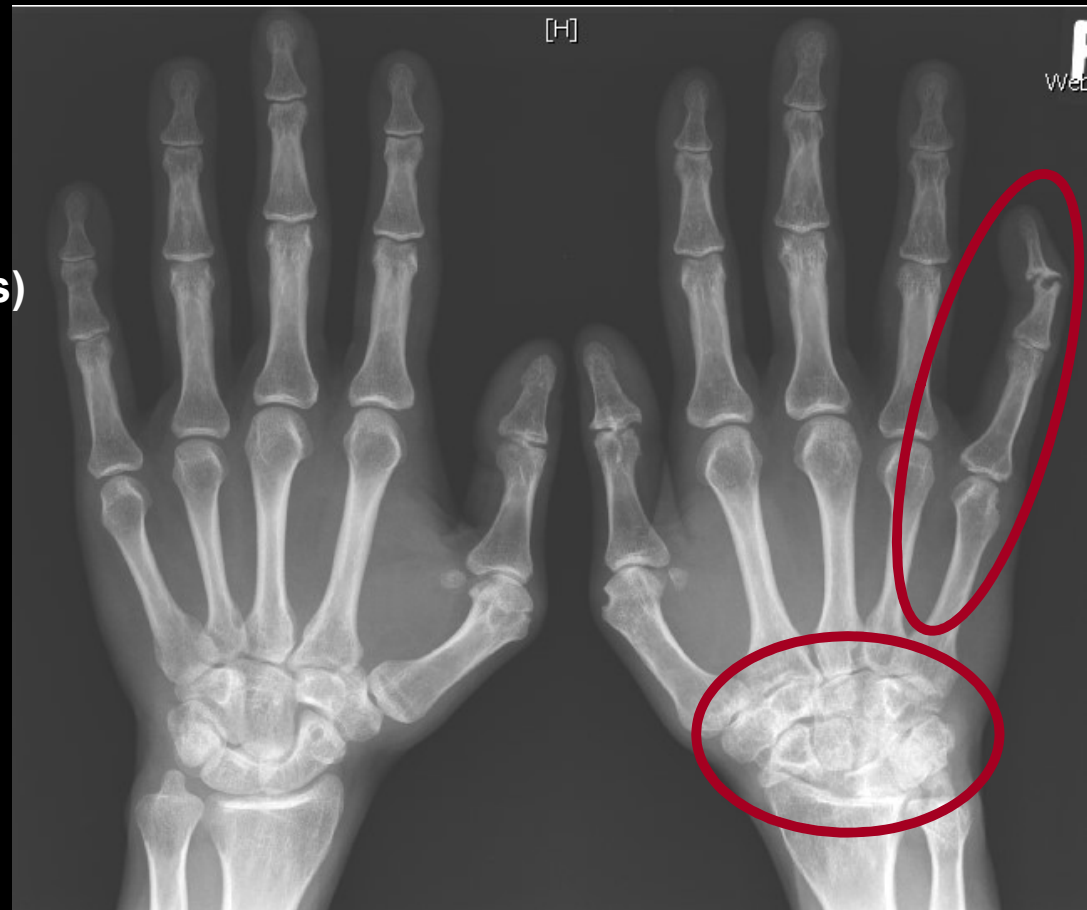
Rheumatoid arthritis – Radiographic changes

■ Ulnare Subluxation /Schwanenhals MCP



Psoriarthritis (PsA) – Radiographic changes

- Fusiform soft tissue swelling
- Maintenance of mineralization
- Dramatic joint space loss
- **Marginal erosions** („Pencil-in-cup“ erosions)
- **Bone proliferation**
- Bilateral **asymmetric**



Inhalt

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- **Crystal arthropathies**
- **Cases and Mimickers**

Crystal deposition disease

- **Gouty arthritis** (Monosodium urate)
- **CPPD deposition disease** (Calcium pyrophosphate dihydrate)
- **HA crystal deposition disease** (Calcium hydroxyapatite)

- **Hemochromatosis** (iron deposition)
- **Alkaptonuria** (Homogentisic acid)

Crystal deposition disease



Gout

Crystal deposition disease

Gout

■ Primary idiopathic

- M:F = 20:1
- 40-50 years

■ Secondary:

- Hereditary
- Myeloproliferative disease
- Endocrine disorder
- Drug therapy



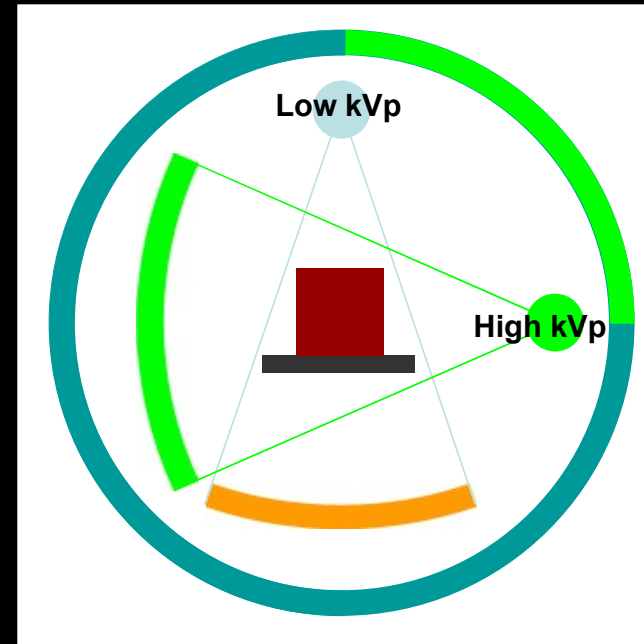
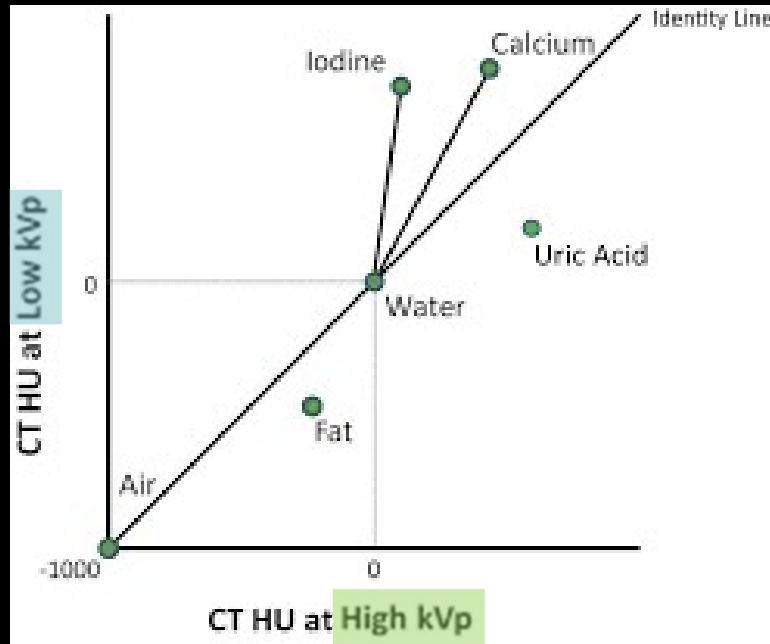
Crystal deposition disease

Gout

- Soft tissue swelling
- Tophi (calcification rare)
- Preserved joint space
- Erosions
 - Well-defined
 - Extraarticular erosions
- Overhanging edge
- Polyarticular, Asymmetric
- **MTP I (90%), TMT, CMC**
- Olecranon bursitis



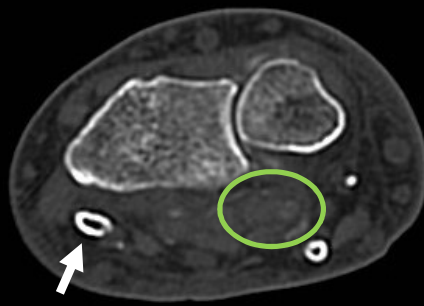
Crystal deposition disease



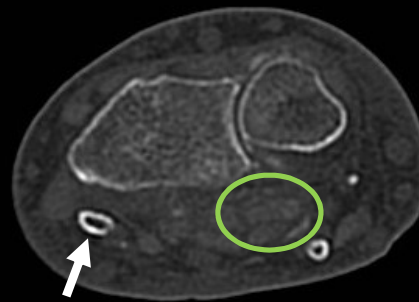
Siemens, 2006

Crystal deposition disease

- DECT zur Detektion von **Gichttophi**



80kV



Sn150kV



Crystal deposition disease

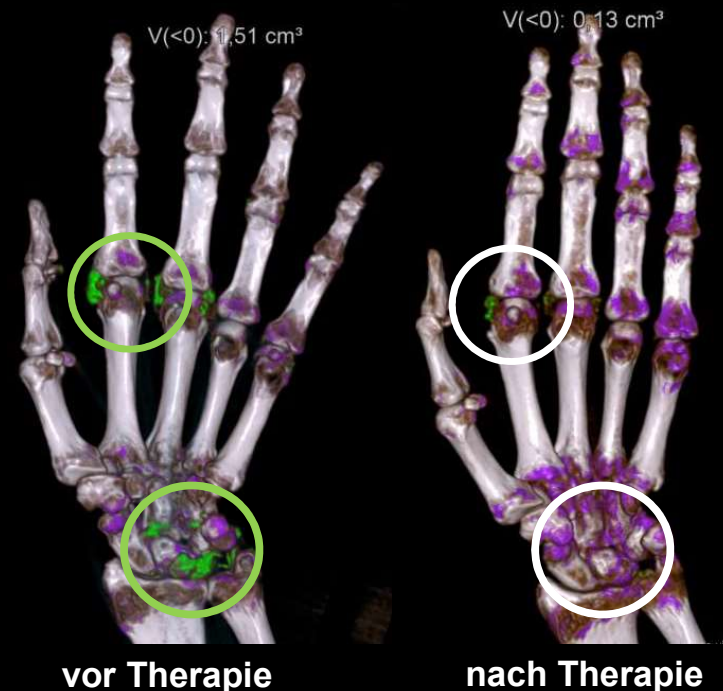
■ Gicht - Diagnose:

- Goldstandard: Arthrocentese
- invasiv und insensitiv (Sens.~70%)
- DECT zur Detektion von Gichttophi

■ DECT - Einfluss auf Therapie:

- 40% Diagnose Gicht ausgeschlossen
- 50% Wechsel der Therapie
- 83% erfolgreiches Ansprechen

Finkenstädt et al., Eur Radiol 2016



Crystal deposition disease

CPPD

Knee

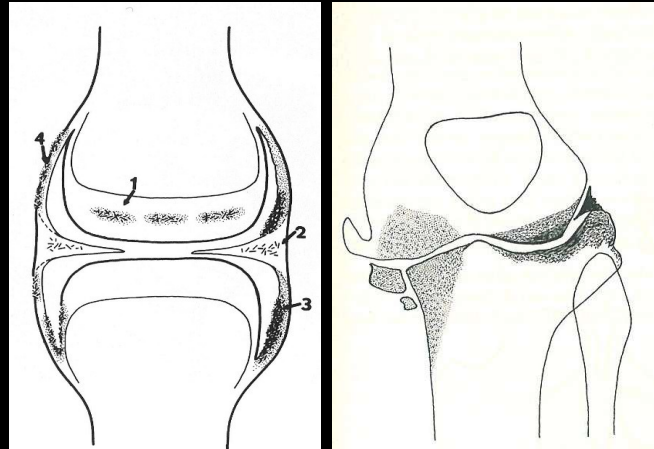
Meniscal calcification

Hyaline cartilage calcification

Patellofemoral arthropathy

Subchondral cysts

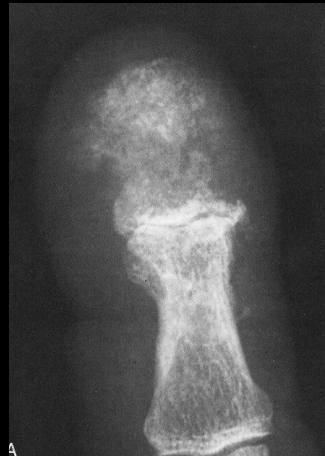
Osseous bodies



Crystal deposition disease

CPPD

- Calcifications
- Joint space narrowing
- Bone sclerosis
- Variable Osteophytes
- Prominent subchondral cysts
- Distribution: non-weight bearing



Crystal deposition disease

CPPD

Wrist and Hand

TFCC calcification

Radiocarpal and MCP Arthropathy

SLAC

Absence of erosions



Differentials

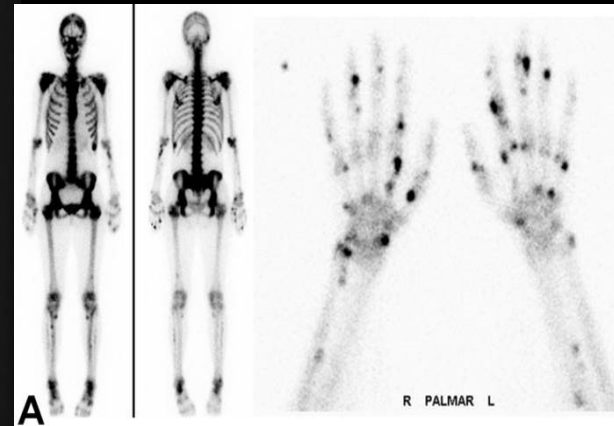


Favero, M., Belluzzi, E., Ortolan, A. *et al.*
Erosive hand osteoarthritis: latest findings and outlook.
Nat Rev Rheumatol **18**, 171–183 (2022).
<https://doi.org/10.1038/s41584-021-00747-3>

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Cases and Mimickers

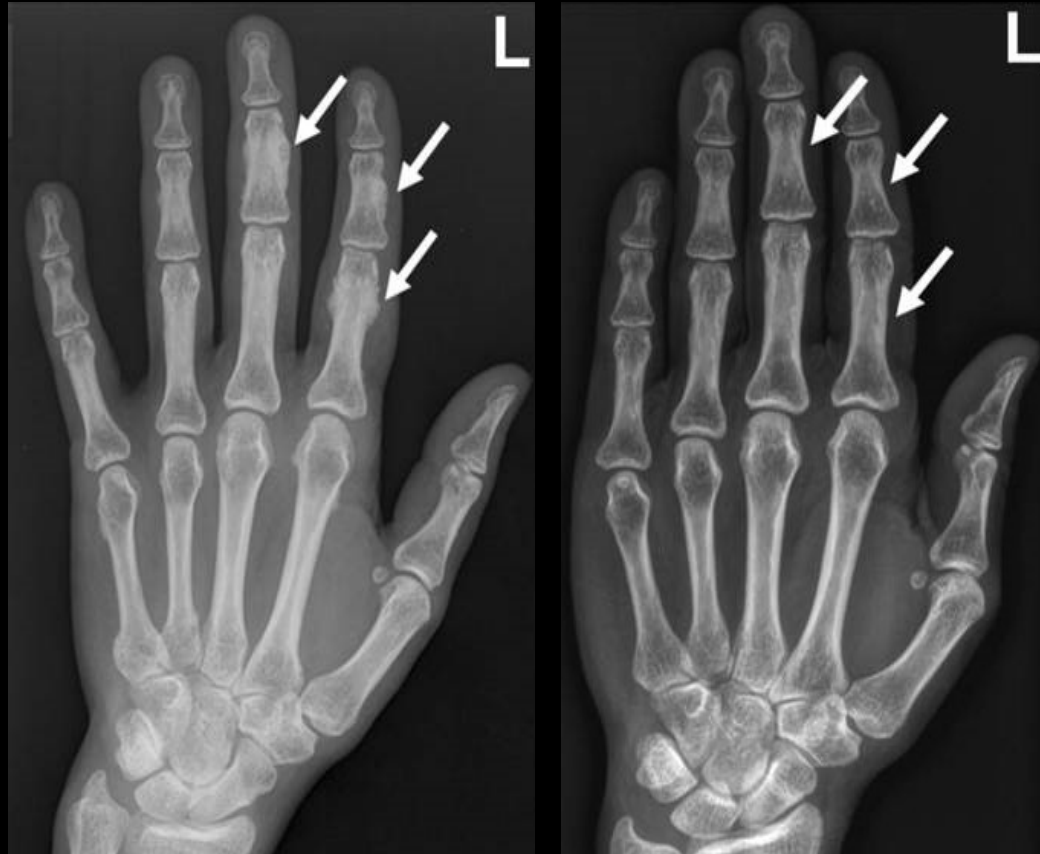


Cases and Mimickers



Periostitis

Cases and Mimickers



Gerber, Guggenberger et al., Blood 2012

Zusammenfassung: Handröntgen

- **Dosis und Technik**
- **Ulnar sided wrist pain**
- **Degenerative vs. inflammatory changes**
- **Crystal arthropathies**
- **Cases and Mimickers**

THANK YOU



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Referenzen

The Radiology Assistant : Bone tumors - Differential diagnosis

Basisdiagnostik von Knochentumoren
Erlemann R., Radiologe 2009

An Approach to Undiagnosed Bone Tumors
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Madewell JE, Ragsdale BD, Sweet DE:
Radiologic and pathologic analysis of solitary bone lesions. Part I: Internal margins.
Radiol Clin North Am 19:715-748, 1981

Stacy et al.,
Pitfalls in MR image interpretation prompting referrals to an orthopedic oncology clinic
Radiographics 2007

Favero, M., Belluzzi, E., Ortolan, A. *et al.*
Erosive hand osteoarthritis: latest findings and outlook.
Nat Rev Rheumatol **18**, 171–183 (2022)

Radiopaedia.org, the peer-reviewed collaborative radiology resource