CRYSTAL-INDUCED ARTHRITIS

- Gouty Arthritis
- CPPD Disease
- Hydroxyapatite Disease

Crystals Found in Synovial Fluid

Monosodium Urate Monohydrate	Acute Gout
	Tophaceous Gout
	Asymptomatic
Calcium Pyrophosphate Dihydrate	Acute Pseudogout
	Destructive Arthropathy
	Asymptomatic

Crystals Found in Synovial Fluid (continued)

Basic Calcium Phosphate	Acute Calcific Periarthritis Acute Arthritis Destructive Arthropathy (Milwaukee Shoulder/knee)
Calcium Oxalate	Acute, Subacute Arthritis Asymptomatic
Lipid	Acute Arthritis
Cholesterol	Asymptomatic

GOUT

- Prevalence increases with age
- Prevalence increases with serum urate concentrations
- Most common cause of inflammatory arthritis in males over 40
- Peak onset is 40-50 yrs for males and after 60 yrs for females

Incidence of Gout in Relation to Serum Urate Concentrations

Incidence (per 1000) concentration (mg/dl)		Serum urate
Per year	5 yr cumulative	
0.8	5.0	<7.0 (0.42 mmol/l)
0.9	6.0	7.0-7.9 (0.42-0.47 mmol/l)
4.1	9.8	8.0-8.9 (0.48-0.53 mmol/l)
49	220	>9.0 (0.54 mmol/l)

Temperature (°C)	Maximal Equilibrium Concentration of U^- in the Presence of 140 nM Na^+ (mg/100ml)
37	6.8
35	6.0
30	4.5
25	3.3
20	2.5
15	1.8
10	1.2

ACUTE GOUTY ARTHRITIS

- 1st MTP joint of great toe involved in >50% of initial attacks and over time is affected in >90% of patients (podagra)
- other joints in order of frequency: insteps, ankles, heels, knees, wrists, fingers and elbows

Acute Gouty Arthritis

- Abrupt onset of severe joint inflammation, often at night
- Subsides completely over 3 to 10 days
- 75% in first MTP Joint
- Urate Crystals in Synovial Fluid
- May have Hyperuricemia
- Usually Monoarticular, may be Polyarticular

ACR

Gout: podagra

Gout: tophus, finger

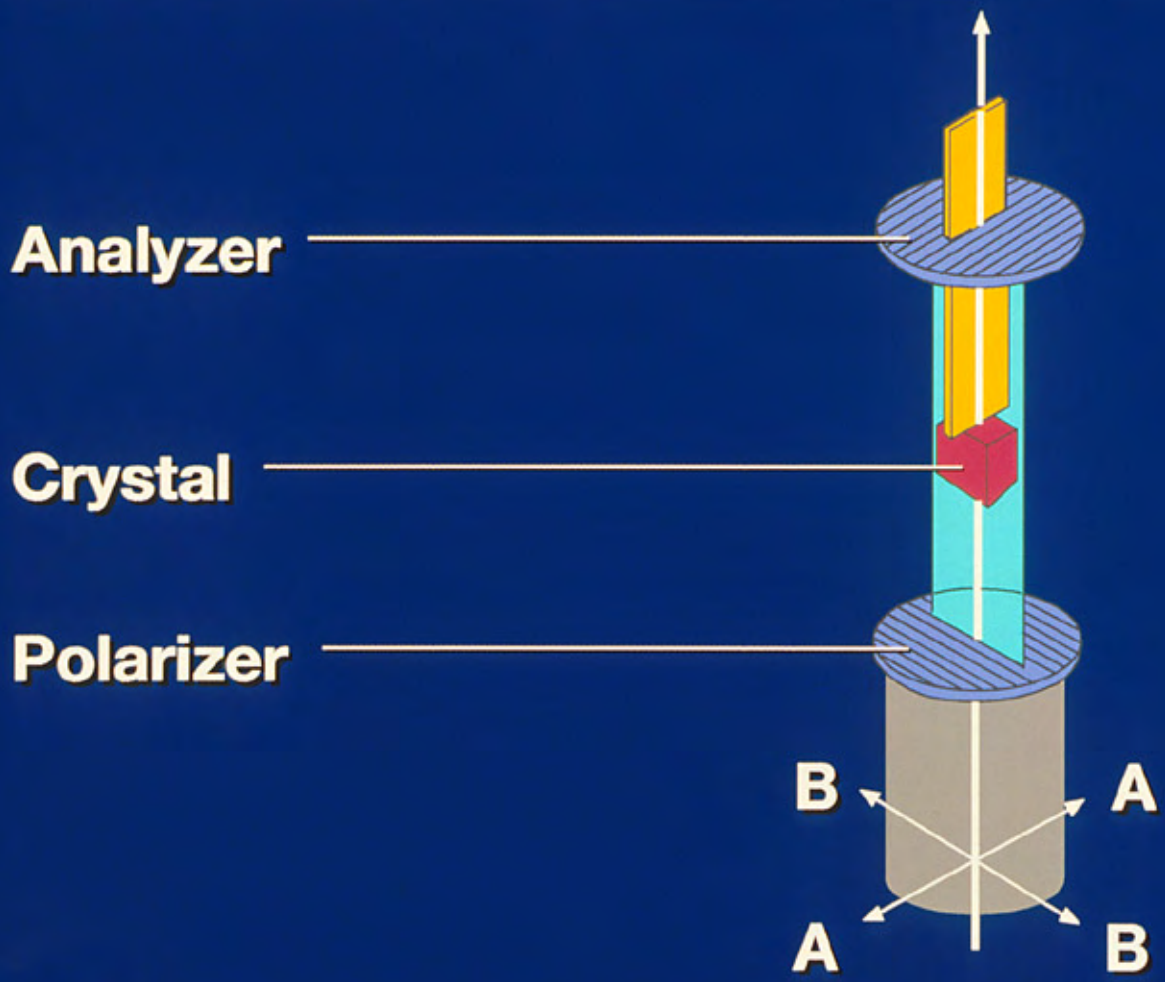
Gout: olecranon bursitis

Gout: tophi, ear

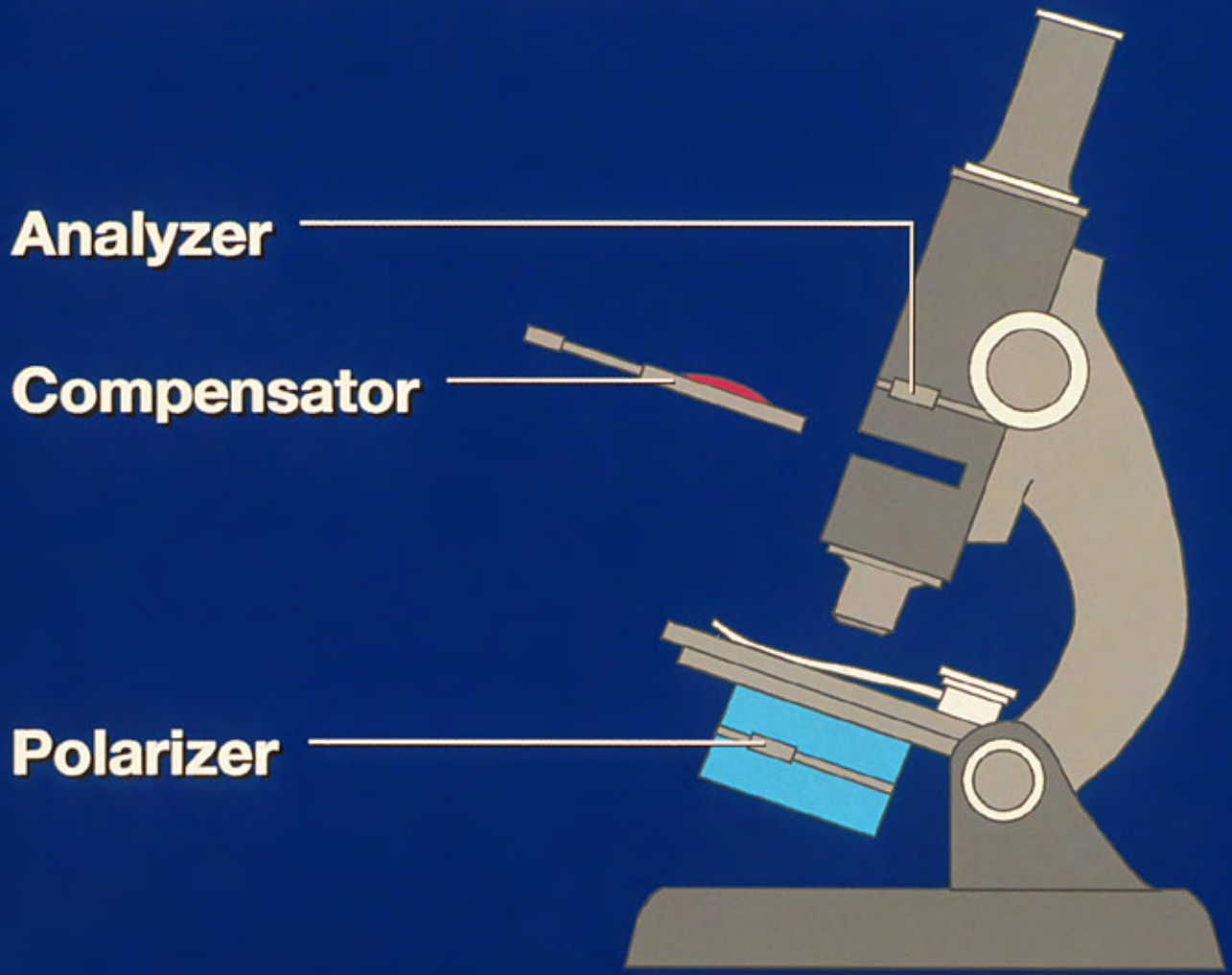
Establish the Diagnosis of Gout

- Presence of MSU crystals in fresh synovial fluid
- Presence of MSU crystals in soft tissue tophi
- Typical radiographic features in the setting of hyperuricemia: soft tissue swelling and densities (tophi) and punched-out bony erosions with sclerotic margins and overhanging edges (rat-bite erosions)

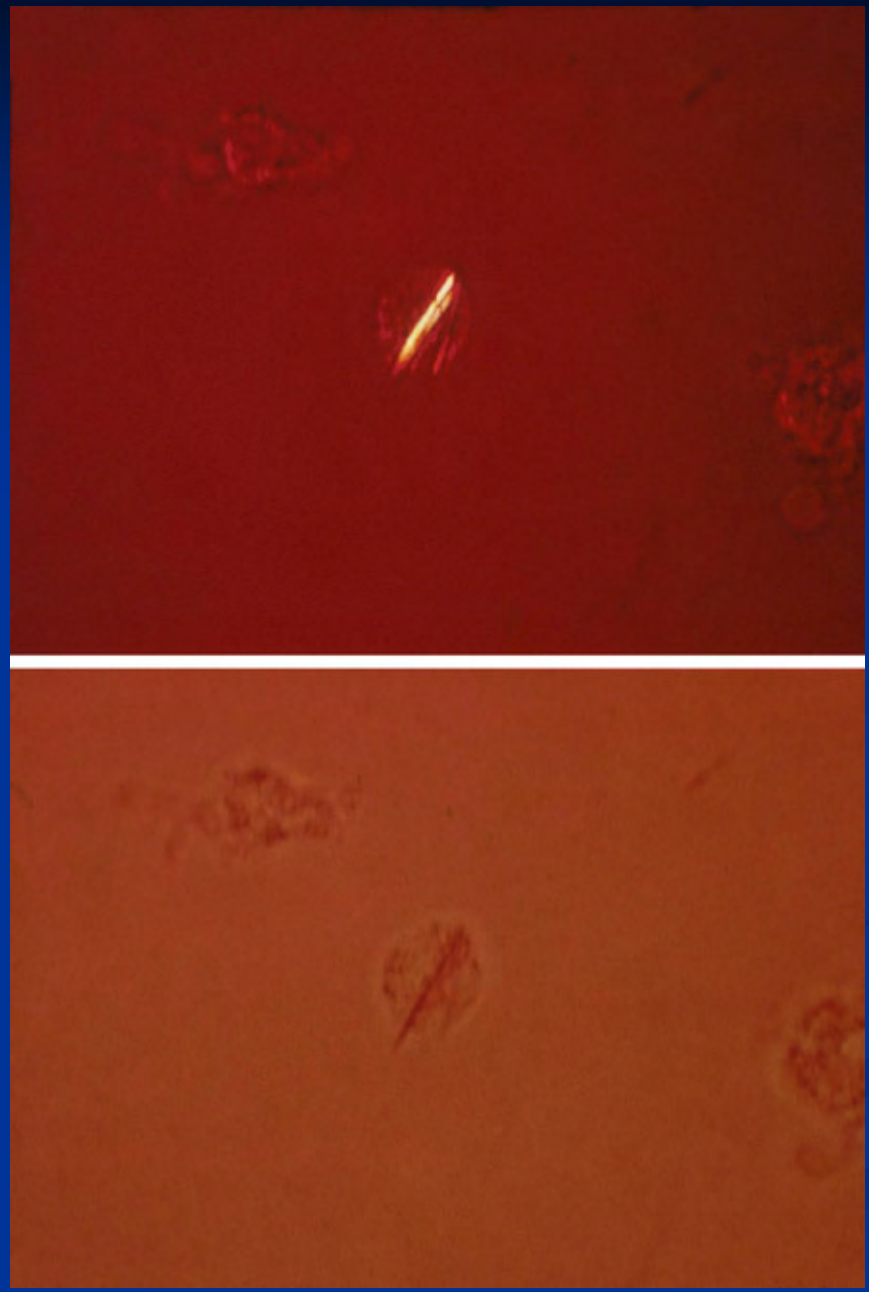
Polarized Light



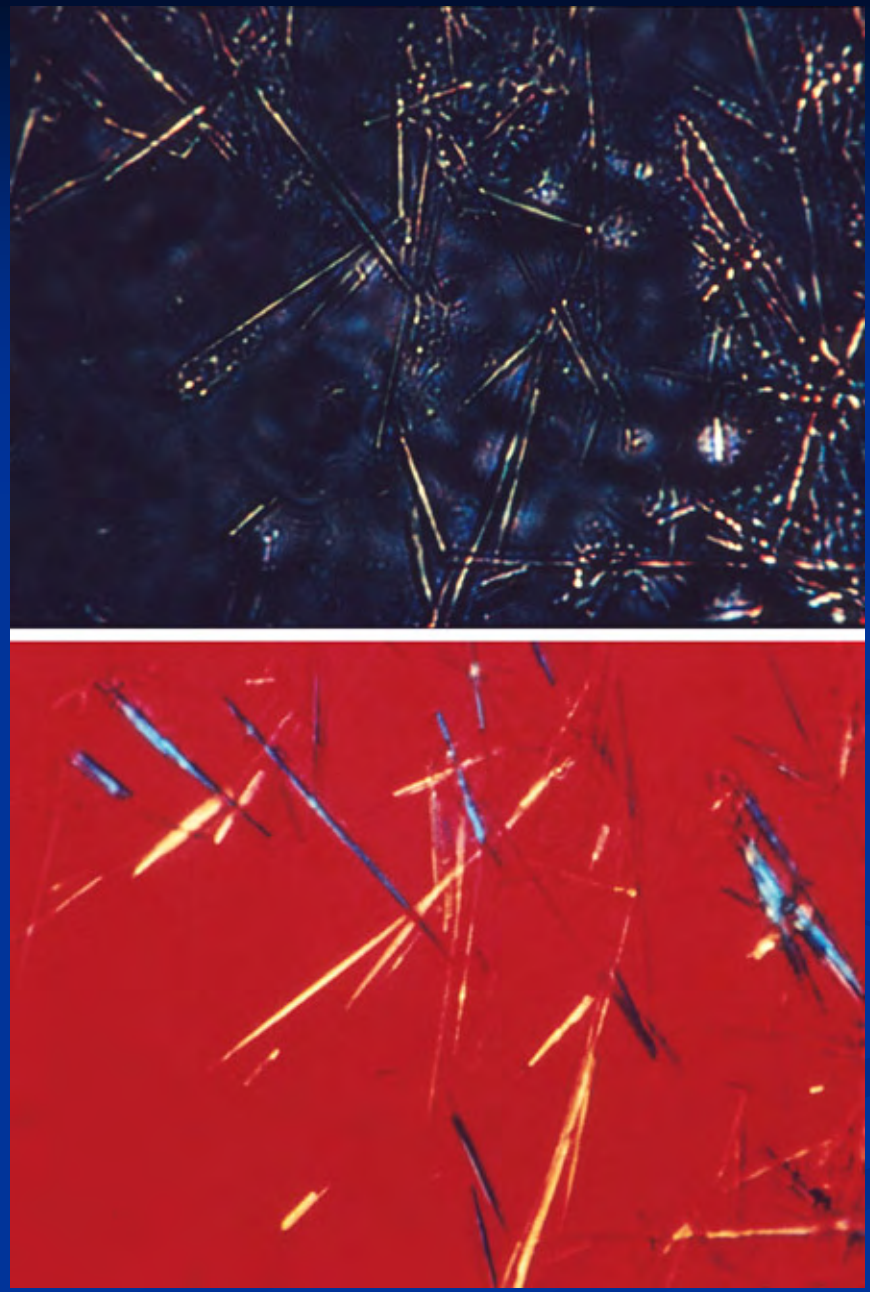
Polarizing Microscope



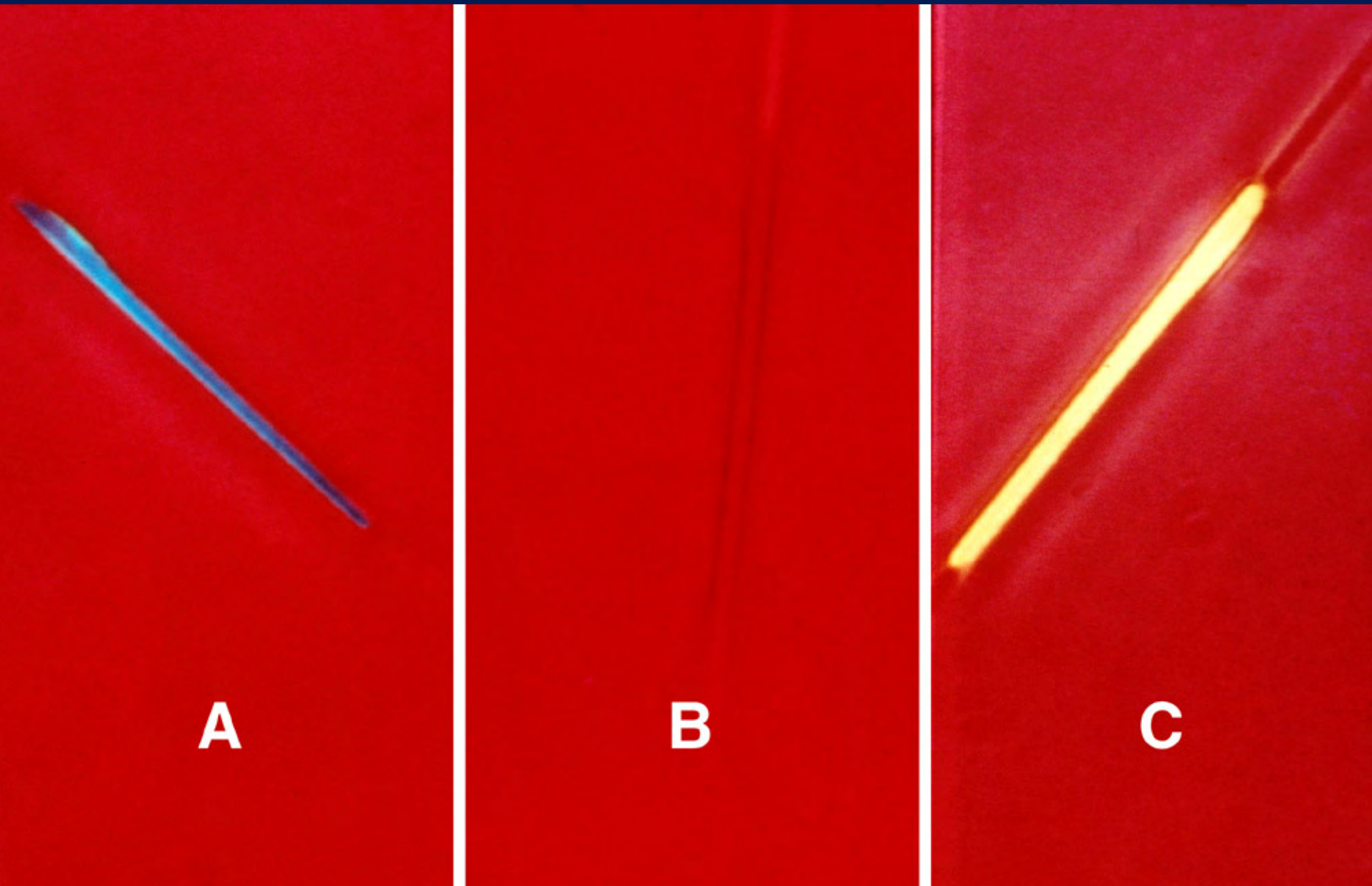
Gout: phagocytosed urate crystals



Gout: urate crystals (ordinary and polarized light microscopy)



A-birefringent MSU crystal perpendicular to orienting line of compensator
B-same crystal extinct on the axis of the polarizer or analyzer
C-birefringent MSU crystal parallel to orienting line of compensator



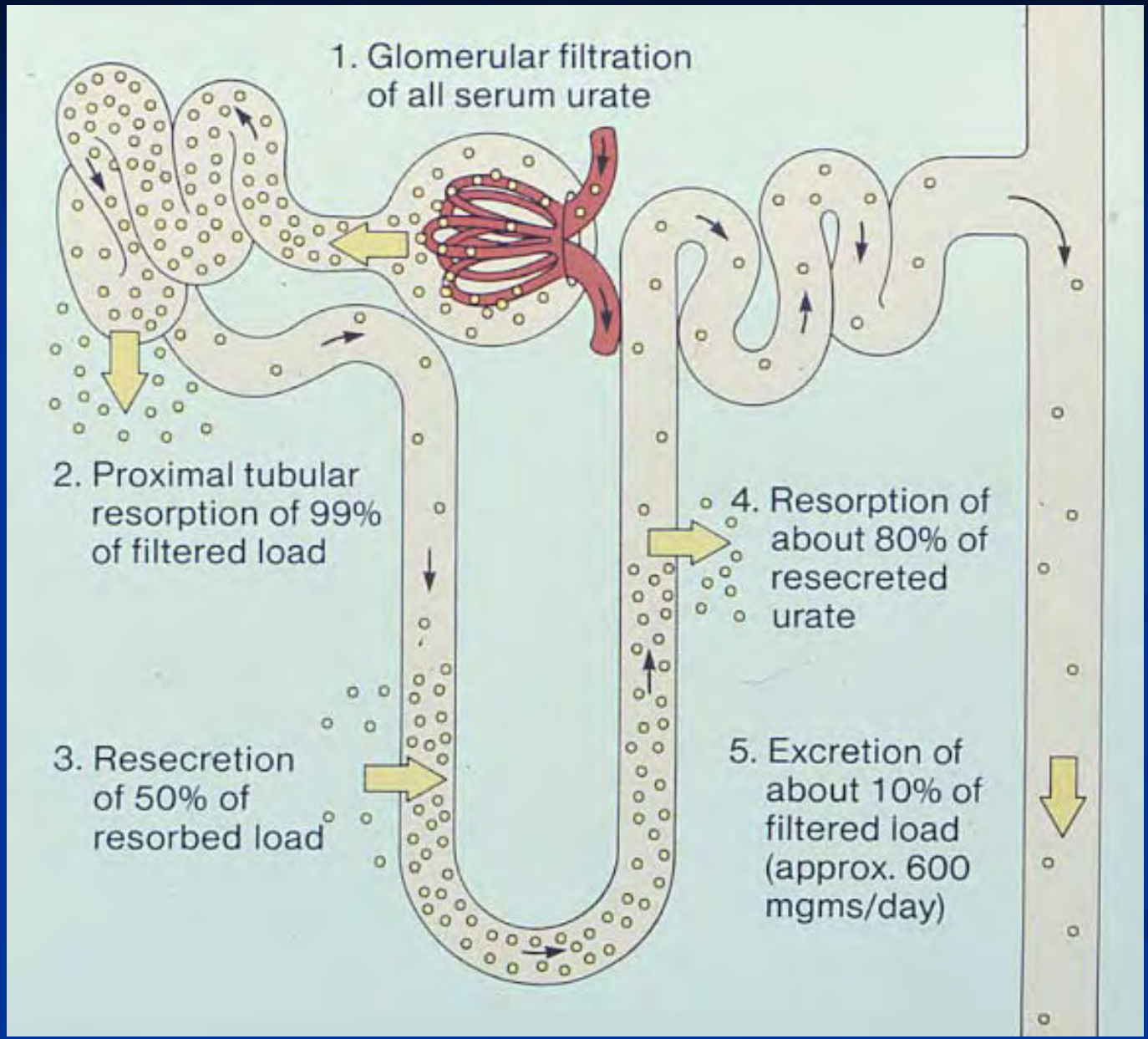

Erosion with overhanging edge

HYPERURICEMIA

- Urate overproduction
- Uric acid under-excretion
- Combined overproduction & under-excretion

Hyperuricemia

- Overproduction (10%)
  - Ethanol
  - Deficiency of HGPRT or G6PD
  - Superactive PRPP Synthetase
  - Myeloproliferative Disorders
  - Psoriasis


1. Glomerular filtration of all serum urate
2. Proximal tubular resorption of 99% of filtered load
3. Resecretion of 50% of resorbed load
4. Resorption of about 80% of resecreted urate
5. Excretion of about 10% of filtered load (approx. 600 mgms/day)

GOUT AND ALCOHOL

There is no truth in medicine better established than the fact that the use of fermented liquors is the most powerful of all the predisposing causes of gout.

Sir Alfred Baring Garrod

1819-1907

ACUTE GOUTY ARTHRITIS TREATMENT OPTIONS

- **NSAIDs and colchicine**
- **Corticosteroids**
  - **intra-articular**
  - **systemic**

TREATMENT OF GOUT
COLCHICINE

Colchicum automnale

- *I find the power of colchicum so great, that if I feel a little gout coming on, I go into the garden, and hold out my toe to the plant, and it gets well directly.*

  Sydney Smith

  1771-1845

GOUTY ARTHRITIS: WHEN TO INITIATE CHRONIC TREATMENT

- **>2-3 acute attacks within 1-2 years**
- **Renal stones (urate or calcium)**
- **Tophaceous gout**
- **Chronic gouty arthritis with bony erosions**
- **Asymptomatic hyperuricemia with serum uric acid >12 mg/dL or 24-hr urinary excretion >1100 mg**

Allopurinol

- Xanthine oxidase inhibitor
- Titrate dose to normalize serum uric acid
- Use lower dosage in patients with CRI
- Hypersensitivity syndrome
  - rare
  - high mortality (20% - 30%)
  - desensitization (po or iv)
  - oxypurinol, the active metabolite

URICOSURIC AGENTS

- Under-excretors with preserved renal function
- Can precipitate gouty attack, so use colchicine prophylactically
- Probenecid most commonly used

CPPD DISEASE

- Calcium pyrophosphate dihydrate (CPPD)
- Prevalence increases with age
- Chondrocalcinosis on radiographs (not all will have CPPD disease)
- Weakly positively birefringent crystals in synovial fluid

CPPD DISEASE PRESENTATIONS

- Pseudogout
- Pseudo-rheumatoid arthritis
- Pseudo-osteoarthritis
- Asymptomatic (radiographic only)
- Pseudo-neuropathic (Charcot joint)

CPPD Crystal Deposition Disease: Associations

Hyperparathyroidism

Familial Hypocalciuric Hypercalcemia

Hemochromatosis

Hemosiderosis

Hypophosphatasia

Hypomagnesemia

Hypothyroidism

Gout

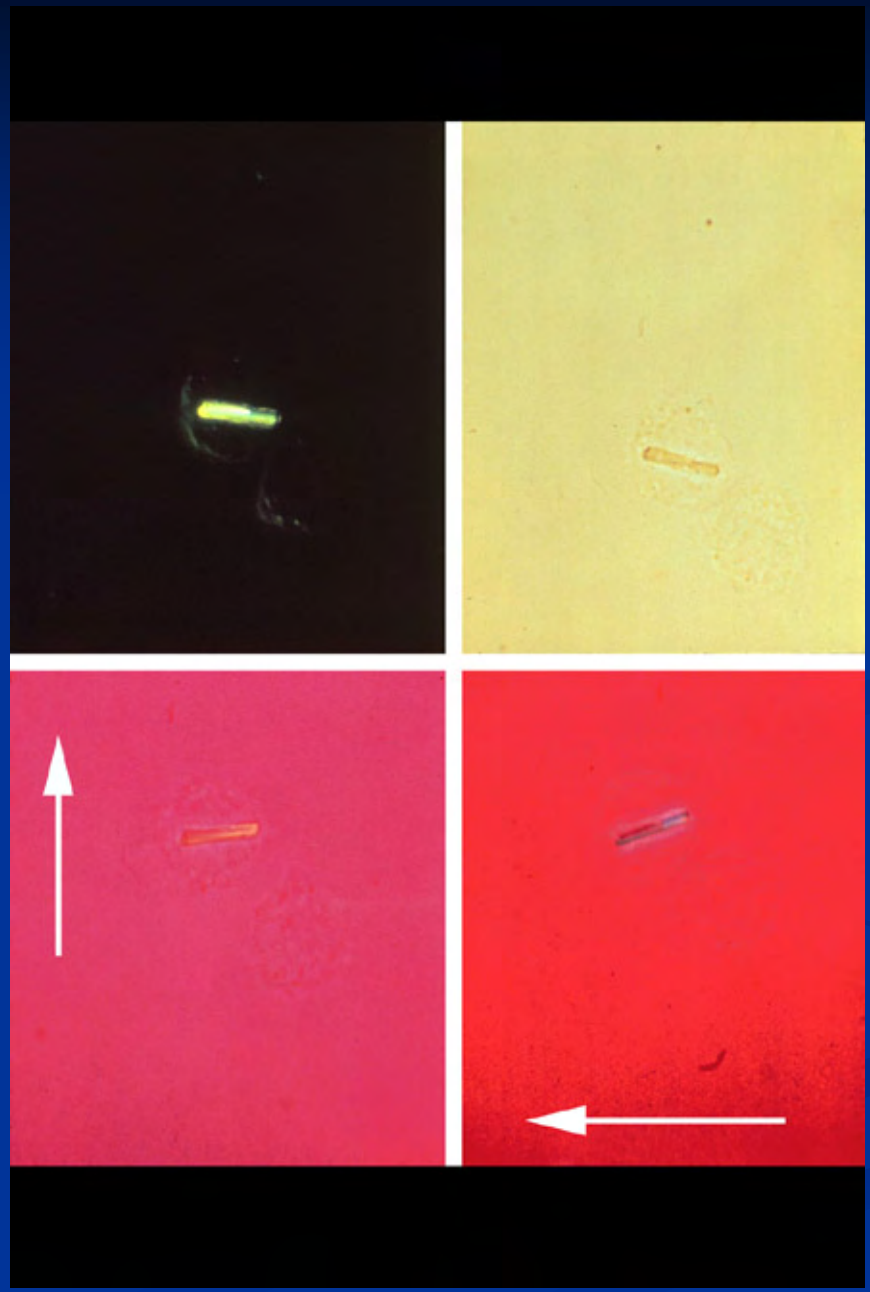
Neuropathic Joints

Aging

Amyloidosis

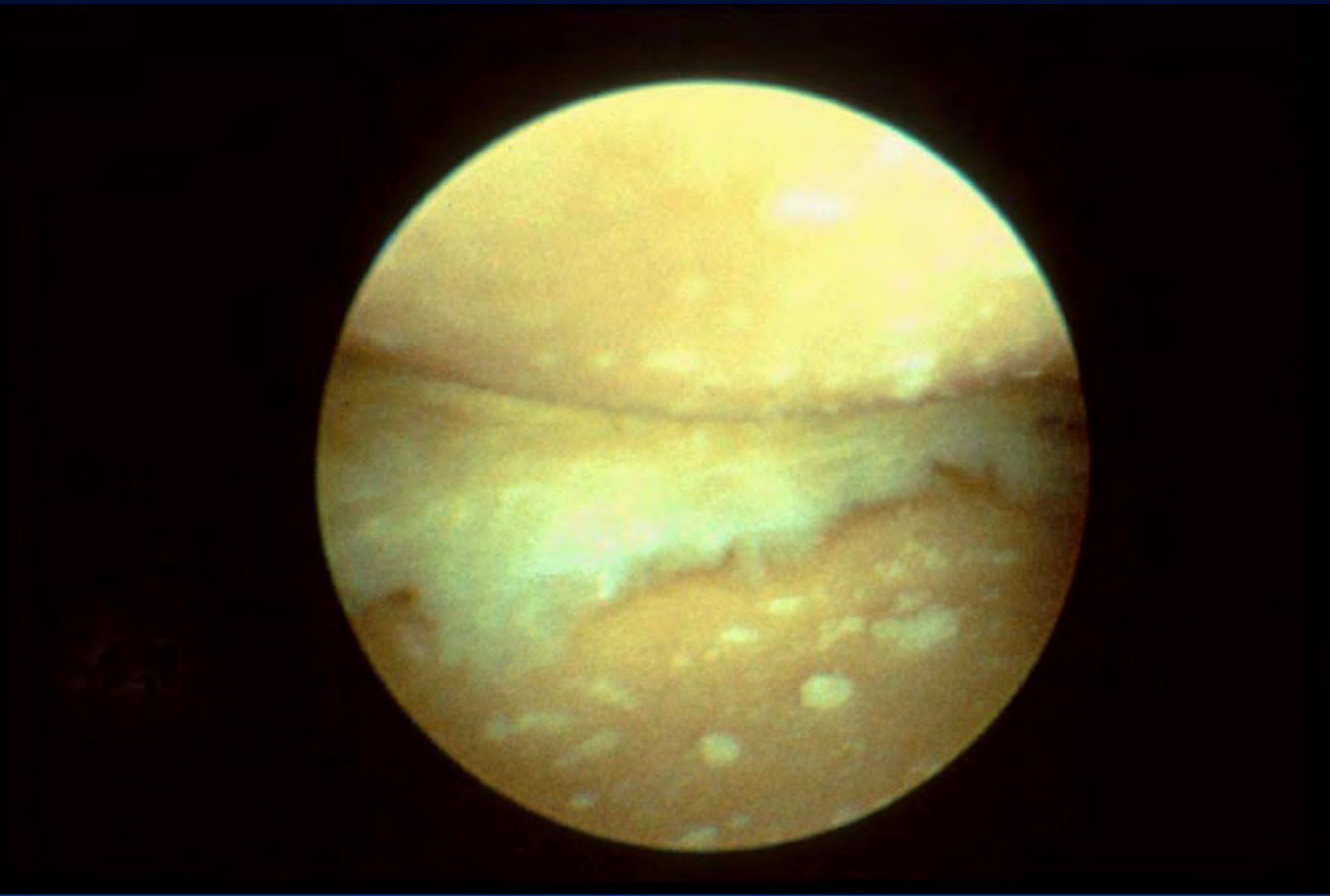
Trauma

Chondrocalcinosis: calcium pyrophosphate crystals



KNEE CHONDROCALCINOSIS

Chondrocalcinosis: knee (arthroscopic view)



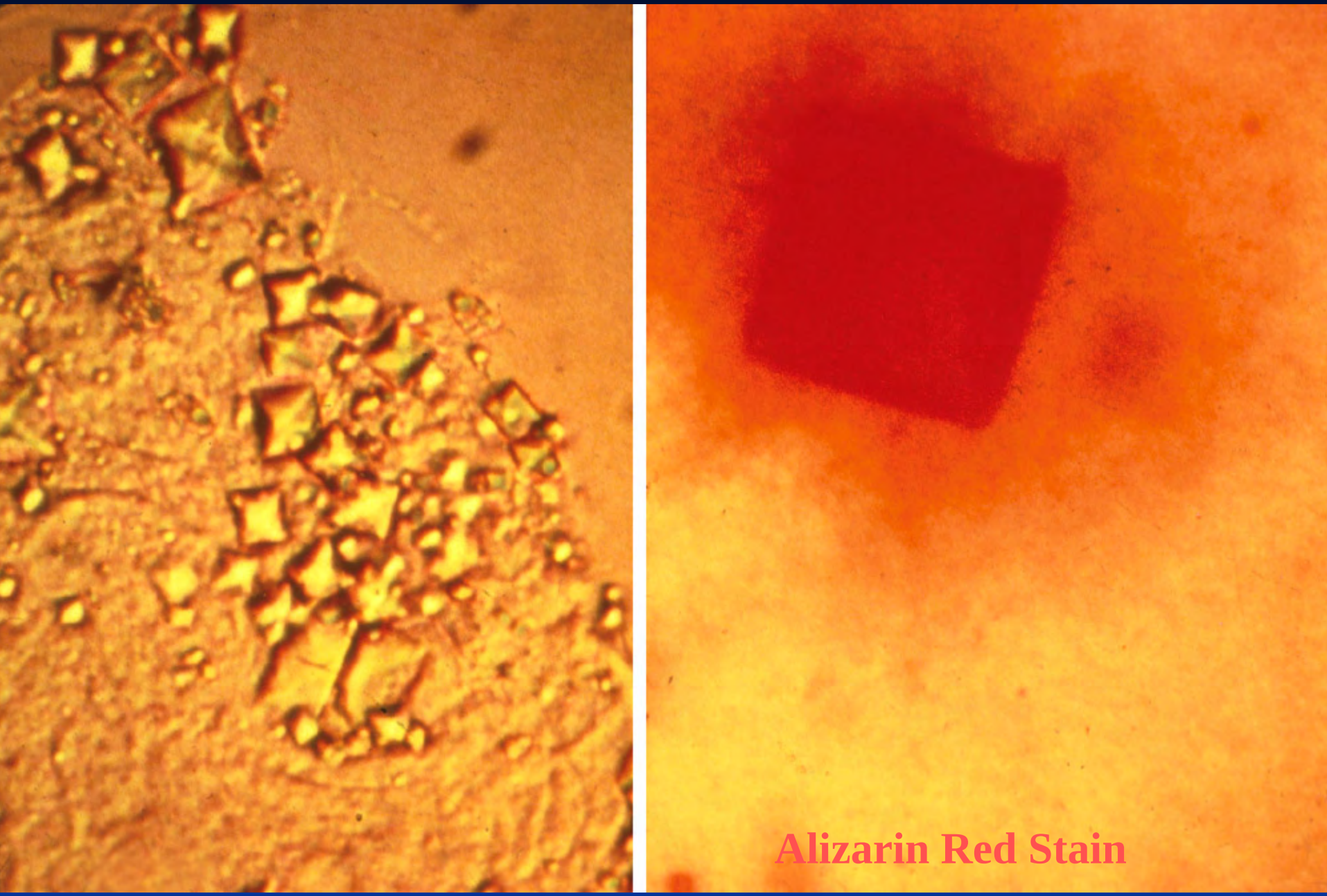
PSEUDOGOUT TREATMENT

- NSAIDs - caution in older patients with renal insufficiency
- Intra-articular (IA) steroids
- Systemic steroids for those intolerant to NSAIDs and when IA steroids not practical
- Colchicine po, but caution in elderly patients

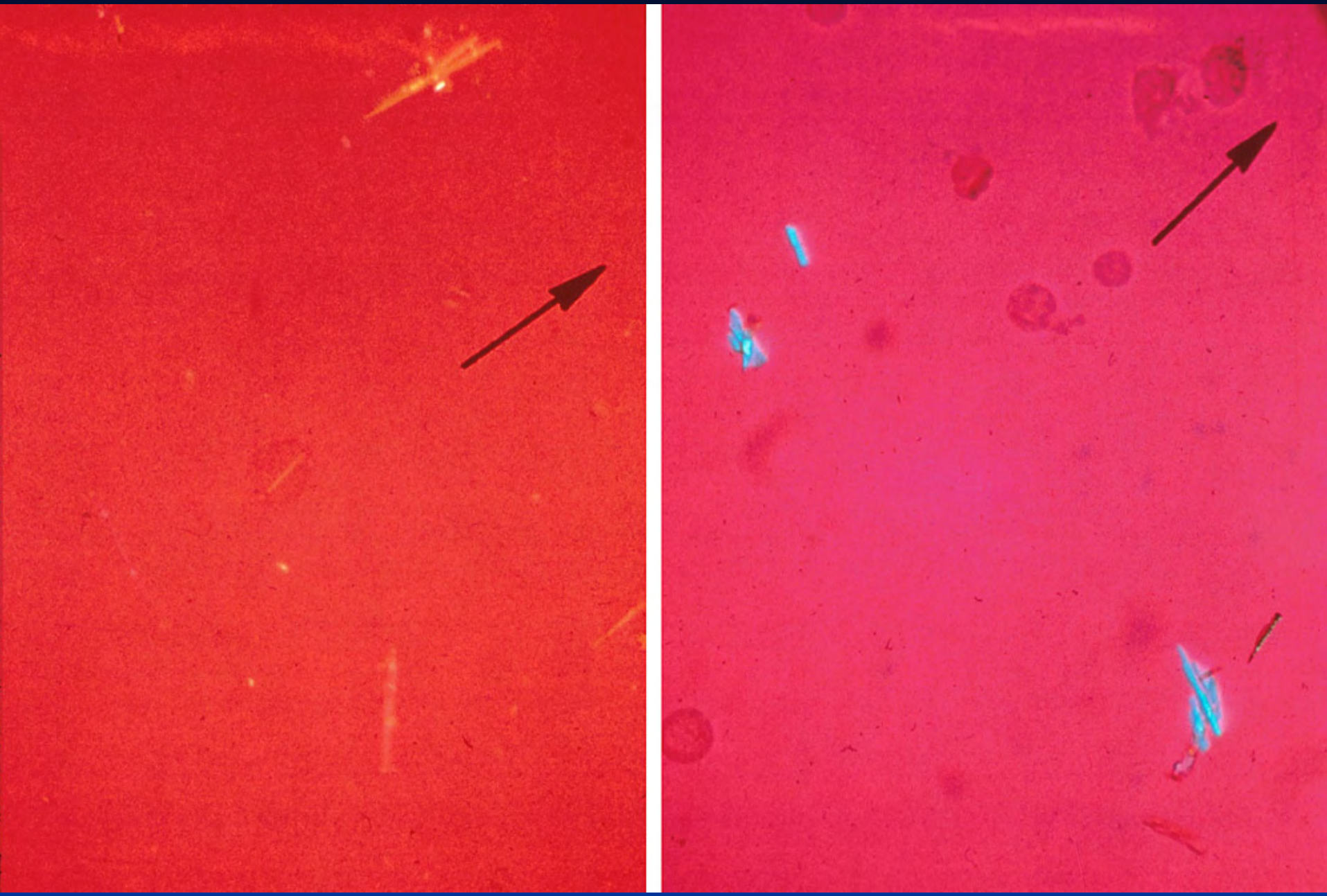
OTHER SF CRYSTALS

- Calcium Hydroxyapatite and other basic calcium pyrophosphate crystals
- Steroids (from IA injections)
- Cholesterol (chronic joint effusions or bursitis)
- Talc (from gloves)

Calcium oxalate crystals



Steroid crystals (compensated polarized light microscopy)



Starch and cholesterol crystals (photomicrographs)