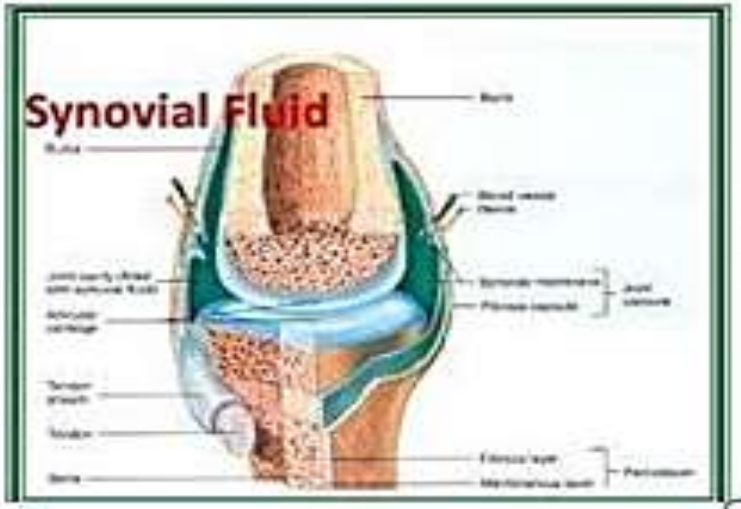
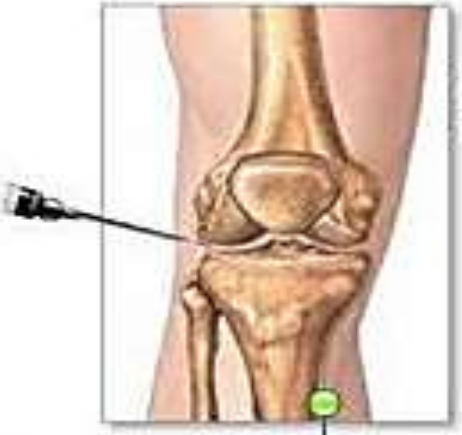
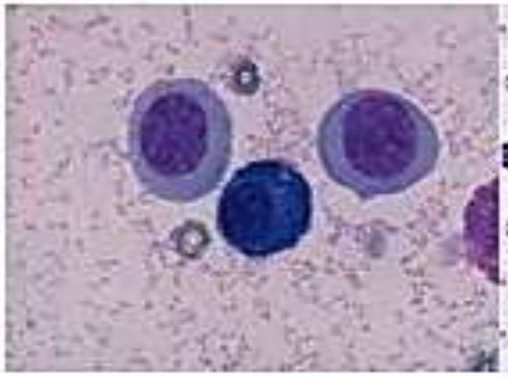
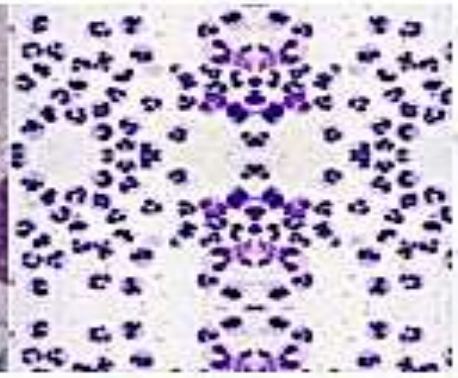
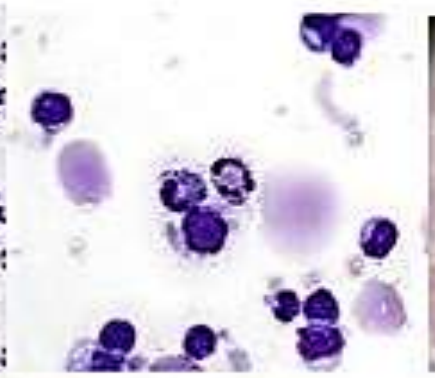


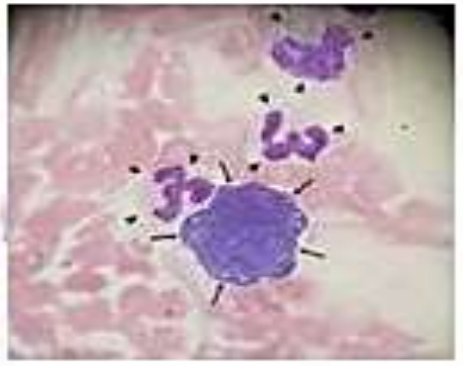


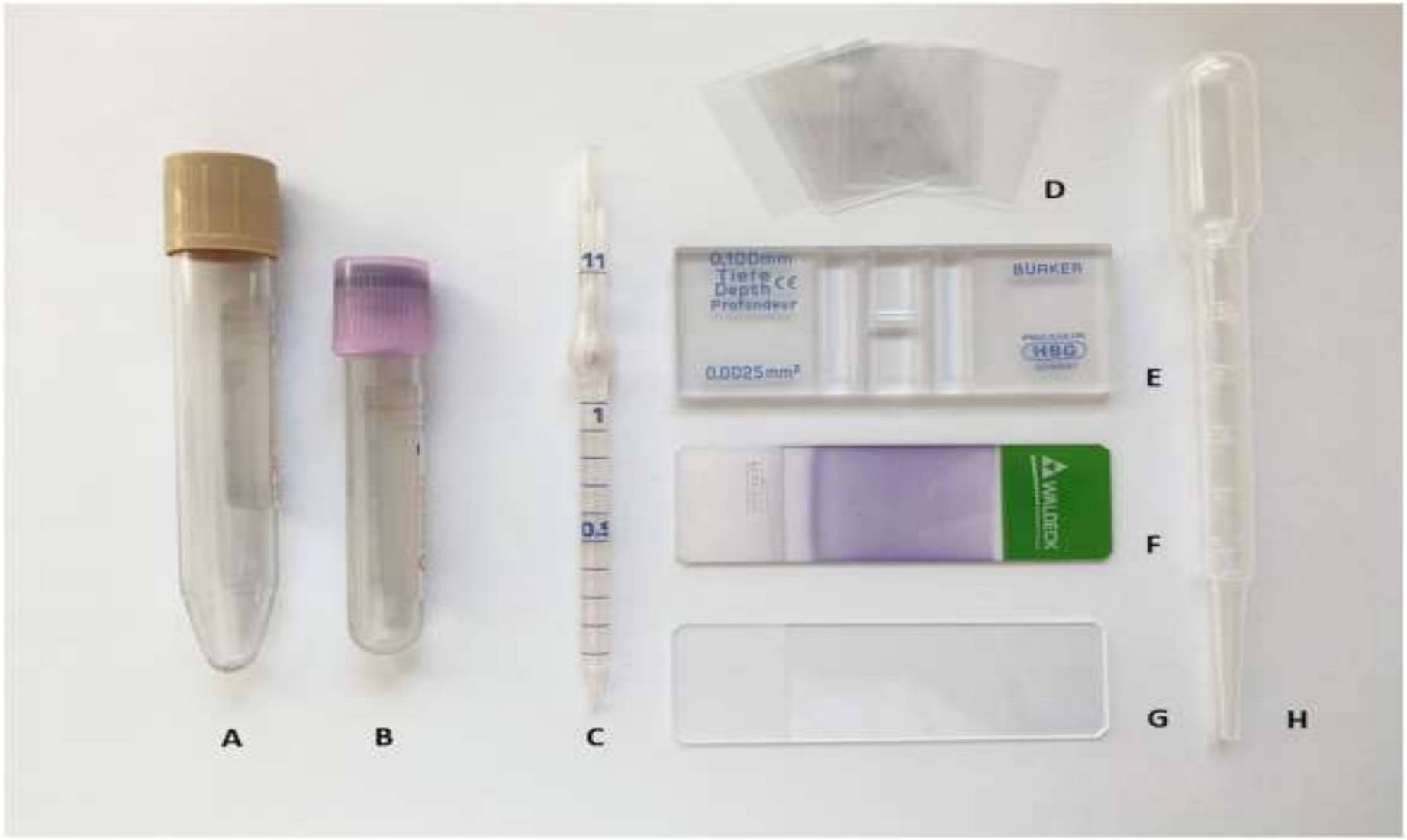
Needle is inserted into the joint, and fluid is withdrawn











Laboratory equipment and disposables required to perform basic SF analysis. A: plain tube; B: EDTA tube; C: WBC counting pipette; D: coverslips; E: hemocytometer; F: pre-stained slide; G: microscope slide; H: plastic pipette.

SYNOVIAL FLUID ANALYSIS

- Synovial fluid (SF) has the advantage of being near the joint tissues, which are primarily altered during these articular diseases. It can be collected with arthrocentesis, a minimally invasive articular procedure [4]. It Can be rapidly examined and provides useful information on the degree of inflammation and cell type involvement, and remains the “gold standard” test for the diagnosis of crystal-induced and septic arthritis

Composition

- Glucose slightly less than blood levels < 10 mg/dl
- Uric acid similar to plasma
- Hyaluronic acid 3-4 mg - viscosity for lubrication
- Lubricin produced by synovial cells - lubricant
- Na, Cl, urea, urate, glucose,
- Total protein and immunoglobulin is 1/2 to 1/4 th that of plasma

Diagnostic importance of Arthrocentesis

- Relief of pressure and pain
- Fasting a minimum of 4-6 hrs and blood sample collected at the same time. To be able to allow the chemical constituents between the plasma and synovium to balance.

ACCREDITATION GUIDELINES FOR THE SF COLLECTION

- Prompt analysis is necessary because delay may lead to false negative results. When SF is removed from the joint, its WBC count decreases with time, and mildly inflammatory fluids with WBC counts up to 6000 cells/mm^3 can decrease to a non-inflammatory range of <2000 cells/mm^3 after only 6 h. ACCURATE NUCLEATED CELL COUNTS ARE CRUCIAL.
- **Tube number 1** - first fluid portion in **NO ANTICOAGULANT** tube to be sent for chemical or immunological evaluation. ANCA etc.
- **Tube number 2** - 2.5 ml in anticoagulant bulb (EDTA) for TLC, DLC, wet preparation and mucin clot and string tests.
- **Blood Culture Bottles** – **best for SF culture**.
- **Tube number 3** - third fluid portion will be placed in an **anticoagulant** tube for microbiology. Even if there is "nothing", send needle to for culture and sensitivity.
- Crystal analysis : **1 ml in a heparin tube ("green top").**
- E. Saline Tube for Cell Count
- **Do not refrigerate**. All 3 tubes to be **immediately transported at room temperature** for analysis as the chemical composition and microbes jeopardised if not tested right away. Delay can cause RBCs & WBCs to breakdown. Refrigeration can adversely affect the microbes and cause changes in the synovial crystals.
- **Use talc free gloves** for sample collection as they can introduce particulates that could interfere with the synovial crystal analysis.

Classification of SF Based on Visual Examination

TEST	NORMAL	Group I Non Inflammatory	Group II Inflammatory	Group III Septic	Group IV Haemorrhagic
VOLUME	< 3.5	> 3.5	> 3.5	**> 3.5**	> 3.5
COLOUR	Clear Colourless	Clear Straw coloured Yellow	Cloudy/turbid Yellow-white **If crystals Cloudy/Milky Dense yellow**	**Cloudy Yellow-green**	Cloudy, Red brown
VISCOSITY	High forms viscous strings of 4-6 cm as HA polymerization	High forms viscous strings of 4-6 cm as HA polymerization	Low	**Low**	Decreased

VOLUME AND COLOUR

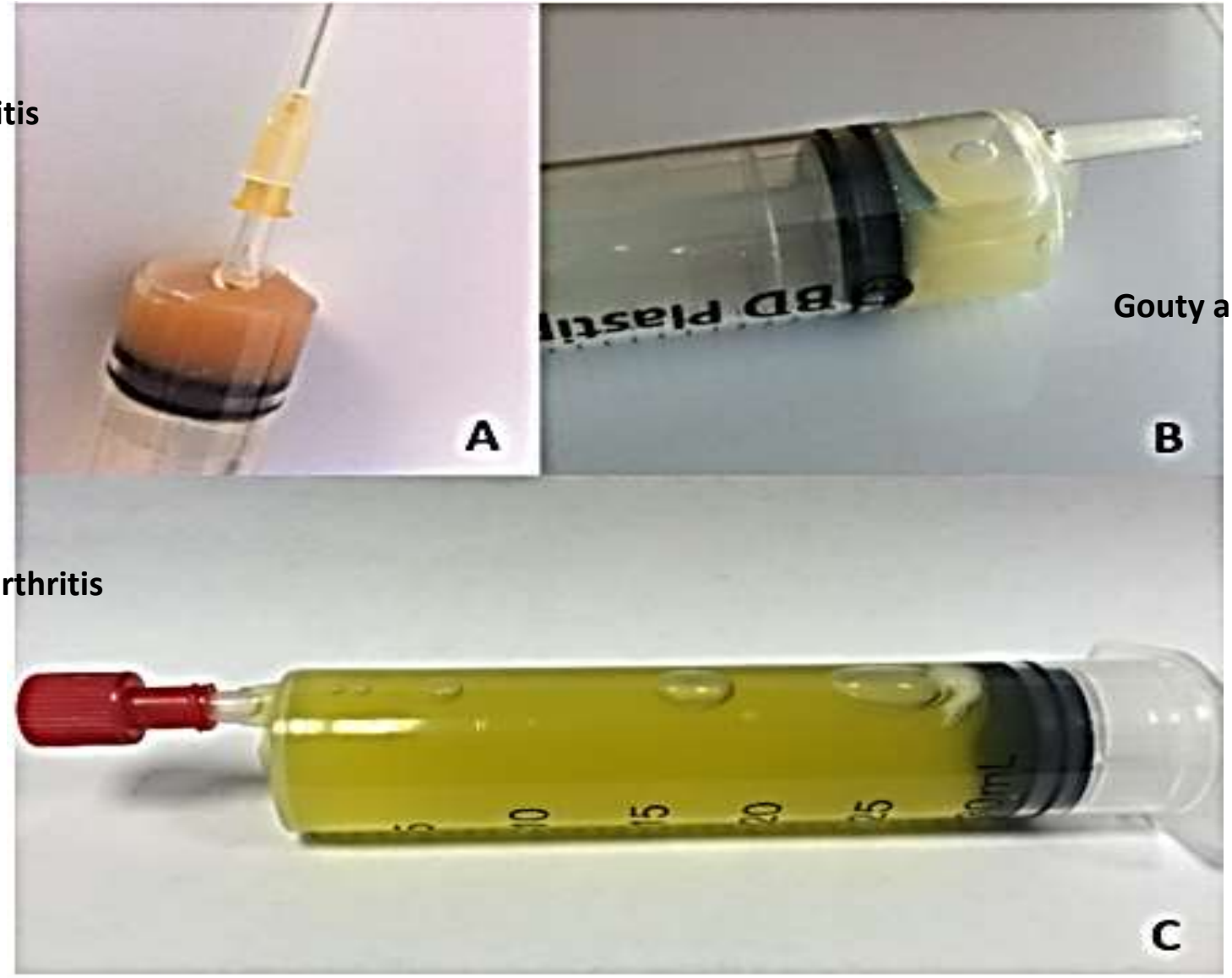
VOLUME - Irrespective of the joint size - The SF VOLUME ↑ during inflammation, due to

- Release of cytokines and endothelial cell activation → Altered synovial membrane permeability.
- SF volume does not correlate with the type of disease, the largest effusions have been observed in **psoriatic arthritis** when compared to other inflammatory and non-inflammatory conditions such as rheumatoid arthritis, crystal arthritis, and osteoarthritis (OA) [5].
- In the case of small joints in the fingers or in the big toe, the most common sites for gout attacks, SF analysis offers important diagnostic information - the presence of diagnostic crystals. Ultrasound guidance for joint aspiration can be extremely helpful [6].

COLOUR -Normal – Colourless to very pale-yellow.

- Inflammation → Due to cells, fibrin fragments, and depolymerized macromolecules the colour becomes intense and varies depending on degree of inflammation.
- Longstanding inflammatory fluids may have a greenish hue due to the presence of white cell myeloperoxidase. Orange to Greenish in septic arthritis
- Milky indicates presence of a large amount of crystals, such as that found in Milwaukee arthritis,
- Unniform red colour in hemarthrosis.
- A xanthochromic color or red streaks may be due to the puncture of small synovial capillaries during the aspiration.

Septic arthritis



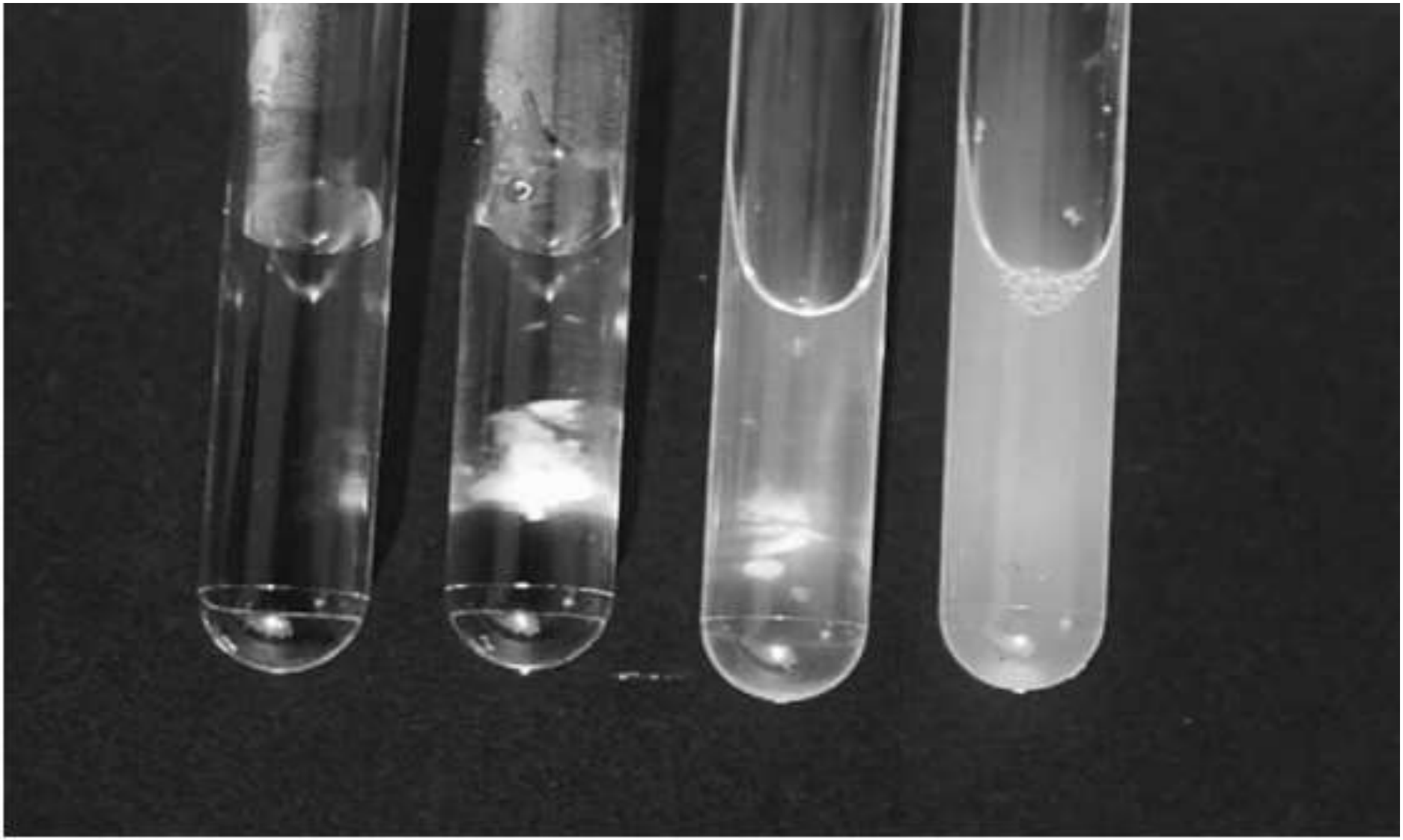
Gouty arthritis

Psoriatic arthritis

Inflammatory SF samples

Color and clarity of SF samples at different degrees of inflammation.

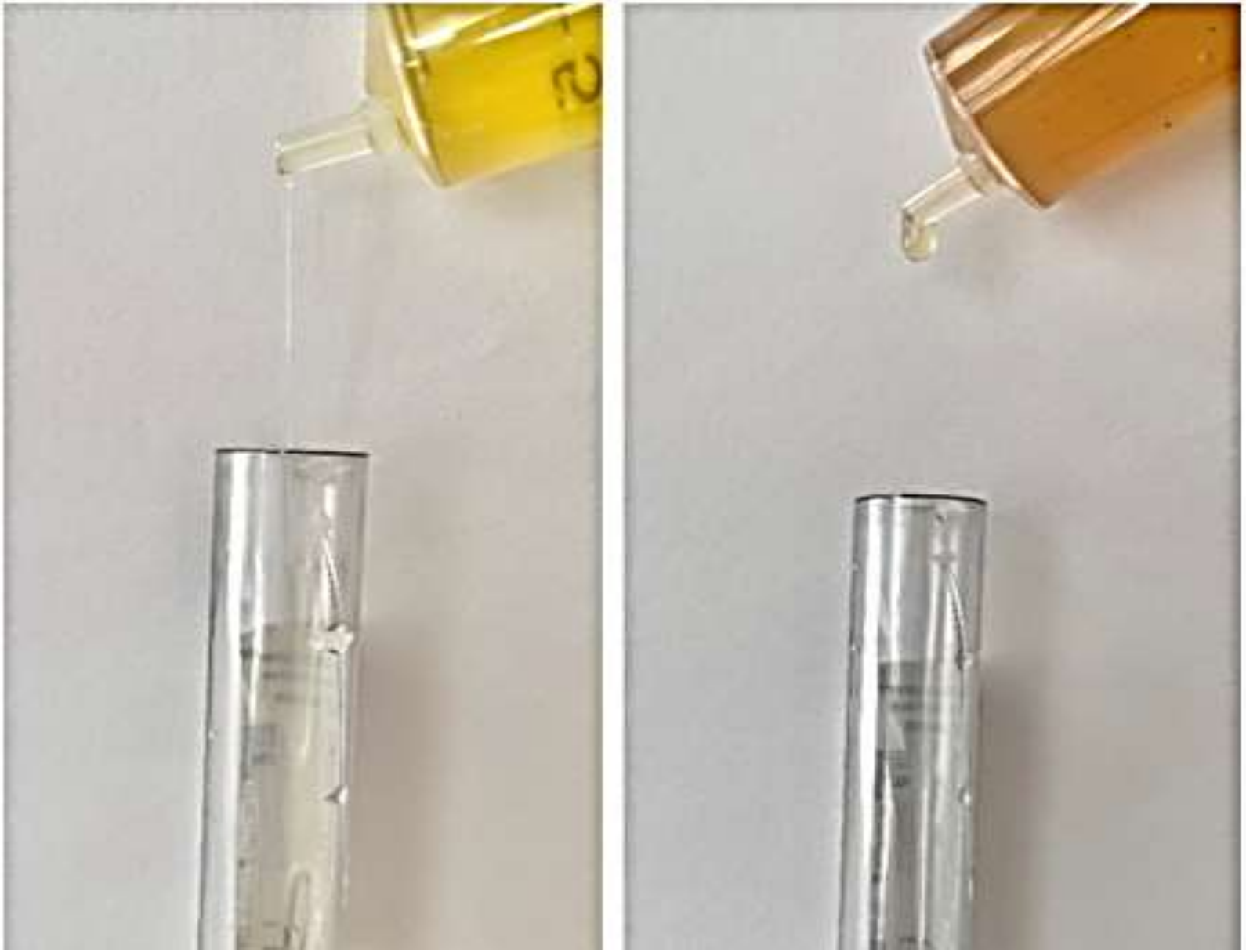
https://www.sciencedirect.com/science/article/pii/S1521694223000347#fig2



Mucin clot test. Hyaluronic acid (HA) content of synovial fluid can be measured semiquantitatively. Drops of synovial fluid are placed in 2.5% acetic acid solution. Tubes (left to right) contain acetic acid solution, tight ropy clot indicating normal HA content, small clot with turbid supernatant indicating reduced HA content, and turbid supernatant with no evidence of clot indicating extremely low HA content

Determination of the colour and clarity of the synovial fluid – the sample is yellow and slightly translucent in NON INFLAMMATORY CONDITIONS

Viscosity test – Place by a drop of the SF between a thumb and index finger and then measure the continuing string
it is low (the string is shorter than 3 cm).



Drop test performed using a fresh SF aspirated from an OA (left panel) and an inflammatory, less viscous (right panel) joint

SF CATEGORIES

Native adult joint synovial fluid analysis

According to the American Rheumatologic Association guidelines

Non-inflammatory <200 to ≤ 2000 WBC/mm^3

Inflammatory > 2000 – ≤ 10,000

Strongly Inflammatory >10,000 to 50,000 WBC/ mm^3

Sepsis > 50,000 WBC/ mm^3

Differential with polymorphic nuclear cells (PMNs)

>75 percent PMNs indicative of bacterial joint infection

[8] ***Ropes MW, Bauer W. Synovial fluid changes in joint disease. Cambridge Massachusetts: Harvard University Press; 1953.***

[2] Zahar A, Lausmann C, Cavalheiro C, Dhamangaonkar AC, Bonanzinga T, Gehrke T, Citak M. How Reliable Is the Cell Count Analysis in the Diagnosis of Prosthetic Joint Infection? J Arthroplasty. 2018 Oct;33(10):3257-3262.

Normal Synovial fluid analysis

Basic tests
Volume/Color/Clarity
Viscosity
pH
Biochemical tests
Protein /Glucose /Lactate /Uric acid
Hematological tests
Total and Differential Cell count
Immunological tests
Rheumatoid factor
Immunoglobulins
Complement
Microbiology
Synovial Fluid Gram Stain and Culture
Bacteria (Anaerobes if arthroplasty)
Mycobacteria, Fungal Culture on tissues
PCR
Crystal analysis of crystals
Uric acid /Calcium pyrophosphate etc.

BSR and ACR guidelines recommend that when assessing patients with a joint effusion gross analysis, PLM, cell counts and microbiological assays are performed. Other tests such as mucin clot test, glucose, protein and pH studies have been shown to be less effective. ***[11 Shmerling RH, et al. Synovial fluid tests. What should be ordered? JAMA 1990;264:1009–14.]***

The ACR committee suggests that unexplained inflammatory fluid, particularly in a febrile patient, is assumed to be infected until proven otherwise

BIOCHEMICAL TESTS OF SOME CLINICAL RELEVANCE

Glucose (SF sample in Sodium Fluoride) -is normally the same as venous glucose in the fasting patient (70 – 110 mg/dL); less than 40 mg/dl (< ½ venous glucose) **Decreased values** -when there are many white cells, especially neutrophils, active in the joint space. **(In septic arthritis, synovial fluid glucose is often more than 40 mg/dL below the venous value).**
- low SF glucose suggests an infected joint, but low levels are present in only 50 % in septic joints and can also occur in *RA*; (**Not an important test –** Wheelss)

Total protein ≥ 3 g/dl The healthy synovial membrane is impermeable to high molecular weight proteins. Its permeability ↑ with progressive inflammation resulting in **higher molecular weight proteins (e.g., fibrinogen)** to pass through the synovial membrane. **The lack of fibrinogen in normal SF is also the reason why no coagulate can form within it. The formation of coagulates occurs in inflammatory processes and an increase in synovial membrane permeability.**

Rheumatoid factor

Rarely elevated only in SF and not in serum, FALSE POSITIVES IN OTHER CHRONIC DISEASES.

Occasionally rheumatoid factor is not present in the blood but may be detected in the SF. For this reason the determination of the rheumatoid factor is diagnostically relevant only if is negative in serum (seronegative RA).

Lactate level increases due to ↑ glycolysis of leukocytes

Classification Of Diseases with joint effusions

GROUP 1. Non inflammatory effusions:

< 200 - 2000 WBC/mm3

PMNs < 25%

- **Osteoarthritis or Degenerative Joint Disease** -most samples contain < 500 cells/mm^3
- **Traumatic joint disease** 200 -1,000 cells/mm^3 - intra-articular bleeding into joint
- **Avascular necrosis** -MRI
- **Osteochondrosis dissicans**-The Wilson's Test +
- **Osteochondroma –** X-Ray
- Rheumatic fever*
- **Myopathy assoc with hypothyroidism** (myxedema)
- **Acromegaly**
- **Arthropathy assoc with hemochromatosis-** Iron Overload tests – S. transferrin saturation > 45%, High ferritin, MRI liver
- **Gaucher's** dis - enzyme assay BGL (beta-glucosidase leukocyte) as low low glucocerebrosidase enzyme activity. • **Arthropathy with ochronosis-Bx** presence of the ochre-colored, banana-shaped fibers in the dermis, urine test for HGA (Homogentisic acid) in joints a musculoskeletal manifestation of alkaptonuria.
- **Paget's disease-** Urine levels of deoxypyridinoline and N-telopeptide are elevated, high ALP, High Ca++ as immobility
- **Arthropathy associated with sickle cell anemia**

*** Can belong to either group 1 or 2**

Joint fluid findings

Typical **joint fluid analysis** findings include:

Colour: straw-like

Clarity: translucent

Viscosity: increased

WBC: 200 – 2000 cells/mm^3

Neutrophils: 25 %

Gram stain: negative

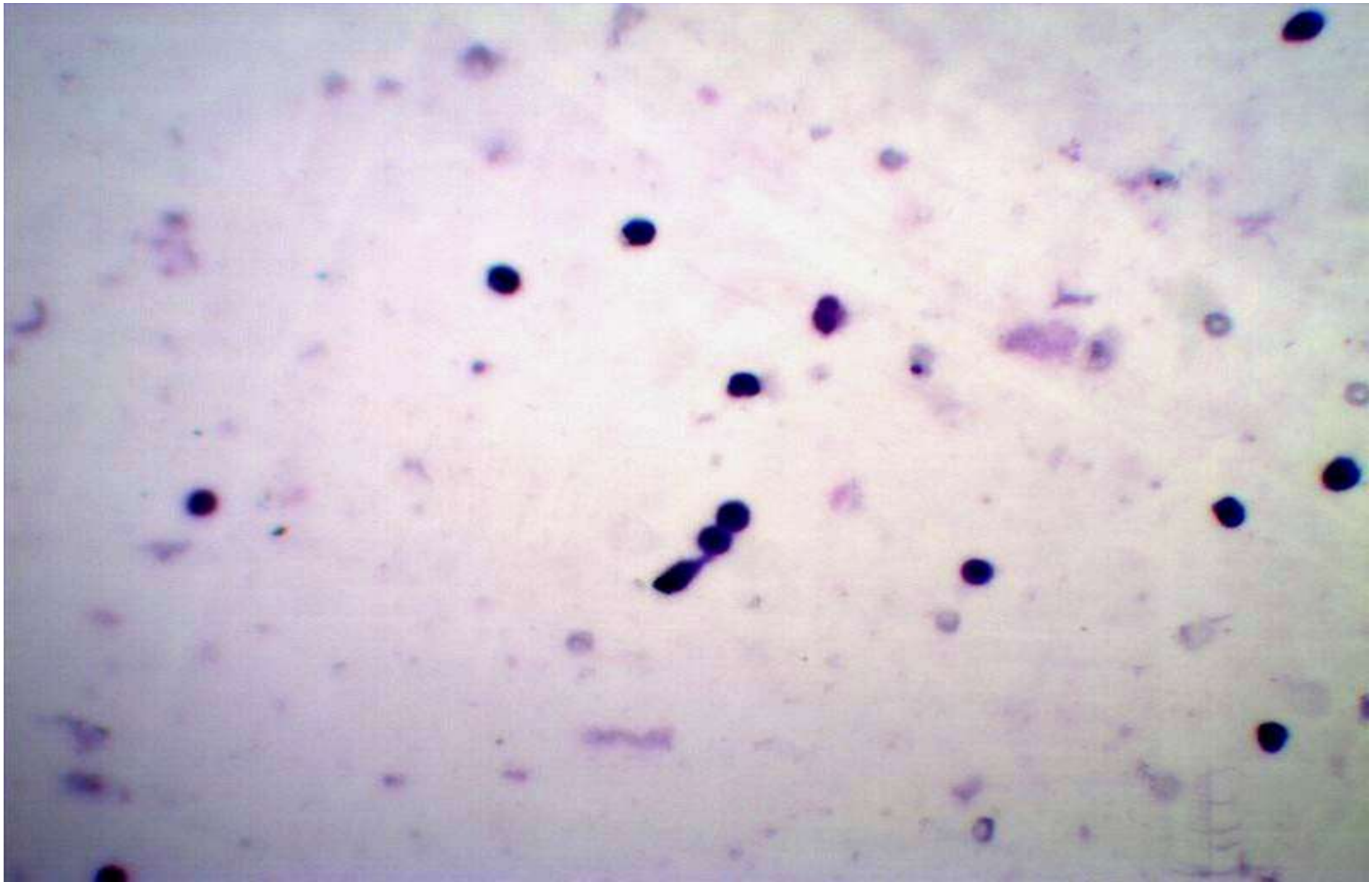
Crystals: negative

CBC, CRP: typically normal.

X-ray of the affected joints: for fractures or other changes consistent with OA.

MRI of the affected joints: To assess for any other pathology.

The ACR committee suggests that unexplained inflammatory fluid, particularly in a febrile patient, is assumed to be infected until proven otherwise by appropriate culture.



Synovial fluid smears showing predominance of lymphocytes. In case of osteoarthritis

Classification Of Diseases with joint effusions

GROUP 2. Inflammatory effusions

Nucleated cell count ≥2000 WBCs per mm^3 is inflammatory in the absence of blood, either as a "bloody tap" or hemarthrosis.

Suspicion of infection increases with increase in TLC

Rheumatoid arthritis - 30,000 cells//$mm^{3,,}$ PMNs < 75%

Crystal induced synovitis

Psoriatic arthritis-ESR, CRP

Reactive arthritides - Reiter's syndr, Enteropathic arthritis, Ulcerative colitis, Arthritis following bact infections (e.g., Yersinia)- Young men

Whipple's dis- Bx Pas+ foamy macro small bowel

Scleroderma Nailfold capillaroscopy for microcirculation

Villonodular arthritis (benign synovioma)- Xray/US Hip, Non-contrast MRI – D/D Amyloid Arthropathy

Vasculitis -X-rays, MRI , CT, BV **Bx-** inflamm,

Charcot's arthopathy- MRI, periph neuro

SLE *

Medication induced SLE –hydralazine, anti-seizure meds, 90% joint s/s (ANA, Anti DS DNA, Anti Smith, Anti RO, ESR, low – platelets/TLC/lymphos

Arthropathy assoc with amyloidosis – amyloid deposition in joints or extra-articular tissues- Congo red stain - **Bx**

Polymyalgia rheumatica- Age > 50, ESR,CRP,MRI

Polychondritis- clinical Diagnosis, polyclonal hyper-gammaglobulinemia,

Sarcoidosis- **Bx** non caseating granulomas

Behçet's synd-Bx - synovium incr vascularity with perivasc lympho infiltration.

Ankylosing spondylitis-HLA B27, X-Ray

JRA _>5 Jts in 1st 6 mths of illness In Child < 16 Yrs. HLA DR4, ANA, ESR, Complement, CRP. RF

Rheumatic fever*Prolonged PR interval, fever, jt pains, ESR>60

Polymyositis* -**Muscle Bx**

•Agammaglobulinemia –low IgG/A/M

•Infective arthritis-

Joint fluid findings:

Colour: yellow- It appears turbid and yellowish in both acute gout and sepsis.

Clarity: cloudy

Viscosity: decreased

WBC: 2000–50,000 cells/mm^3

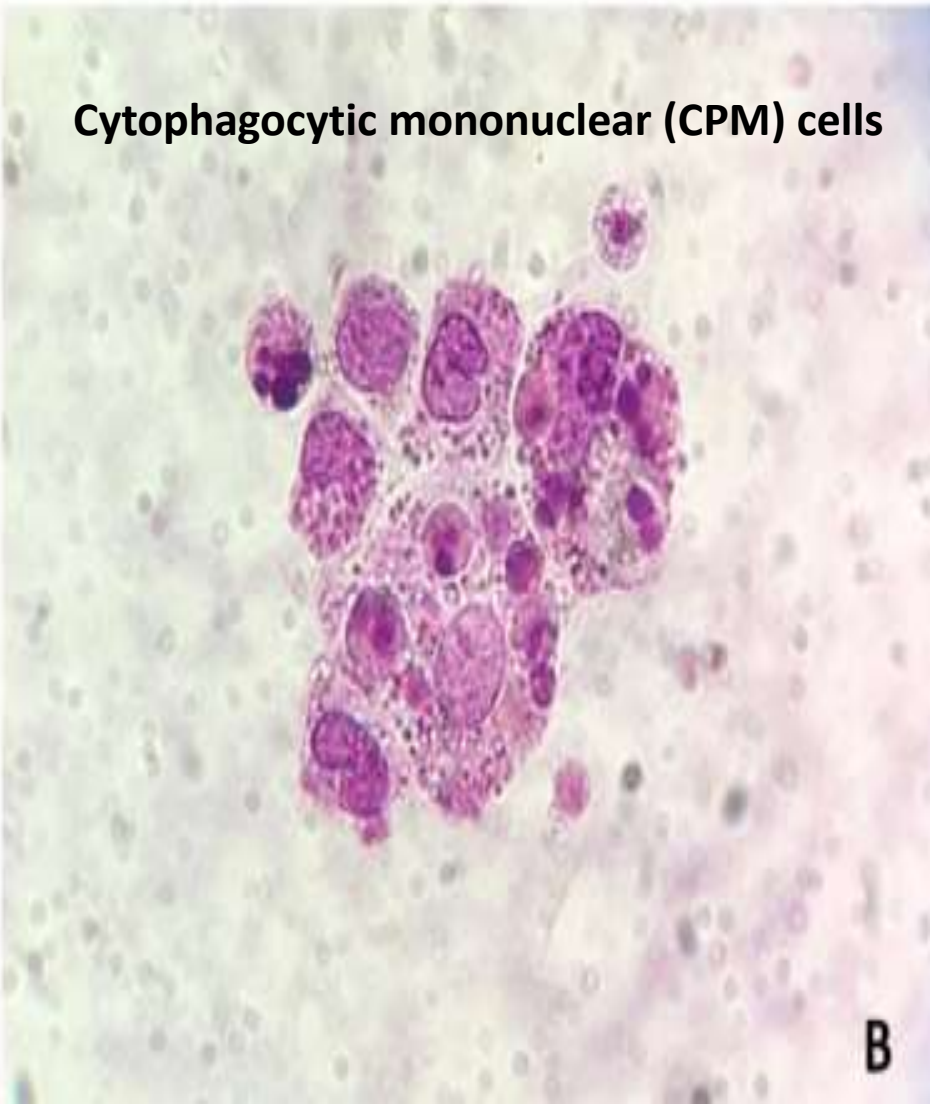
Neutrophils: >50 %

Gram stain: negative

Crystals: positive

Gout – needle shaped negative birefringent crystals

Pseudogout – rhomboid positively birefringent crystals



Cytophagocytic mononuclear (CPM) cells (Reiter's cells) They are apoptotic PMN leukocytes at varying degrees of degeneration. Although with low sensitivity , CPM cells can be found in SERONEGATIVE ARTHRITIS.

TRAUMATIC TAP OR TRAUMATIC HEMARTHROSIS	TRUE HEMORRHAGIC EFFUSION
Hemmorhagic SF is artificial hemorrhagic SF (e.g. due to blood vessel damage during the arthrocentesis). Initially aspiration is clear, but fresh blood appears after some fluid is withdrawn. or Initially the aspiration is bloody and then later clears, blood contamination is likely.	**Fluid remains bloody throughout collection**
Aspirate may have streaks of blood on aspiration	
Generally does coagulate	**Usually fails to clot due to Chronic Fibrinolysis**
SUPERNATANT OF A CENTRIFUGED SAMPLE will disclose typical Straw-coloured Fluid.	**SUPERNATANT OF A CENTRIFUGED SAMPLE appears Xanthochromic (yellow-tinged discoloration) from from Ruptured Red Blood Cells.**
The fluid will typically change color from less to more sanguineous over the course of the procedure,	**Typically reveals joint fluid that is overtly and uniformly sanguineous, with chronicity, the fluid becomes rusty or brown in color.**

Group 3 Disorders With Hemarthrosis & Hemorrhagic Synovial Fluid

Traumatic	Non Traumatic	Post-operative
With **fracture** -Intra-articular elbow # are universally associated with hemarthrosis **Without fracture** -twisting FORCE of the KNEE joint. **Lipohemarthrosis** indicates either a # with intra-articular extension or significant intra-articular soft tissue injury	**Hemorrhagic disease** Hereditary - Classical hemophilia, Coagulation Factor Deficiencies (Bleeding into knee after minimal trauma most common) Acquired - Advanced liver or renal disease, Vit K deficiency, DIC, Anticoagulant Therapy **RARE CAUSES** Chondrocalcinosis Neuropathic - Charcot joint Infectious -Pyogenic arthritis Vascular: Vit. C deficiency, ruptured periph artery aneurysms, OA (degenerative tears of periph arteries) Sickle cell anemia Tumors - Benign - Synovioma, Villonodular, Pigmented Synovitis) Malignant tumour -arising near a joint cavity or metastatic[1][2]	**Post-operative recurrent hemarthrosis** - Frequently associated with total knee arthroplasty and is an an uncommon complication following arthroscopy.[3]

Dougados M. Synovial fluid cell analysis. Bailliere's Clinical Rheumatology 1996; 10:519.
Baker CL. Acute hemarthrosis of the knee. J Med Assoc Ga 1992; 81:301
Worland RL, Jessup DE. Recurrent hemarthrosis after total knee arthroplasty. J Arthroplasty. 1996 Dec;11(8):977-8.

Classification Of Diseases with joint effusions

GROUP 3.
HEMORRHAGIC EFFUSIONS

Caused By

- Hemophilia Or Other Hemorrhagic Diathesis,
- Scurvy,
- Trauma With Or Without Fracture, Neuropathic Arthropathy,
- Pigmented Villonodular Synovitis, Synovioma,
- Hemangioma
- Other Benign Neoplasms

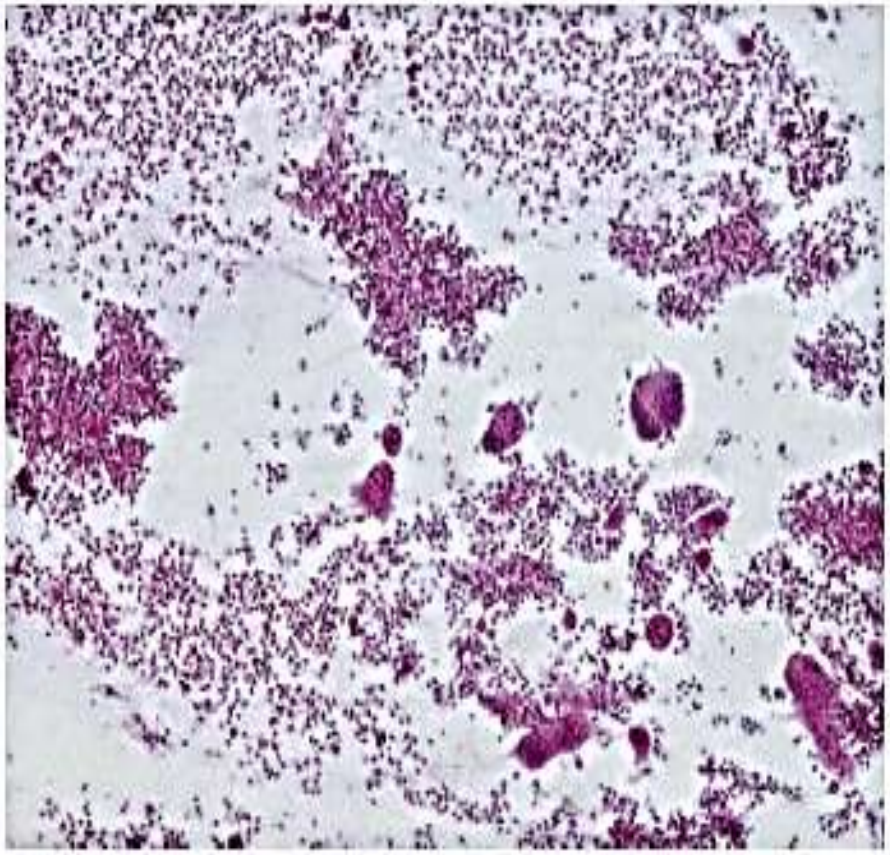
RBCS in the SF suggest recent haemarthrosis or a traumatic tap.
Haemarthrosis is likely if frank blood which does not clot is present following a traumatic aspiration
Lipohemarthrosis : marrowfat leakage into SF, Fat globules alone not diagnostic
Hemarthrosis and hemorrhagic SF

Hemmorhagic SF is artificial hemorrhagic SF (e.g. due to blood vessel damage during the arthrocentesis). Hemorrhagic SF is relatively easy recognizable by the fact that there are streaks of blood.

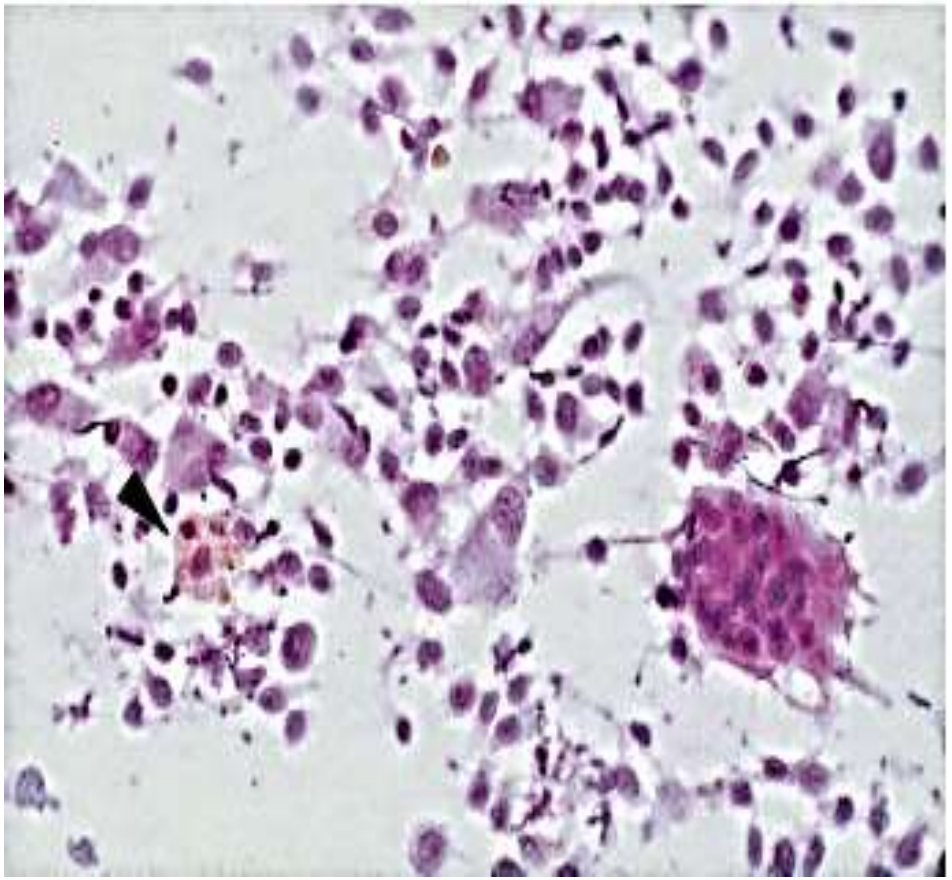
Joint fluid findings
Colour: red/xanthochromic
Clarity: bloody
Viscosity: variable
WBC: 200-2000 mm^3
Neutrophils: < 25%
Gram stain: negative
Crystals: negative

Further investigations
Hb may be low if bleeding was significant
Coagulation studies: may reveal impaired coagulation
X-ray of the affected joint: may identify associated fractures in the context of trauma

The prevention of early onset osteoarthritis as a result of blood inducing damage on cartilage should be one of the goals in management of traumatic hemarthrosis (Nikhil Potpally et al Cartilage. 2021 Dec; 13(1 Suppl): 116S–121S)



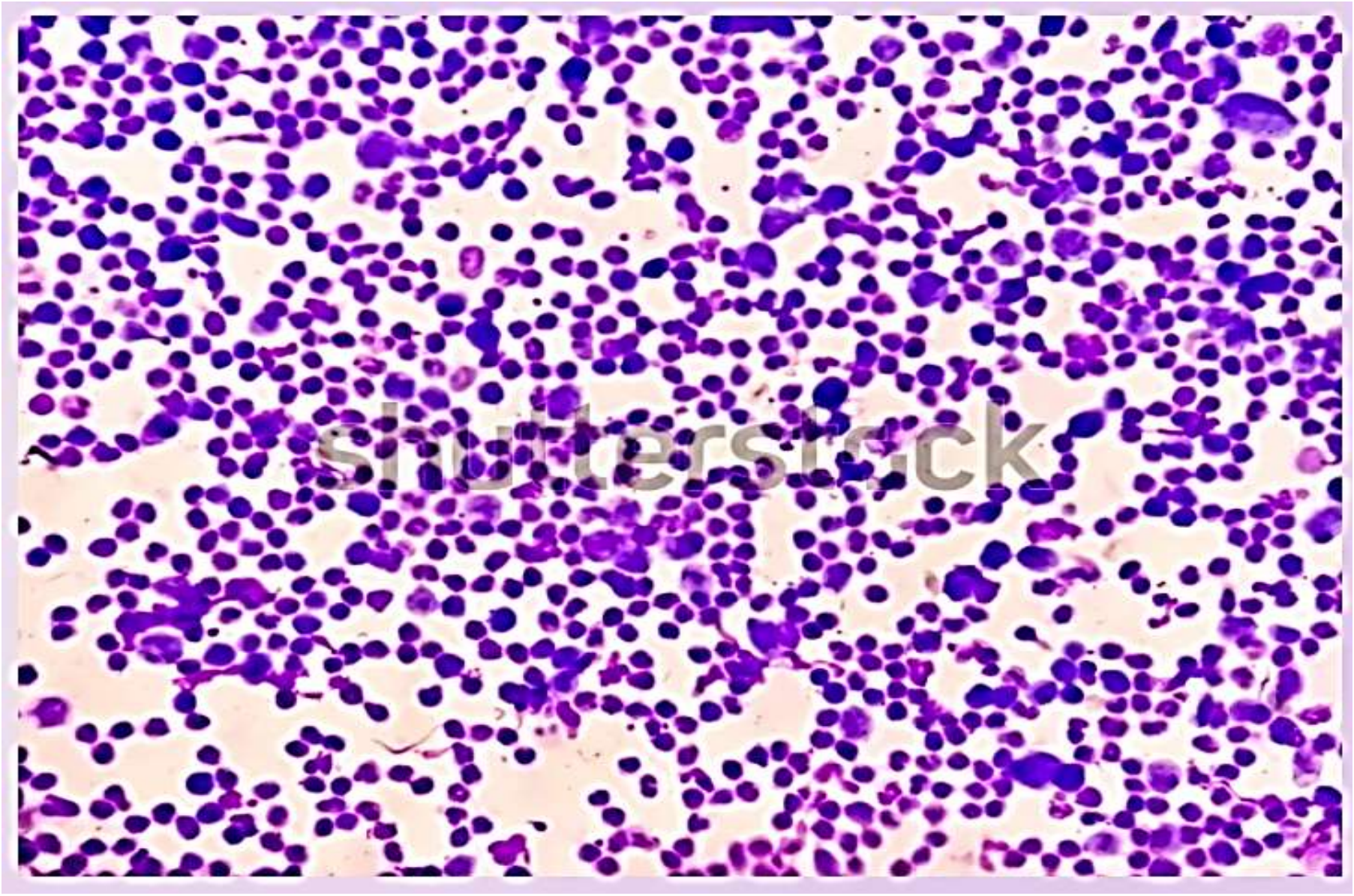
Low-power view of a very cellular aspirate of pigmented villonodular synovitis



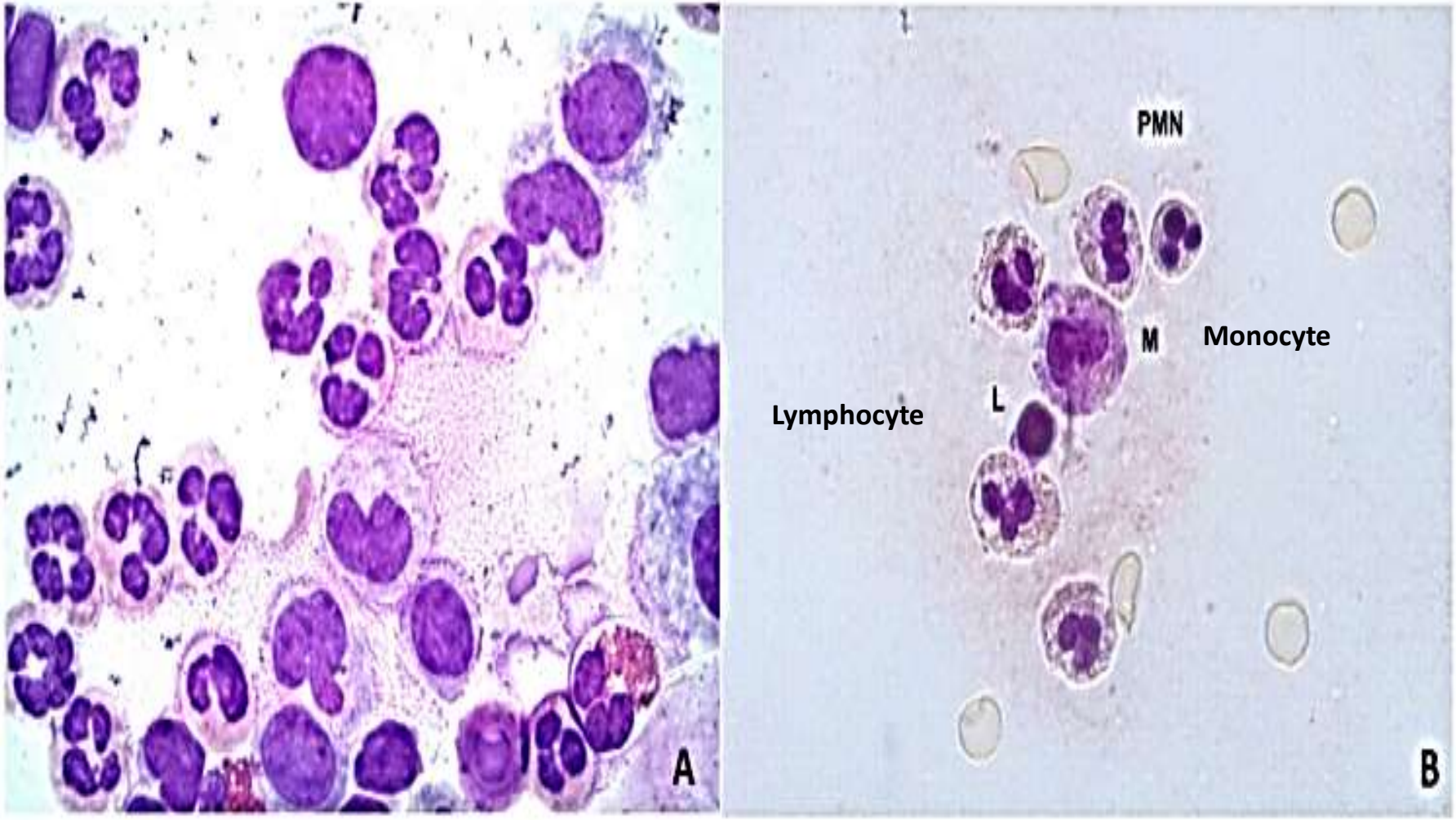
High-power view of pigmented villonodular synovitis showing numerous histiocytes, a giant cell, and some inconspicuous golden pigment -(arrowhead)

Pigmented Villonodular Synovitis - Locally aggressive synovium tumor of the hand (swelling of tendon sheath) or knee (effusion), **usually affecting only a single joint , characterized by joint effusions**, expansion of the synovium, and bony erosions. **PVNS is the intra-articular form of tenosynovial giant cell tumor**
Presents in pts 30 to 40 yrs old with recurrent atraumatic knee hemarthrosis.

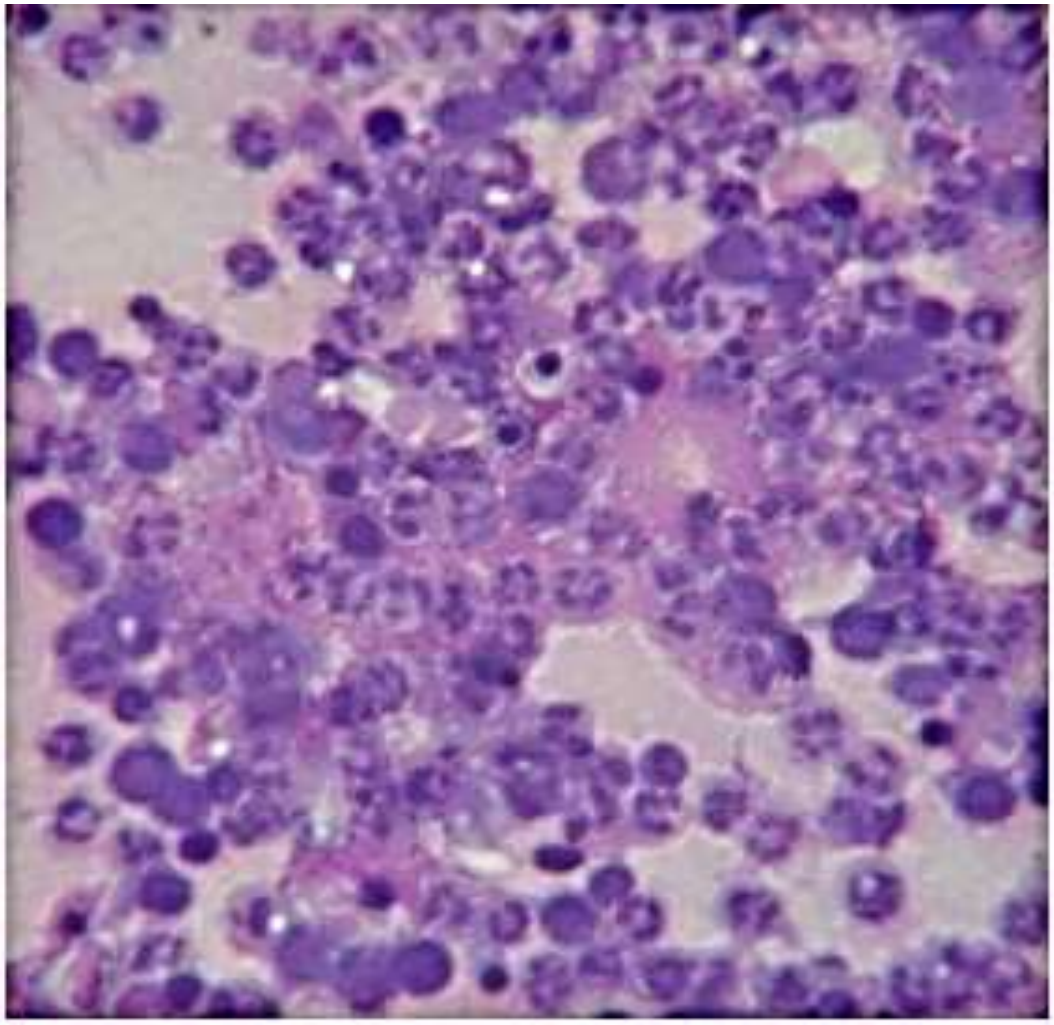
Arthrocentesis revealing a brown fluid, and biopsy revealing hemosiderin-stained multinucleated giant cells.



Synovial Fluid Cytology: Plenty WBC, microscopic examination of synovial fluid, predominance of neutrophils seen case of S**eptic arthritis or Crystal-induced arthritis.**



Differential cell count



Few mononuclear cells and lots of neutrophil granulocytes - (Crystal associated and Bacterial (Septic arthritis)

NON-CRYSTALLINE PARTICLES

Ragocytes or (rheumatoid arthritis cells) first described in RA. Are characterized by the presence of pale green to olive green refractile granules in the cytoplasm, larger than conventional granulocyte granules. In RA which they have been shown to contain immune complexes - immunoglobulin, rheumatoid factors, fibrin, and antinuclear factors and their size varies between 0.20 and 0.33 µm.

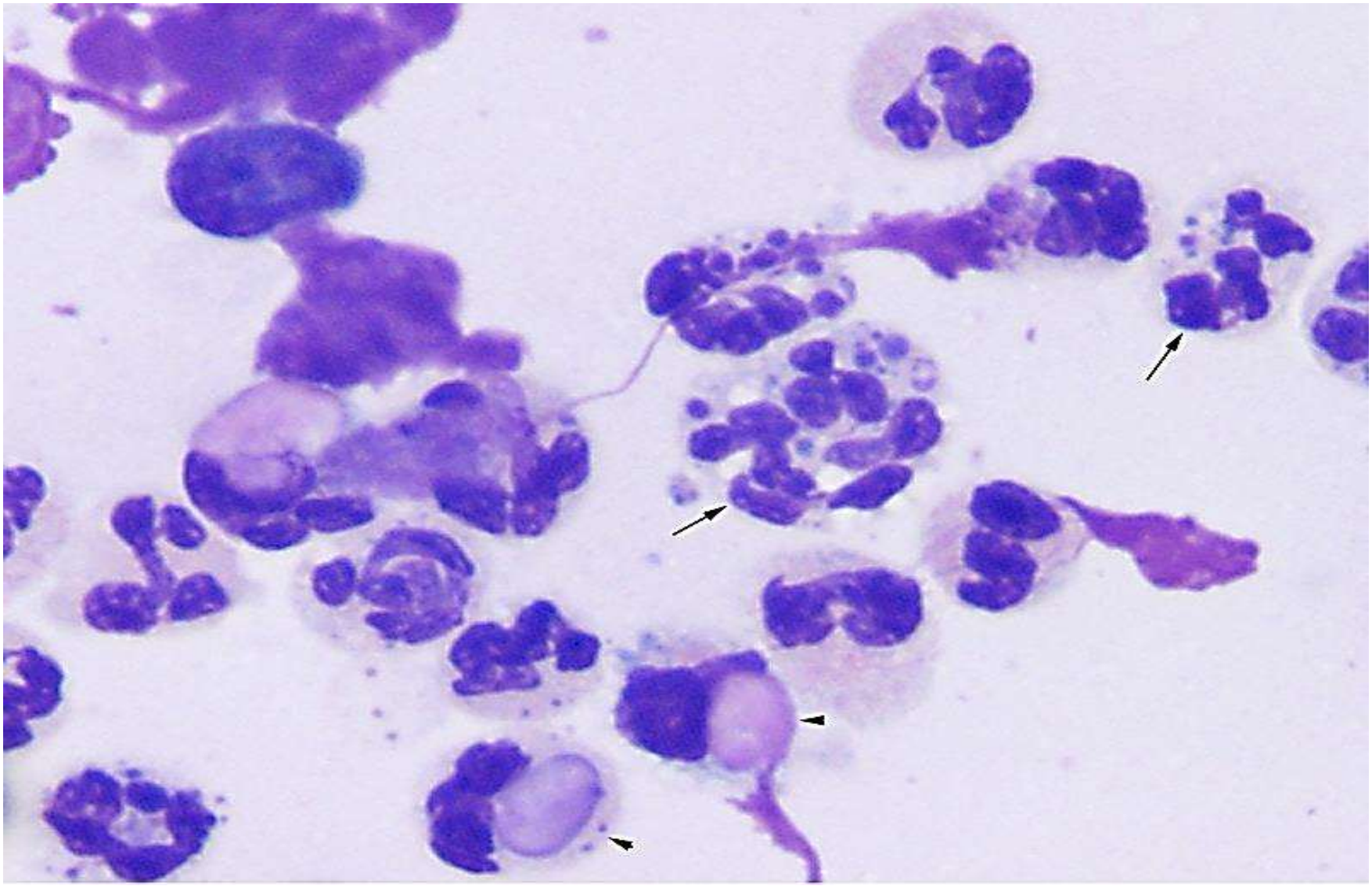
A **constant feature of all inflammatory arthropathies, so diagnostic value is somewhat limited.**

However, with the exception of RA, septic arthritis, gout and pseudogout**, ragocytes rarely account for more than 50% of all nucleated cells,** they are found in seropositive RA (20–90%) and also in cases of septic arthritis and acute crystal induced arthritis

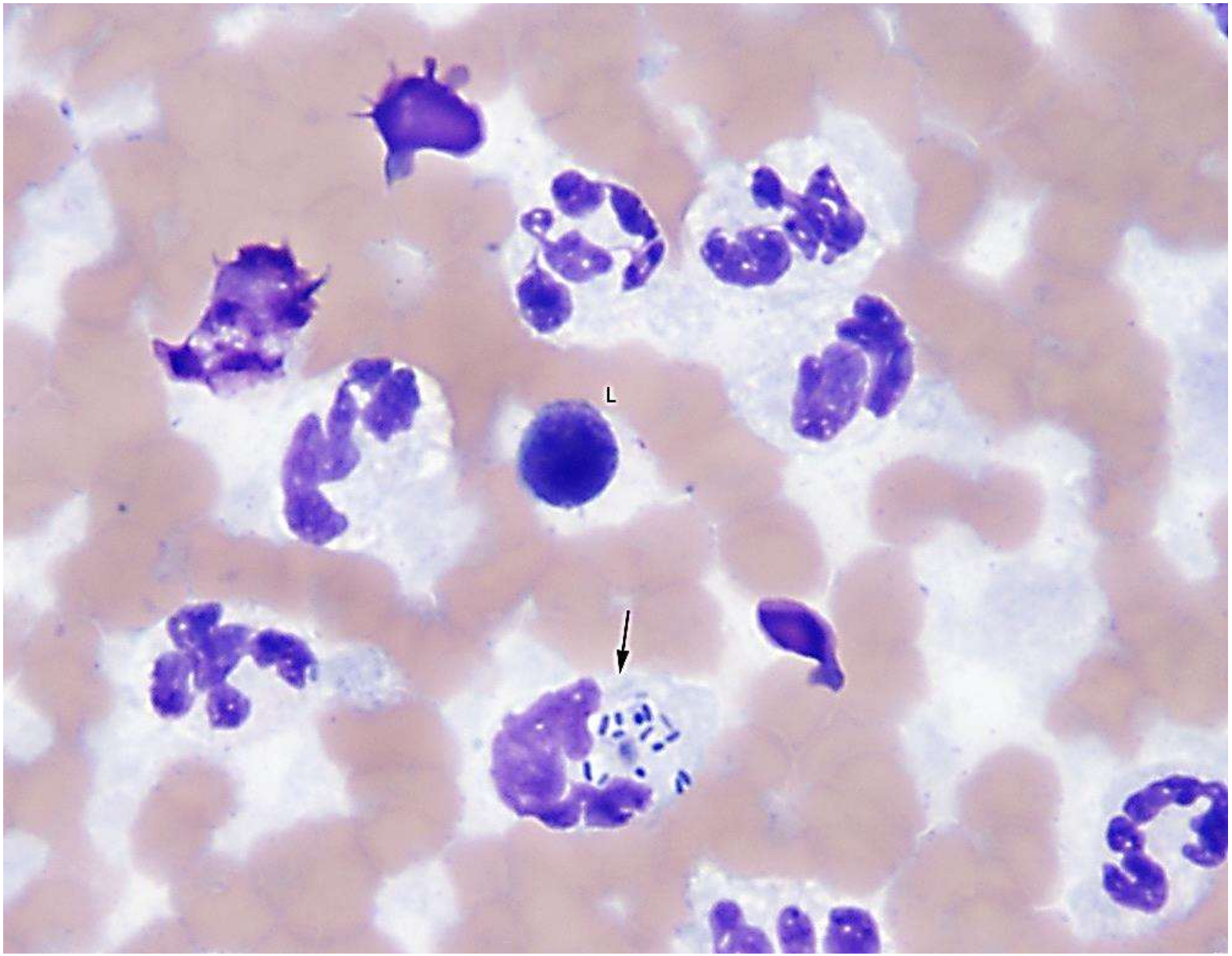
If a crystal arthropathy is excluded, ragocyte counts above 70% are diagnostic of RA, and above 90%, of septic arthritis.

If septic arthritis and acute crystal arthritis have been excluded finding of > 60% ragocytes in the SF indicates that the patient has, had, or may develop seropositive RA *[12 Freemont AJ, Denton J. Atlas of synovial fluid cytopathology. Current Histopathology, Vol 18. Dordrecht: Kluwer, 1991].*

Ragocytes >90% in Septic arthritis is diagnostic even in the absence of detectable organisms.



Direct smear of a joint fluid : numerous neutrophils containing purple to dark blue particulate material in their cytoplasm (presumably nuclear fragments or nuclear antigen:antibody complexes) (arrows). These cells are called "ragocytes". Some classic lupus erythematosis (LE) cells are also seen. The latter are neutrophils which contain large light purple homogenous nuclear material in their cytoplasm (displacing nuclei to the periphery) (arrowheads).



Septic inflammation There are increased numbers of non-degenerate neutrophils in this blood-contaminated joint fluid sample. Bacteria are phagocytized within a mildly degenerate neutrophil (arrow). Low numbers of lymphocytes (L) are seen.

NON-CRYSTALLINE PARTICLES

- Most common are **fragments of articular cartilage** or, particularly in the knee, internal ligament and meniscal fibrocartilage.
- With the advent of prosthetic surgery and particularly as the number of aging prostheses increases, wear of implanted material leads to the presence of foreign material within the joint mimics crystals if they fragment and can cause diagnostic problems.
- **Although difficult to recognize, these may be important harbingers of imminent prosthetic failure.**

Classification of SF Based on Laboratory Examination

TEST	NORMAL	Group I Non Inflammatory	Group II Inflammatory	Group III Septic	Group IV Haemorrhagic
VOLUME	< 3.5	> 3.5	> 3.5	**> 3.5**	> 3.5
COLOUR	Clear Colourless	Clear Straw coloured Yellow	Yellow-white	**Yellow-green**	Red brown
VISCOSITY	High	High	Low	**Low**	Decreased
WBC Count cells/µl	<200 mostly mononuclears	< 2,000 Counts are<500 in DJD	>2,000-50,000	**50,000- >200,000**	<5000
Neutrophils	<25%	<25%	>50% - <75%	**>90%**	>25%
Glucose	Approx = to plasma level	Approx = to plasma level	< plasma level	**< plasma level**	Approx = to plasma level
Culture	Negative	Negative	Negative	**OFTEN POSITIVE**	Negative
Associated diseases		OA, Osteochondritis, Traumatic Arthritis, Neurorthropathy	RA, Gout, Crystal Arthritis, Reactive Arthritis, SLE	**Bacterial, fungal, mycobacterial infections**	Trauma, Tumour, Prosthesis, Bleeding disorders

Classification of Synovial Effusions

Examination	Normal	Non-inflammatory	Inflammatory	Infectious Septic	Hemorrhagic Traumatic
Appearance & Colour	Clear Colourless	Clear Straw-colored,	Cloudy Yellow	Turbid / purulent Yellow Green	Turbid Bloody,
Viscosity	High	High	Low	Low	Variable
PMN %*	< 25%	< 30%	>50% - <75%	Often > 90% despite lower TLC Can be > 75%	50 - < 5000
WBC count*	60 - < 200 mostly mononuclear cells	200 to <2000 <500 in DJD	>2000 to 50,000	50,000 to 2,00,000	Affected by amount of blood
Culture	Negative	Negative	Negative	Often positive	Negative
Crystals	Negative	Negative	Possible	Negative	Negative

Effusions containing > 100,000 leukocytes per cubic ml are septic, this is more a guideline than a rule.

*WBC count and PMN % in infectious arthritis are lower **if organism is less virulent** (eg, in gonococcal, Lyme, tuberculous, or fungal arthritis) **or partially treated**. Some effusions in SLE and other connective tissue diseases are only equivocally inflammatory, with a WBC count of 500 to 2000/µL.

CLASSIFICATION OF SF FINDINGS IN VARIOUS DISORDERS

Group & Category	Visual	Viscosity	Mucin clot Grade	Cell count WBCs AND PMNs	Others
I Normal	Clear Colour less,	High	Good	< 200 WBCs, < 25% PMNs	
II Non inflammatory	Yellow, slightly Cloudy	Decreased	Fair	<2000 WBCs, < 30% PMNs	
III Inflammatory	White, cloudy, turbid, opaque	Absent	Poor	<50,000 WBCs, <50% <75% PMNs	
IV Septic	**Purulent Yellow, Green Turbid**	**Absent**	**Poor**	**50,000 to 2,00,000 WBCs > 90% PMNs *****	**Positive cultures**
V Crystal induced	**Cloudy, turbid, opaque, milky**	**Absent**	**Poor**	**50,000 to 2,00,000 WBCs < 90% PMNs *****	**Crystals present**
VI Haemorrhagic	Red, brown xantho chromia	Absent	Poor	50 – 5,000 < 50% PMNs	RBCs present

Monoarthritis

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A joint working group established between the British Society for Rheumatology and the Research Unit of the Royal College of Physicians devised the present guidelines

Potential major diagnoses

1. Septic arthritis - less common than gout, predisposing factors RA, a prosthetic joint, IV drugusers
2. Gout - middle-aged men
3. Pyrophosphate crystal deposition disease (pseudogout) in elderly , diuretic-induced gout, which is often seen in females
4. Traumatic synovitis and mechanical problems (including joint problems after a fracture)
5. Haemarthrosis
6. Reactive arthritis - common in the young, especially in young men
7. Monoarticular onset of a subsequent inflammatory polyarthritis

Investigations –

- SF Aspiration fluid if possible [9, 10]. Knee joints easy to aspirate, metatarsophalangeal joint, is difficult and successful aspiration may be unlikely.
- Microscopy, including polarising microscopy, of synovial fluid
- Gram stain and culture of synovial fluid
- Blood culture, CBC, ESR, CBC,
- Joint X-rays

Challenges and Limitations of SF Analysis

Products of normal or abnormal joint metabolism will be in dynamic equilibrium with the serum and dependent complex set of variables such as the hydrostatic and osmotic gradients across the joint, so that isolated single estimations of a product in the SF are not easy to interpret. The peripheral WBC, ESR, and jWBC (Joint fluid WBC) are extremely variable in adults with septic arthritis. Laboratory tests do not rule out septic arthritis with accuracy.

Lack of availability of normal SF for comparison with disease samples.

Measuring drug levels and antibodies, proved to be of limited value diagnostically.

The greatest problems in diagnosing septic arthritis are recognizing Gram-negative organisms and organisms rendered Gram negative by incomplete antibiotic therapy, and distinguishing contaminating organisms from true pathogens.

Magnitude of potential overlap between the synovial fluid leukocytosis in infected joints and in joints afflicted with other forms of inflammatory arthropathy.

Patients with only a moderate synovial fluid leukocytosis, especially those potentially immunocompromised, must be considered to have infectious arthritis unless other causes of inflammatory arthropathies are demonstrated.