INFECTIOUS DISEASES

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EFCS
European Federation of Cytology Societies

Deutsche Gesellschaft für Zytologie 1960



ECC 2024

45th European Congress of Cytology

Cytopathology
The clinical interface

Leipzig

23-26 June 2024

- Name of the speaker: Prof Nalini Gupta

- Financial relationships: Nil
- I will not discuss off label use or investigational use in my presentation.

Bright Red Baccilli on Ziehl-Neelsen staining: Tuberculosis & its differentials

Prof Nalini Gupta, MD, DNB, MNAMS
Department of Cytology and Gynecological Pathology
Postgraduate Institute of Medical Education and Research, Chandigarh



Ziehl-Neelsen staining



Franz Ziehl
Bacteriologist



Friedrich Carl Adolf Neelsen
Pathologist

In reality the Ziehl-Neelsen technique is based on the work of at least five people: Koch, Ehrlich, Rindfleisch, Ziehl, and Neelsen. So the correct name should be: Koch-Ehrlich-Rindfleisch-Ziehl-Neelsen method, a name which stands little chance of being used in practice. In some ways it seems justified to continue using the well-known name 'Ziehl-Neelsen method'. The publications

P. J. BISHOP G. NEUMANN **THE HISTORY OF THE ZIEHL-NEELSEN STAIN** *Tubercle, Lond.*, (1970), **51**, 196

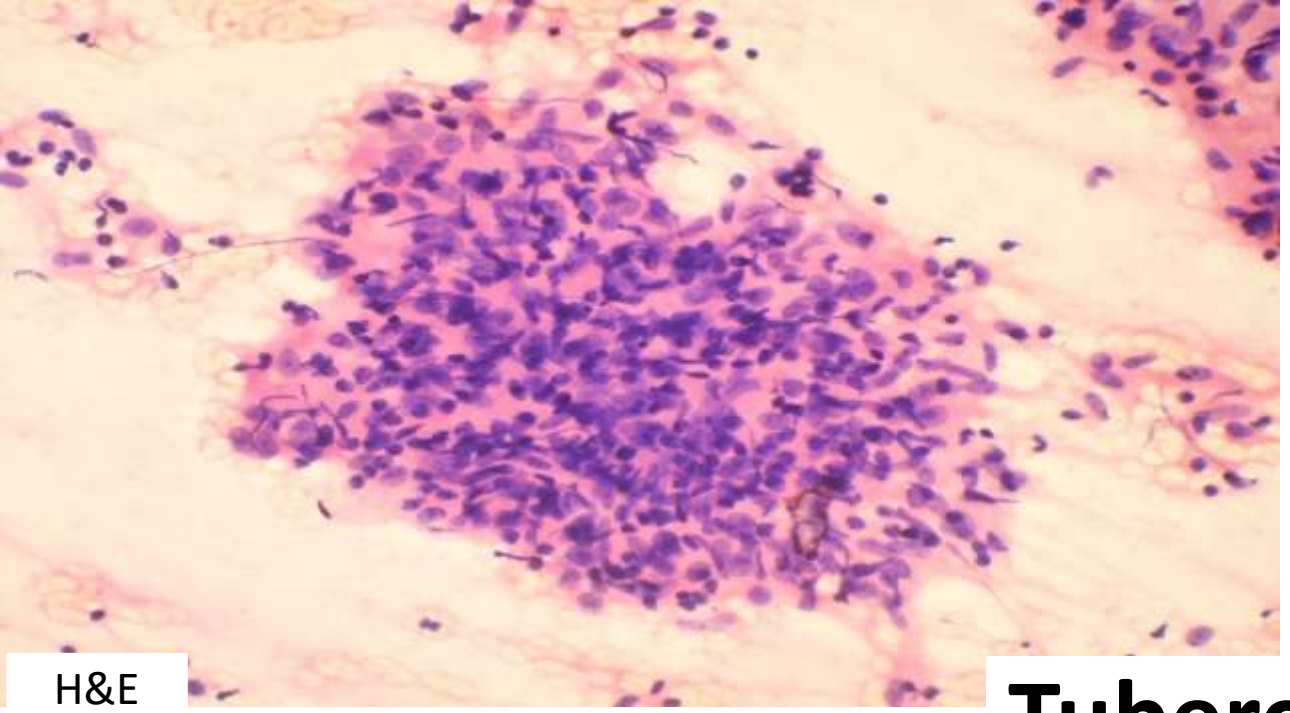
Acid-fastness

- It is a physical property that gives a bacterium the ability to resist decolorization by acids during staining procedures
- A unique feature of certain bacteria like *Mycobacterium tuberculosis*
- Are there other bacilli or structures which are acid-fast on ZN staining?

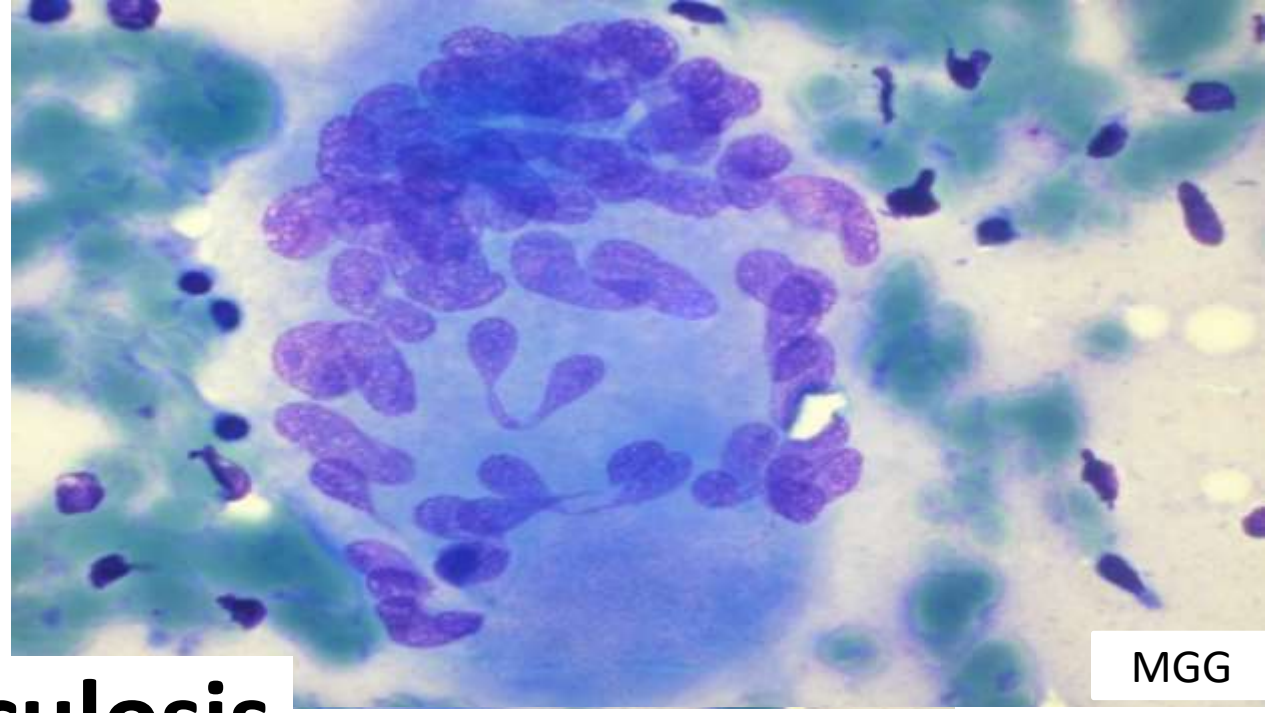
Case 1

- 29 F
- Cervical LN
- Left cervical lymph node
- H/O Fever on and off x 5 months
- LOA and LOW

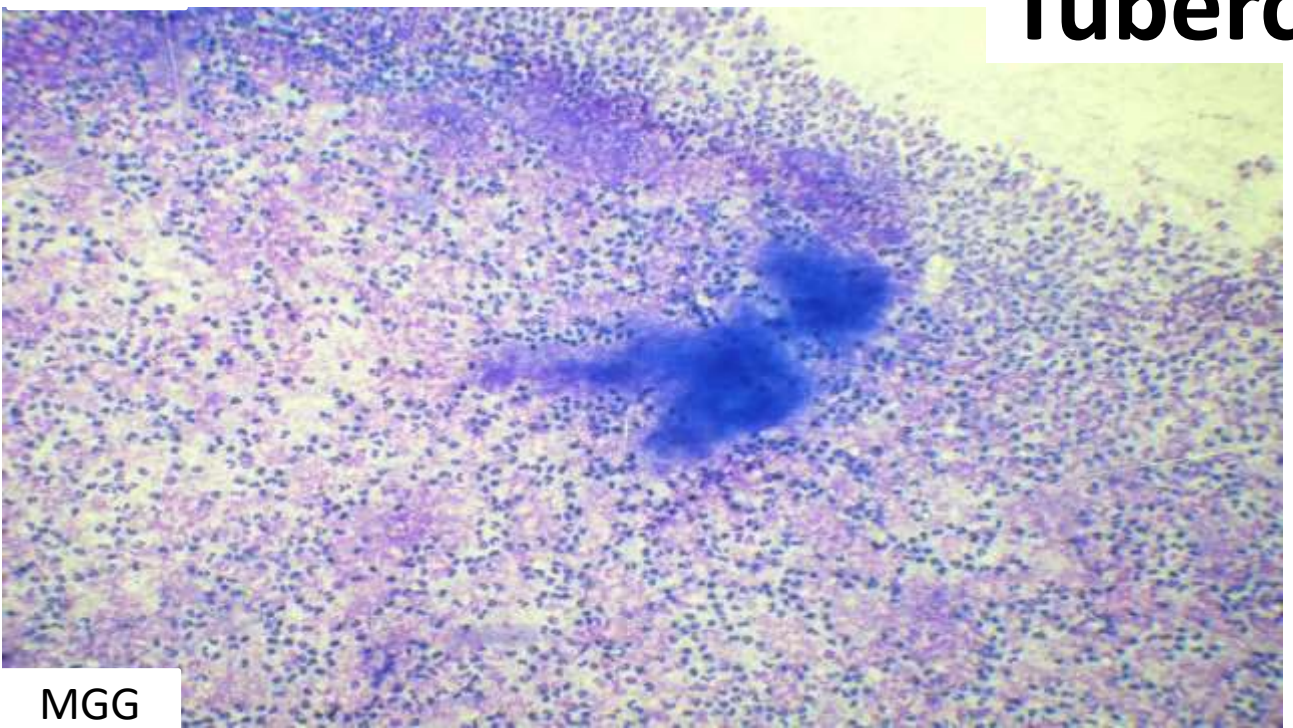
Tuberculosis



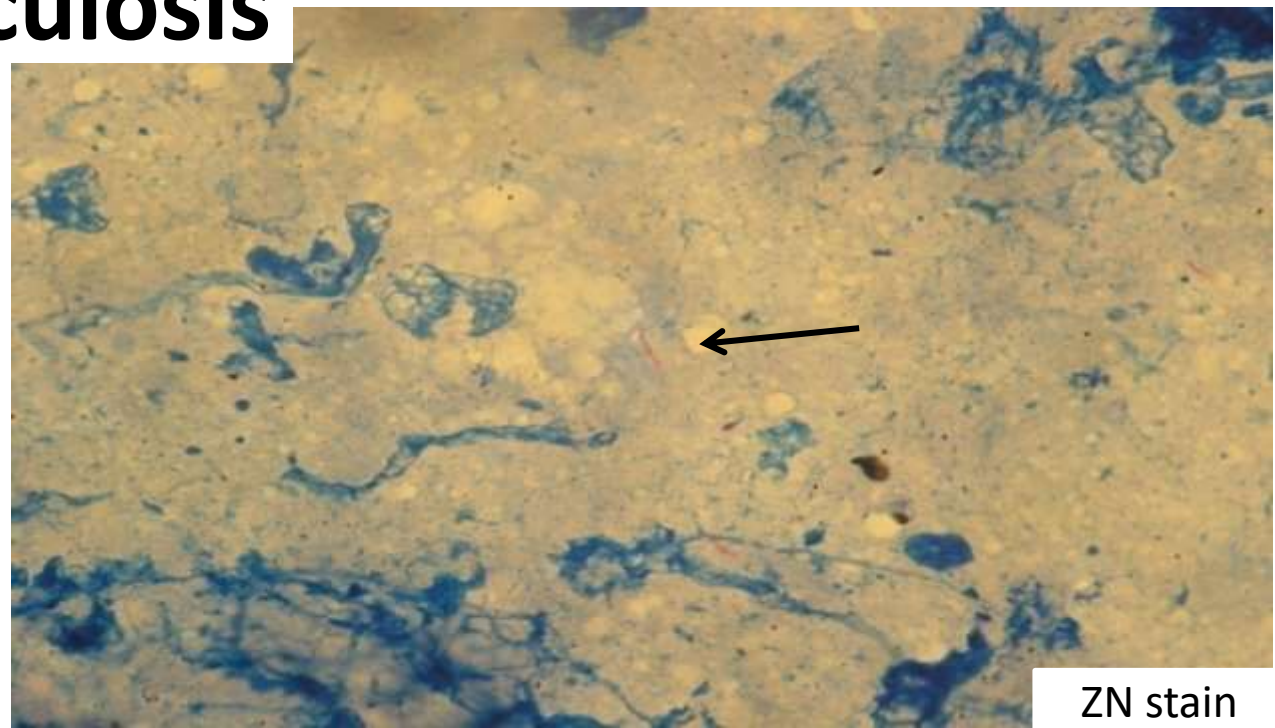
H&E



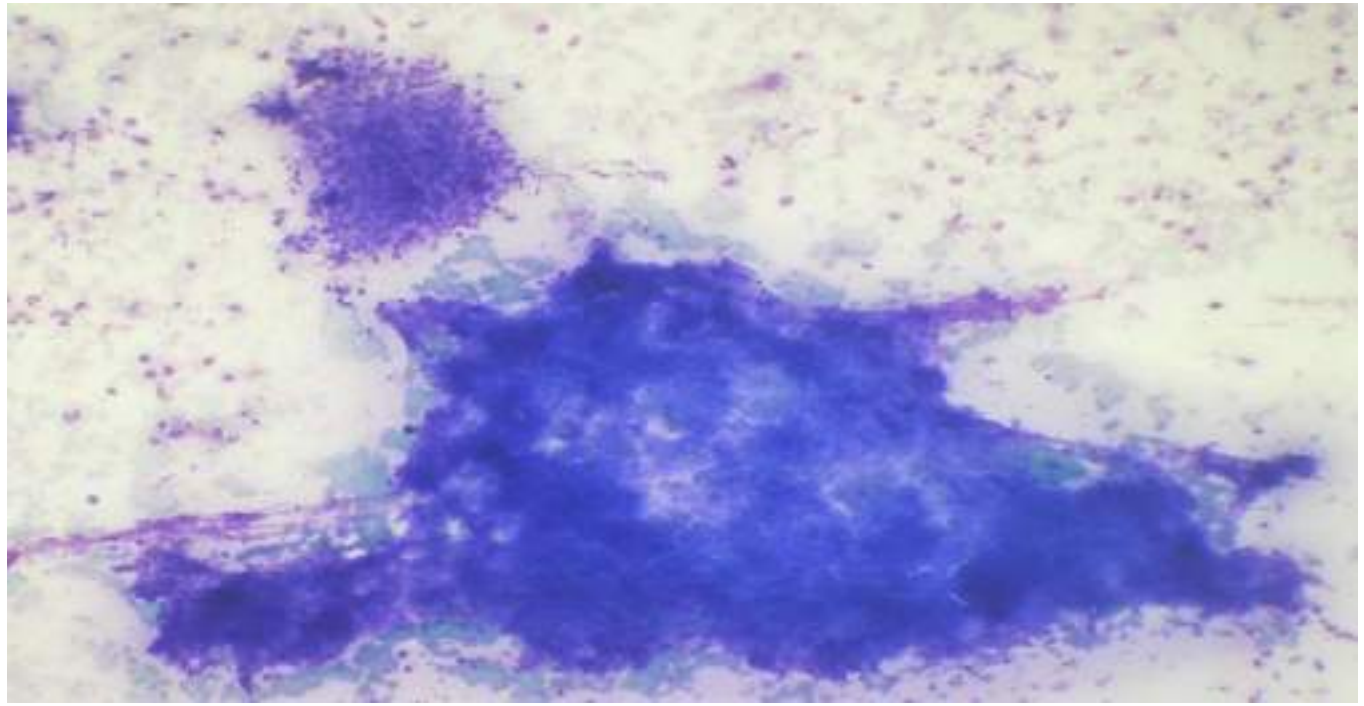
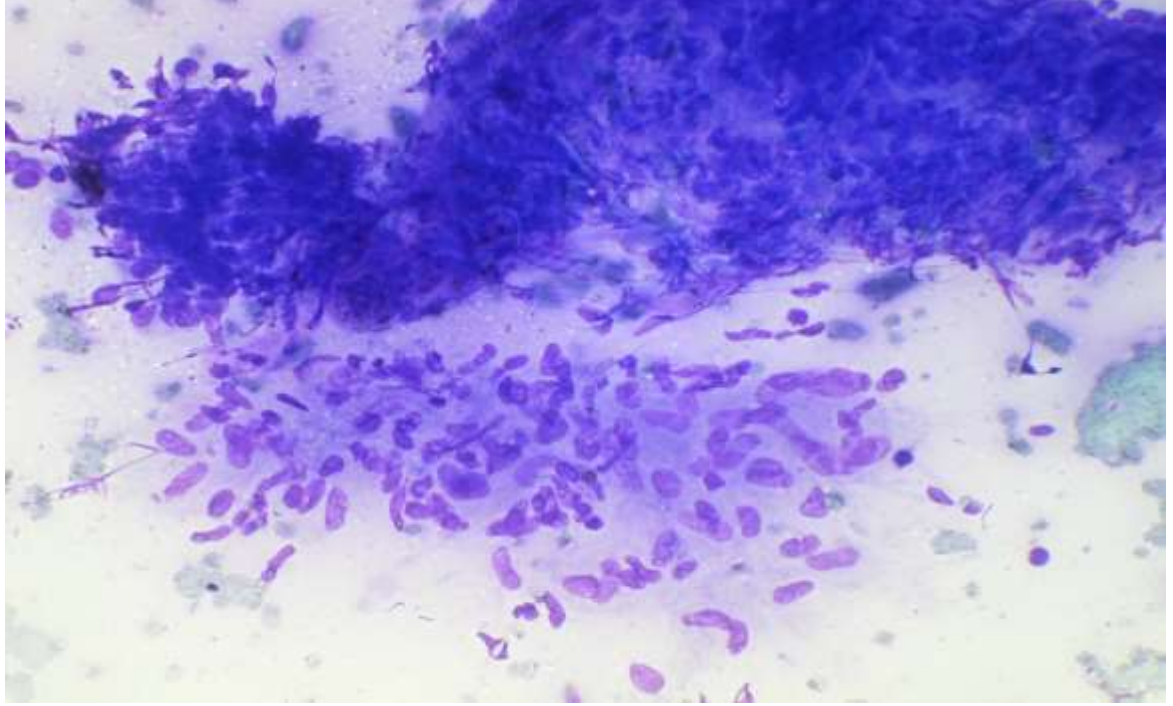
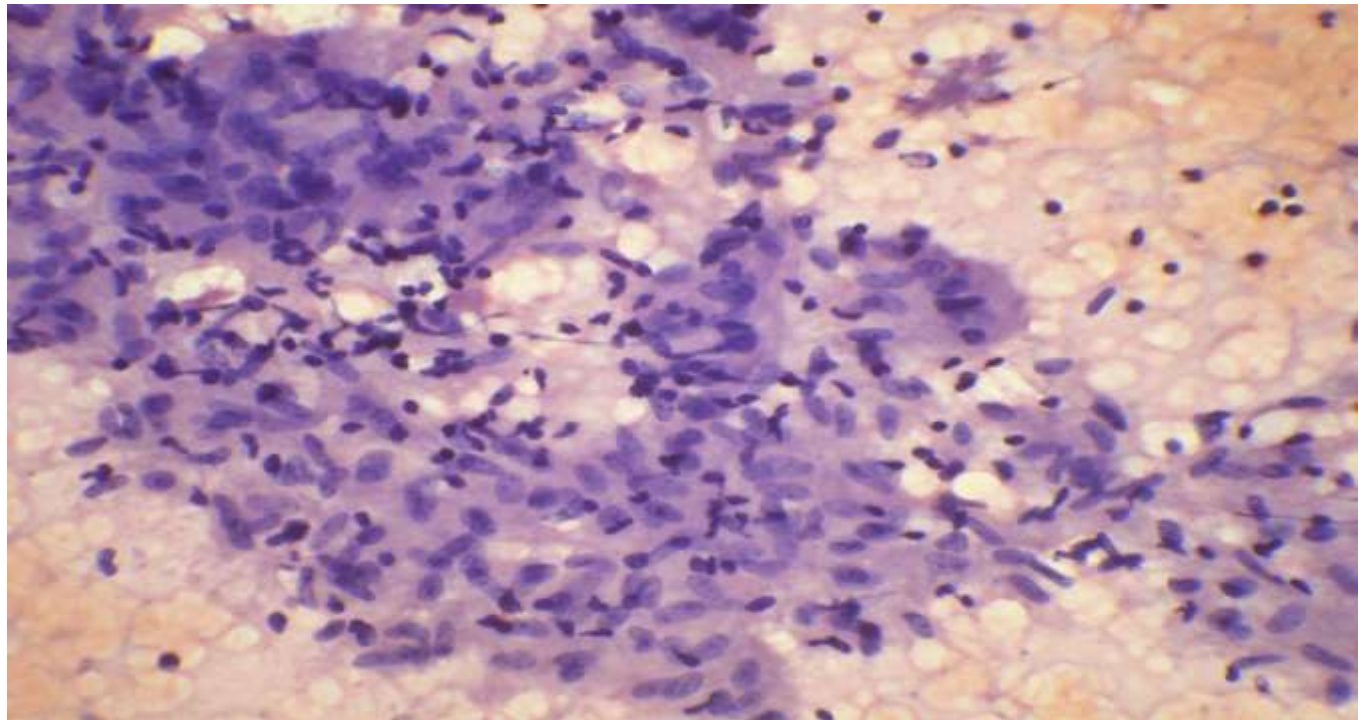
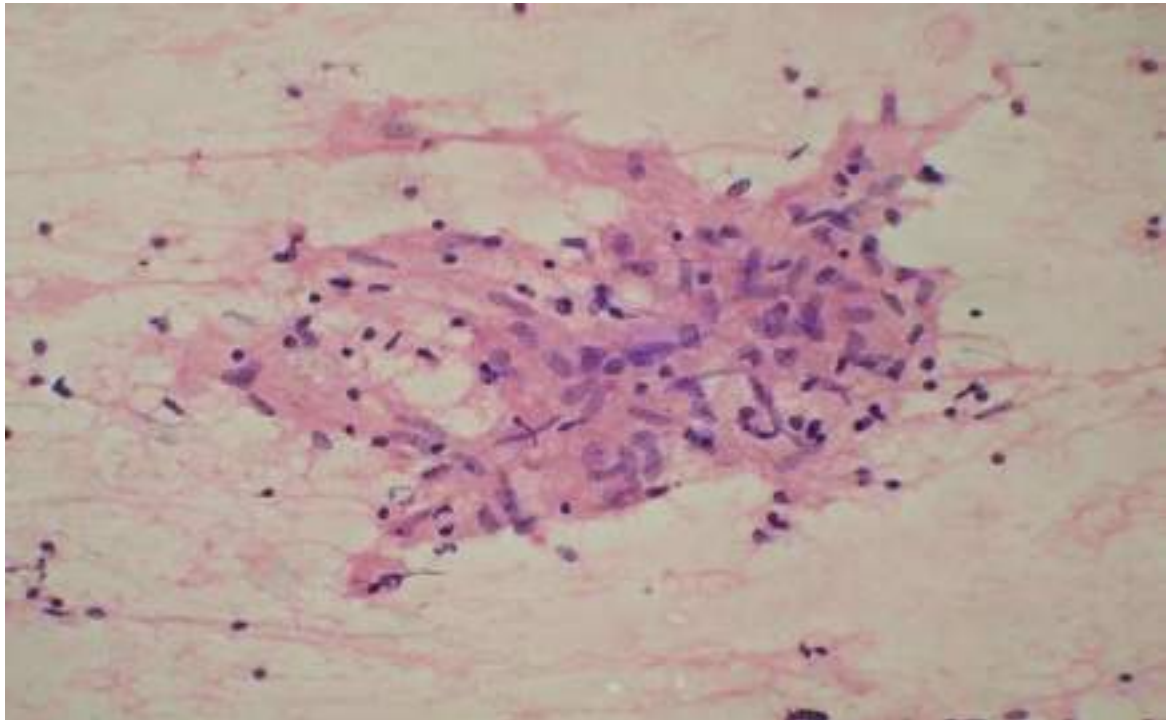
MGG



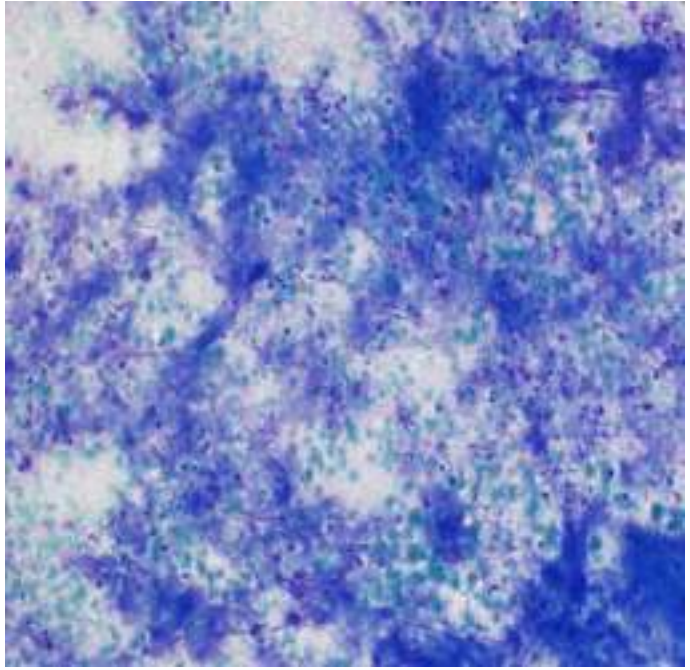
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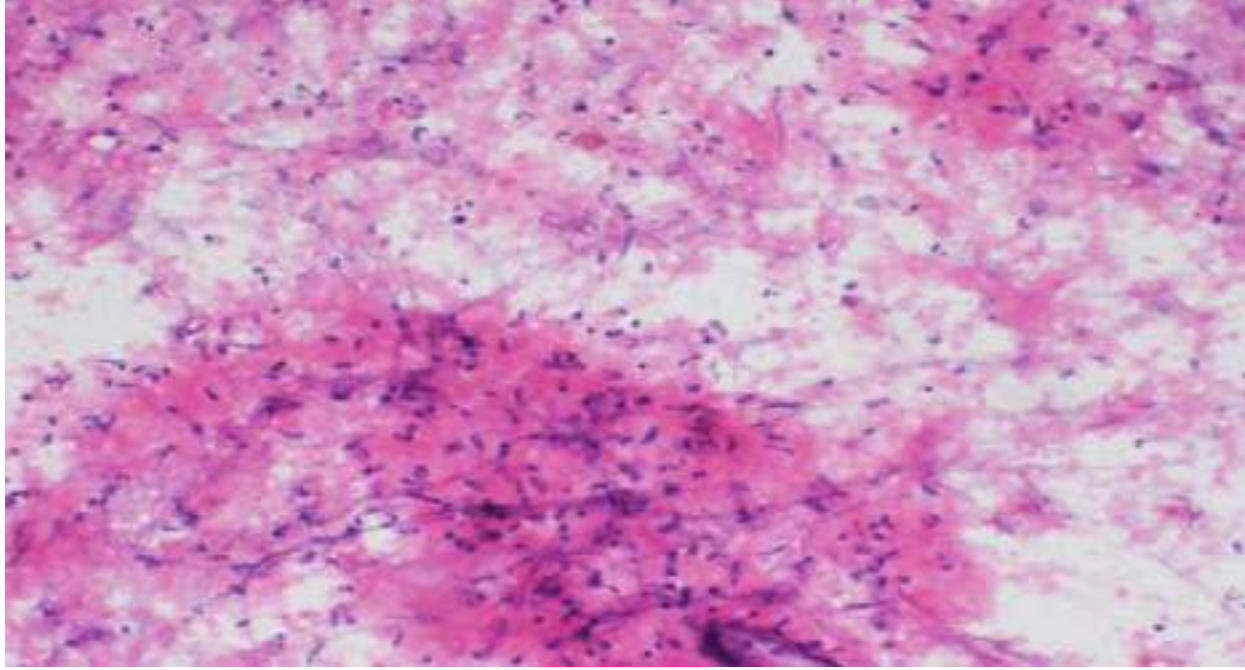


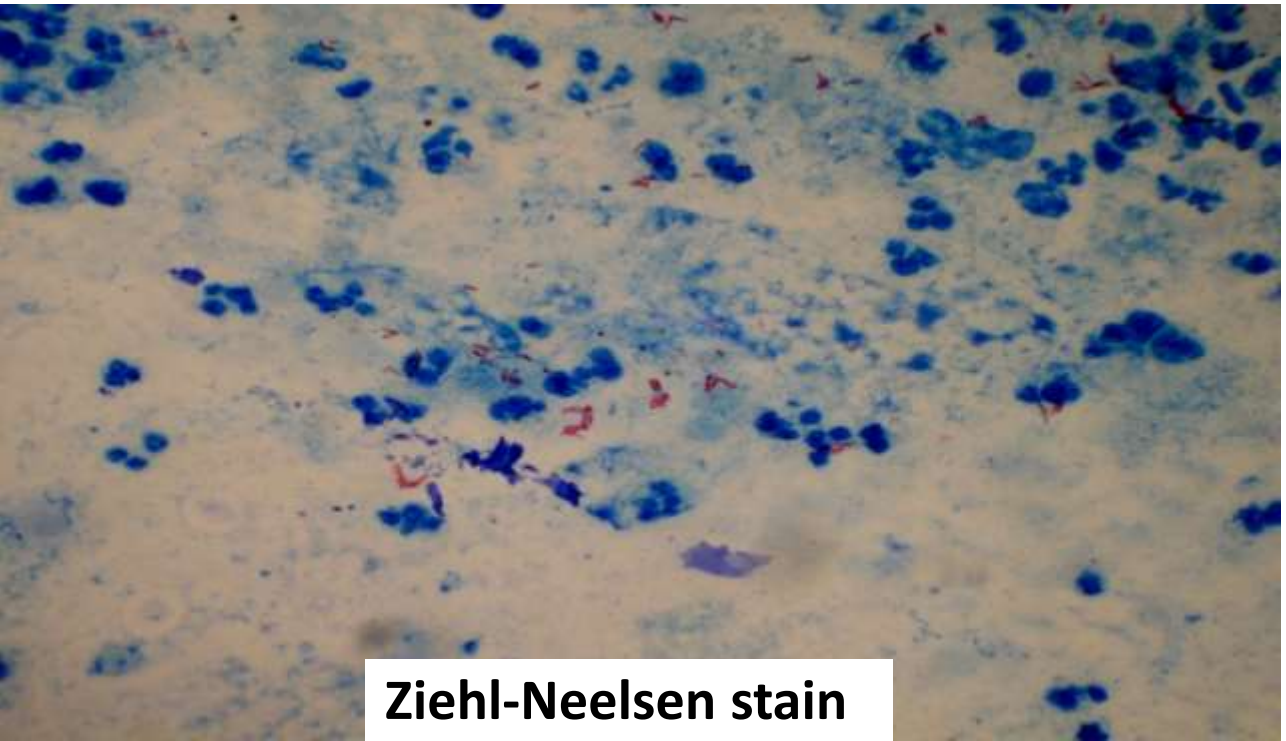
ZN stain

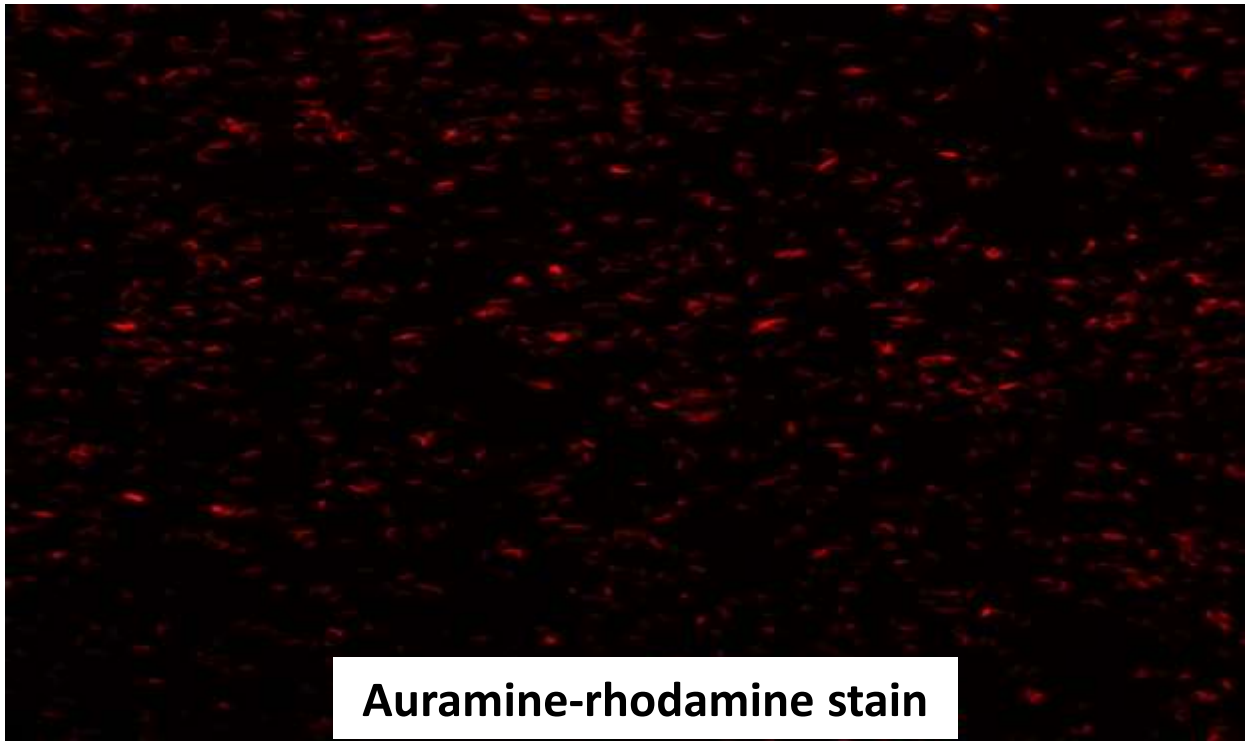








Ziehl-Neelsen stain



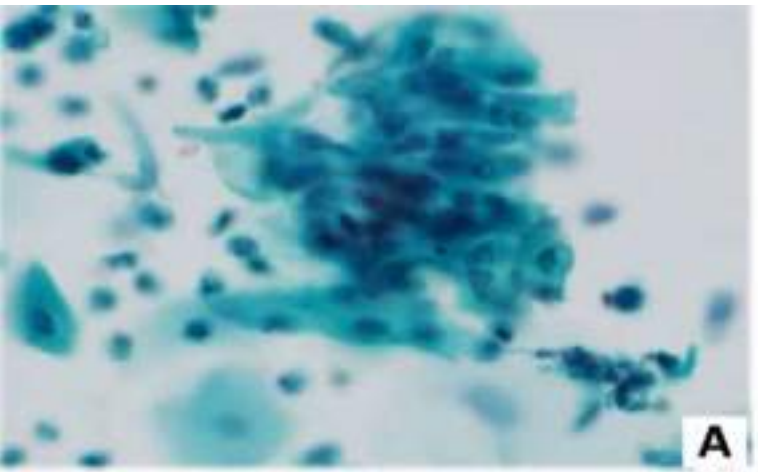
Auramine-rhodamine stain

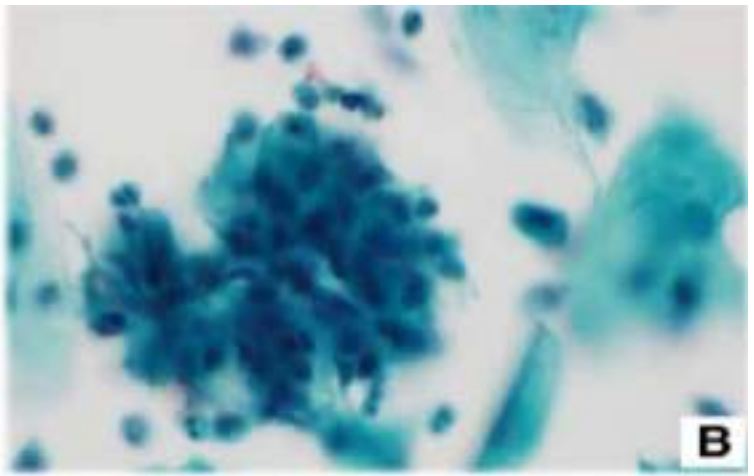
Diagnostic Cytopathology

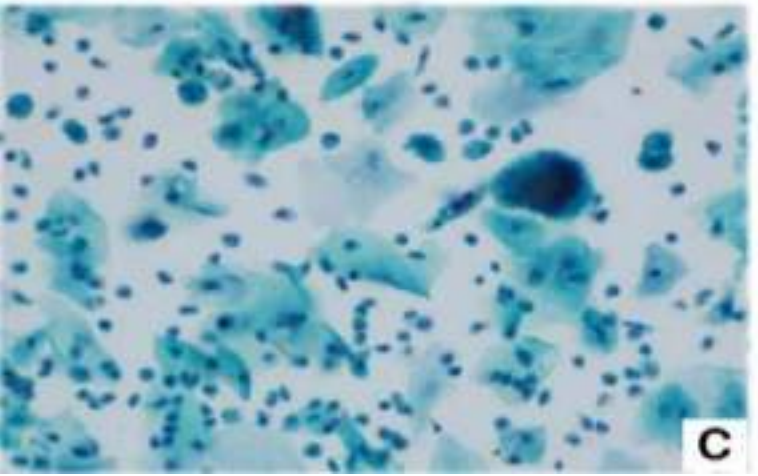
BRIEF REPORTS | Full Access

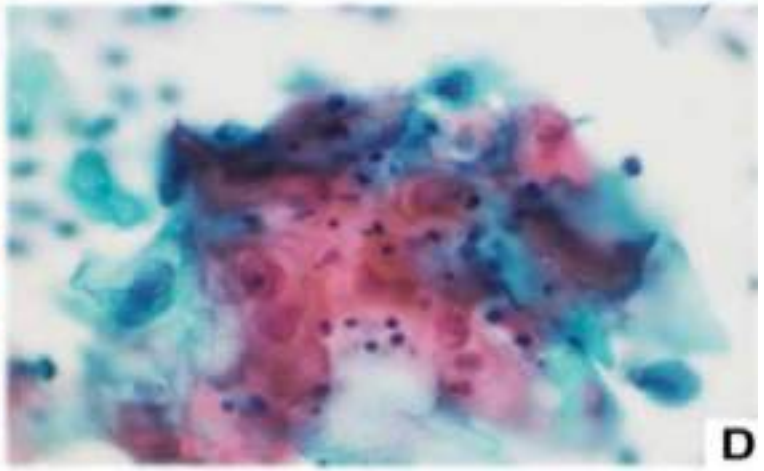
Tuberculosis in Pap samples with emphasis on LBC: Caught only when thought

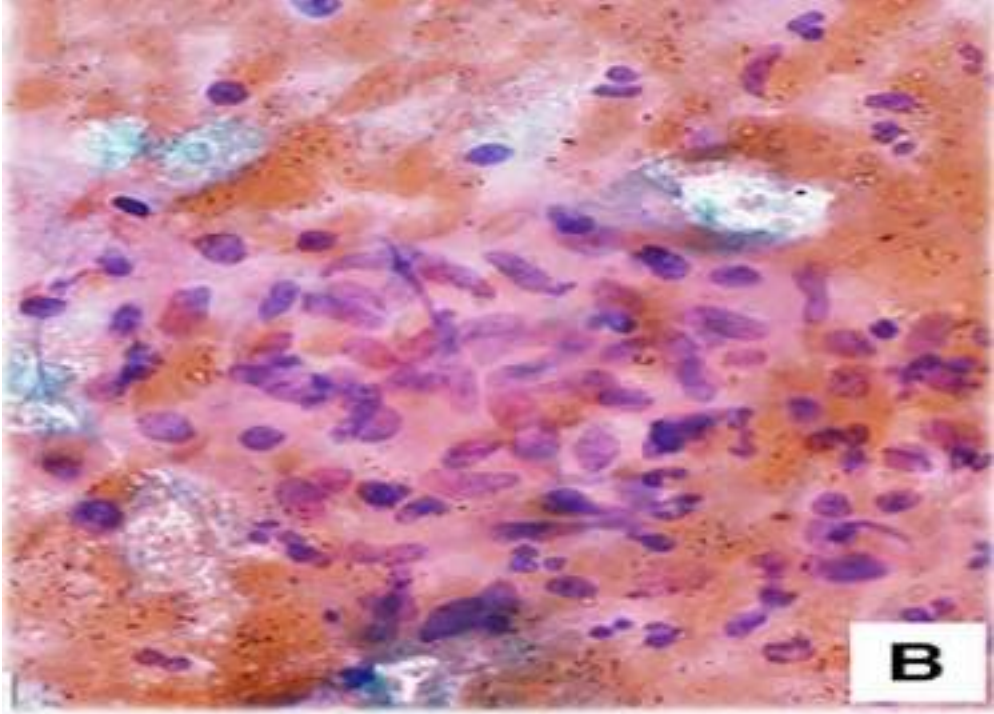
Vani Bharani MD, Nalini Gupta MD, DNB, Vanita Suri MD, Arvind Rajwanshi MD, FRCPath

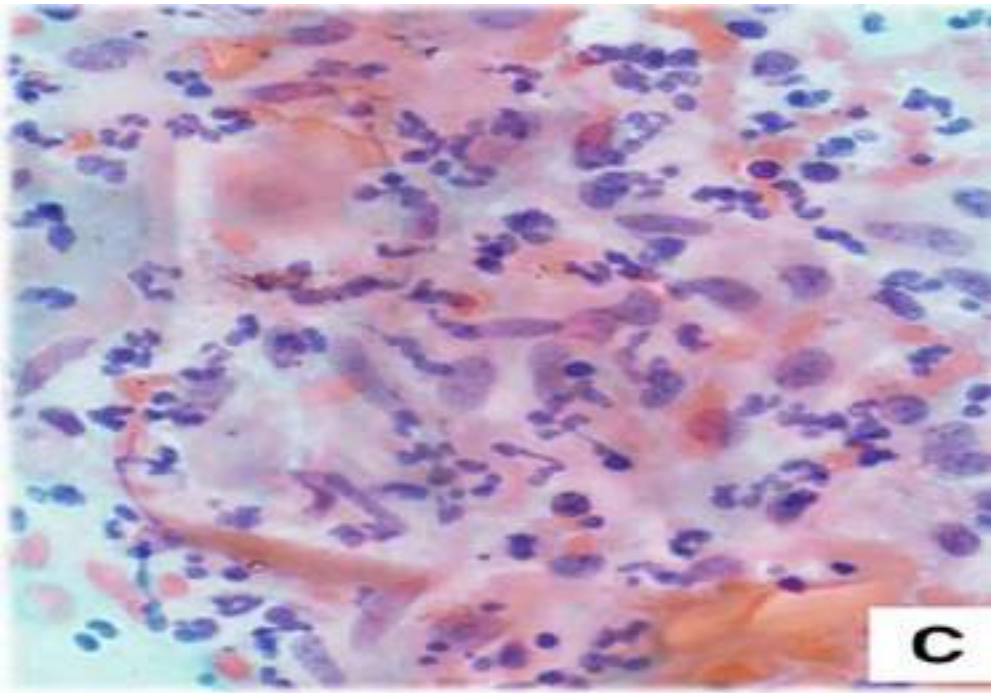








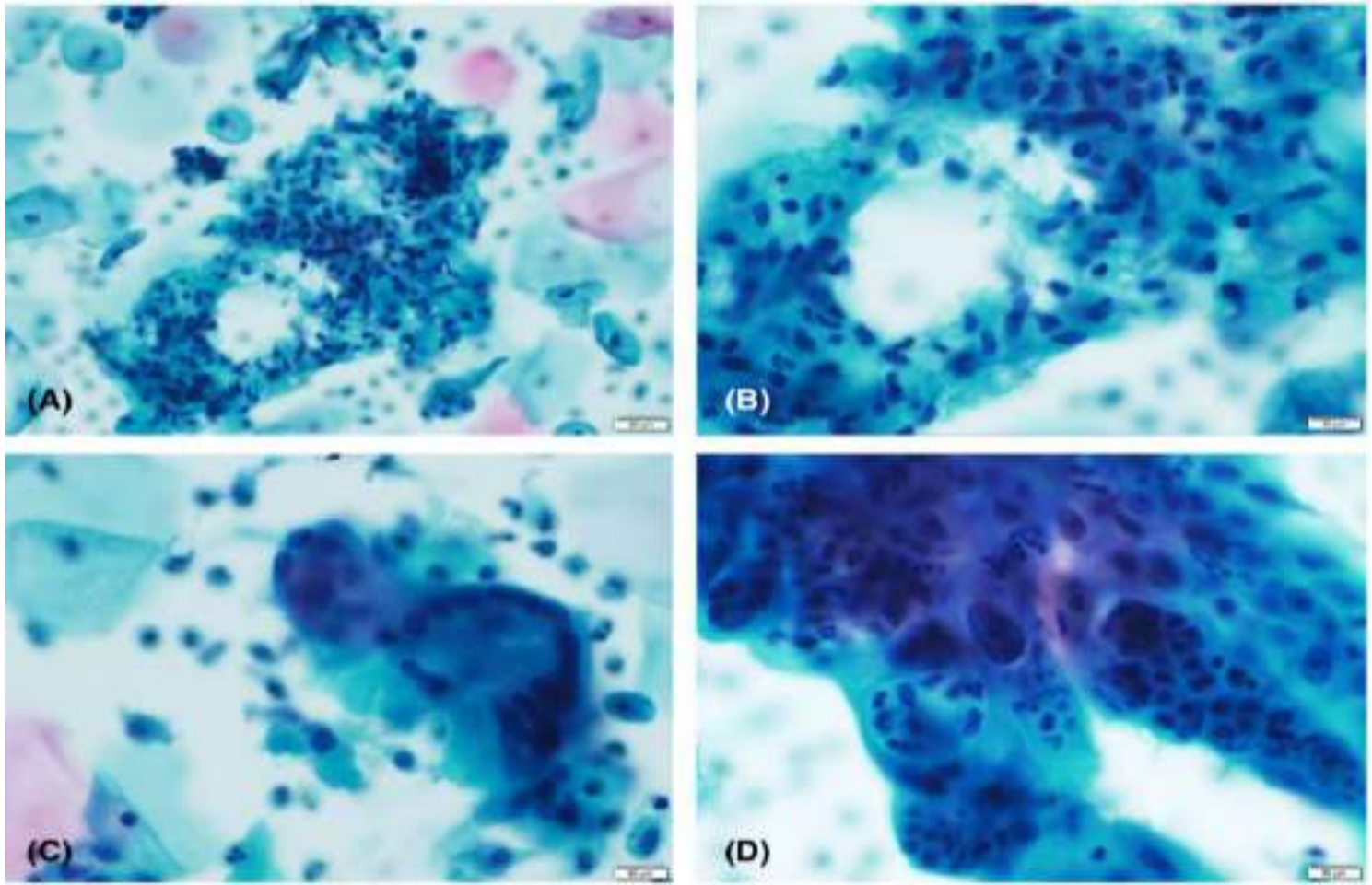


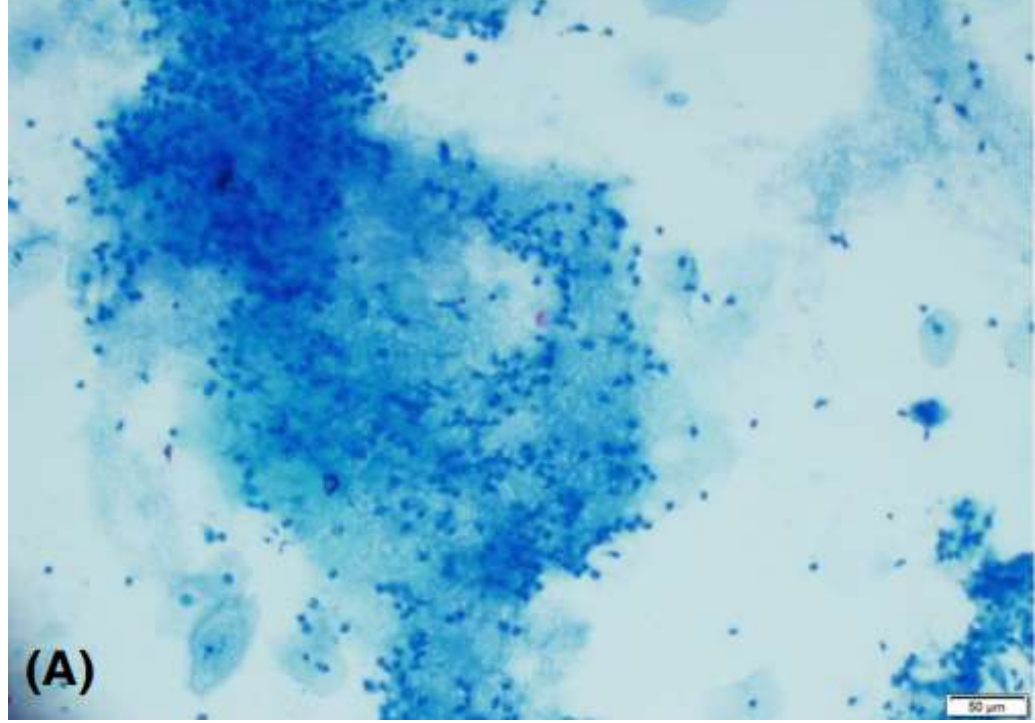


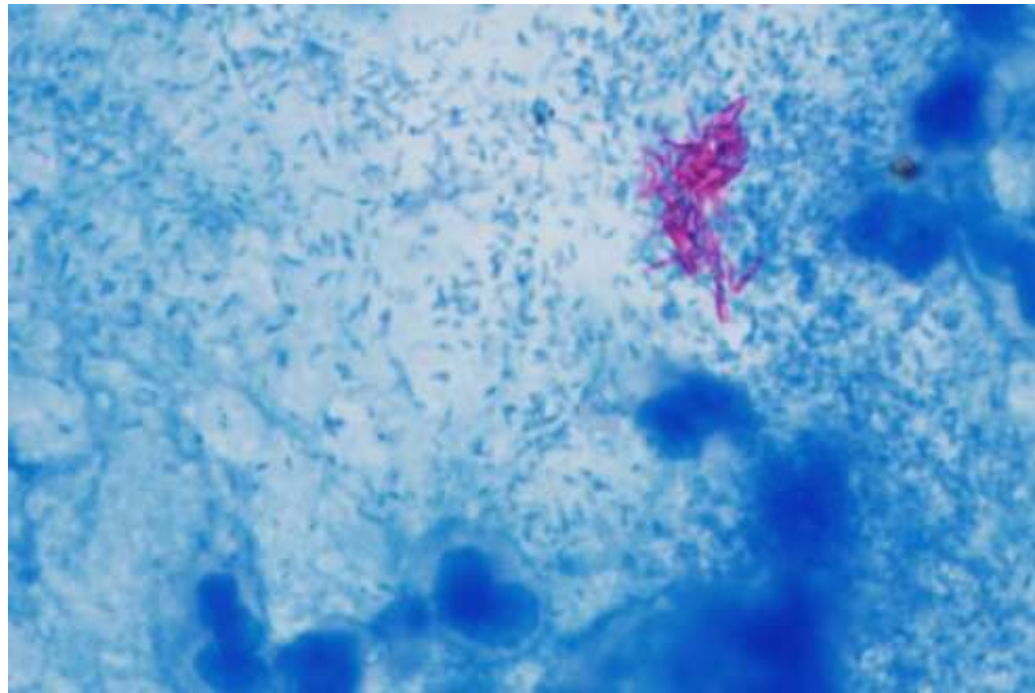
Case Reports > Cytopathology. 2020 Sep;31(5):487-489. doi: 10.1111/cyt.12823. Epub 2020 Jun 3.

Cytological diagnosis of cervical tuberculosis in a woman with cervical growth

Pankaj Kumar [1], Parikshaa Gupta [2], Nalini Gupta [2], Arvind Rajwanshi [2]



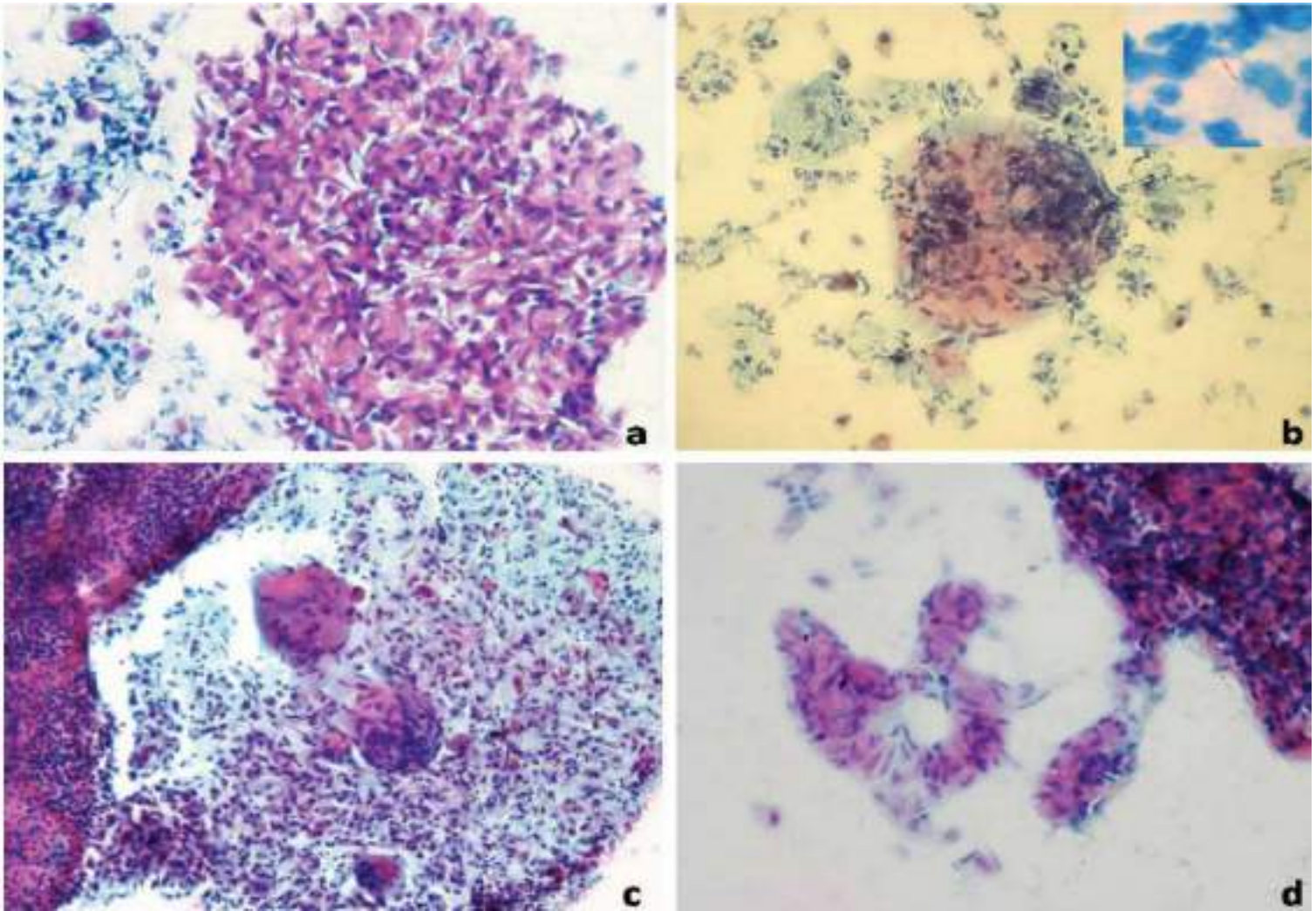


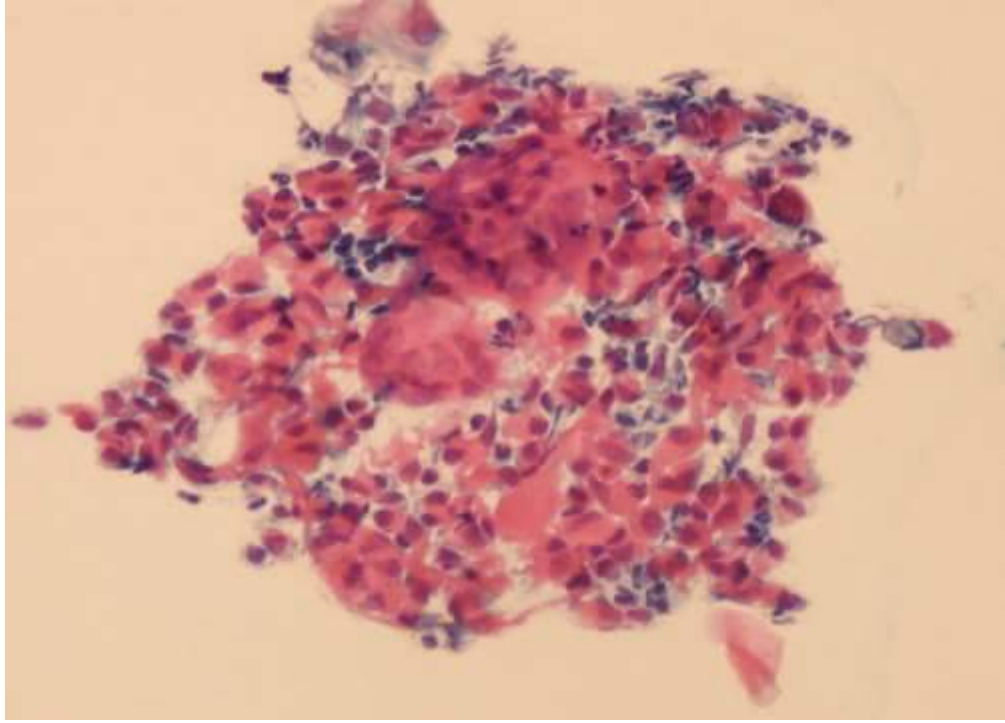


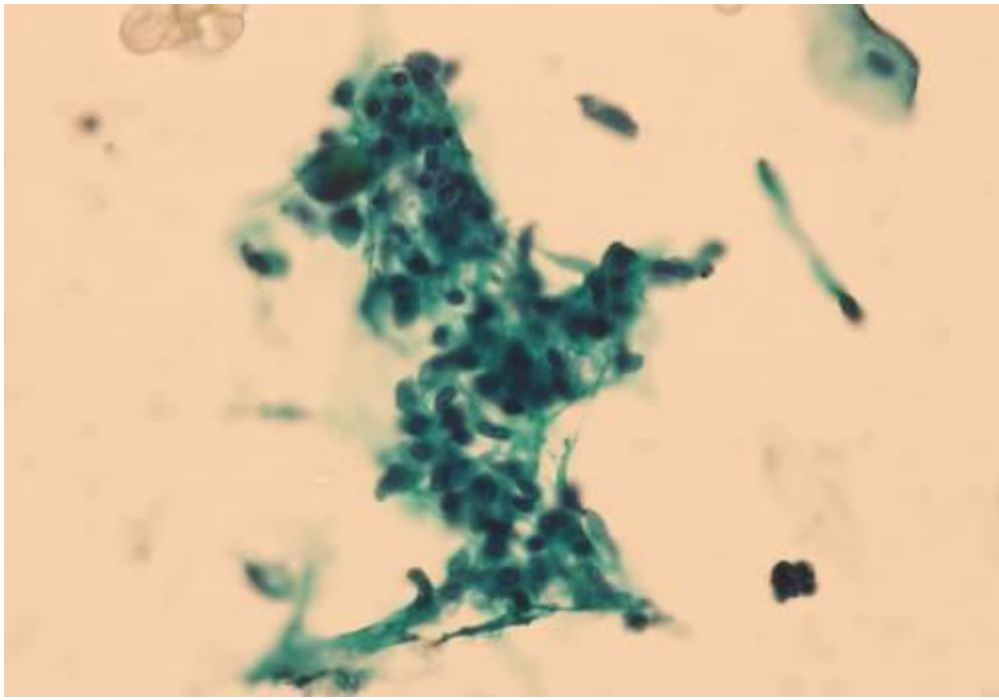
Case Reports › Diagn Cytopathol. 2010 Oct;38(10):765-7. doi: 10.1002/dc.21327.

Epithelioid cell granulomas in urine cytology smears: Same cause, different implications

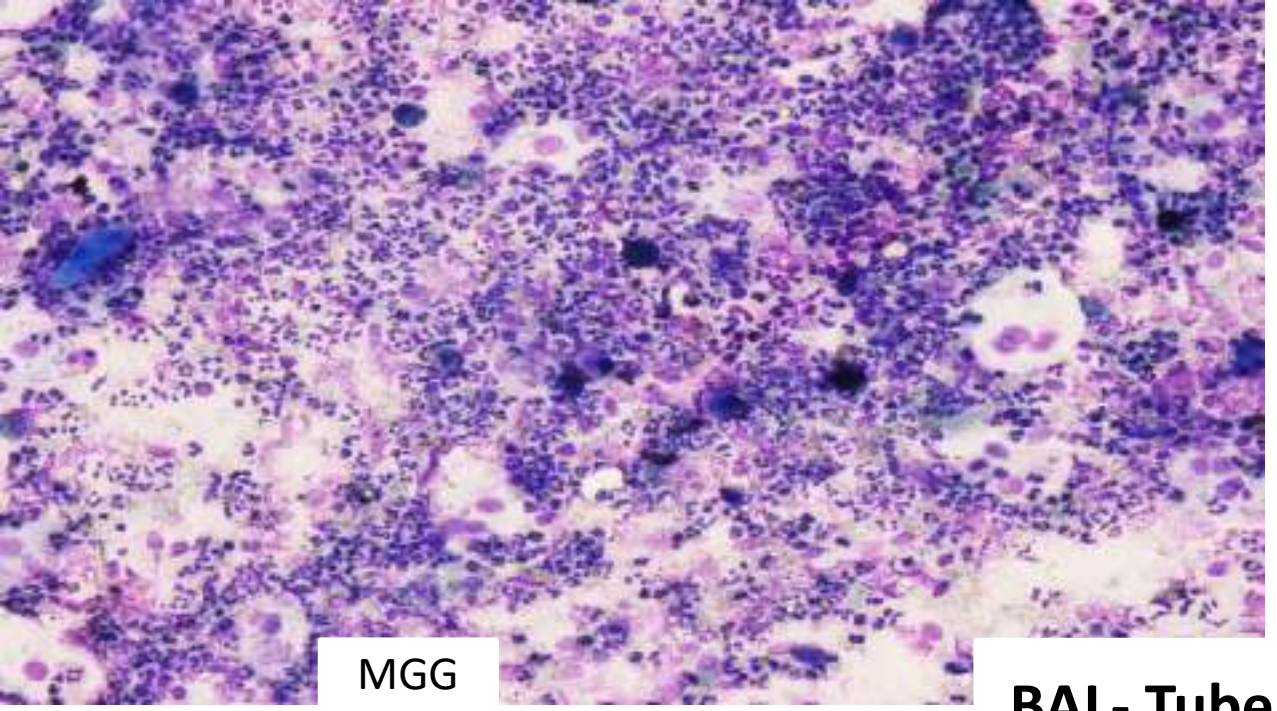
Sandeep Kumar Arora [1], Nalini Gupta, Raje Nijhawan, A K Mandal



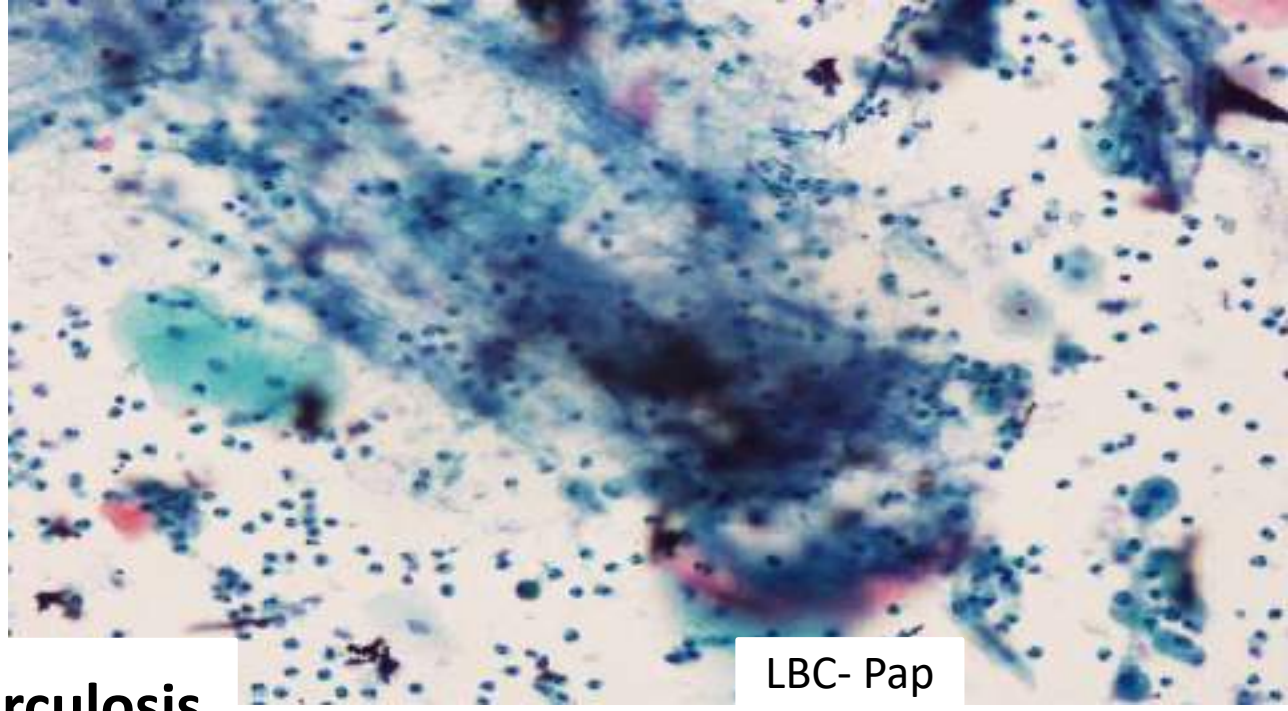




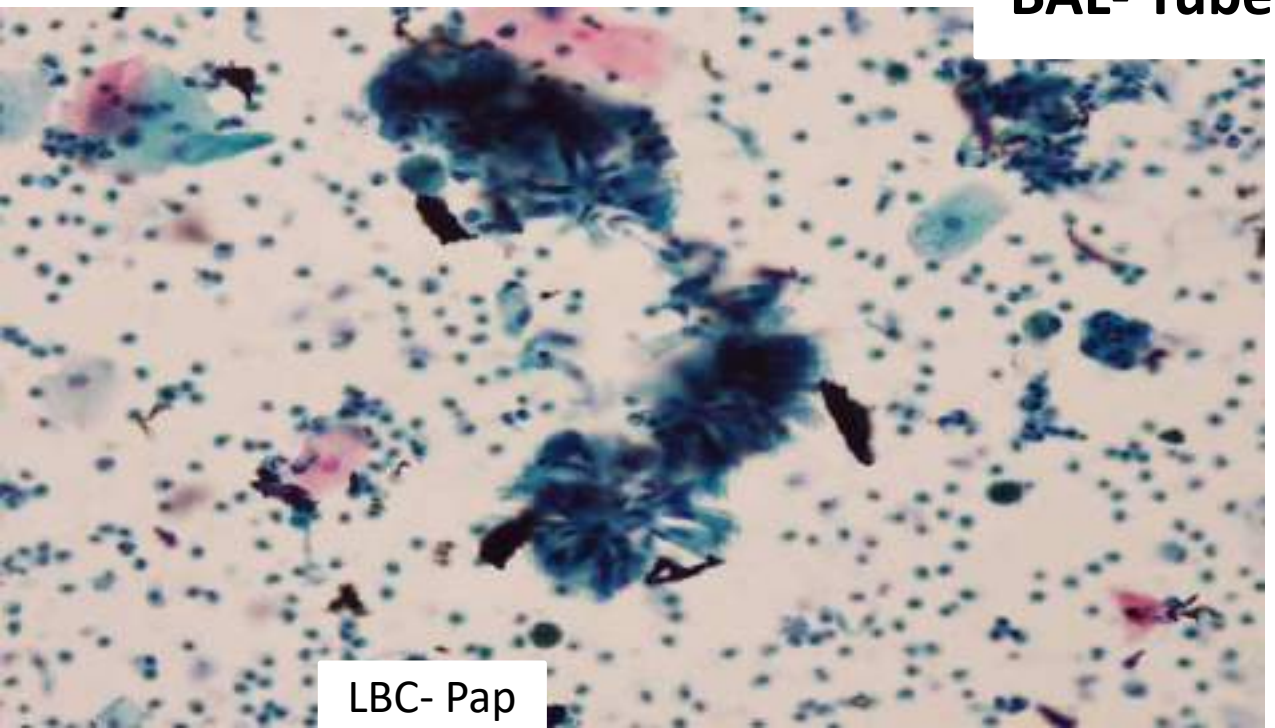
BAL- Tuberculosis



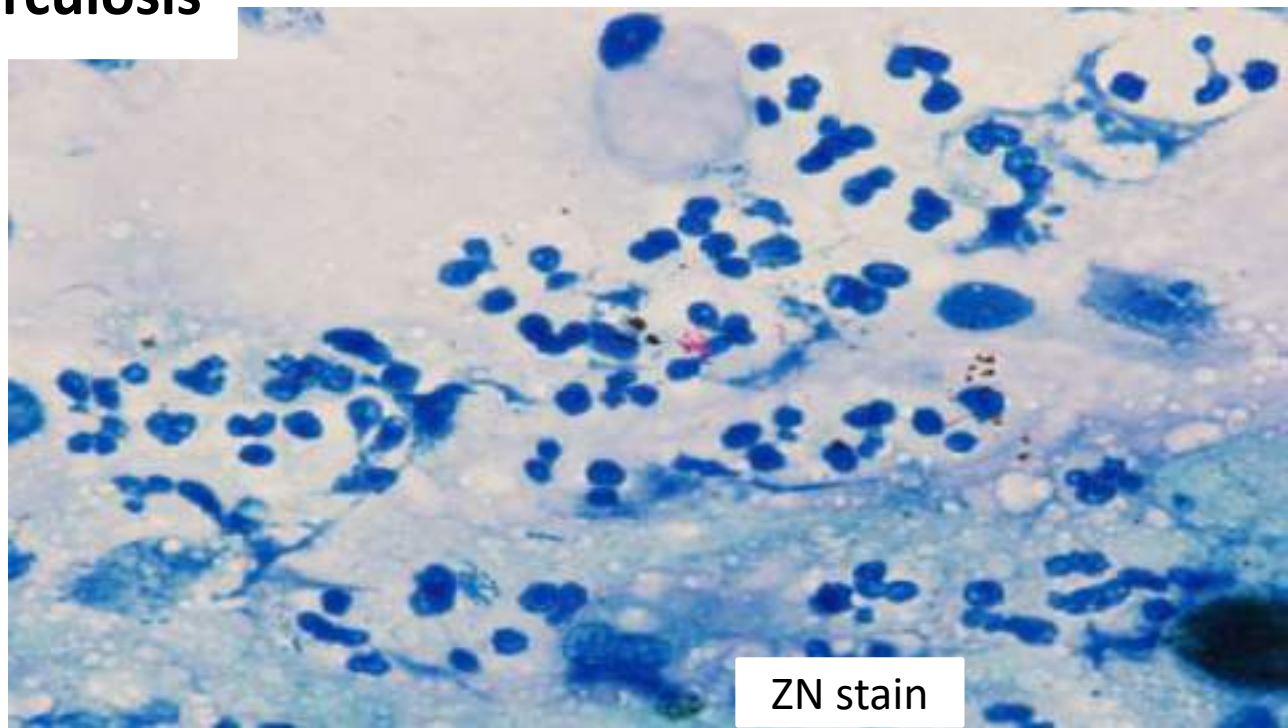
MGG



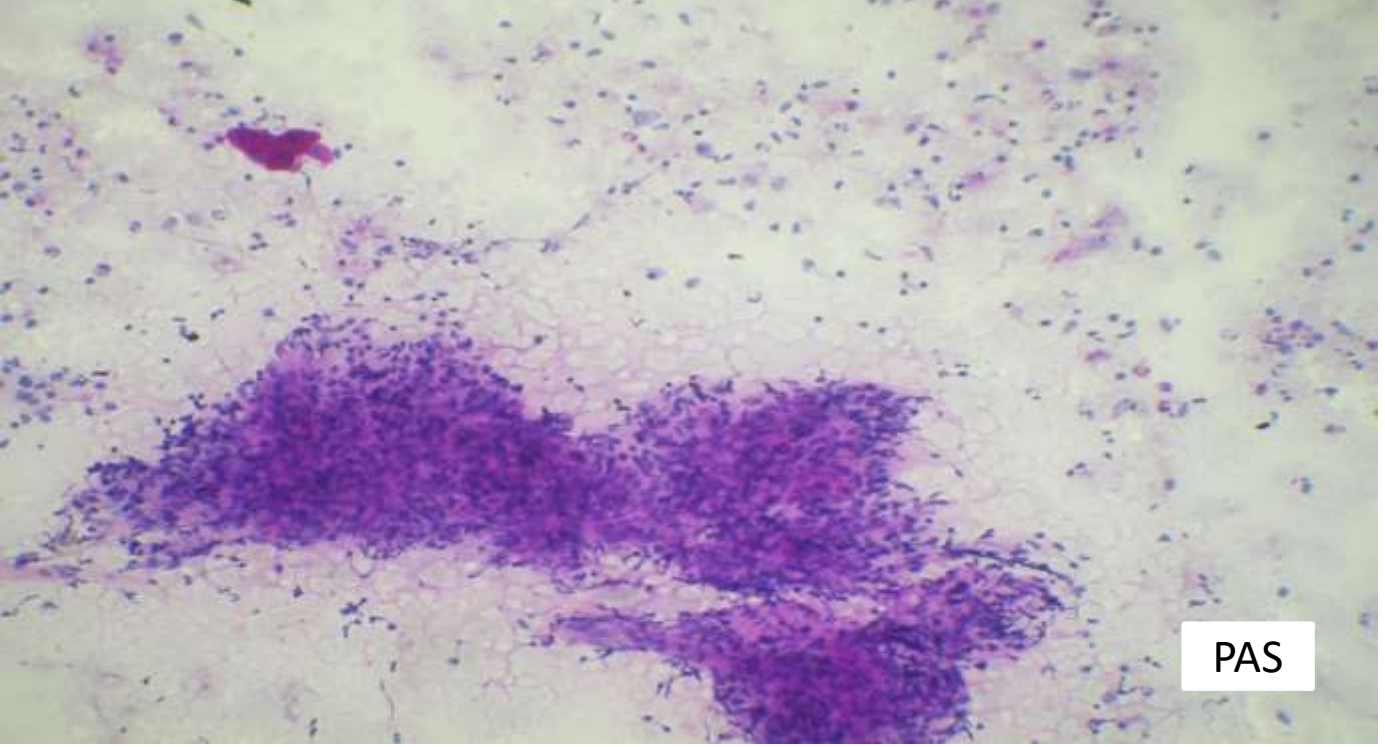
LBC- Pap



LBC- Pap



ZN stain



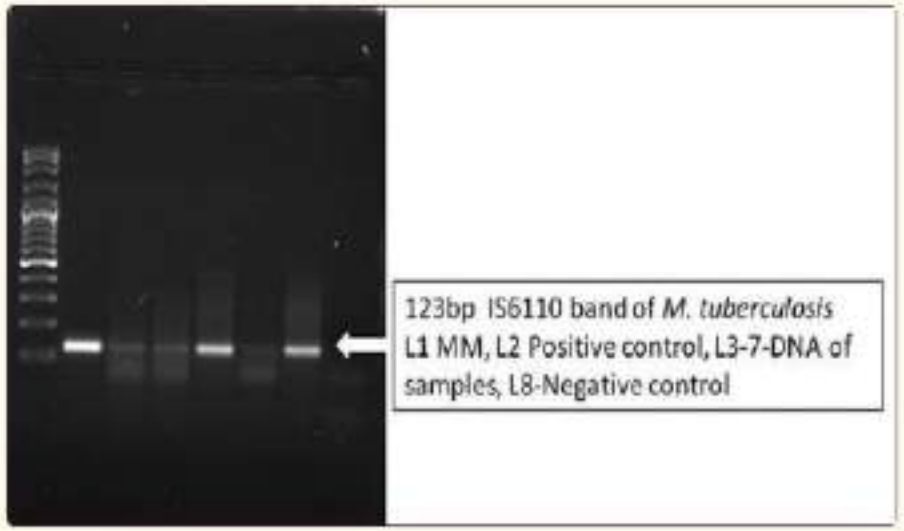


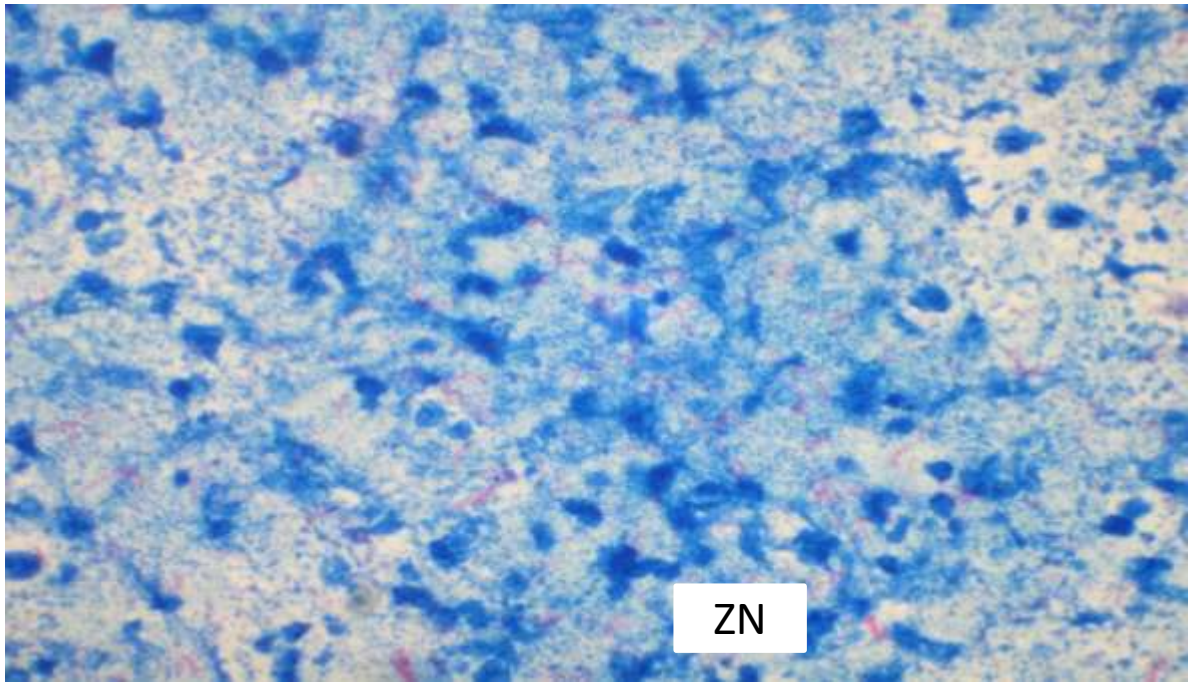
Figure 1

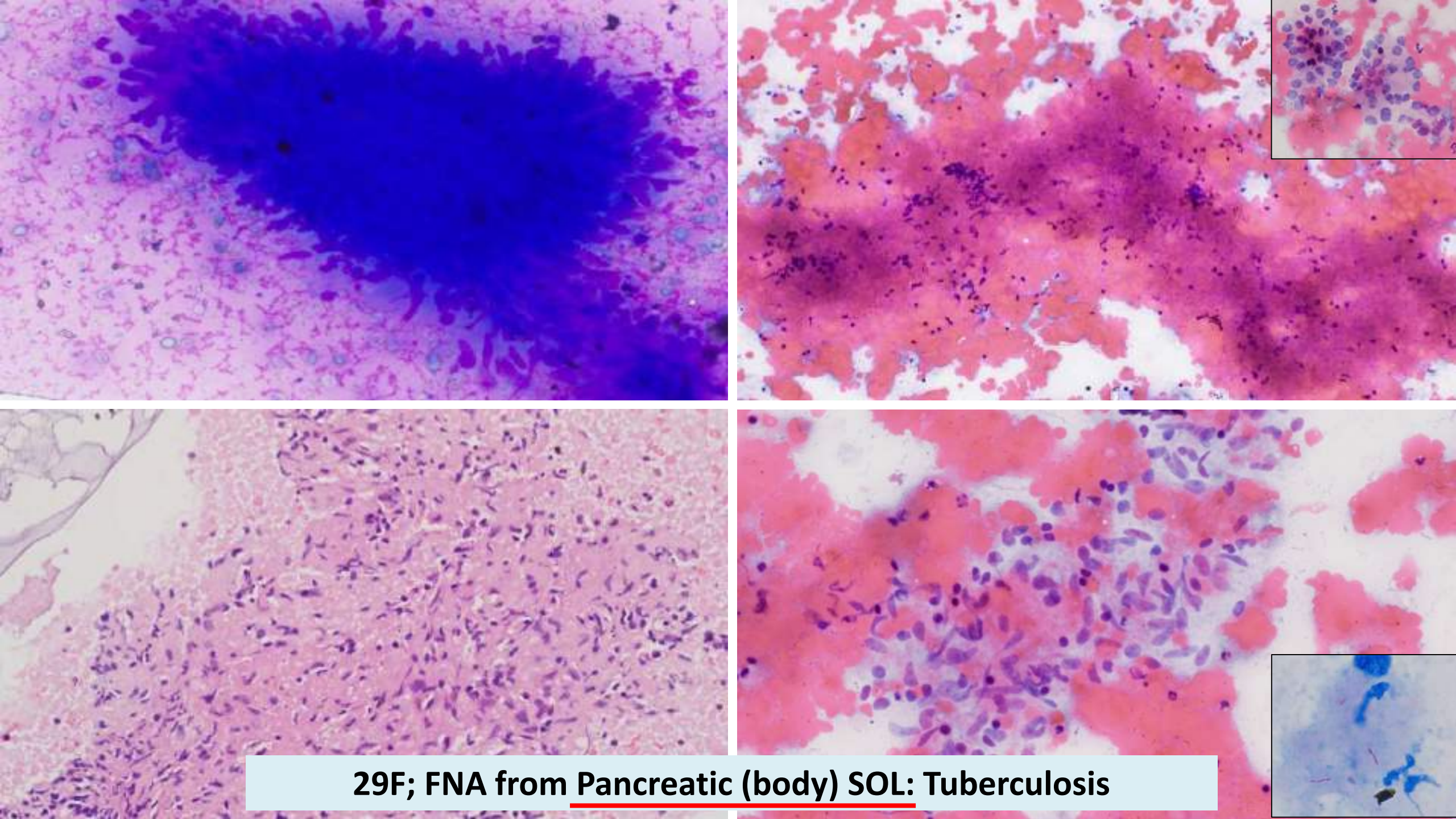
Gel photograph of polymerase chain reaction for *Mycobacterium tuberculosis* (IS6110Primers)

Cytojournal. 2017; 14: 1. PMCID: PMC5288951
Published online 2017 Jan 20. doi: 10.4103/1742-6413.198815 PMID: 28217140

Evaluation of polymerase chain reaction in space-occupying lesions of liver reported as granulomatous inflammation/tuberculosis on fine-needle aspiration cytology

Kusum Sharma, MD, Nalini Gupta, MD, DNB,[1,*] Kapil Goyal, MD,[2] Ajay Kumar Duseja,[3] Aman Sharma,[4] and Arvind Rajwanshi[1]





29F; FNA from Pancreatic (body) SOL: Tuberculosis

Role of polymerase chain reaction in breast tuberculosis

Subtitle:

Breast Disease, vol. 35, no. 2, pp. 129-132, 2015

Article type: Research Article

Authors: Nalini, Gupta[a; *] | Kusum, Sharma[b] | Barwad, Adarsh[a] | Gurpreet, Singh[c] | Arvind, Rajwanshi[a]

Ocul Immunol Inflamm. 2016 Dec;24(6):615-620. doi: 10.3109/09273948.2015.1063670. Epub 2015 Dec 8.

Detection of Mycobacterium tuberculosis Genome in Subretinal Fluid of Patients with Latent Tuberculosis Infection

Priya Bajgai [1], Kusum Sharma [2], Reema Bansal [1], Nalini Gupta [3], Aman Sharma [4], Amod Gupta [1]

Case Reports. Natl J Maxillofac Surg. 2012 Jul;3(2):199-201. doi: 10.4103/0975-5950.111381.

Tuberculosis of parotid gland masquerading parotid neoplasm

Sameer Vyas [1], Neeraj Kaur, Thakur D Yadav, Nalini Gupta, Niranjan Khandelwal

Cytopathology. 2011 Dec;22(6):392-6. doi: 10.1111/j.1365-2303.2010.00830.x. Epub 2010 Nov 30.

Thyroid tuberculosis - role of PCR in diagnosis of a rare entity

N Gupta [1], K Sharma, A Barwad, M Sharma, A Rajwanshi, P Dutta, A Sharma

Comparative Study. Sarcoidosis Vasc Diffuse Lung Dis. 2016 Oct 7;33(3):258-266.

Role of Xpert MTB/RIF in differentiating tuberculosis from sarcoidosis in patients with mediastinal lymphadenopathy undergoing EBUS-TBNA: a study of 147 patients

Sahajal Dhooria [1], Nalini Gupta, Amarjit Bal, Inderpaul Singh Sehgal, Ashutosh Nath Aggarwal, Sunil Sethi, Digambar Behera, Ritesh Agarwal

Case Reports. J Midlife Health. 2016 Oct-Dec;7(4):193-196. doi: 10.4103/0976-7800.195700.

Peri and post-menopausal women with complex adnexal masses, ascites, and raised CA-125: Is it ovarian cancer or tuberculosis?

Rashmi Bagga [1], Tanuja Muthyala [1], Subhas Chandra Saha [1], Shalini Gainder [1], Pradip Kumar Saha [1], Radhika Srinivasan [2], Arvind Rajwanshi [1], Nalini Gupta [2]

J Assoc Physicians India. 2019 Dec;67(12):21-24.

Evaluation of Multiplex PCR for Rapid Diagnosis of Female Genital Tuberculosis

Seema Chopra [1], Susmita Sharma [2], Kusum Sharma [3], Nalini Gupta [4], Aman Sharma [5], Lakhbir Kaur Dhaliwal [1], Arvind Rajvanshi [4], Meera Sharma [6]

Endosc Ultrasound. 2016 Jan-Feb;5(1):61-2. doi: 10.4103/2303-9027.175924.

Primary esophageal tuberculosis mimicking esophageal cancer with vascular involvement

Vishal Sharma, Surinder Singh Rana [1], Puneet Chhabra, Ravi Sharma, Nalini Gupta, Deepak Kumar Bhasin

Case Reports. Endoscopy. 2013;45 Suppl 2 UCTN:E317-8. doi: 10.1055/s-0033-1344565. Epub 2013 Sep 5.

Pancreatic tuberculosis presenting as an unusual head mass

S S Rana [1], V Chaudhary, N Gupta, S Sampath, B R Mittal, D K Bhasin

Expert Rev Respir Med. 2022 Sep;16(9):1011-1015. doi: 10.1080/17476348.2022.2118717. Epub 2022 Sep 7.

Endosonographic characteristics of mediastinal lymph nodes for predicting malignancy in high tuberculosis burden settings: a study of 774 subjects

Kuruswamy Thurai Prasad [1], Vallappan Muthu [1], Inderpaul Singh Sehgal [1], Sahajal Dhooria [1], Navneet Singh [1], Nalini Gupta [2], Ashutosh Nath Aggarwal [1], Ritesh Agarwal [1]

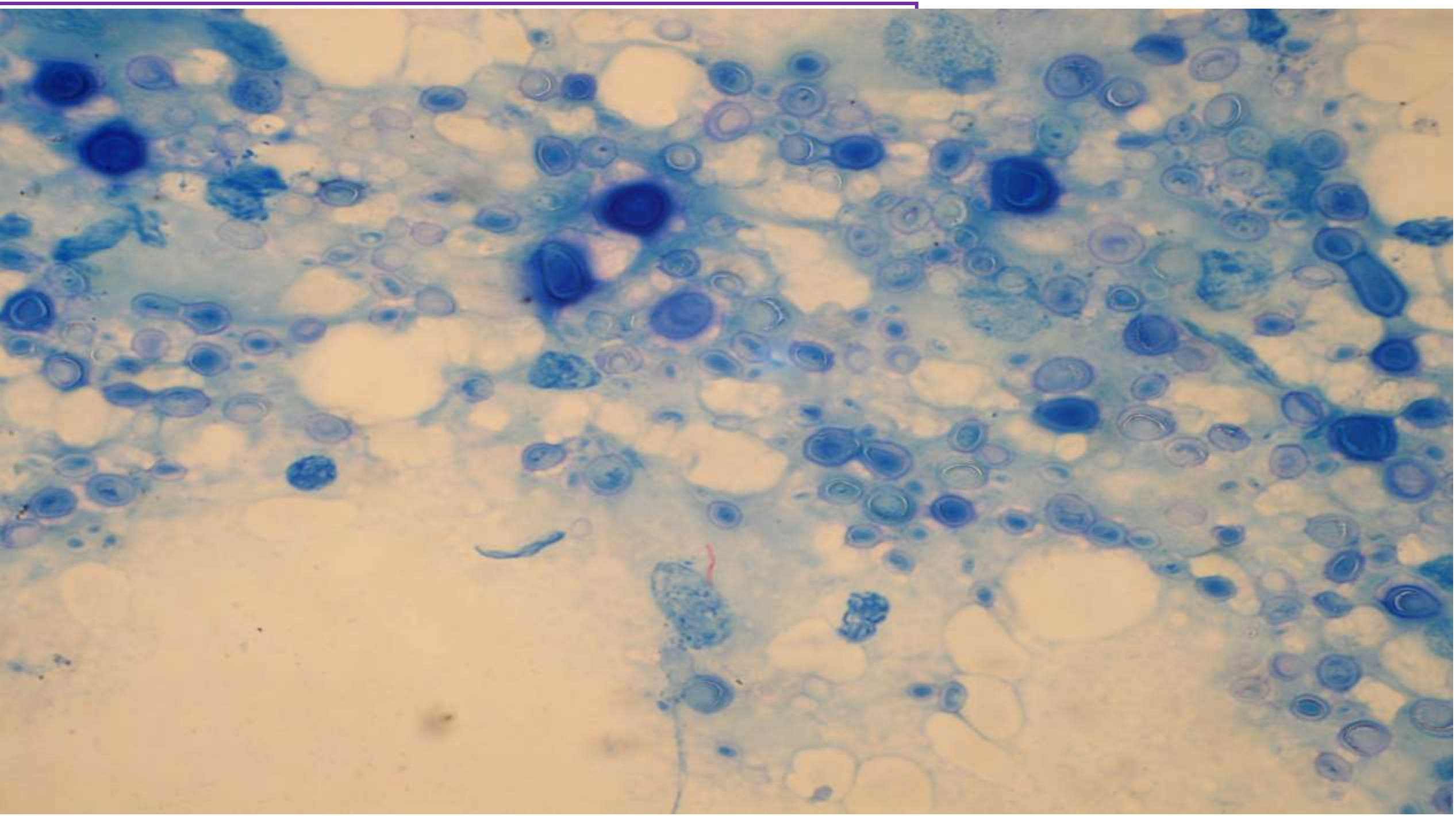


Table II. Cytomorphological Features of Tuberculosis

Features	*Number of cases*	*AFB positive*	
		Number	*Percentage*
Epithelioid cells and giant cells	32	3	9.4
Epithelioid cells only	14	3	21.4
Epithelioid cells and necrosis	27	7	25.9
Epithelioid cells, giant cells, and necrosis	60	32	53.3
Necrosis, polymorphs, and lymphocytes	15	12	80.0
Acellular material	12	8	66.7
Total	160	65	40.6

Rajwanshi A et al. Fine-needle aspiration cytology diagnosis of tuberculosis. Diagn Cytopathol 1987;3:13-16.

Table II. Results of Culture for Mycobacteria

Smear type	*Smear+; culture+*	*Smear+; culture−*	*Smear−; culture+*	*Smear−; culture−*	*Total*
Necrotic material only	4	1	9	19	33
Necrotic material with granuloma	13	6	8	24	51
Granuloma without necrosis	0	2	1	10	13
Culture grossly contaminated					3
Total	17	9	18	53	100

Table I. Results of Staining for Acid-Fast Bacilli

Smear type of tuberculous lymphadenitis	*Total number of stains*	*AFB positive*	
		Number	*Percentage*
Necrotic material only	146	26	17.8
Necrotic material with granuloma	170	56	32.94
Granuloma without necrosis	74	10	13.5
Total	390	92	23.58

Table III. Comparison of Overall Sensitivity of ZN Stain, Culture, and PCR

Method	*ZN stain*	*Culture*	*PCR*
Overall sensitivity	76.47%	88.23%	88.23%

Srinivasan R, et al. Diagn Cytopathol. 1989

Comparative Study > Indian J Med Microbiol. 2013 Jan-Mar;31(1):24-8.
doi: 10.4103/0255-0857.108714.

Multiplex polymerase chain reaction using insertion sequence 6110 (IS6110) and mycobacterial protein fraction from BCG of Rm 0.64 in electrophoresis target genes for diagnosis of tuberculous lymphadenitis

K Sharma [1], N Gupta, A Sharma, G Singh, P K Gupta, A Rajwanshi, S C Varma, M Sharma

> Tuberculosis (Edinb). 2016 Sep;100:114-117. doi: 10.1016/j.tube.2016.07.015. Epub 2016 Jul 29.

Loop-mediated isothermal amplification (LAMP) assay for speedy diagnosis of tubercular lymphadenitis: The multi-targeted 60-minute approach

Megha Sharma [1], Kusum Sharma [2], Aman Sharma [3], Nalini Gupta [4], Arvind Rajwanshi [4]

> Tuberculosis (Edinb). 2023 Sep;142:102379. doi: 10.1016/j.tube.2023.102379. Epub 2023 Jul 17.

Determining the diagnostic potential of Truenat MTB Plus for Tubercular lymphadenitis and detection of drug resistance and a comparison with GeneXpert Ultra

Kusum Sharma [1], Megha Sharma [2], Nalini Gupta [3], Tanish Modi [4], Himanshu Joshi [1], Ritu Shree [5], Aman Sharma [6]

Case 2

- 48 M
- Cough and hemoptysis
- Right lower lung lesion
- CECT Scan: Centri-lobular ground-glass attenuation nodules and a larger sub-pleural ground-glass nodule
- CT guided FNAC done from sub-pleural nodule

Pitfalls in the diagnosis of Wegener's granulomatosis on fine needle aspiration cytology

Cytopathology. 2007

A. Awasthi*, P. Malhotra†, N. Gupta*, D. Gupta† and A. Rajwanshi*

Departments of *Cytopathology and †Pulmonary Medicine, Postgraduate Institute of Medical Education and Research, Chandigarh, India

Granulomatosis with polyangiitis

Case 3

Commentary

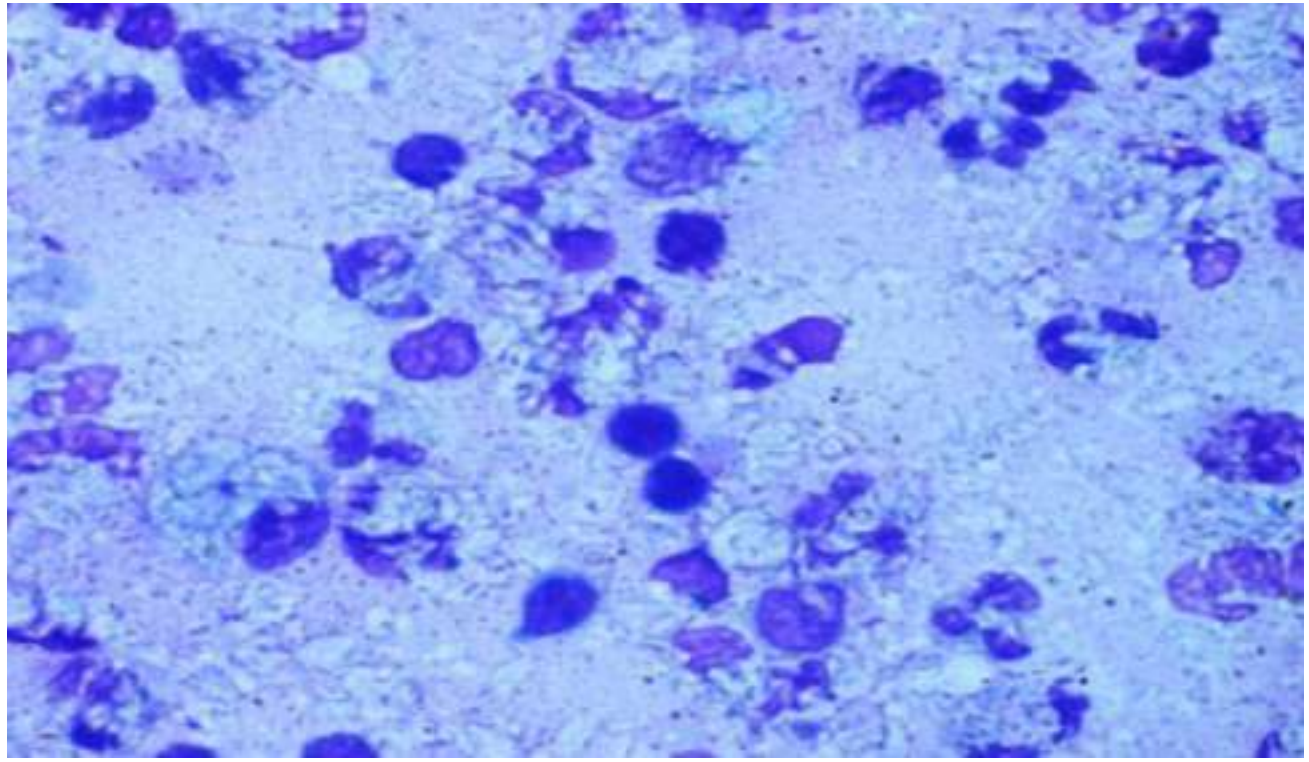
Open A

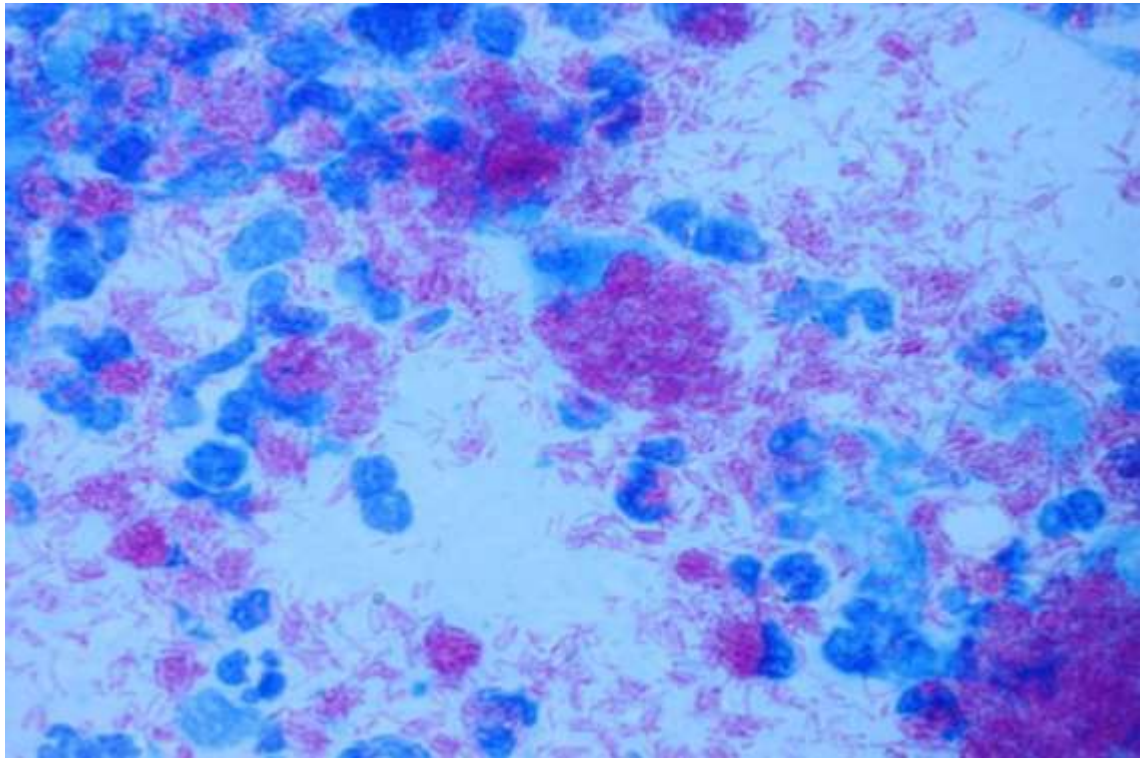
FNAC of Bacillus- Calmette- Guerin lymphadenitis masquerading as Langerhans cell histiocytosis.

Nalini Gupta, Vijay Kumar, Raje Nijhawan*, Radhika Srinivasan and Arvind Rajwanshi

CytoJournal 2004, **1**:6

Address: Department of Cytopathology and Gynecological Pathology, Postgraduate Institute of Medical Education and Research, Chandigarh, India

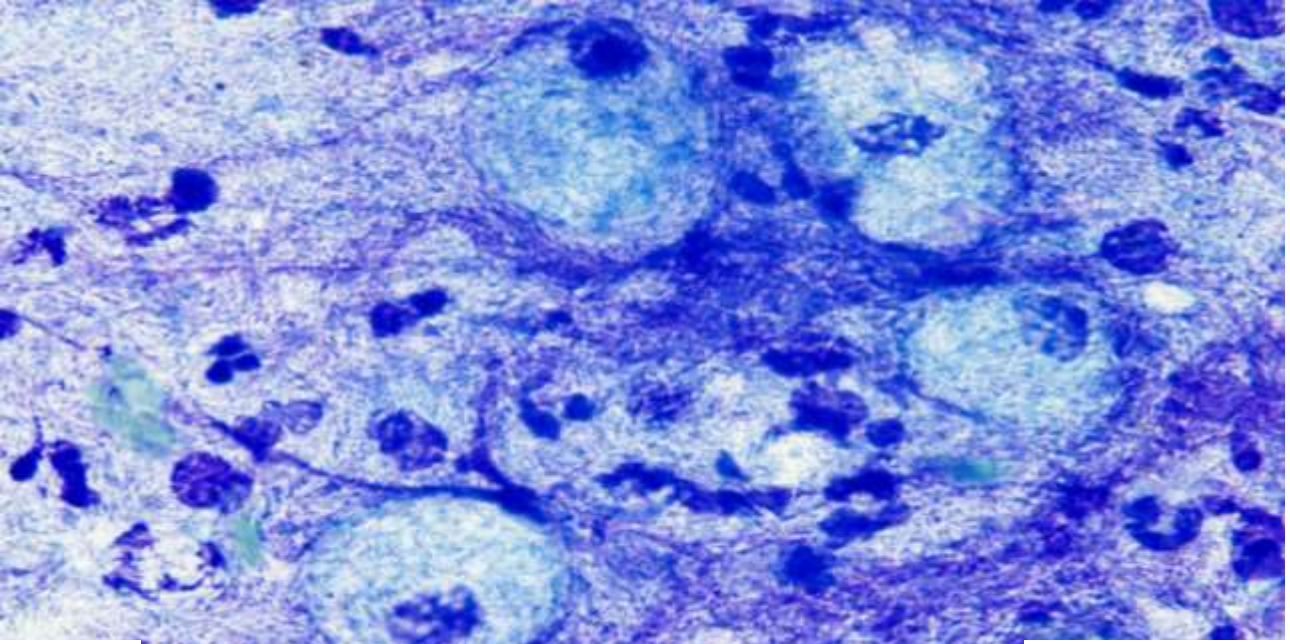




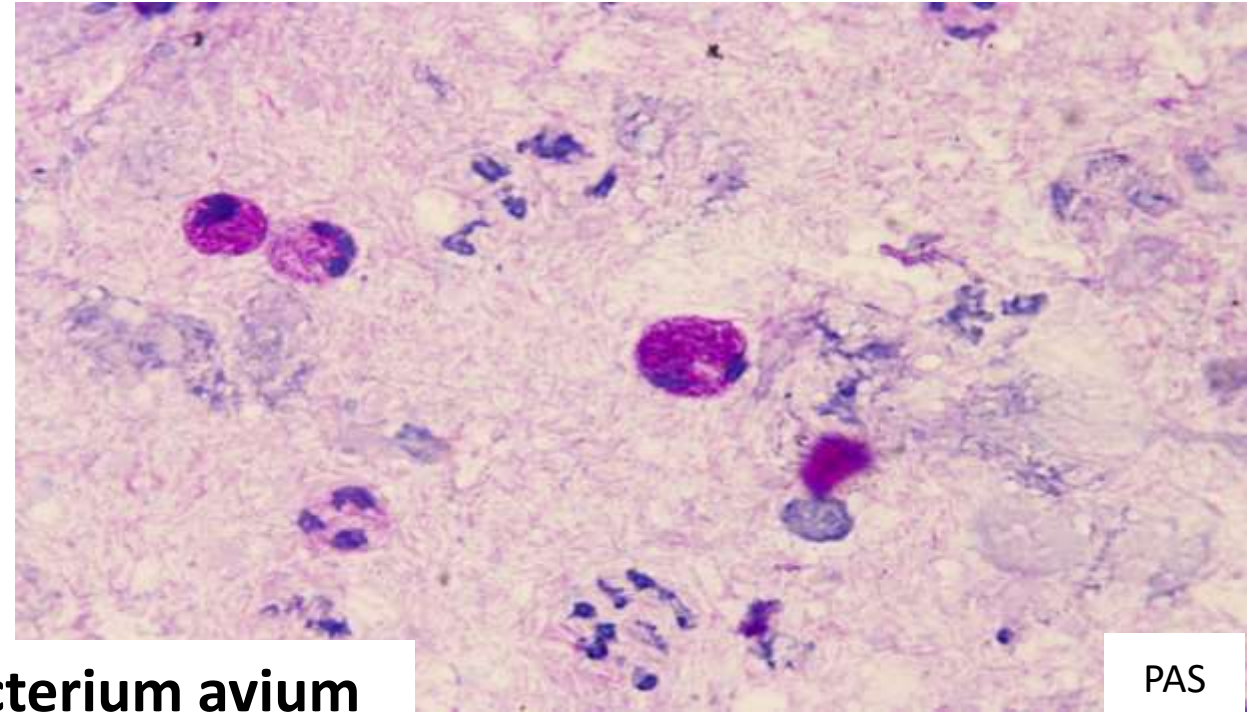
An infant presented with skin rash, lymphadenopathy, delayed milestones with moderate hepato-splenomegaly

Case 4

- 35 M; HIV-seropositive male on HAART
- H/O fever & weight loss x 3 months & new skin lesions
- CD4 count was 41 cells/mm^3
- CT scan: Multiple enlarged retroperitoneal lymph nodes with thickening of walls of jejunum, ileum & transverse colon
- USG guided FNAC: from lymph nodes
- Aspirate sent for LJ medium & BACTEC MGIT 960 culture
- Aspirate sent for home-brew MPCR (targets M. tuberculosis & M. avium)

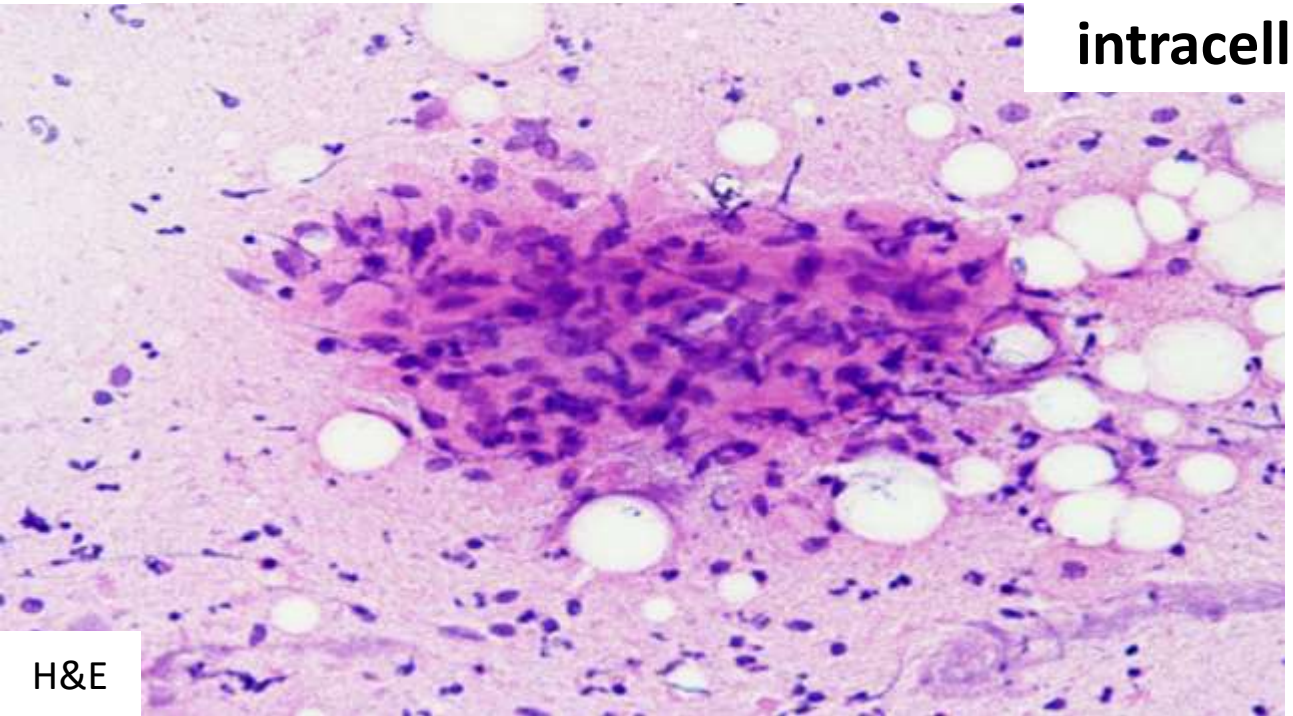


MGG

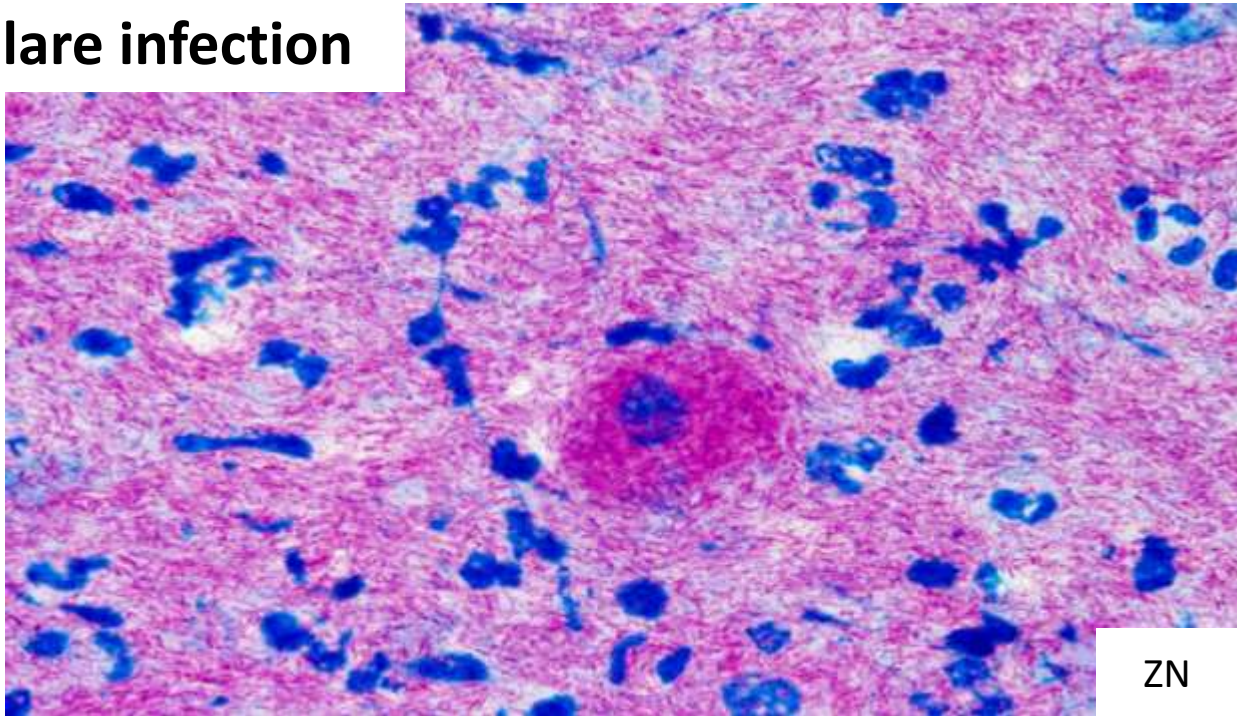


PAS

Mycobacterium avium intracellulare infection



H&E



ZN

Sharma K, Mewara A, Gupta N, Sharma A, Varma S. Multiplex PCR in diagnosis of *M. tuberculosis* and M. avium co-infection from lymph node in an AIDS patient. Indian J Med Microbiol 2015;33:S151-3.

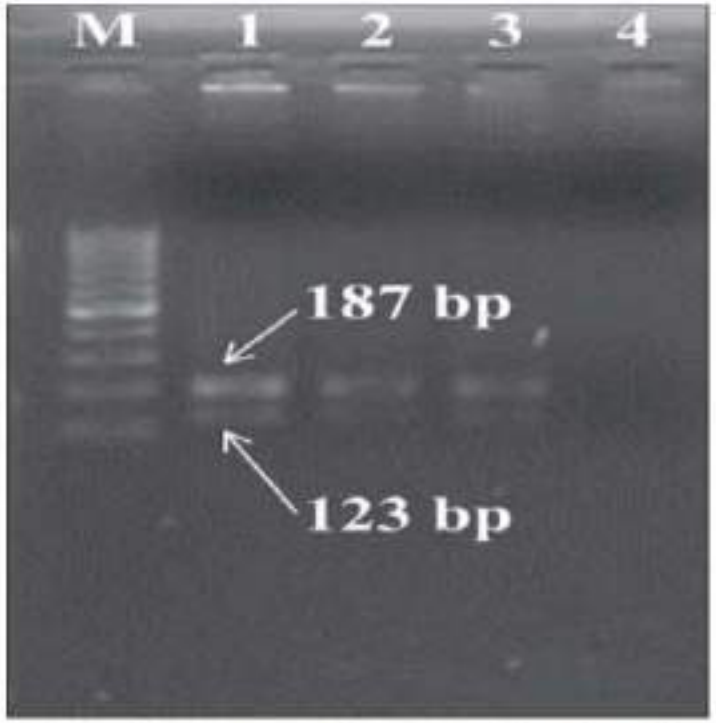


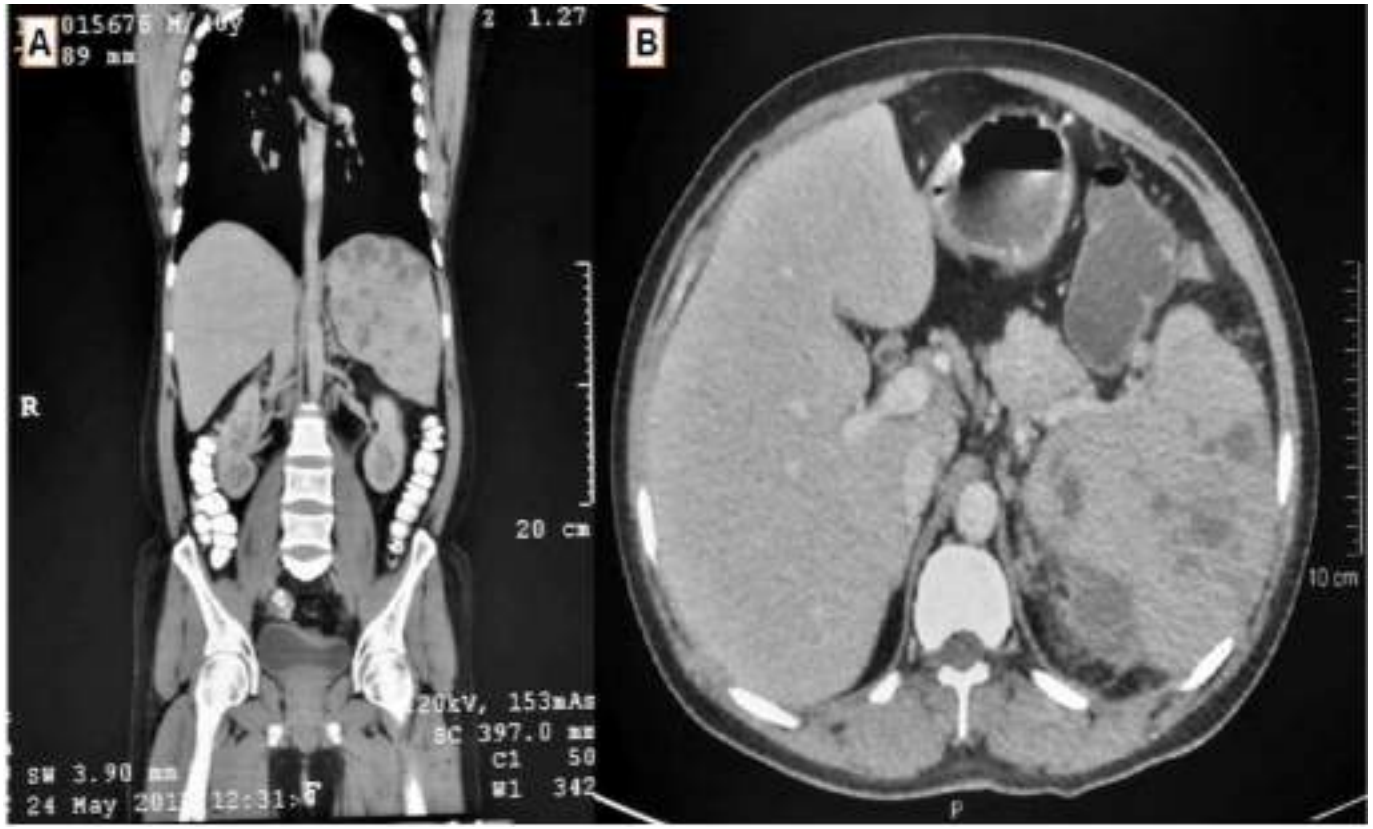
Figure 2: MPCR showing specific bands for both *M. tuberculosis* (123 bp) and *M. avium* (187 bp). Lane 1: Positive control; lanes 2 and 3: Sample in duplicate; lane 4: negative control; lane M: 100 bp DNA ladder

MPCR was carried out in duplicate using IS6110 primers specific for M. tuberculosis complex & IS1245 primers specific for M. avium

Splenic granulomas: a rare manifestation of *Mycobacterium avium* complex in an immunocompetent host

BMJ Case Rep 2018.

Nupoor Acharya,[1] Arghya Chattopadhyay,[1] Kusum Sharma,[2] Aman Sharma[1]



38 M; diabetic on insulin therapy
Splenic FNAC: Epithelioid cell granulomas & reactive lymphoid cells
ZN Stain: negative

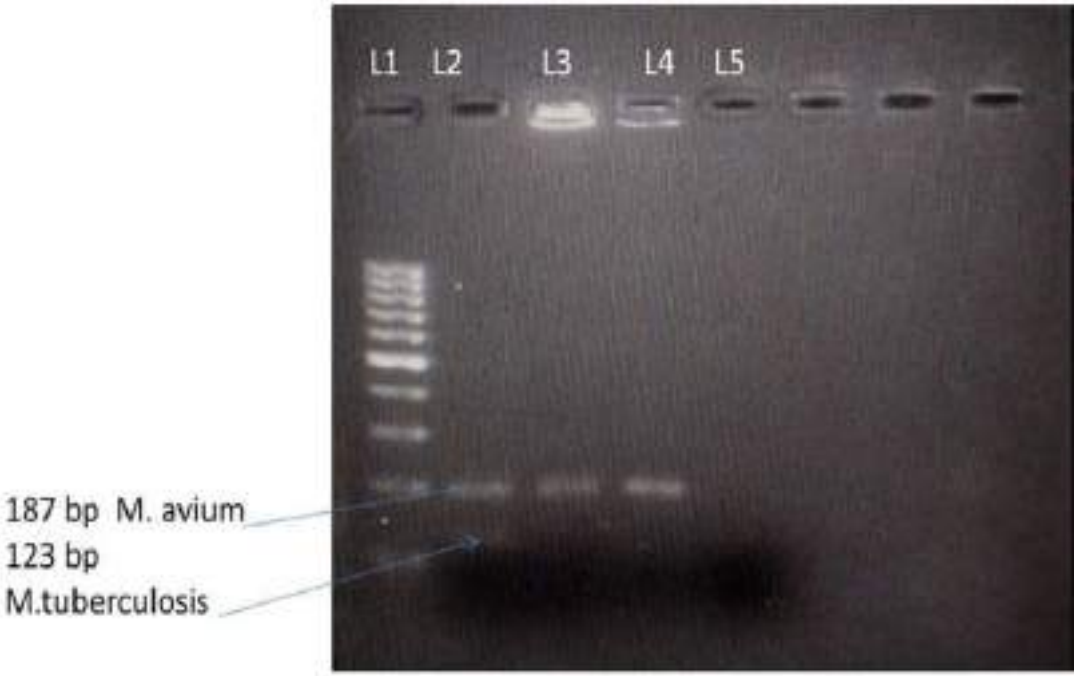
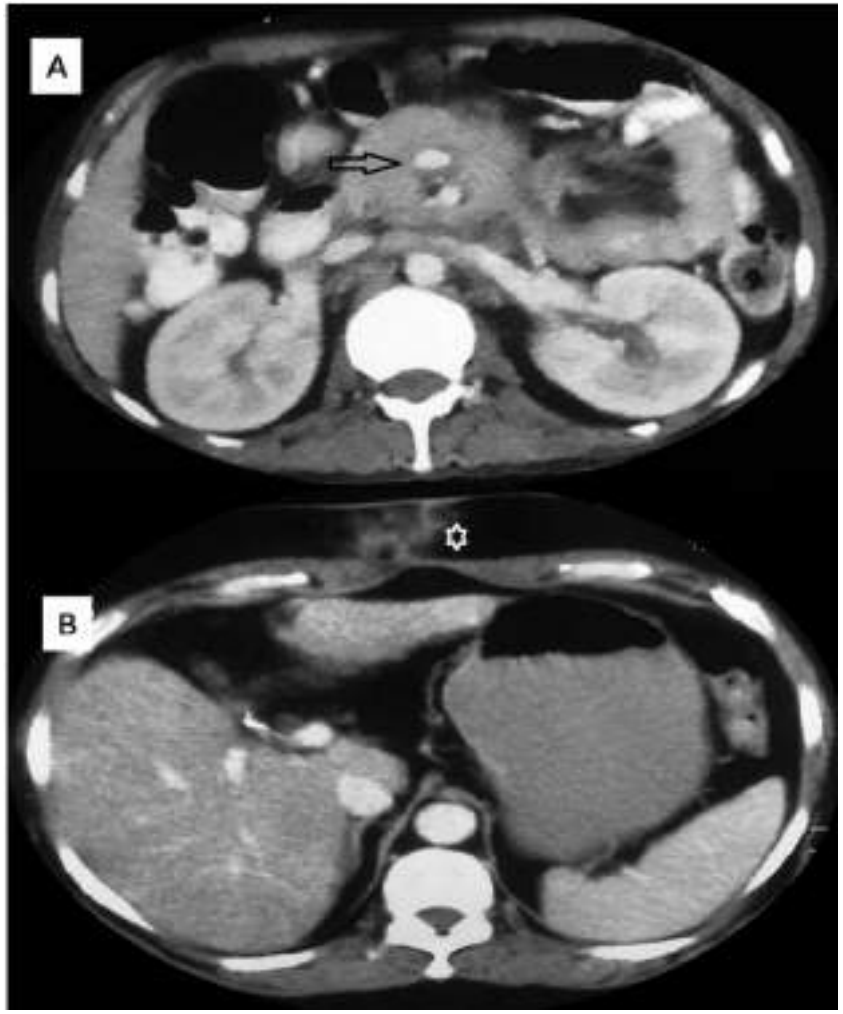


Figure 2 Gel picture of multiplex PCR for *Mycobacterium avium* and *M. tuberculosis*: L1, 100 bp molecular marker; L2, positive control with 187 bp band specific for *M. avium* and 123 bp band specific for *M. tuberculosis*; L3–4, DNA extracted from patient sample positive for 187 bp band specific for *M. avium*; L5, negative control.

Letter: Abdominal *Mycobacterium avium-intracellulare* Infection—A Series in Immunocompromised and Port Site Infections

Anuraag Jena[1] Kusum Sharma[2] Anupam Singh[1] Harjeet Singh[3] Vishal Sharma[1]

J Gastrointest Infect 2023;13:103–104.

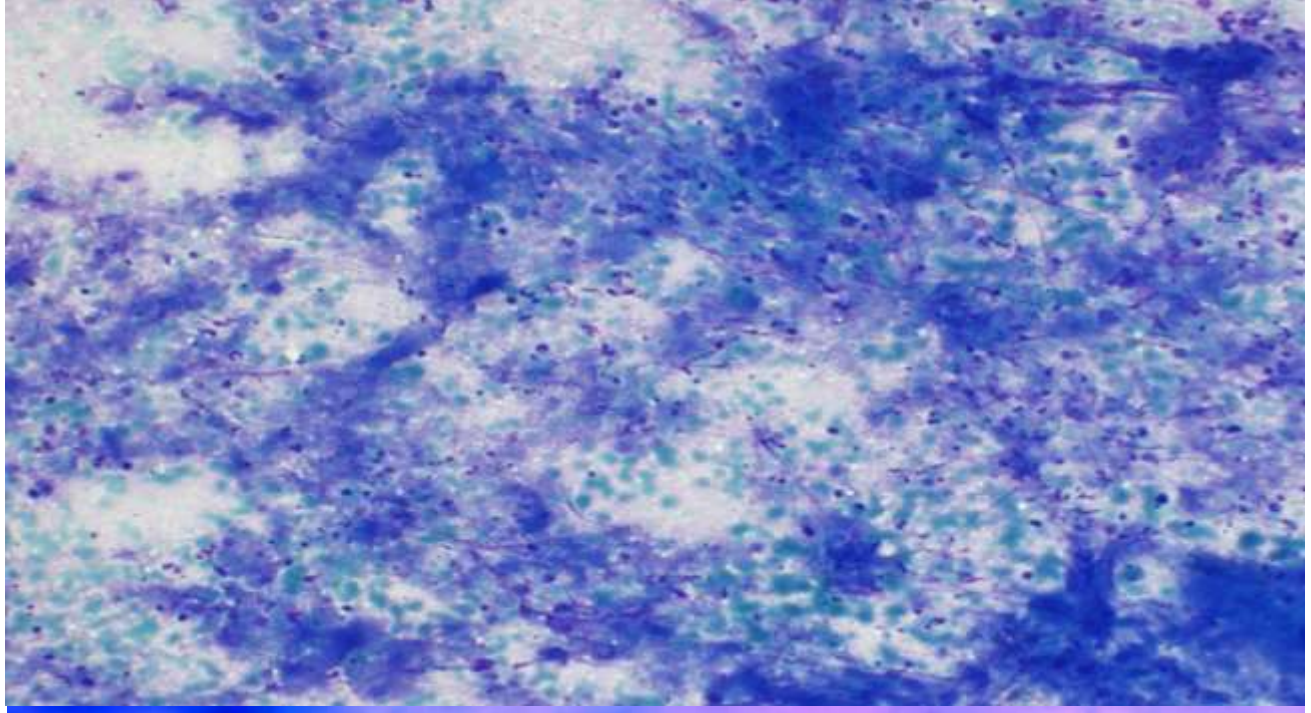


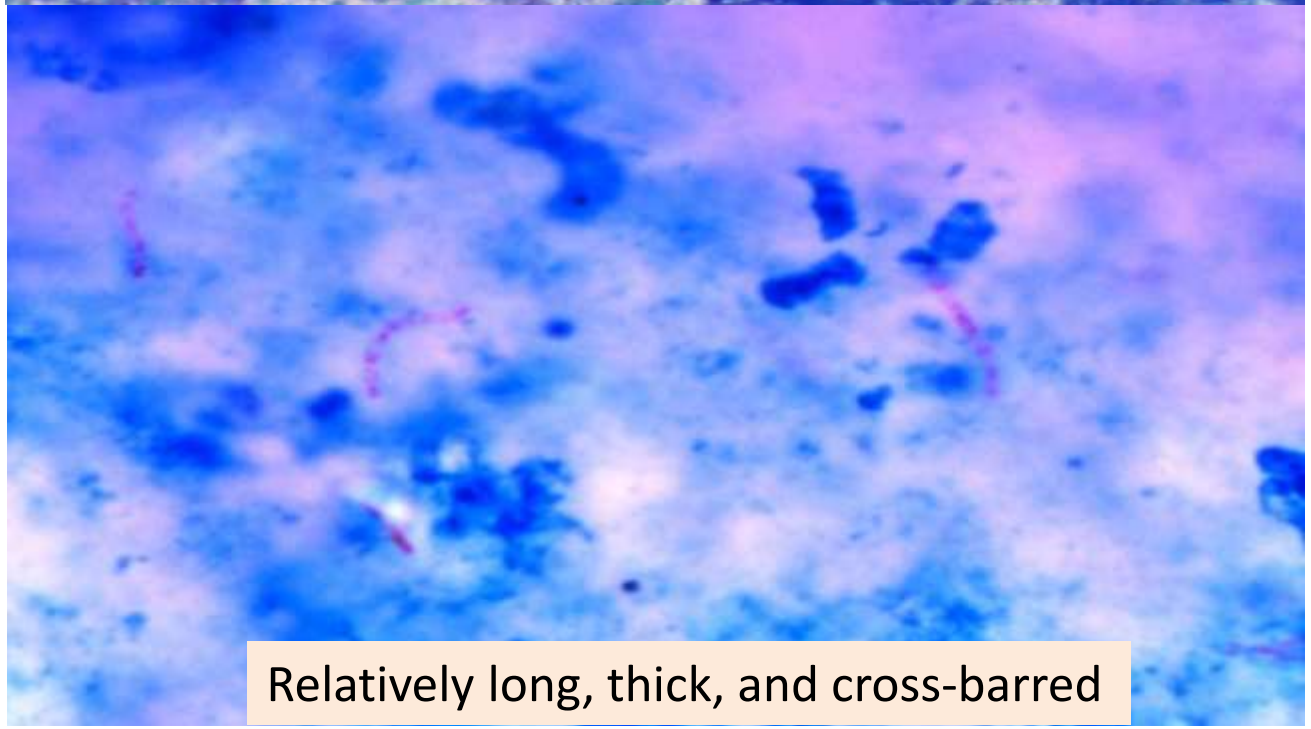
A discharging sinus in the abdomen at the site of port placed for laparoscopic cholecystectomy

Case 5

- 41 M, HIV-seropositive
- H/O fever & weight loss for 4 months & cervical lymphadenopathy
- FNAC was done from right cervical lymph node

Mycobacterium kansasii

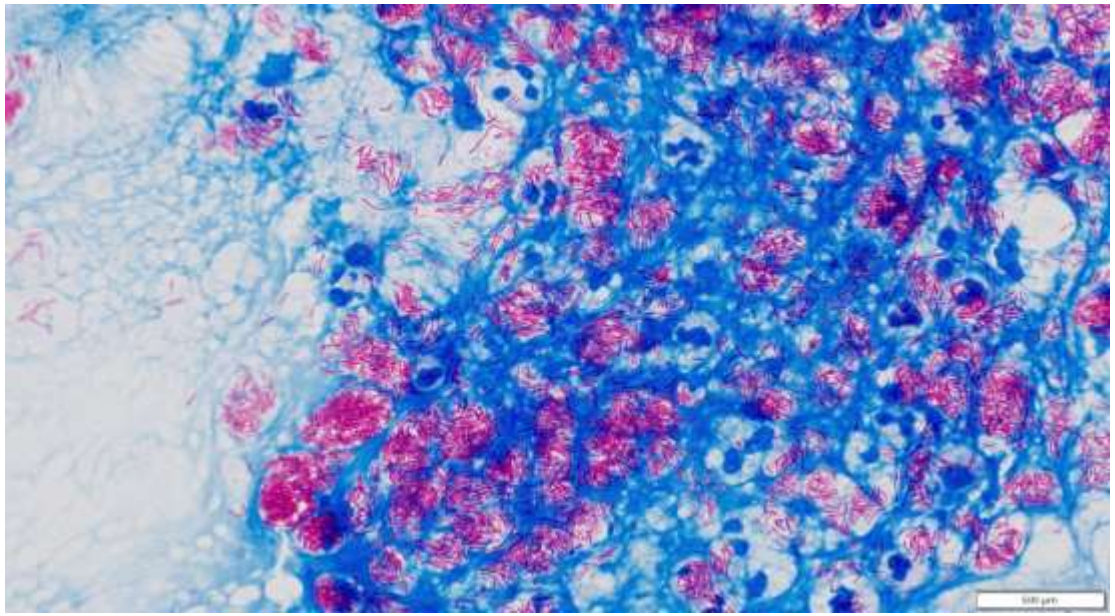




Relatively long, thick, and cross-barred

Case 6

- 34-year-old Male
- H/O Blurred vision and sensitivity to light
- Impression smear from cornea



Mycobacterium abscessus Complex

Mycobacterium abscessus Complex

- A group of rapidly growing, multidrug-resistant, non-tuberculous mycobacteria (NTM)
- Responsible for a wide spectrum of skin & soft tissue diseases, CNS infections, bacteremia, & ocular and other infections
- 3 subspecies: *M. abscessus* subsp. *abscessus*, *M. abscessus* subsp. *massiliense*, *M. abscessus* subsp. *Bolletii*
- *rpoB* gene–based sequencing: a more reliable method for identifying *M. abscessus* complex to the subspecies level

Identification & Isolation of MTB and NTM

- **Microscopy**: Acid-fast staining (ZN, Auramine-rhodamine)
- **Culture**: Löwenstein-Jensen, Middlebrook 7H10/7H11
- **Liquid culture-based p-nitrobenzoic acid (PNB) Test**: Using liquid culture for identification of MTB complex
- **Card Test**: Using culture colony, identifies MTB complex; MPB 64 Ag
- **Biochemical Identification**: Species identification through biochemical tests (Time consuming)
- **Molecular Methods**: PCR and sequencing for species identification; MALDI-TOF

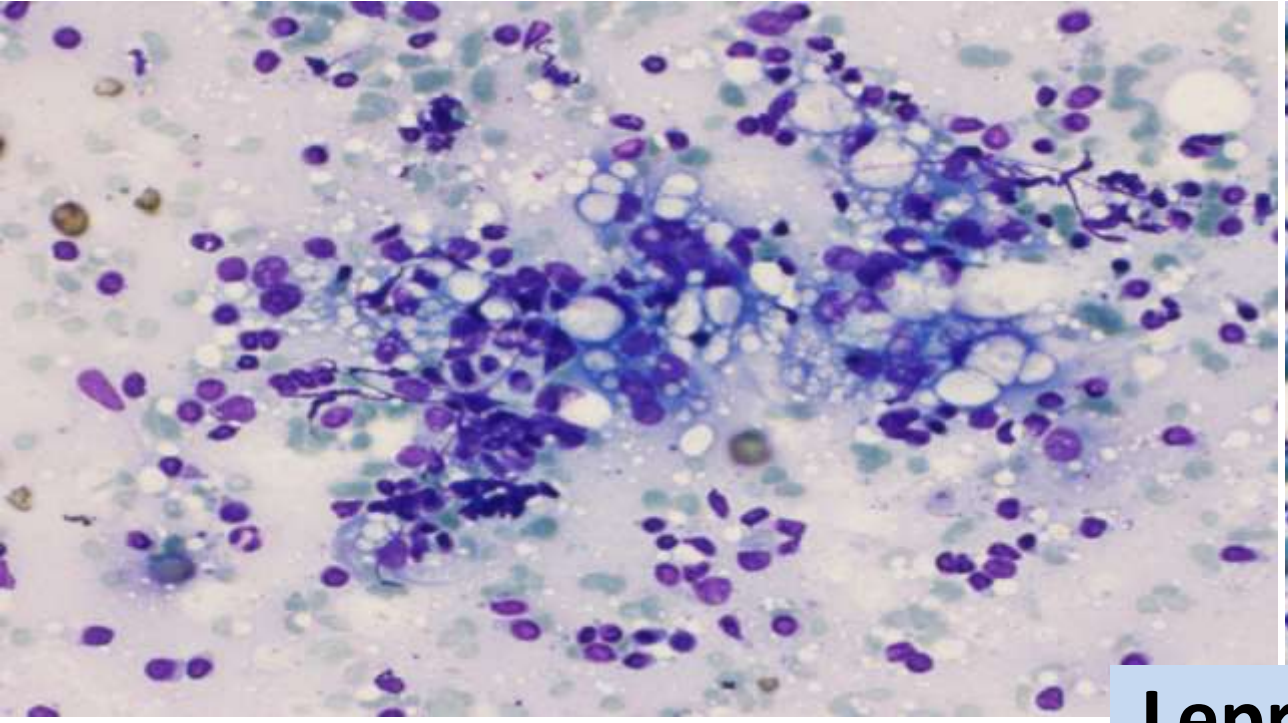


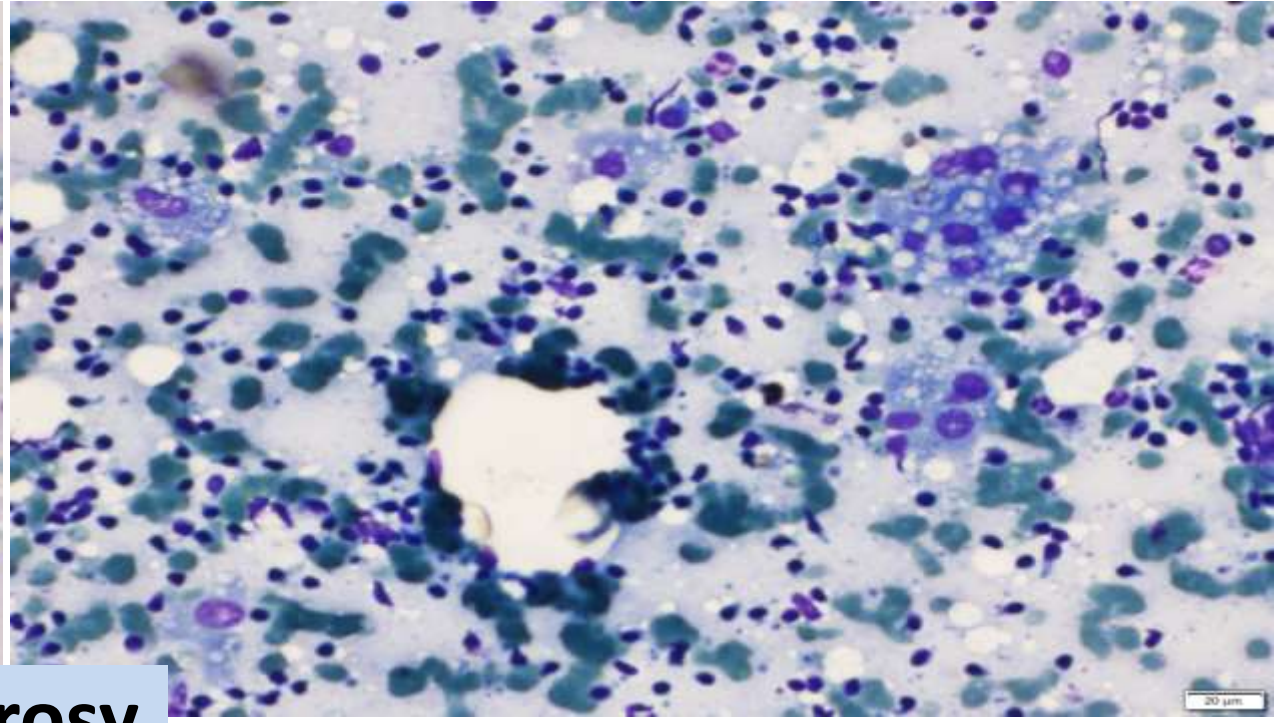


IS6110, rpoB and hsp65

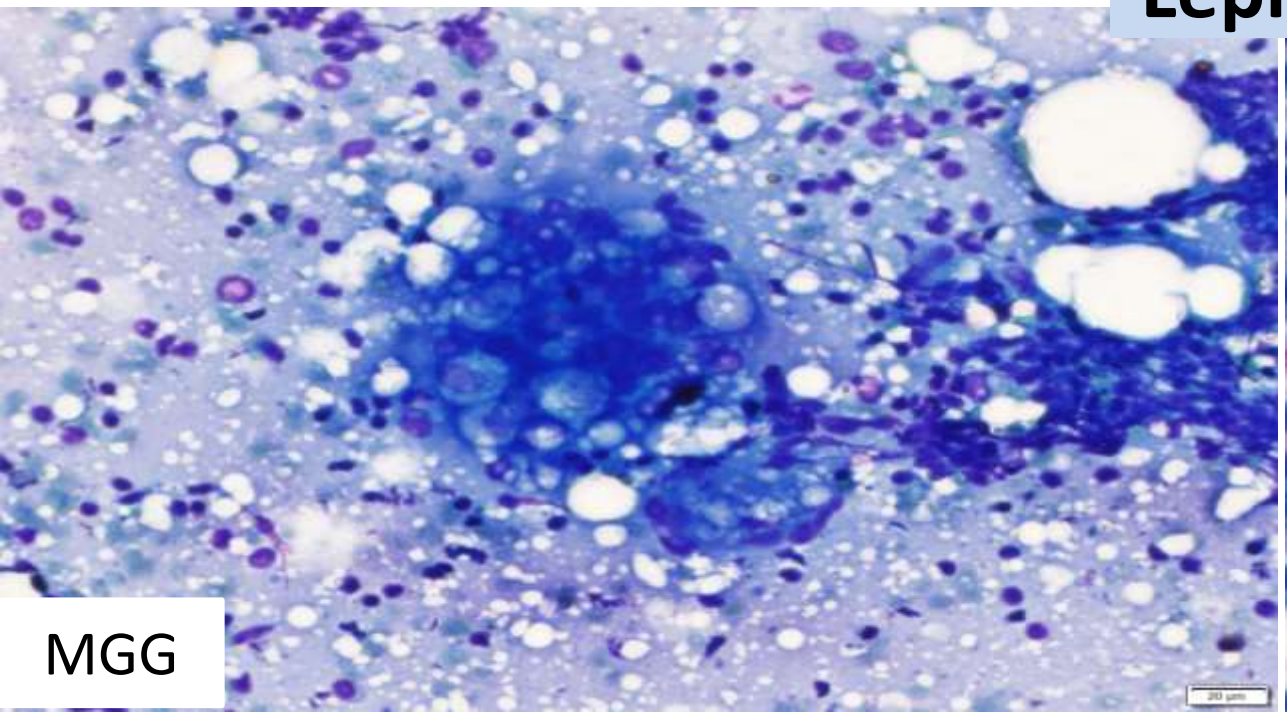
Case 7

- 47-year-old male
- FNAC was done from right cervical lymph node
- K/C/O ……

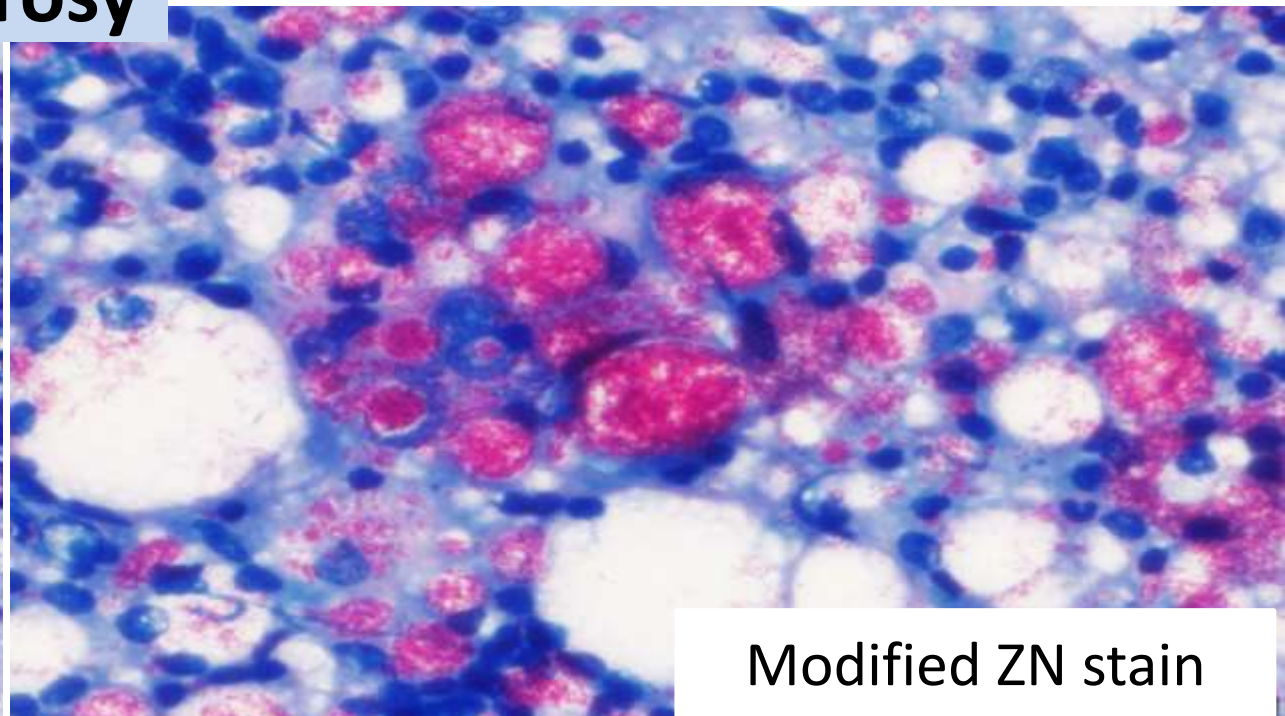




Leprosy



MGG



Modified ZN stain

Leprosy Lymphadenopathy

- *Mycobacterium leprae* is an obligate intracellular, gram-positive organism that is acid-fast
- Virchow or globus cell
  - Characteristic cell in lepromatous leprosy
  - Syncytial histiocyte
  - Multinucleated cells
  - Vacuolated cytoplasm with numerous lepra bacilli (globi)

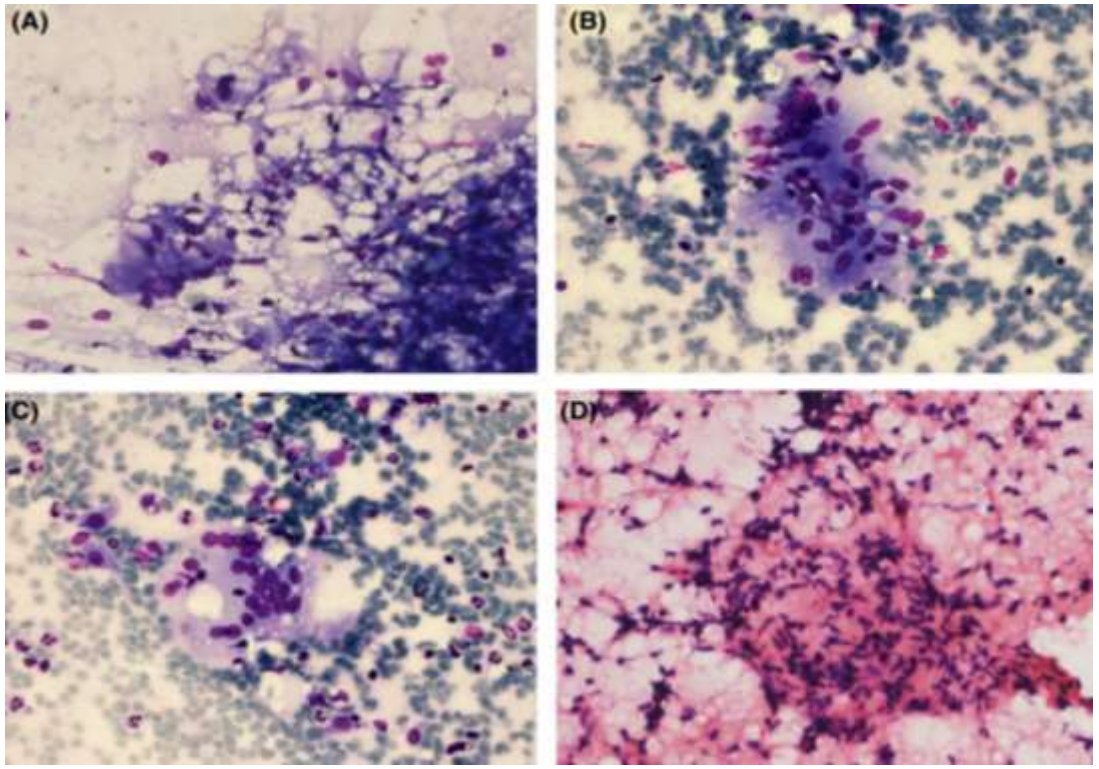
Cytopathology

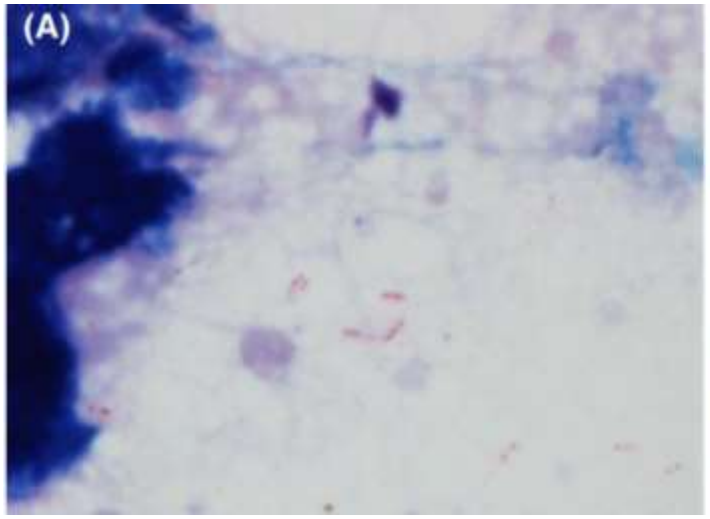
CORRESPONDENCE | Full Access

Cytopathology. 2021;32:290–292.

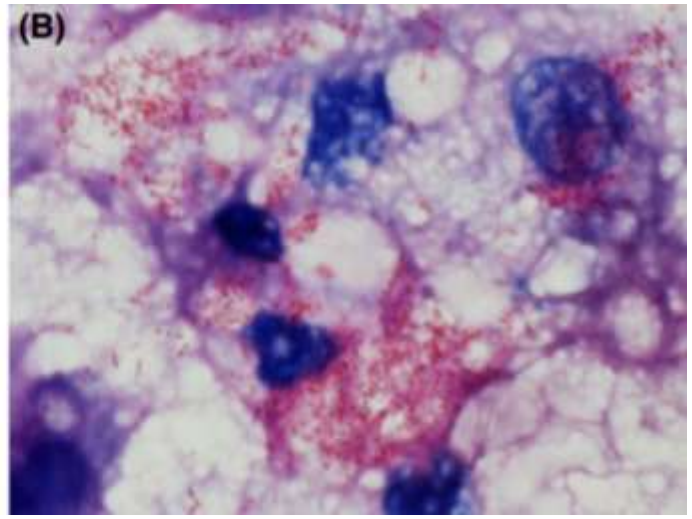
Cytology in the diagnosis of concomitant tuberculosis and leprosy by polymerase chain reaction using cytology scrapings

Ariba Zaidi, Parakriti Gupta, Parikshaa Gupta, Kusum Sharma, Tarun Narang, Arvind Rajwanshi





Ziehl-Neelsen staining



Wade-Fite staining

- 50 M; K/C/O Lepromatous leprosy (LL)
- H/O LOW, LOA, fever, weakness, malaise & lymphadenopathy
- FNAC from left cervical lymph node
- PCR using insertion sequence IS6110: for MTB

Case 8

45M; H/O trauma left leg; left inguinal

Diagnostic Cytopathology

Diagn Cytopathol. 2011

Brief Report | Full Access

Two cases of nocardiosis diagnosed by fine-needle aspiration cytology: Role of special stains

Nalini Gupta M.D., D.N.B. ✉ Radhika Srinivasan M.D., Ph.D., Rajiv Kumar M.D., Arunaloke Chakrabarti M.D.

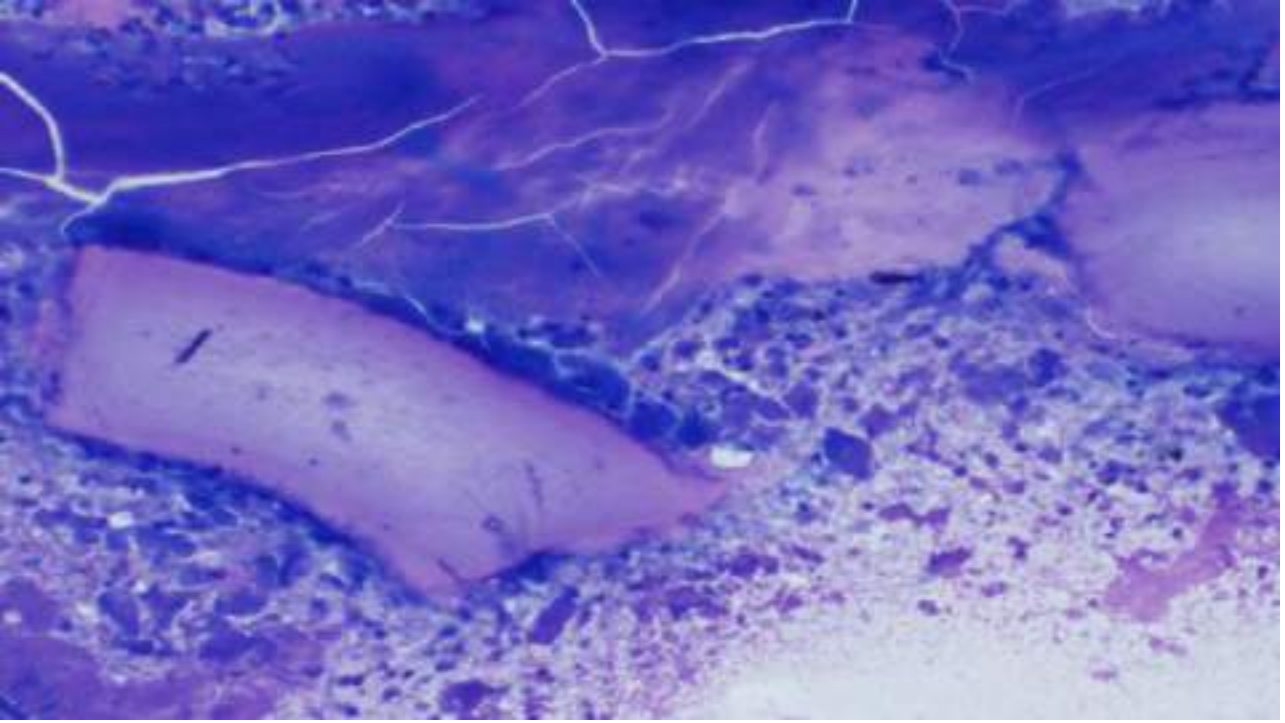
MGG

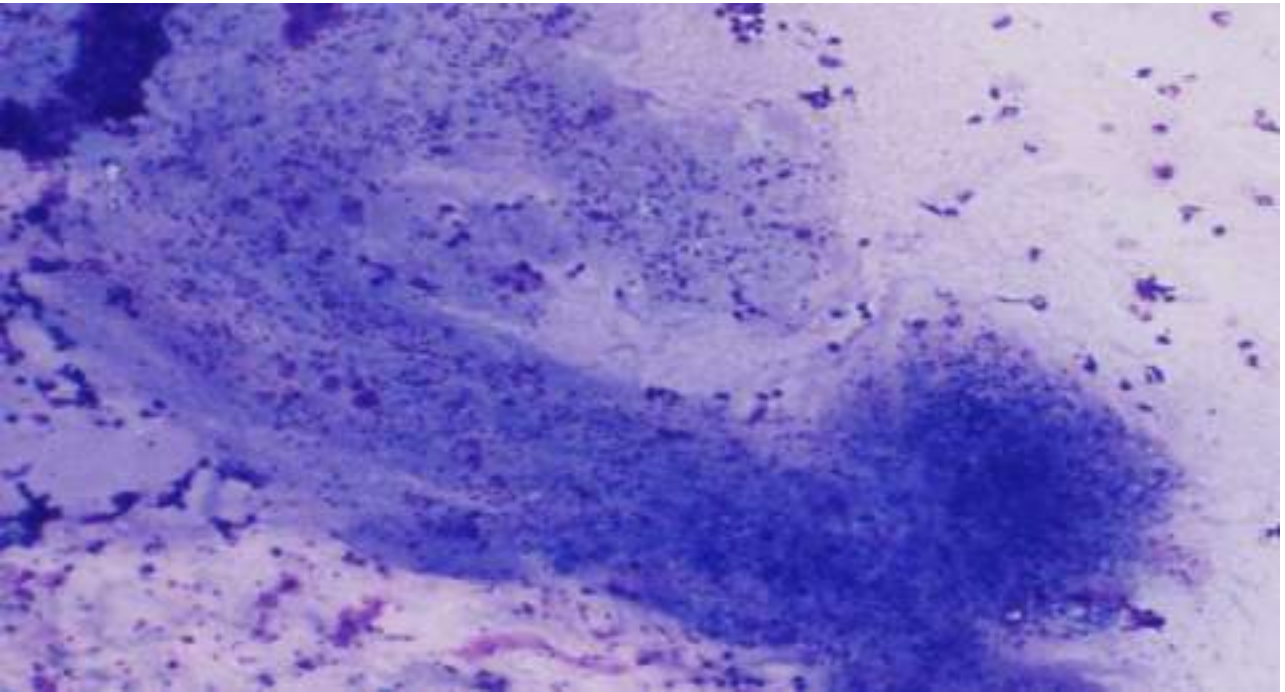
MGG

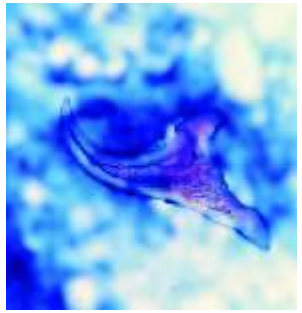
Nocardia

Modified ZN stain

Modified ZN stain







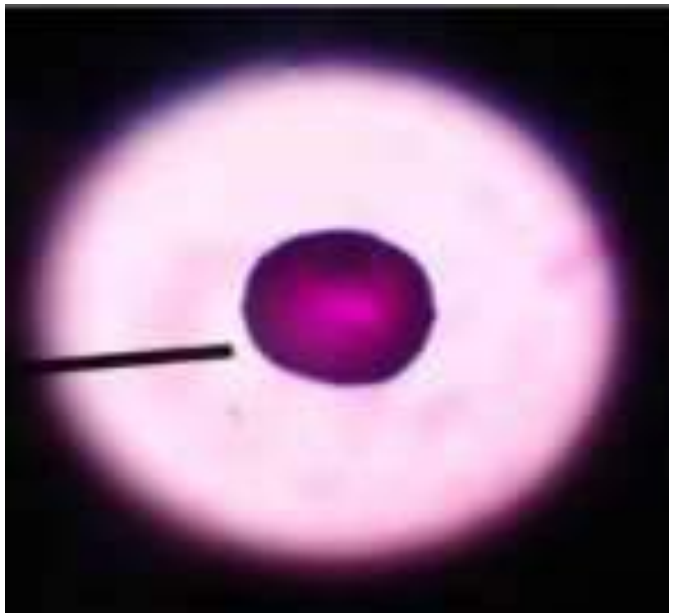
Hooklets of Hydatid & Cysticercus

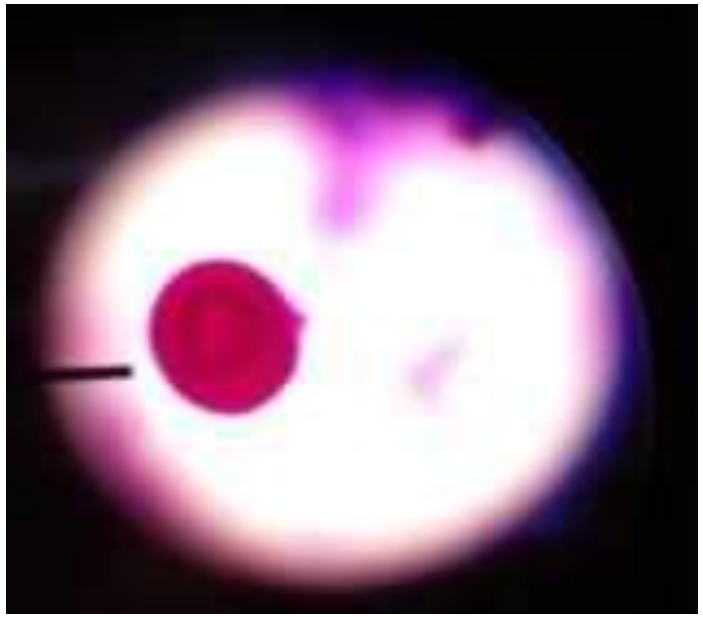
Application of Ziehl Neelsen Staining Method for *Taenia* spp. Eggs Differentiation

Machrumnizar Machrumnizar [1], Arleen Devita [2], Yuliana Yuliana [1], *Suriyani Tan [1]

1. *Department of Parasitology, Faculty of Medicine, Trisakti University, Jakarta, Indonesia*
2. *Department of Microbiology, Faculty of Medicine, Trisakti University, Jakarta, Indonesia*

Iran J Parasitol: Vol. 17, No. 3, Jul-Sep 2022, pp.332-338





T. solium eggs

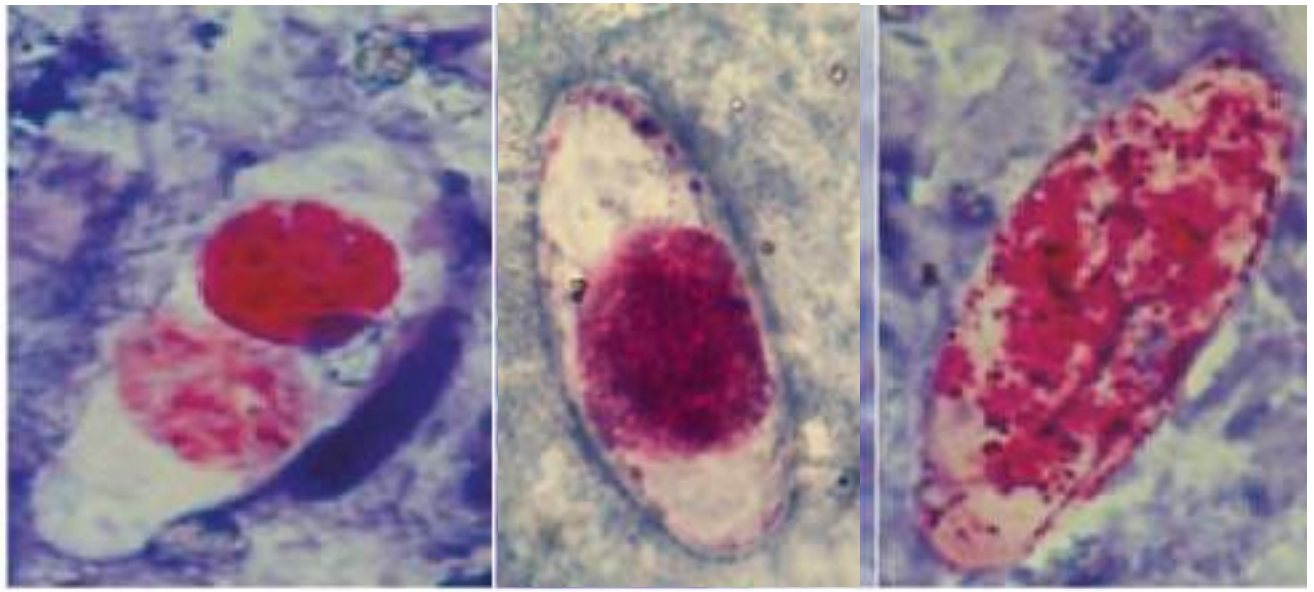
Purplish blue in color on ZN staining

Smaller in size, spherical in shape

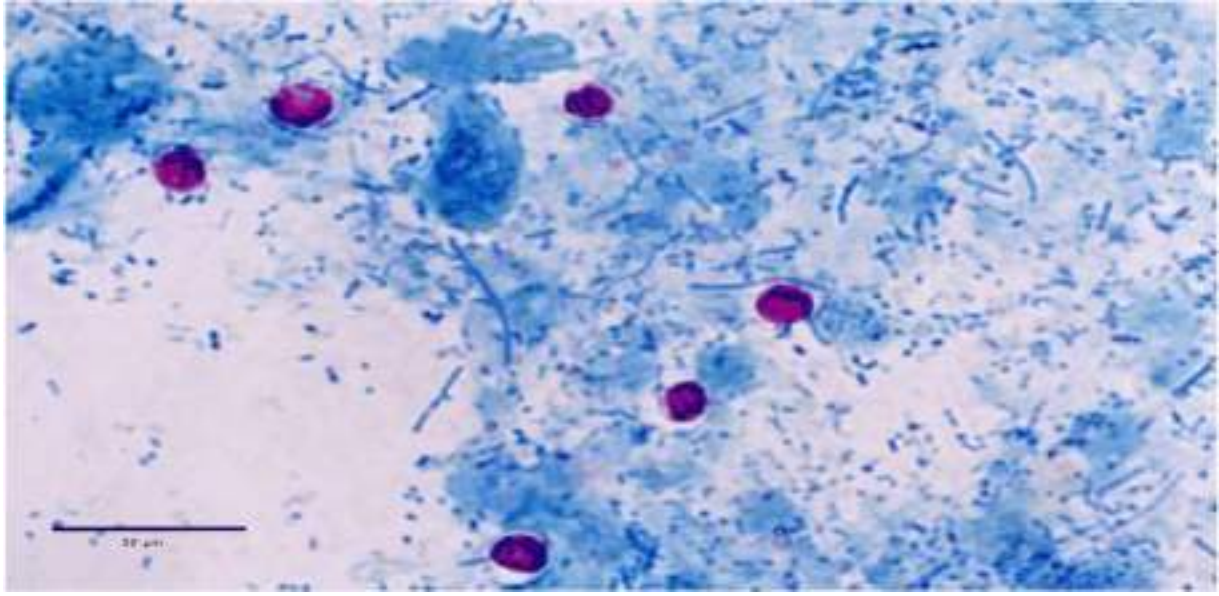
T. saginata eggs

Magenta red color on ZN staining

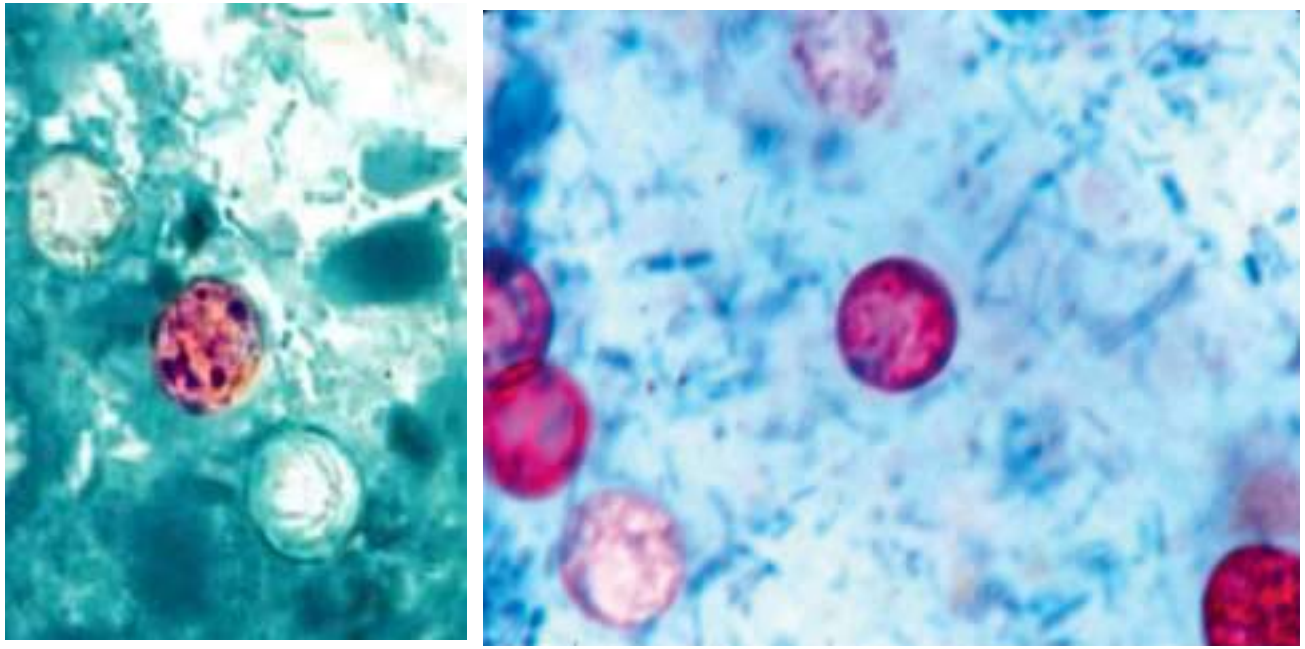
Slightly larger, Round to oval in shape



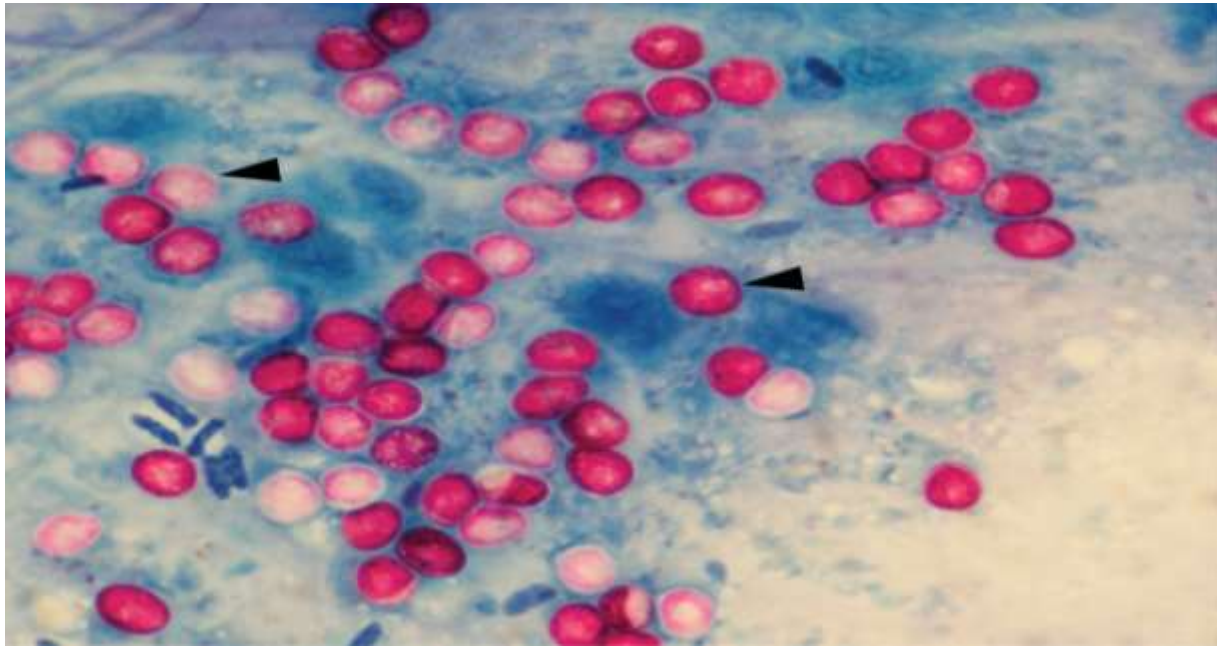
Wakid MH. Was this the first case of **Cystoisospora belli** in Saudi Arabia? J King Abdulaziz Univ Med Sci 2019



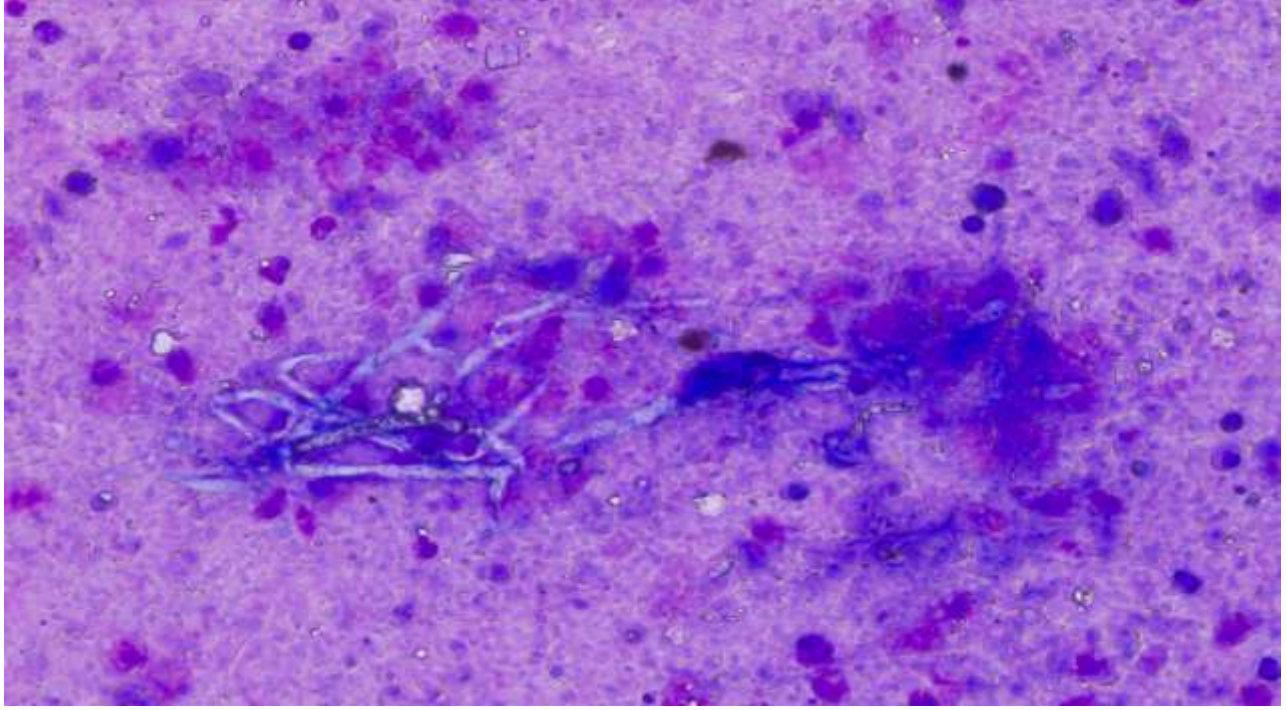
Fernández P et al. Molecular characterisation & risk factor analysis of **Cryptosporidium spp.** in calves from Italy. Parasitology Research. 2018

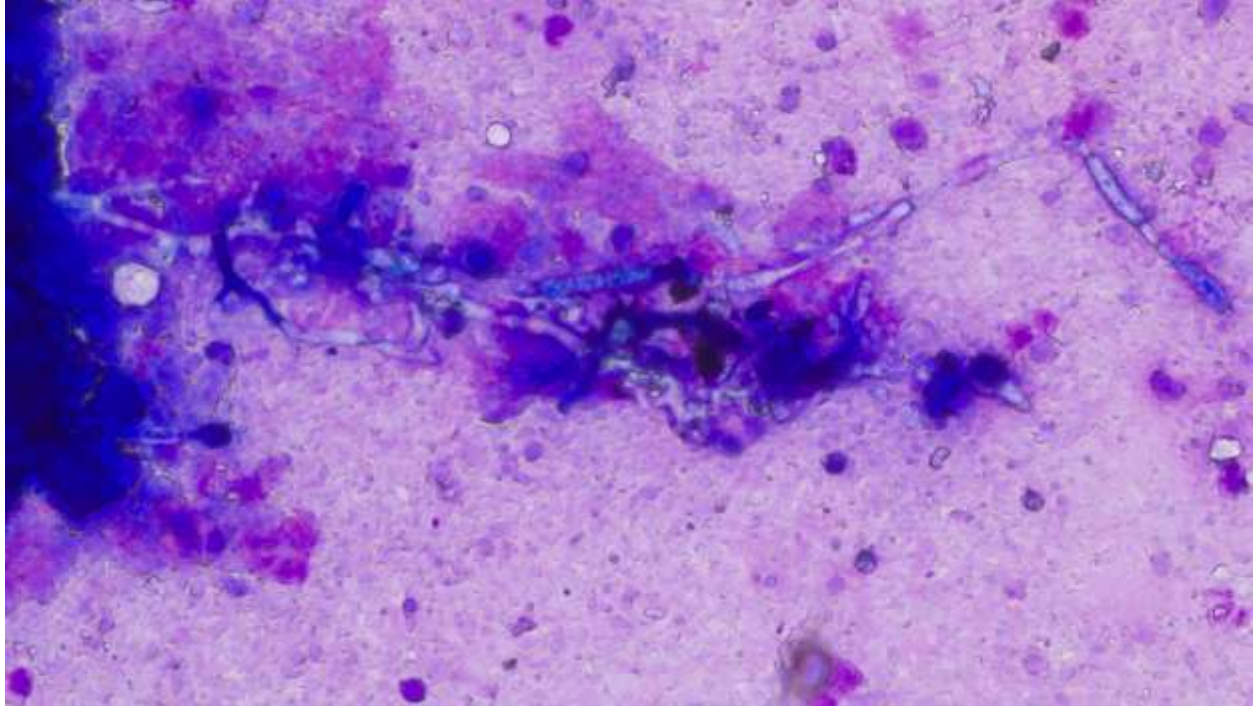


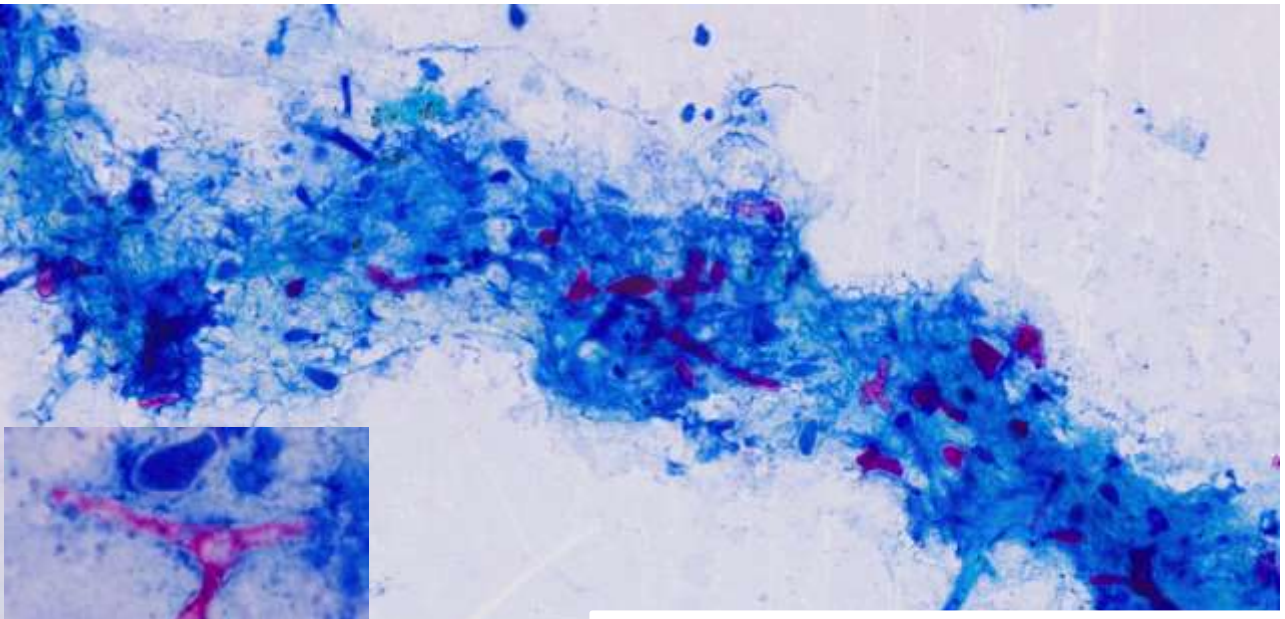
Connor BA. **Cyclosporiasis**; Editor(s): Ryan ET et al. Hunter's Tropical Medicine & Emerging Infectious Diseases; 10th ed.; Elsevier, 2020

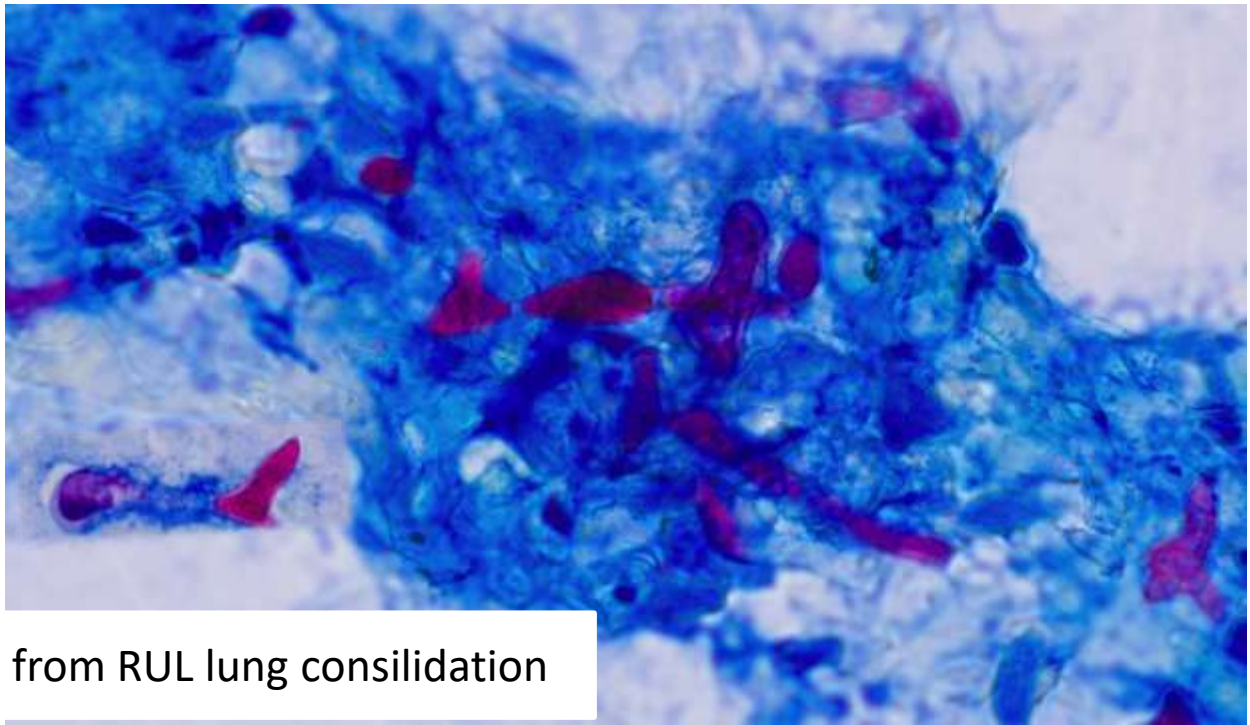


https://ar.inspiredpencil.com/**Cryptosporidium-parvum-**acid-fast-stain

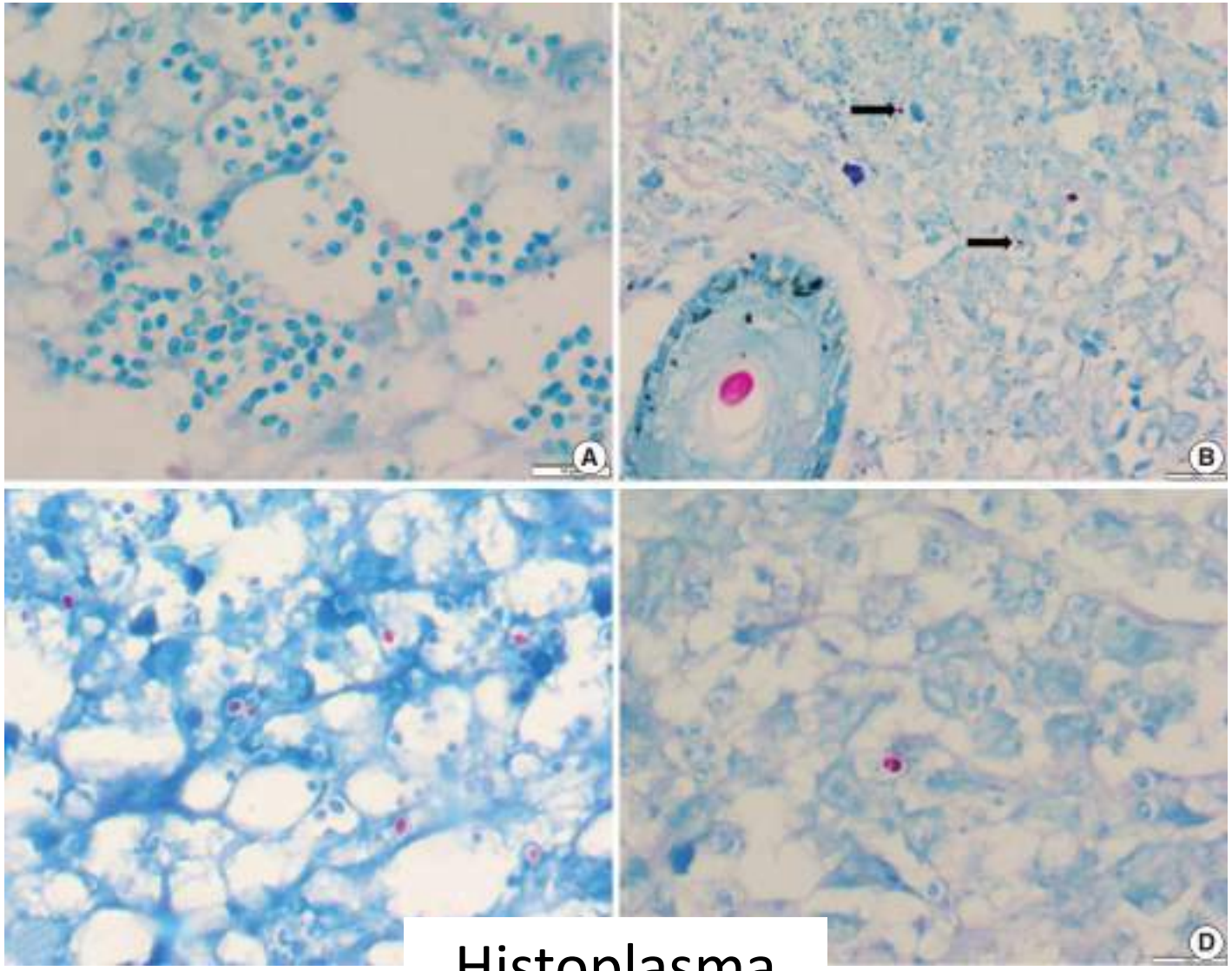




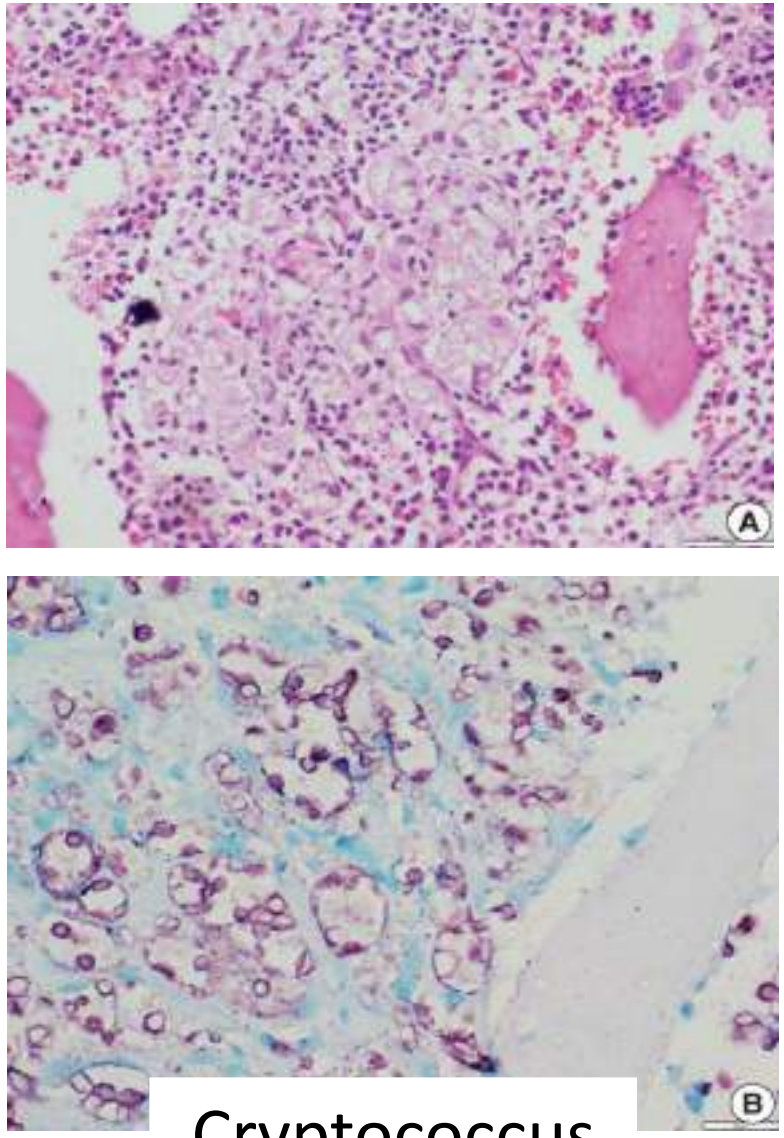




19M;K/C/O Type 1 Diabetes; FNAC from RUL lung consilidation



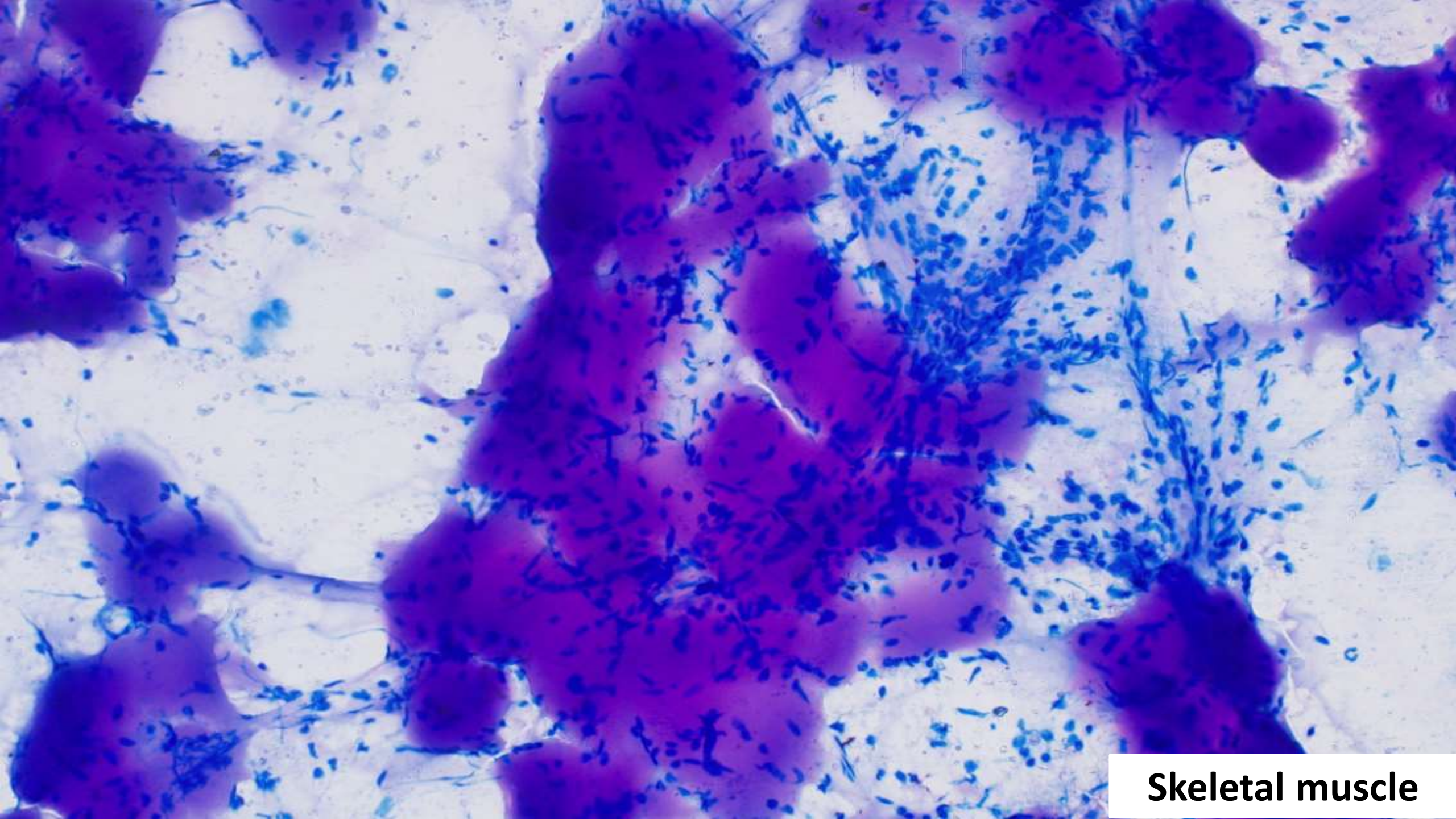
Histoplasma



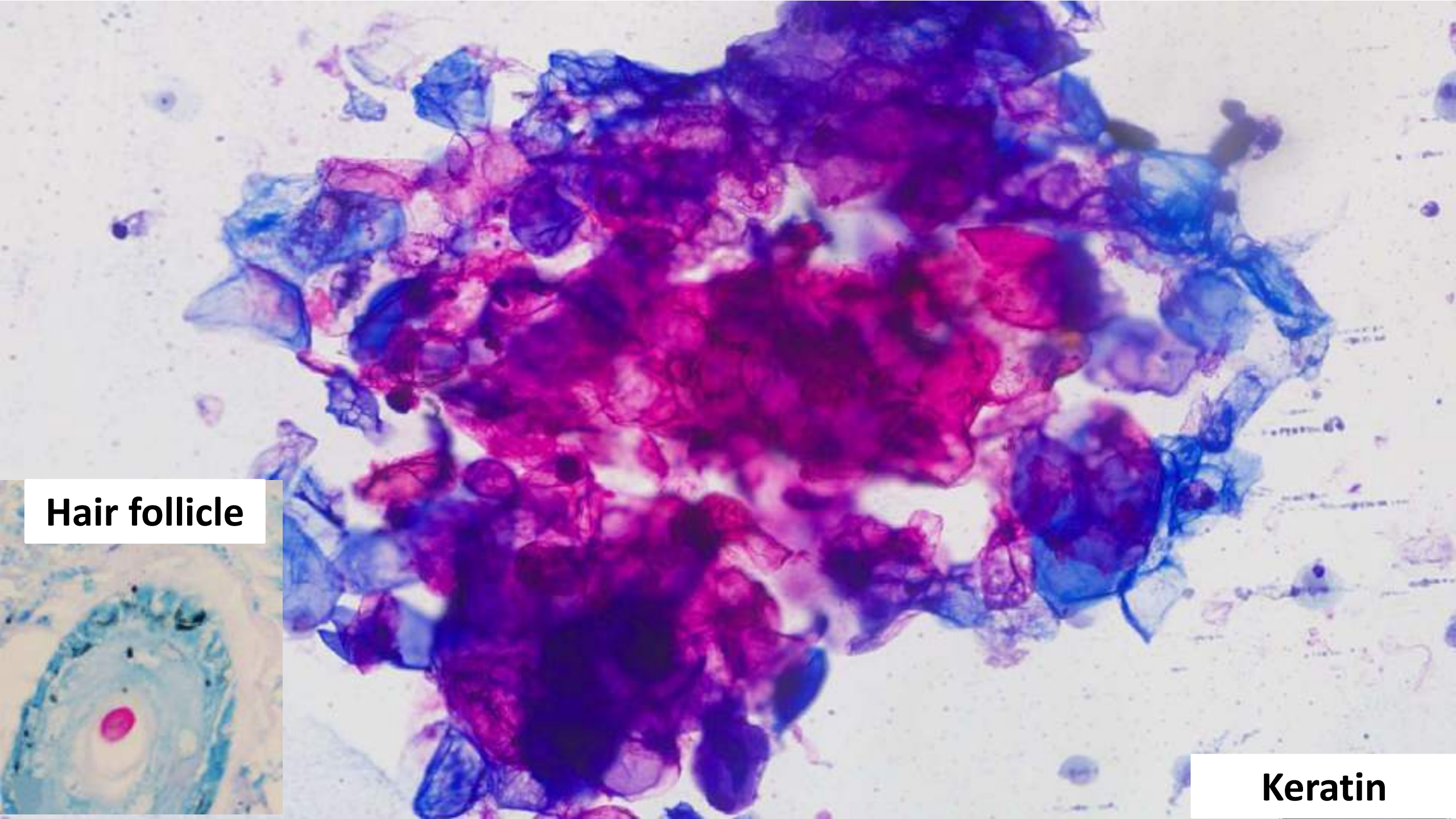
Cryptococcus

Acid-Fastness of *Histoplasma* in Surgical Pathology Practice

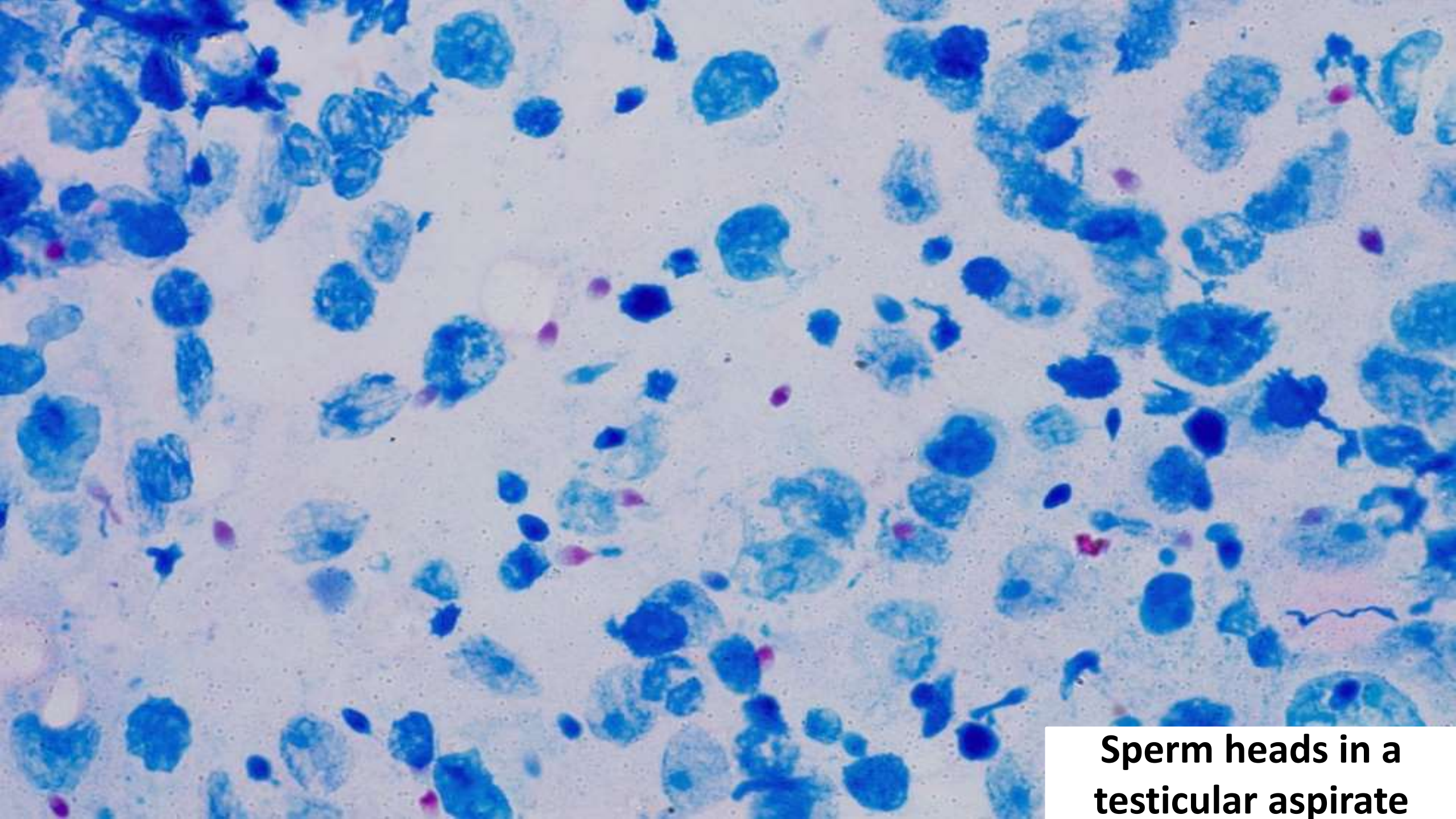
Rajeshwari M, Journal of Pathology and Translational Medicine 2017



Skeletal muscle


Hair follicle
Keratin


Charcot leyden crystals



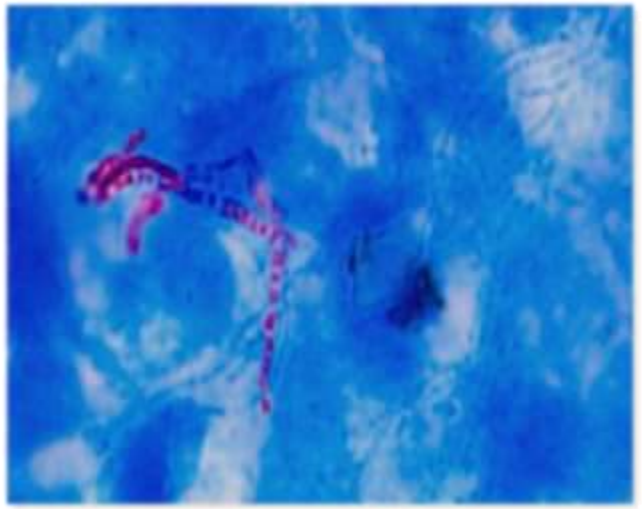
Sperm heads in a testicular aspirate

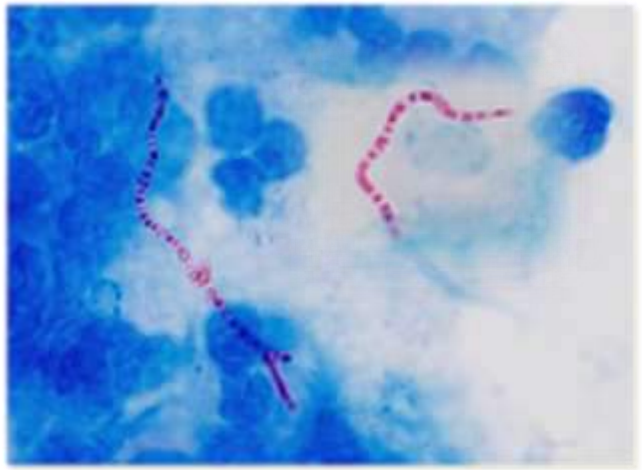
Acid-fast bacilli or other structures

- Genus *Mycobacterium*– *M. leprae, M. tuberculosis, M. smegmatis, M. Avium complex, M. kansasii, M abscessus*
- Genus *Nocardia*– *N. brasiliensis, N. cyriacigeorgica, N. farcinica, N. nova*
- Bacterial endospores; Head of sperm
- Oocysts of Cryptosporidium parvum, Cystisospora belli, Cyclospora
- Taenia saginata eggs; Hooklets of Hydatid cysts; Sarcocystis
- Nuclear inclusion bodies in lead poisoning
- Blastomyces & histoplasma (fungal yeasts)

Causes of False-positive results

- Reuse of positive slides/scratched slides (improper storage)
- Contamination of dye/water
- Presence of intestinal contamination
- Improper discoloration (with sulfuric acid)
- Transferred from oil on magnifying lens
- Artefacts (precipitation of old stains)





Take home message

- Ziehl-Neelsen staining has stood test of time.
- Ziehl-Neelsen staining remains a valuable tool in the modern world due to its simplicity, cost-effectiveness, and reliability in detecting acid-fast bacteria.
- Not all acid-fast bacilli are MTB.
- Be mindful of potential false positive results in ZN staining.



Thanks…

Indian Academy of Cytologists Symposium
Infections and Cancer:
Association, Masquerades, Serendipitous

Dr Bharat Rekhi, Professor, Pathologist,

Tata Memorial Hospital, Parel, Mumbai



rekhi.bharat@gmail.com

Disclosure Information

Bharat Rekhi

I have no relevant financial relationships to disclose.

Infections and Cancer

- Certain infectious agents are **associated** with causation of cancer : Human Papilloma virus with cervical and oropharygeal cancers.

- Cancers cause a **immunosupression**, including with chemotherapeutic agents : Opportunity for infectious diseases : Koch's/Tubercular, viral, fungal and parasitic infections

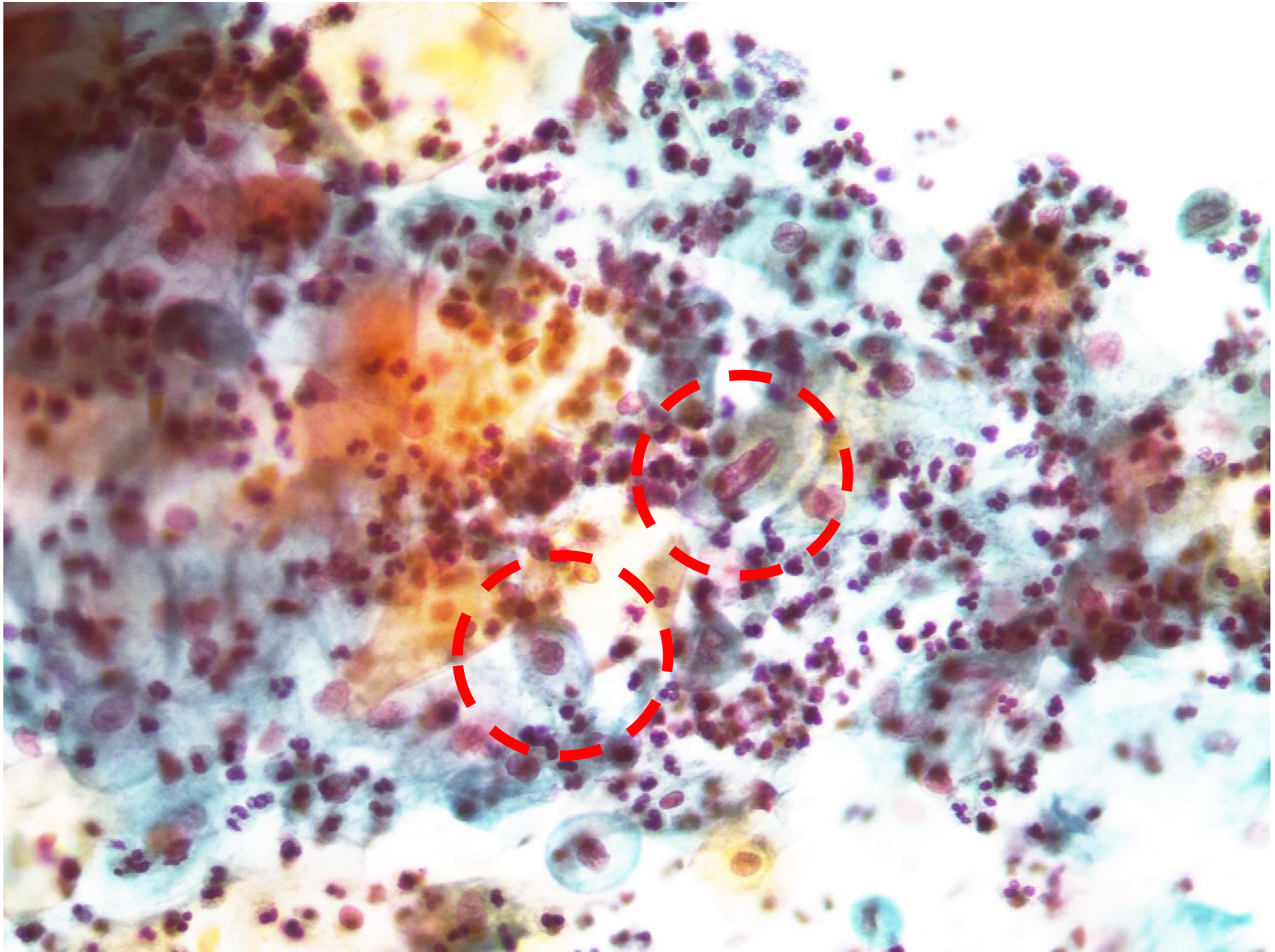
- Widespread or certain localized infections **mimic cancers** : Koch's, parasites,

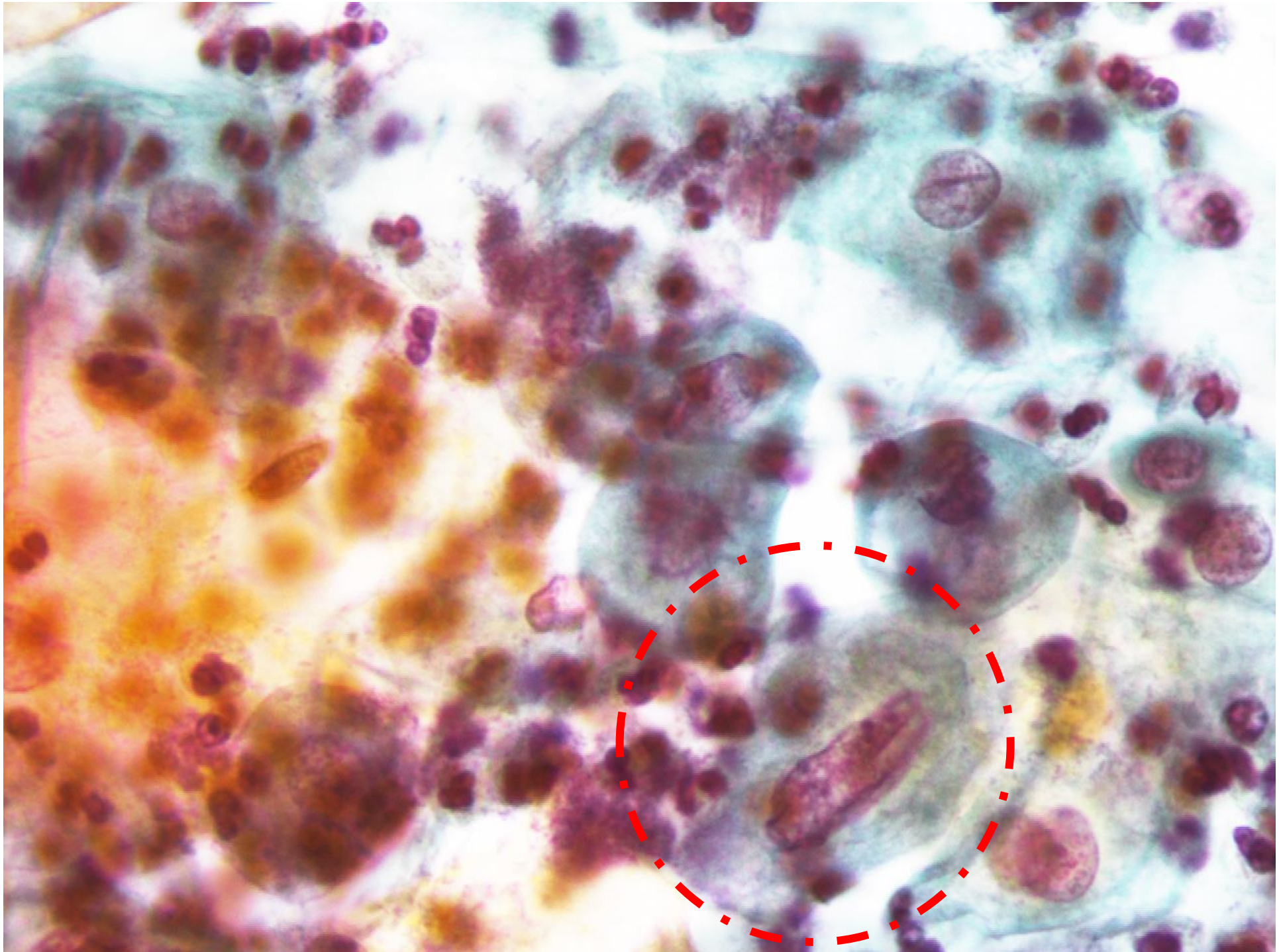
- Incidental infections : **Serendipitous**

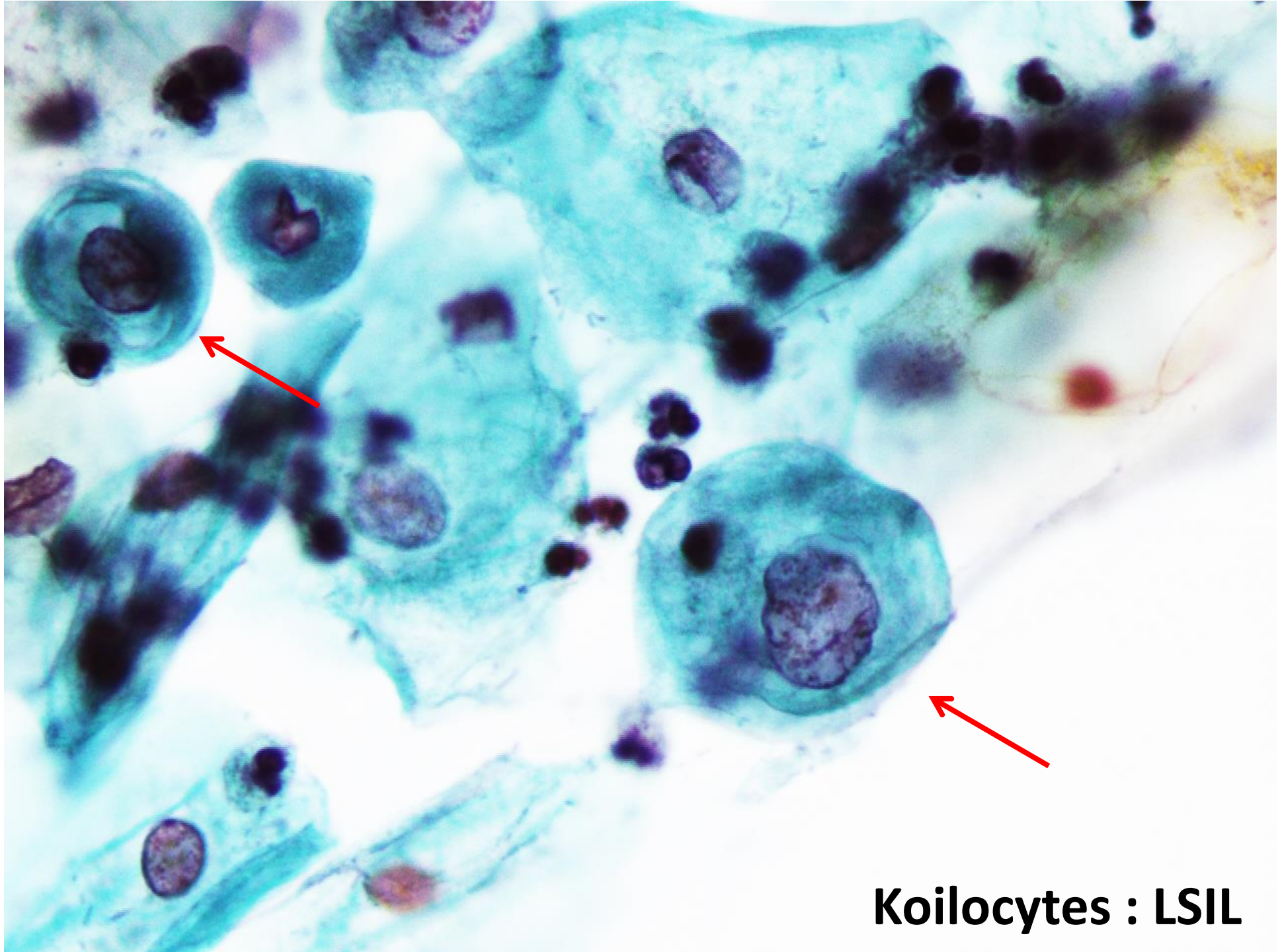
Case 1 : Association and Cause

- A 30-year-old lady, on screening,

Underwent a cervico vaginal Pap smear examination





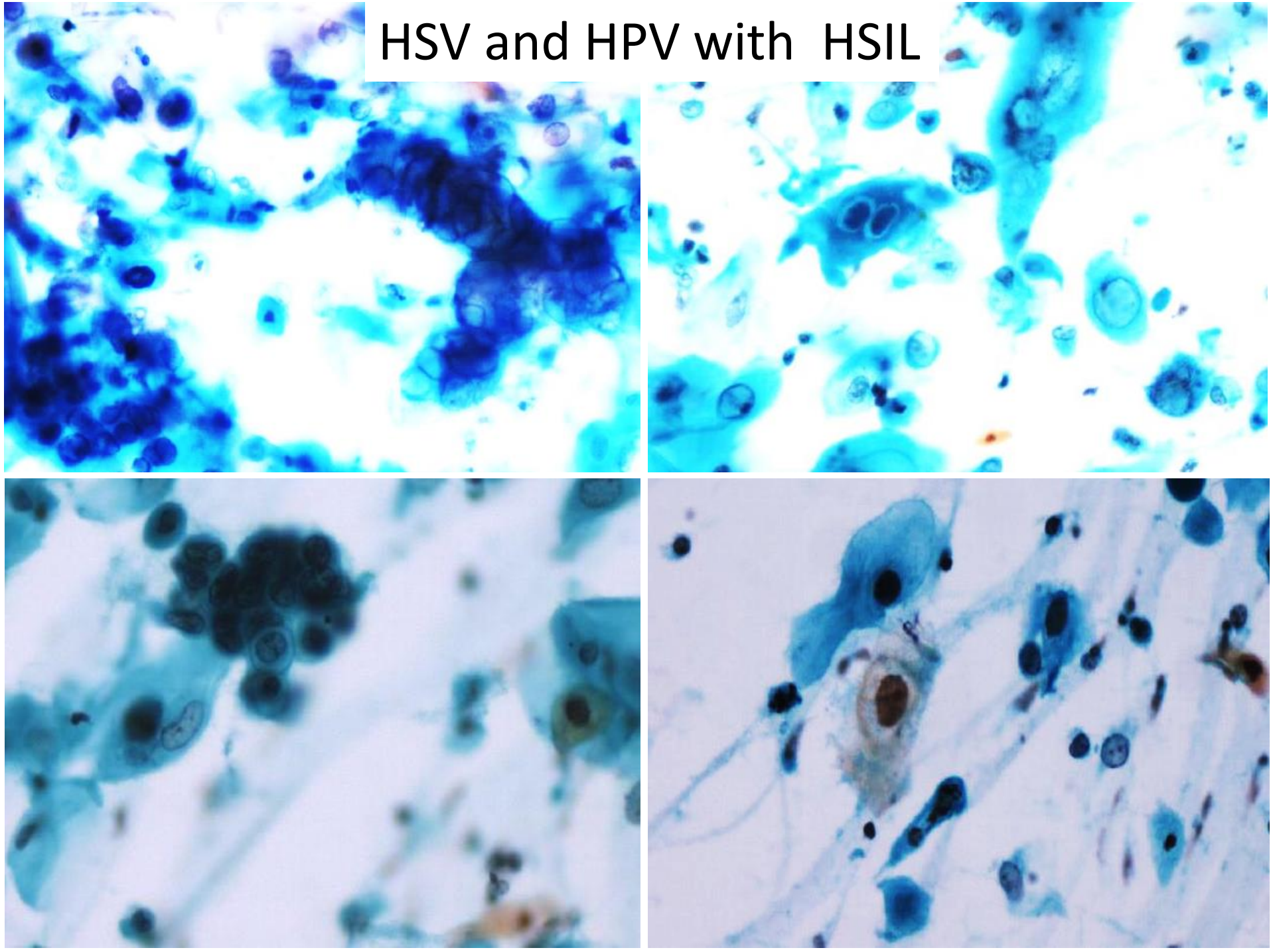

Koilocytes : LSIL

Another case

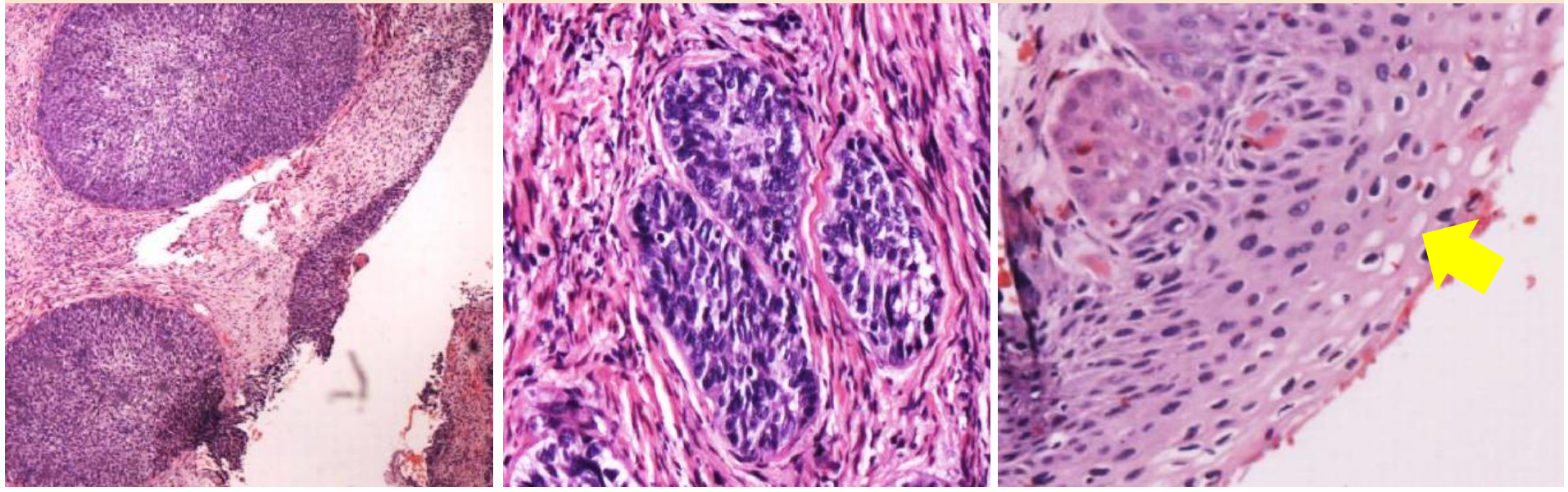
Vaginal smear of a 57-year-old lady , with complaint of anuria. History of squamous carcinoma of the uterine cervix, treated with radiation therapy 10 yrs back

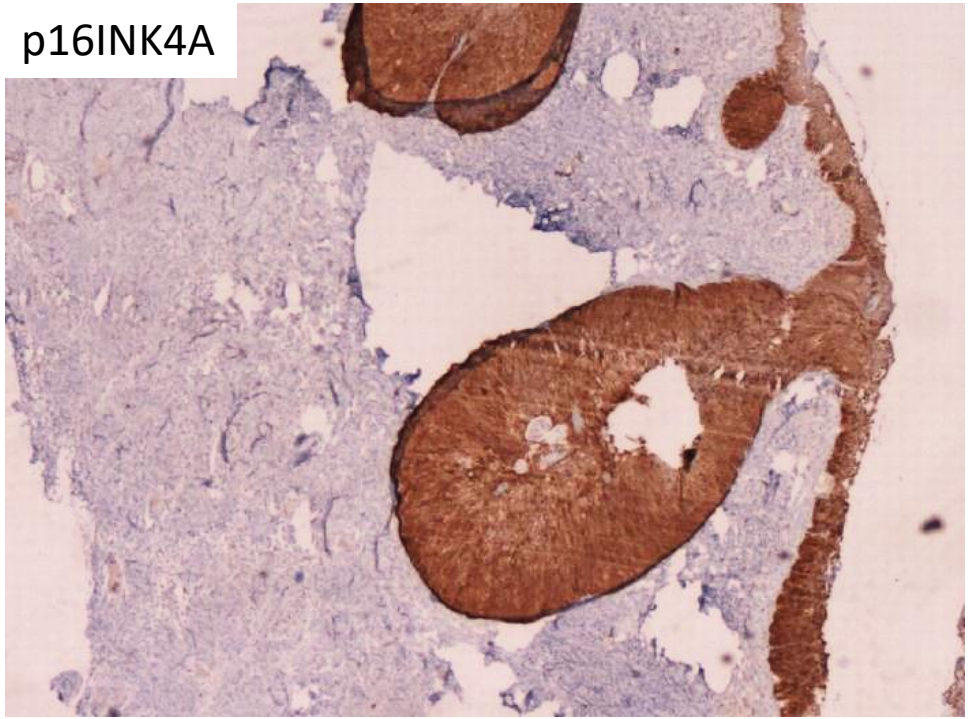
Vaginal examination : A small induration in the cervix and the adjacent vaginal wall; cervical atrophy and minimal ulceration over cervix and vaginal mucosa

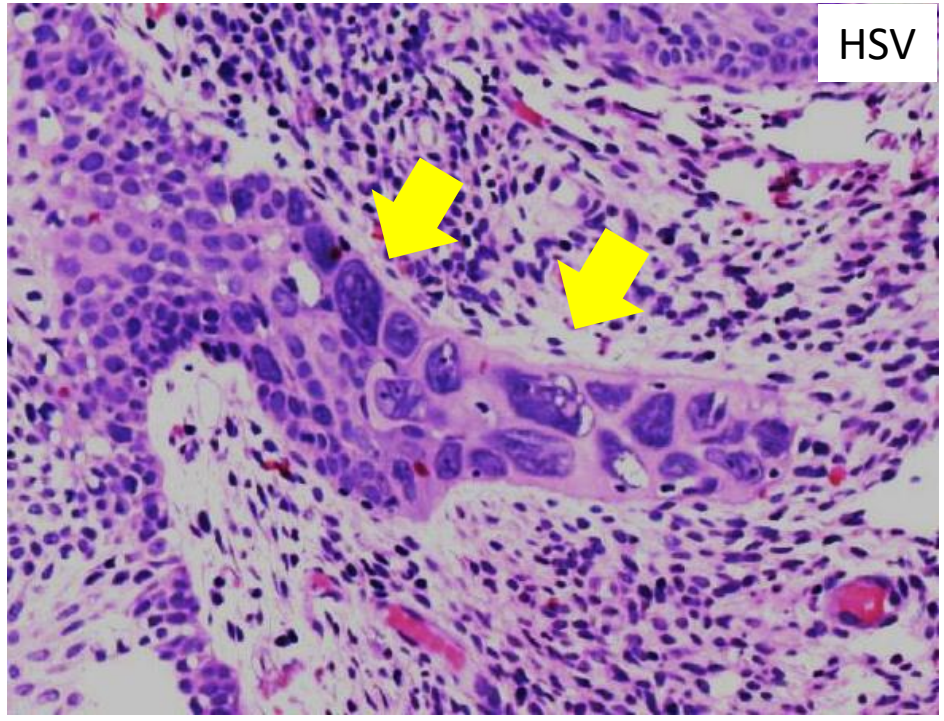
HSV and HPV with HSIL



Invasive Squamous Carcinoma (R) with HPV and HSV





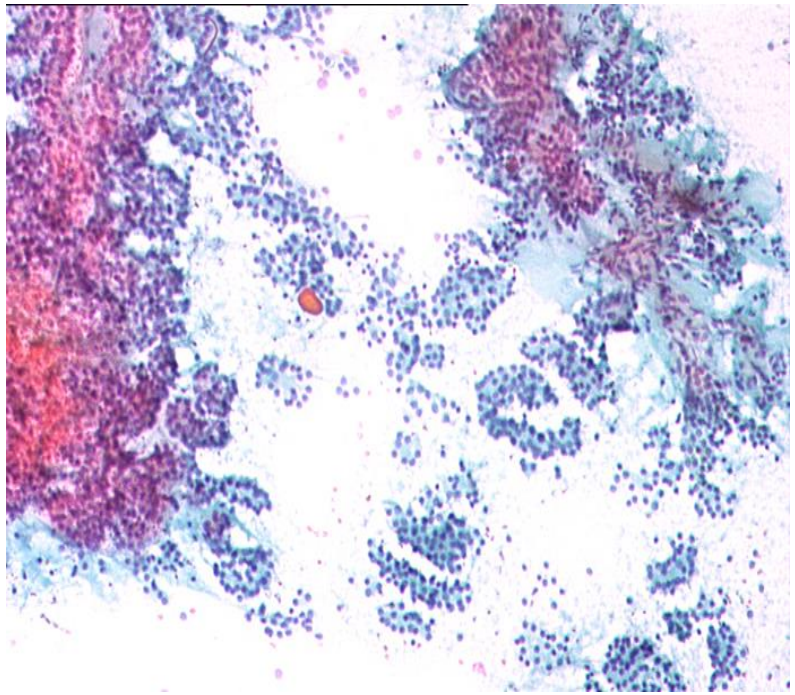


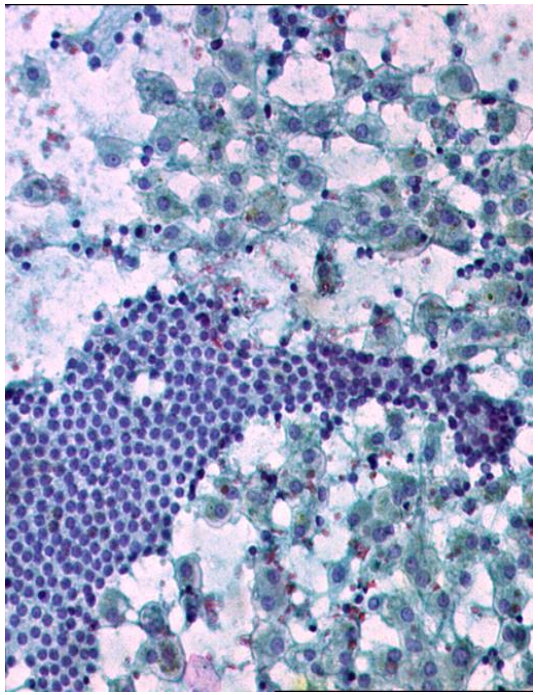
Interesting case Association!

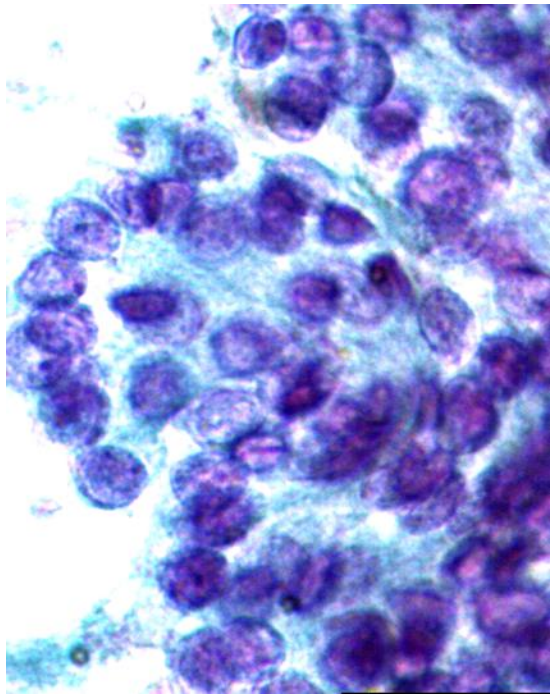
- A 55-year-old gentleman from Ranchi (Jharkhand, India) was referred to our hospital with complaints of anterior neck swelling since 2 months, associated with dysphagia

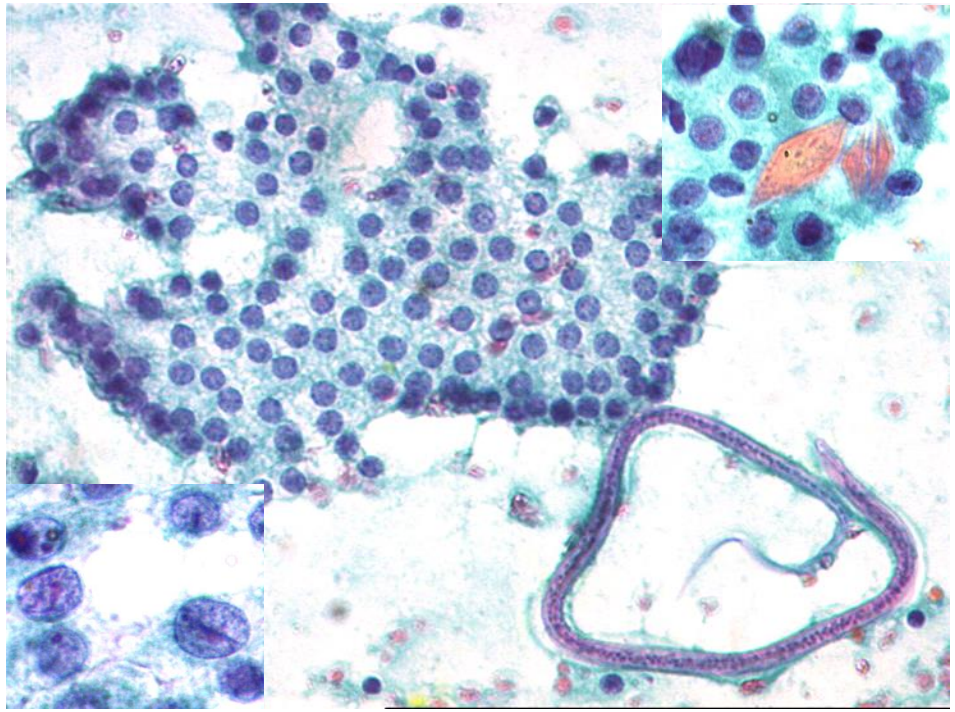
- On local examination, a soft swelling was noted over his right thyroid and isthmus and a 10×7 cm hard swelling was noted over his left thyroid

- Clinically : Stage IV thyroid carcinoma











Follicular lesion of uncertain significance with coexisting microfilariae

- The possible explanation : the lodgment of the parasite in the thyroid vasculature, including lymphatics

- Patient hailed from an area with high endemicity, both for goiter and filariasis



CytoJournal

Rekhi B, Kane SV. Cytojournal. 2011 Feb 12;8:4.



Cases 2 and 3



Clinical History (Received later!)

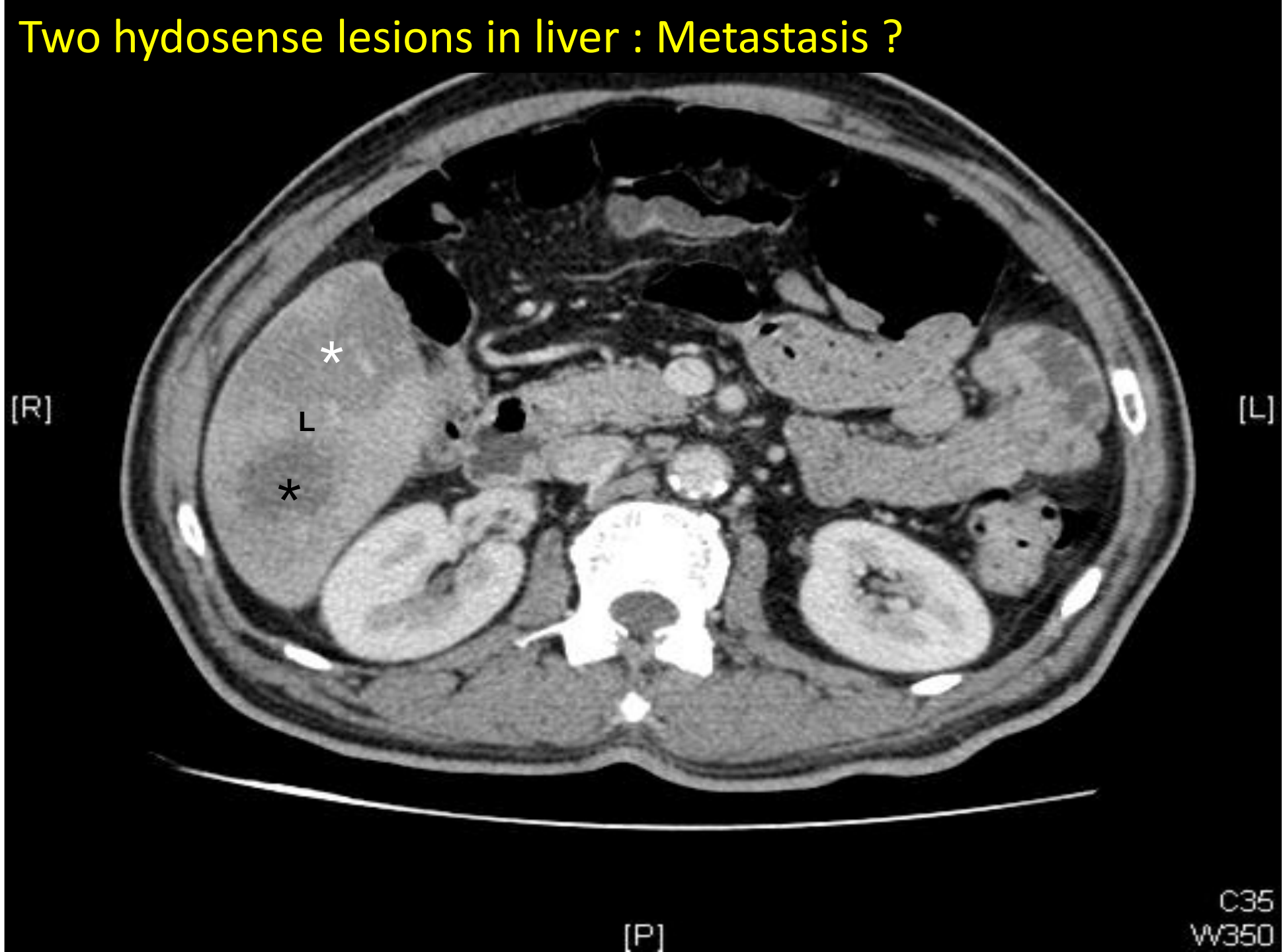
- A 67-year-old man presented with complaints of constipation and mucus discharge, per rectum since 15 days, along with dull to severe abdominal pain. No history of diarrhea

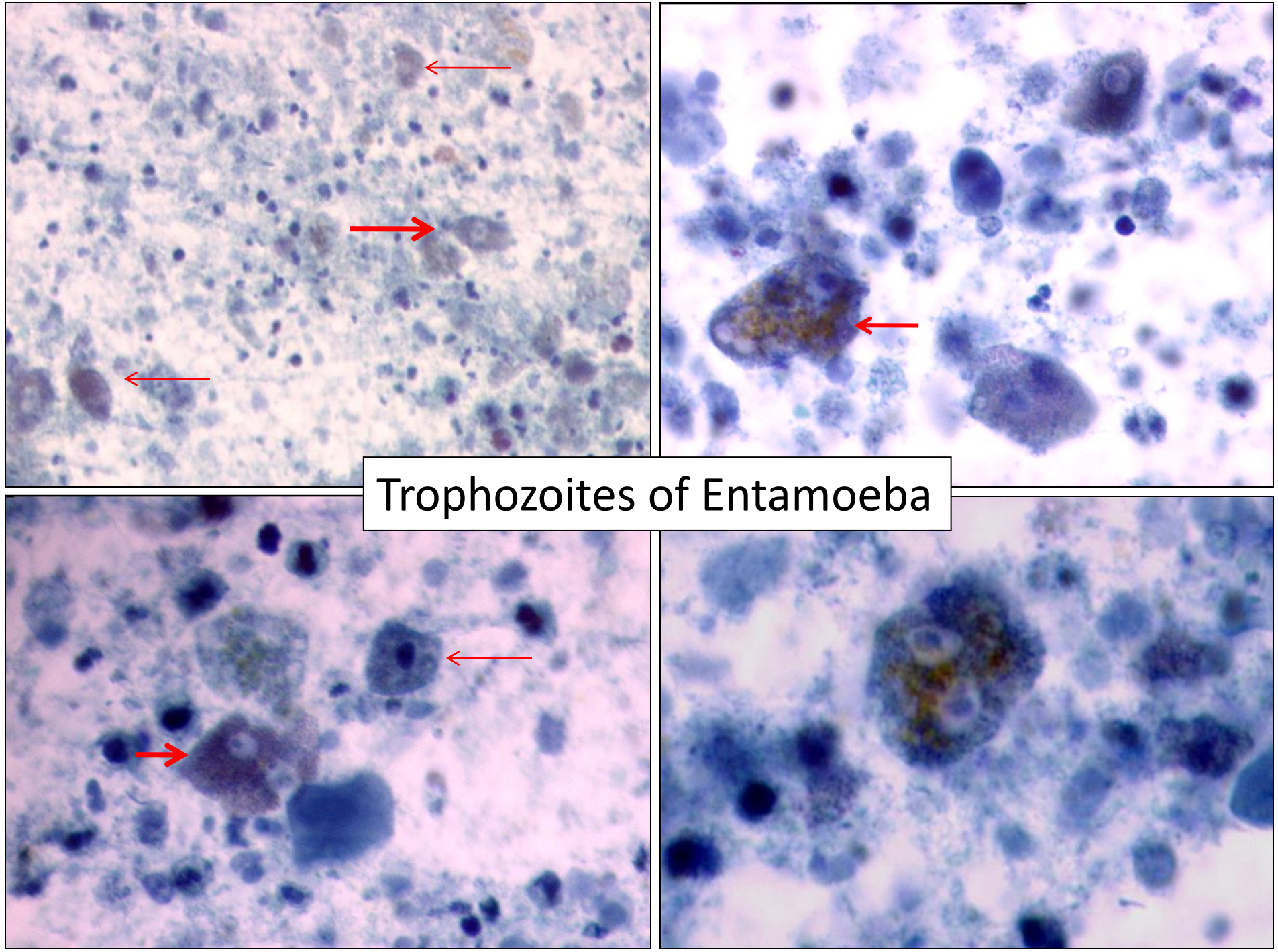
- Rectal endoscopic examination : 2 lesions measuring 6 and 8 cm from the anal verge

- Lesions : shallow ulcers with sharply demarcated edges

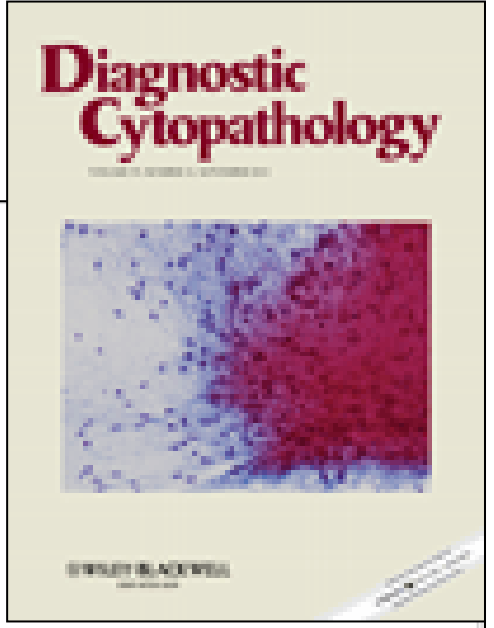
- Low Hemoglobin. Alkaline phosphatase levels : high (433 U/L). Serum bilirubin : increased (3.97 mg/L). SGOT and SGPT levels : increased

Two hydosense lesions in liver : Metastasis ?





Trophozoites of Entamoeba



IMAGES IN CYTOLOGY

Section Editor: Shahla Masood, M.D.

Cytomorphological Spectrum of Amoebic Liver Abscess in an Uncommon Case, Clinically Masquerading as Malignancy

Bharat Rekhi, M.D., D.N.B., M.I.A.C.,[1*] Mukta Ramadwar, M.D., F.R.C. (Path.),[1] and Parul Shukla, M.S.[2]

Impact : Patient referred from Oncology to a general hospital for treatment and relieved.

CASE REPORT

DOI:10.1111/j.1365-2303.2007



Pancreatic tuberculosis masquerading as pancreatic carcinoma in two cases: role of fine needle aspiration cytology in diagnosis

A. Khurana*, B. Rekhi*, S. V. Kane*, P. Shukla† and M. Ramadwar*

Departments of *Pathology and †Surgical Oncology, Tata Memorial Hospital, Parel, Mumbai, India

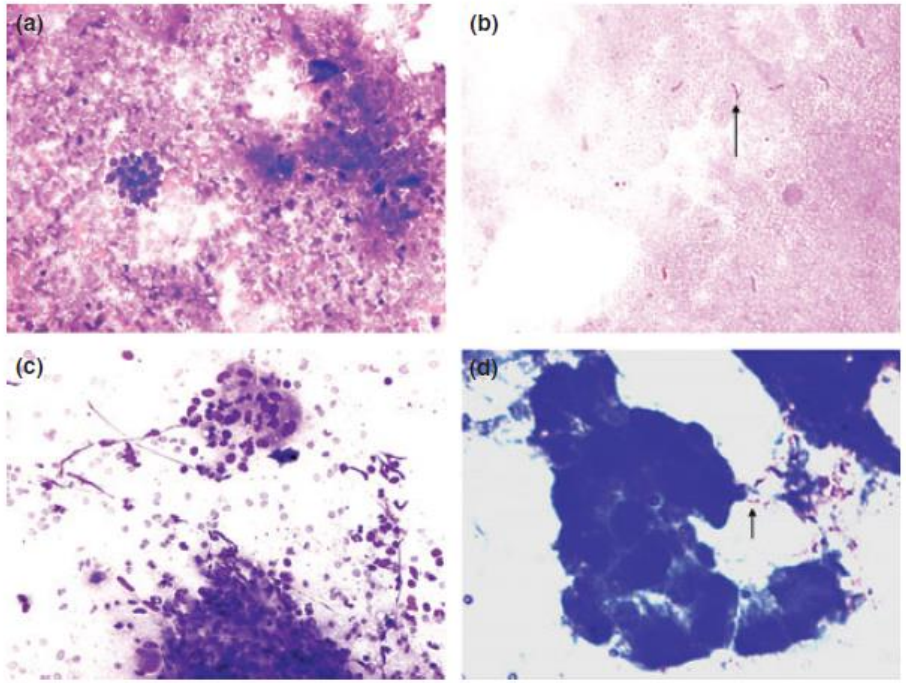


Figure 1. (a) FNAC smears showing a cluster of pancreatic acinar cells amidst caseation necrosis (MGG ×400); (b) ZN staining showing several AFBs (ZN ×1000); (c) a cluster of epithelioid histocytes with an occasional giant cell (MGG ×400); (d) acid fast bacilli (ZN ×1000).

Case 3. An association misdiagnosed !

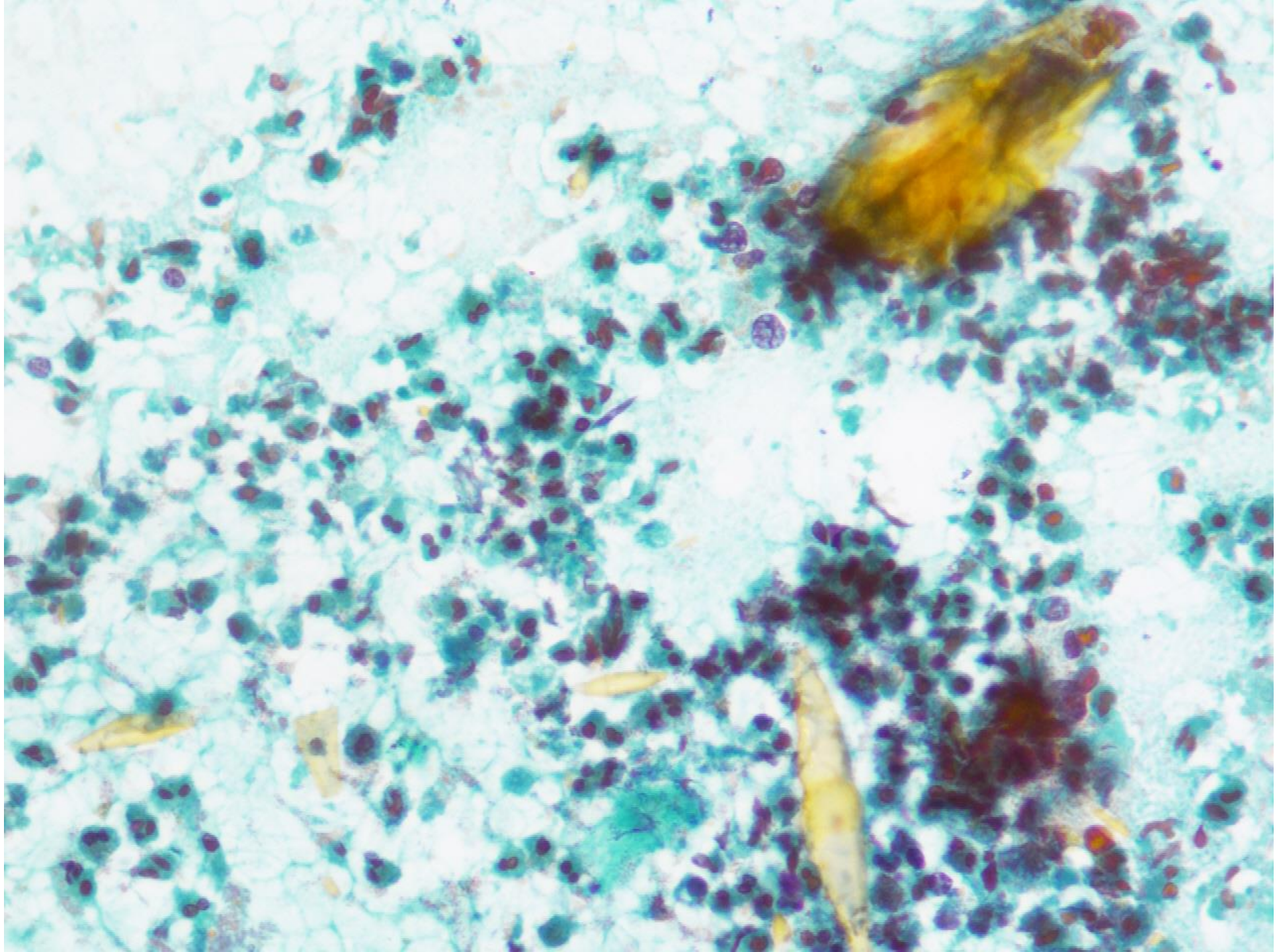
A 64-year-old lady, known case of carcinoma cervix presented with a lesion in her liver

USG abdomen and pelvis :

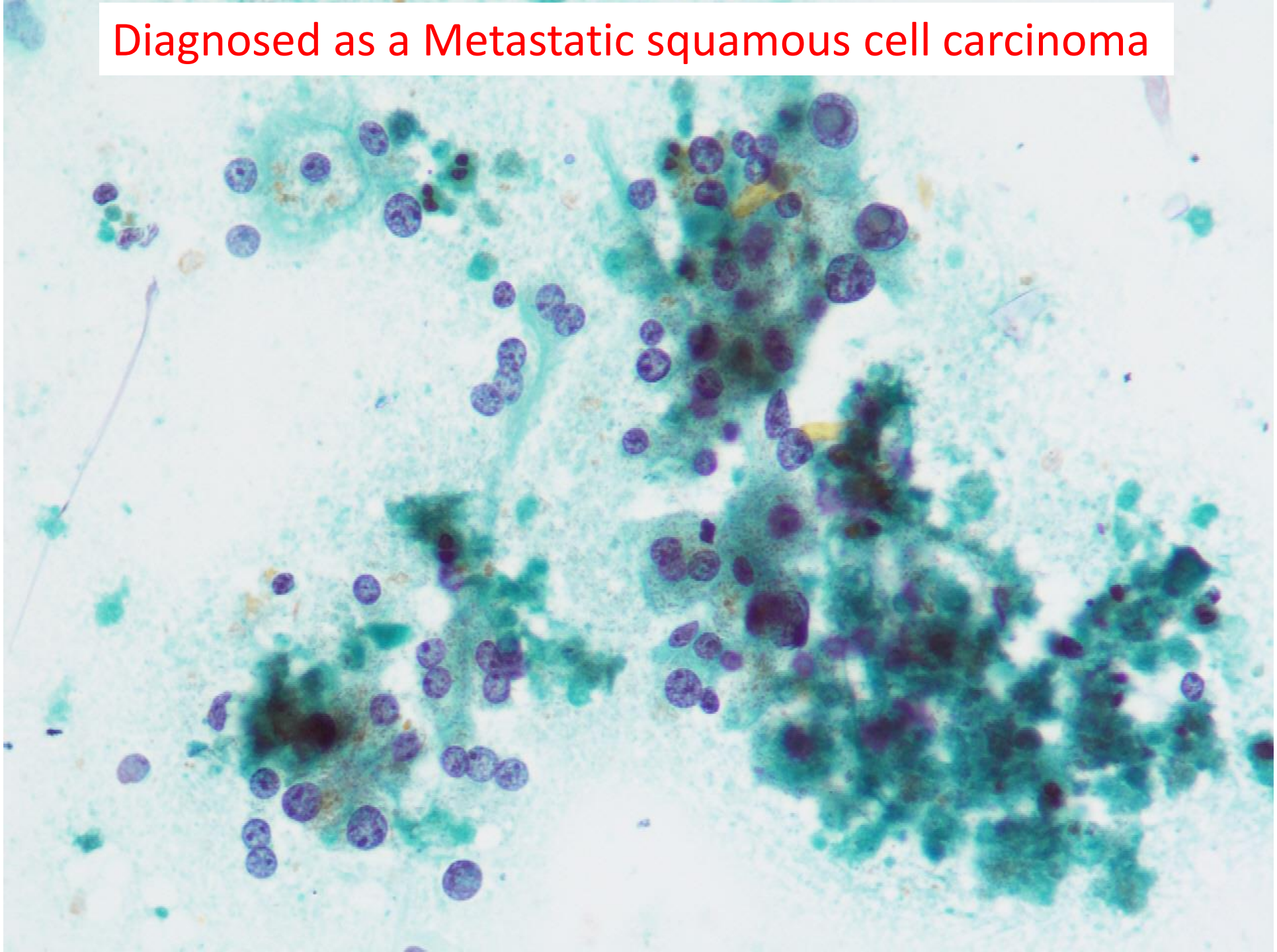
A target lesion measuring 1 cm x 1 cm in segment II. A curvilinear, hypoechoic lesion in segment III suggestive of probable extension into adjacent vessel

The liver was normal is size, shape and showed homogenous echotexture

? Metastasis

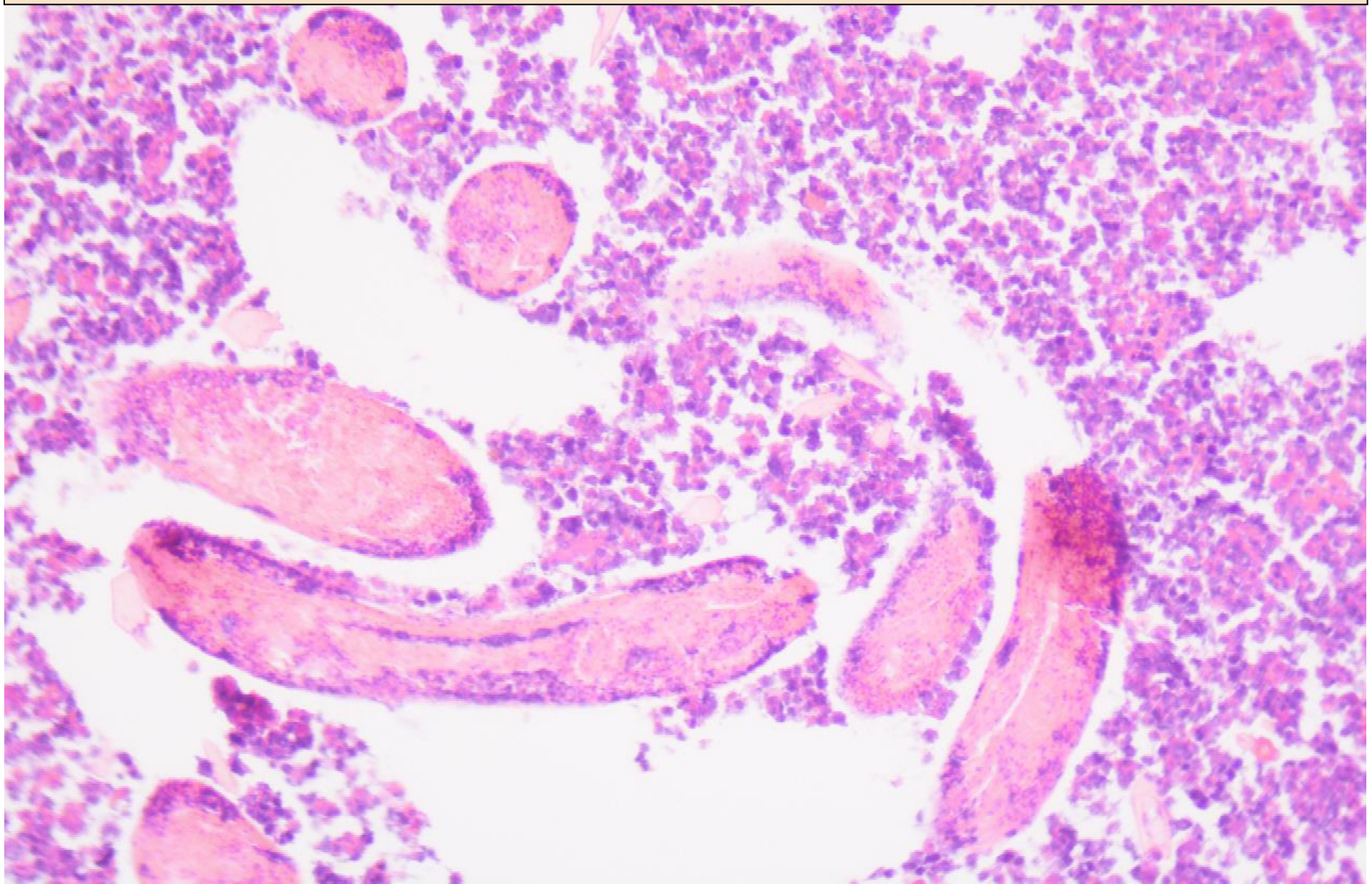


Diagnosed as a Metastatic squamous cell carcinoma

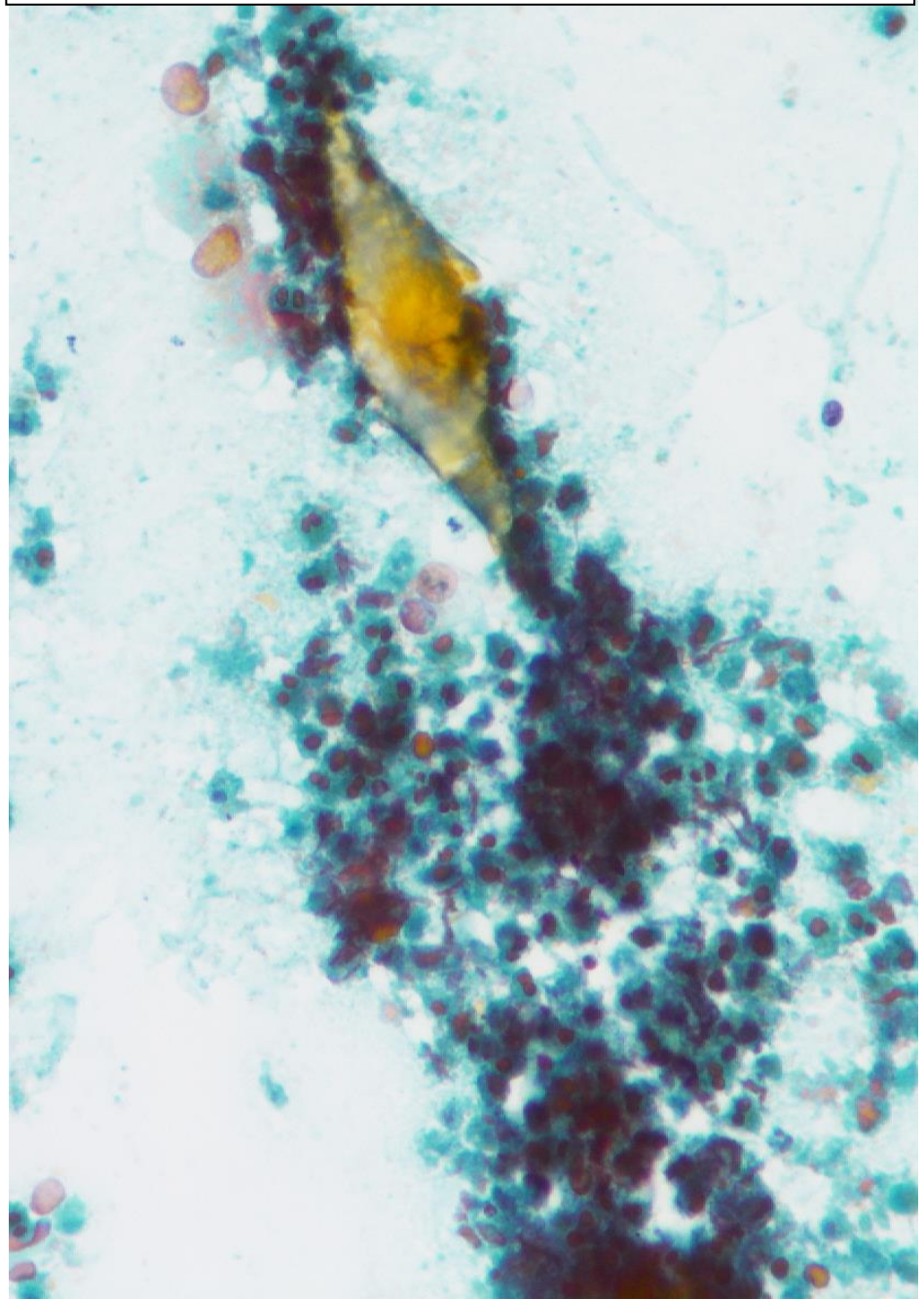


Nematode : *Capillaria Hepatica*

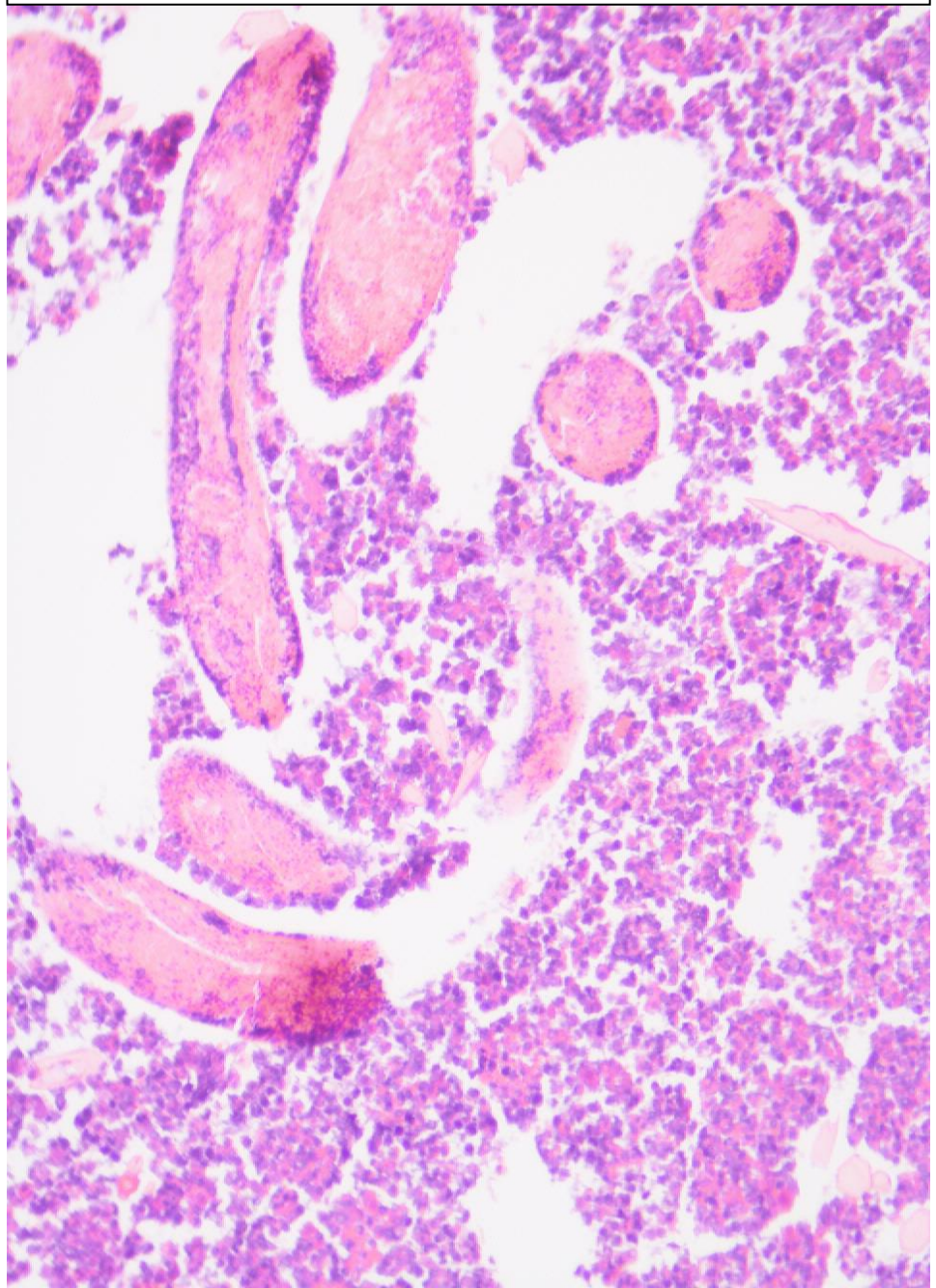
Courtesy : Dr R. Kelkar, Former HOD, Dept Microbiology, TMH

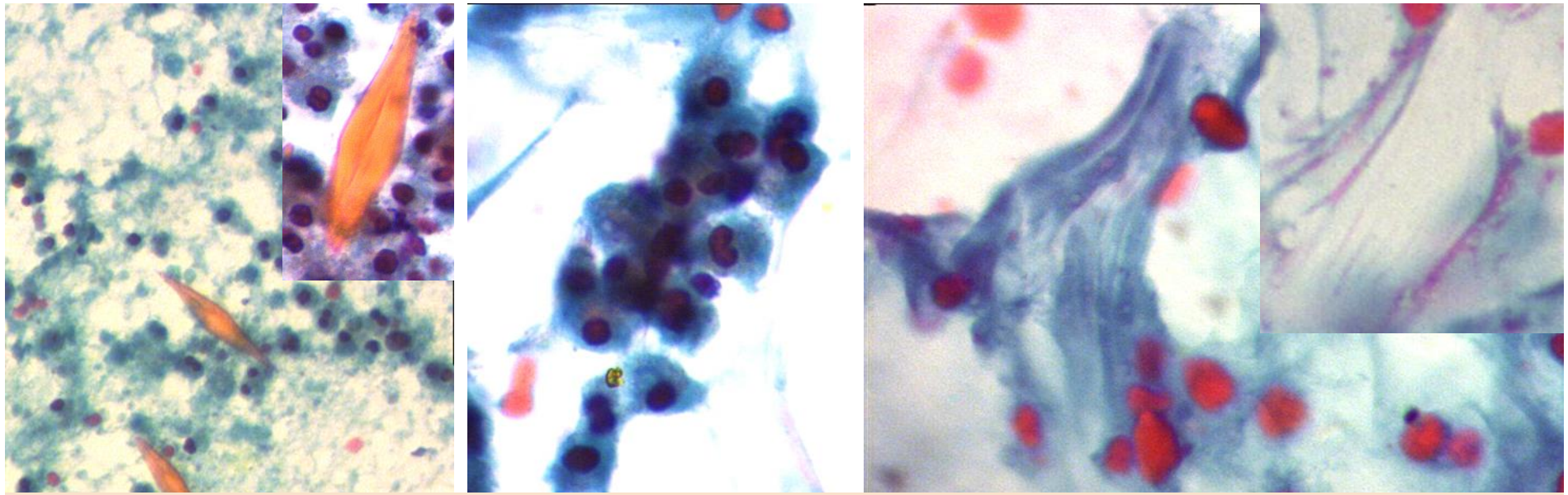


Charcot-Leyden crystals

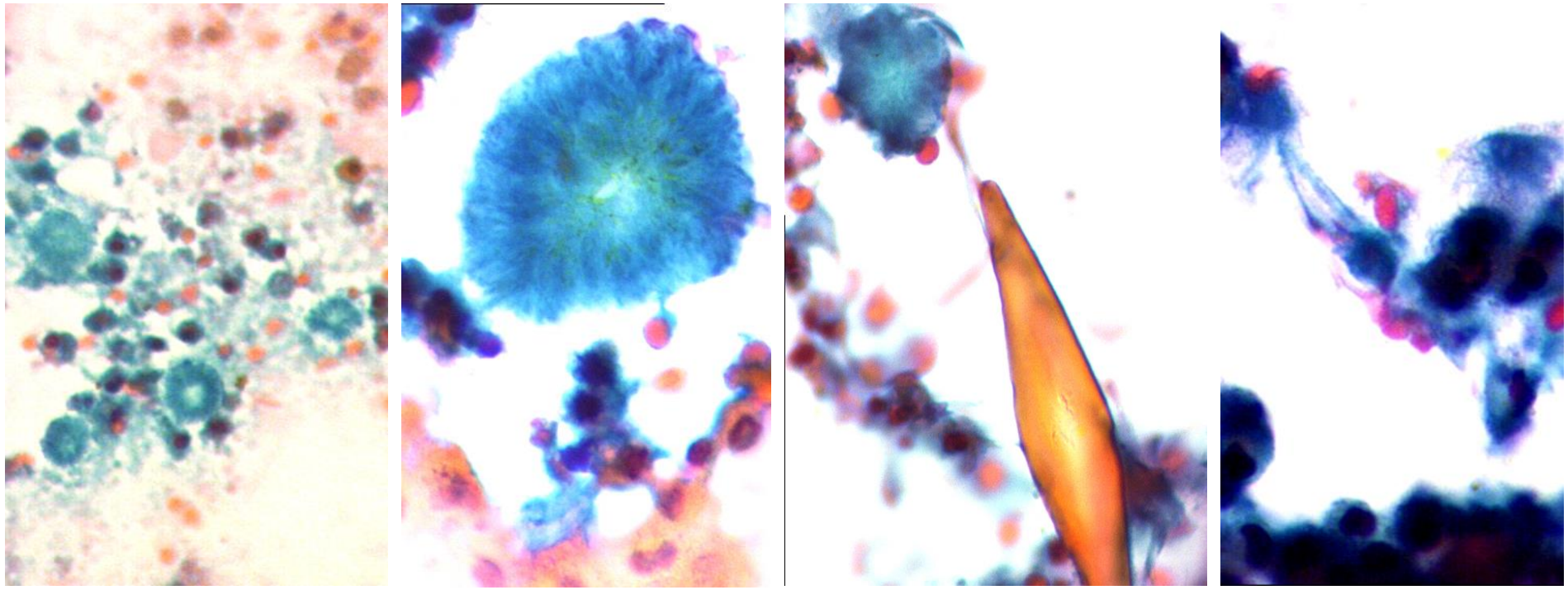


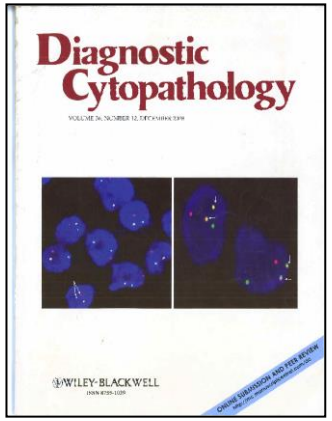
Capillaria Hepatica





CL crystals in Hydatid cyst. Rekhi B.J Cytol. 2012 Jan;29(1):48-50





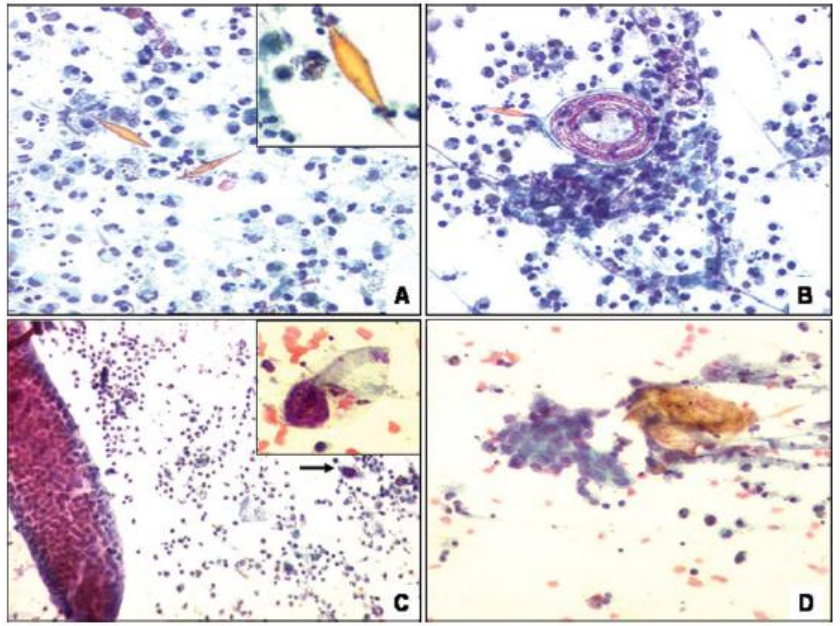


Fig. C-1. A: FNAC smears from left breast lump showing several inflammatory cells, including eosinophils, macrophages, and neutrophils, along with Charcot-Leyden (CL) crystals (Papanicolaou stain, ×400). Inset: showing a single orangeophilic, refractile, bipyramidal Charcot-Leyden crystal (Papanicolaou stain, ×1000). **B:** Tightly coiled, sheathed microfilaria, with clearly defined body nuclei (Papanicolaou stain, ×400). **C:** Adult gravid female filarial worm containing numerous round ameboid sperms (Papanicolaou stain, ×400). Inset: showing a single fertilized egg (Papanicolaou stain, ×1000). **D:** A single cluster of benign breast epithelial cells and few CL crystals (Papanicolaou stain, ×400).

IMAGES IN CYTOLOGY

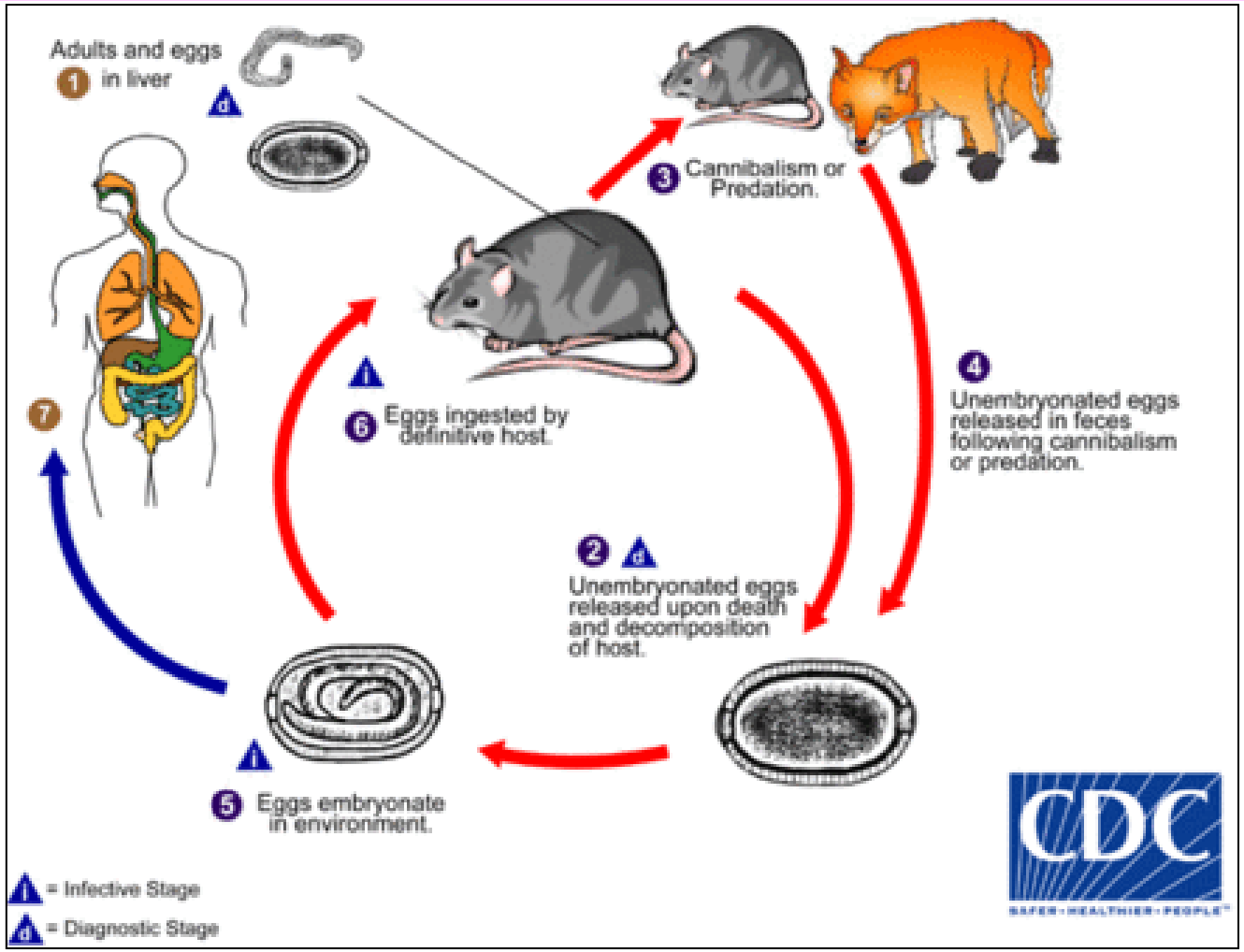
Section Editor: Shahla Masood, M.D.

Panorama of Cytomorphological Findings of Filariasis in the Contralateral Breast, Clinically Mimicking a Carcinoma in a Known Case:

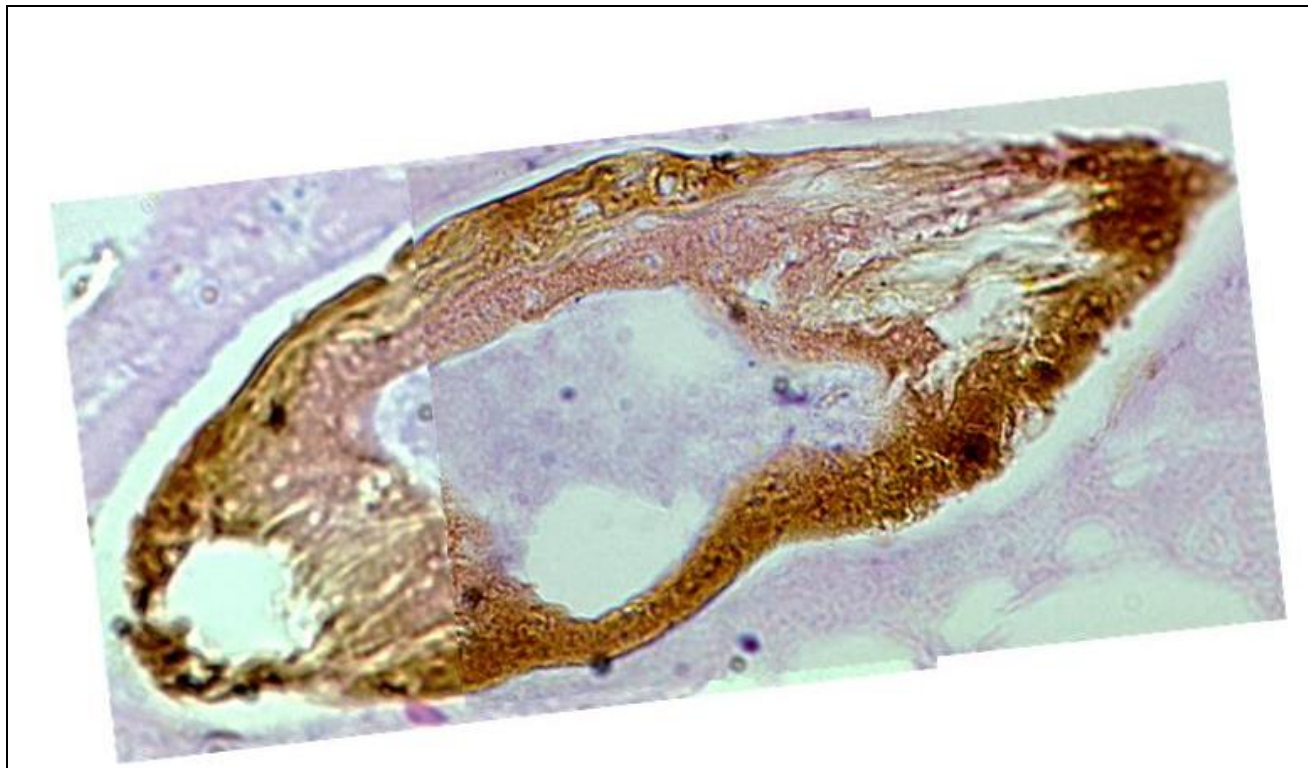
A Case Report

Paromita Roy, M.D., Bharat Rekhi, M.D., D.N.B., M.I.A.C., M.A.S.C.P.,* and R. F. Chinoy, M.D., D.P.B.

- Capillaria *hepatica* is a parasitic nematode which causes hepatic capillariasis in rodents and numerous other mammal species, including humans. The life cycle of C. hepatica may be completed in a single host species

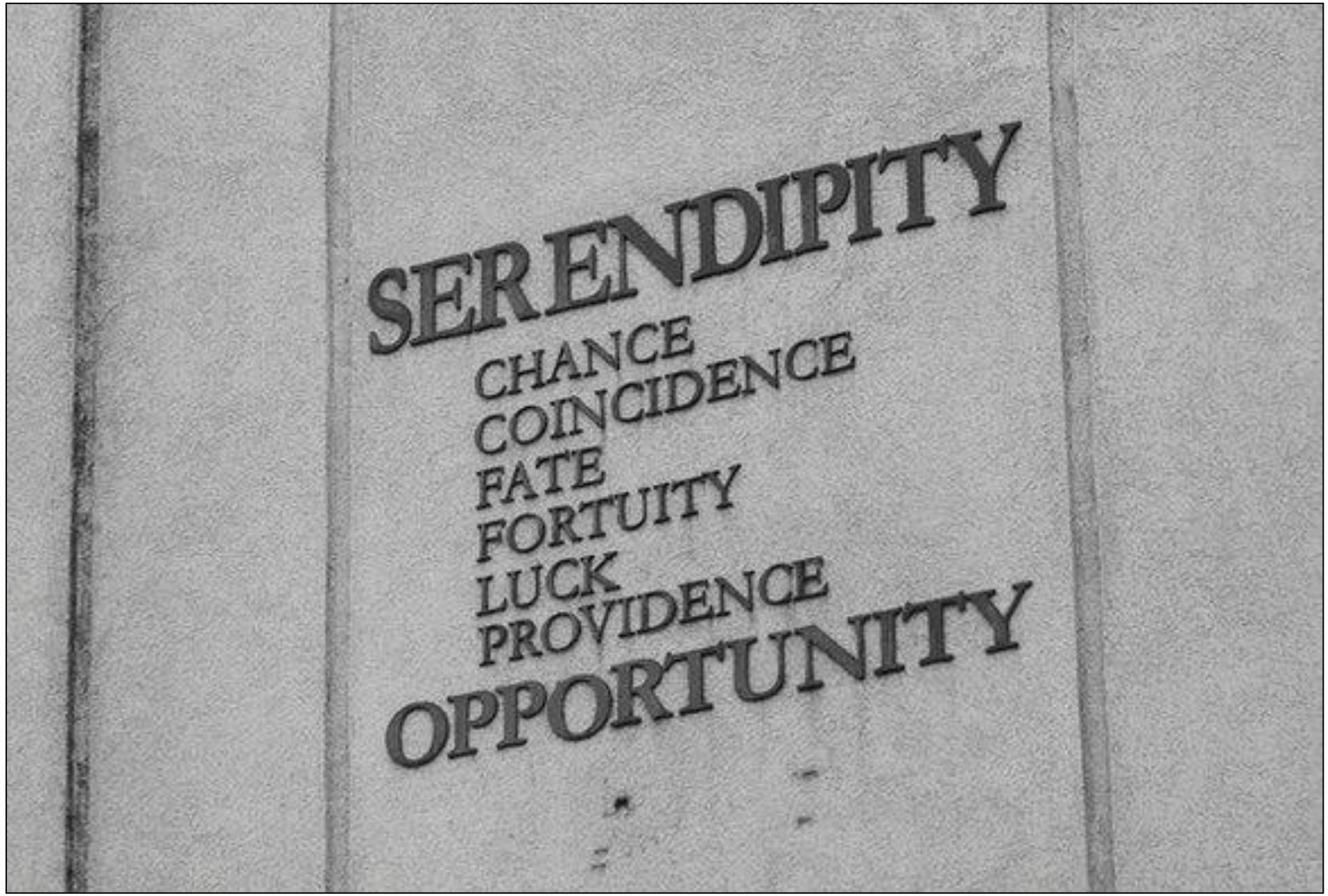


Liver fluke (Fasciola Hepatica)
Associated with Eating watercress





TMH Case


SERENDIPITY
CHANCE
COINCIDENCE
FATE
FORTUITY
LUCK
PROVIDENCE
OPPORTUNITY

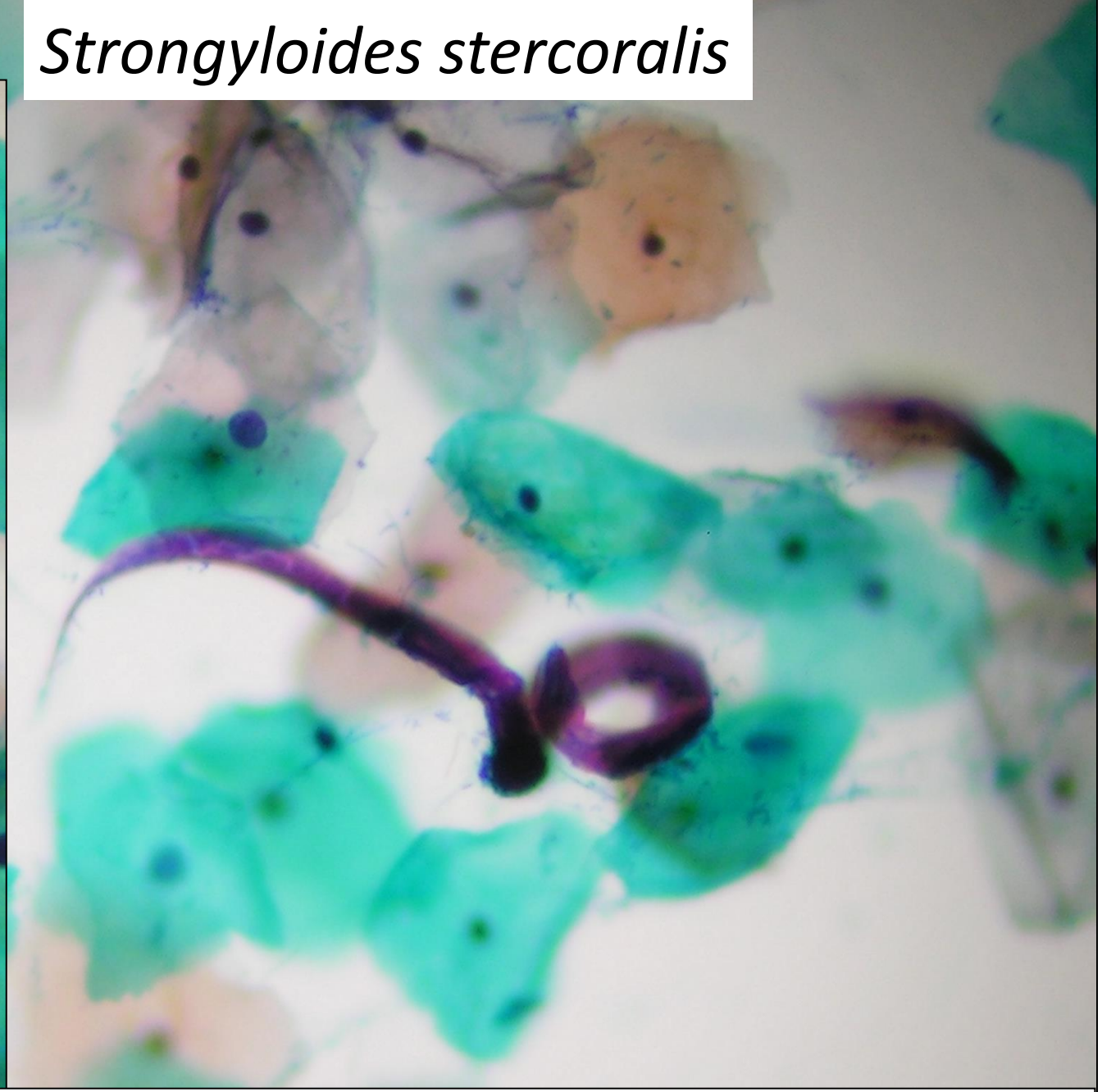
Case 4

- A 47-year-old post-menopausal lady, diagnosed with cervical intraepithelial neoplasia grade II, on cervical biopsy, 4 years ago, came for a routine follow-up

- Her yearly cervicovaginal Papanicolaou (Pap) smears in the last 3 consecutive years were negative for intraepithelial lesion or malignancy

Strongyloides stercoralis





Larva with broad anterior and tapering posterior

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Images in Cytopathology

Serendipitously identified *Strongyloides stercoralis* in a cervicovaginal smear

Vinita Mayekar[1], Irene Ruben[1], Bharat Rekhi[1,2]
Departments of [1]Cytopathology, and [2]Pathology, Tata Memorial Hospital, Parel, Mumbai, Maharashtra, India

Address for correspondence: Dr. Bharat Rekhi, Department of Pathology, 8th Floor, Annex Building, Tata Memorial Hospital, Dr. E.B. Road, Parel, Mumbai - 400 012, Maharashtra, India. E-mail: rekhi.bharat@gmail.com

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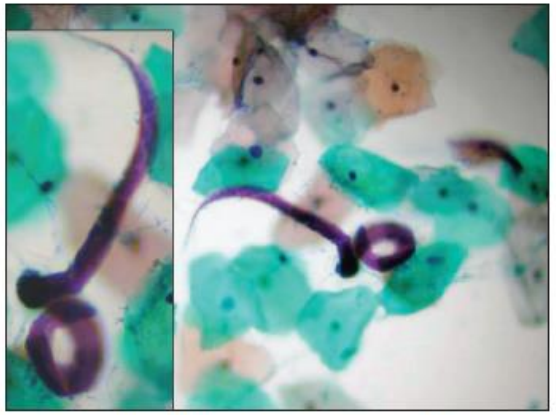


Figure 1: Papanicolaou (Pap) smear showing superficial and intermediate

References

1. Fritsche T, Smith JW. Medical parasitology. In: Henry JB, editor. Clinical Diagnosis and Management by Laboratory Methods. 19th ed. Philadelphia, PA: WB Saunders Co.; 1996. p. 1252-310.
2. Genta RM, Walzer PD. Strongyloidiasis. In: Walzer PR, Genta RM, editors. Parasitic Infections in the Immunocompromised Host. New York: Marcel Dekker; 1989. p. 463-525.
3. Avram E, Yakovlevitz M, Schachter A. Cytologic detection of *Enterobius vermicularis* and *Strongyloides stercoralis* in routine cervicovaginal smears and urocytograms. Acta Cytol 1984;28:468-70.
4. Murty DA, Luthra UK, Sehgal K, Sodhani P. Cytologic detection of *Strongyloides stercoralis* in a routine cervicovaginal smear. A case report. Acta Cytol 1994;38:223-5.
5. Daneshbod Y, Monabati A, Bedayat GR, Soroor G. *Strongyloides*

Enclosures (Infections and Cancers) :

- CASE 1: Assoc. and cause :Koilocyte (HPV) and LSIL.

  Another case : HPV+ HSV +Recurrent SCC (post-treated SCC)

- CASE 2: Mimic/Masquerade: Amoebic Liver abscess

- CASE 3: Mimic; misdiagnosed : *Capillaria Hepatica* in a post-treated case of carcinoma cervix

- CASE 4: Serendipitous : *Strongyloides stercoralis* in Pap smear

Interesting Infectious Disease Cases

Dr. Ram Nawal Rao
MBBS MD MIAC
Professor

Department of Pathology, Sanjay Gandhi Postgraduate Institute of Medical Sciences, Lucknow-UP-India 226014

Disclosure Information : Nil

Name of Speaker : Dr Ram Nawal Rao

- I have the following relevant financial relationships to disclose: NIL
  - Consultant for:
  - Speaker's Bureau for:
  - Grant/Research support from:
  - Stockholder in:
  - Honoraria from:
  - Employee of:

- - OR -

- I have no relevant financial relationships to disclose.

- - AND -

- I will not discuss off label use or investigational use in my presentation.

CASE 1

- 2.5 Yr Old boy, presented with moderate to high grade fever x15 days (102 F to 103 F).
- No cough/ear discharge/headache/vomiting or burning micturition.
- No history of loose stools.
- Pain abdomen x10 days (intermittent pain abdomen
- H/o constipation++, passage of hard stools–sometimes blood streaked.
- Abdominal distension x3-4 day, left side of abdomen.

CLINICAL PRESENTATION

- No histry of pallor/ icterus/ cyanosis/ clubbing/ LAD / edema.
- Liver is palpable 3 cm BCM,
- TLC : 21.3x1000/ul,
- HB : 8.4gm/dl,
- PLT : 639x1000/cmm.

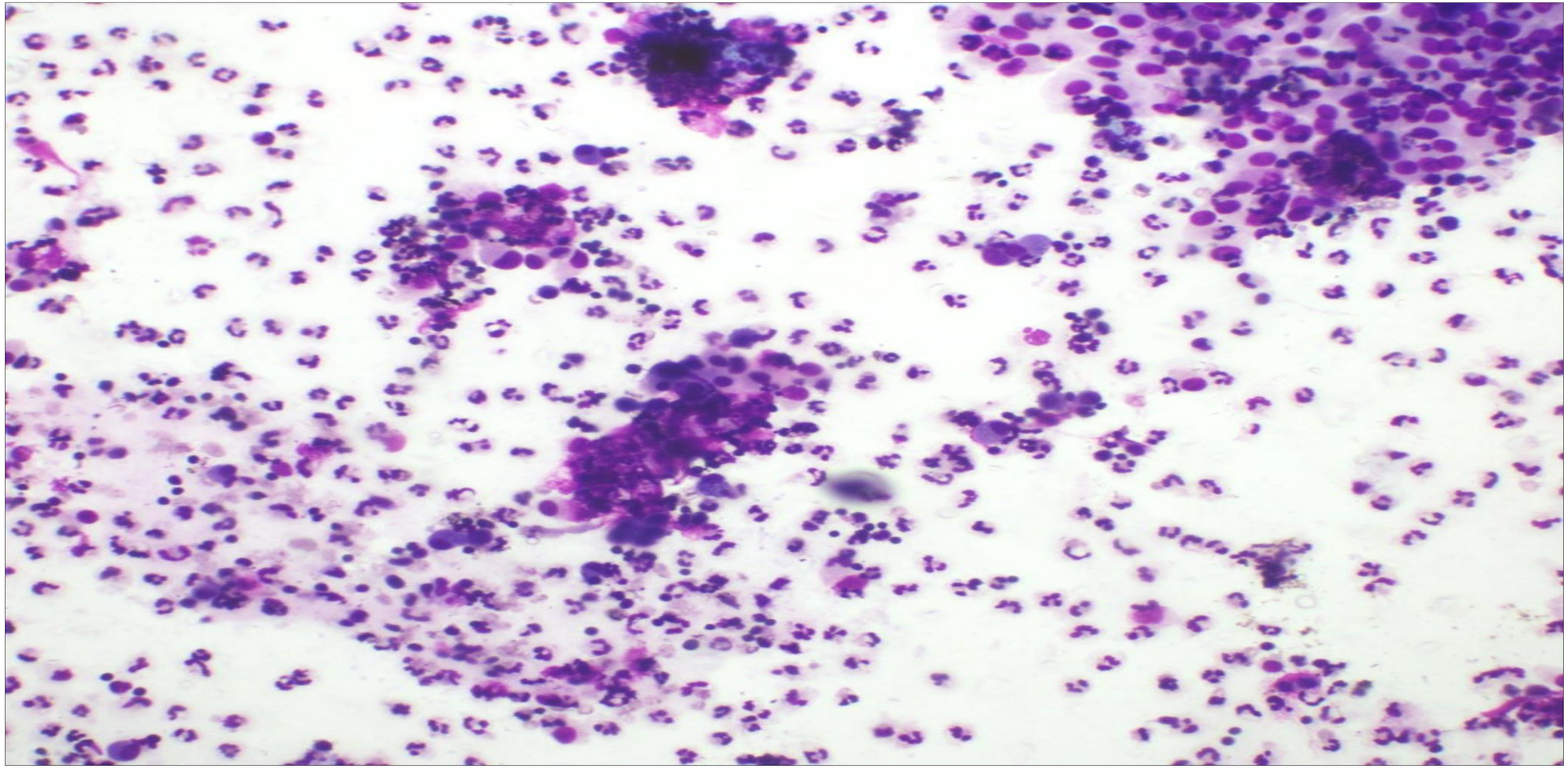
RADIOLOGICAL FINDINGS

- USG showed a mass in the abdomen, a suspicion of intussusceptions was raised.
- CT scan of the abdomen showed irregular heterogenous enhancing mass approximately 5.5 x 5.5 x 3.5 cm, adjacent bowel loops.
- Similar thickening is also noted involving the ileal loop in the right iliac fossa with maximum thickness of 10.5 mm.

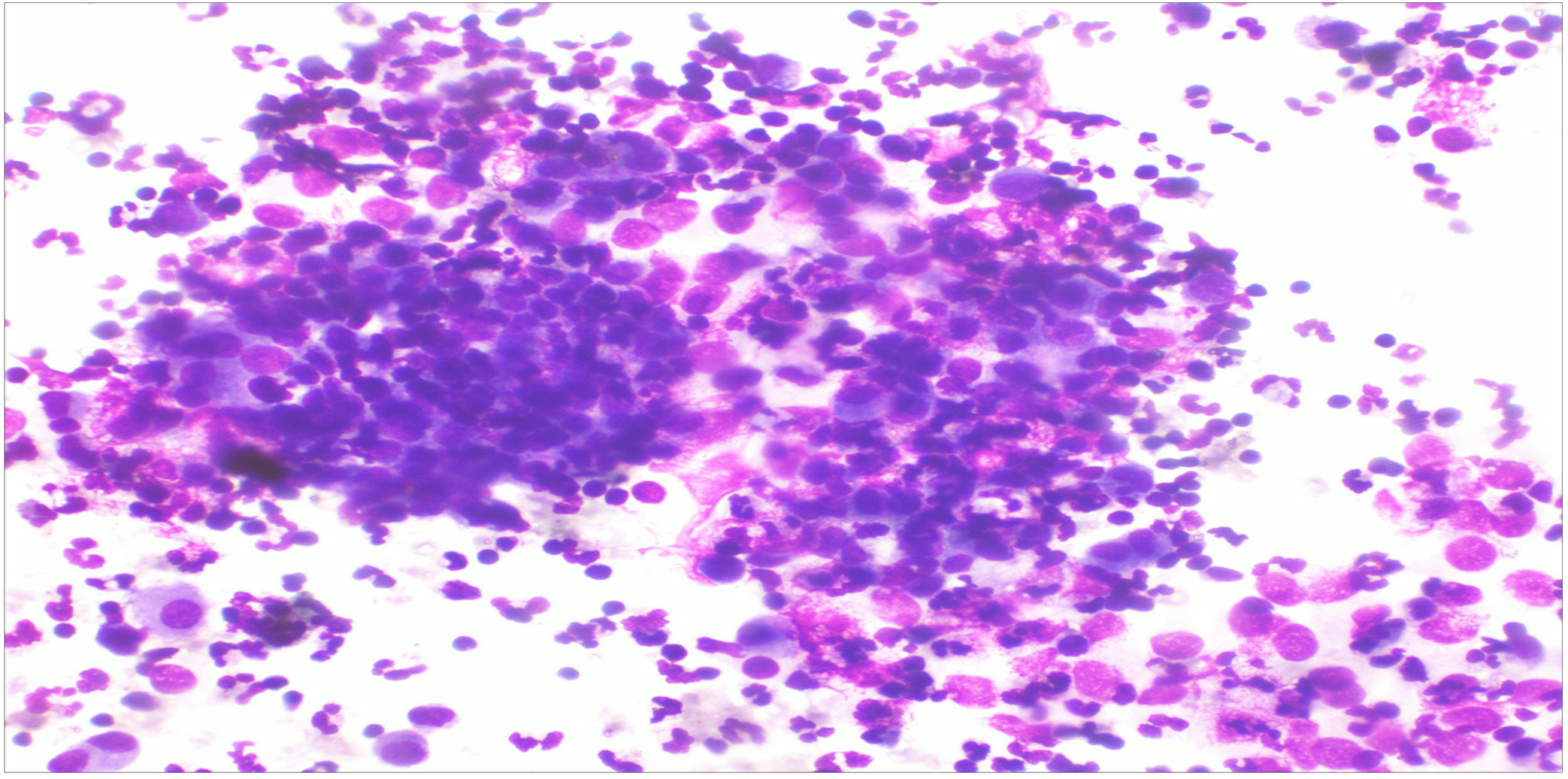
COLONOSCOPY

- Child also underwent colonoscopy–that showed a large ulcerated area covering 1/3rd of the circumference of the ascending colon – below which there was a proliferative growth.
- Mucosa of the surrounding area showed multiple superficial ulcerations with abnormal vascularity.

USG GUIDED FNAC

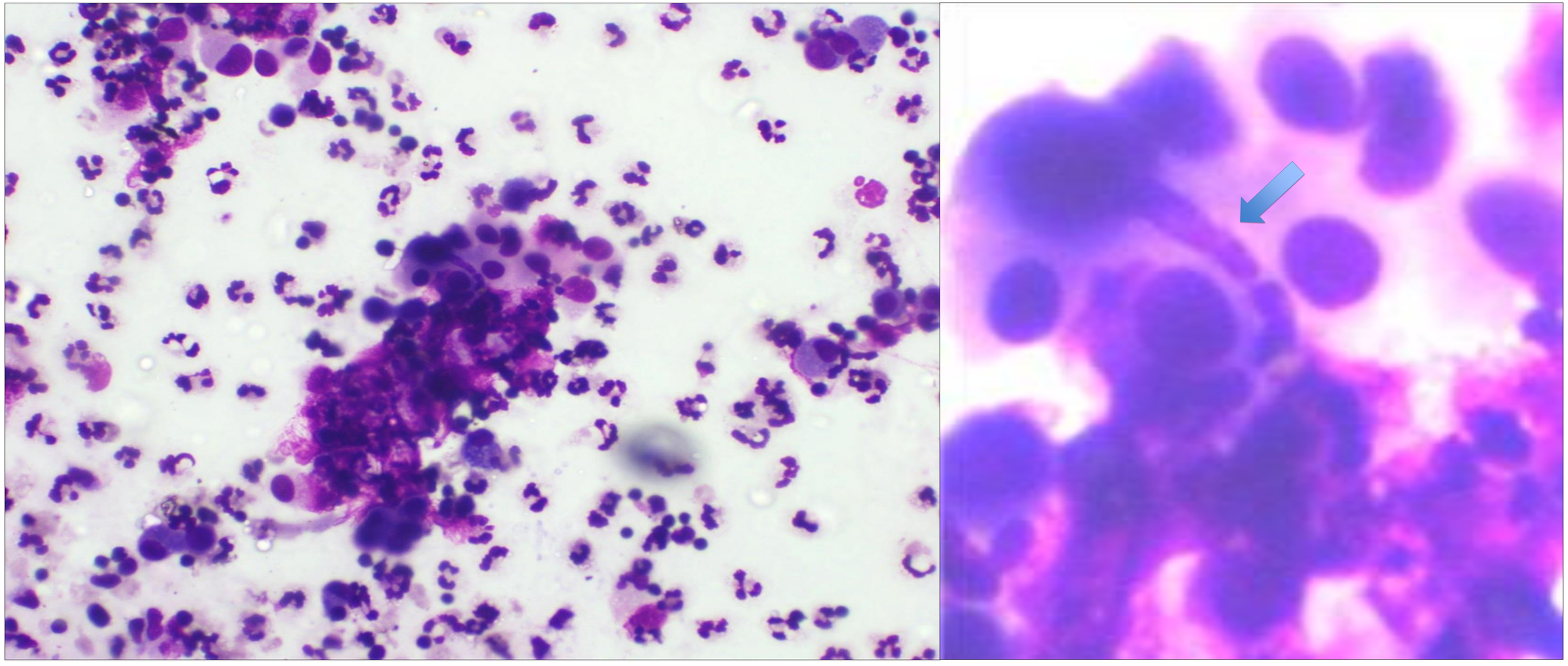


The cytospin smears from Mass are cellular and show predominantly polymorphonuclear leukocytes admixed with reactive mesothelial cells and histiocytes on a clear background. Few sheets of benign columnar epithelial cells are also seen. Several saptate fungal element wit broad based are seen. No atypical/mailgnant cells are seen.

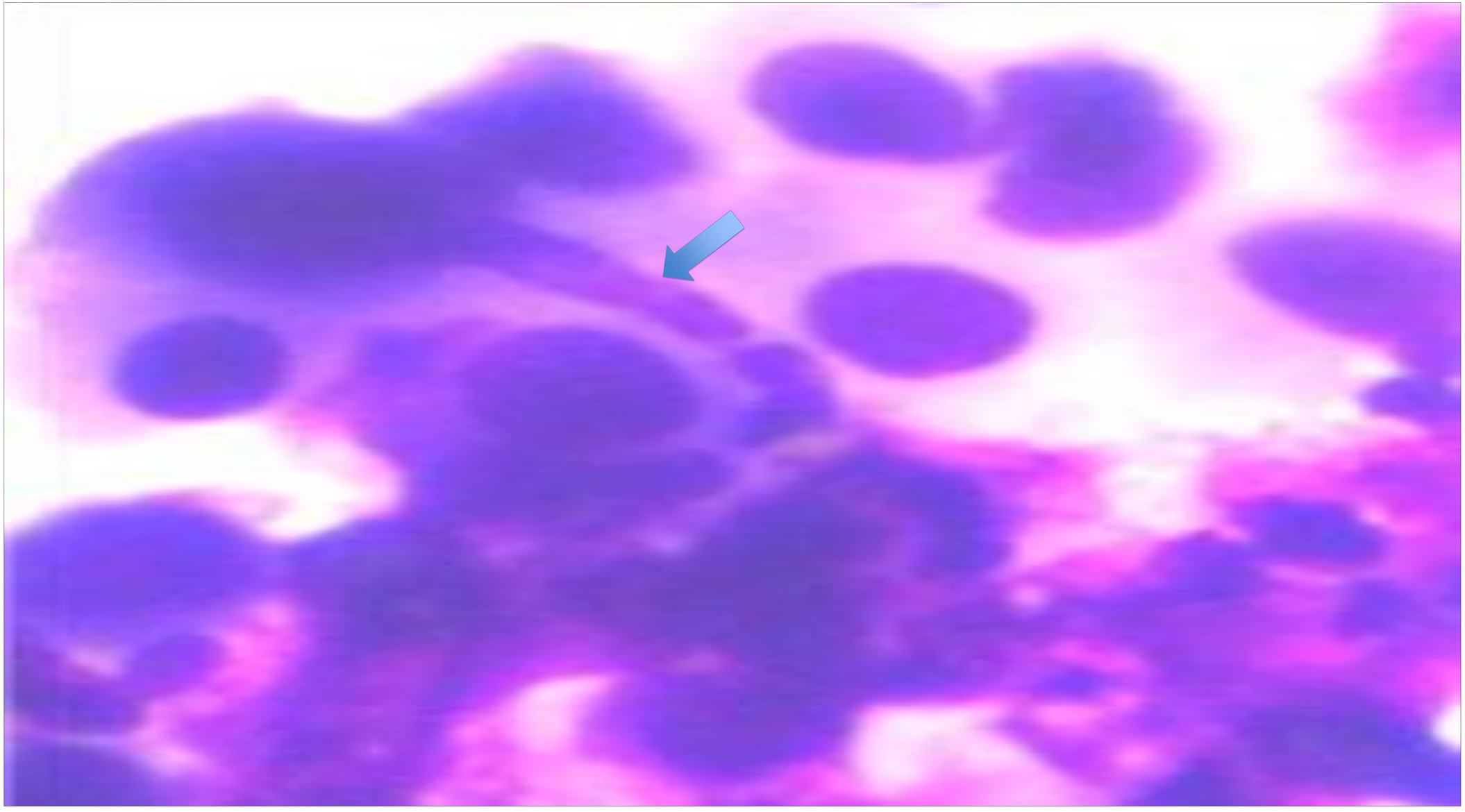


The cellular smears show predominantly polymorphonuclear leukocytes admixed with reactive mesothelial cells and Fungal elements.

USG GIUDED FNAC

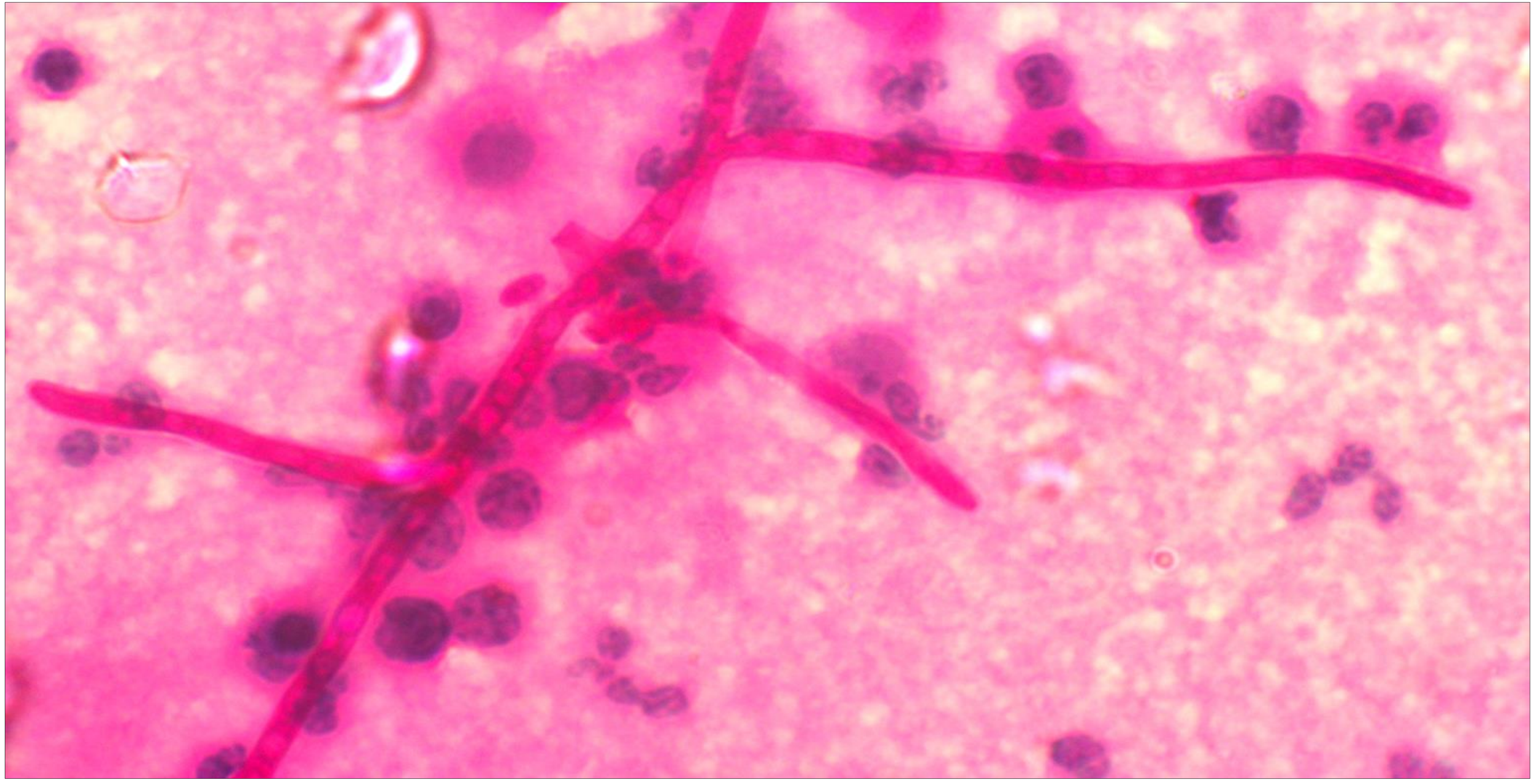


The cytospin smears from Mass are cellular and show predominantly polymorphonuclear leukocytes admixed with reactive mesothelial cells and Several septate fungal elements wit broad based.



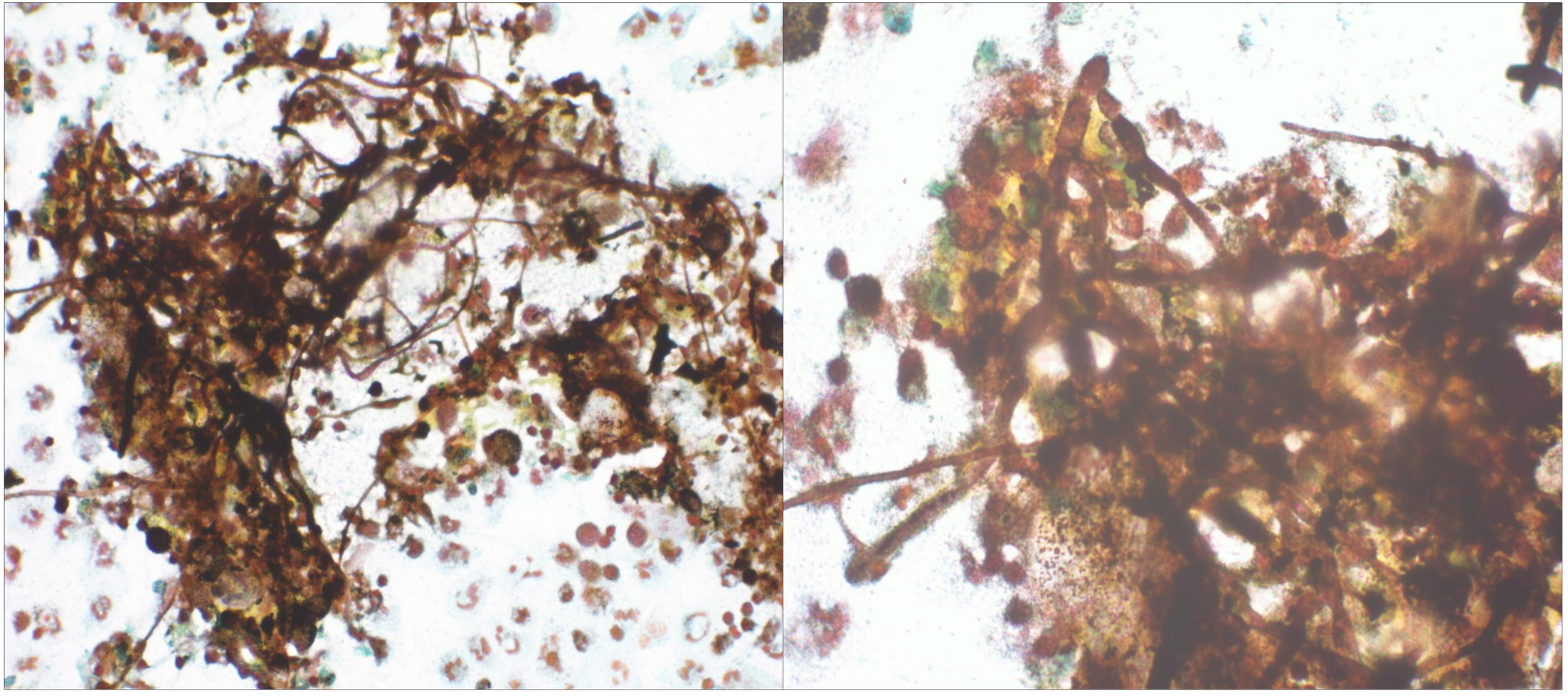
Septate fungal element with broad based.

PAS STAIN

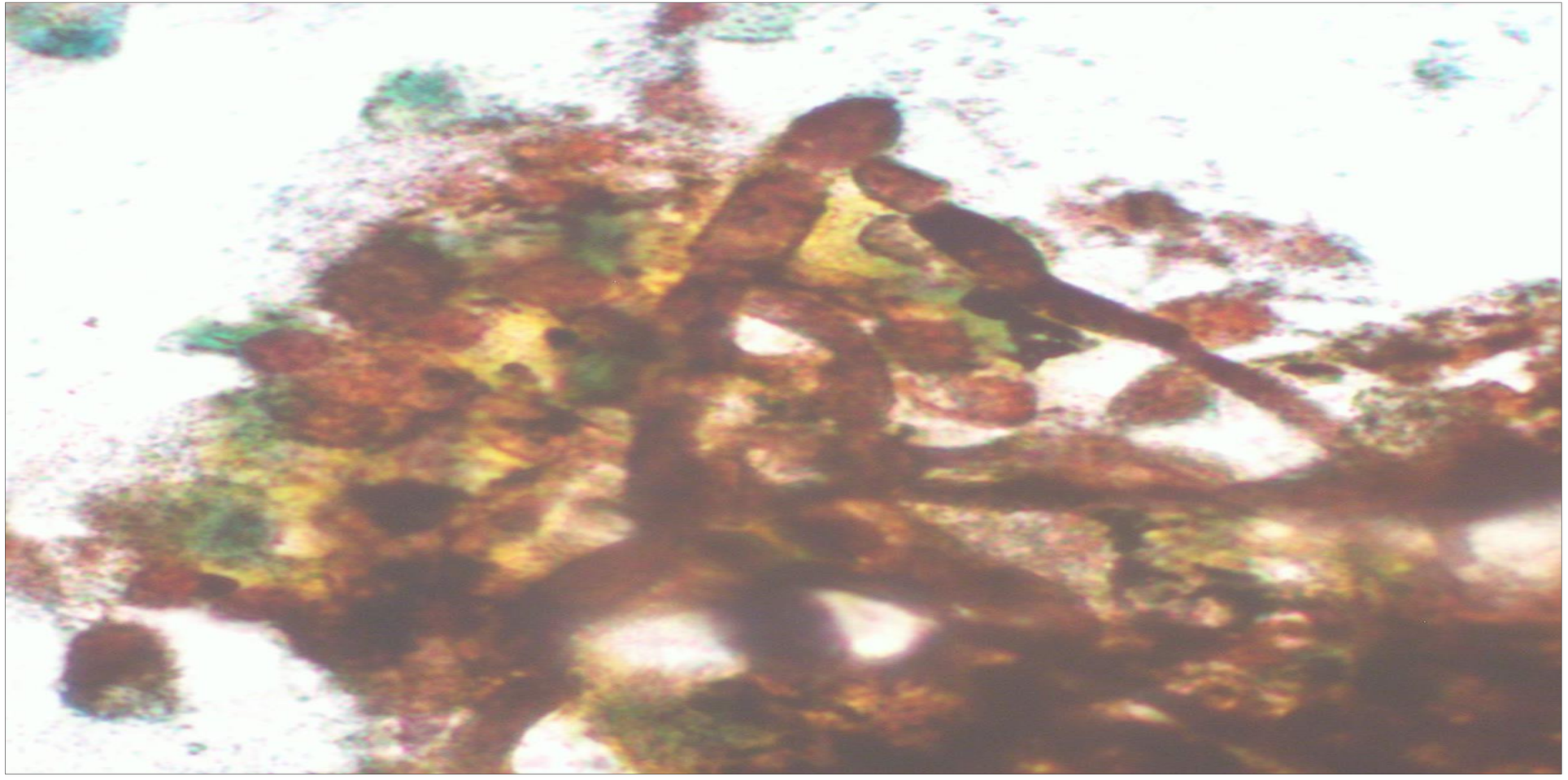


Septate fungal elements with broad based.

CSM STAIN

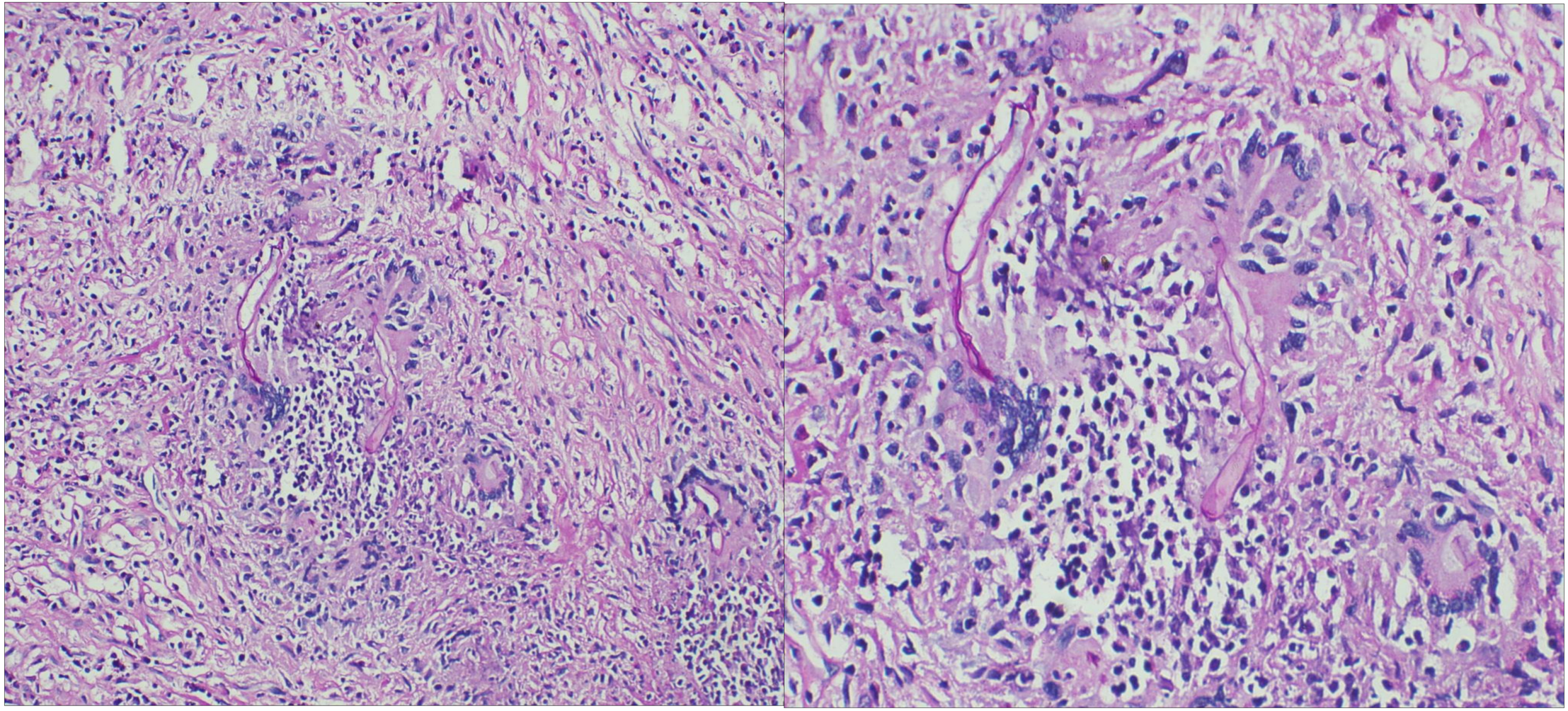


CSM STAIN



Several Septate fungal elements with broad based. The morphological features of the fungus are s/o Mucor species. Correlation with fungal culture is advised.

HISTOPATHOLOGICAL FINDINGS

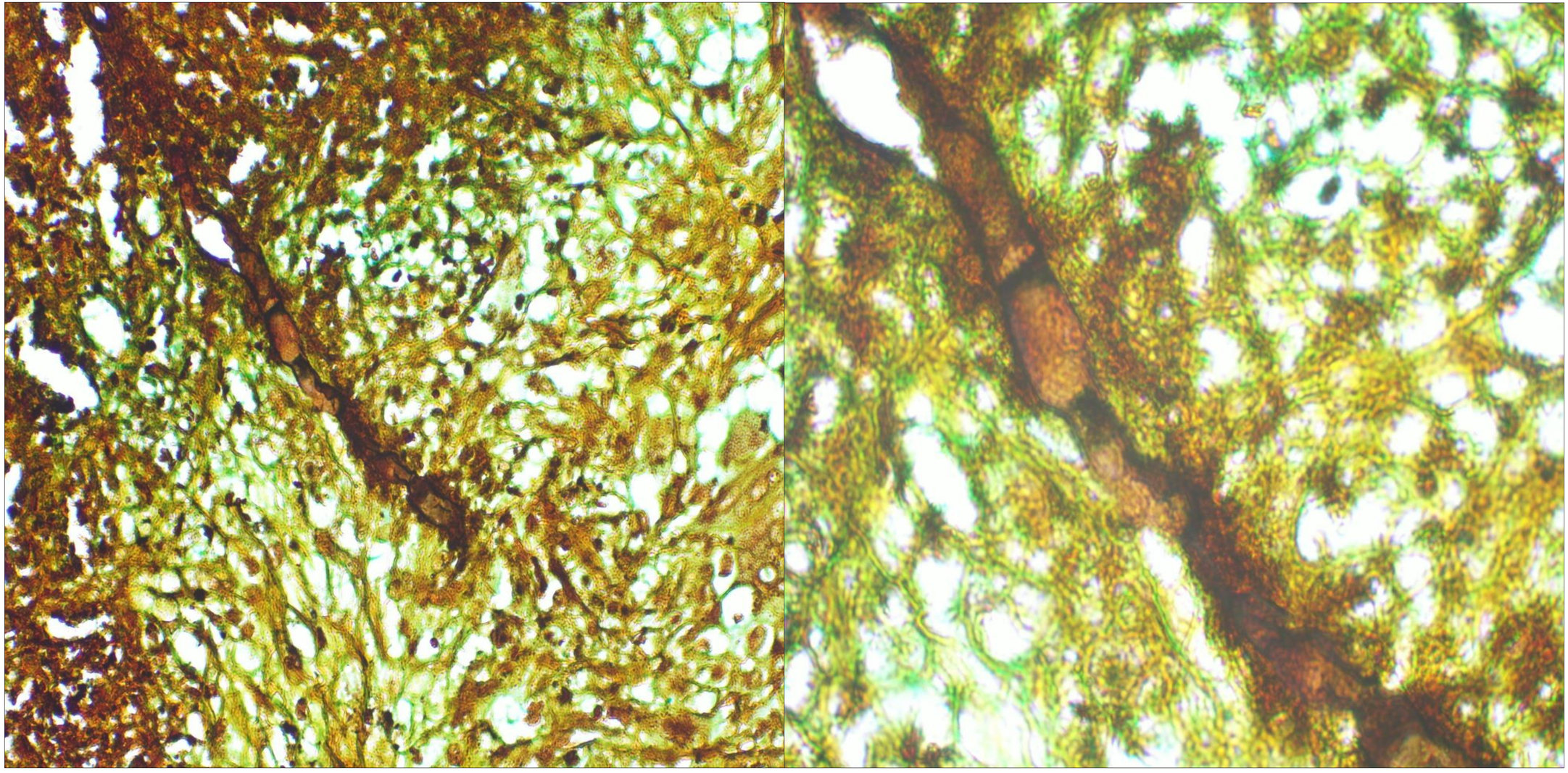


There are necrotising granulomas with histiocytic palisading along with eosinophillic microabscesses. Many scattered multinucleated giant cells and many broad, non-septate, fungal elements are seen. These is a granular eosinophilic material (*Splendore- Hoeppli phenomenon).*

HISTOPATHOLOGICALPXAMINATION

Section shows fibrocollagenous and fibroadipose tissue infiltrated by sheets of dense inflammatory cell infiltrate comprising chiefly of eosinophils, neutrophils, histiocytes and few plasma cells and lymphocytes. There are necrotising granulomas with histiocytic palisading along with eosinophillic microabscesses. Many scattered multinucleated giant cells are seen. Few broad, non-septate, fungal elements can be appreciated. These are focally surrounded by granular eosinophilic material (*Splendore-Hoeppli phenomenon).* ***ABDOMINAL LUMP BIOPSY : CONSISTENT WITH FUNGAL INFLAMMATION***

CSM



KOH wet mount shows plenty epithelial cells and few broad sparsely septate right angle branching fungal hyphae

GASTROINTESTINAL ENTOMOPHTHOROMYCOSIS
S/O
BASIDIOBOLOMYCOSIS

Basidiobolomycosis

- Basidiobolomycosis is a rare disease caused by the fungus *Basidiobolus ranarum*, an environmental saprophyte found worldwide.
- *B. ranarum* is a member of the order Entomophthorales, of the class Zygomycetes.
- Visceral involvement by basidiobolomycosis is rare with the first case of gastrointestinal basidiobolomycosis (GIB) reported in 1964.
- Only 73 cases of GIB have been reported in the medical literature so far.

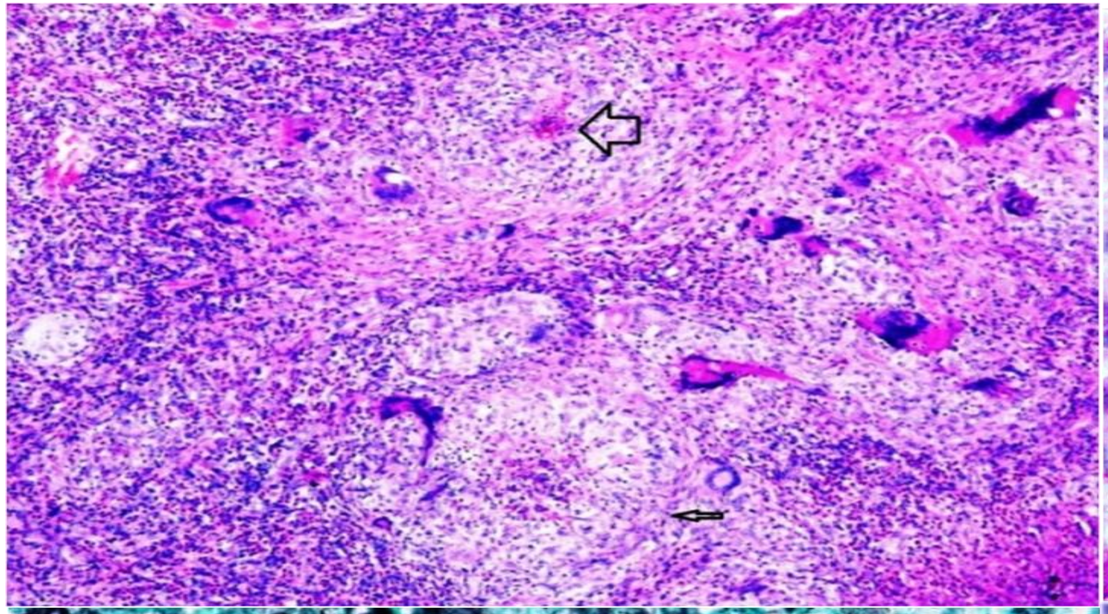
Basidiobolomycosis

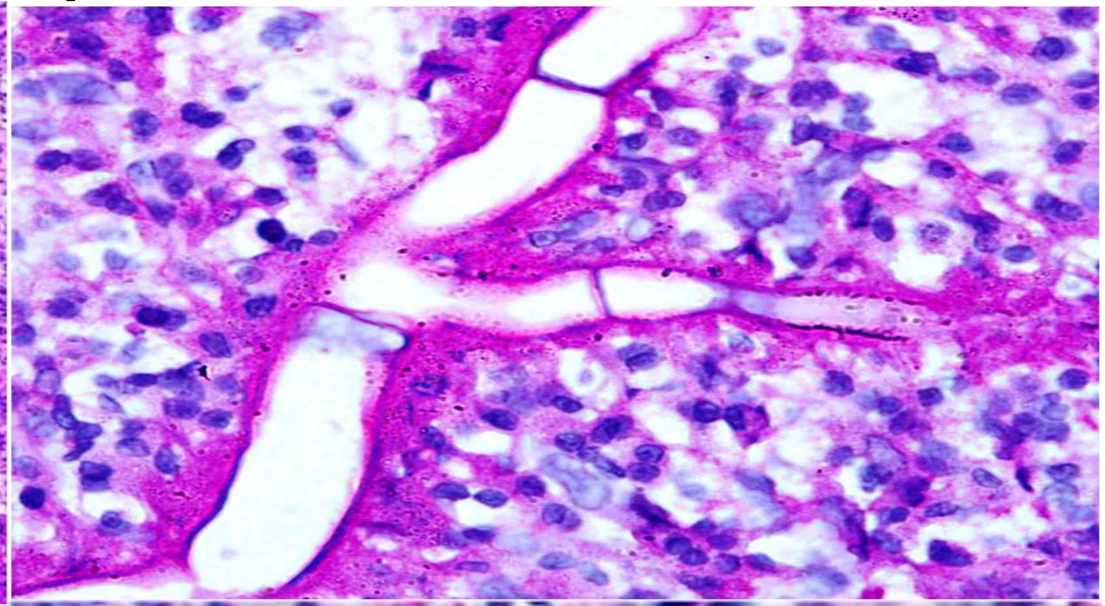
- Basidiobolomycosis is usually a subcutaneous infection that affects mostly young, male persons, and it is transmitted through traumatic inoculation .
- The most common presenting symptom is abdominal pain, followed by fever, weight loss, or abdominal mass.[4]
- Most cases have been reported from tropical and subtropical climates, mainly East and West Africa and Indonesia.
- Only 2 cases of invasive retroperitoneal basidiobolomycosis have been reported..

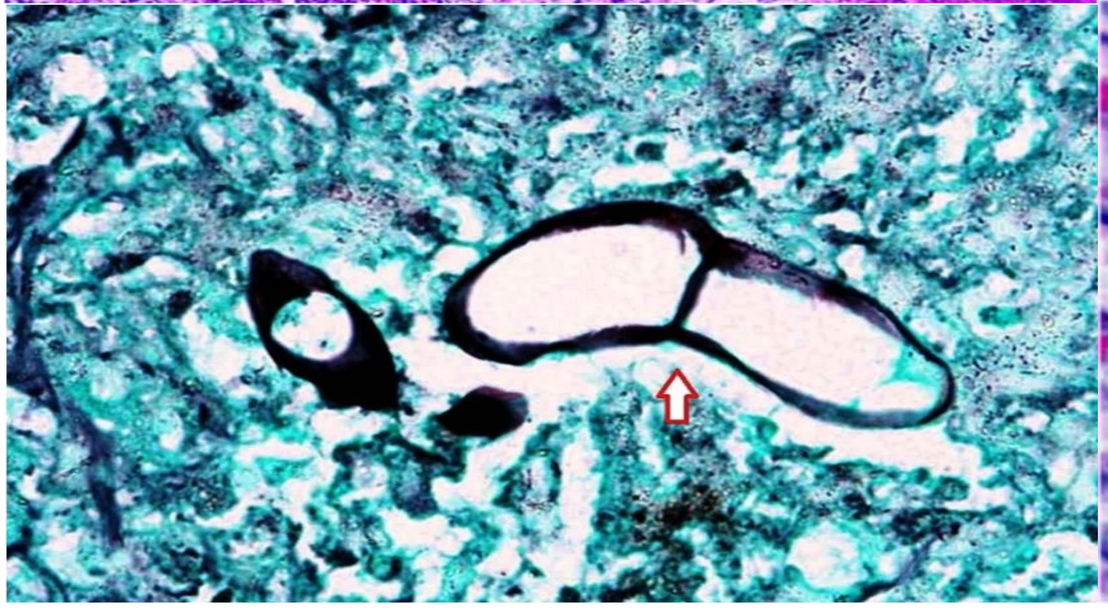
TREATMENT AND FOLLOW-UP

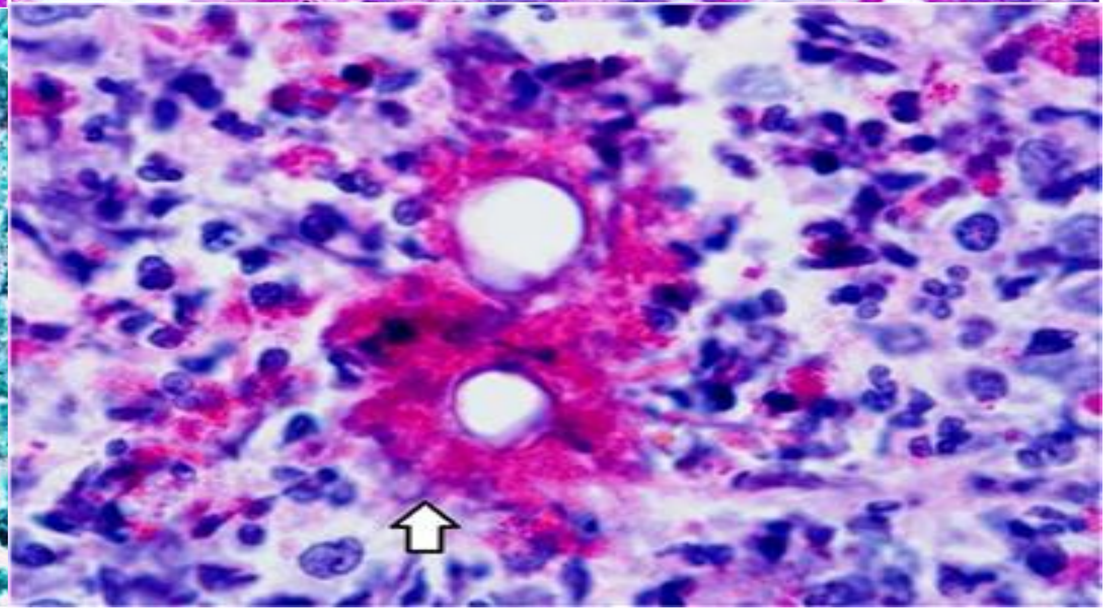
- Advise debulking surgery and azole therapy.
- Child was started on Inj Voriconazole (since IV Itraconazole).
- Child showed dramatic response to IV Voriconazole in the form of being afebrile within 48 hrs of starting IV Itraconazole.
- Pt continue Itraconazole therapy for 3 to 6 months duration.
- Dose of combination therapy of Itraconazole and Voriconazole may be given.
- Child also demonstrated normalization of blood counts (TLC and eosinophils) within a week of starting antifungal therapy.

Earlier Reported case









CASE 2

Clinical presentation:

A 2 year old male child presented with:

- Abdominal distention since 1 month.
- Moderate to high grade fever for 1 month.
- Fever was 4 to 5 spikes per day, Not associated with rigor or chills.
- No complaints of loose motions or vomiting

General examination

- Pulse-90/min
- BP-92/40 mmHg
- Febrile, pallor+
- No peripheral lymphadenopathy
- No skin rashes, joint abnormalities
- No icterus, pedal edema, clubbing, cyanosis

Systemic examination :

- Respiratory system: Normal vesicular breath sound
- Cardiovascular system: Normal heart sound, no murmur
- Central nervous system: active, alert, no neck rigidity, no focal deficits.

Abdomen Soft

- Liver - 9cm BCM, soft, non tender, round margins, span - 13cm
- Spleen - not palpable

Clinical differential diagnosis

- Liver abscess
- Hepatoblastoma
- Lymphoma
- Storage disease

Laboratory Investigations

Parameter	Value
Haemoglobin	8.9 gm/dl
Total leucocyte count	22300/μl
Differential leucocyte count	N-37, L-41, E-18, M-04
Platelet count	490000/μl
RBC morphology	Microcytic hypochromic
Corrected reticulocyte count	1.5%
ESR	130 mm/hr (0-20)

LFT

Laboratory Investigations

Parameter	Value
Total bilirubin	9.1 mg/dl (0.1-1.3)
Direct bilirubin	4.2 mg/dl (0.1-0.4)
AST	166 U/l (5-40)
ALT	100 U/l (5-40)
ALP	466 U/l (35-150)
GGT	107 U/l (1-86)
LDH	491 U/l (85-450)

Laboratory Investigations

Parameter	Results
ANA	2+ positive coarse speckled at 1:80
IgG	2210 mg/dl (80-1800)
IgA	37.7 mg/dl (90-450)
IgM	548 mg/dl (60-280)
IgE	604 U/ml (150-300)
Viral marker	Negative
HIV ELISA	Negative
Alfa feto protein	6 ng/ml (0-8)

RADIOLOGICAL FINDINGS

USG abdomen

Liver - 13.7cm, normal echoes, PV- 5.9 mm, no iHBRD

kidneys - normal

Spleen - 7cm normal

No ascites

Triple phase CT

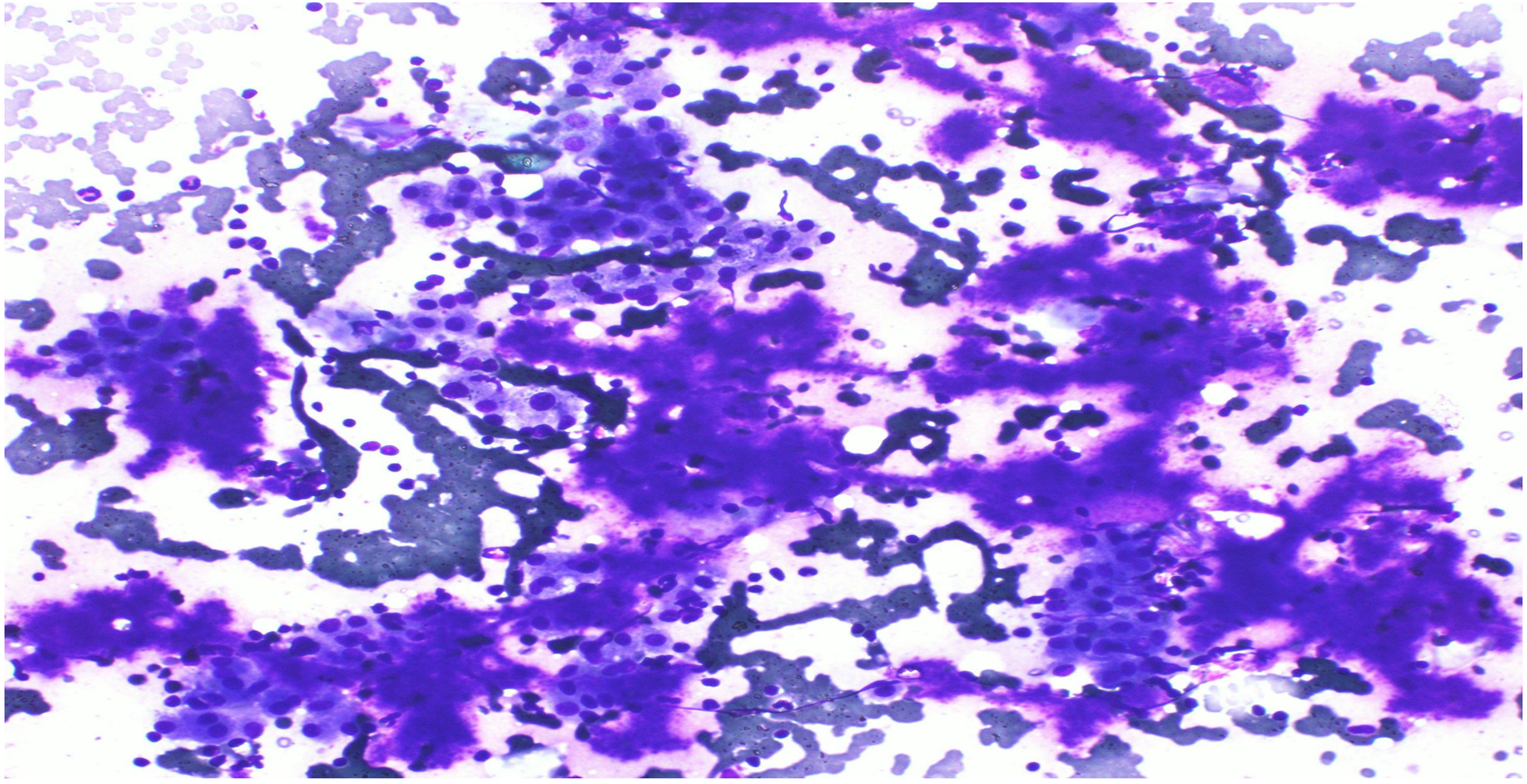
Enlarged liver - 13cm, no focal lesions

Spleen - 8.4cm

Few subcentimetric lymph nodes in periportal region

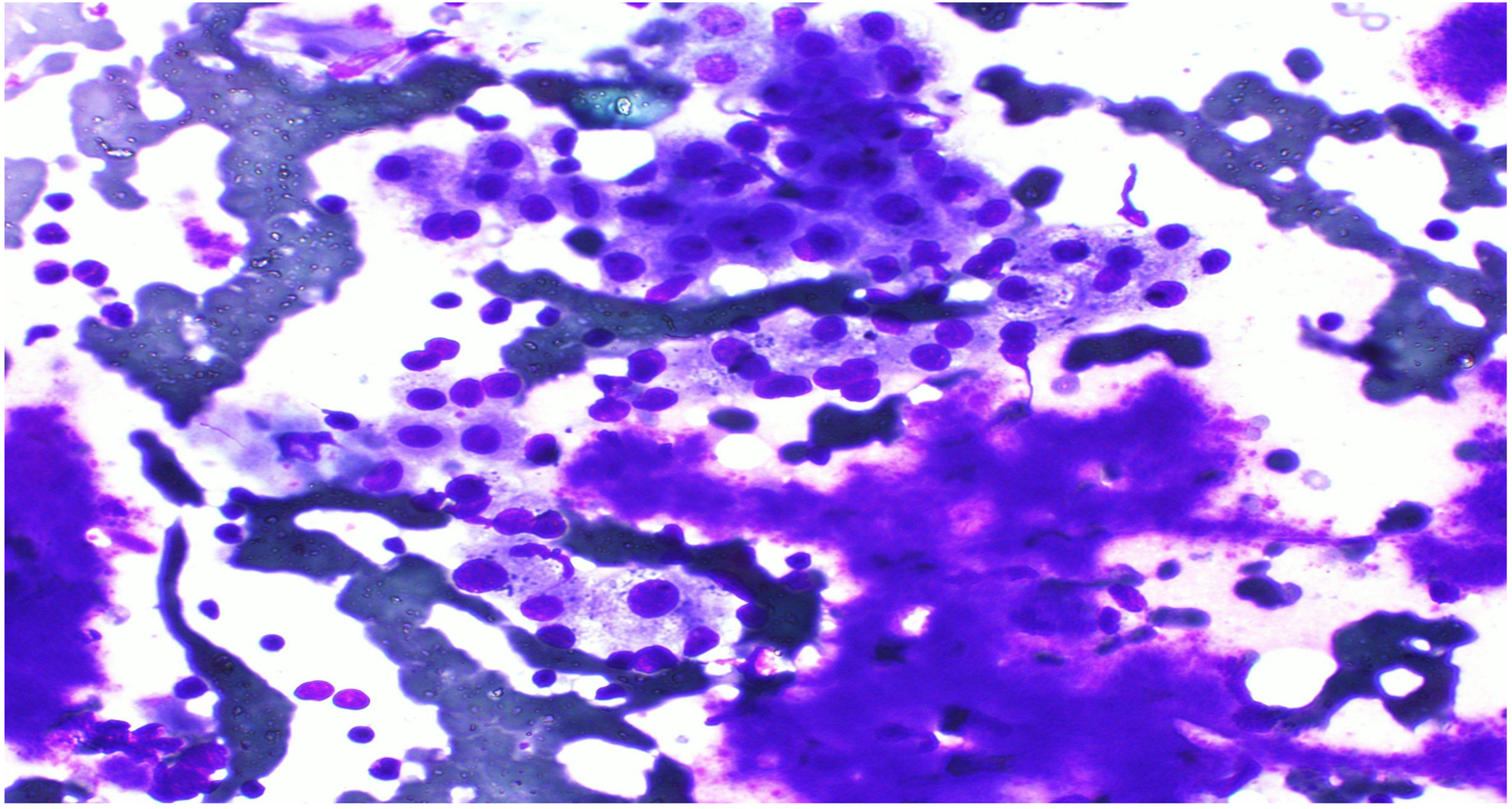
No ascites

CYTOLOGICAL EXAMINATION: USG GUIDED FNAC



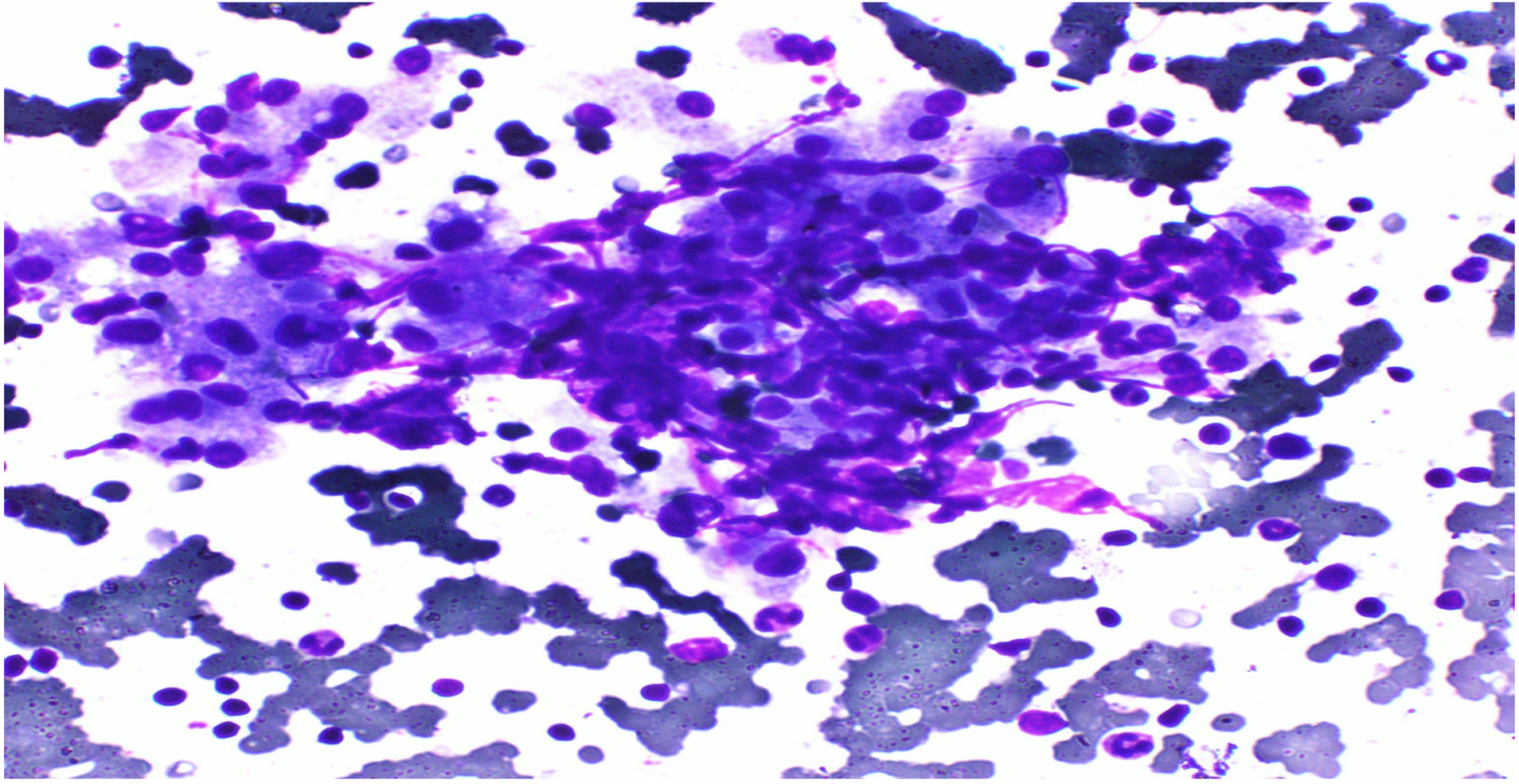
Hepatocytes, Necrosis and few lymphoid cells

CYTOLOGICAL EXAMINATION



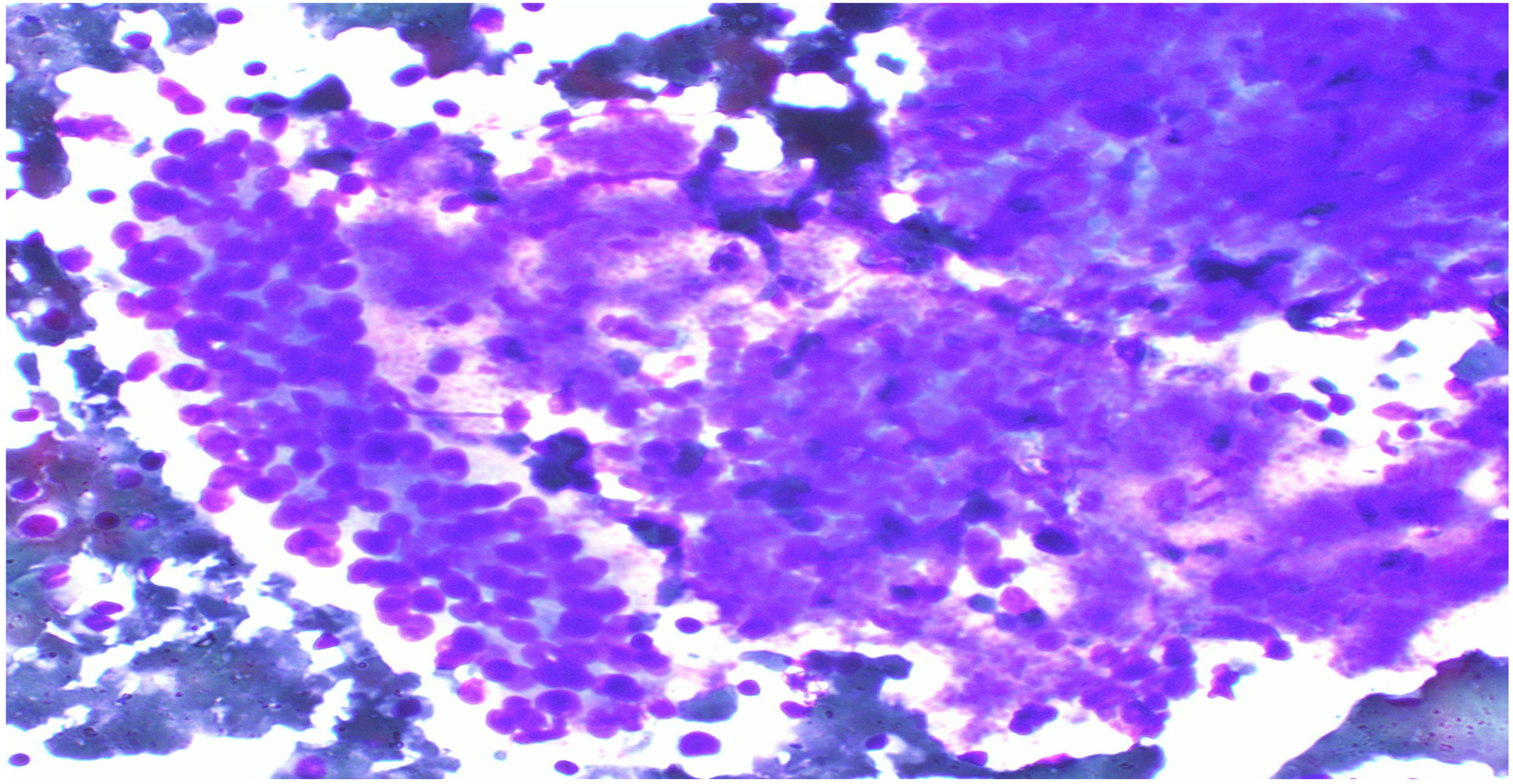
Hepatocytes and Necrosis

CYTOLOGICAL EXAMINATION



Hepatocytes and few lymphoid cells

CYTOLOGICAL EXAMINATION

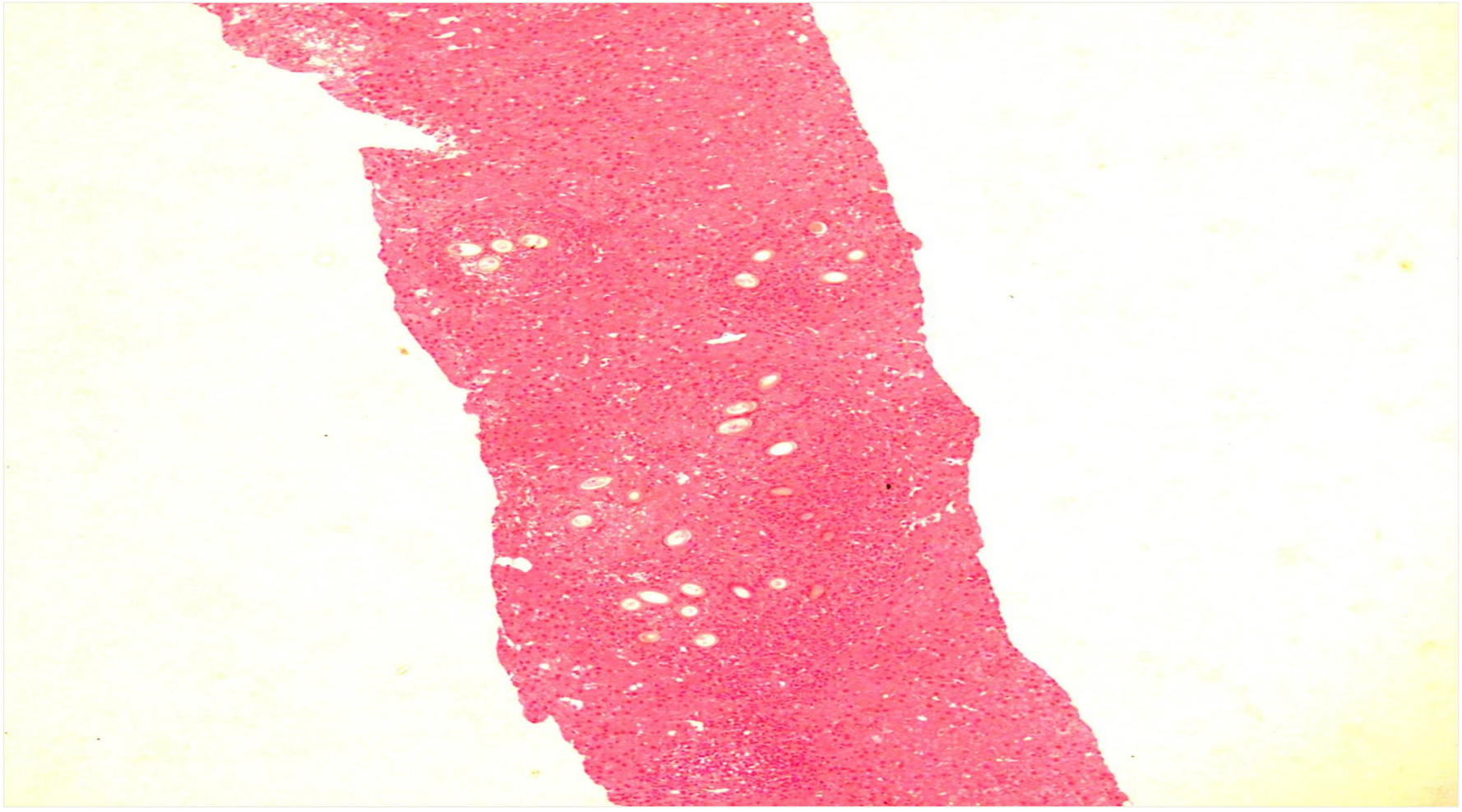


Duct epithelial cells and degenerated cells ? Atypical cells

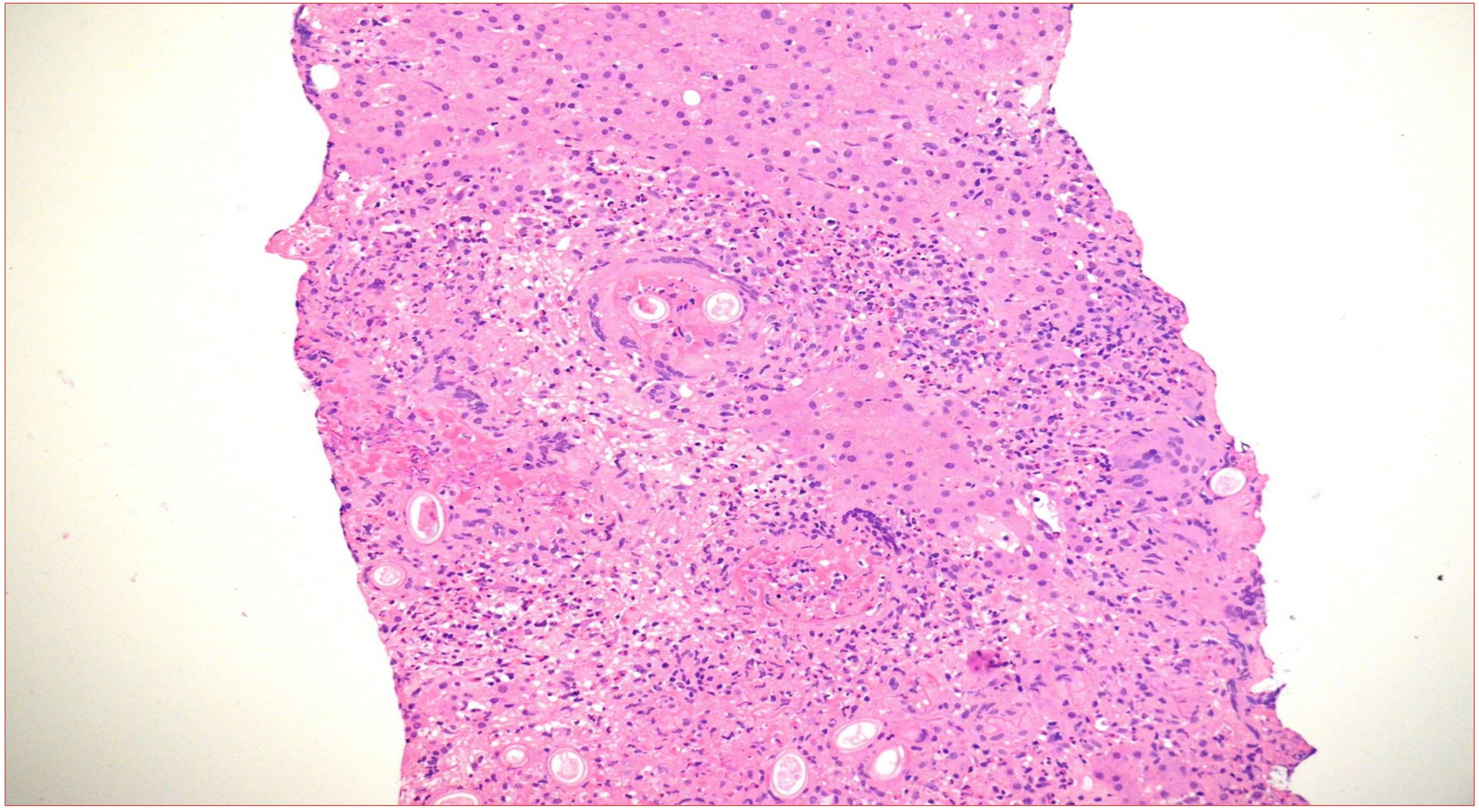
CYTOLOGICAL DIAGNOSIS

- NECROSIS
- PARASITES
- FUNGUS
- GRANULOMATOUS INFLAMMATION
- MALIGNANCY

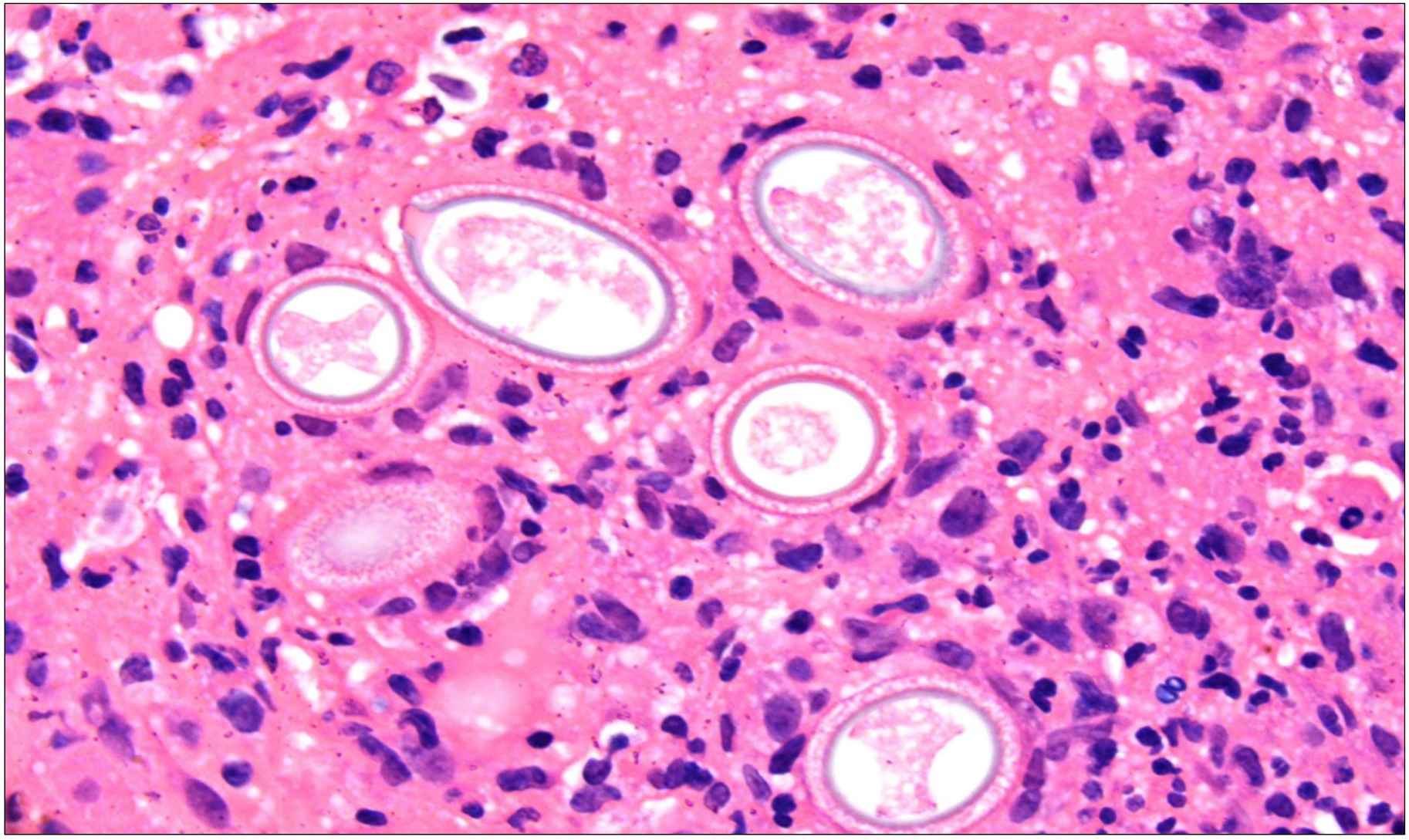
HISTOPATHOLOGICAL EXAMINATION



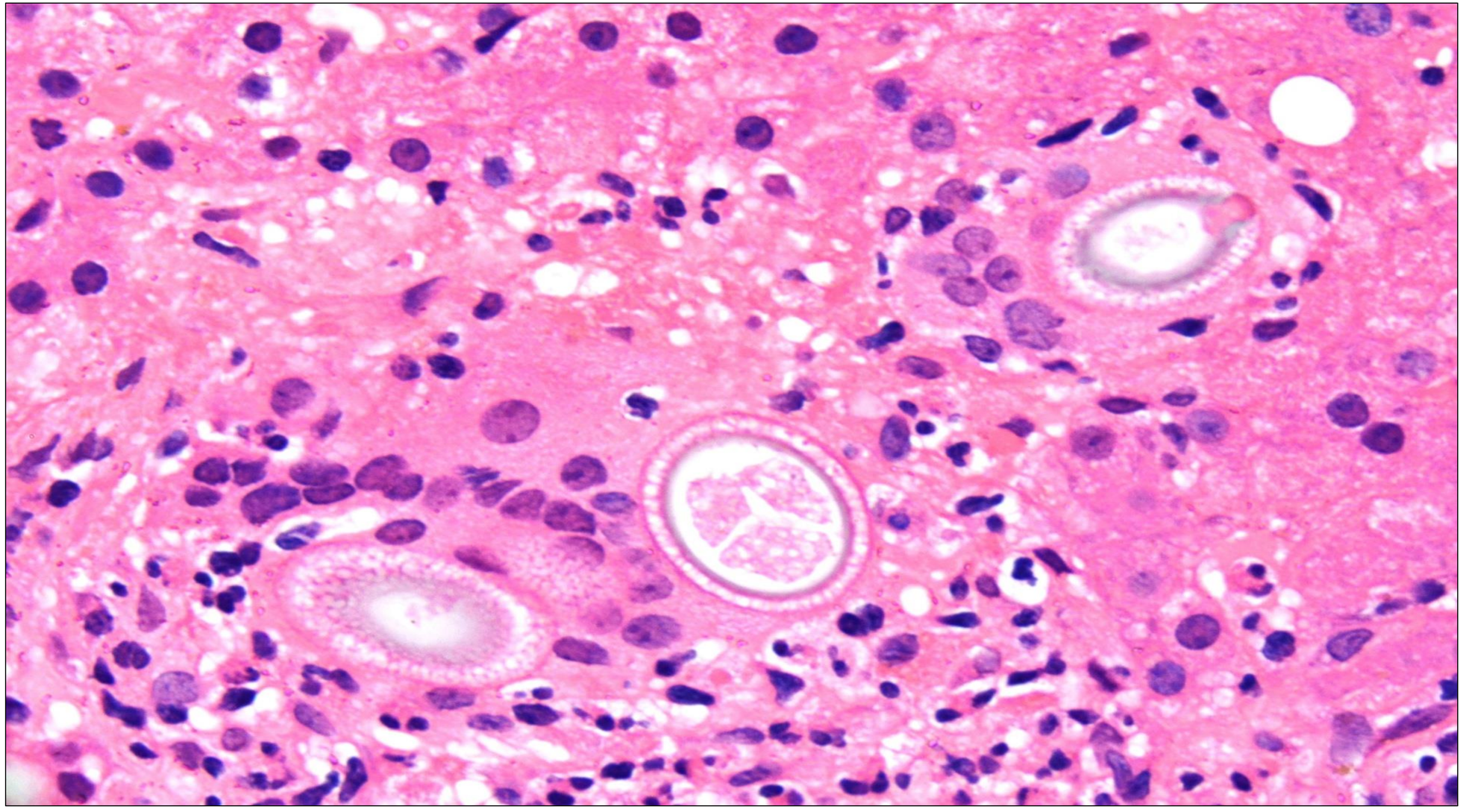
Histopathological examination revealed largely preserved lobular architecture



Histopathological examination: Liver biopsy showed preserved lobular architecture and few discrete granulomas surrounded by abundant eosinophilic infiltrate in the portal areas.

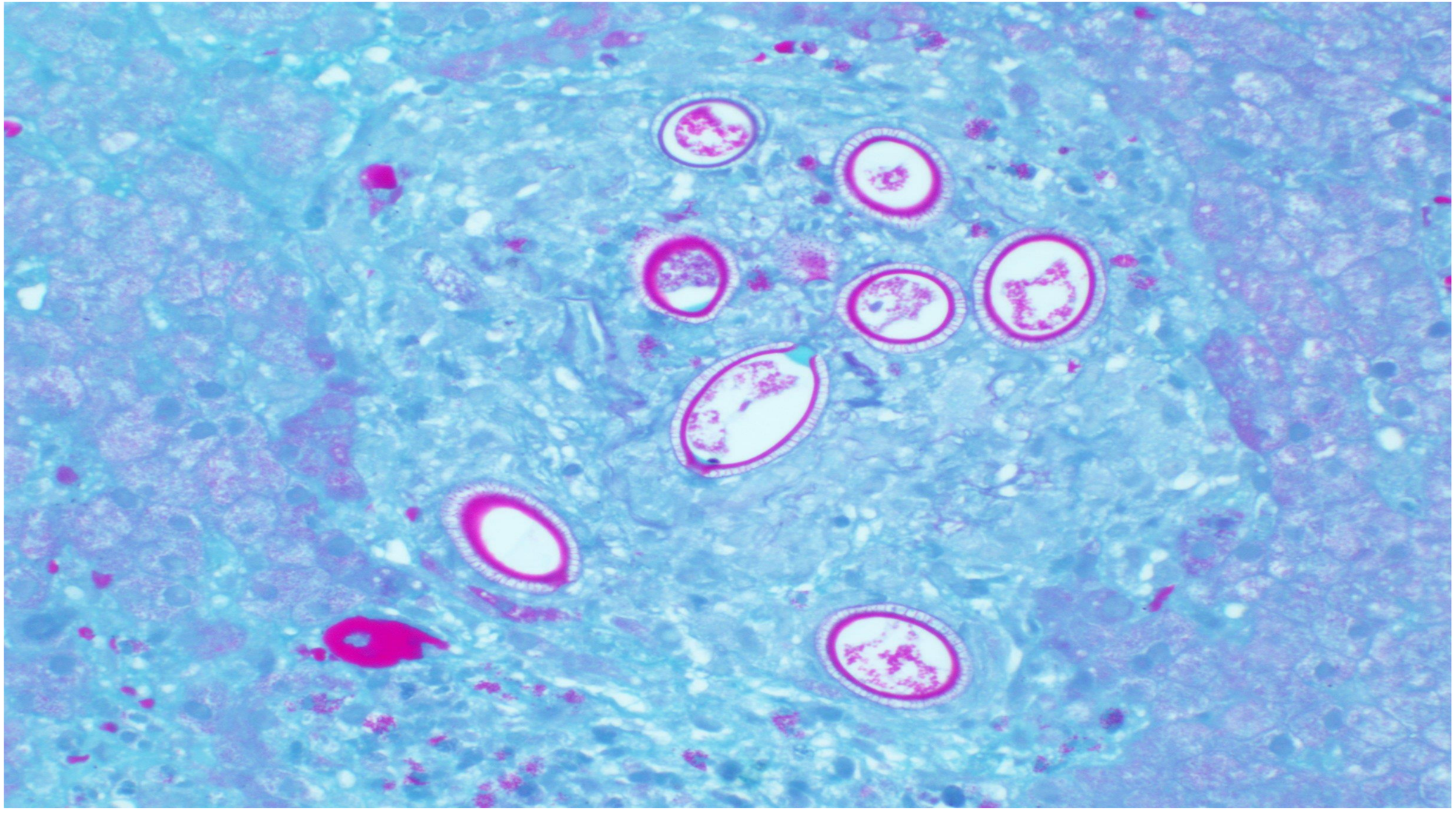


The center of the granulomas and many spherical to oval structures (EGGS) with radial striations and eosinophilic shell.

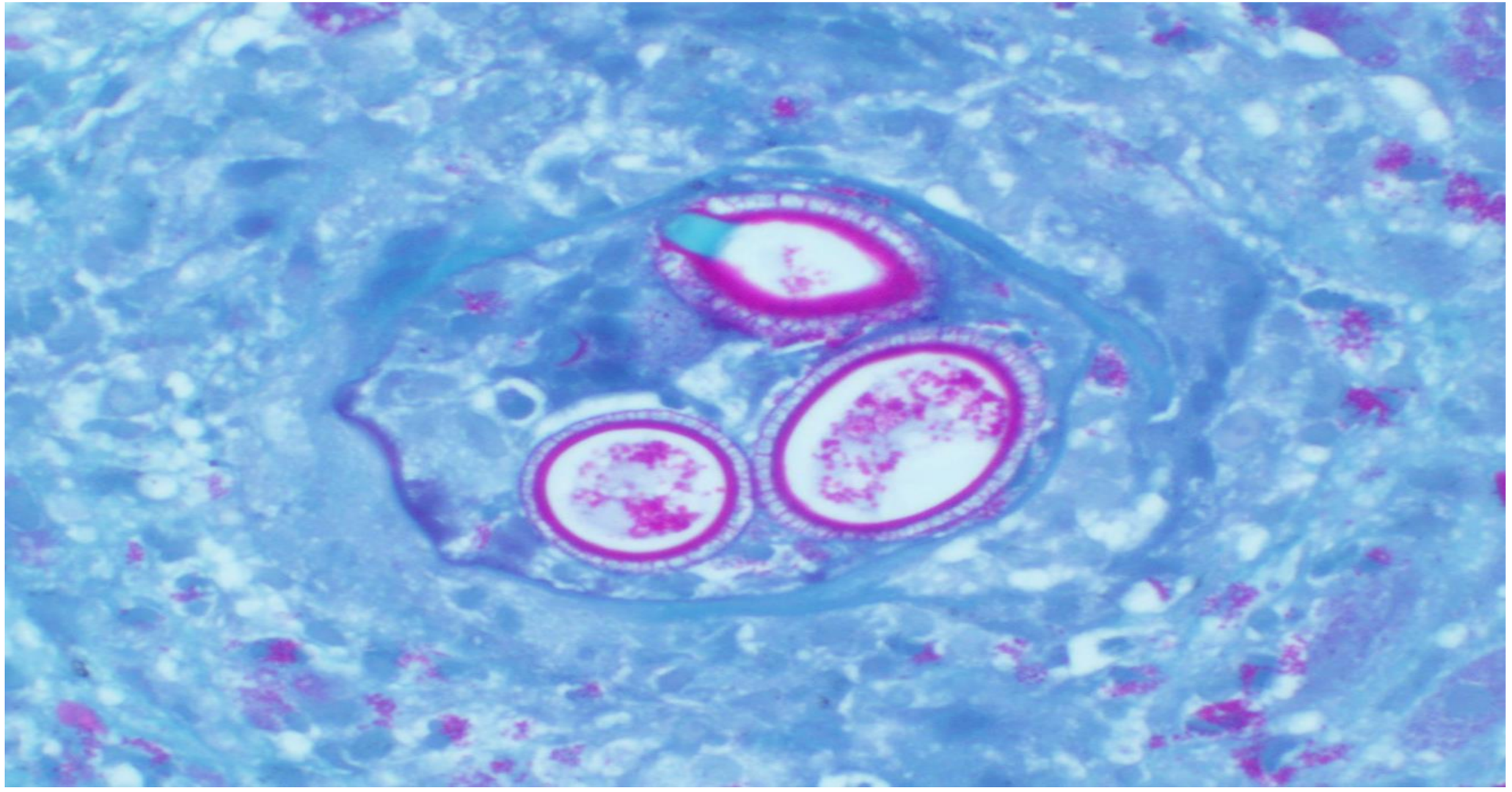


Spherical Eggs and Giant cell Reactions

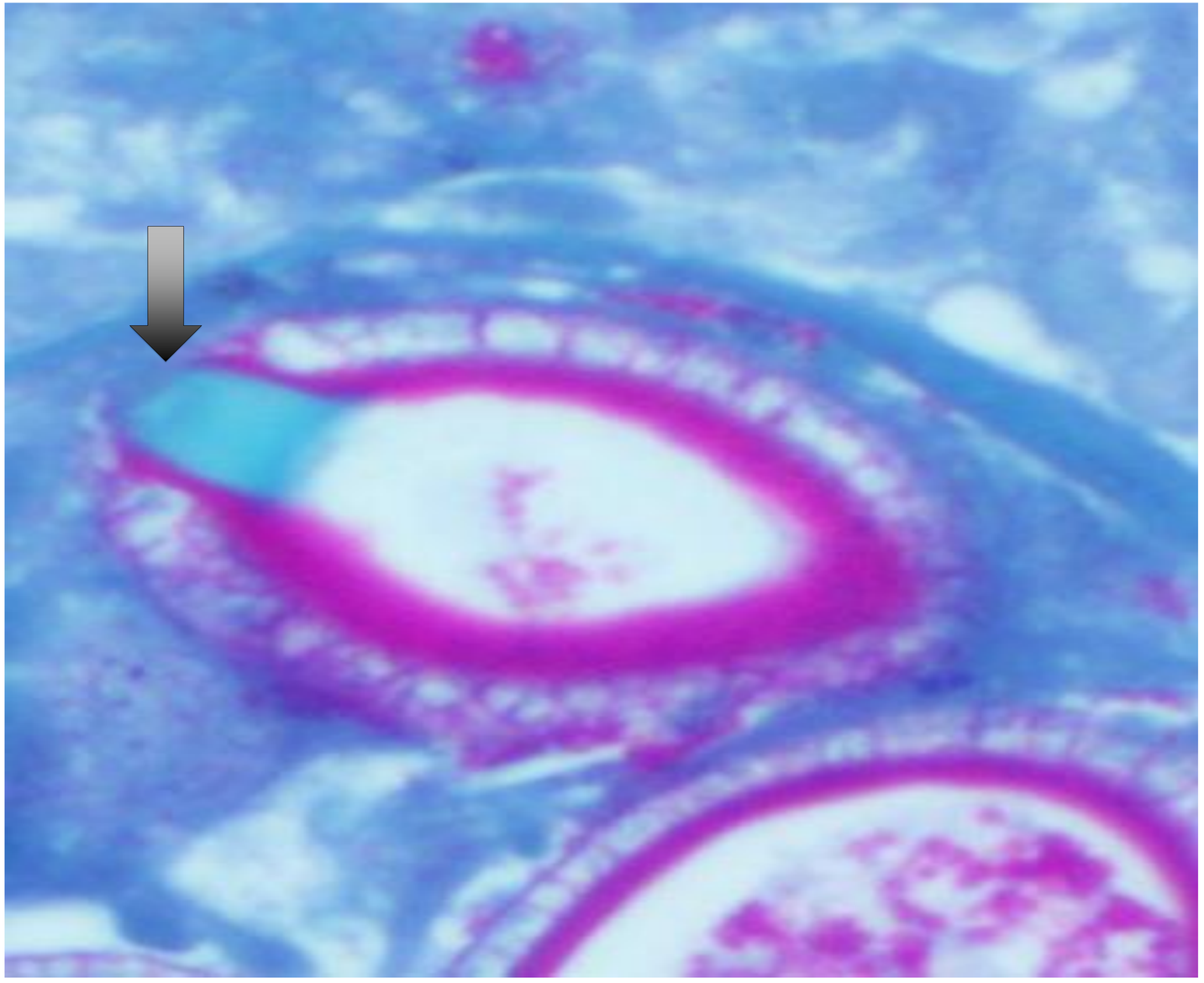
MT STAIN



Spherical eggs with radial striations and polar bodies



Spherical Eggs with polar bodies in Massan trichome stain



Arrow also showed polar bodies in Massan trichome stain

Some of these structures also showed polar bodies in Massan trichome stain, A final histopathological diagnosis of parasitic hepatitis secondary to **Capillaria hepatica infection** was rendered.



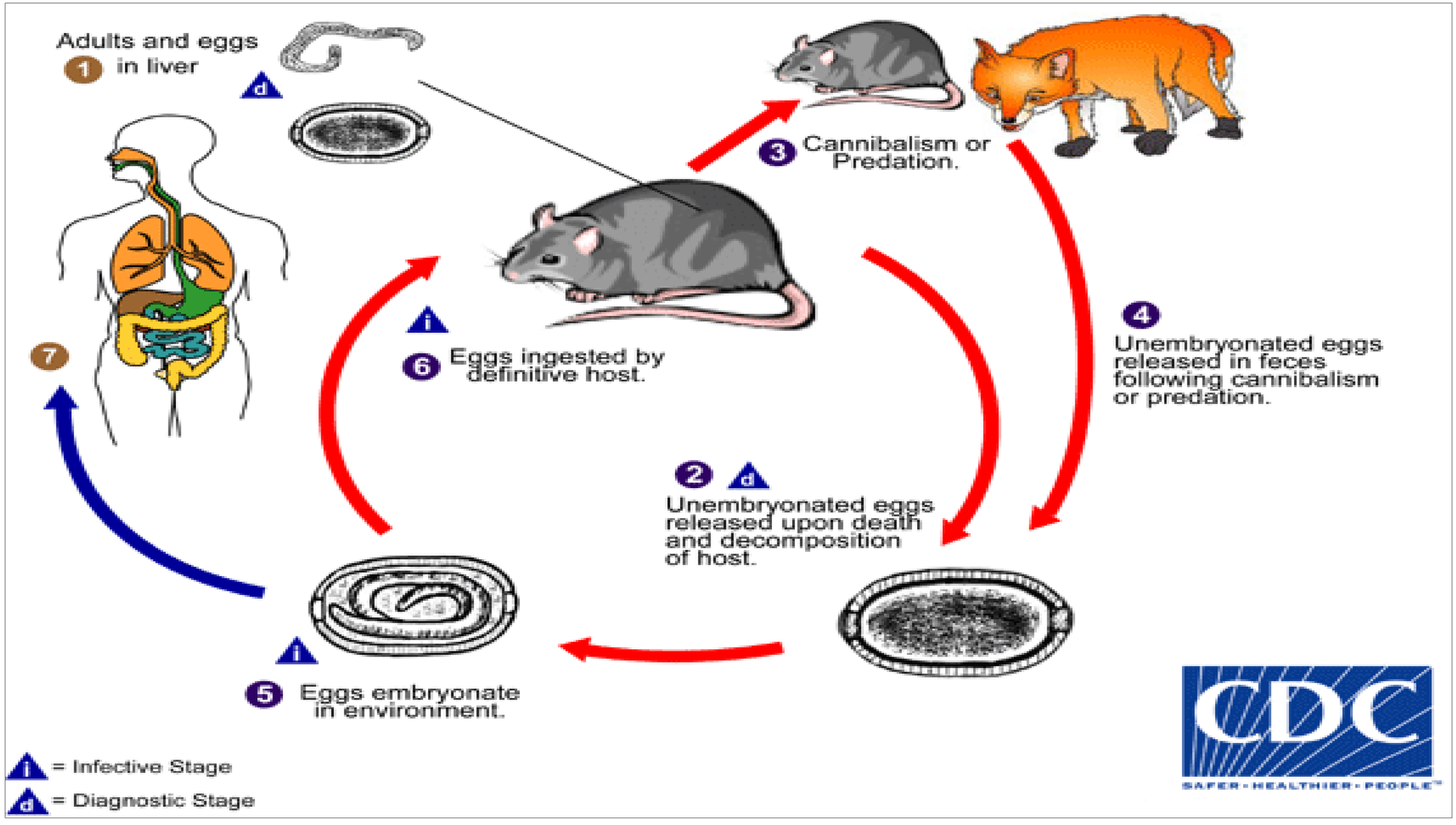
EGG: barrel shaped and 21 to 31 µm wide and 40 to 54 µm long

Capillariasis

- Capillaria hepatica
- Parasitic disease in humans.
- Two different species, Capillaria hepatica and Capillaria philippinensis.
- C. hepatica is transferred through the fecal matter of infected animals and can lead to hepatitis.
- C. philippinensis is transferred through ingesting infected small freshwater fish and can lead to diarrhea and emaciation.

- Capillaria hepatica discovered in 1893 by Bankroft
- Nematode of family Trichocephalidea and class Trichuroidea, similar to Trichuris trichiura.
- The parasite primarily infects the rodents with rare cases affecting humans.
- ~90% of the rats are infected with Capillaria species, worldwide occurrence of sporadic cases.
- Humans are the accidental host and very few cases (<50) have till date been reported. Five cases reported from India till date

LIFE CYCLE OF CAPILLARIA HEPATICA



Treatments and Follow-UP

- Patient started with Albendazole 200 mg / day for 21 days
- Prednisolone 1mg/kg/day for 21 days to reduce hepatic inflammation
- After 1 day fever subsided.
- After 21 days liver was normal in size, liver enzymes reduced, leucocyte and eosinophil count were within normal limits.

CONCLUSIONS

- Capillaria hepatica can present with nonspecific complaints like fever, hepatosplenomegaly and eosinophillia,.
- Timely and accurate diagnosis is essential to prevent/control liver disease.
- Must be kept in the list of differential diagnosis in children with chronic fever and eosinophilia.

Interesting Cases

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Department of Pathology
SMS Medical College & Attached Hospitals
Jaipur INDIA

Disclosure Information

Dilip Ramrakhiani

I have no relevant financial relationships to disclose.

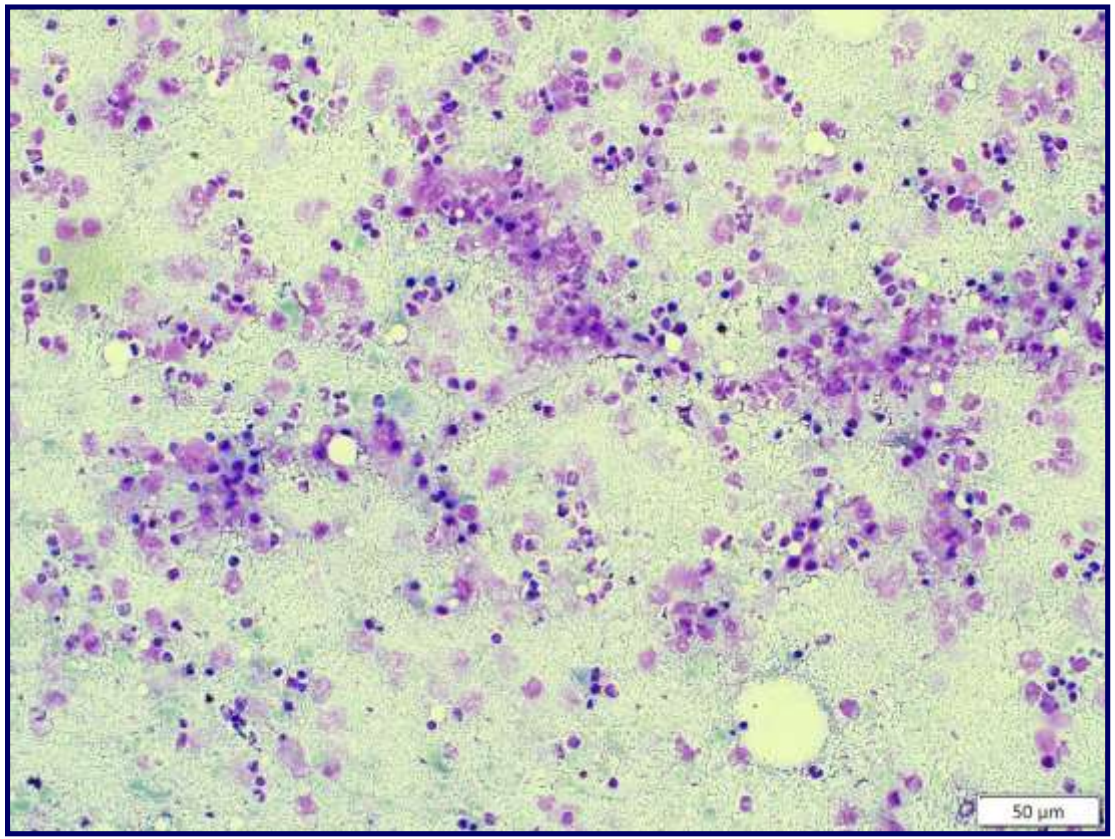
Case -1

Swelling Over the Right Cheek

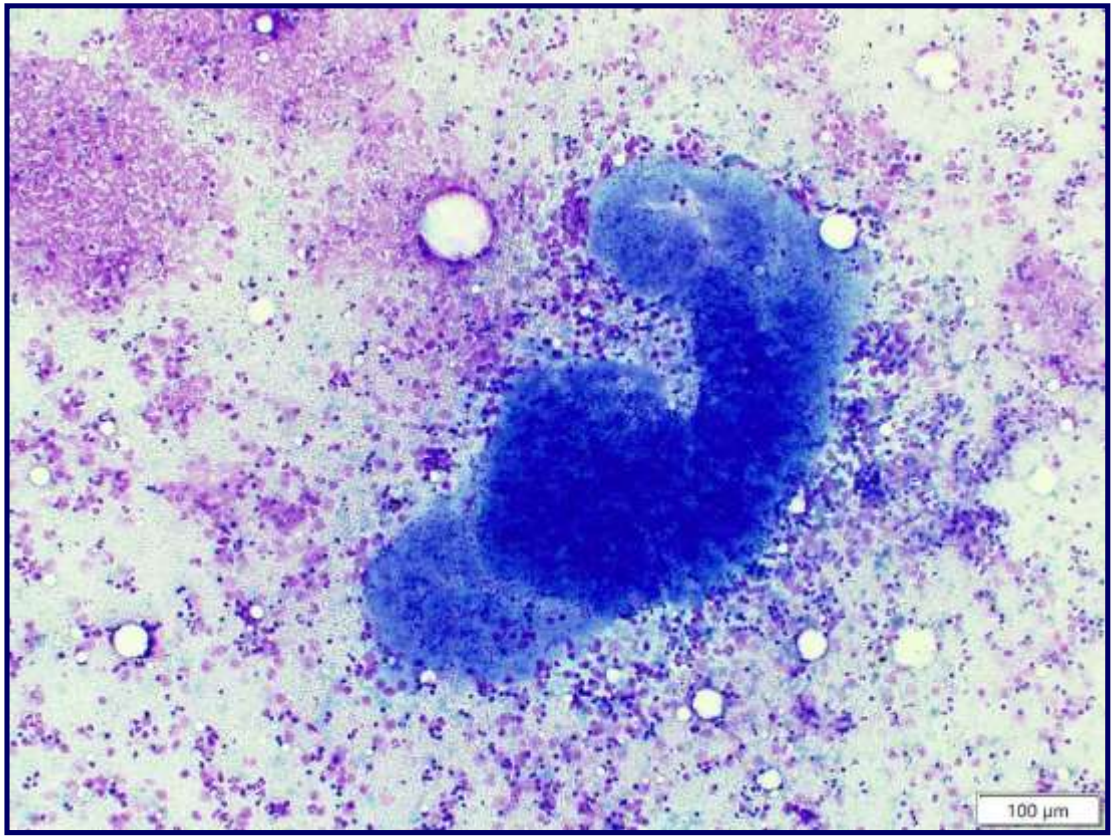
Case History

- A **25 year female** presented with 1 cm diameter soft swelling over the right cheek for 7 days
- She was a case of acute lymphatic leukaemia and had completed her full course of chemotherapy 6 months back
- FNAC was done from this swelling …

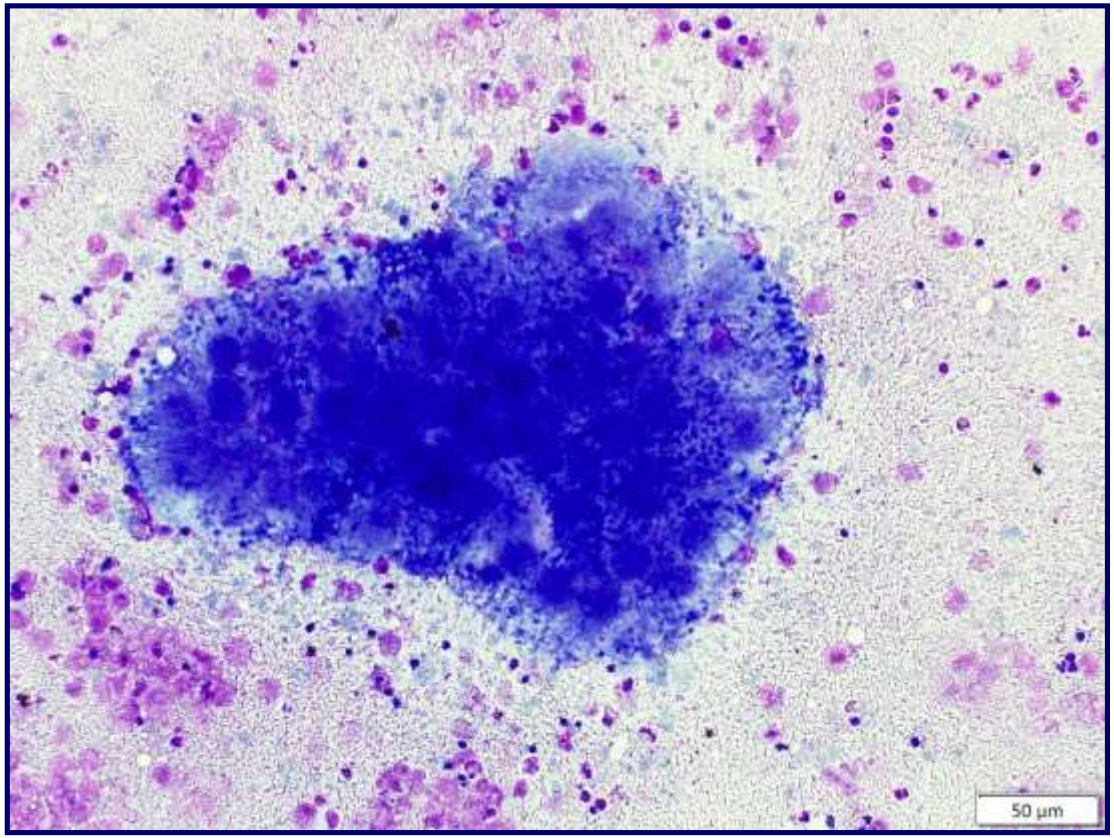
Air-Dried Smears



Air-Dried Smears



Air-Dried Smears



Diagnosis

Cysticercosis

Discussion

- The present case shows abundant inflammatory cells along with multiple fragments of tegument layers of cysticercosis.
- These are well circumscribed fragments with multiple small nuclei.
- The cytology smears are characteristic of cysticercosis.
- The history of acute leukemia is just coincidental.

Discussion

- Cysticercosis is caused by Taenia solium parasite.
- It often shows skin involvement.
- The aspirate usually yields thin fluid material.
- The presence of eosinophils, multinucleated giant cells and epithelioid cell granulomas in a skin nodule are the features of a parasitic infection and one should always search the tegument layer of cysticercosis in such case

Take-Home Points

- The history of cutaneous cysticercosis is often deceptive
- The presence of tegument layer is characteristic of such lesion
- In addition, the background may show eosinophils and epithelioid cell granulomas

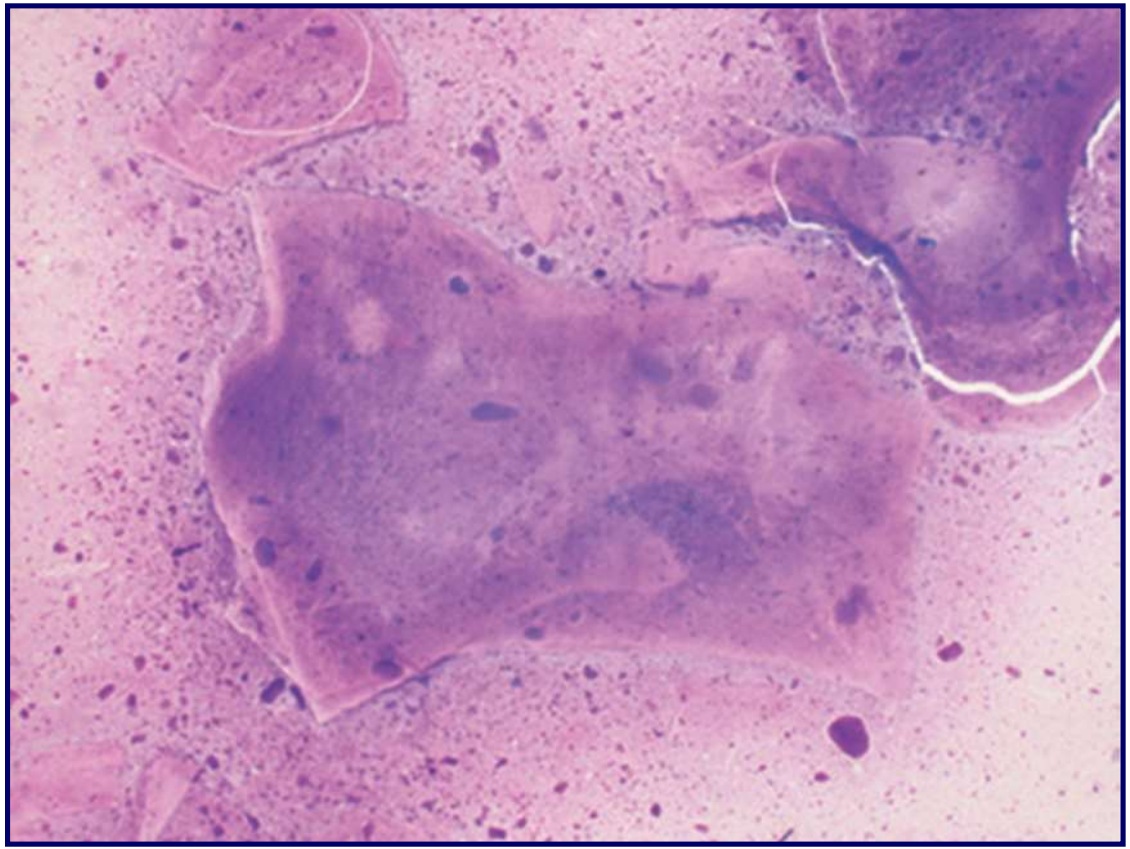
Case -2

Cystic Swelling in the Lumbar Vertebra in a Young Male

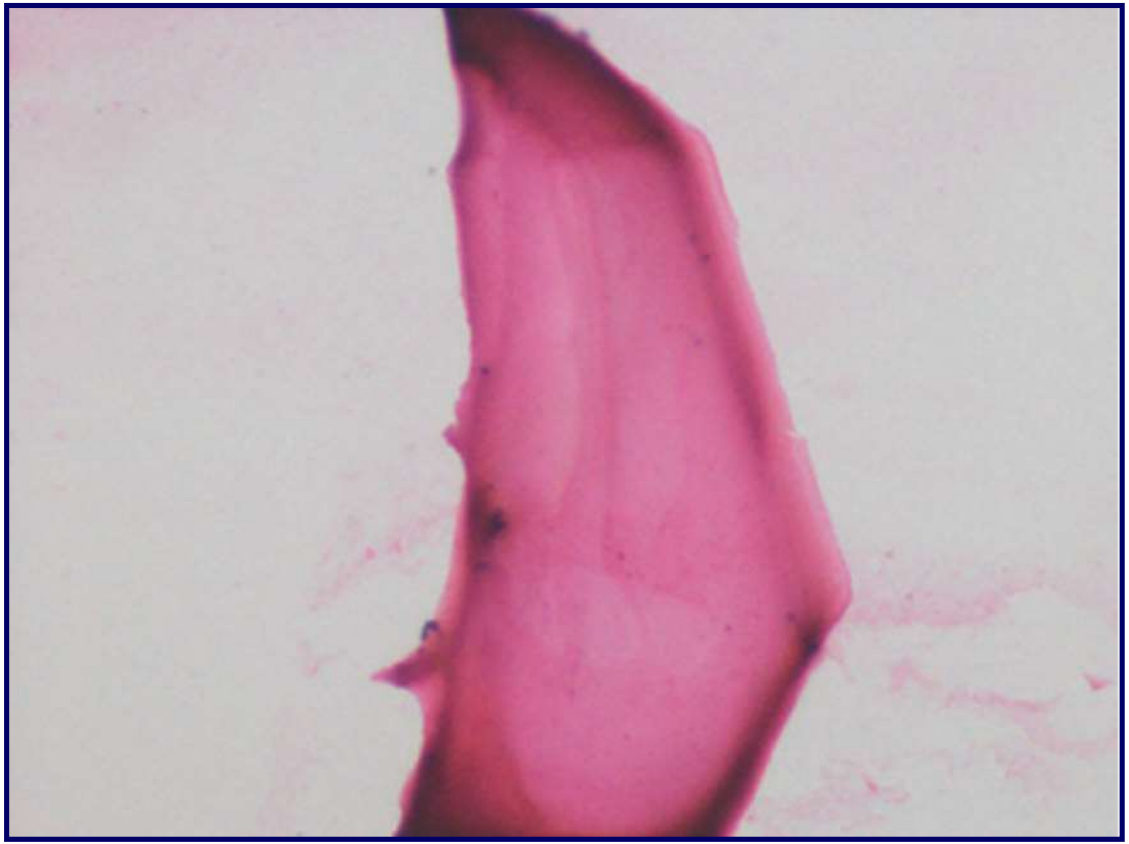
Case History

- A **25-year male** presented with pain in the back and weakness in both lower limbs for 25 days.
- USG showed a 5 cm diameter swelling in the vertebral canal at fourth lumbar region compressing the spinal cord.
- CT scan-guided FNAC was done from the L4 vertebral region

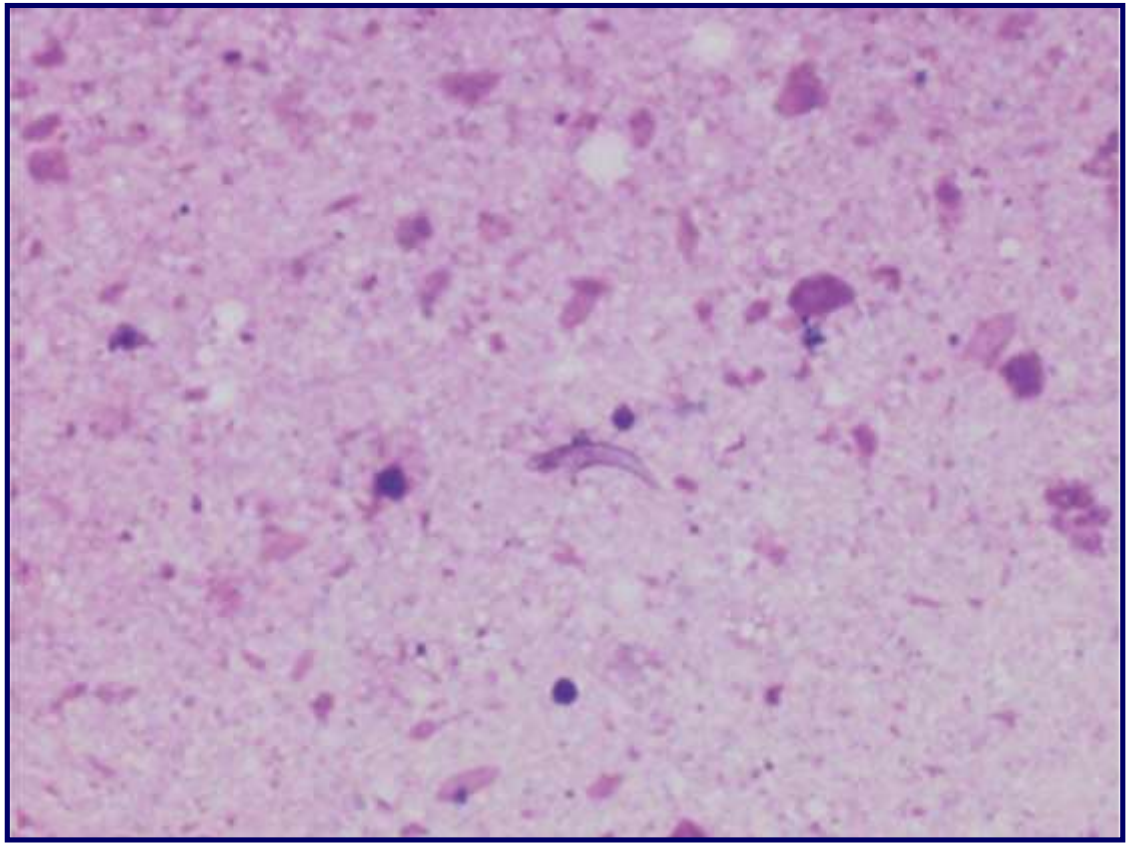
CT-Guided FNA. Air-Dried Smears



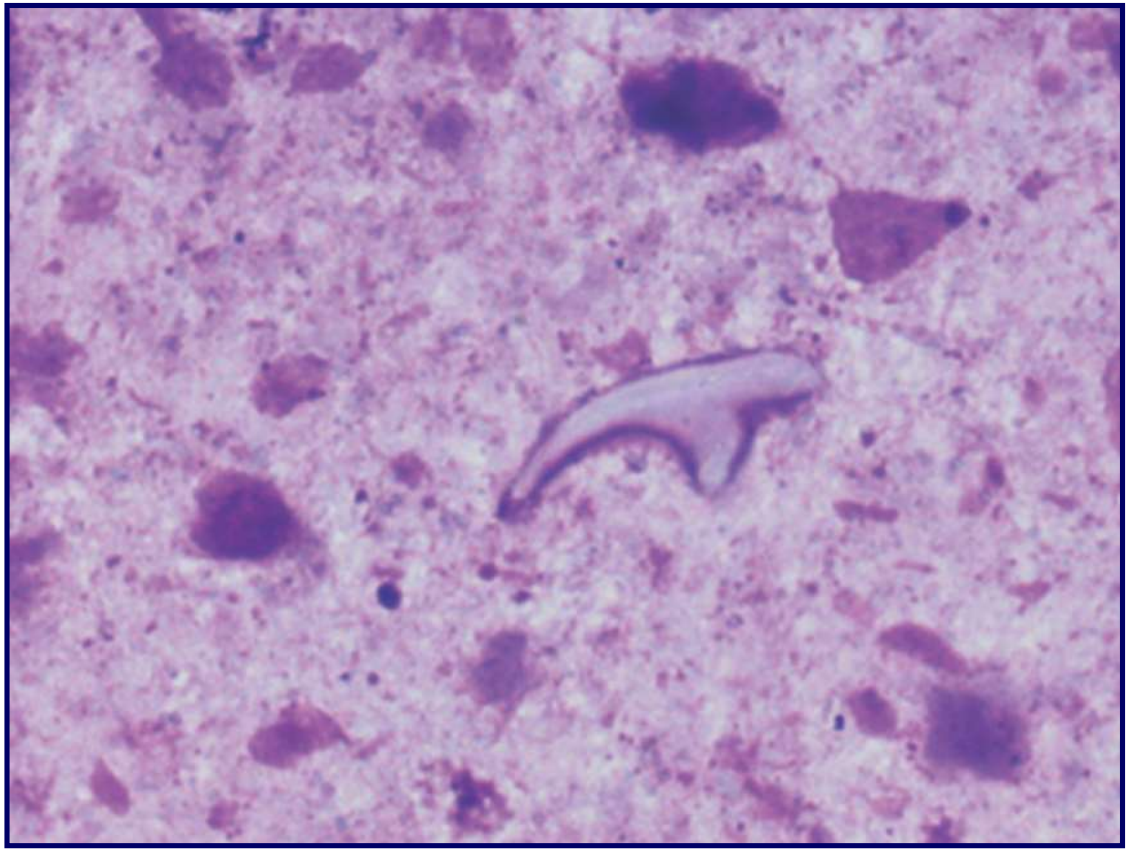
CT-Guided FNA. Alcohol Fixed Smears



CT-Guided FNA. Air-Dried Smears



CT-Guided FNA. Air-Dried Smears



Diagnosis

Hydatid Cyst

Discussion

- The FNAC smears of the present case show laminated membranous structures and hooklets of Echinococcosis.
- The cytomorphology is characteristic of hydatid cyst.

Discussion

- The tapeworm, Echinococcus granulosus is the causative factor of Hydatid cyst.
- The human being is the accidental intermediate host of this parasite.

Discussion

- The hydatid cyst is a cystic cavity filled with fluid. It contains an inner germinal layer and outer laminated membranous layer.
- It commonly occurs in lung and liver.
- Primary hydatid cyst in the spine is unusual

Discussion

- Fine needle aspiration may rupture the cyst and may initiate an anaphylactic reaction.
- Therefore in a suspected case for the diagnostic purpose one should be careful to do FNAC.

Take-Home Points

- Hydatid cyst is caused by Echinococcus granulosus
- Lung and liver are common locations of the hydatid cyst. Spine is rarely involved by hydatid cyst
- The presence of laminated membranous structures and hooklets of Echinococcosis are the features of this lesion

Case -3

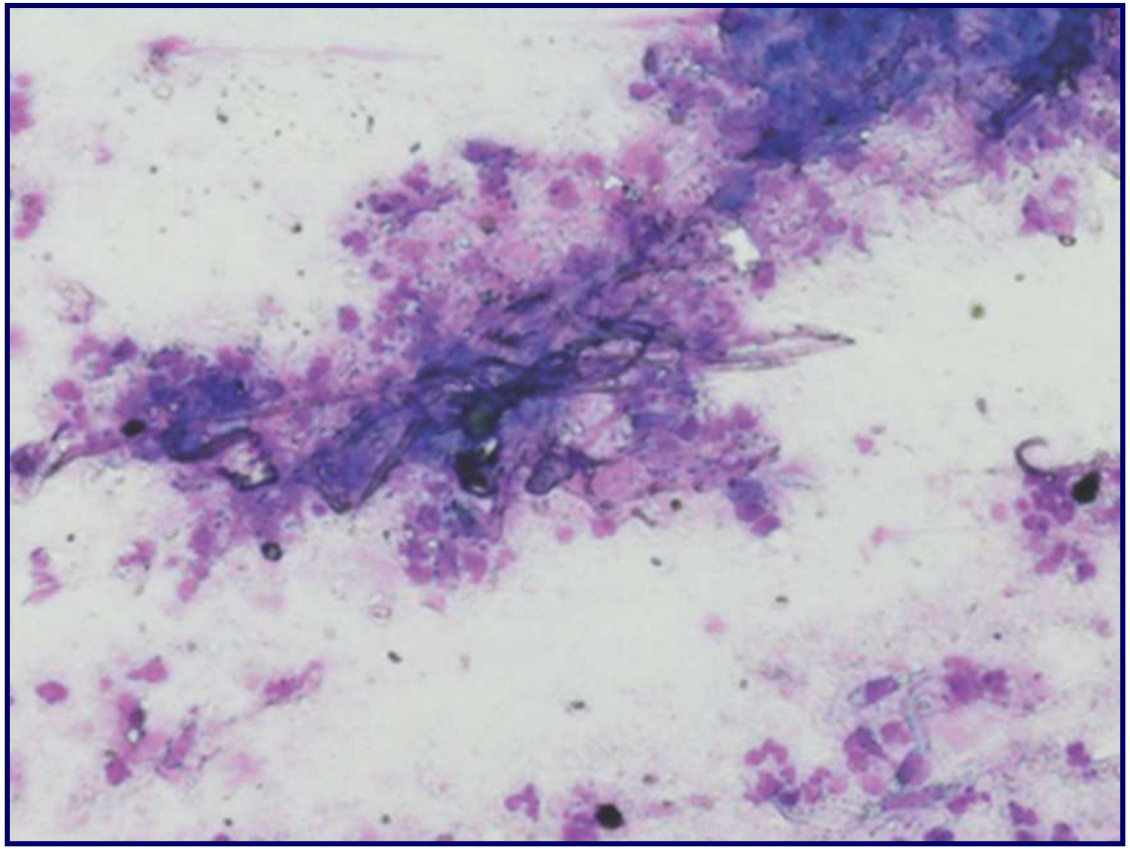
Space-Occupying Lesion of the Lung in a Case of Systemic Lupus Erythematosus



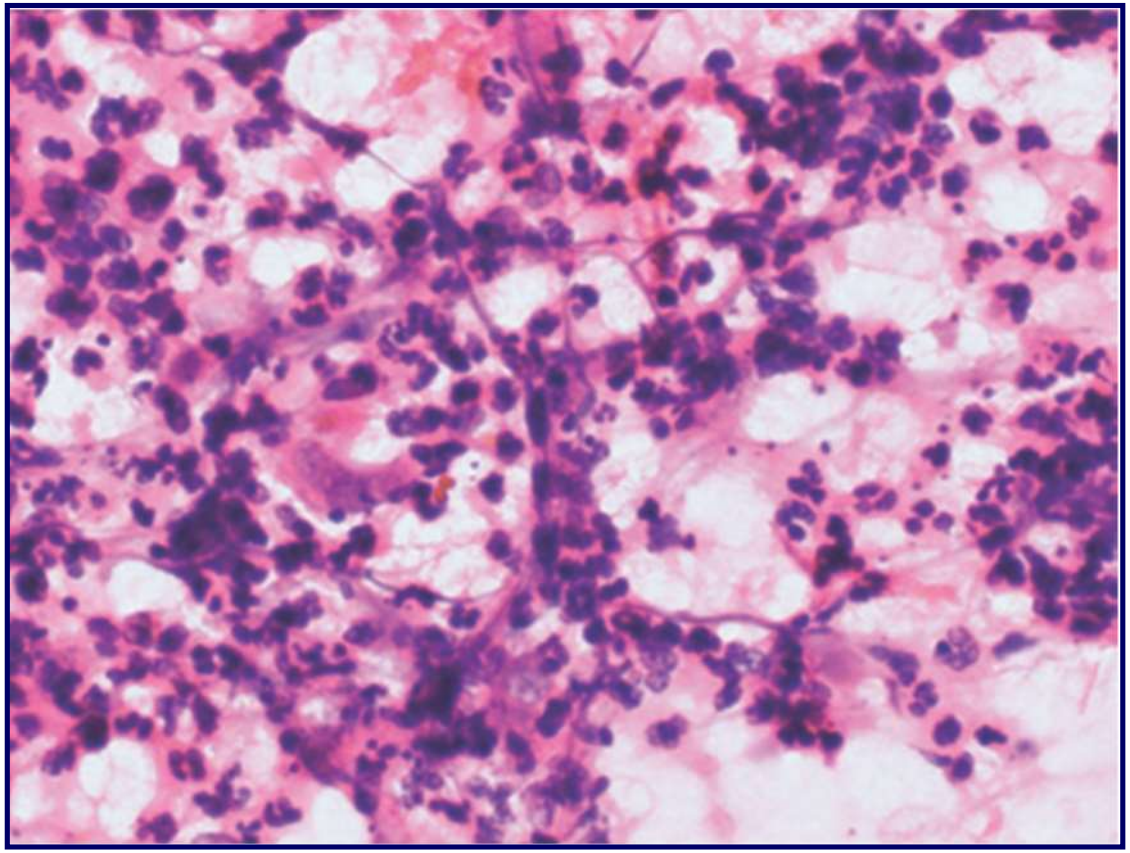
Case History

- A **54-year female** had a chronic cough and expectoration for last 3 months.
- She was taking steroid for the systemic lupus erythematosus for last 6 months.
- Her USG chest showed a 5 cm diameter space-occupying lesion in the upper lobe of the left lung.
- USG guided FNAC was done from the lung lesion.

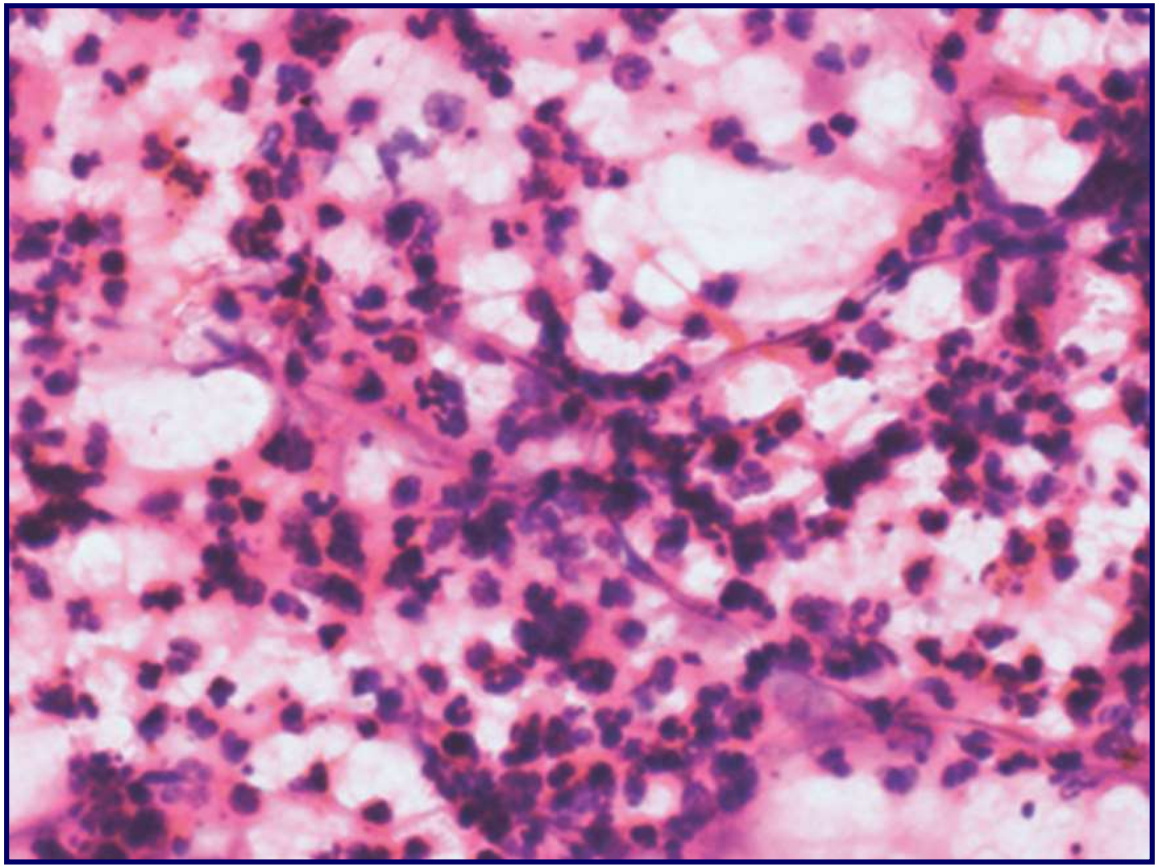
US-Guided FNA. Air-Dried Smears



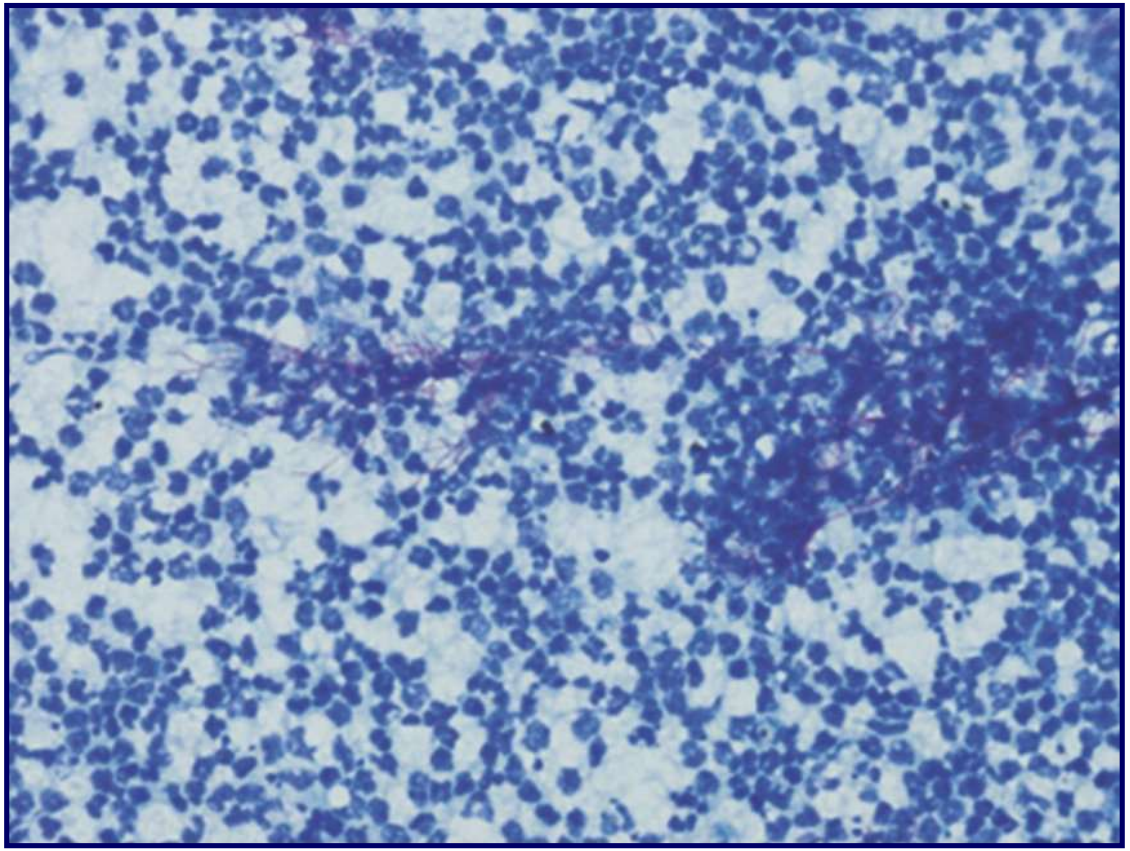
US-Guided FNA. Alcohol Fixed Smears



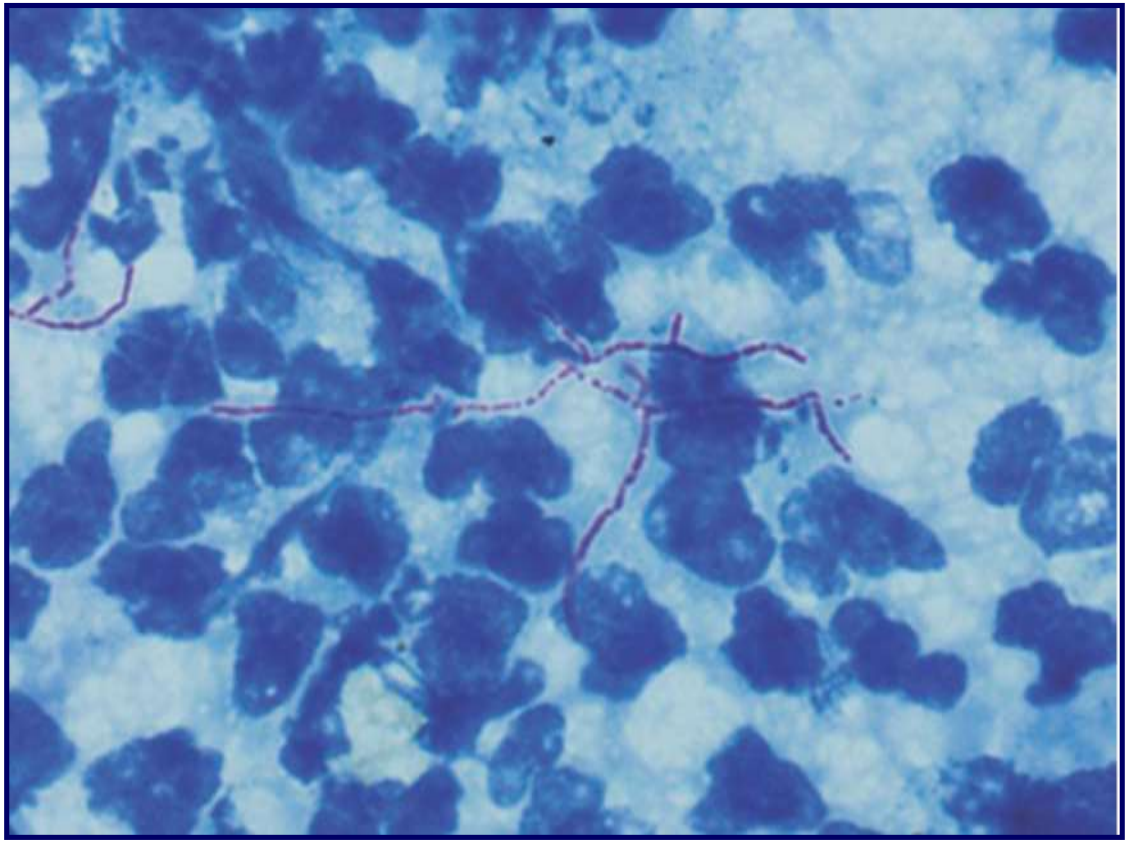
US-Guided FNA. Alcohol Fixed Smears



US-Guided FNA. Modified ZN Stain



US-Guided FNA. Modified ZN Stain



Diagnosis

Nocardia Infection

Discussion

- The cytology smears of the index case show necrosis and abundant polymorphs.
- Haematoxylin and Eosin stained smear shows filamentous organisms.
- These organisms are better visualized in modified Ziehl Neelsen stain.
- The microorganisms are long, slender and branched.
- The morphology is characteristic of Nocardia

Organism	Gram Stain	Acid Fast Stain	Appearance
Aspergillus	-	-	Septate acute angle branching hyphae
Actinomycosis	++	-	Filamentous, sunray appearance
Candida	++	-	Thin septate branching hyphae with spores
Nocardia	++	+	Long slender branched filaments

Discussion

- Nocardia is a gram-positive and filamentous weak acid-fast bacillus.
- The organisms enter through skin erosion or by inhalation.
- They commonly cause disease in the immunocompromised patient.
- The index case was also immunosuppressed (the patient was under steroid).

Discussion

- As it is challenging to identify Nocardia in Haematoxylin and Eosin or May Grunwald Giemsa stain so high clinical suspicion is needed for their detection.
- The culture of Nocardia is necessary in every case for further confirmation.
- The treatment of Nocardia includes intake of either trimethoprim or amikacin, imipenem, meropenem, ceftriaxone, cefotaxime

Take-Home Points

- Nocardia is a gram positive bacteria. They are weakly acid fast positive by modified Ziehl Neelsen stain.
- The organisms are thin and filamentous.
- Nocardia should be distinguished from actinomycosis that often form clusters and give a sun-ray appearance. Actinomycosis is gram positive and acid fast negative.
- Nocardia may infect the lung, soft tissue and brain.

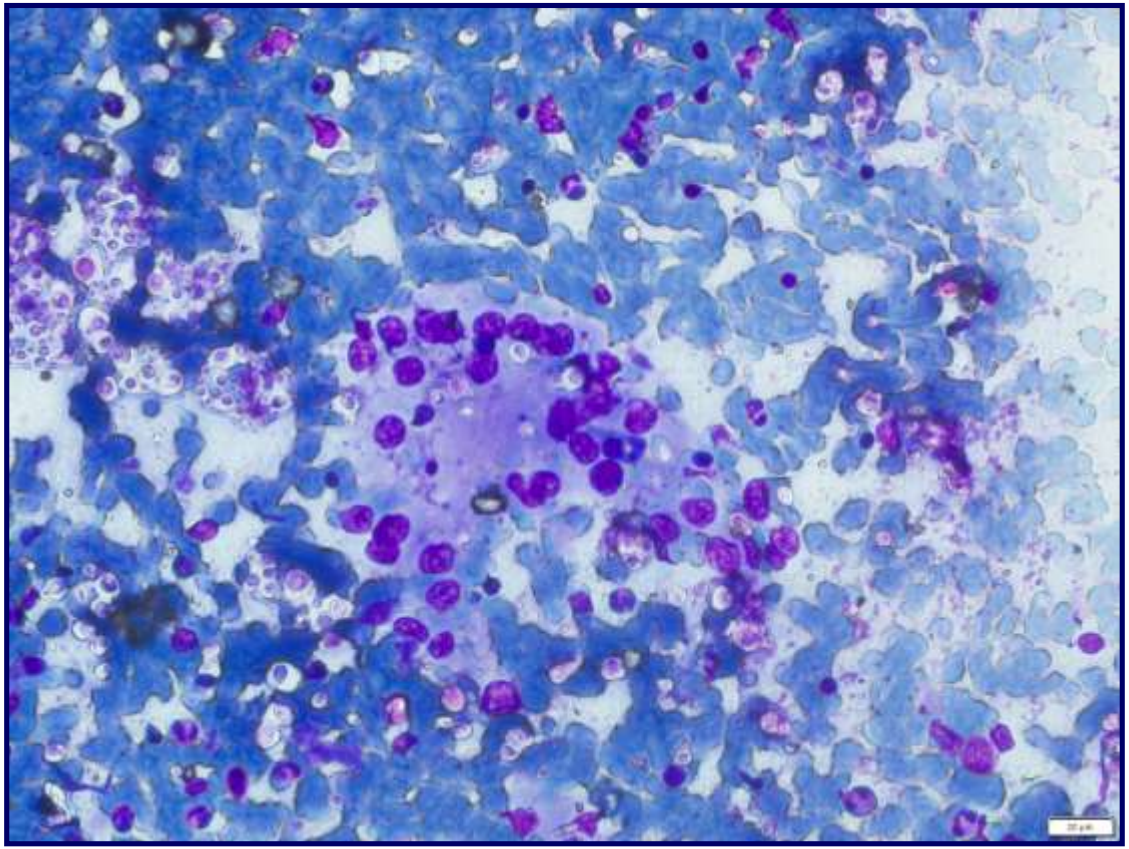
Case -4

Abdominal Lymph Nodes with Fever and Pain Abdomen in a Child

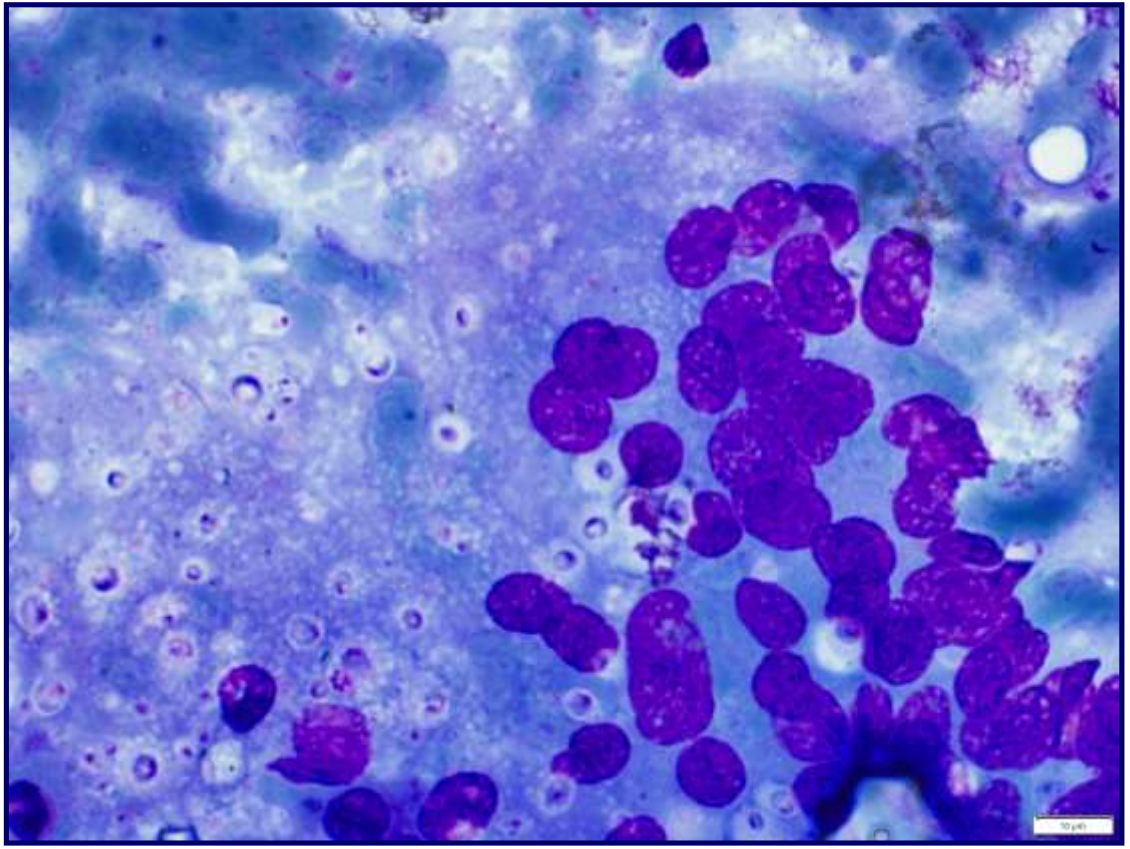
Case History

- A **15-year-old female** presented with fever and pain abdomen.
- Her USG abdomen showed multiple 2–3 cm diameter lymph nodes.
- Her blood count and hemoglobin were within normal limit. However, the patient was positive for HIV serology.
- USG guided FNAC smears showed….

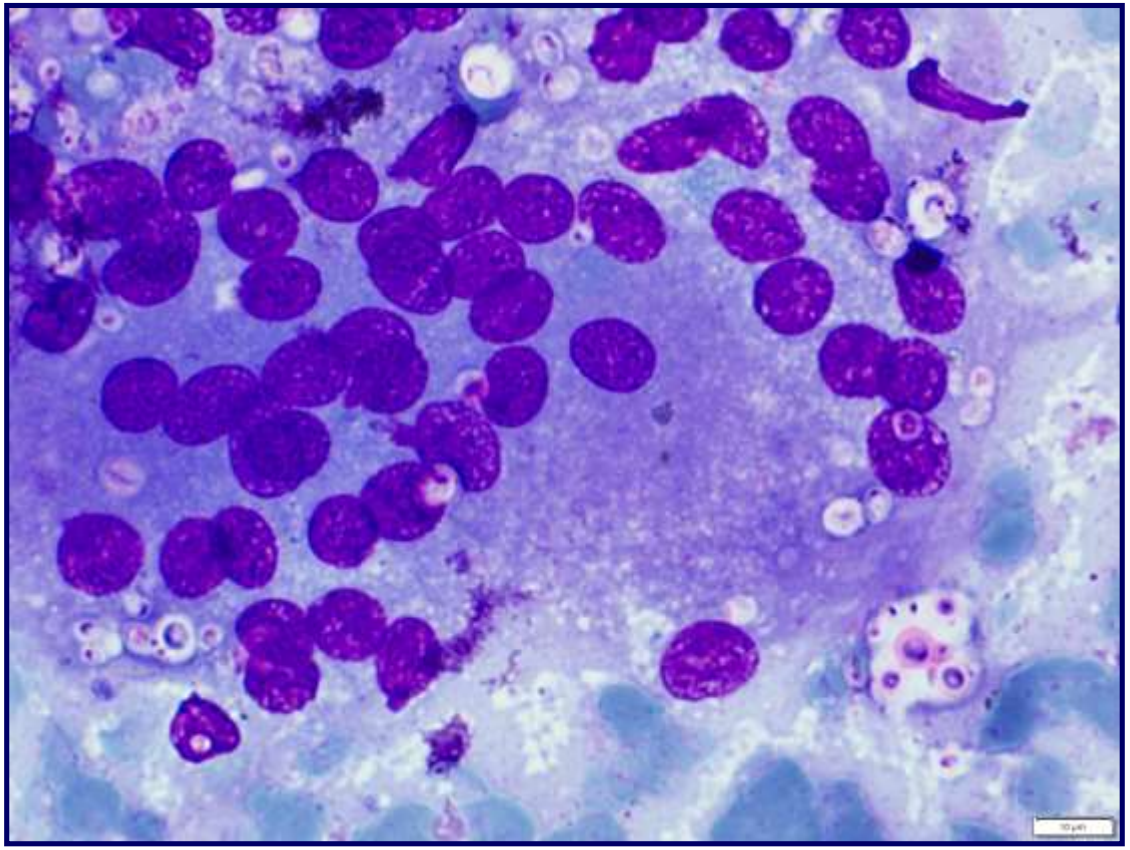
US-Guided FNA. Air-Dried Smears



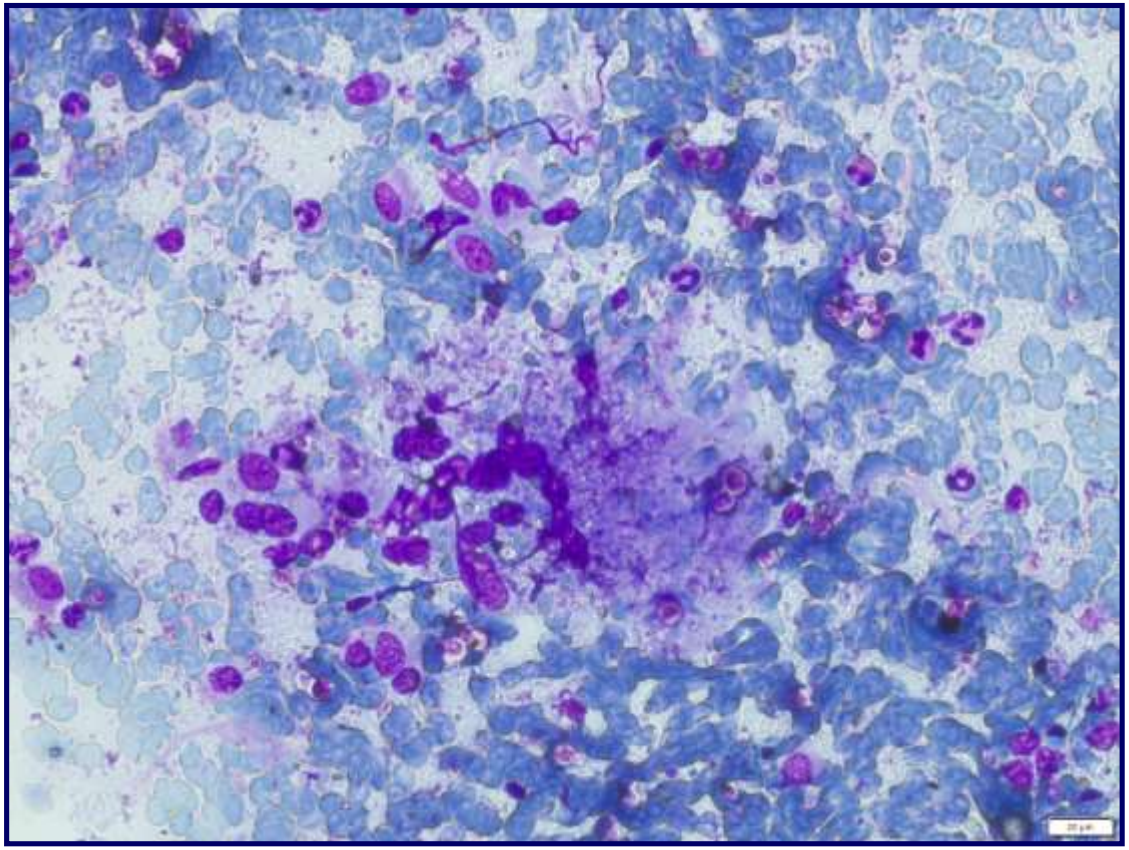
US-Guided FNA. Air-Dried Smears



US-Guided FNA. Air-Dried Smears



US-Guided FNA. Air-Dried Smears



Diagnosis

Cryptococcal infection

Discussion

- The present case shows lymphocytes, histiocytes, many multinucleated giant cells and epithelioid cell granuloma.
- The giant cells showed round to oval yeast cells with thick mucinous capsules within & in their periphery.
- The cytomorphology is consistent with cryptococcal infection.

Discussion

- Cryptococcal infection is mainly caused by Cryptococcus neoformans.
- The infection commonly occurs in immunocompromised patients.
- The index case was HIV positive immunocompromised girl.
- Cryptococcus is round to oval 4–10 μ diameter organism.
- The capsule of the organism is highlighted by India ink, mucicarmine, GMS & PAS.

Take-Home Points

- Cryptococci are opportunistic fungi and frequently seen in immunocompromised patients (in this index case HIV positive patient)
- The organisms are round 4–10 µm in size with an outer capsule
- The capsule is better visualized by India ink or mucicarmine.

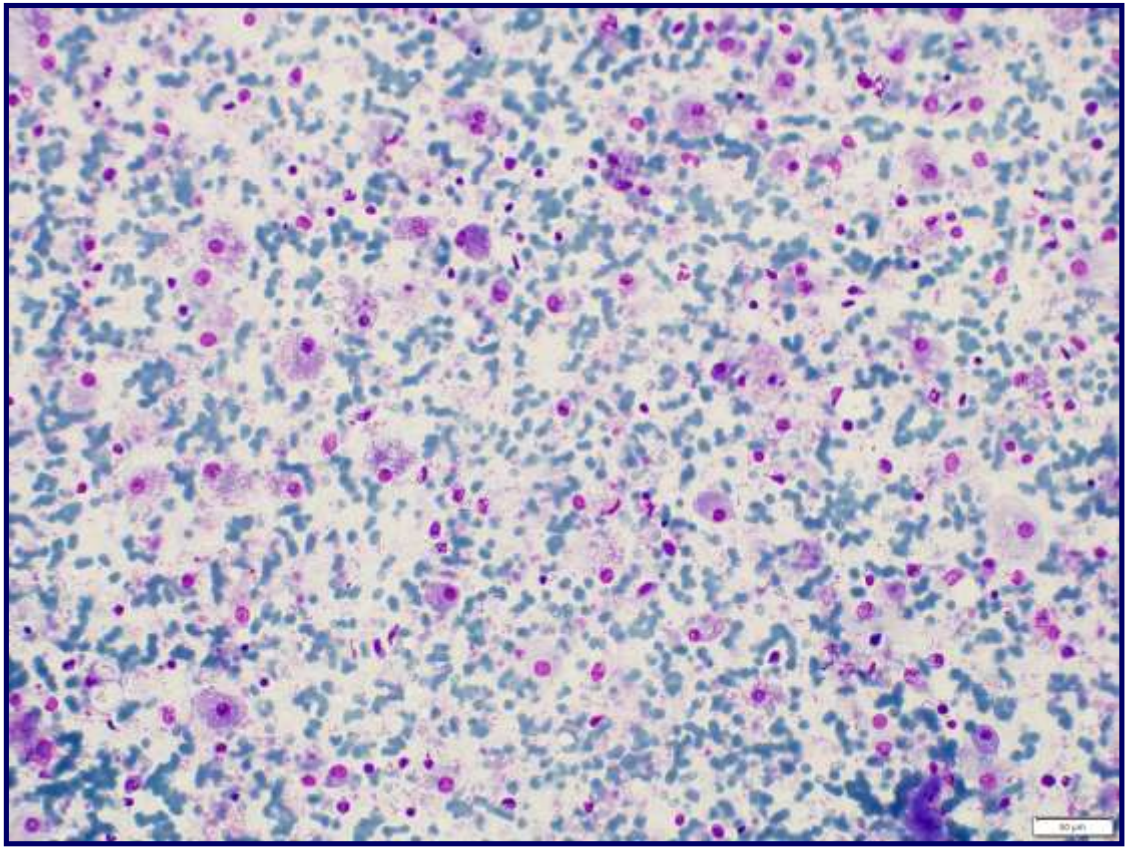
Case -5

Bilateral Adrenal Lesions

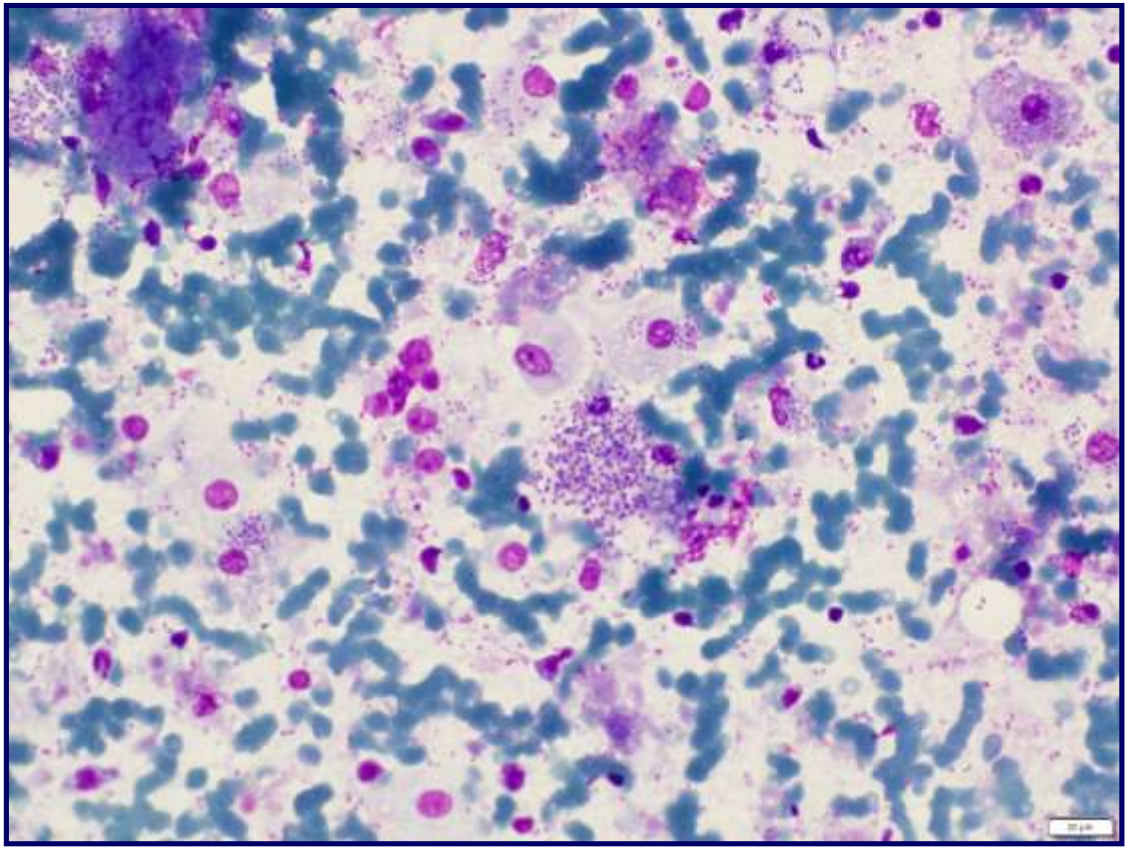
Case History

- A **51 year old male** presented with pain abdomen and fever for 15 days.
- He had mild pallor. On examination, there was no palpable lymph nodes. Abdominal examination did not show any enlargement of liver or spleen.
- The patient was positive for HIV. His USG of the abdomen revealed bilateral 6 cm diameter space occupying lesions. USG guided FNAC was done from the adrenal.

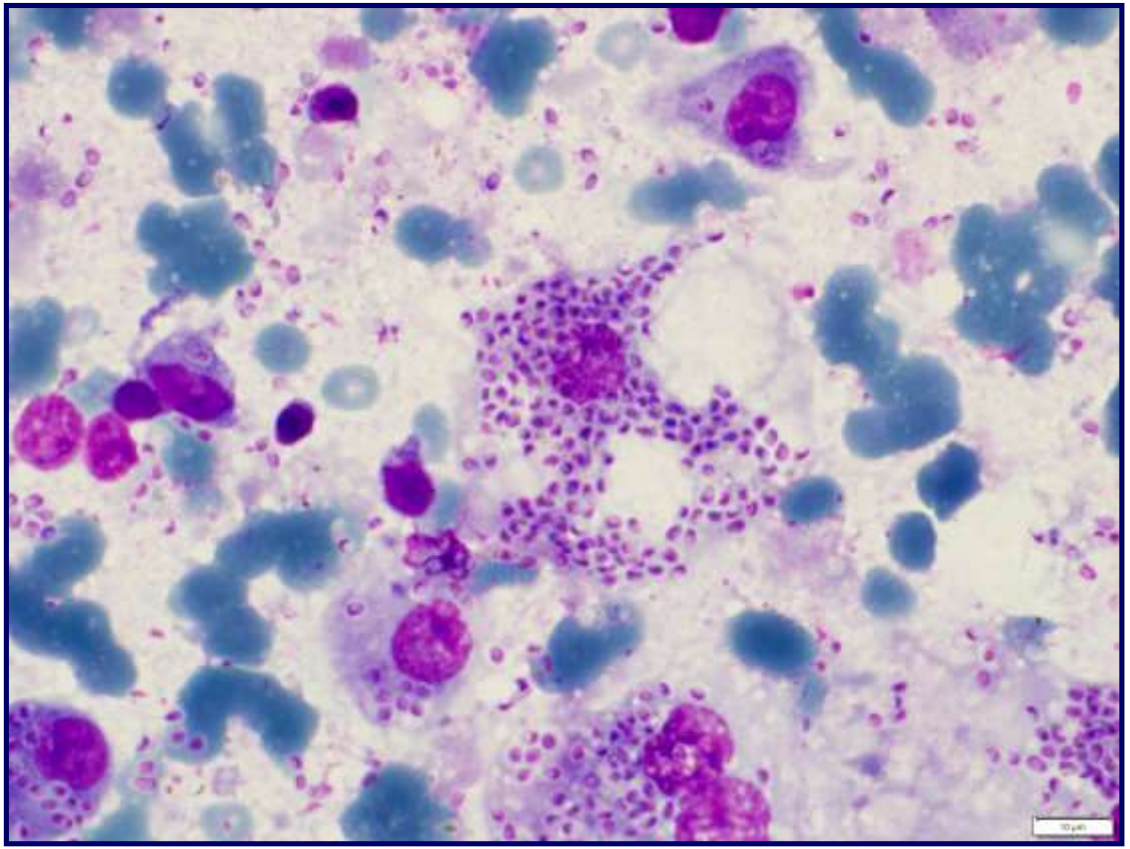
US-Guided FNA. Air-Dried Smears



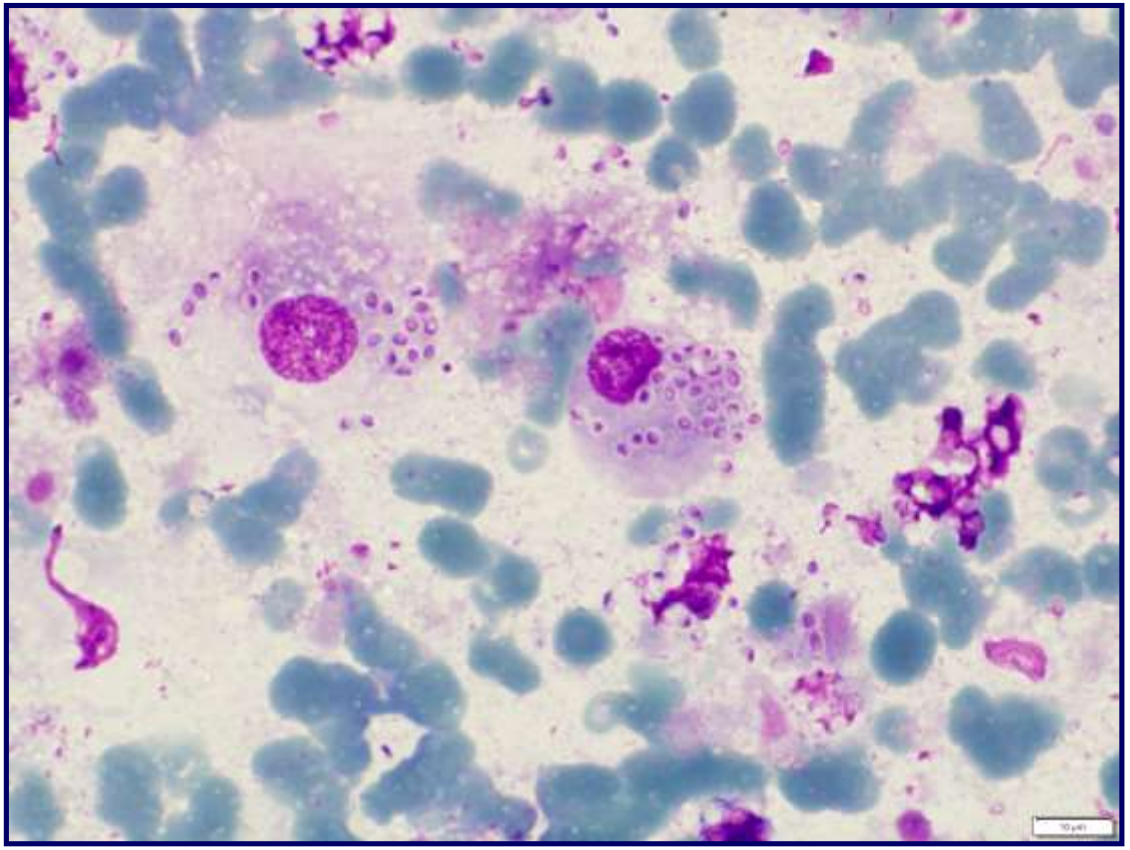
US-Guided FNA. Air-Dried Smears



US-Guided FNA. Air-Dried Smears



US-Guided FNA. Air-Dried Smears



Diagnosis

Histoplasma infection

Discussion

- The characteristic diagnostic features of this case include:
- Abundant foamy histiocytes and lymphocytes
- Many uniform small round to oval structures (3–4 µm) of histoplasma are seen.
- The organism is surrounded by a clear halo.

Discussion

- Other organisms such as cryptococci and leishmania.
- Cryptococci: Round clear refractile organism with a thick outer capsule.
- Leishmania: The small oval structures with kinetoplast in one pole.

Discussion

- Histoplasmosis is a fungal infection caused by Histoplasma capsulatum.
- The organisms are loaded in the excreta of birds.
- The infection is transmitted to man by inhalation of the spores.
- The infection occurs mainly in the immunocompromised patients.

Discussion

- Lungs, lymph nodes and spleen are commonly affected.
- Adrenal gland may be involved in the disseminated histoplasmosis infection.
- However, the isolated adrenal gland involvement by histoplasmosis is rare.

Discussion

- The organisms are easily identified as round shaped 3–4 µm structures in routine May Grunwald Giemsa stain.
- In haematoxylin and eosin stain it shows clear space due to the artefactual retraction of the cell wall and may give false impression of capsule.
- The infection often shows necrosis and multinucleated giant cells, lymphocytes and ill formed epithelioid cell granulomas.

Take-Home Points

- Histoplasmosis is caused by Histoplasma capsulatum.
- It occurs mainly in the immunocompromised patients.
- The isolated adrenal gland involvement by histoplasmosis is rare.
- The organisms: Round shaped 3–4 µm structures in routine May Grunwald Giemsa stain.
- Cytology smear: Necrosis, multinucleated giant cells, lymphocytes and ill formed epithelioid cell granulomas along with intracellular organisms.

Parasitic Infestations in Cytology

DR. PARIKSHAA GUPTA, *MD, DNB, DIP. RCPATH, MAMS, MIAC*

Associate Professor, Department Of Cytology & Gynecological Pathology

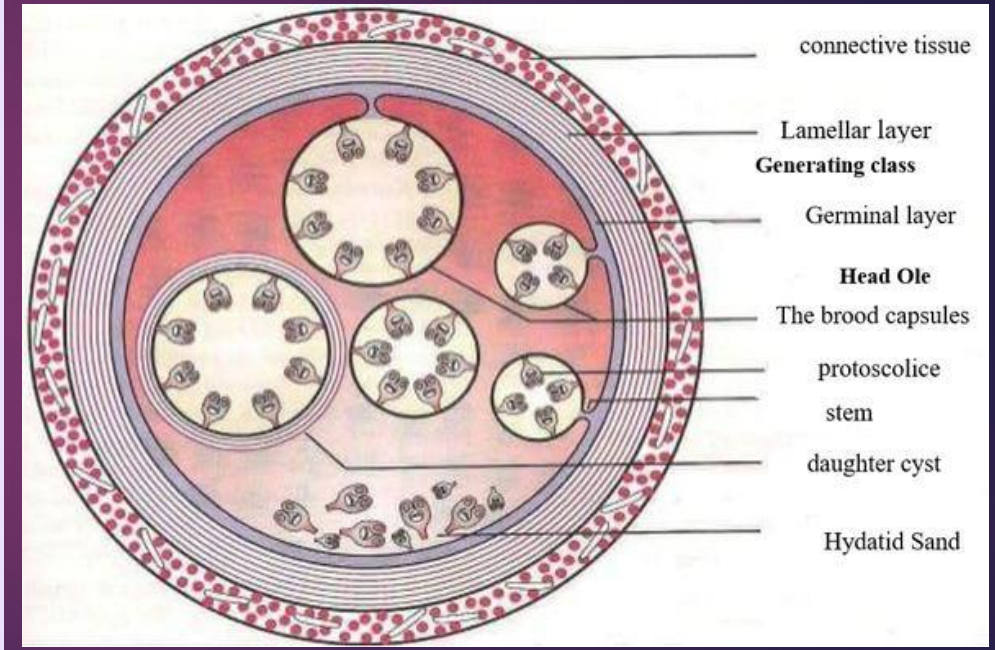
Postgraduate Institute of Medical Education & Research, Chandigarh, India

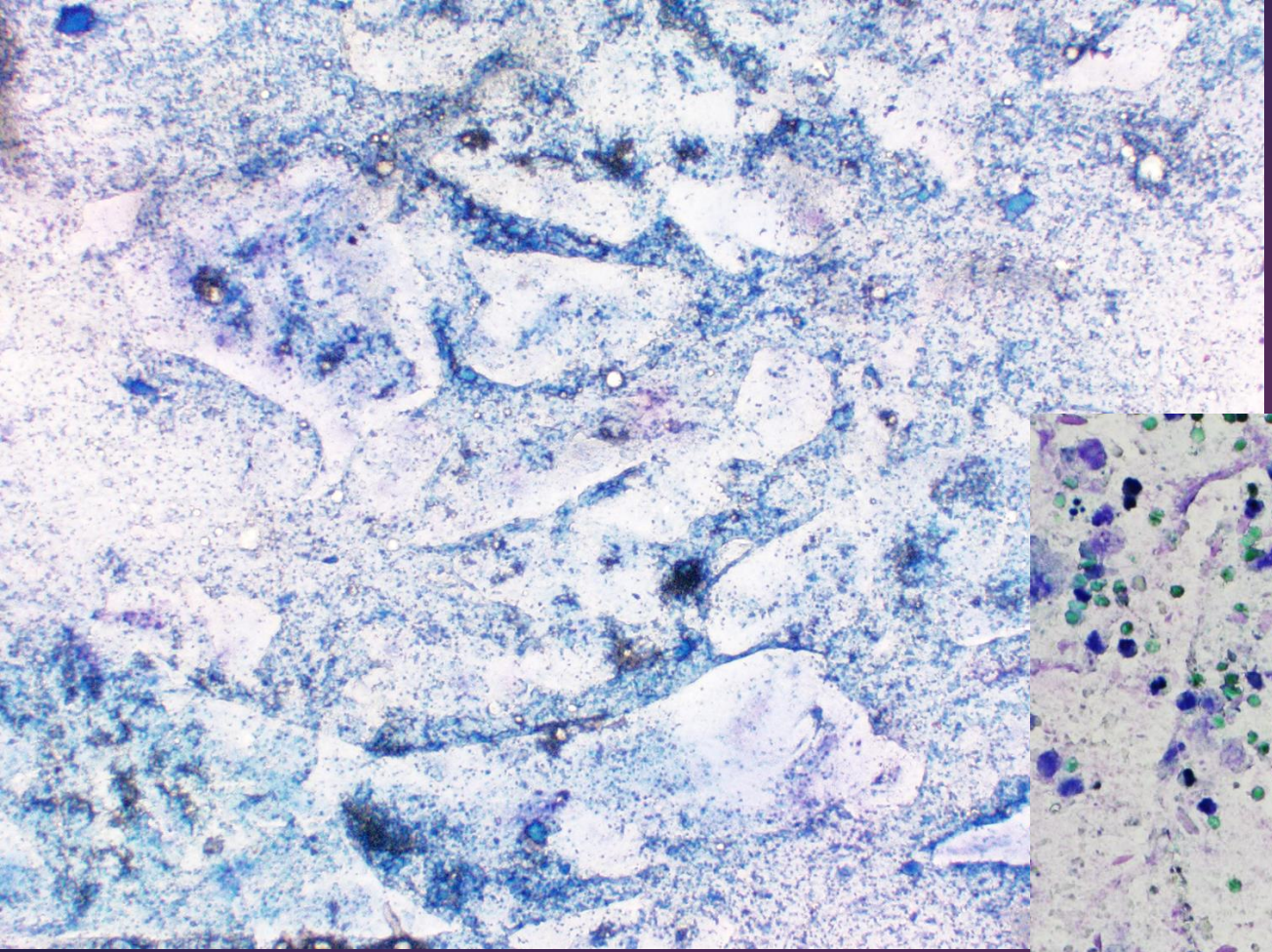
Parasitic Infestations in Cytology

- **Parasites**: Extremely broad and diverse class of microorganisms
- Broadly divided into **2 main categories**: **protozoa** and **helminths**
- In the **West**, parasite infections are relatively **rare**;
  - do affect a substantial number of patients, particularly the severely immunocompromised
- **Detection** is extremely **important** because many of these organisms are **treatable**
- **Cytology** specimens: **minimally invasive**, **affordable**, **reliable**, **quick**: **invaluable** for evaluation of parasitic infection
- Furthermore, these can be used for performing various **ancillary tests**

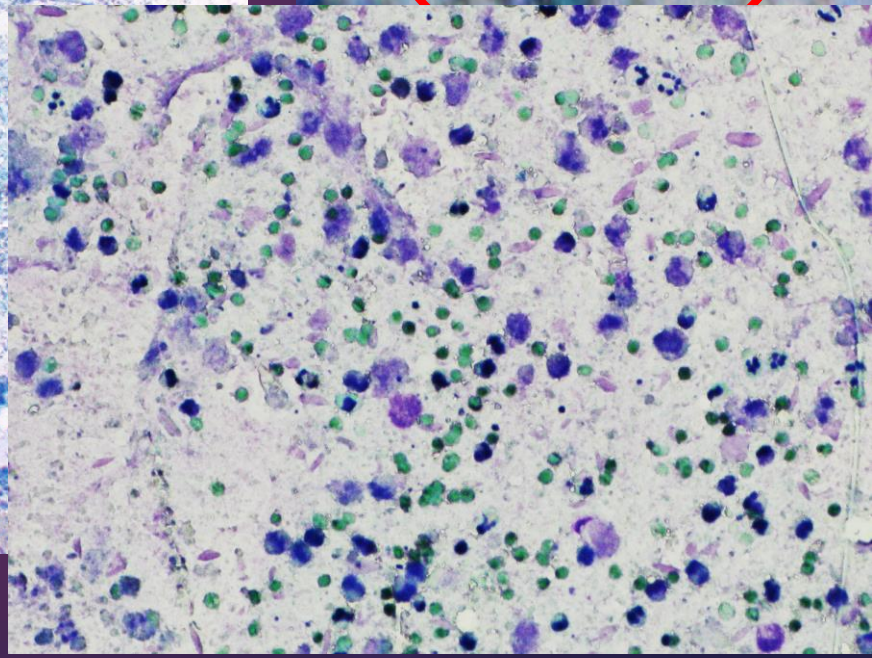
Echinococcosis

- **Zoonotic larval infection** that infects humans globally; Hydatid disease
- **E. granulosus (2-7 mm), E. multilocularis (1-4 mm)**
- Ingestion of **embryonated eggs;** form **cysts, enlarge**
- **Any body part** affected; s/s vary
- **Hydatid cyst**: 3 layers: **pericyst**; the **ectocyst**/middle **laminated membrane**; & the inner **germinal layer**







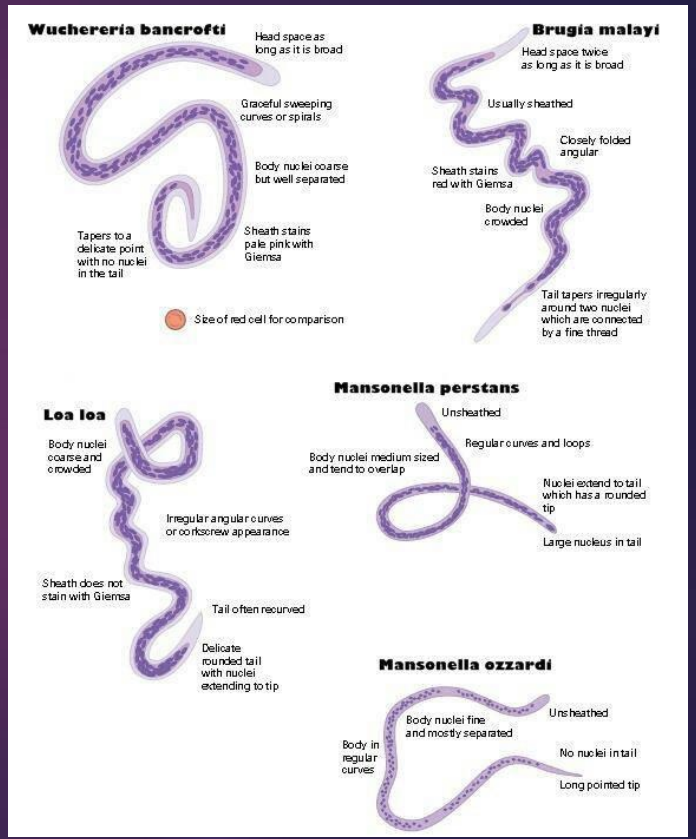


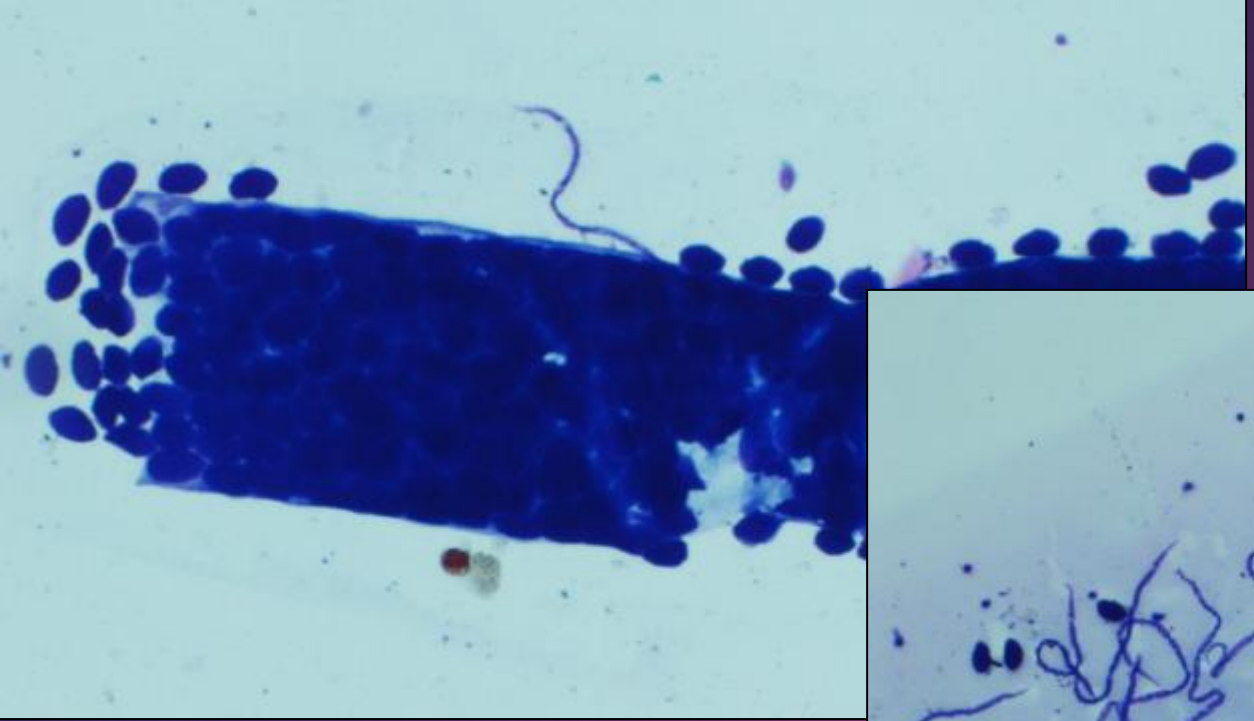
Filariasis

- **Tropical** countries
- Human infestations: 4 filarial spp.: **W. bancrofti, B. malayi, Onchocerca volvulus, and Loa loa**
- In India: ***Wuchereria bancrofti or Brugia malayi***
- ***Elephantiasis:*** blockade of lymphatics
- **Microfilariae** have been detected in almost **every site of the body** possibly because of their **ability to migrate along the lymphatics**.

Cytology:

- Gravid **adult worms (3-10 cm long)**
- **Microfilariae (200-300 x 10 um)** are **relatively uncoiled; elongated**. Outer **sheath** with the **nuclei** not reaching up to the tip (Wb)



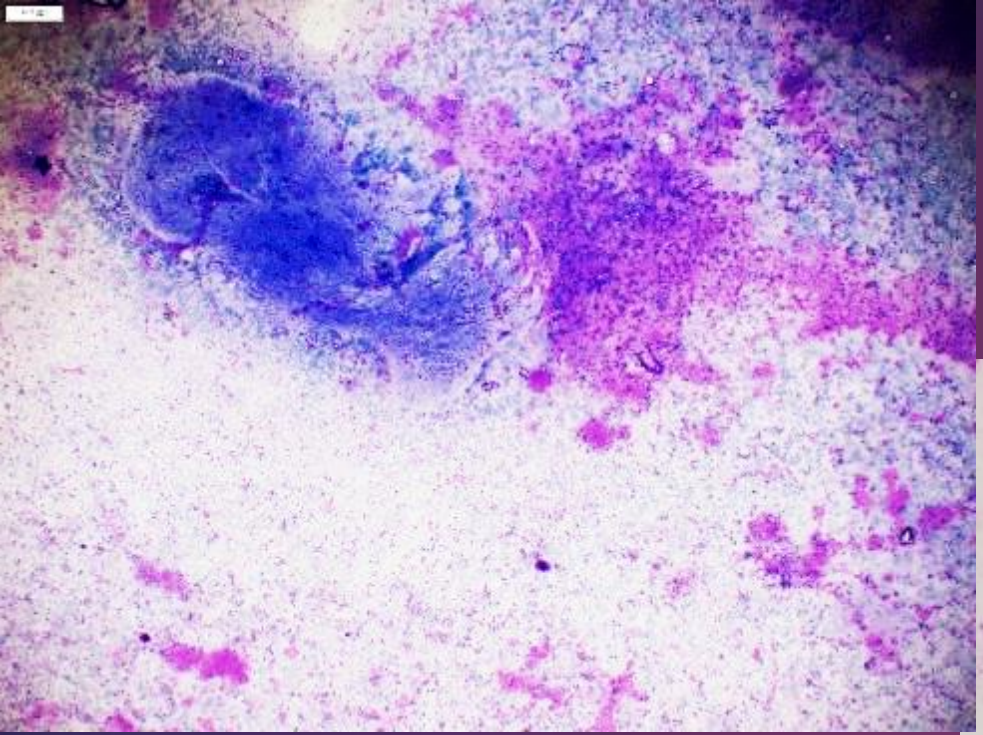


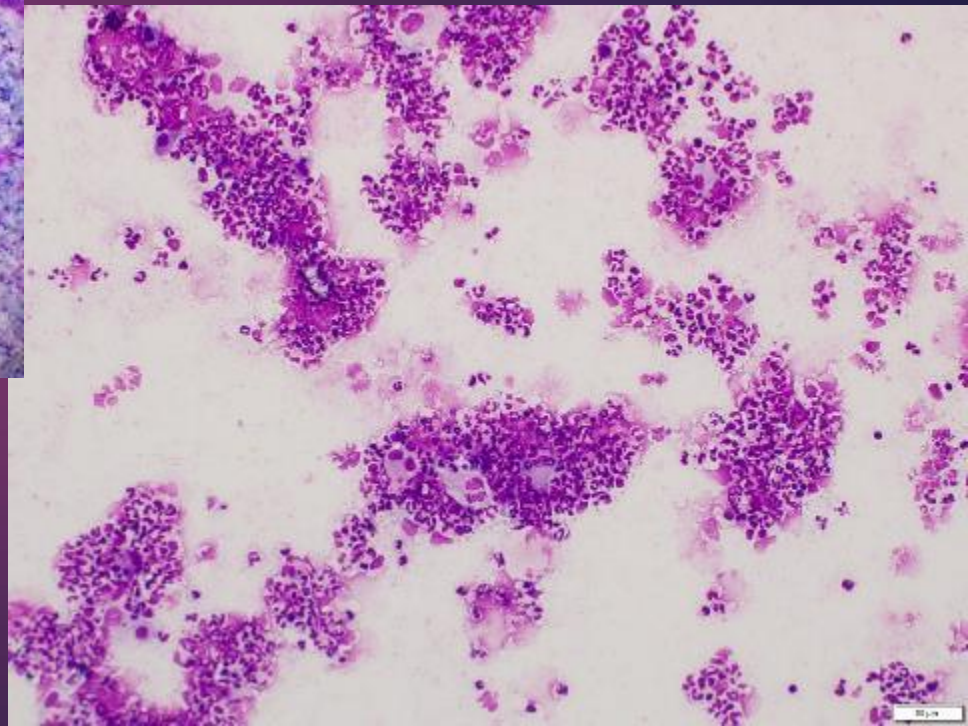


Cysticercosis

- Infection by **larval stages** of the parasitic cestode, **Taenia solium**
- Acquired from the **fecal-oral route** (**ingestion of eggs**), **not via the ingestion of cysticerci** in **undercooked pork**, which is associated with **intestinal taeniasis**
- Cysticerci may develop in **skeletal and heart muscle**, **skin**, **subcutaneous** tissues, the **lungs**, **liver**, **oral mucosa,** and other tissues. S/s vary



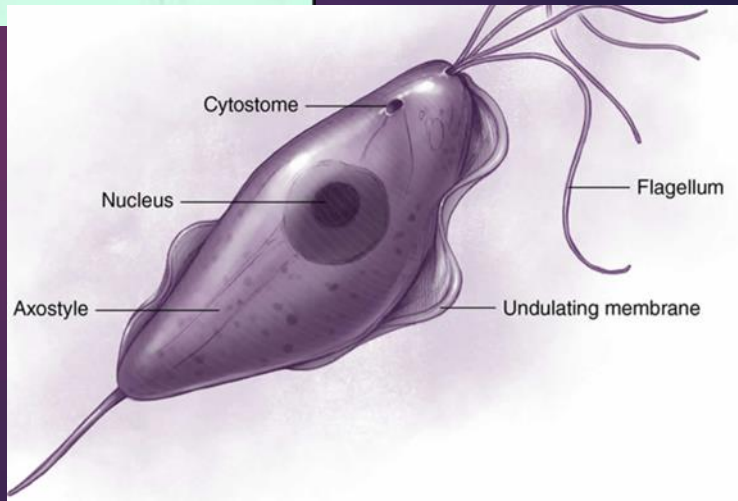


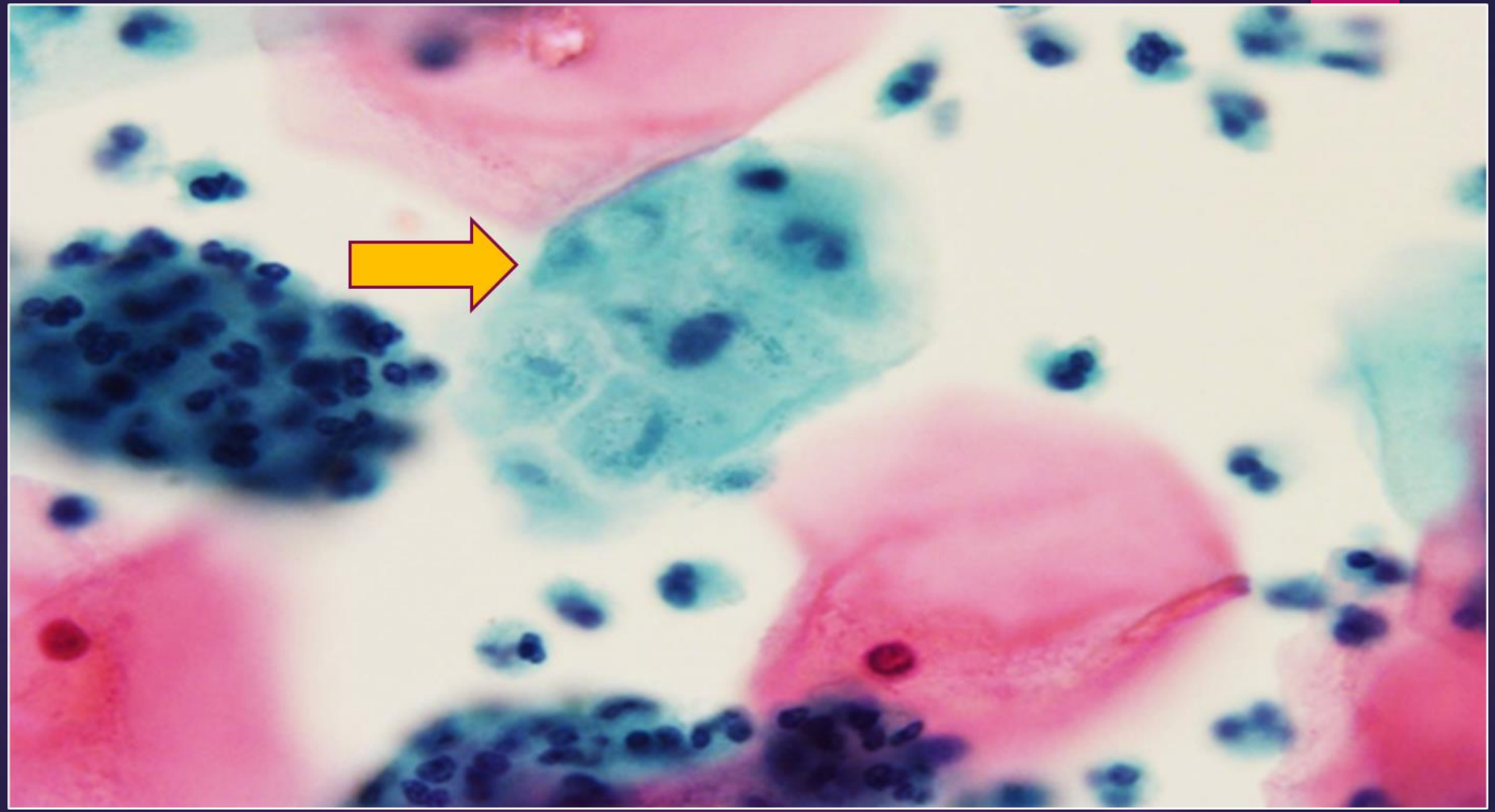


Trichomoniasis

- Parasitic protozoan; STD
- Burning, itching, and a ***malodorous*** vaginal discharge.
- 50% may be asymptomatic; **Strawberry cervix; urethritis**
- **15 -30 µm** long, **flagellated**, **pear/kite shaped**, pale, eccentrically placed nucleus and red cytoplasmic granules
- Cx: commonly *a/w Leptothrix*
- **Accompanied by marked inflammatory changes in the ep. cells**





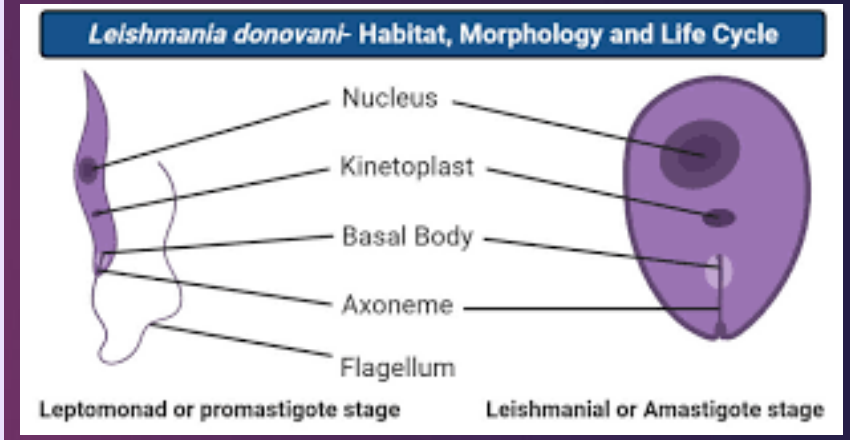


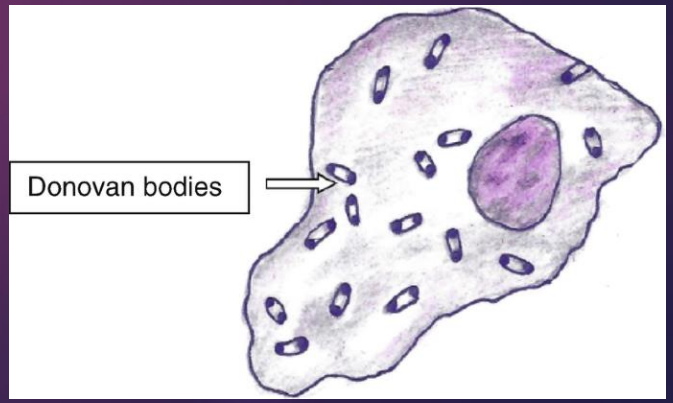
Leishmaniasis

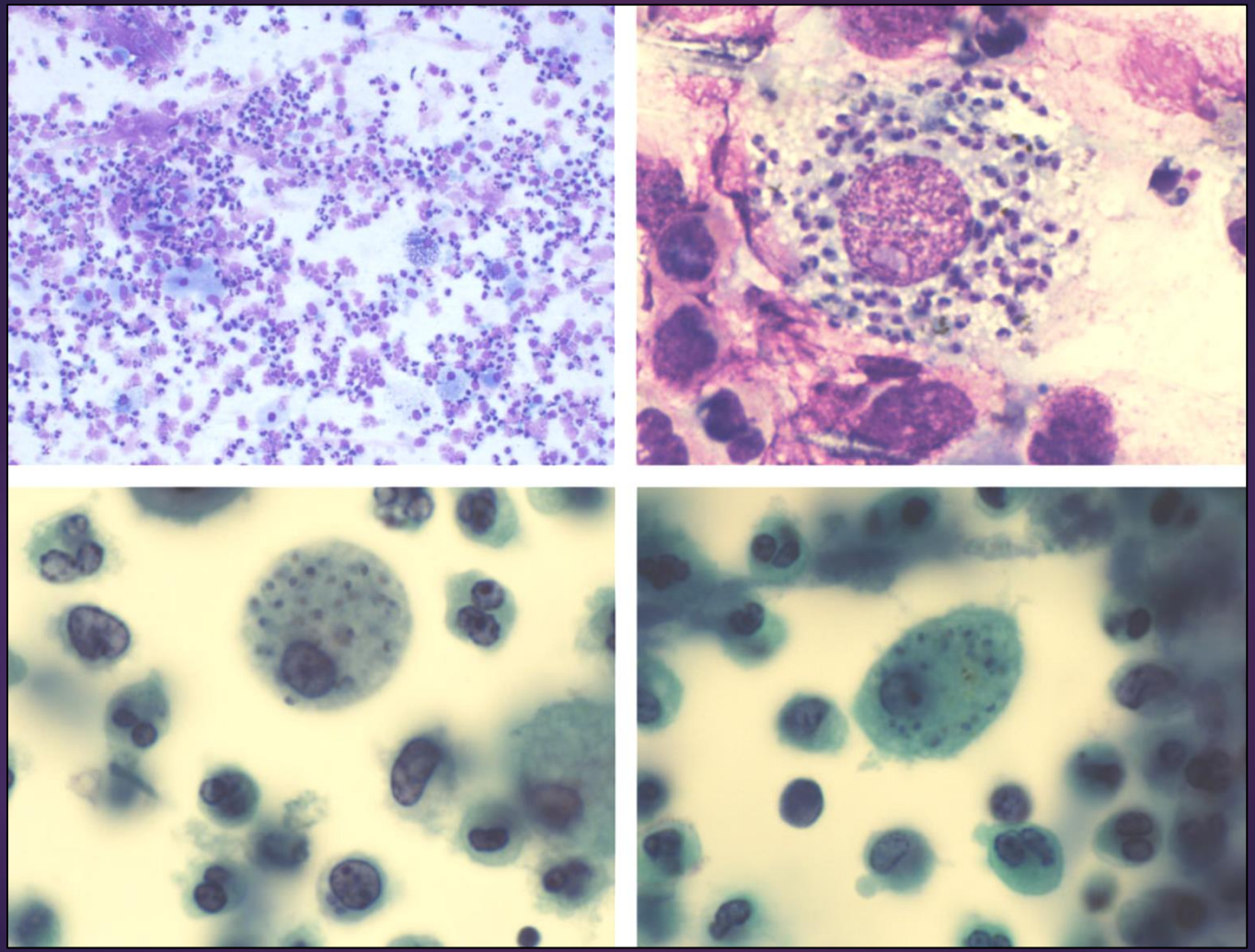
- Caused by ***Leishmania spp.(MC donovani)***
- **Transmitted** by the bite of infected **female phlebotomine sandflies (infective** stage**: promastigote)**
- **Visceral** leishmaniasis, **cutaneous** leishmaniasis & **mucocutaneous** leishmaniasis
- **Sites**: spleen, liver, bone marrow, lymph nodes and intestinal mucosa, skin, mucosa anywhere

Cytology –

- **Intracytoplasmic** small **hematoxyphilic** structures that are round, uniform in appearance, sometimes distributed around the outer rim of the vacuoles
- **Safety-pin appearance**

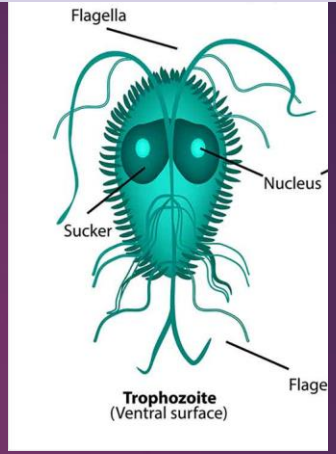


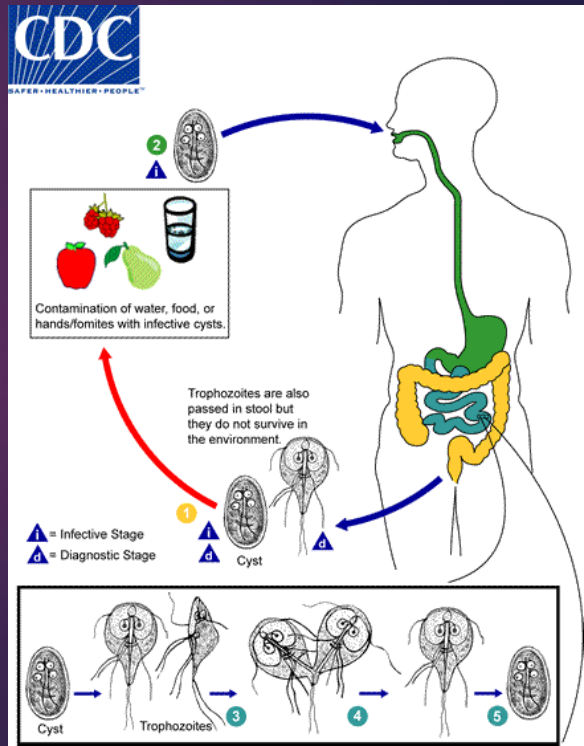


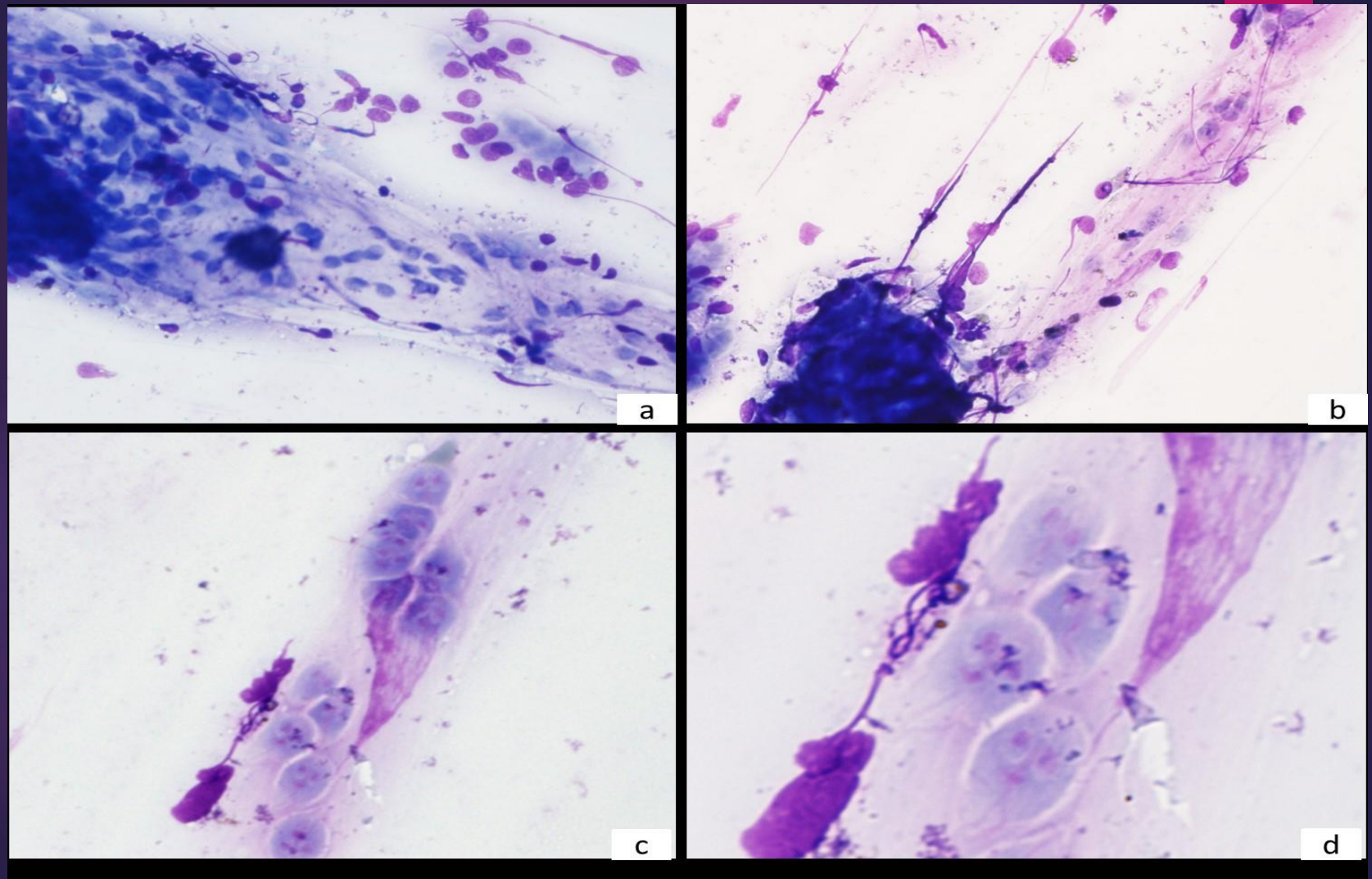


Giardiasis

- Caused by **Giardia duodenalis** (G. intestinalis & G. lamblia)
- Transmitted via **feco-oral route**; contaminated food / water
- Presents with **abd. cramps, watery diarrhea, flatulence**
- **GI cytology: Trophozoites** (can be seen as pear shaped, binucleated, flagellated organisms in the **intestine**
- **Cysts** are **dormant** stages: excreted into the **feces**

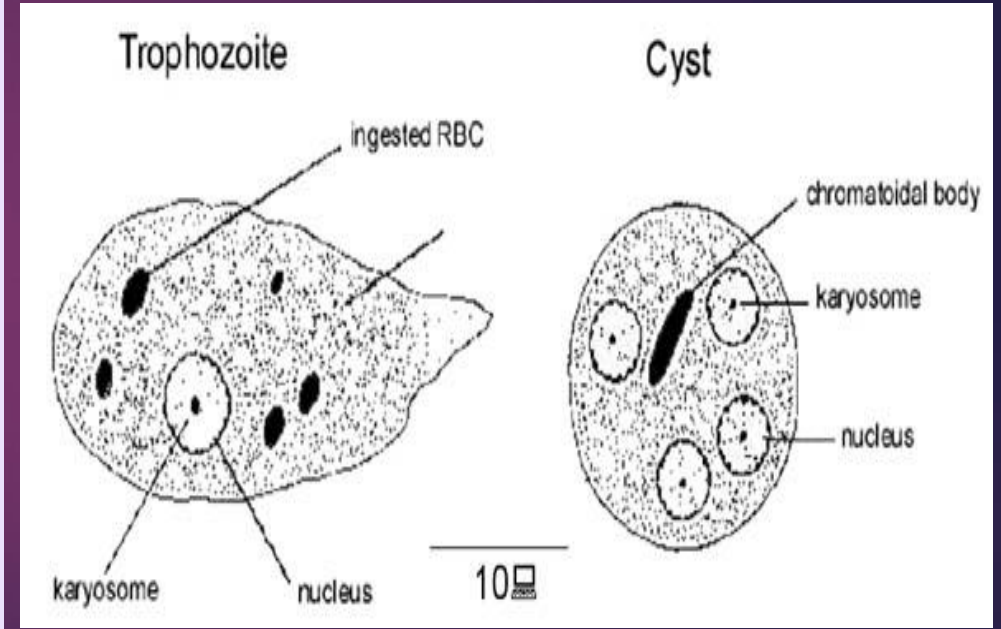





a
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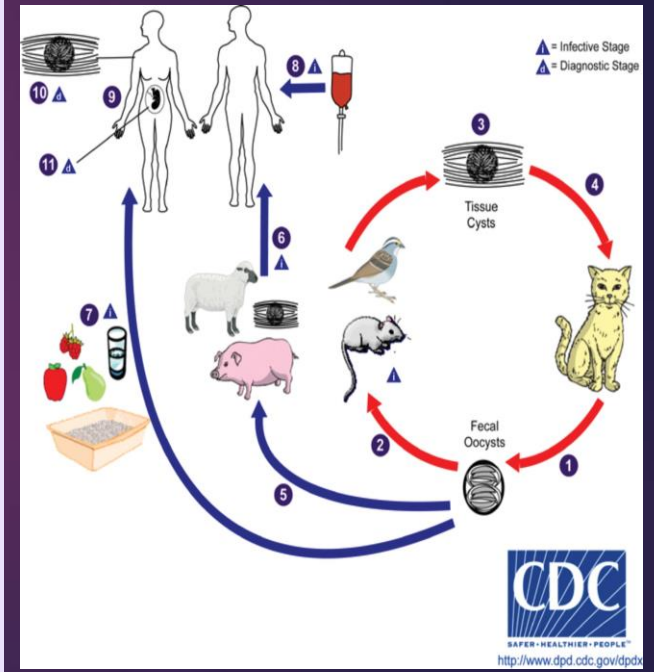
Amoebiasis

- Caused by **Entameba spp. (histolytica, coli, hartmani, dispar)**
- Transmitted via **oro-fecal route**
- **Non-invasive** colonization, **Intestinal amebiasis, & Extra intestinal amebiasis (liver, brain, lungs, heart)**
- 2 morphologic forms: **cysts & trophozoites**
- **Cysts:** Excreted in **formed** stools, remain dormant for long, excystation in small intestine, **bi-quadrinucleate with karyosome**
- **Trophozoites:** Excreted in **diarrheal** stools, **Uninucleate with karyosome/endosome**, irregular with **pseudopodia** & **ingested RBCs**



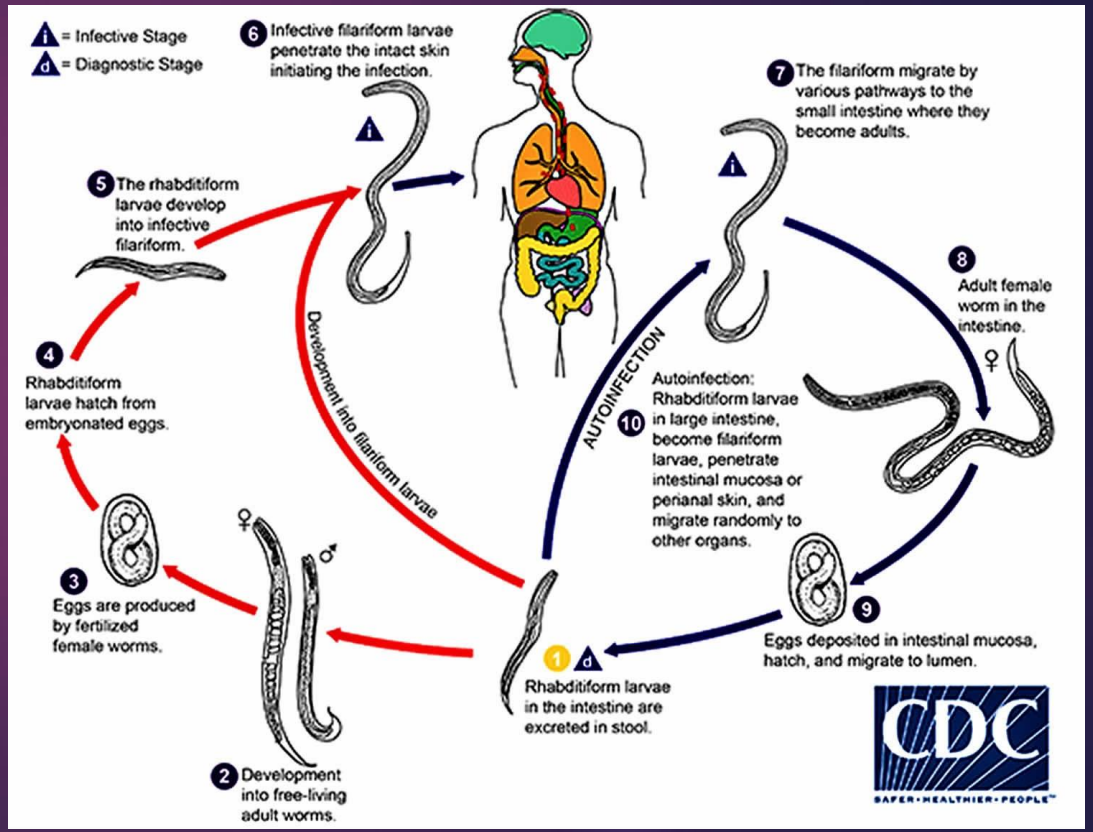
Toxoplasmosis

- Seroprevalent in appr **33% of the world's population**
  - **MC parasite infection in the U.S**; children & young adults
- **Cats: definitive host**
- **Humans** infected through **contaminated soil, pet litter boxes and ingesting undercooked meat**
- Primary infection is **subclinical; Acute** infection: cervical **lymphadenopathy**
  - Unilateral posterior cervical lymphadenopathy is classic presentation
- Infection during **pregnancy**: detrimental to the fetus: **congenital toxoplasmosis**
- **Oocytes-** **tachyzoites-** replicate in all nucleated cells; Form **tissue cysts with bradyzoites** in skeletal muscle, myocardium, brain and eyes: **Encephalitis**, **chorioretinitis**, **pneumonia**, **multiple organ involvement**



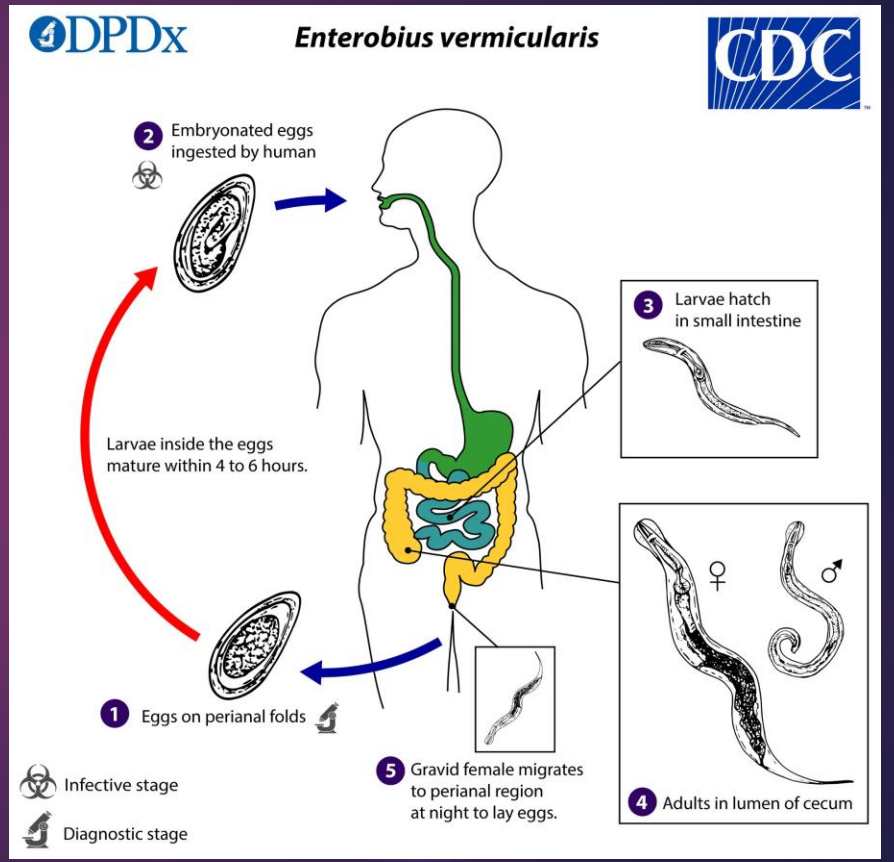
Strongyloidiasis

- Caused by **Strongyloides stercoralis (threadworm; smallest nematode);** Common in **tropics & sub tropics**
- Unique **auto-infective lifecycle: <u>Strongyloides hyperinfection syndrome</u>**
- By this autoinfection cycle, **Strongyloides can multiply indefinitely within its host**, strongyloidiasis has been noted **as long as 75 years after leaving an endemic area**
- Clinically, present with **asthma like symptoms, hemoptysis, abdominal pain,**



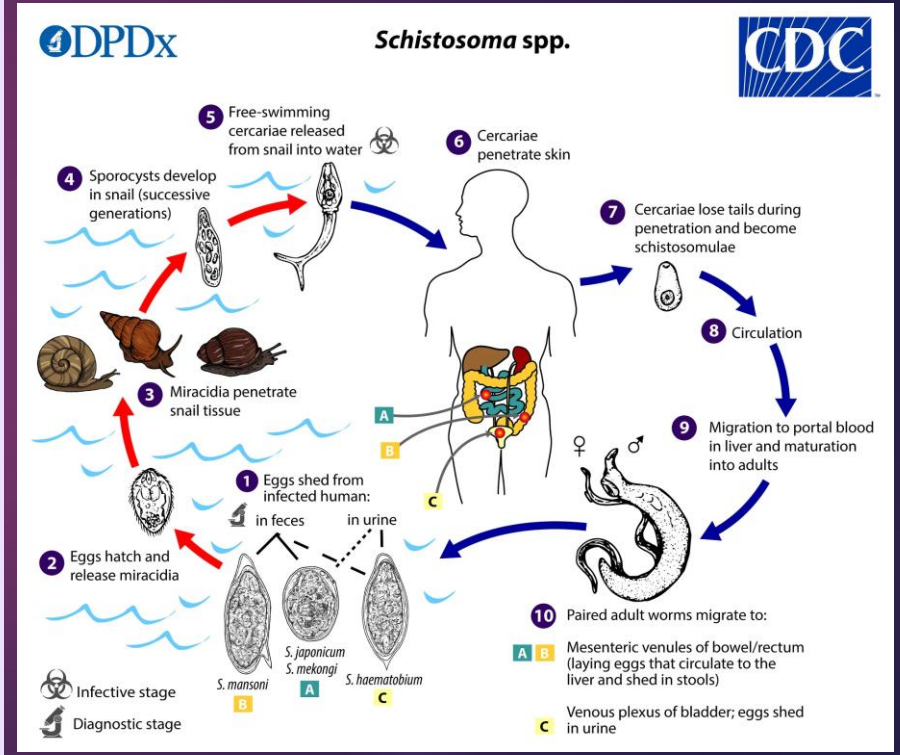
Enterobiasis

- **MC** worm in humans worldwide (**E. vermicularis**; **Pinworm**)
- 3 developmental stages: eggs, larvae and adults.
- The **eggs** are elongate-oval in shape, measure 50-60µm in length by 20-30µm in width, and are characteristically asymmetric about the long axis being **distinctly flattened on one side**.
- **Infective larvae** develop rapidly within the eggs.
- **Adult worms** appear as elongate whitish tubes with pointed tails. **Male** worms are 1-4 x 0.2-0.4mm in size, and their posterior ends are **strongly curved ventrally**. **Female** worms are 8-13 x 0.3-0.6mm in size and have pronounced **slender pointed tails**.



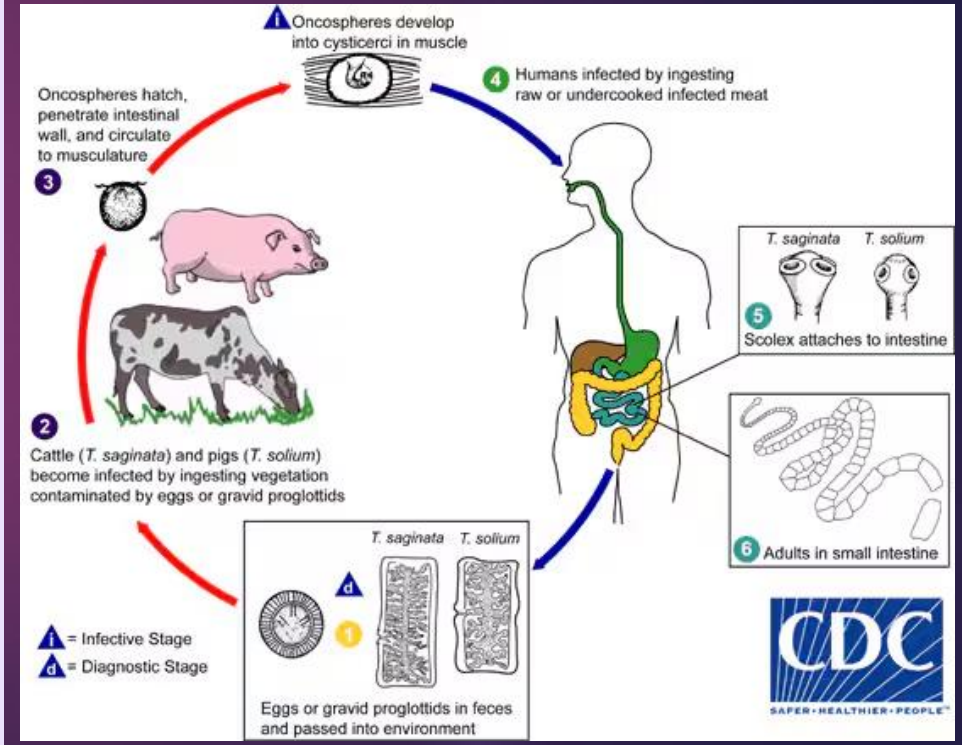
Schistosomiasis

- **Schistosoma hematobium**: trematode (fluke)
- Common in **Africa and Middle East**
- Adult S. haematobium resides in the **bladder and pelvic venous circulation**
- Clinically, most infections are asymptomatic,
  - **cystitis and ureteritis with hematuria**, which if untreated, can progress to **squamous cell carcinoma of the bladder**



Taeniasis

- Caused by the adult tapeworm spp. (4-20 m long)
- **Taenia saginata** (beef tapeworm),
- **Taenia solium** (pork tapeworm), and
- **Taenia asiatica** (Asian tapeworm)
- **Clinically,** MC symptom: **anal pruritus**
- In **female** patients, the female worms can travel up the vaginal canal, causing **vaginitis** and **cervicitis**, and can even enter the uterus, resulting in **endometritis** and possibly **endosalpingitis**



Disclosure Information

Dr Amit Kumar Adhya,
Professor, Dept. Of Pathology & Lab Medicine
All India Institute of Medical Sciences
Bhubaneswar, Odisha, INDIA

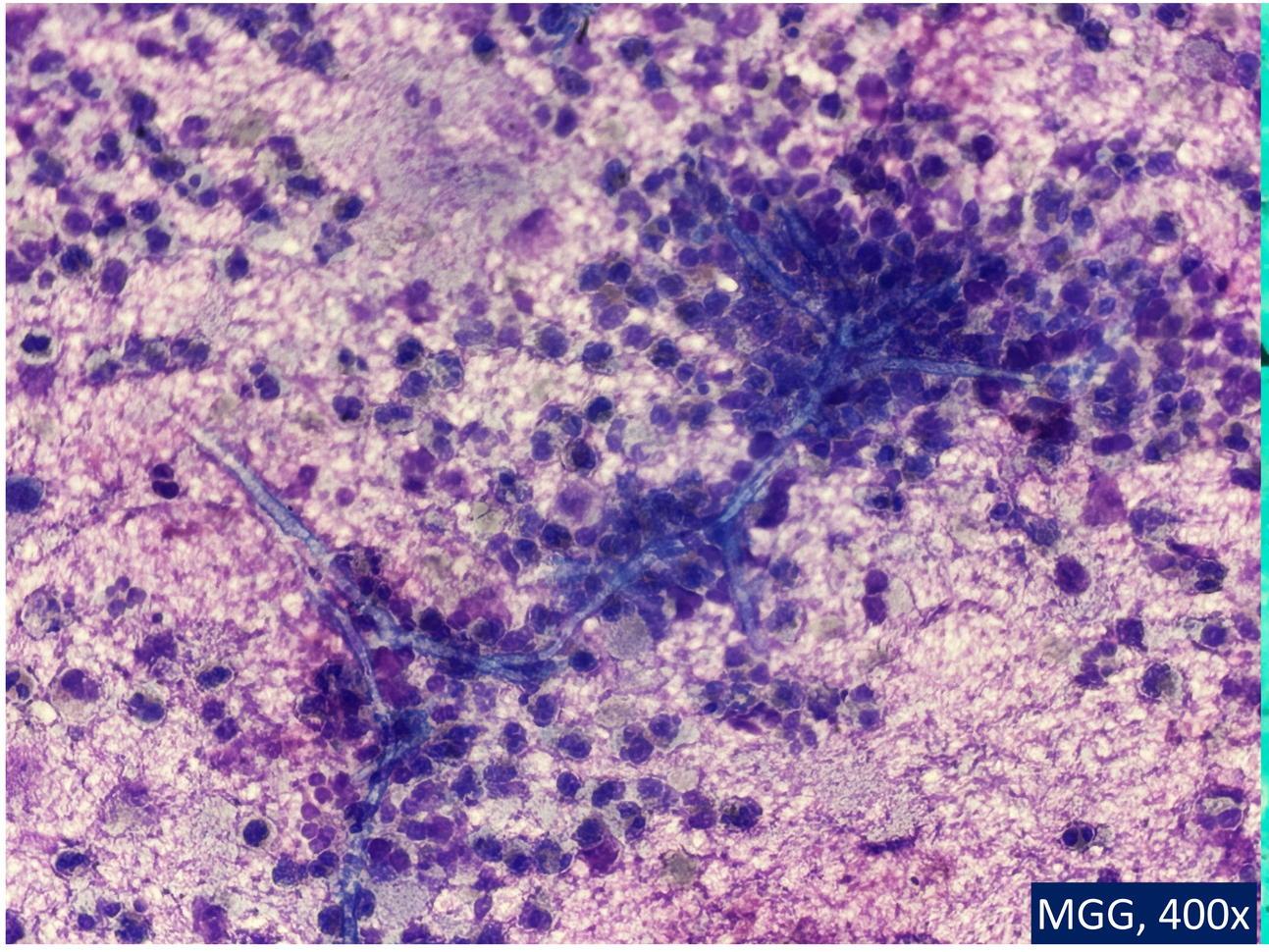
- I have no relevant financial relationships to disclose.

- AND -

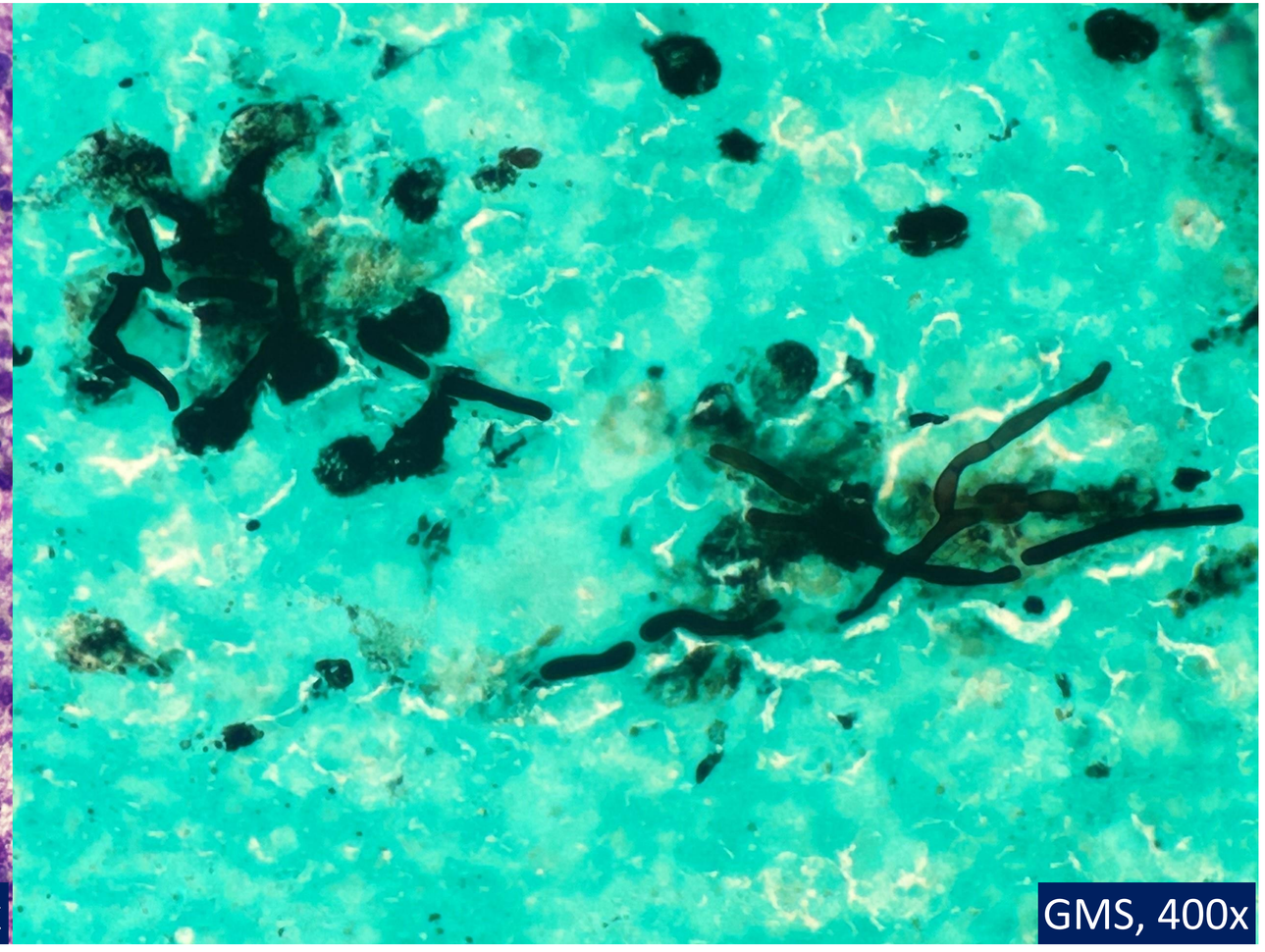
- I will not discuss off label use or investigational use in my presentation.

Case 1

A 3x3 cm, soft, subcutaneous tender swelling on the dorsum of left foot, between 3rd and 4th web space. Overlying skin is erythematous.

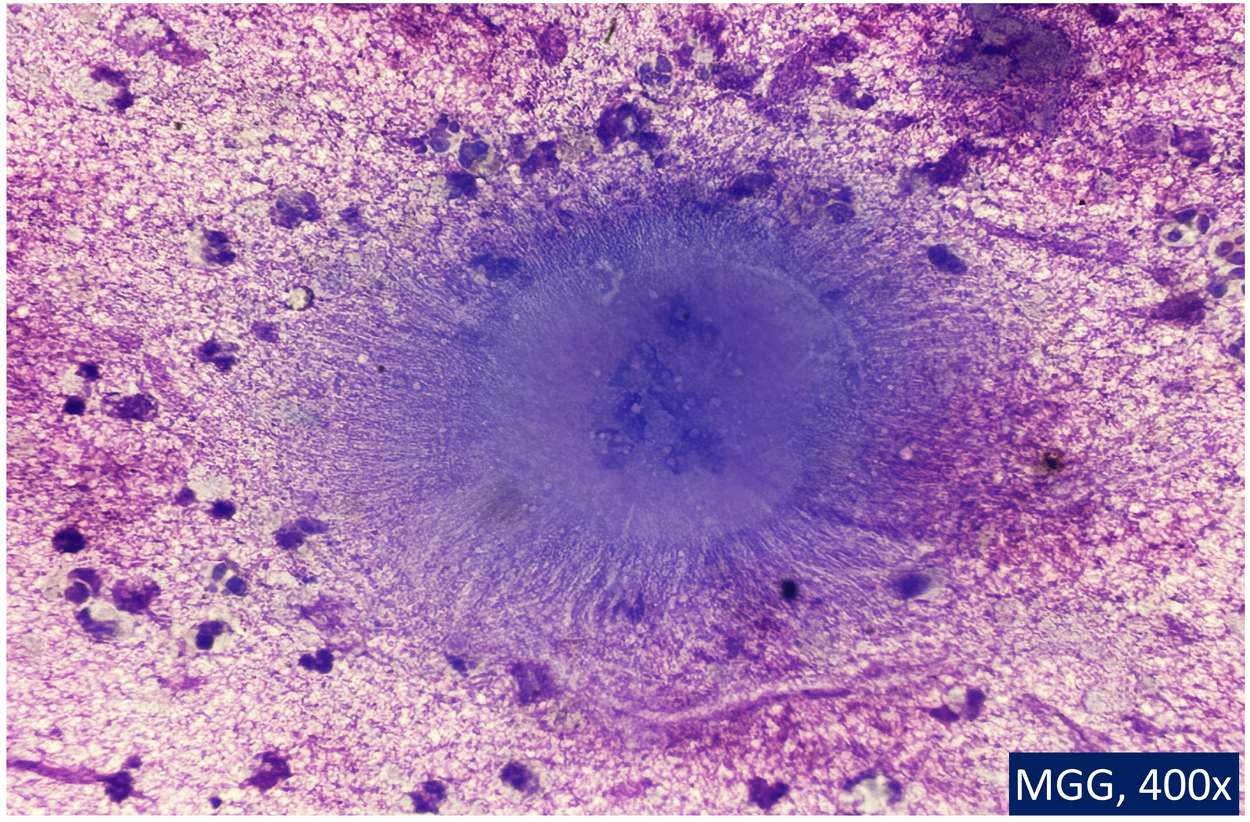


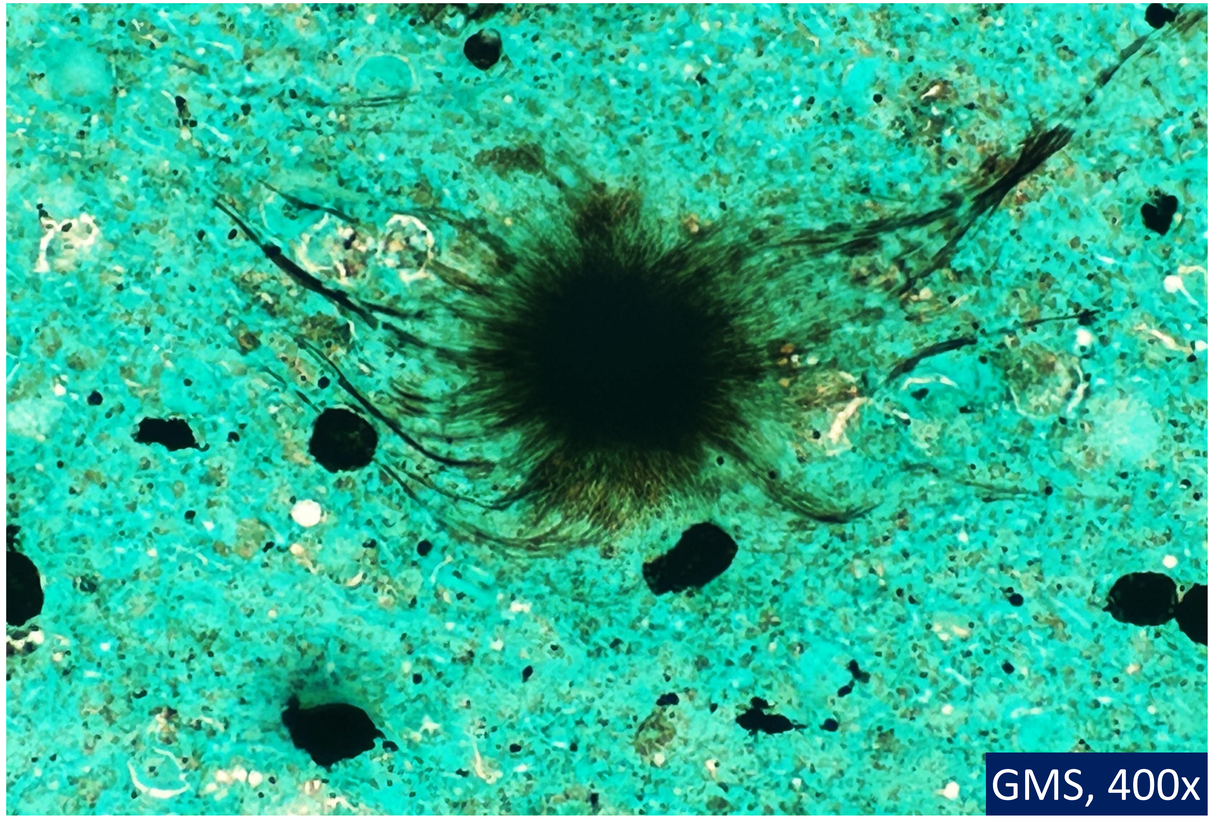
MGG, 400x



GMS, 400x

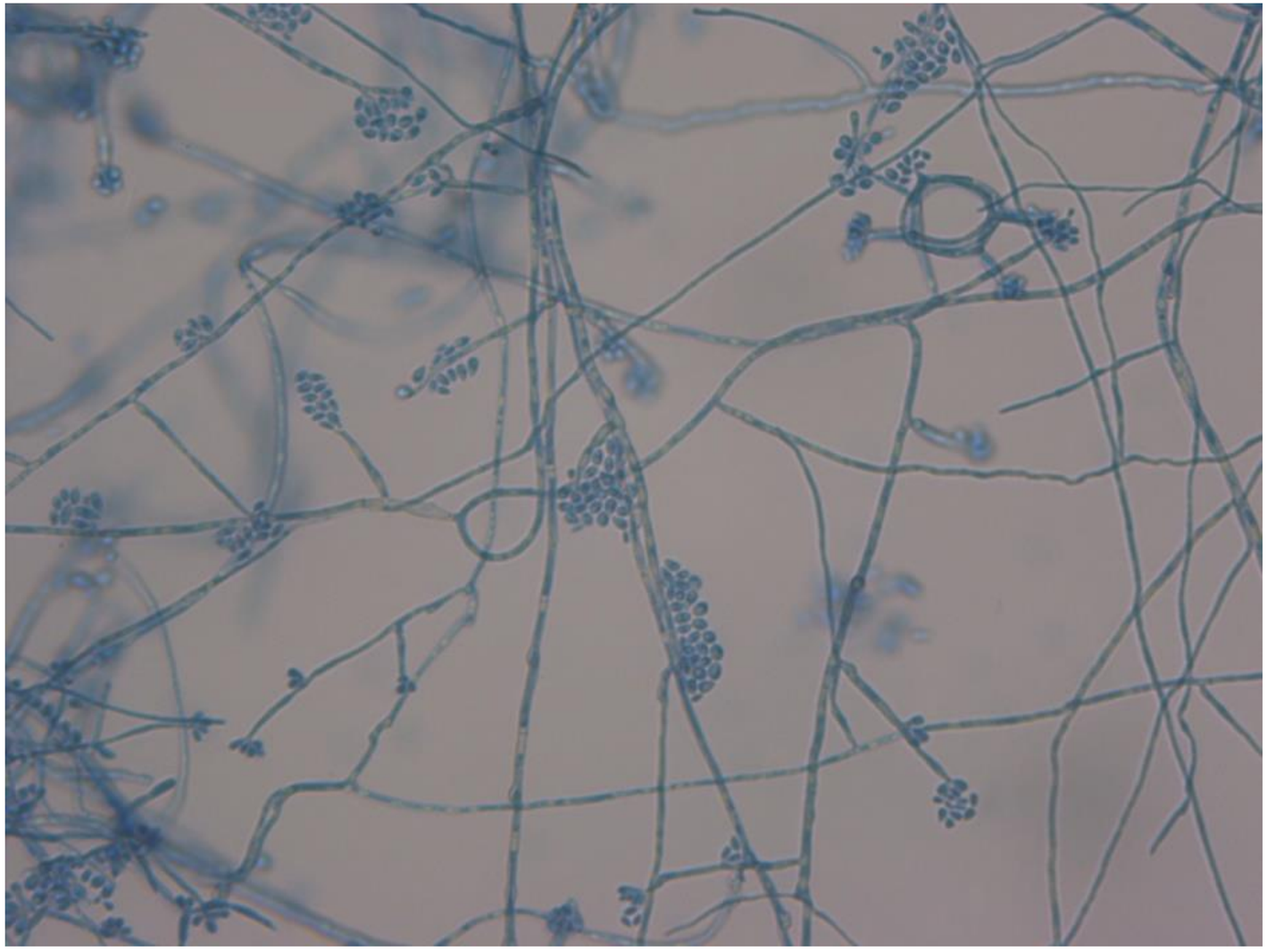
Case 1


MGG, 400x


GMS, 400x

Case 1

Culture findings: *Phaeoacremonium parasiticum*



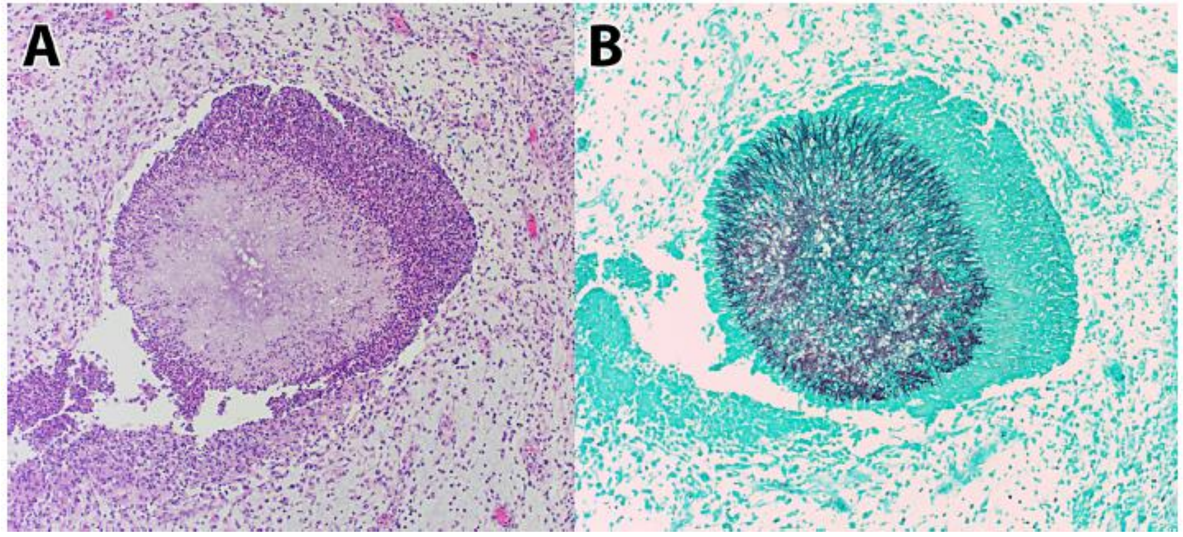
Lactophenol cotton blue stain following growth in cornmeal agar for slide culture at 1 week reveals phialides bearing apical clusters of cylindrical, hyaline conidia and brown septate hyphae consistent with Phaeoacremonium species.

Courtsey: ***Dr Vinay K Hallur****, Additional Professor, & In Charge of ICMR Advanced Molecular Diagnostic and Research Centre for fungi in East India, Department Of Microbiology, All India Institute of Medical Sciences (AIIMS), Bhubaneswar*

Case 2

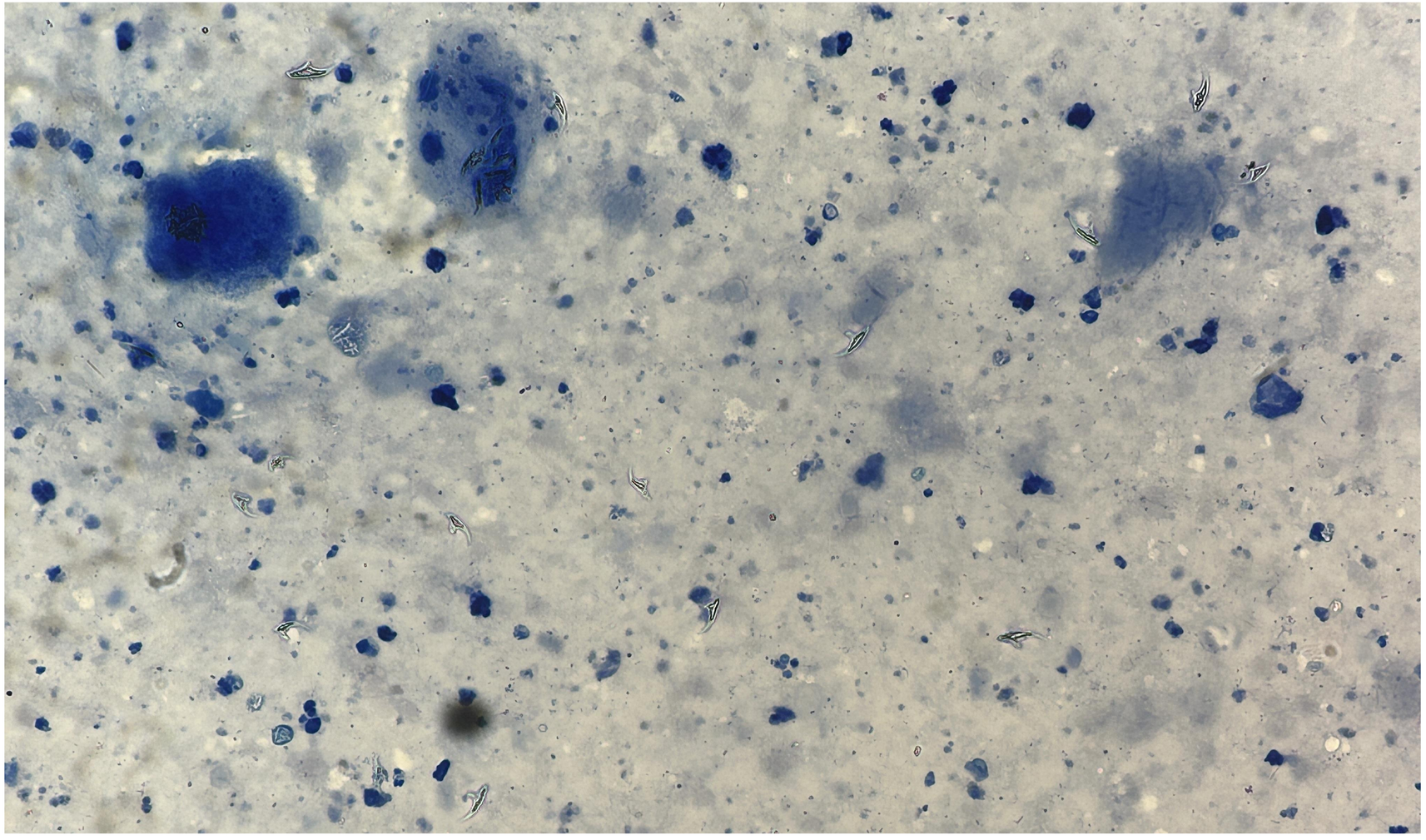
Pheohypomycosis: *Phaeoacremonium parasiticum*

- Dematiaceous molds
- A septate mycelial form in tissue
- 109 species classified in 60 genera
- *Common: E. jeanselmei* and *W. dermatitidis*
- T/t: itraconazole, amphotericin B, 5-fluorocytosine, voriconazole, terbinafine, and surgical debridement

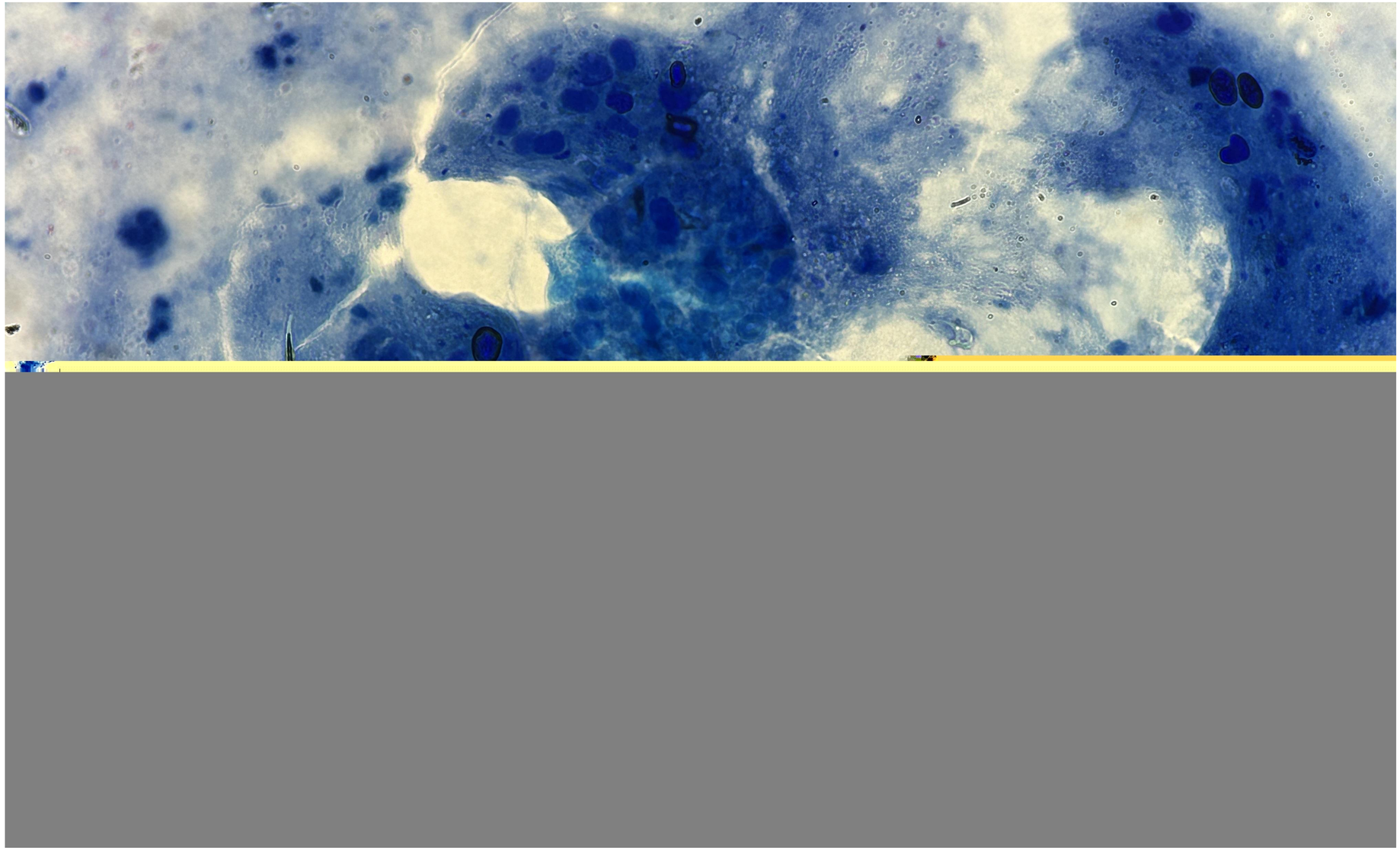


Case 2

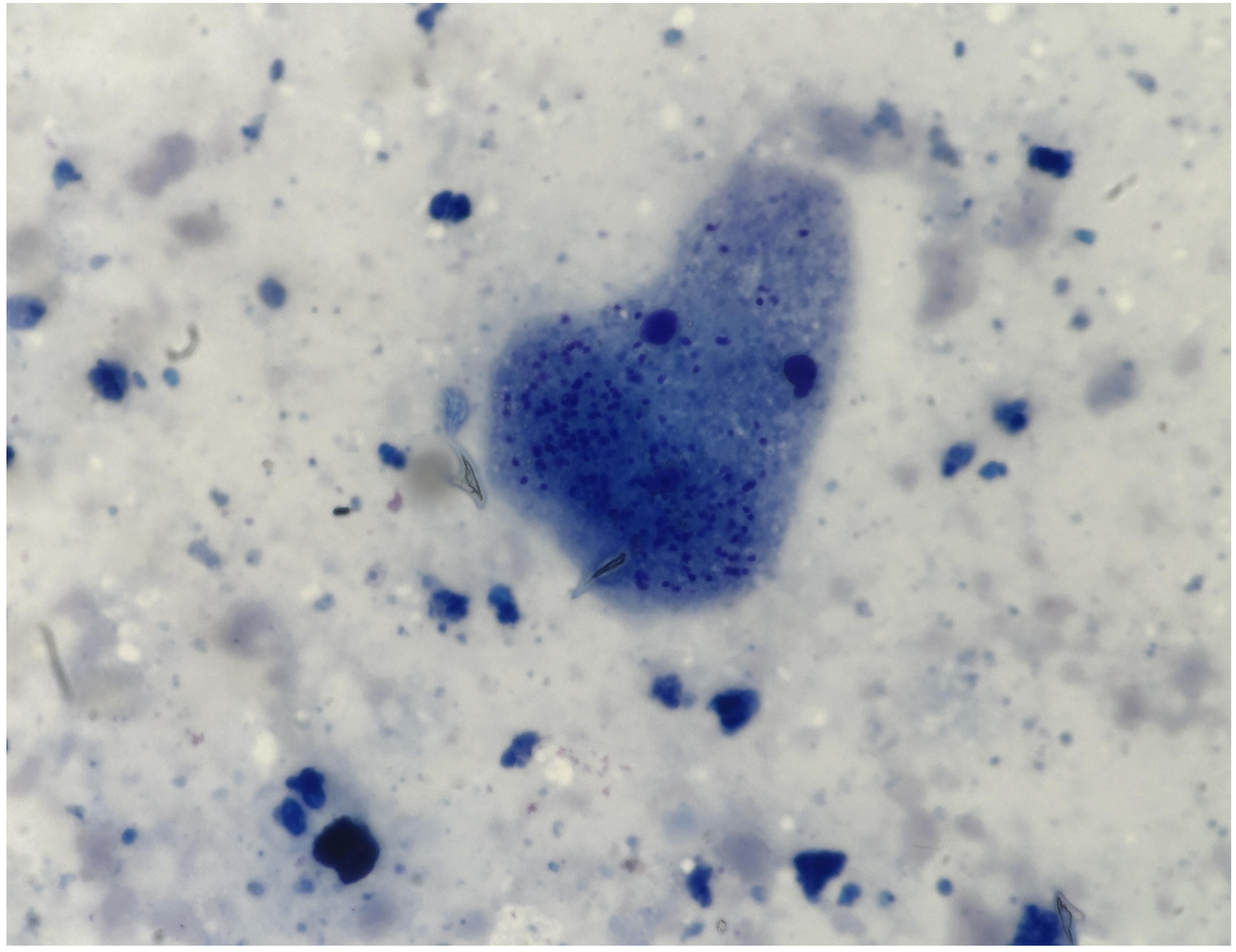
40-yr-Male, Liver SOL- FNAC

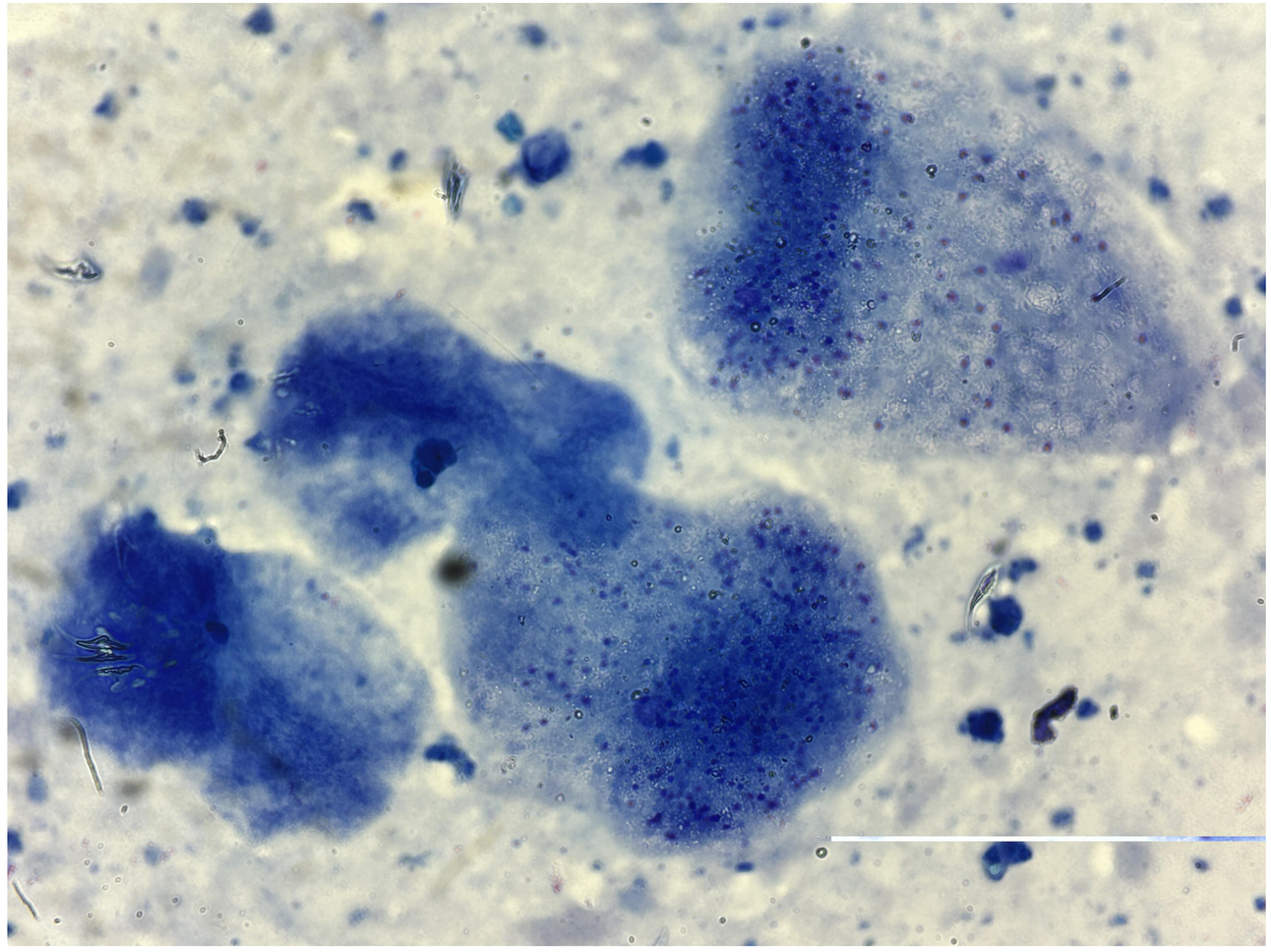


Case 1 40-yr-Male, Liver SOL- FNAC



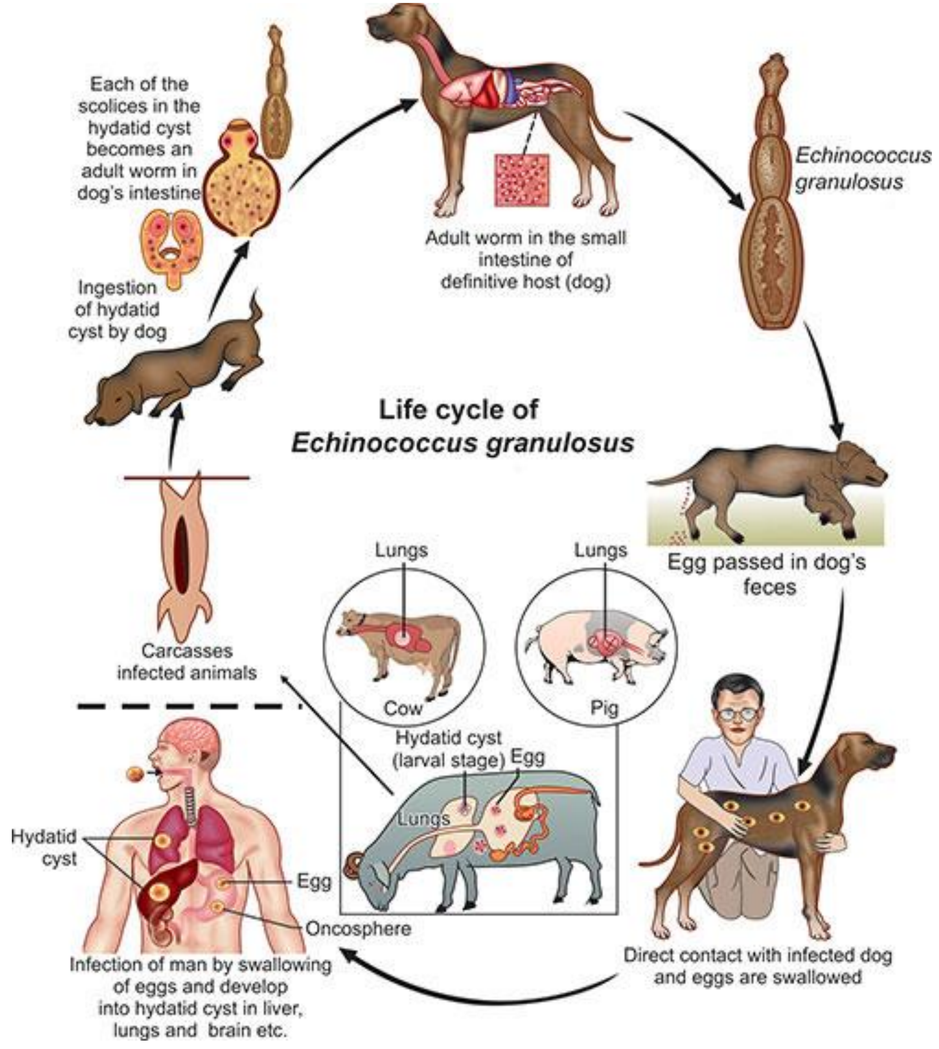
Case 1 40-yr-Male, Liver SOL- FNAC

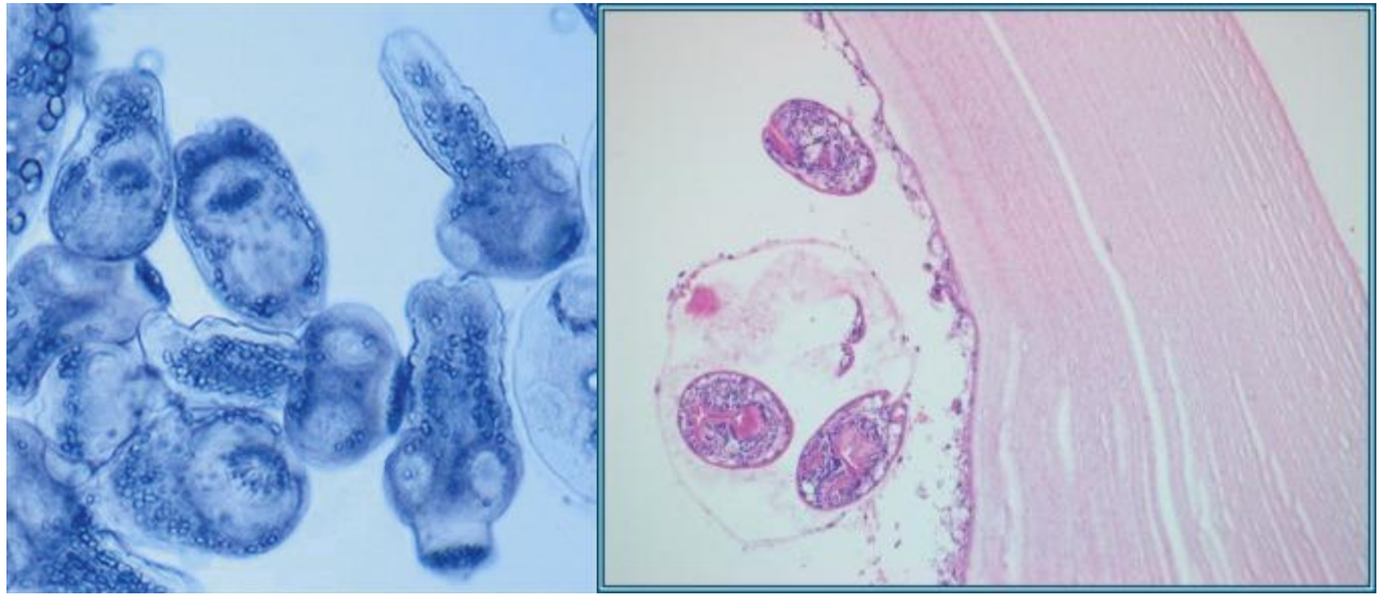




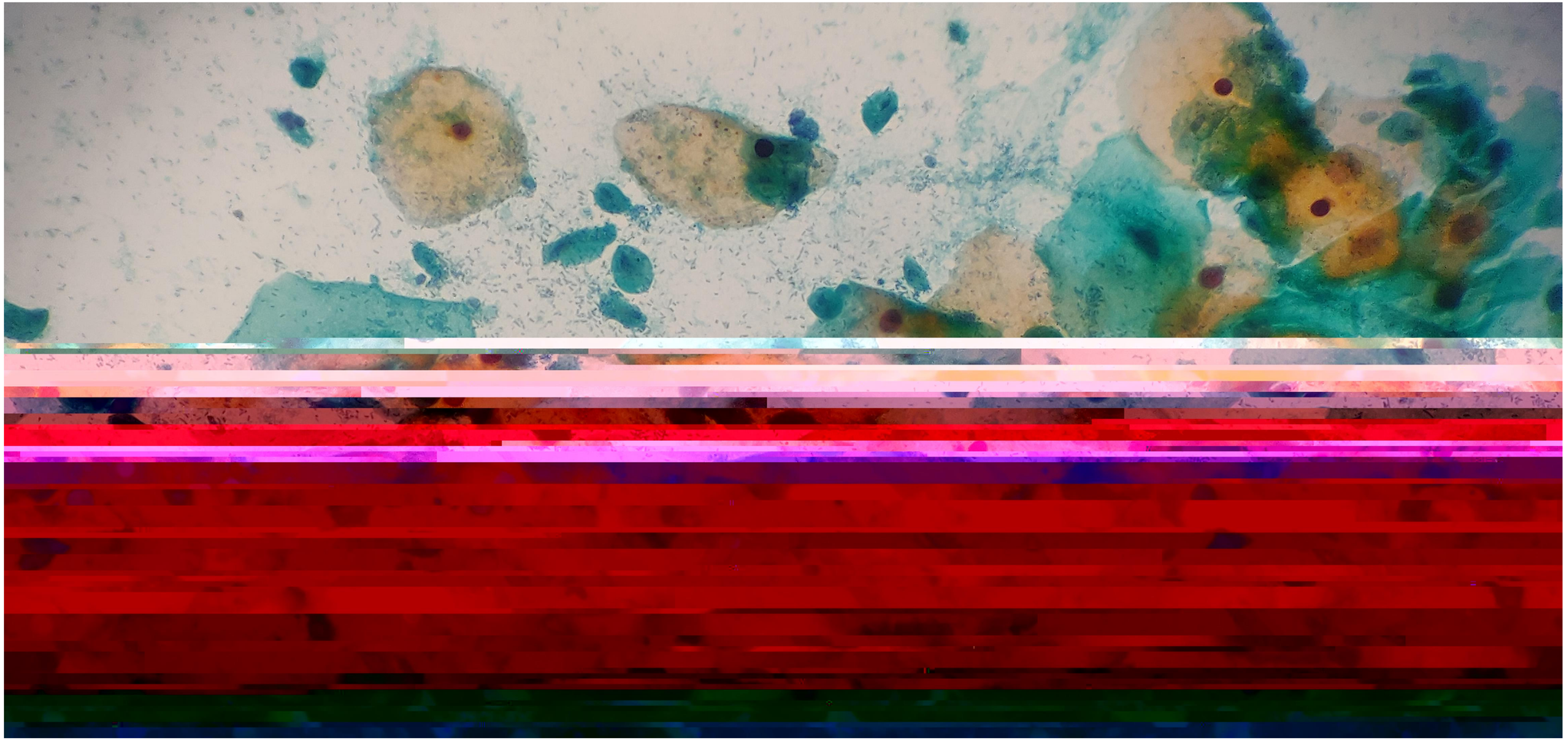
Case 2

40-yr-Male, Liver SOL- FNAC: **Hydatid cyst**

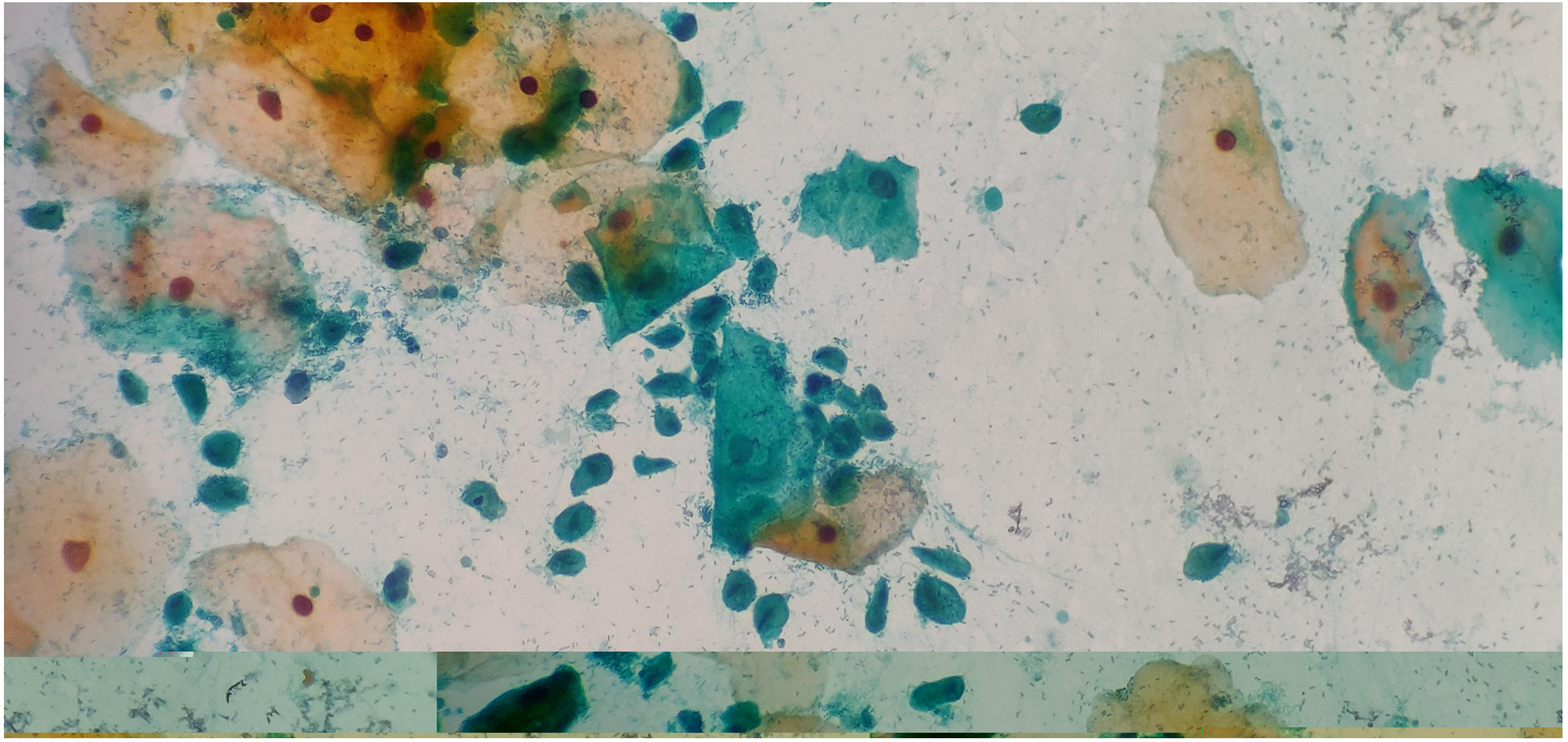




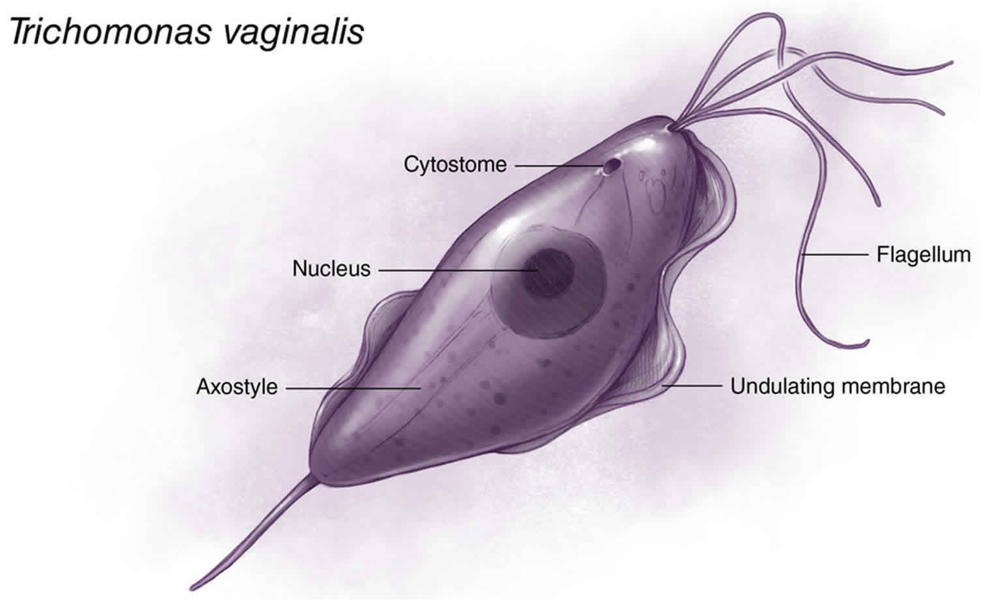
Case 3: 34-y-F, Cervical Smear

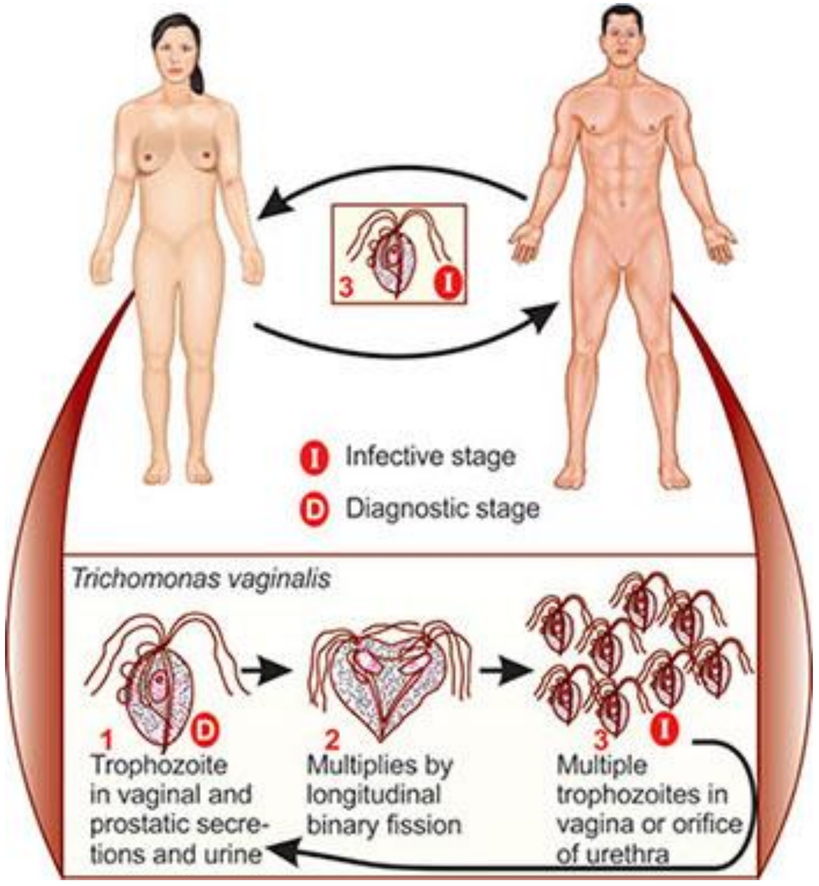


Case 3: 34-y-F CERVICAL SMEAR

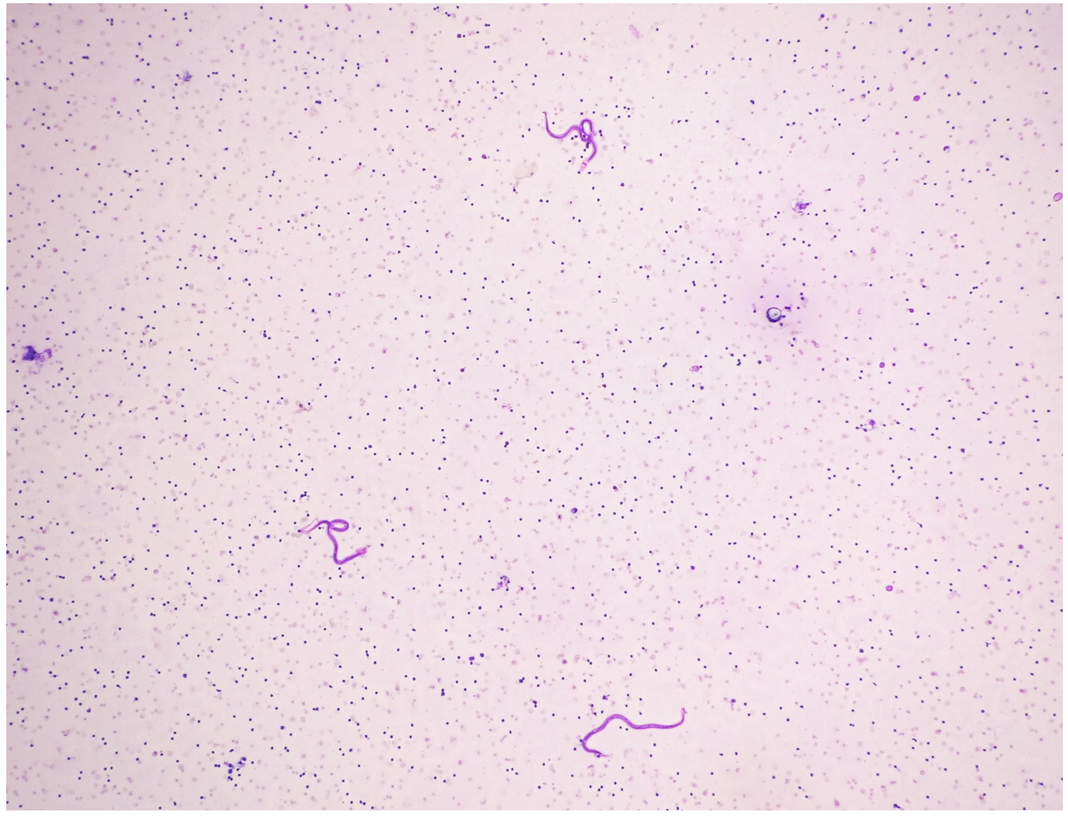


- Trichomonas vaginalis



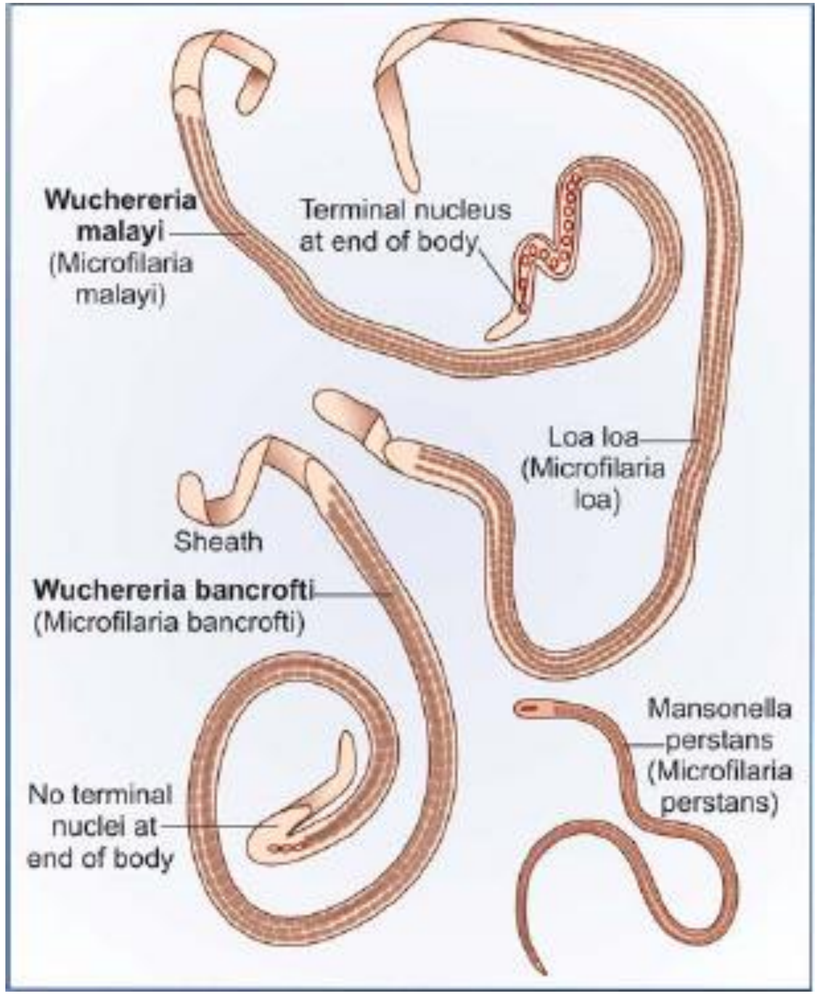


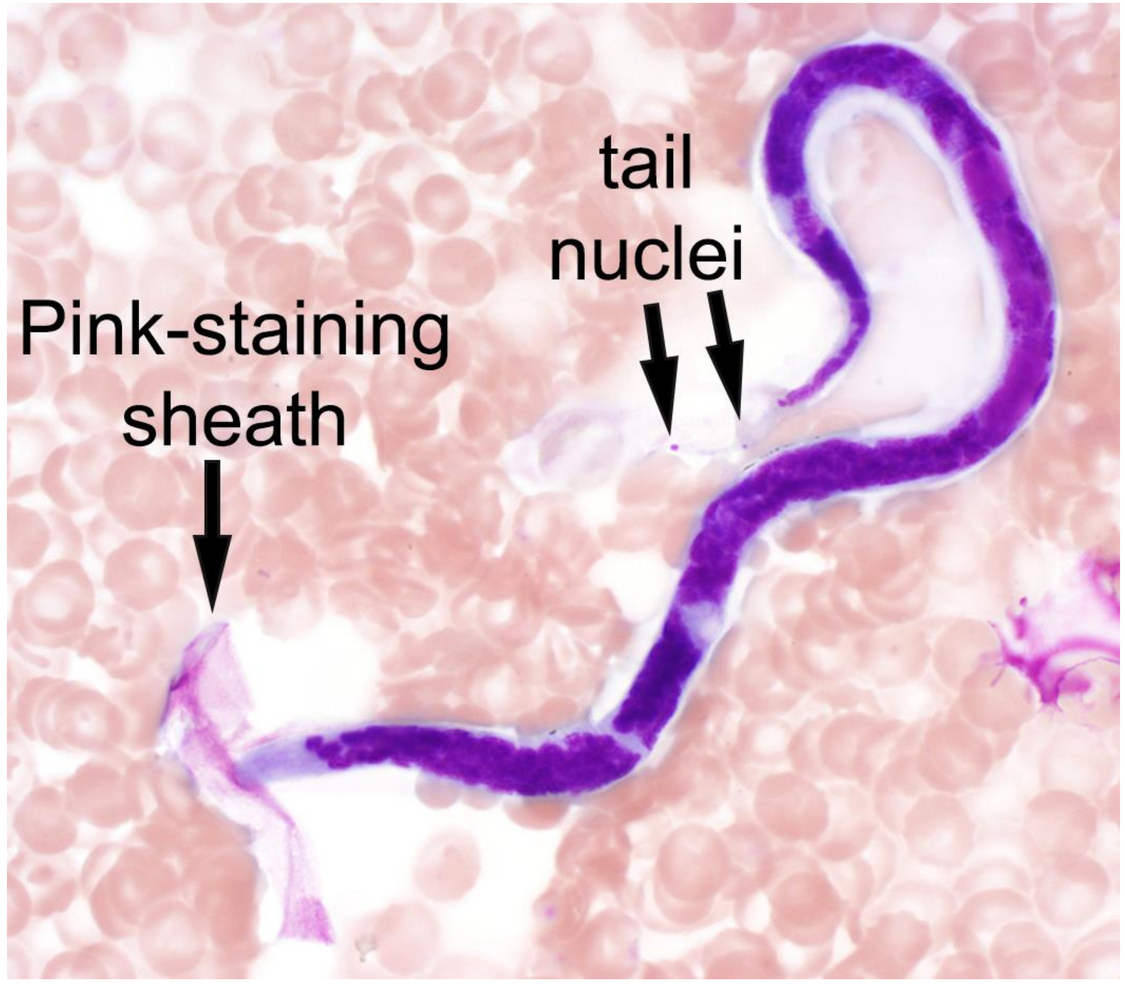
Case 4: 25-y-F, Pleural fluid





Case 4: 25-y-F, Pleural fluid: Microfilaria

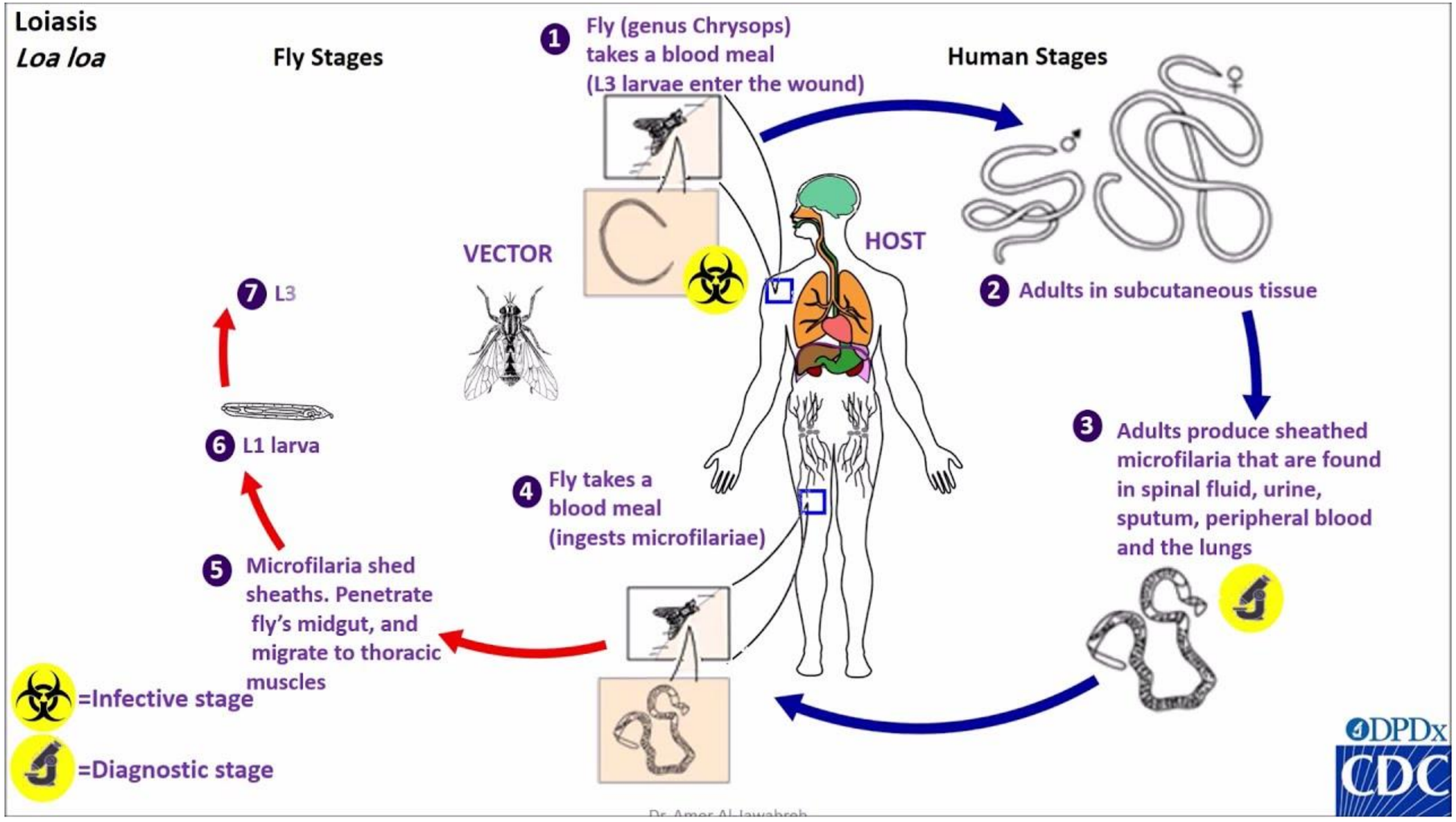




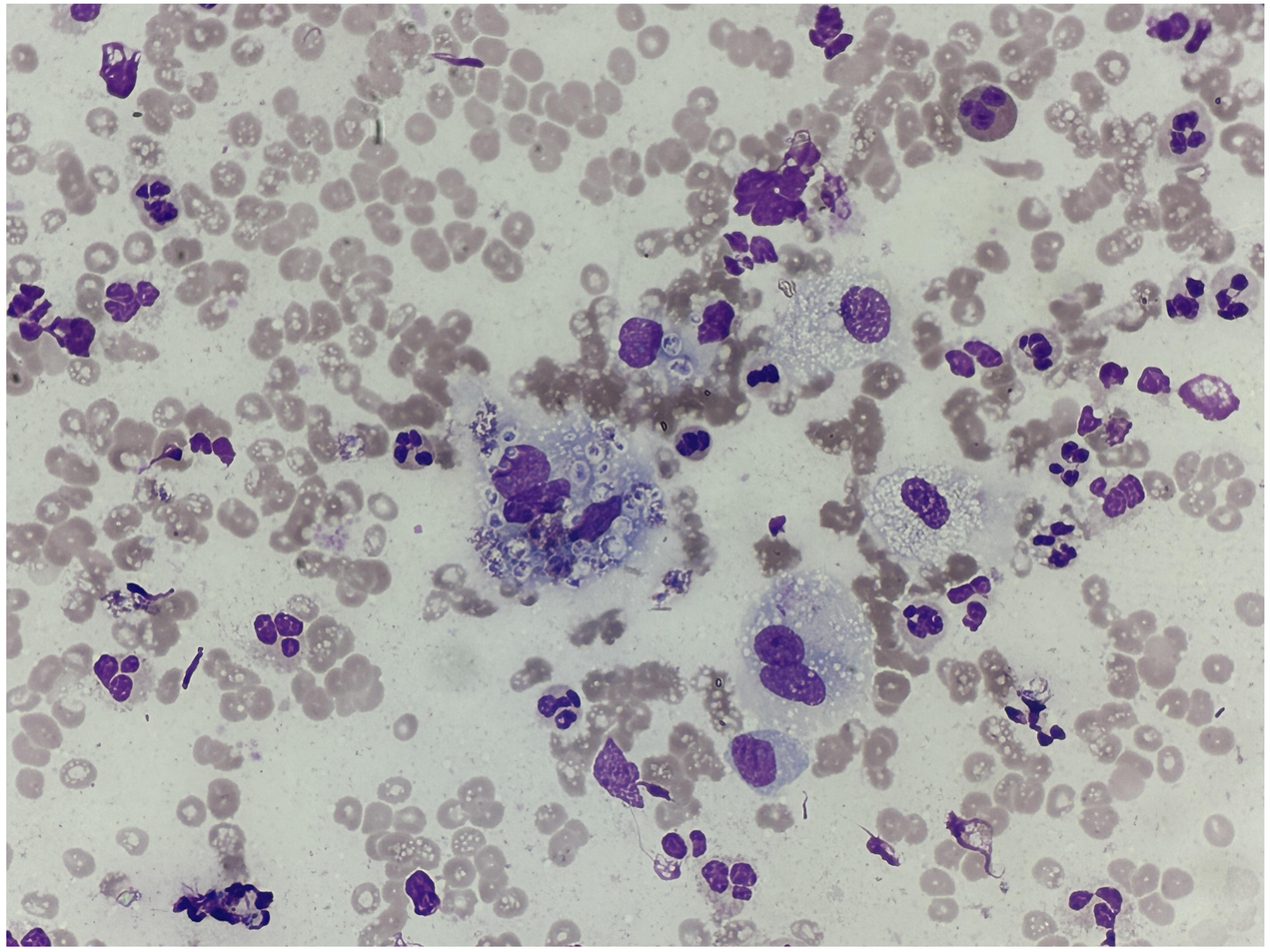
Case 4: 25-y-F, Pleural fluid

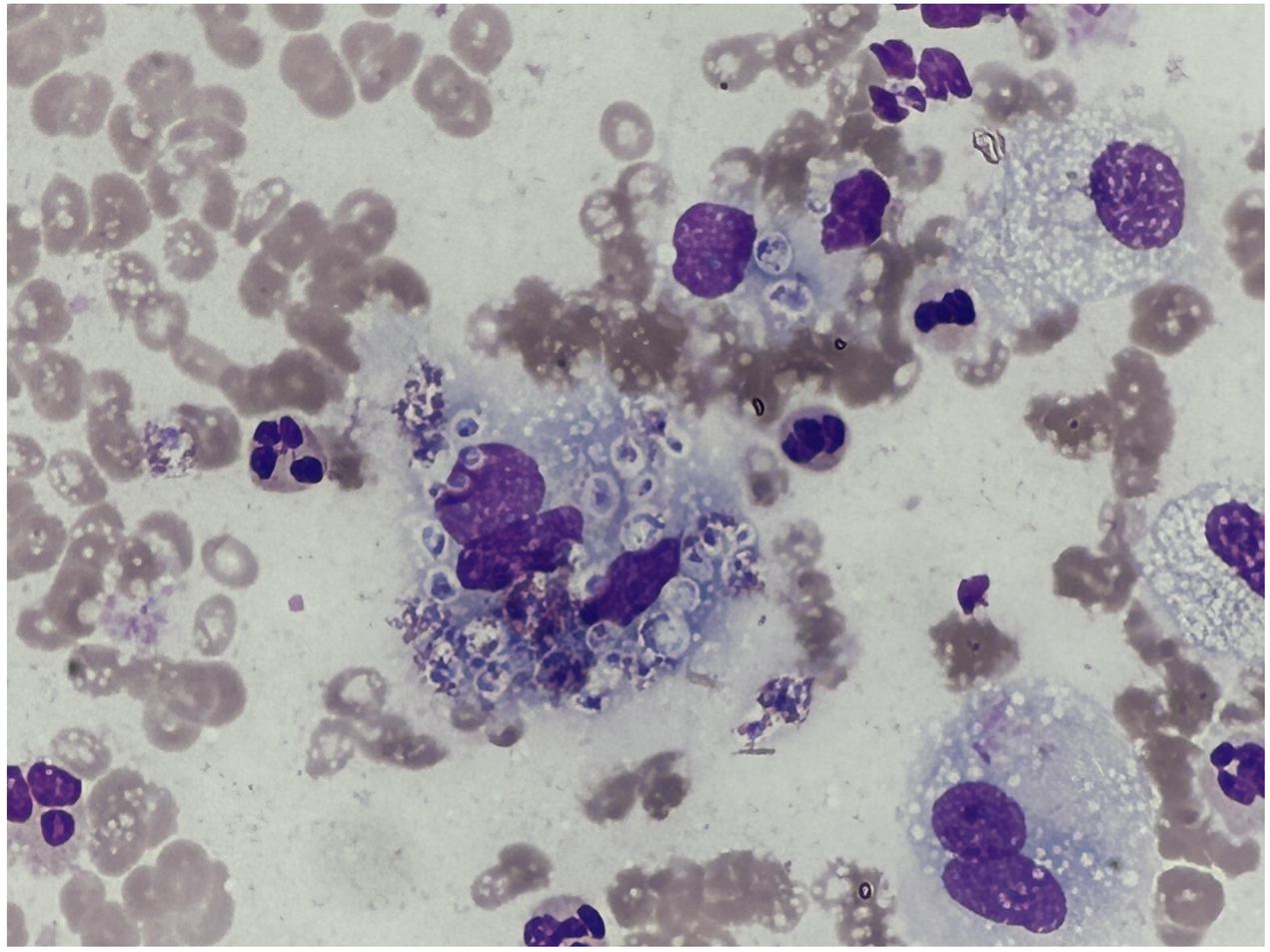
Species	*Wuchereria bancrofti*	*Brugia malayi*	*Loa loa*	*Mansonella perstans*	*Mansonella ozzardi*	*Onchocerca volvulus*
Shape						
Posterior end						
Tail nuclei	Nuclei do not extend to the tip of tail	2 nuclei at the tip of the tail	Nuclei form continuous row in the tip of the tail	Nuclei extend to the tip of the tail	Nuclei do not extend to the tip of the tail	Nuclei do not extend to the tip of the tail
Anterior end						
Size	300 x 8 µm	220 x 6 µm	270 x 8 µm	160 x 4 µm	220 x 4 µm	200 x 360 µm
Sheathed/ unsheathed	Sheathed	Sheathed	Sheathed	Unsheathed	Unsheathed	Unsheathed
Habitat	Blood	Blood	Blood	Blood	Blood	Skin, eye

Case 4: 25-y-F, Pleural fluid

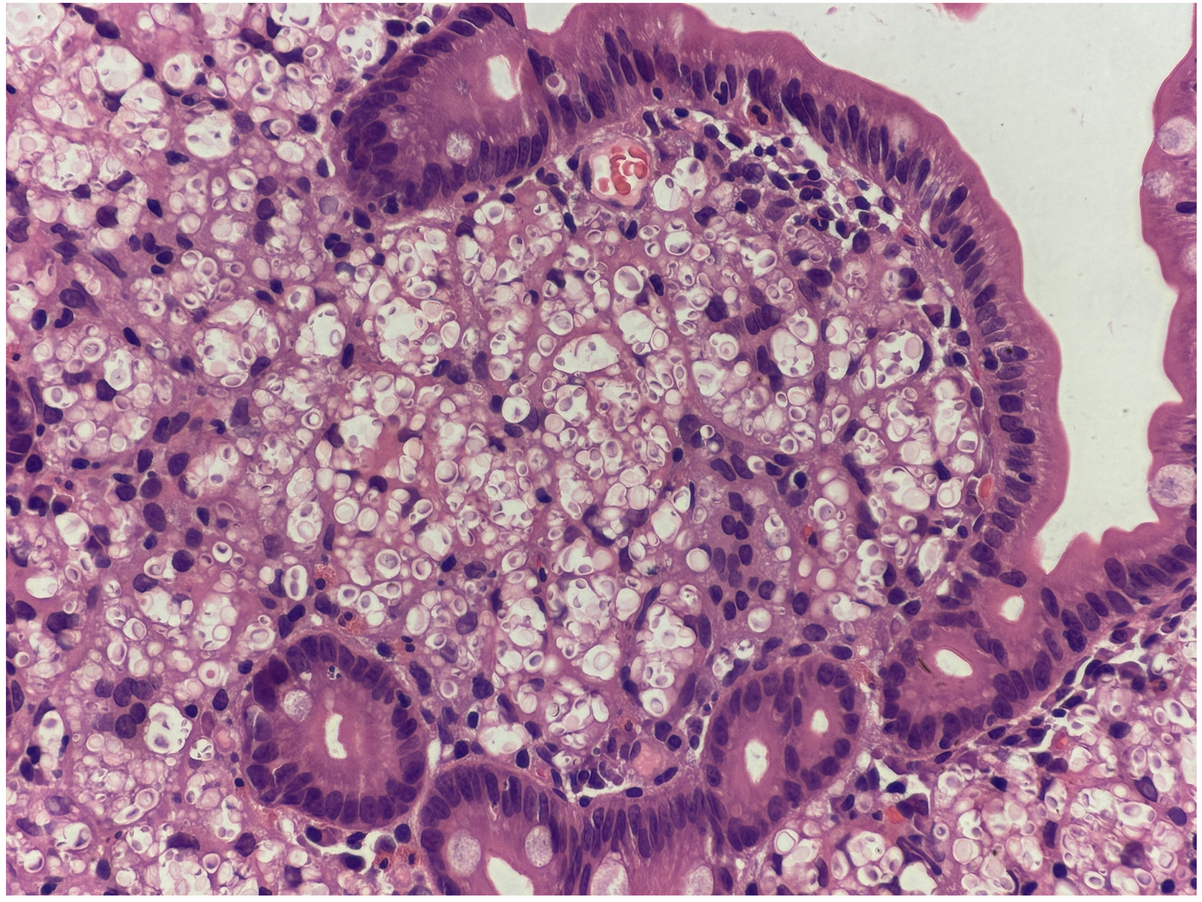


Case 5: 43 Year Male, FNAC of cervical lymph node

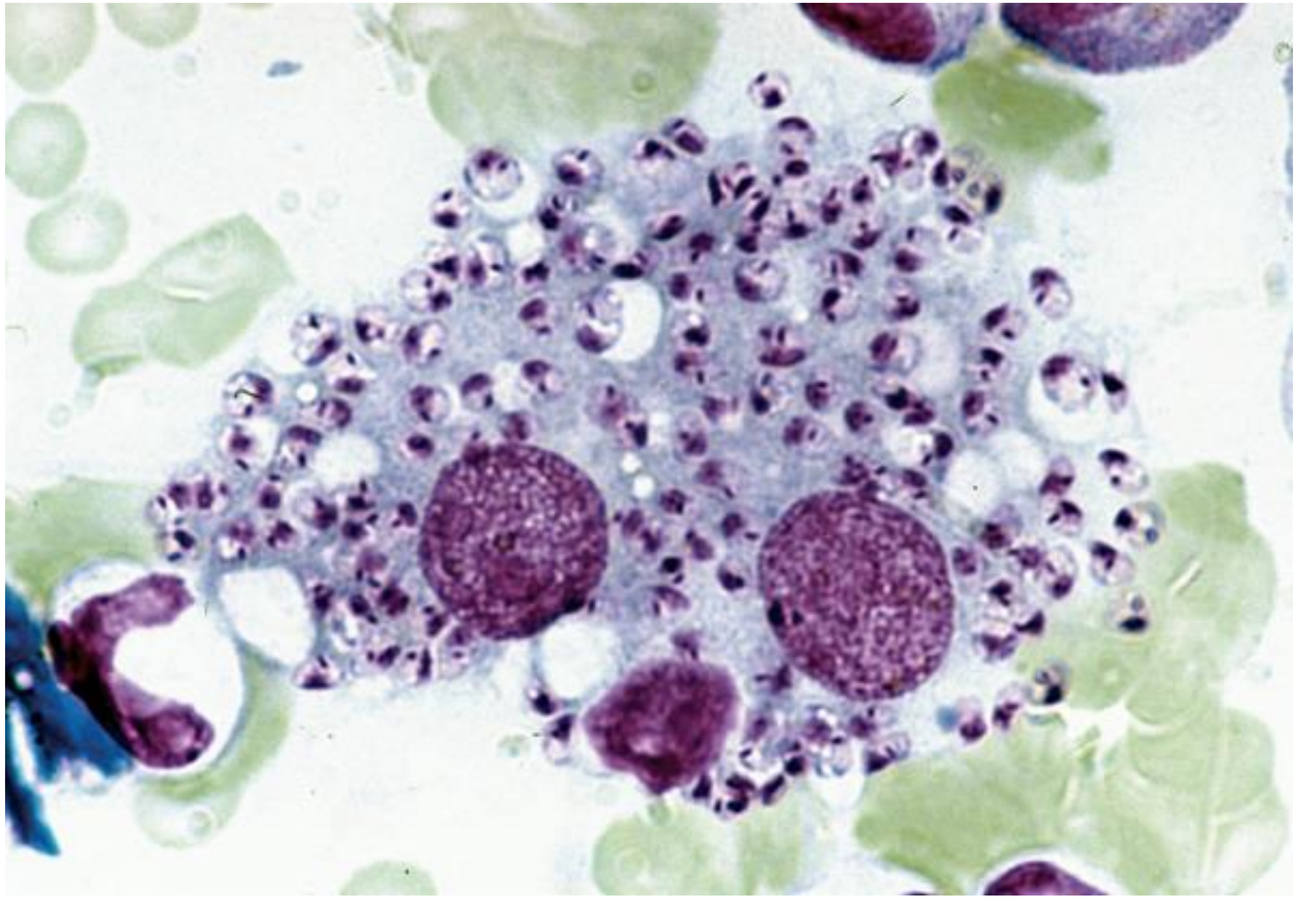




Case 5: Histoplasma infection (*Histoplasma capsulatum)*



Cryptococcus



Leishmania

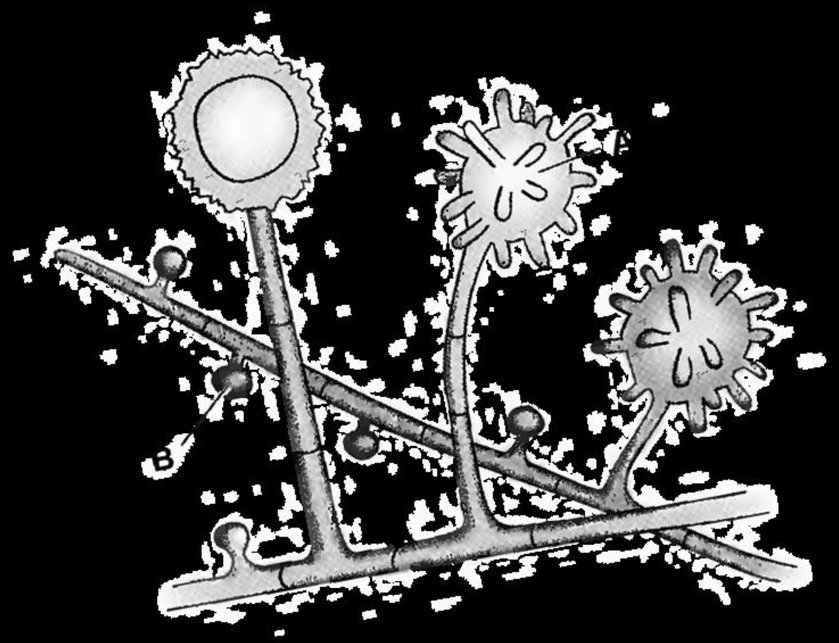
Disclosure Information

Name of Speaker: Dr. Nikita S. Oza

- I have no relevant financial relationships to disclose.

Infectious Diseases: Rare Case 1

" Histoplasmosis – Unusual and rare presentation"



Nikita Oza, MD(Path), FIAC
Histopia Lab – A Culture of Excellence, India
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Introduction

- Histoplasmosis is a granulomatous infectious disease caused by the **dimorphic fungus Histoplasma capsulatum**
- As a soil fungus, it is well adapted to be pathogenic to humans because it does not need to interact with a mammalian host as part of its life cycle.
- In tissues and after inhalation of airborne **conidia**, H. capsulatum remains in the **blastospore state** and does not produce filaments, and is usually **intracellular**
- The spectrum of this illness varies from asymptomatic infection to widespread disseminated disease, more prevalent in immunocompromised patients
- It is primarily a pulmonary disease; however, disseminated infection may affect almost all systems including the reticuloendothelial system, gastrointestinal tract, renal tract, central nervous system, bone marrow and adrenal glands

Introduction

- Morphologically, H. capsulatum is a small spherical or ovoid yeasts measuring 2 to 6 µm
- Has ability to make a dimorphic transition from must-leaven to yeast, to enter host macrophages (also called histiocytes in tissues), and to survive intracellularly.
- Its able to proliferate during active infection, and to persist during clinically inapparent infection, and has the ability to reactivate

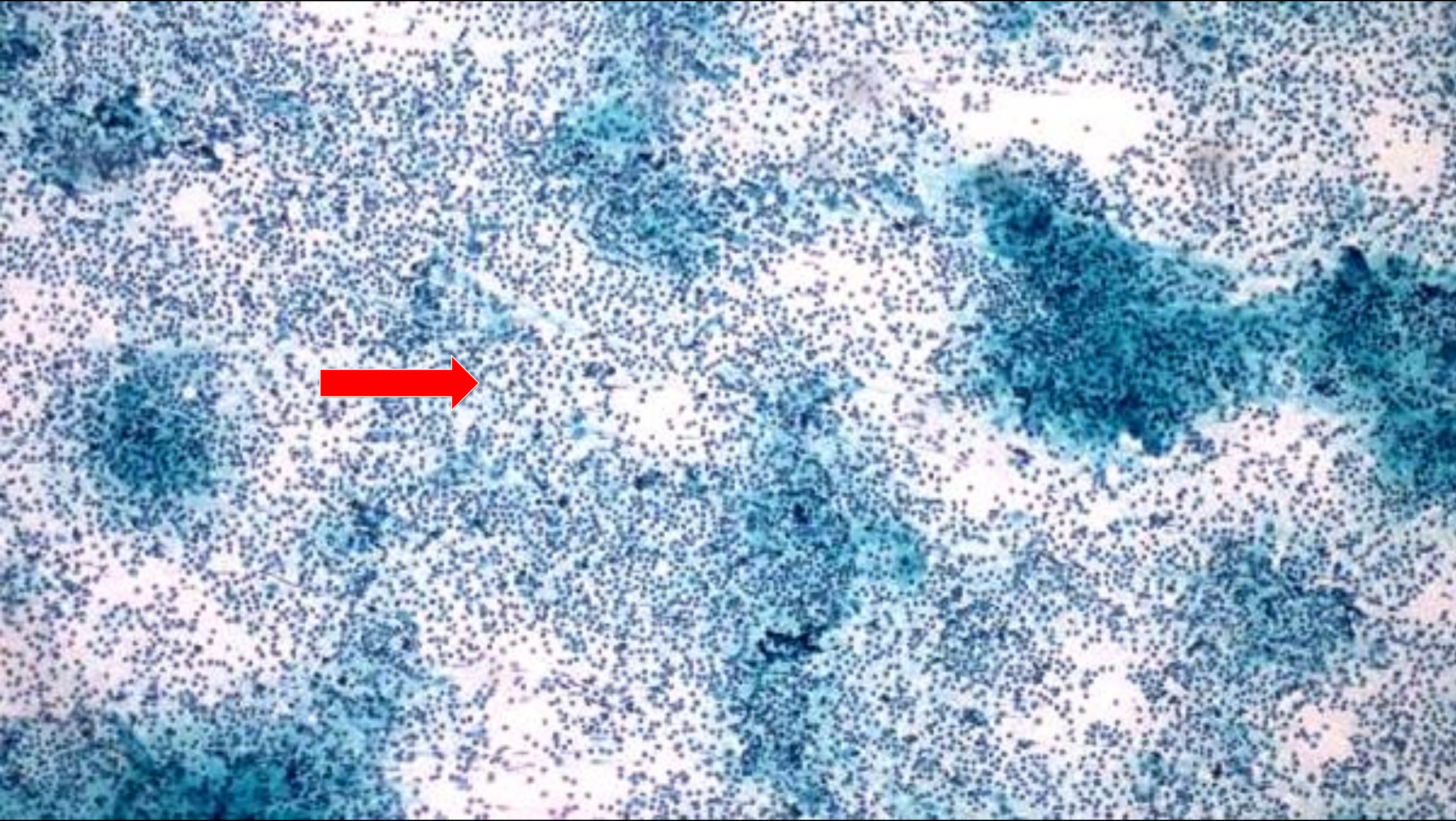
➢ *First described by Samuel Taylor Darling by examining the autopsies of two Caribbean and one Asian persons living and working in Panama who developed disseminated histoplasmosis (darling, 1902).*

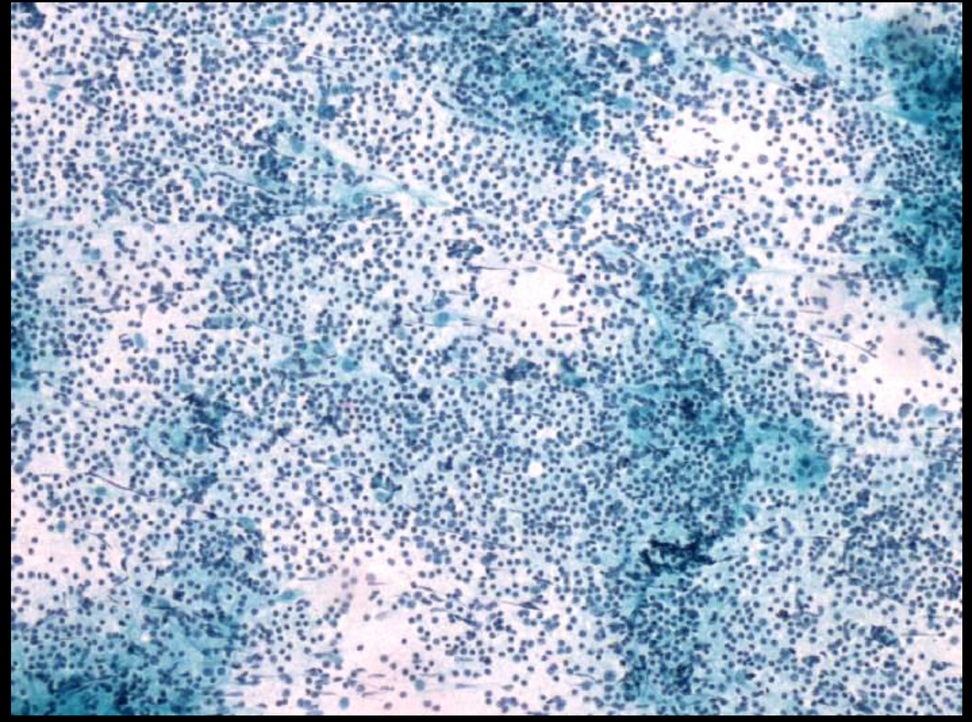
DARLING DISEASE

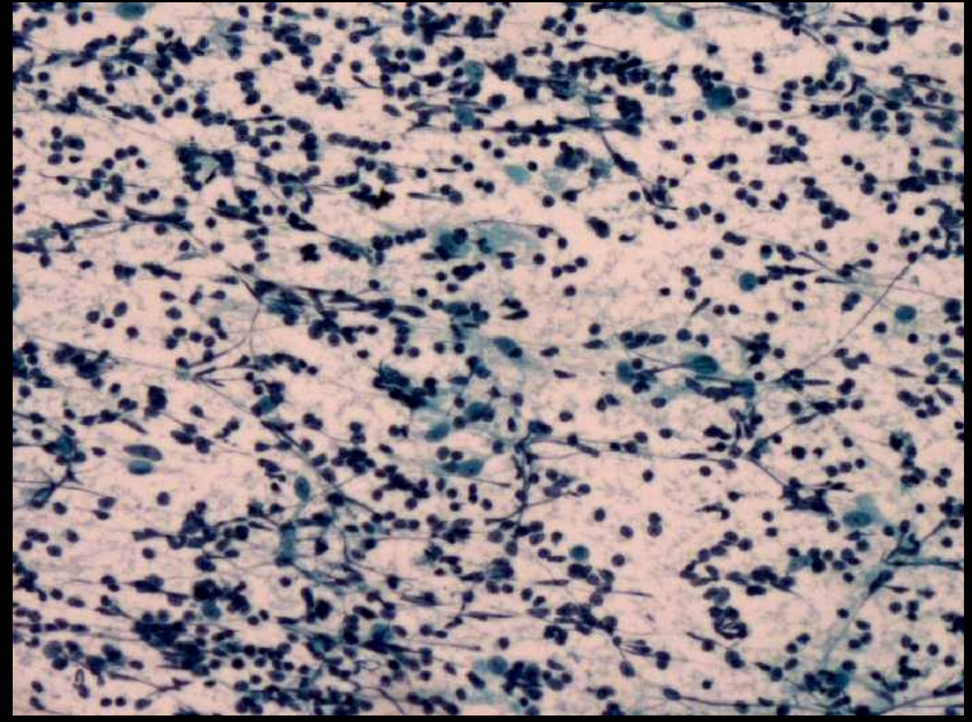
Case

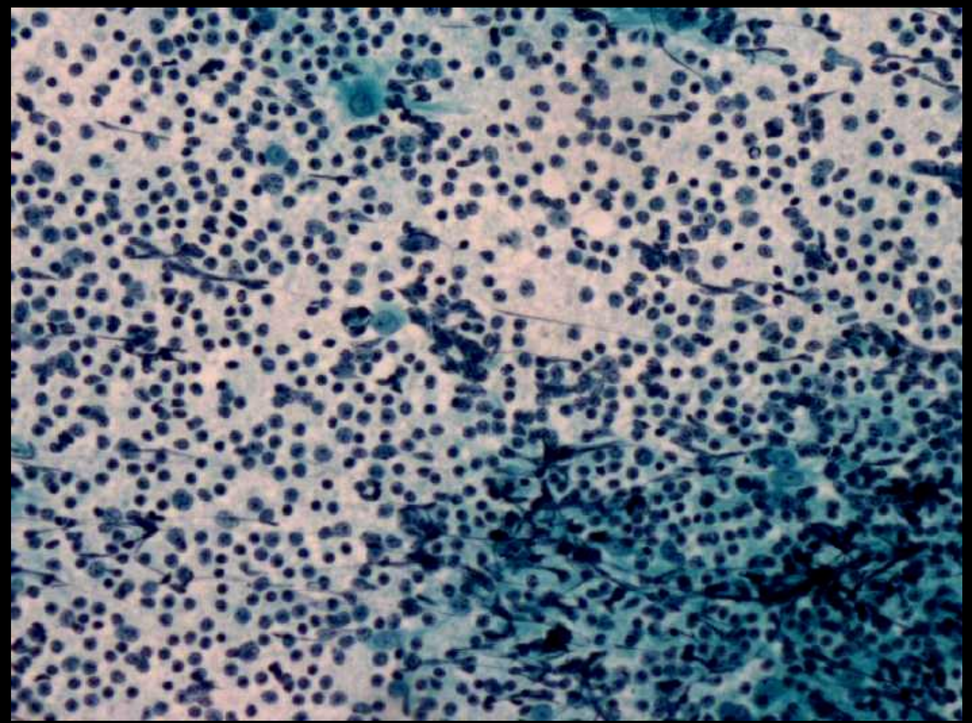
- 41-years male presented with generalized weakness and weight loss.
- **Hemogram** revealed pancytopenia ? Cause.
- **On examination:** Multiple enlarged lymph nodes were palpable involving cervical, axillary and inguinal nodes.
- **USG:** Hepatosplenomegaly
- FNAC from enlarged axillary node with on-site adequacy was performed

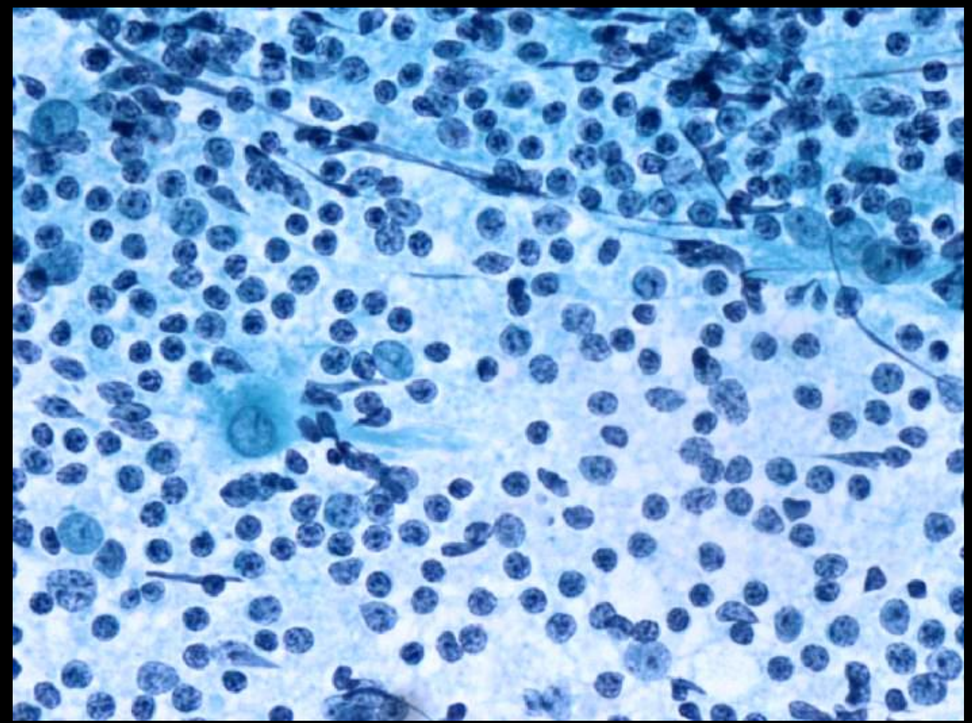


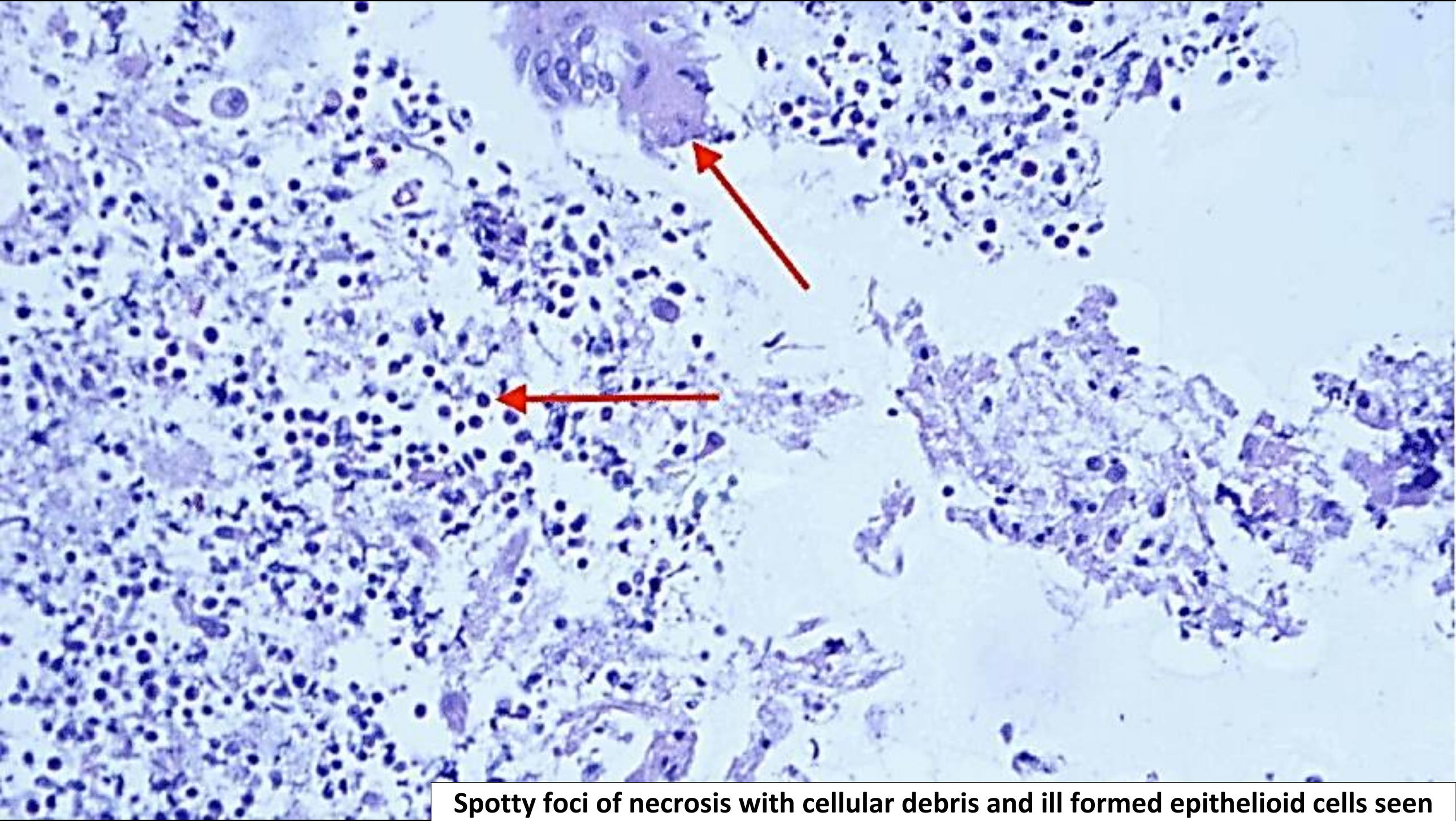




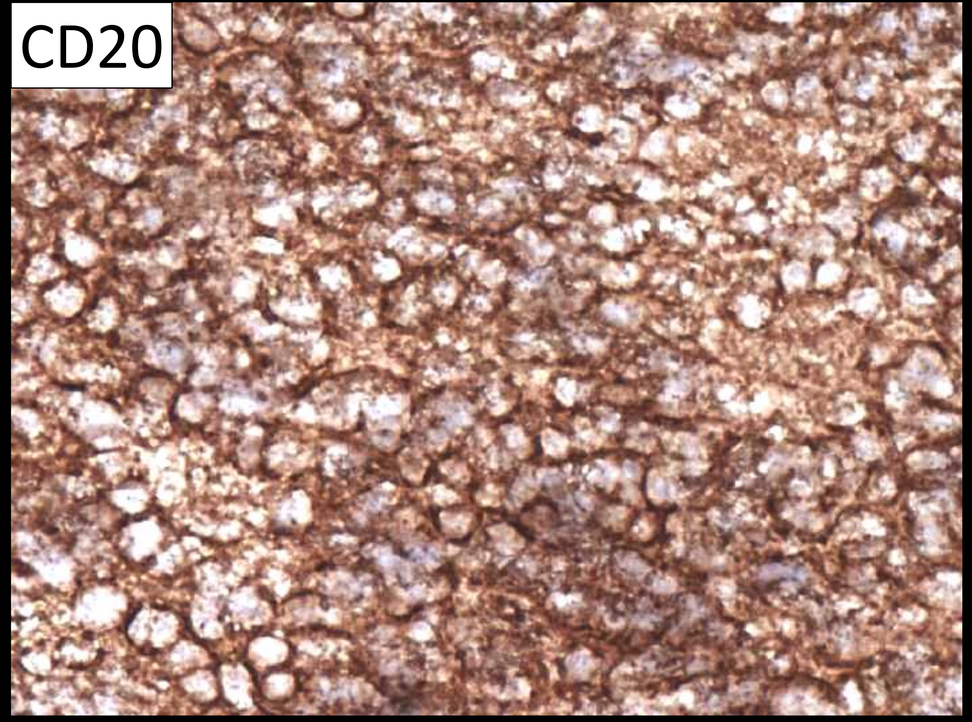




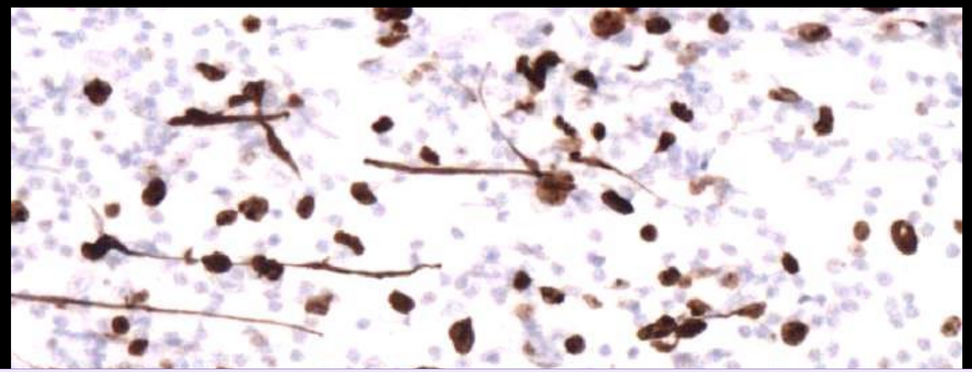


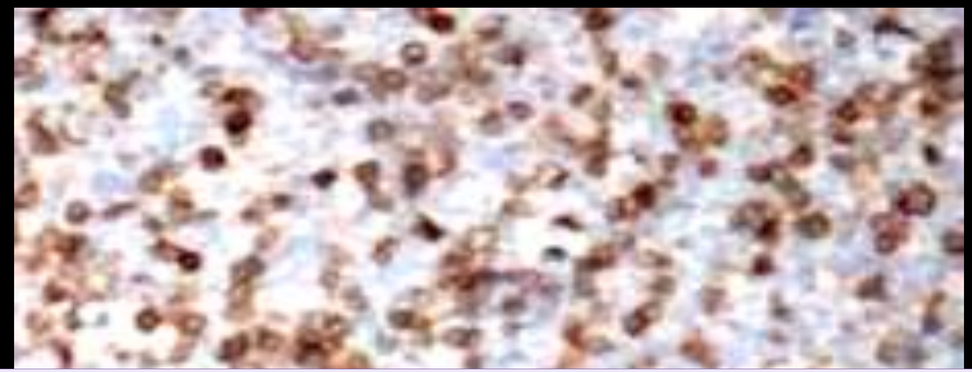


Spotty foci of necrosis with cellular debris and ill formed epithelioid cells seen



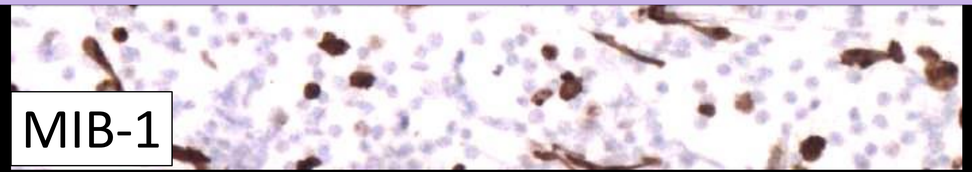




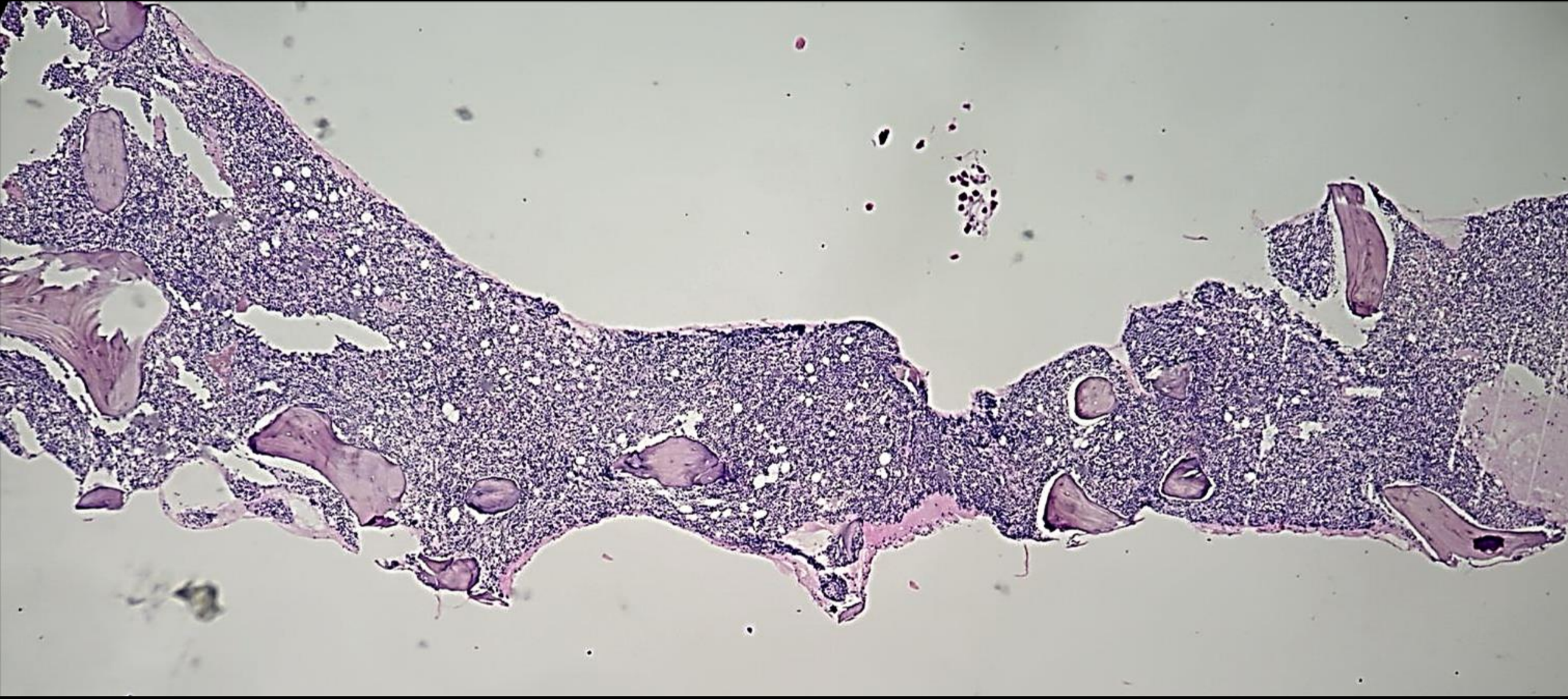


Final impression:

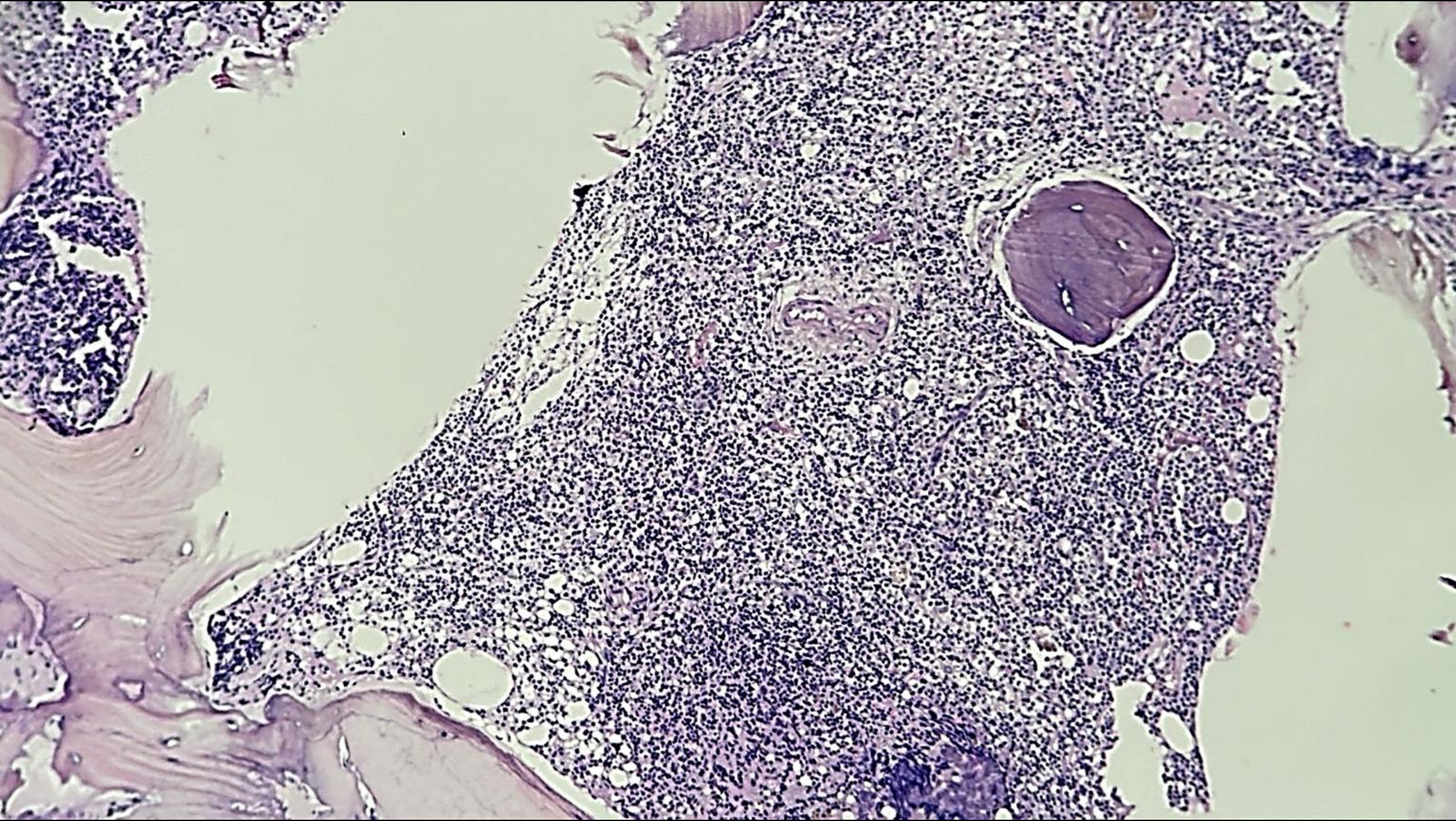
Node involved by low grade B cell lymphoma with granulomatous response.

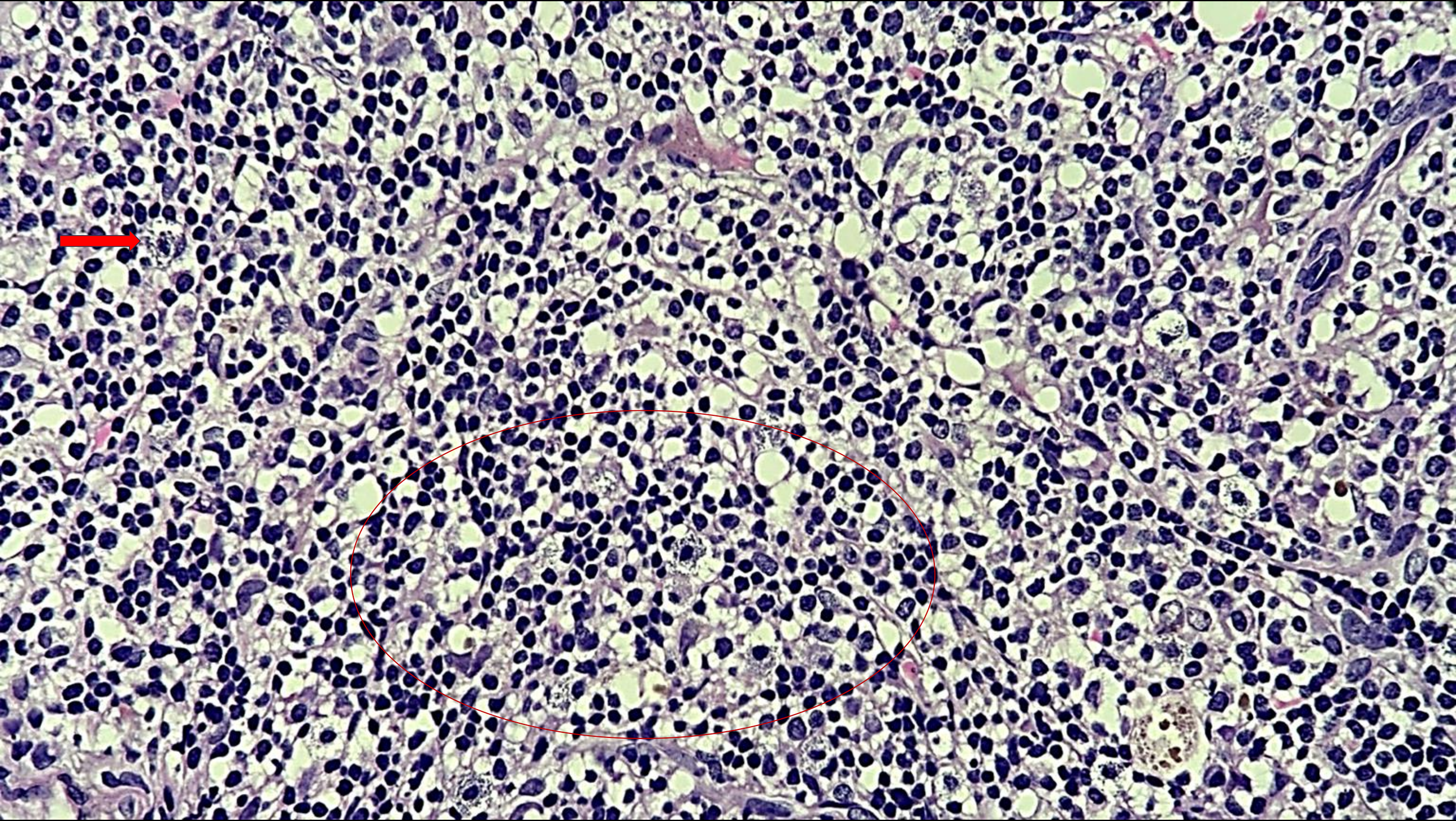


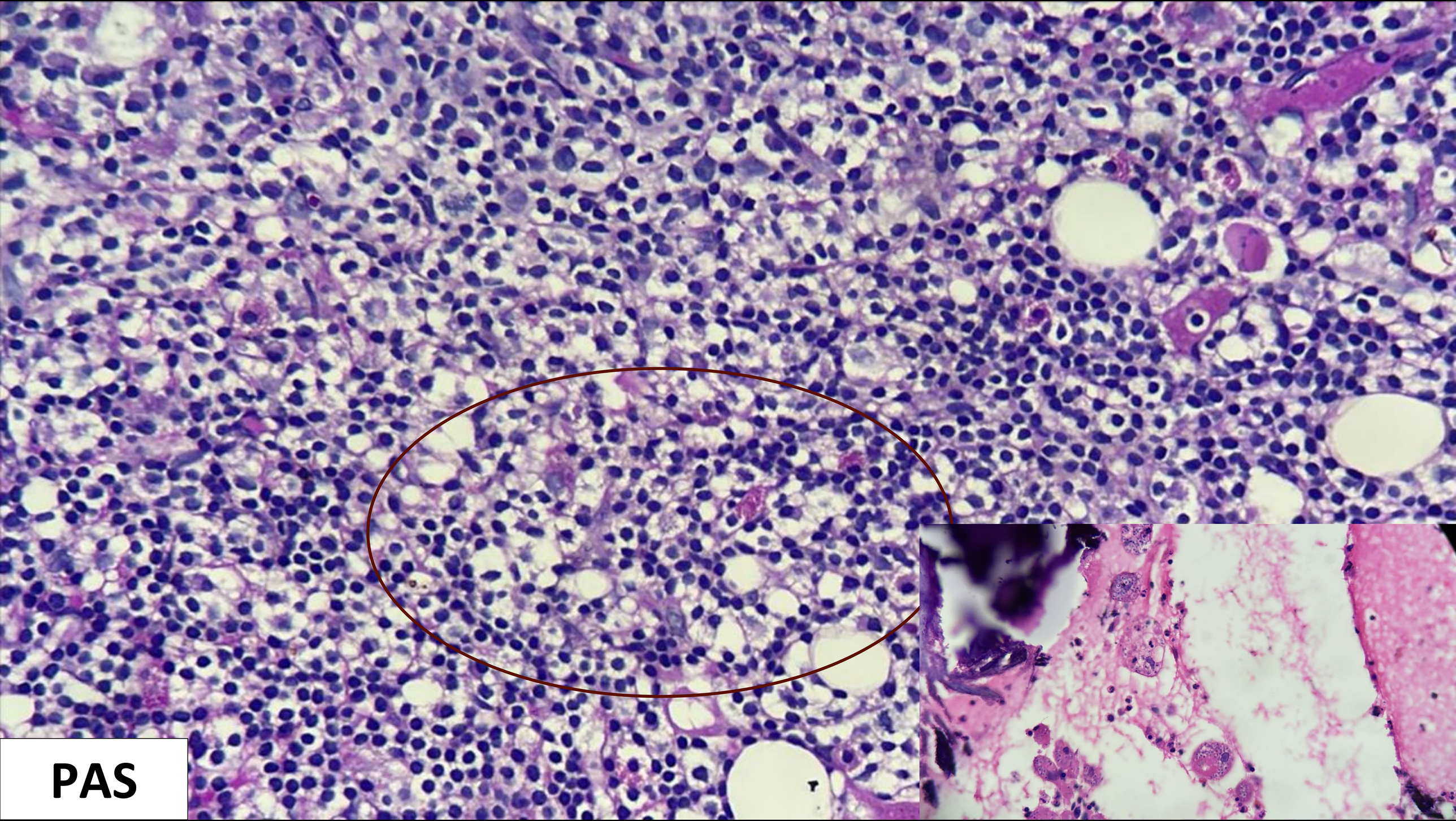


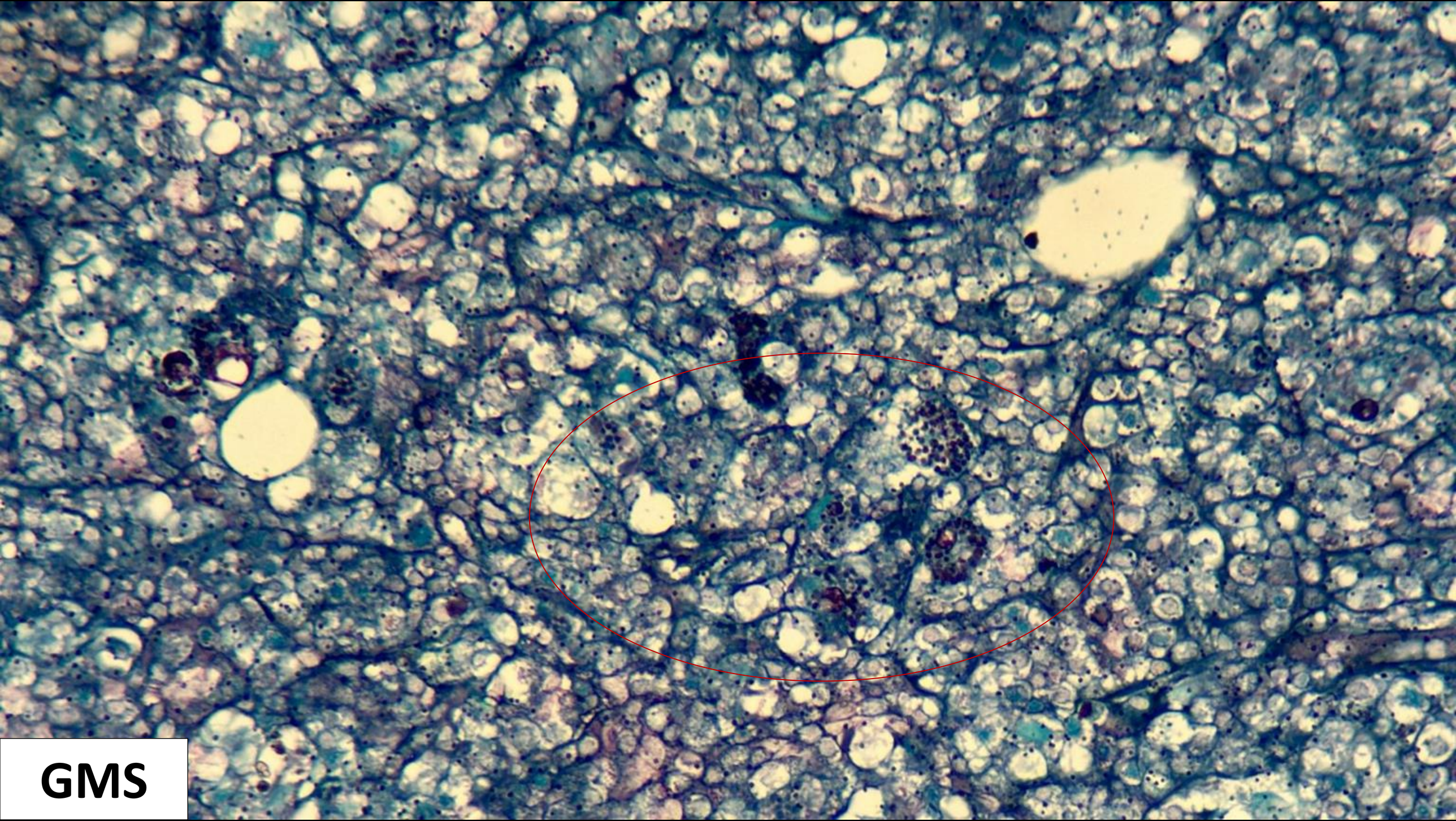


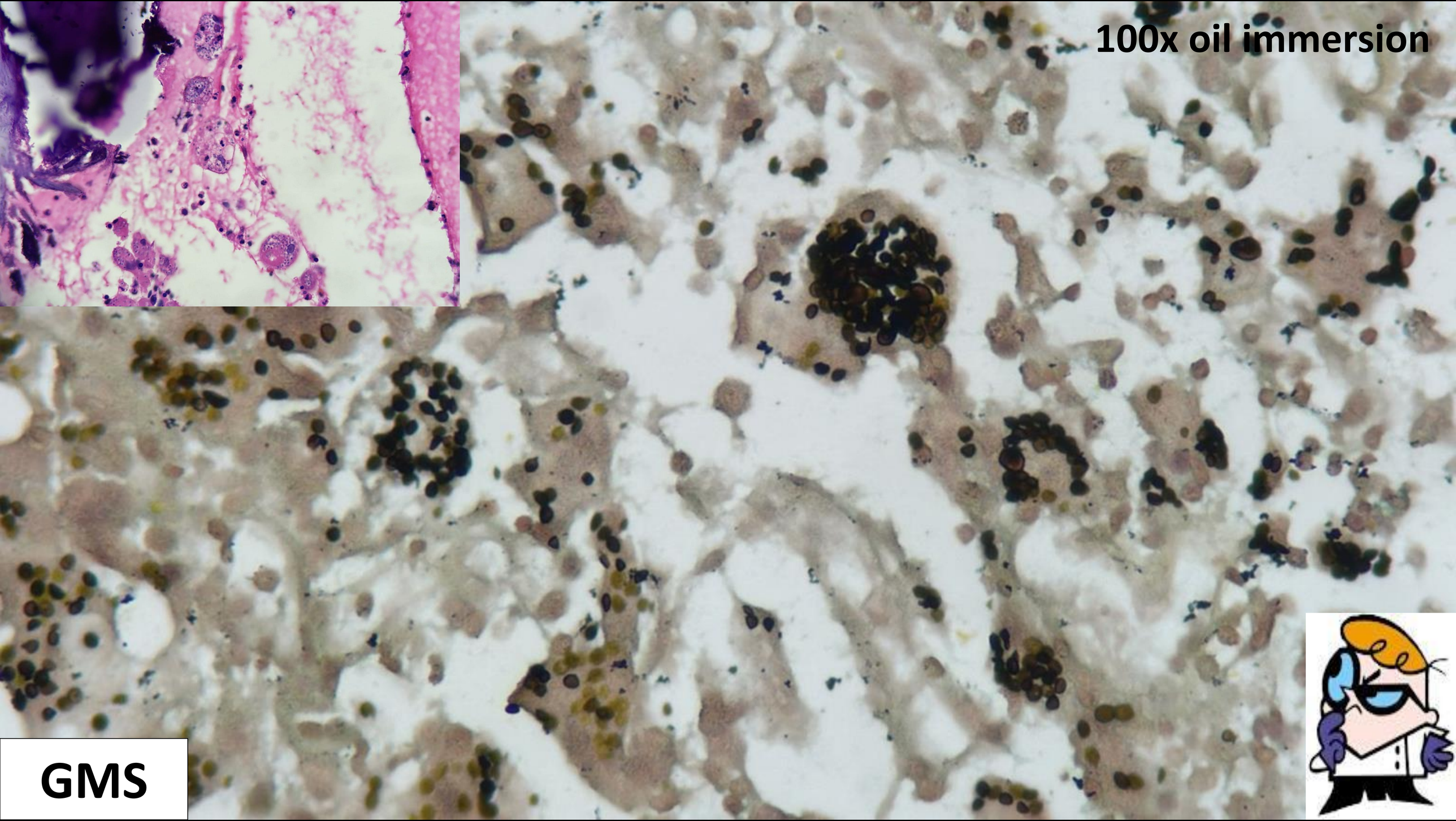
Bone marrow trephine biopsy was performed..






PAS

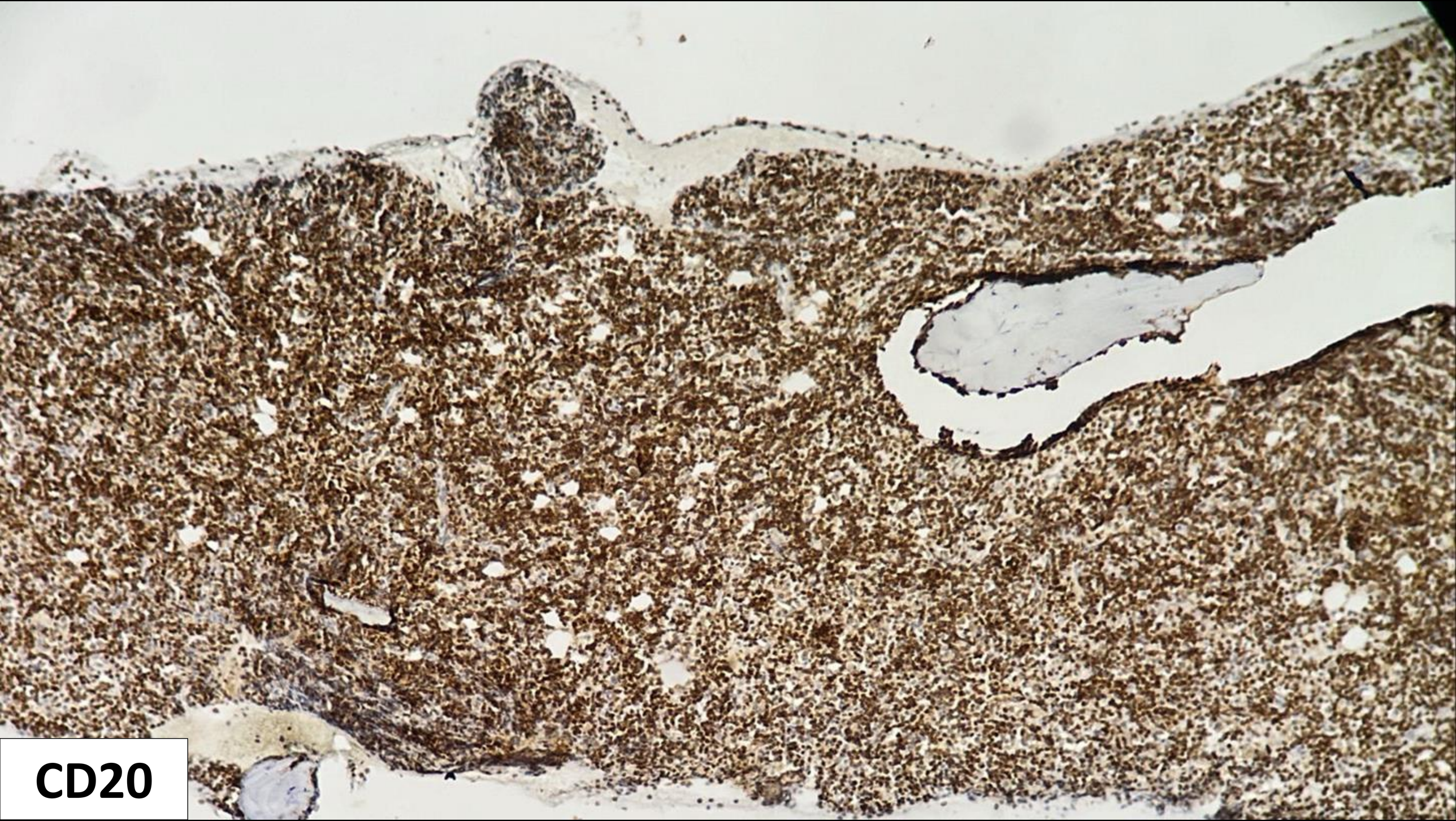

GMS

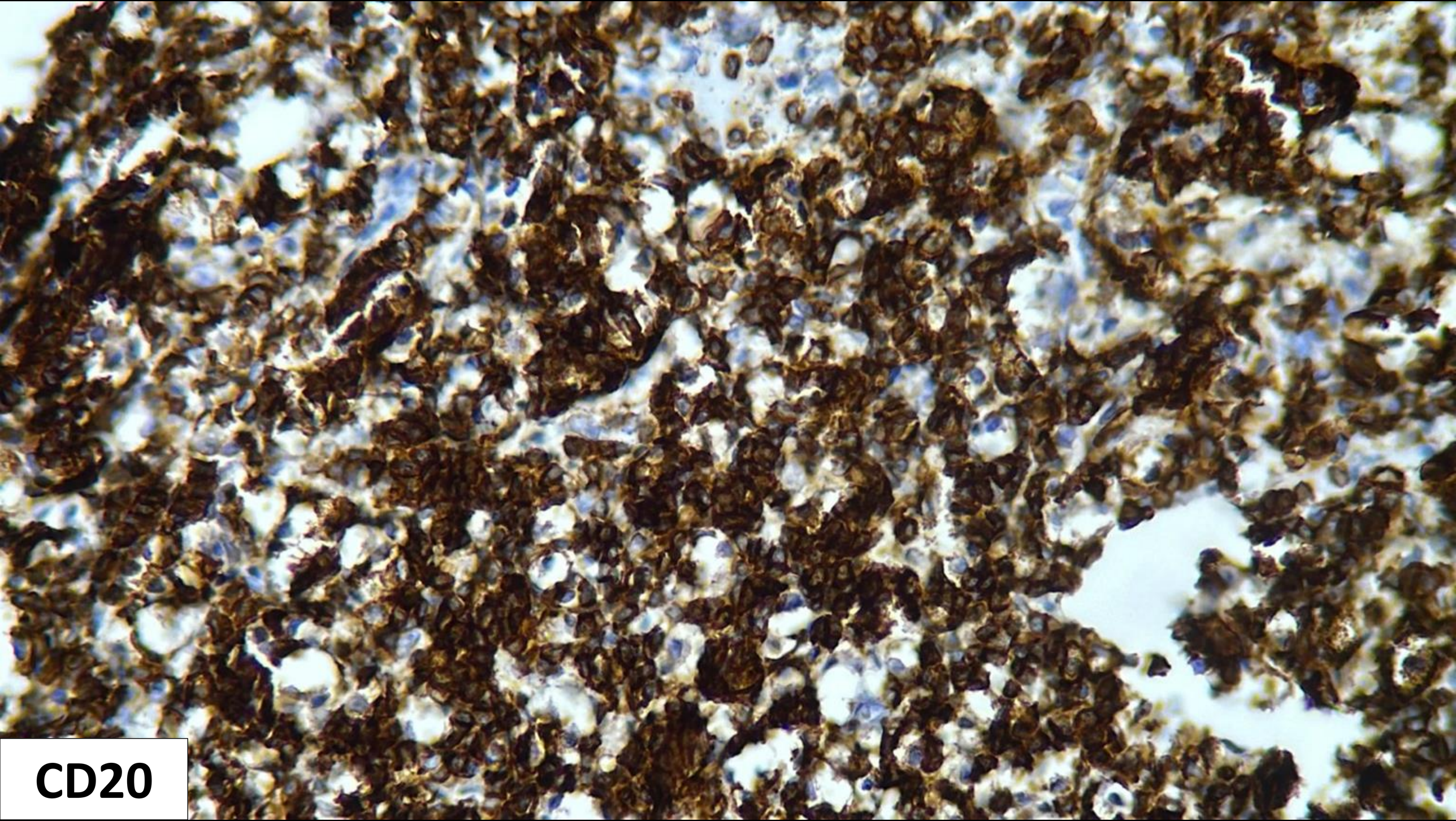

100x oil immersion
GMS

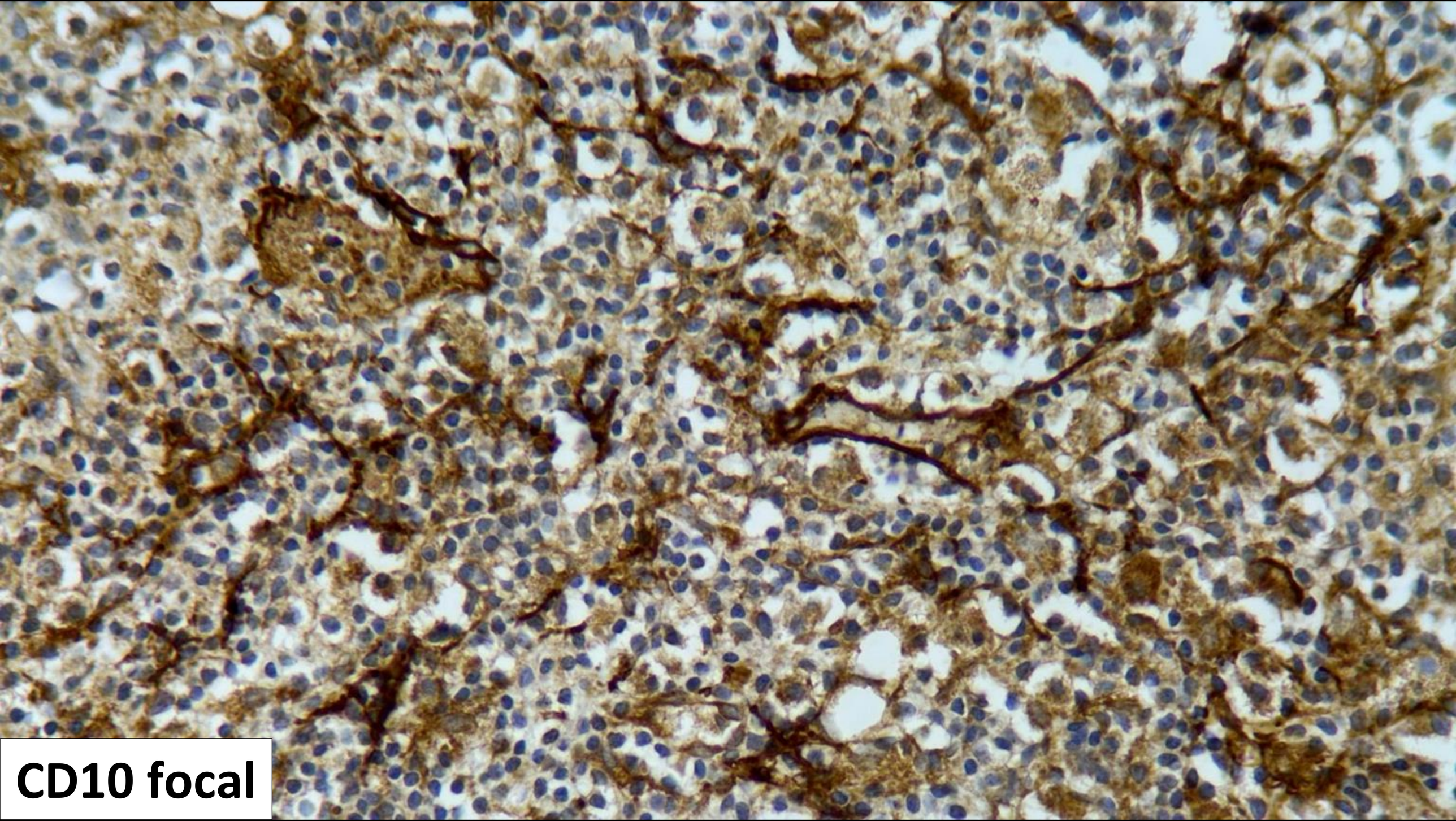
100x Oil immersion

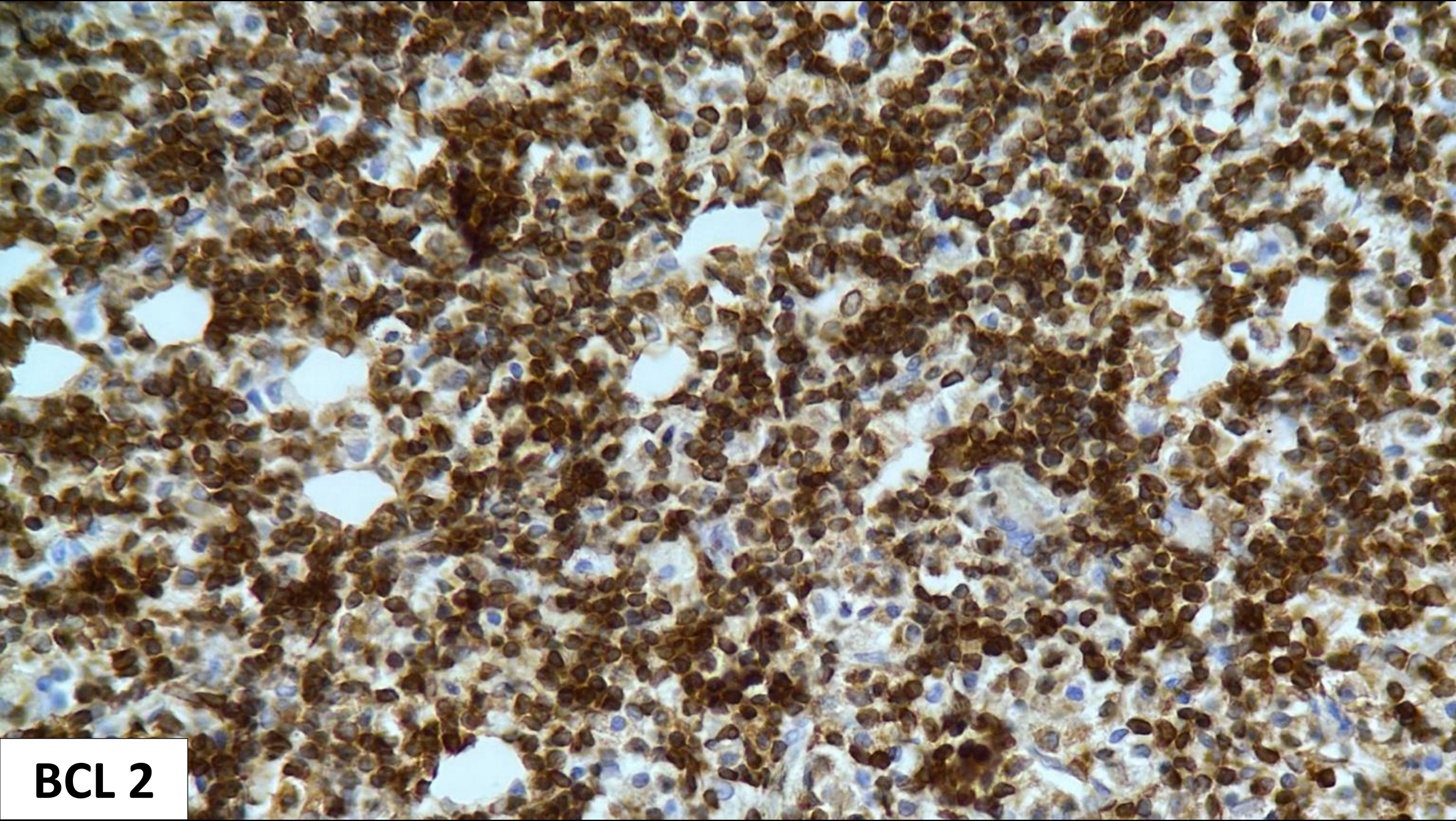
Phagocytized H. capsulatum organisms

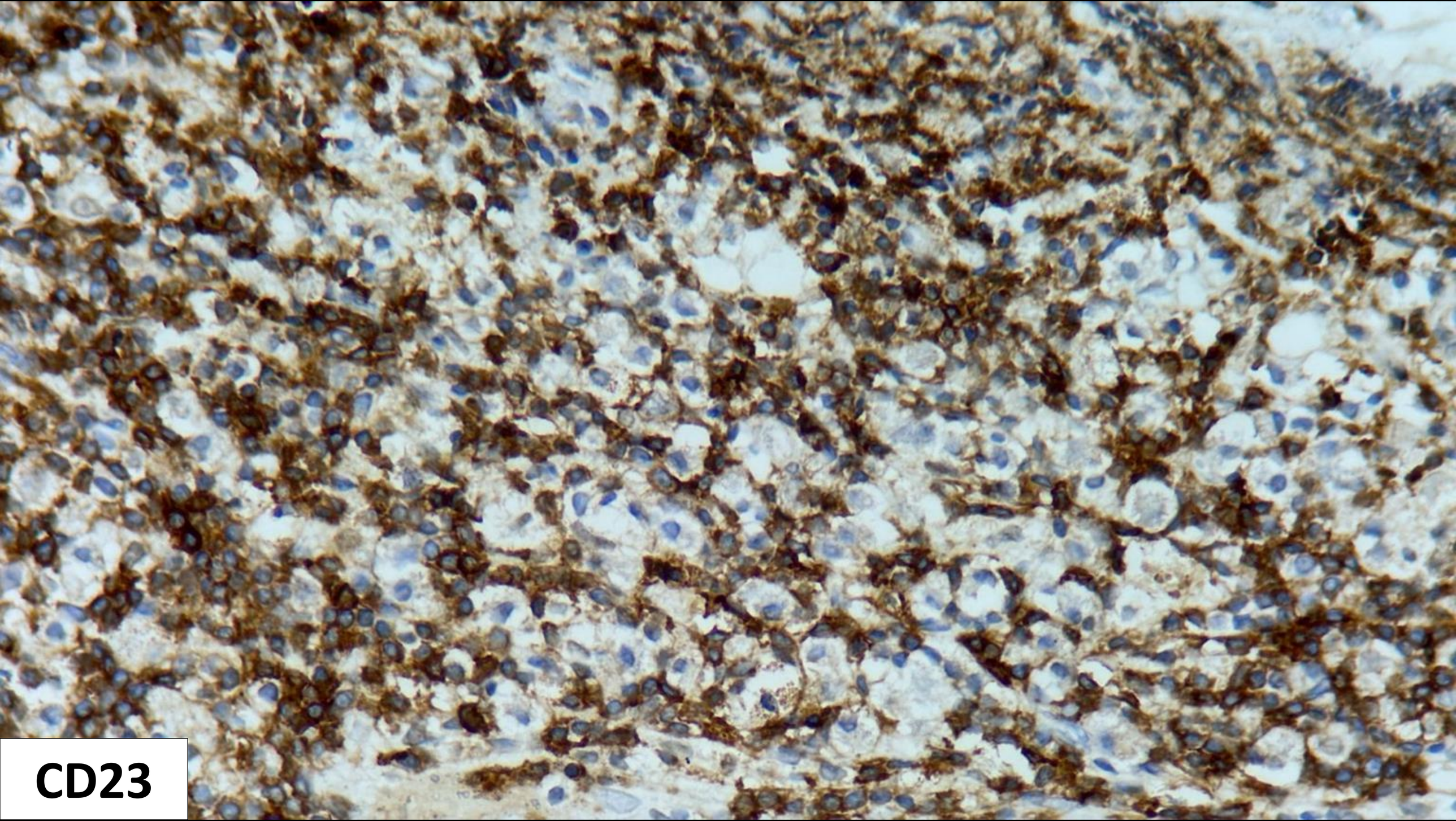


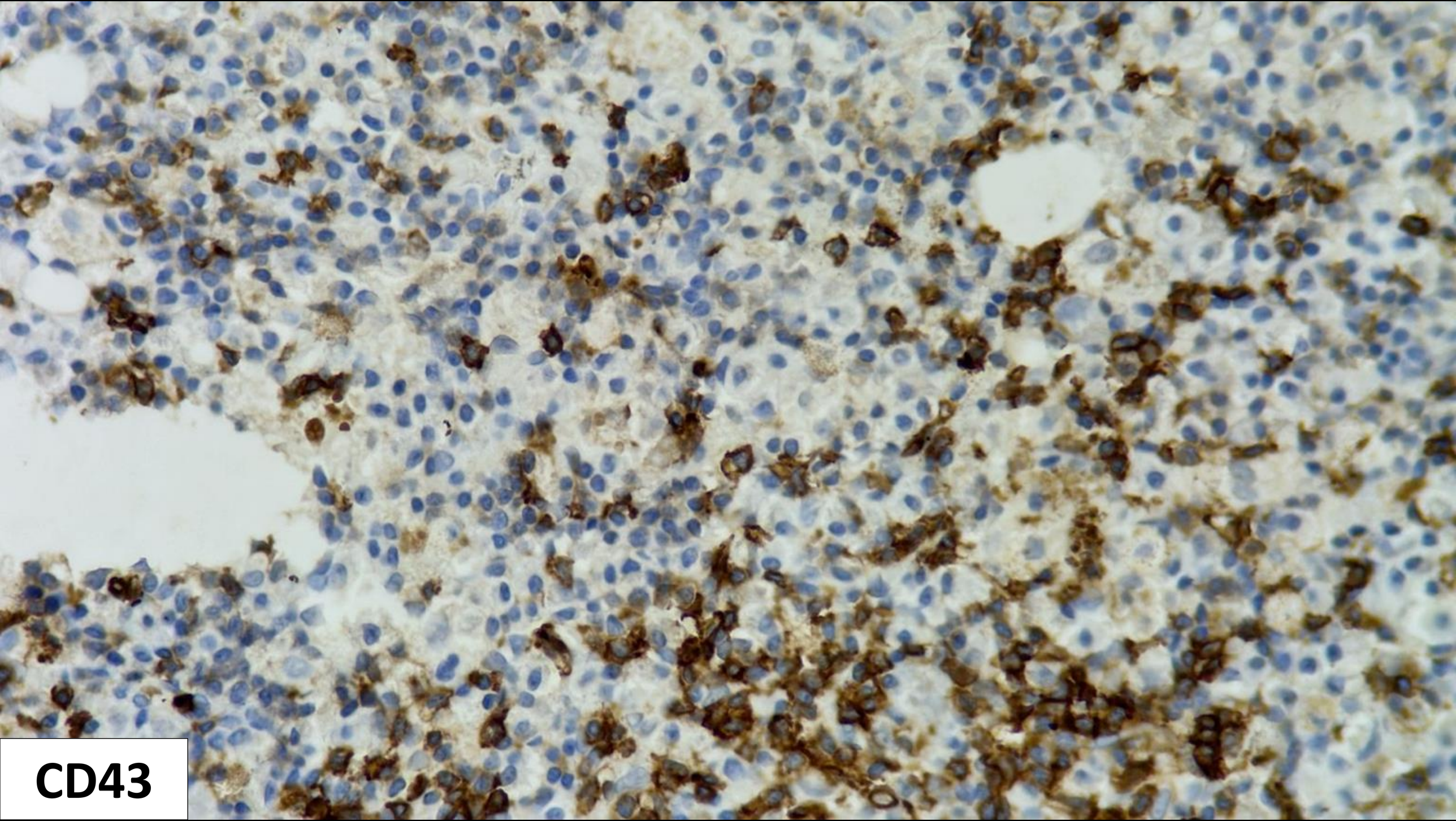

CD20


CD20


CD10 focal

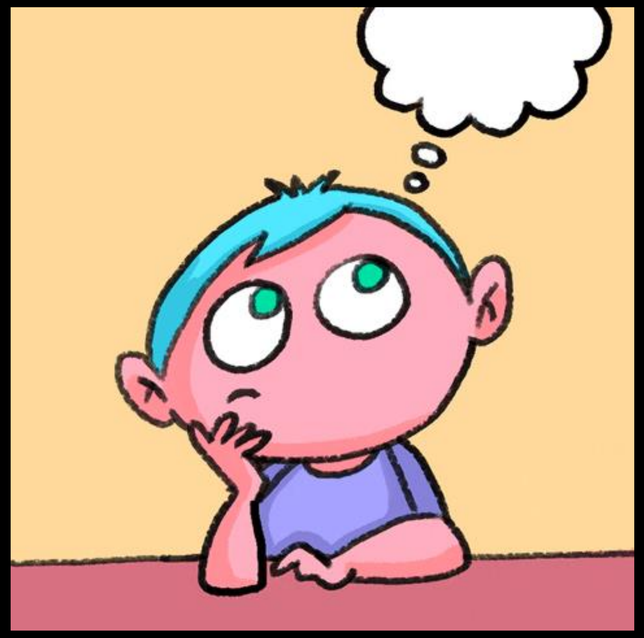

BCL 2


CD23


CD43

- Immunonegative for: CD3, CD5, SOX11, CYCLIND1, LEF1, BCL6

? Fungal ? HLM
? FNAC Smears ? review





Dx offered…

Bone Marrow Trephine Biopsy:

Marrow involved by low grade B cell lymphoma with coexisting fungal infection morphologically consistent with Histoplasmosis

Comment:

Correlation with clinical, microbiological and flow cytometric

Treatment given:
Liposomal Amphotericin induction then itraconazole.
Bendamustine Plus Rituximab chemotherapy.
Close follow up

What do we learn?

- ***H. capsulatum*** is a dimorphic fungus predominantly found in soils enriched with bird and bat excreta. Infection occurs when aerosolized micro conidia of the mold are inhaled from the environment during day-to-day activities in areas where *H. capsulatum* is highly endemic.
- Once *in vivo*; the micro conidia transform to the yeast phase and are found within histiocytes and tissues of the reticuloendothelial system.
- **The infection is self-limiting and restricted to lungs in 99% of the individuals with no preexisting immunological defects.**
- The remaining 1%, however, progress to either disseminated or chronic disease involving the lungs, liver, spleen, lymph nodes, bone marrow and sometimes the skin and mucous membranes

What do we learn?

- Interesting example of epidemiology providing decisive clues about the diagnosis
- From a **clinical standpoint,** features of histoplasmosis and low grade B cell lymphoma may overlap.
- **Constitutional symptoms** like fatigue, fever, weight loss and anorexia, and **clinical findings** including splenomegaly, hepatomegaly, pancytopenia, lymphadenopathy and bony involvement can occur in both NHL and disseminated histoplasmosis
- ***In our patient, the clinical presentation had a cumulative effect of both the diseases***
- The disseminated form of the disease usually occurs in immunocompromised individuals such as those with HIV/AIDS, hematological malignancy, solid organ transplant **but its rare in immunocompetent patient like our patient, Serologically negative**

What do we learn?

- **In immunocompetent hosts,** T lymphocytes activate macrophages to kill this fungus. However, some organs may still harbor foci of viable histoplasma capsulatum, which is controlled but not completely killed by the immune system. In this way, infection may be reactivated whenever the host faces .
- **FNAC** is cost-effective, rapid, and readily repeatable with minimal physical and psychological discomfort for initial diagnosis in superficial tissues as well as deep-seated sites, as the organism can be easily demonstrated in the smears, resulting in prompt initiation of treatment.
- In absence od serological tests, special stains for PAS and GMS confirms the presence of fungal organism and helps to differentiate from LD bodies

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Histoplasmosis: cytodiagnosis and review of literature with special emphasis on differential diagnosis on cytomorphology

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Accepted for publication 9 July 2009

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Histoplasmosis: cytodiagnosis and review of literature with special emphasis on differential diagnosis on cytomorphology

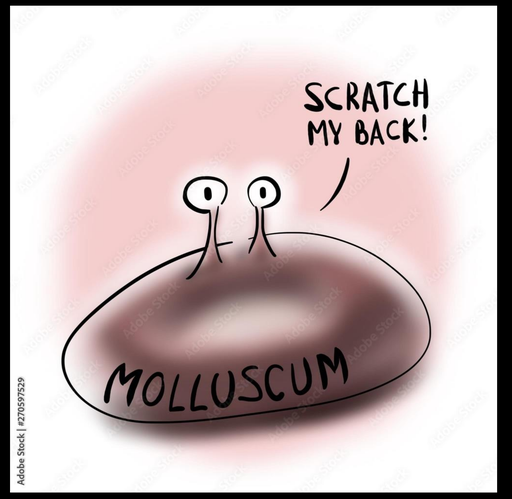
Background: Human infection with *Histoplasma capsulatum* runs the gamut from asymptomatic to disseminate disease. In immunocompromised patients, a tiny inoculum can lead to widespread disseminated infection. Ear diagnosis and initiation of treatment is therefore important.

Objective: To review the cases of histoplasmosis diagnosed on fine needle aspiration cytology (FNAC) and t discuss the clinical presentation, associated inflammatory response, load of organisms and differential diagnos on cytomorphology in these cases.

Methods: Retrospective review of seven cases of histoplasmosis at a tertiary-care centre during the period fro



Infectious Diseases: Rare Cases 2

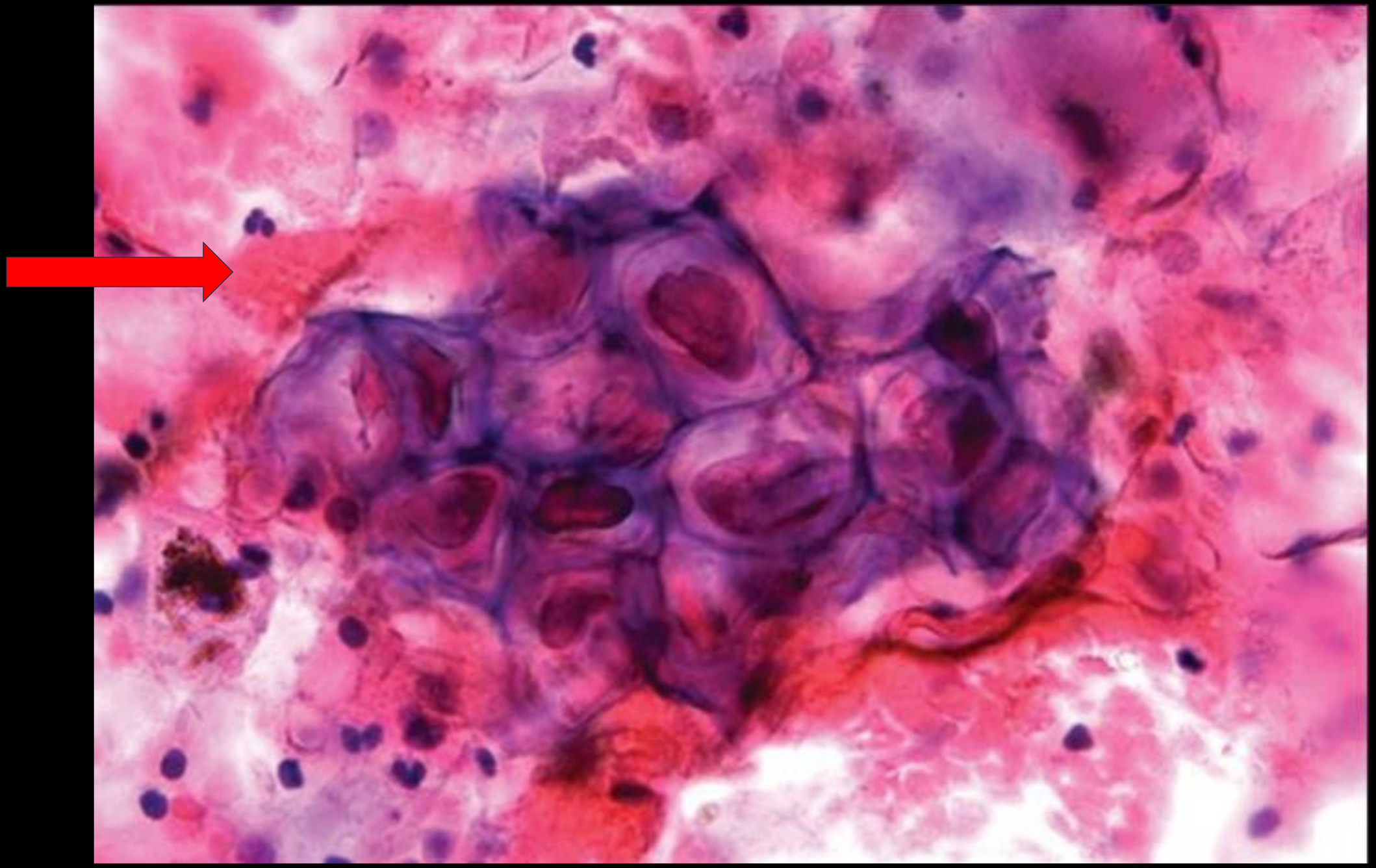


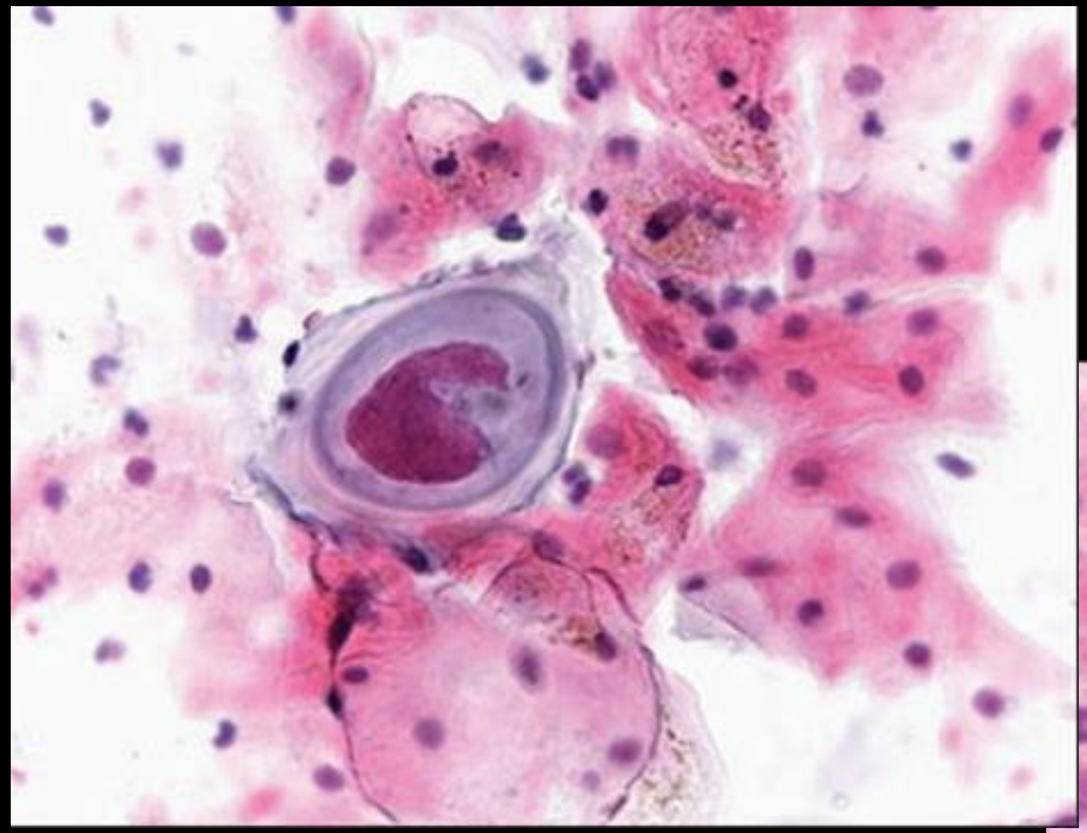
44-years male presented with neck and laryngeal lesion

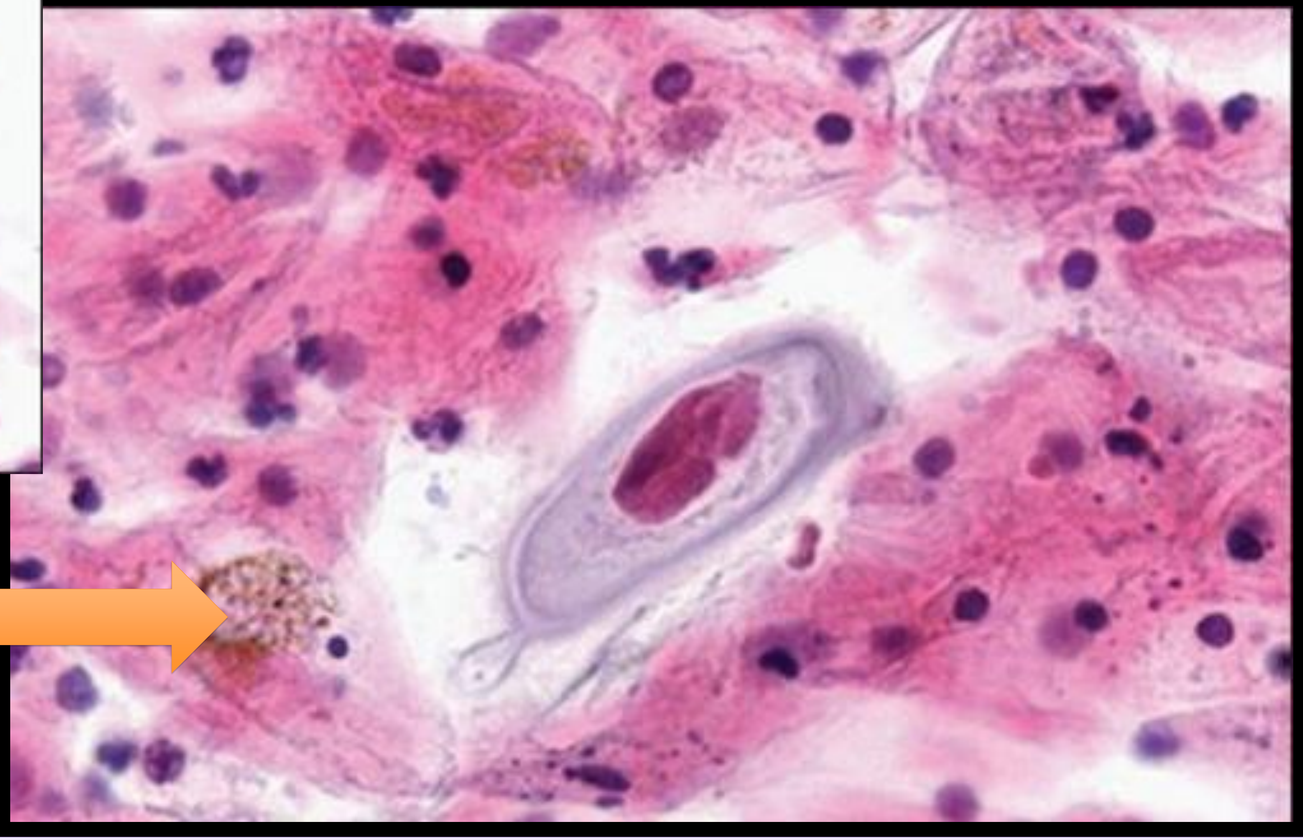
MRI: Ill-defined lobulated mildly enhancing soft tissue lesion involving anterior commissure and anterior 3rd of right and left vocal cord measuring 8 mm in thickness and 1.5 cm in AP length causing partial luminal compromise

- **Neck FNAC and laryngeal biopsy was performed**



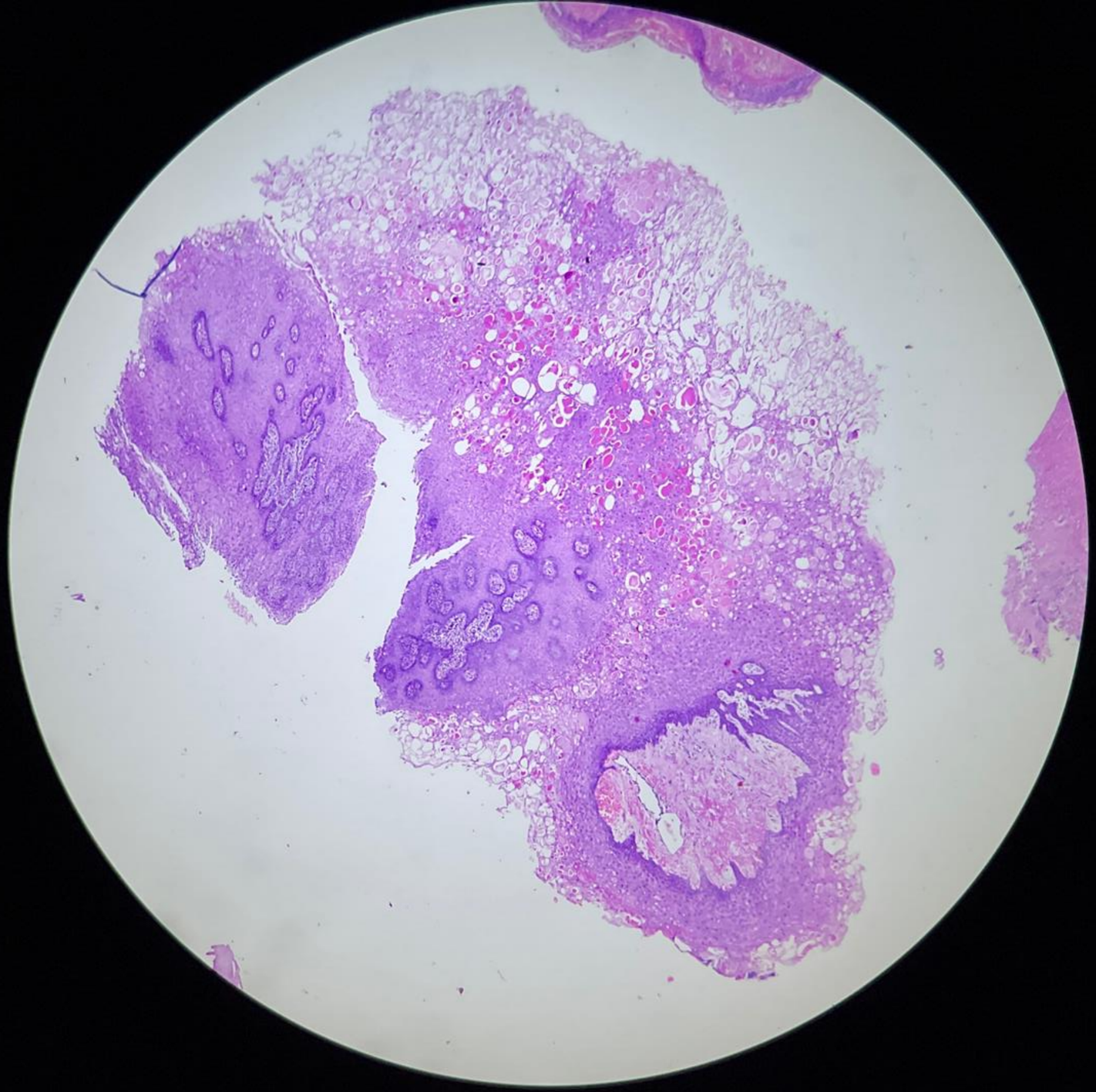


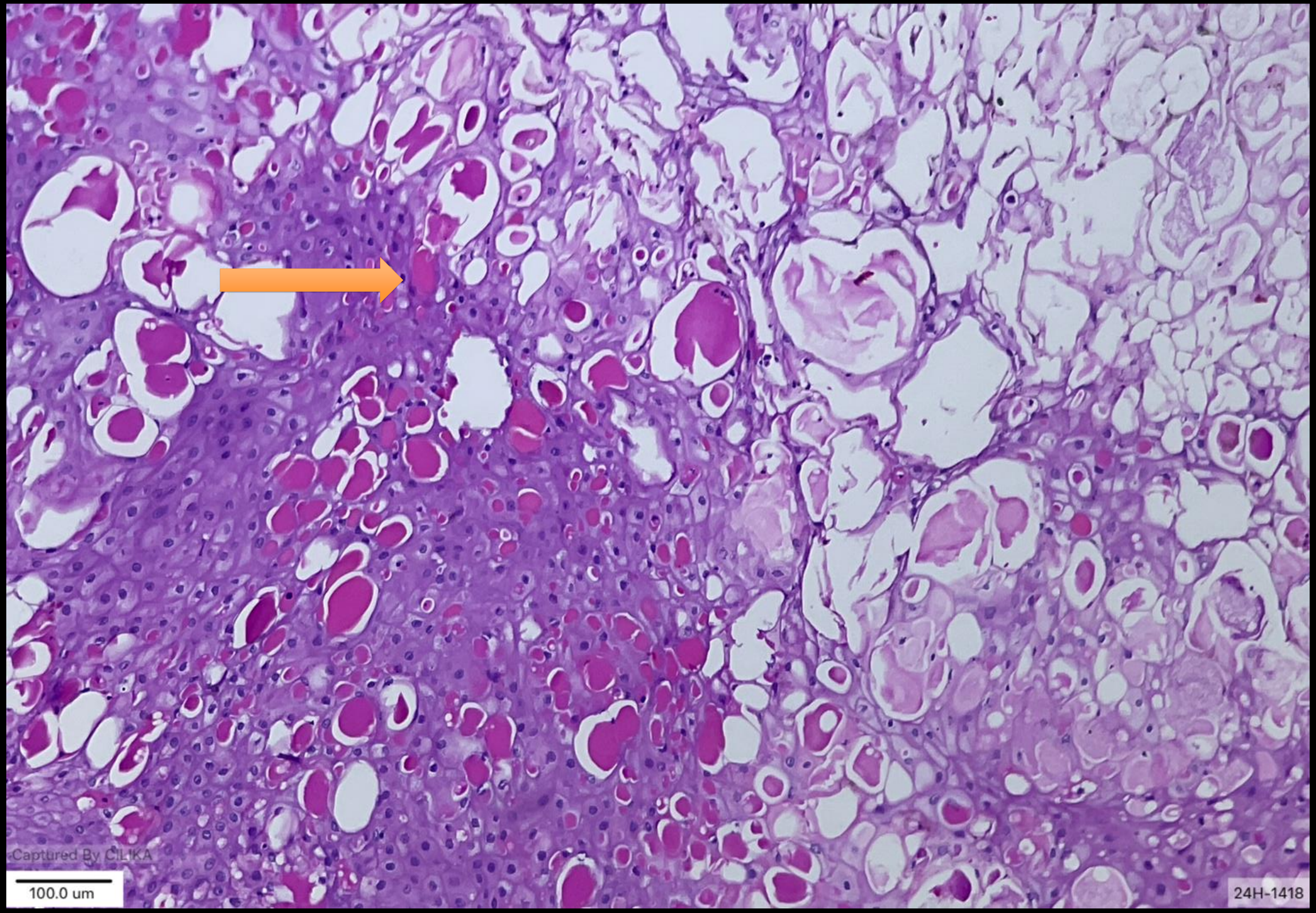


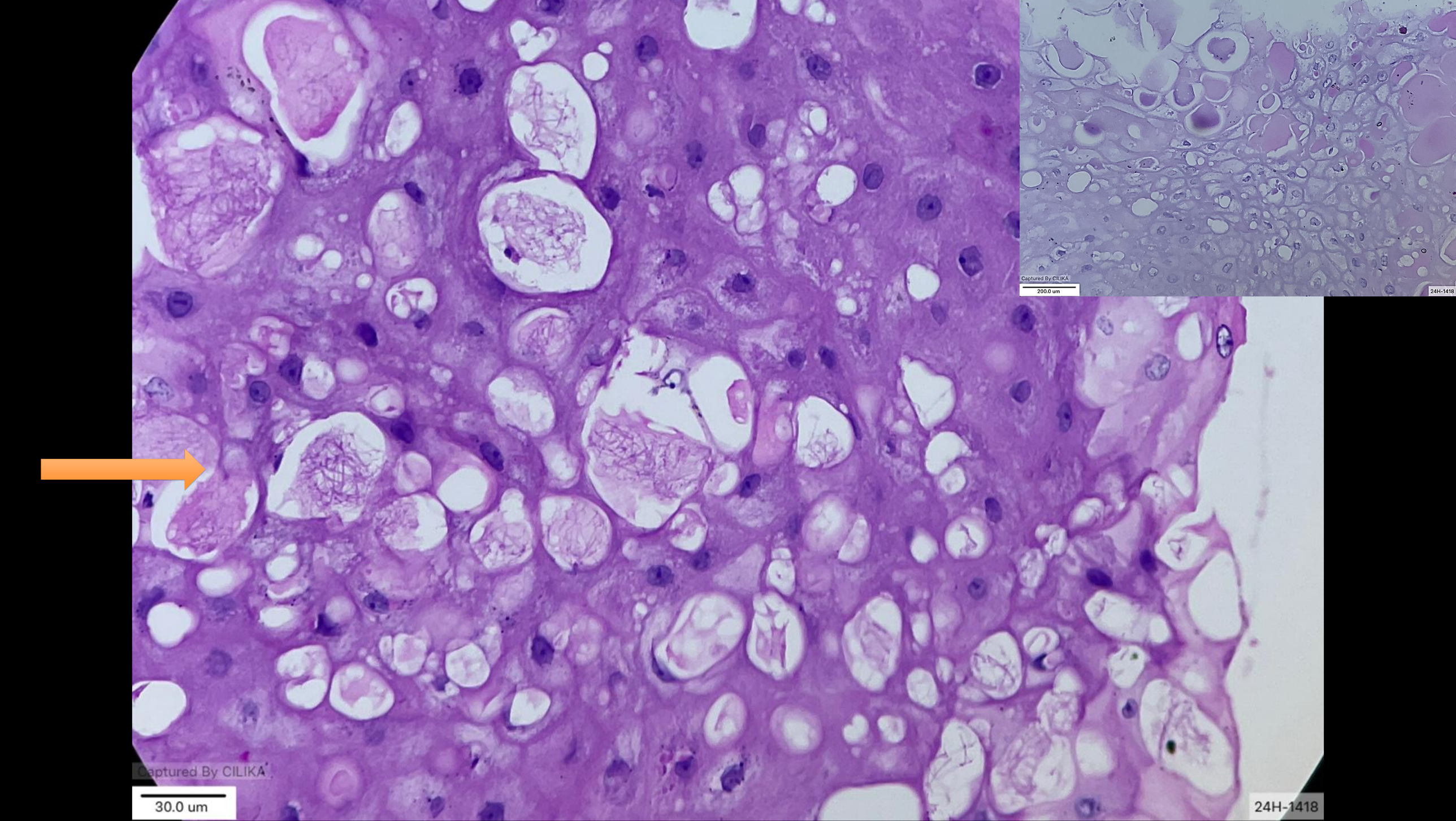


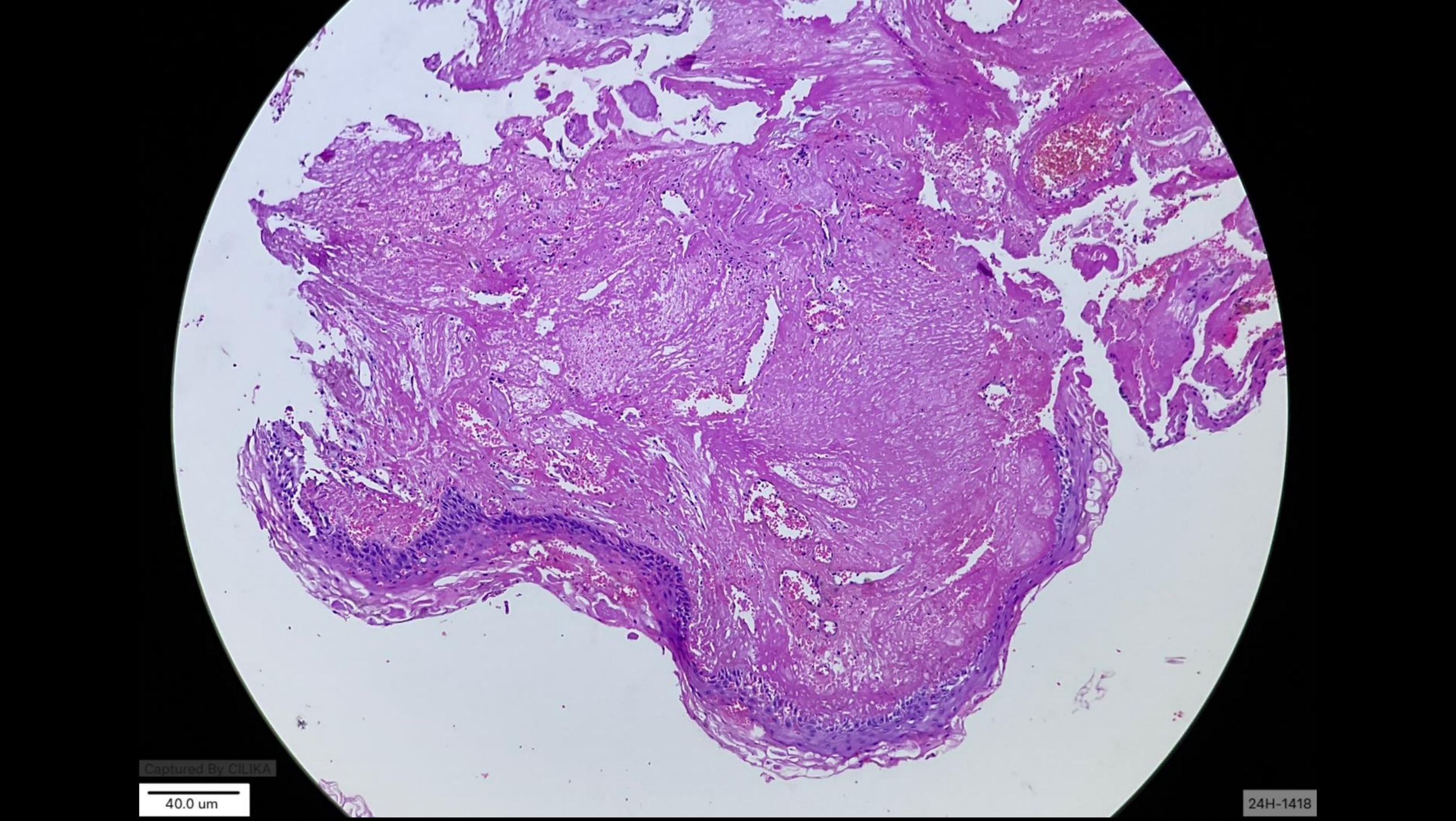
Final impression:

Right neck lesion FNAC: Molluscum Contagiosum.


Captured By CILIKA
600.0 um
24H-1418


Captured By CILIKA
100.0 um
24H-1418


Captured By CILIKA
200.0 um
24H-1418
Captured By CILIKA
30.0 um
24H-1418


Captured By CILIKA
40.0 um
24H-1418



Features are in keeping with the Molluscum contagiosum involving larynx.

What do we learn?

MC is caused by a virus Molluscum contagiosum virus which is a member of the family Poxviridae **(genus Mollusci- poxvirus)**.

- Spread is mainly by direct skin-to-skin contact, and occurs predominantly in children, adolescents, sexually active adults, in individuals with impaired cellular immunity and in association with HIV and HPV infections.
- In immunocompetent hosts, MC is a benign, self-limited skin infection.

What do we learn?

- However, in patients with underlying immune dysregulation, which is characterized by a **T helper 2 (Th2) cytokine** switching pattern within the skin, the lesions may be more diffuse, remain for longer periods of time, and may be more resistant to therapy.
- This most probably re-flects the local deficits in cellular immune reactions within the skin, which are mediated primarily by a T helper 1 (Th1) cytokine pattern.

What do we learn?

- Non sexual transmission in healthy adults has been reported and typically occurs at a site of trauma or other cutaneous injury.
- **Predilection**: Head and neck, flexural areas, genital areas
- Molluscum bodies is pathognomonic, allowing appropriate management of lesion without the need of a biopsy or any other investigation
- **Cytology is rapid, non invasive tool in the diagnosis of MC**
- Useful in patient with an unusual presentation

EFCS
European Federation of Cytology Societies

Deutsche Gesellschaft für Zytologie 1960



ECC 2024

45th European Congress of Cytology

Cytopathology
The clinical interface

Leipzig

23-26 June 2024

Tuberculosis an Unremediable Malady in the Indian Subcontinent - Special Focus on Central India

Dr. Sudha Iyengar
Professor and Head
Department of Pathology
Gajra Raja Medical College,
Gwalior, MP,
India

- India has one of the highest burdens of TB in the world.
- The prevalence of TB in India is influenced by various factors including

1.population density

2.poverty, malnutrition

3.inadequate healthcare infrastructure

4.high rates of HIV co-infection in some regions.

According to data from the World Health Organization (WHO) and India's National Tuberculosis Elimination Program (NTEP), in 2020, India accounted for around 26% of the global TB cases.

The estimated incidence rate of TB in India was approximately 193 cases per 100,000 population, and the prevalence rate was around 247 cases per 100,000 population

States affected by TB 2024 report

- The region comprising Punjab, Haryana, Himachal Pradesh and Chandigarh witnessed a rise in cases between 2020 and 2023.

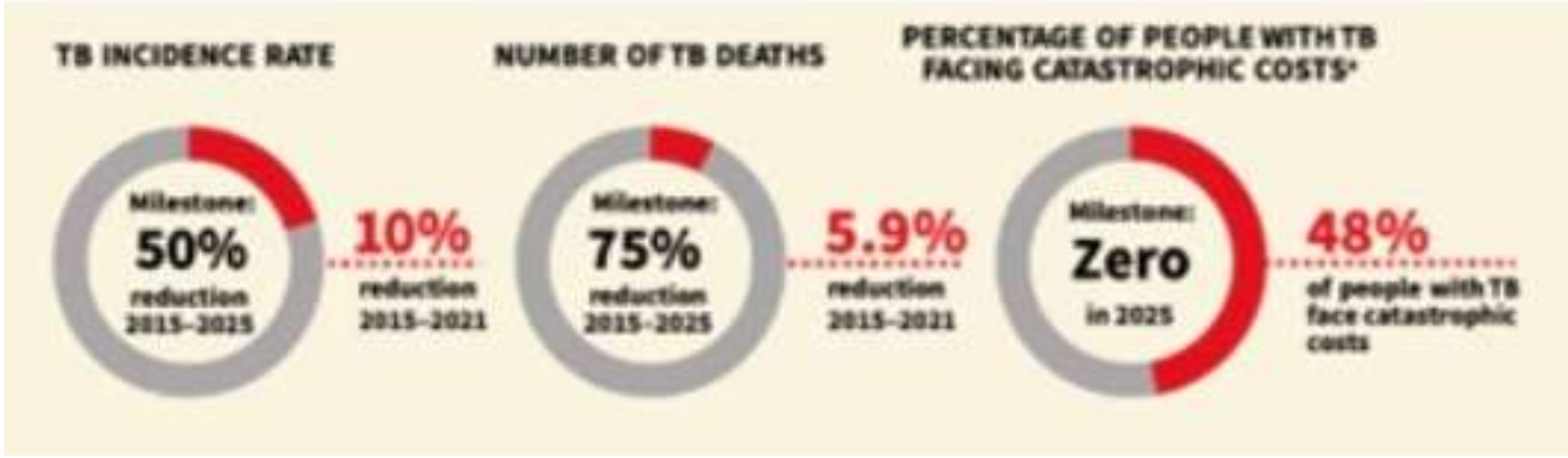
Status of tuberculosis in M.P

- According to the data of 2023 Madhya Pradesh (MP) reported highest no of TB cases and remain second in the country behind only to Jharkhand .

Highlights of Tuberculosis status(2023)

Estimated	Global	India
Incidence	99,00,000 (127/ lakh)	25,90,000 (188/ lakh)
Deaths (excluding HIV)	12,80,000 (17/ lakh)	4,93000 (36/ lakh)
HIV TB cases	7,87,000 (10/ lakh)	53,000 (3.8/ lakh)
HIV TB deaths	2,14,000 (2.7/ lakh)	11,000 (0.78/ lakh)

WHO End TB Strategy: 2025 milestones



TB infection (latent TB)- An individual can have TB bacteria in their body and never develop symptoms. In most people, the immune system can contain the bacteria so that they do not replicate and cause disease. In this case, a person will have TB infection but not active disease.

TB disease (active TB)

- The body may be unable to contain TB bacteria. This is more common when the immune system is weakened due to illness or the use of certain medications.
- When this happens, the bacteria can replicate and cause symptoms, resulting in active TB. People with active TB can spread the infection.

Types

1. Pulmonary Tuberculosis –

- it is the form of disease that develops in a previously unexposed and therefore unsensitized person.

2. Secondary tuberculosis

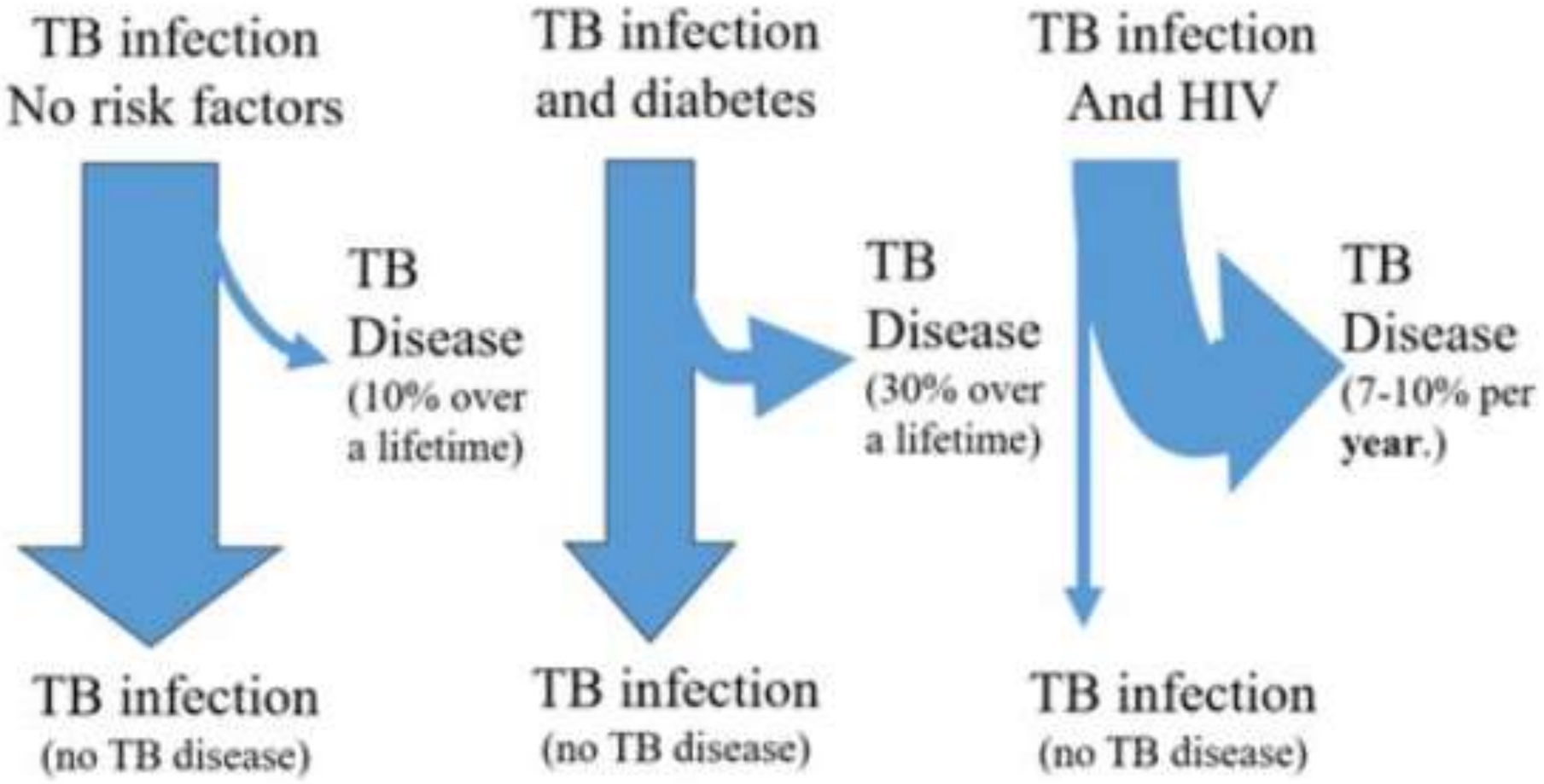
•This pattern of disease arises in previously sensitized host.

•It may follow shortly after primary tuberculosis, but more commonly appears after month to years

•It classically involves the apex of the upper lobe of one or both lungs.

•Usually occurs when host resistance is weakened or reactivation of latent infection.

TB Pathogenesis - Progression to TB disease



Tuberculosis (TB) primarily affects the lungs, but it can also infect other organs and parts of the body. When TB bacteria spread beyond the lungs, it's known as **extrapulmonary tuberculosis.**

1) Lungs: Pulmonary tuberculosis is the most common form of TB, where the infection primarily affects the lungs.

2) Lymph nodes: TB can infect the lymph nodes, particularly those in the neck (cervical lymphadenitis), causing swelling and tenderness.

3**) Spine**: TB can infect the vertebrae, leading to a condition called spinal tuberculosis or Pott's disease.

4) Brain and meninges: Tubercular meningitis occurs when TB bacteria infect the membranes surrounding the brain and spinal cord.

Tubercular bacilli can spread to the brain hematogenouly and cause **tuberculomas, brain abscess and encephalopathy.**

5) Genitourinary system: TB can affect the kidneys, leading to renal tuberculosis, which may cause blood in the urine, flank pain, and urinary symptoms. It can also affect the reproductive organs, such as the testes or uterus.

6) Bones and joints: TB can infect bones and joints, causing symptoms such as joint pain, swelling, and limited mobility. It commonly affects weight-bearing joints such as the hips and knees.

7**) Abdominal organs**: TB can infect organs in the abdomen, such as the liver, spleen, and intestines.

8**) Skin**: Cutaneous tuberculosis can occur when TB bacteria enter the skin through cuts, wounds, or injections.

9) Heart: TB can rarely affect the heart, leading to conditions such as pericarditis or myocarditis.

Risk factor for tuberculosis as follows:-

- The risk of progression from exposure to the tuberculosis bacilli to the development of active disease is a two-stage process
  - governed by both exogenous
  - and endogenous risk factors.
- Exogenous factors play a key role in accentuating the progression from exposure to infection among which the bacillary load in the sputum and the proximity of an individual to an infectious TB case are key factors.

Similarly endogenous factors lead in progression from infection to active TB disease and these are as follows: -

1. Along with well-established risk factors
   - human immunodeficiency virus (HIV)
   - Malnutrition
   - Young age

   Emerging variables such as
   - Diabetes
   - Indoor air pollution
   - Alcohol
   - Use of immunosuppressive drugs
   - Tobacco smoke

   play a significant role at both the individual and population level.

2. Socioeconomic and behavioral factors are also shown to increase the susceptibility to infection.

3. Specific groups such as health care workers and indigenous population are also at an increased risk of TB infection and disease.

4. Health system issues such as the effects of delay in diagnosis of TB in the transmission of the bacilli.

Factors responsible for TB

(a) Bacillary Load -Epidemiological studies shown that smear positive cases are more infectious than the others

- An untreated sputum positive patient can infect approximately 10 individuals per year, and each smear positive case can lead to two new cases of TB, at least one of which will be infectious

(b) Proximity to an Infectious Case -Close contacts of infectious TB cases including household contacts and care givers/health care workers are at a higher risk of becoming infected with *Mycobacterium tuberculosis* and development of primary active tuberculosis.

(c) Socioeconomic and Behavioural Factors -People with low SES are exposed to several risk factors discussed above (including malnutrition, indoor air pollution, alcohol, etc.) which increases their risk for TB. People with lower SES have a higher likelihood of being exposed to crowded, less ventilated places and have limited safe cooking practicing facilities.

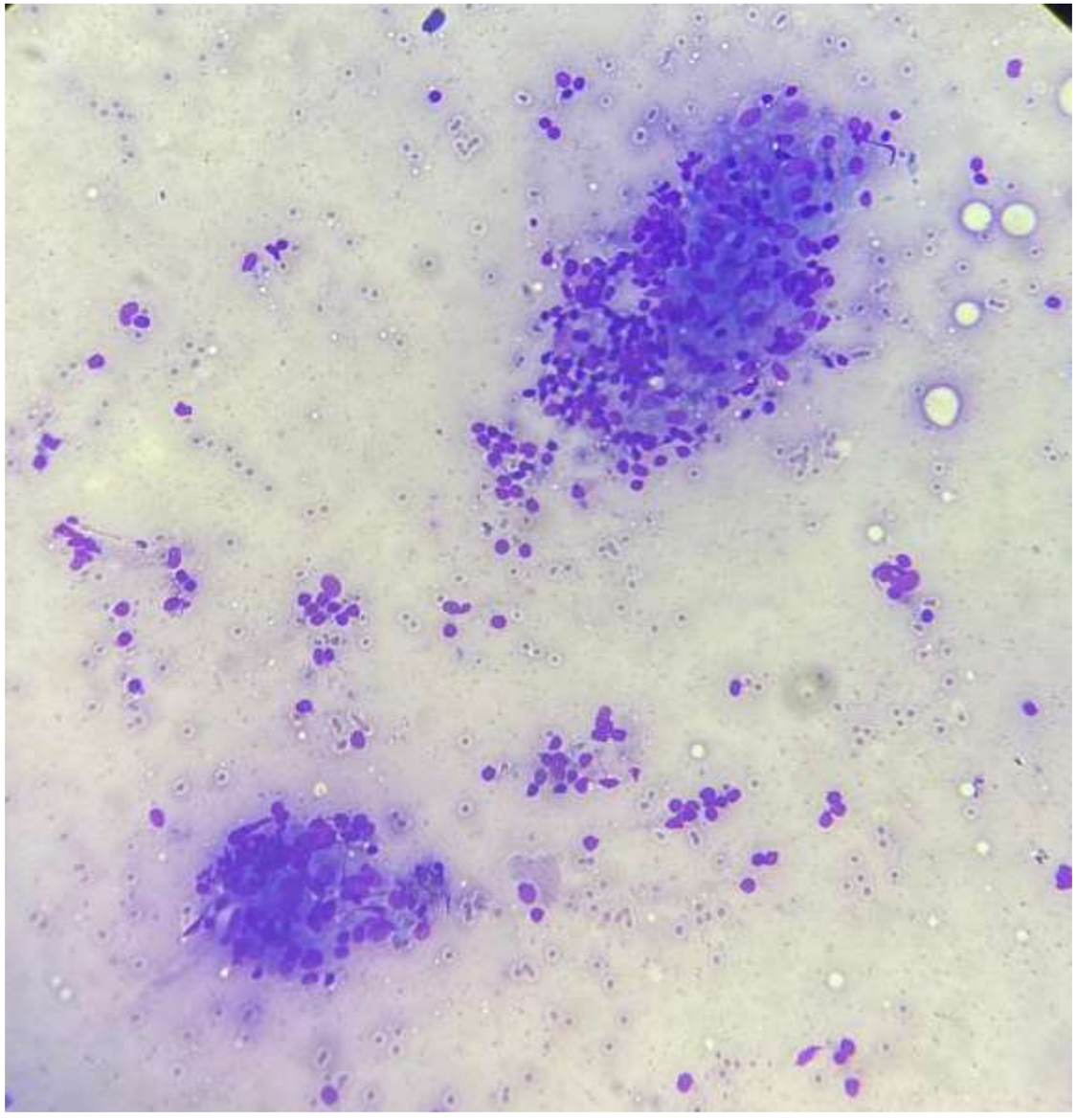
(d) Diabetes -Diabetes has been shown to increase the risk of active TB disease . It is estimated that currently 70% of people with diabetes live in low- and middle-income countries.

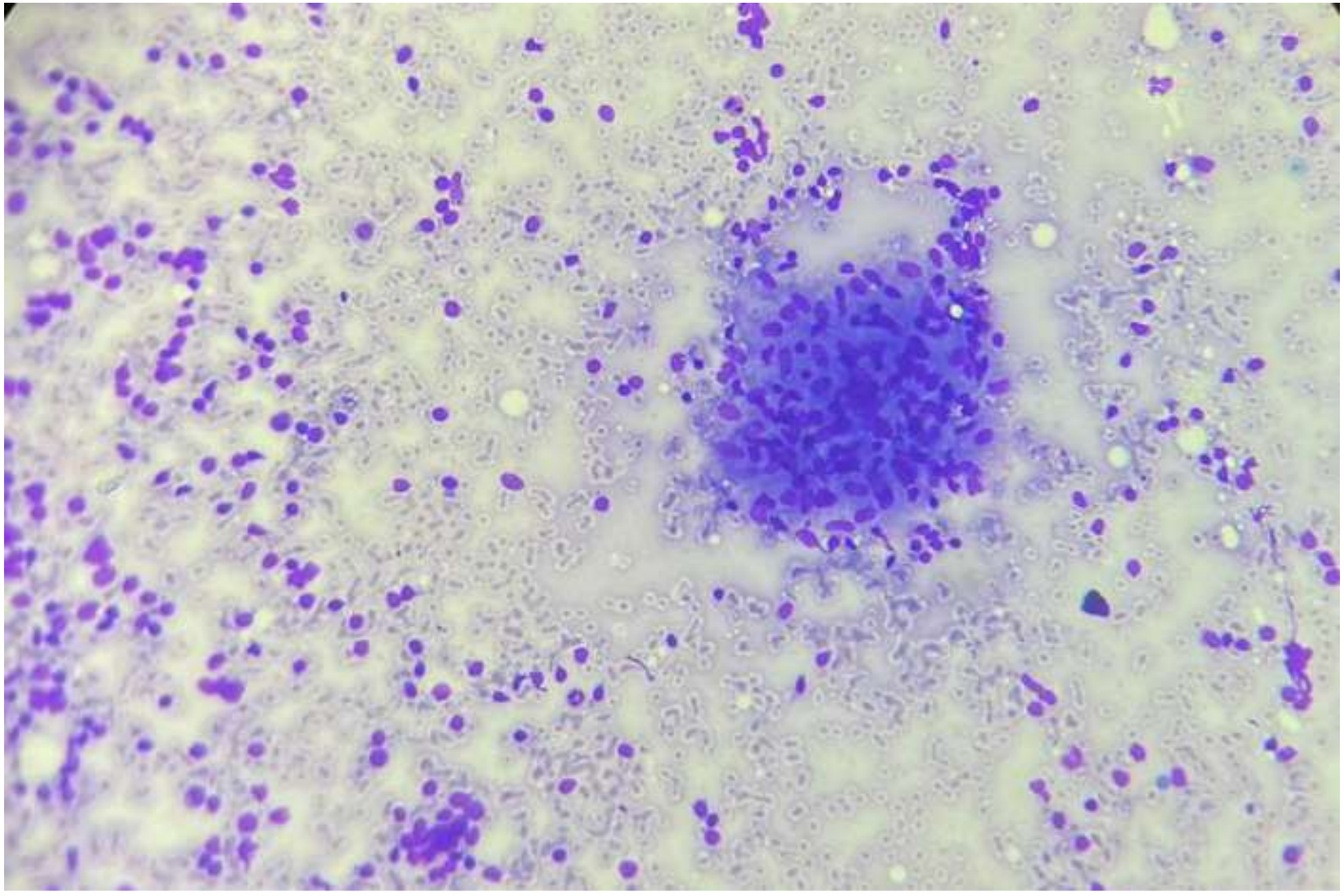
(e) Immunosuppressive Conditions- HIV coinfection is the most potent immuno-suppressive risk factor for developing active TB disease

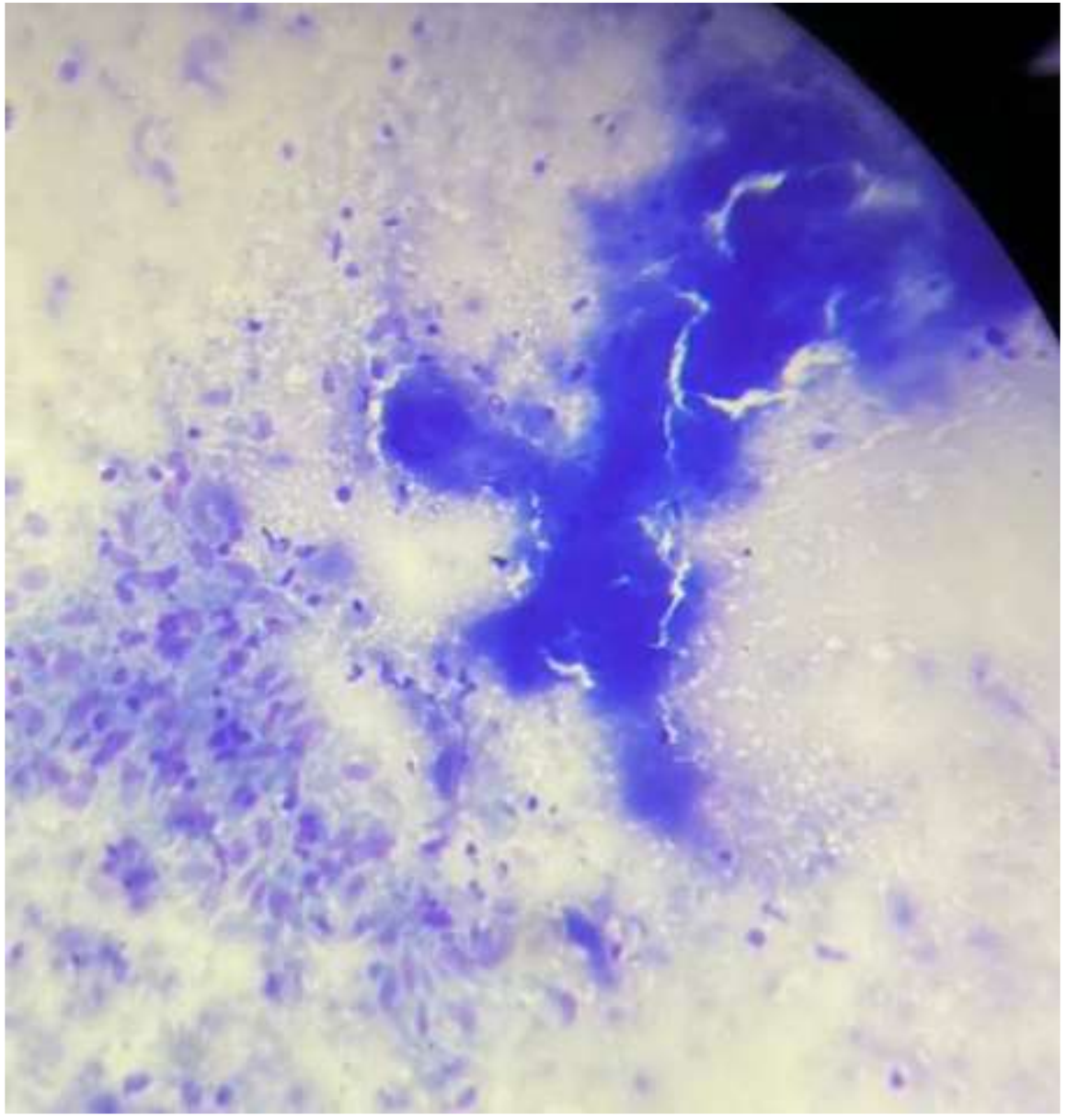
- HIV coinfection greatly increases the chances of reactivation of latent infection of TB and increases the rapid TB progression following primary infection or reinfection with TB

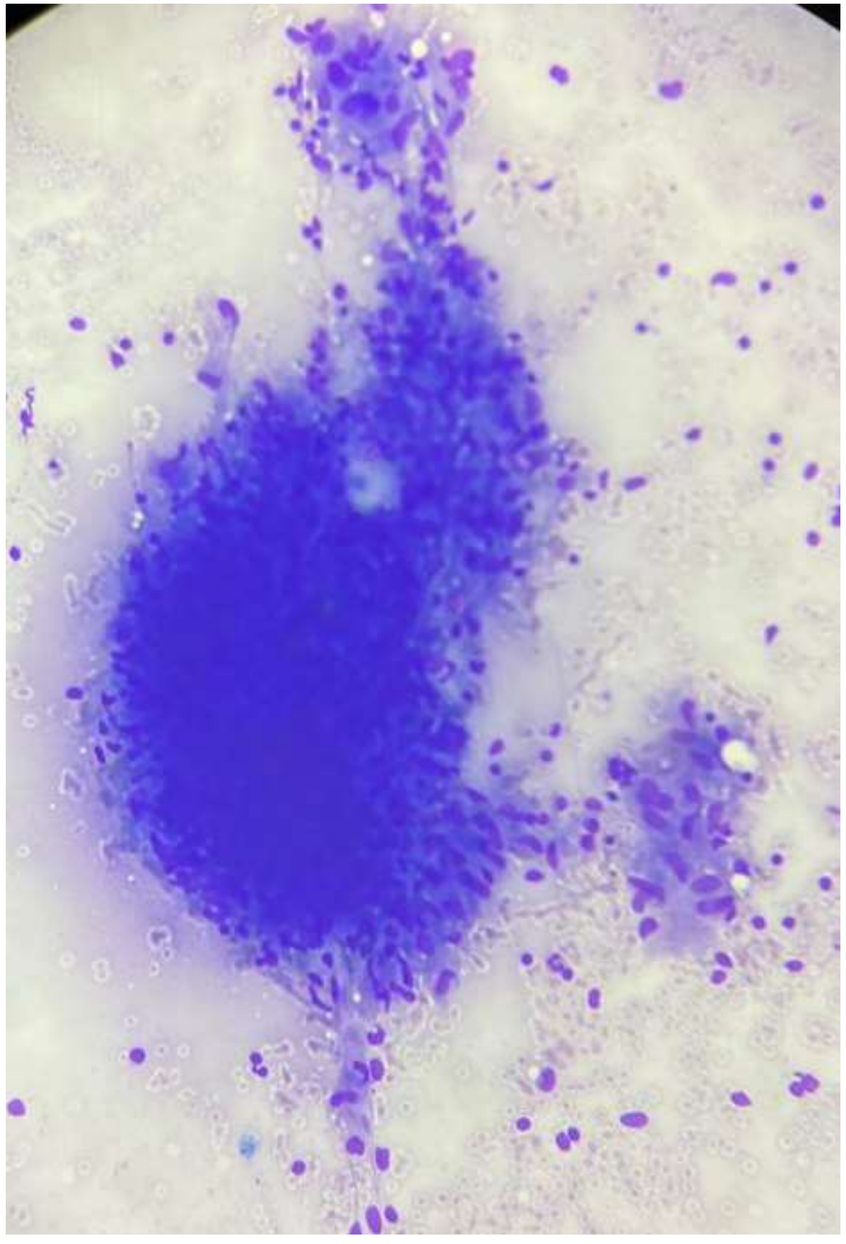
(e) Malnutrition- TB disease can itself lead to malnourishment because of decreasing appetite and changes in metabolic processes

(f) Health System Issues- Health system issues such as delays in diagnosis and treatment, increase the duration in which active cases are infectious, thereby sustaining TB transmission..



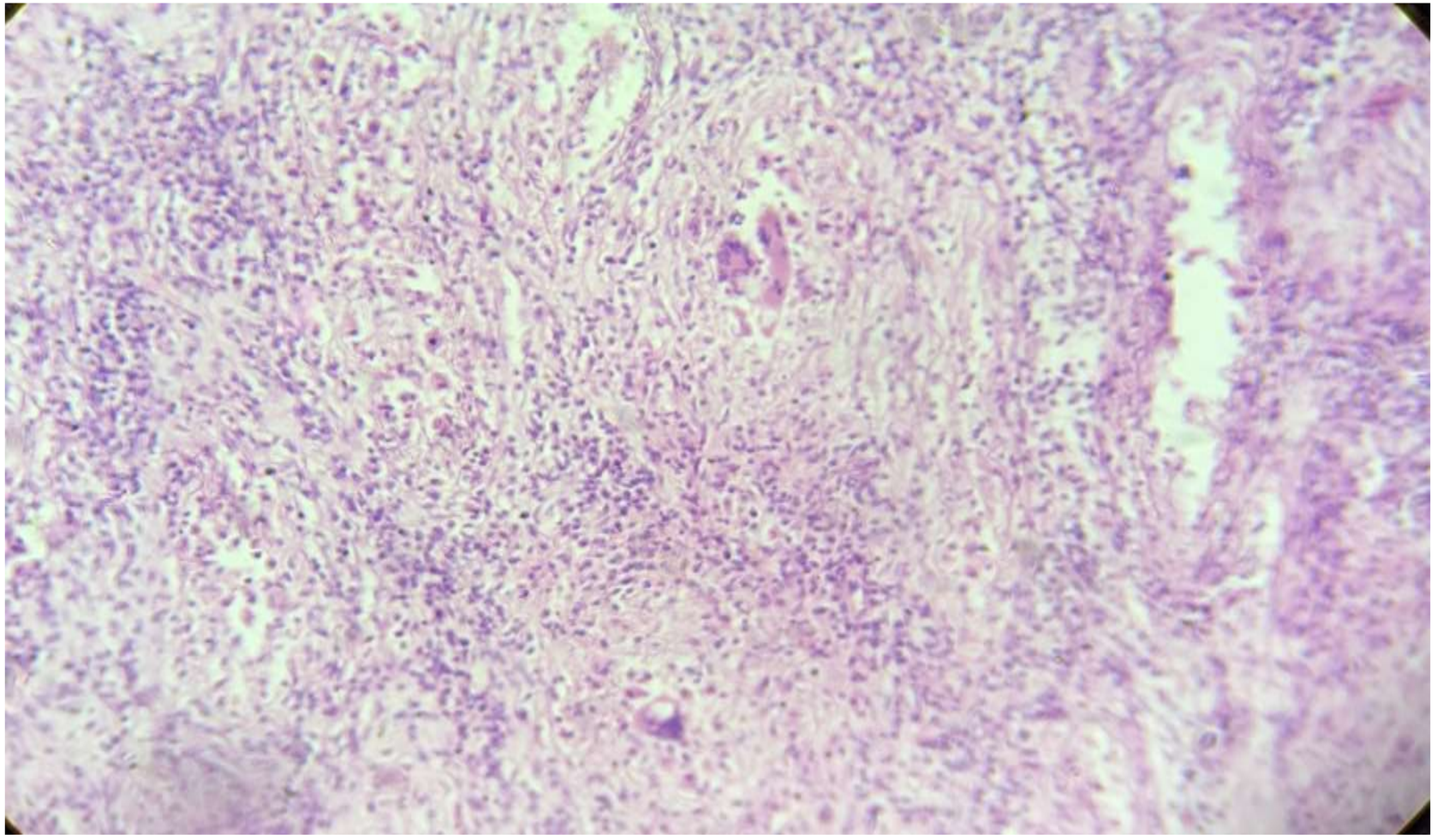




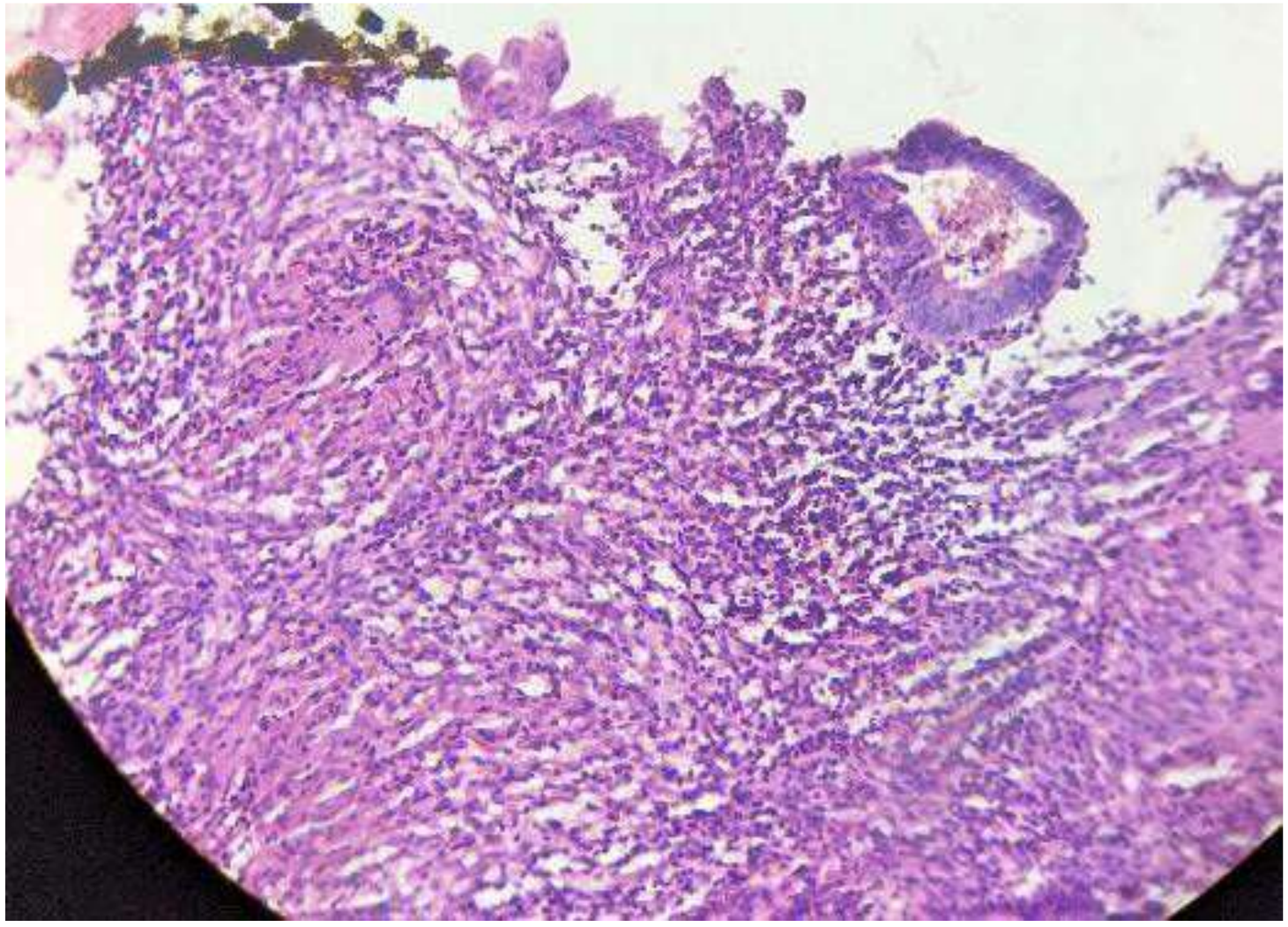




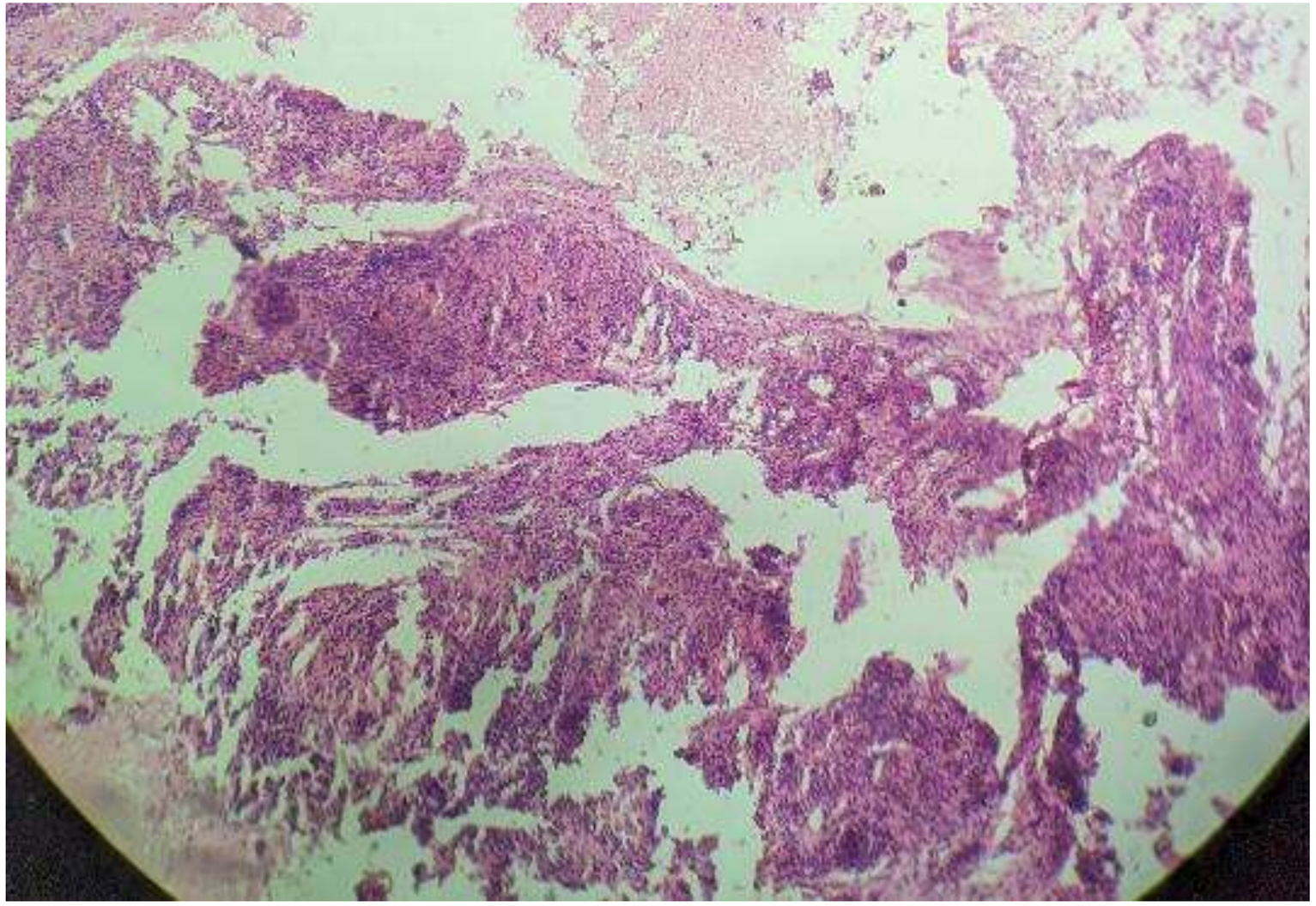
Tubercular orchitis



Intestinal tuberculosis



Tubercular Arthritis



Conclusion

1. Screening for TB (to diagnose latent TB infection) and prophylactic therapy remain the most important tools to reduce the risk of progression to TB disease among high risk individuals (close contacts, HIV infected individuals, health care workers, etc.).

2. HIV coinfection is the most important and potent risk factor for TB infection and disease. Interventions such as early HIV counselling and screening for TB patients and early diagnosis and initiation of antiretroviral therapy (ART).

3. In endemic countries, diagnosis and treatment (through DOTS-Directly Observed Therapy Short course) of smear-positive cases remains the key to TB control by reducing transmission from infectious cases.

4. Malnutrition and indoor air pollution are recognized risk factors which are confounded with the socioeconomic status of a setting.

THANK YOU