TNPCIAPM Newsletter

TN and Pondicherry Chapter of Indian Association of Pathologist and microbiologist

Issue: 3

Jan - July 2023

Office bearers

President:
Dr.Sandhya Sundaram
Vice President
Dr.R.Padmavathi
Secretary
Dr.Chandramouleeswari.K
Joint Secretary
Dr.A.Saragan
Advisor
Dr.B.H.Srinivas
Treasurer
Dr.TelefloBhoopathy
Joint Treasurer
Dr.G.Veeraraghavan
Advisory Board
Dr.S.Seethalakshmi
Dr.A.V.Shanthi
Dr.EzhilvizhiAlavandar
Dr.S.Rajendiran
Dr.Srinivasa Kannan
Dr.Swaminathan

Zone heads

Dr. Bharathi Vidhya Jayanthi
Dr. Geetha Chacko
Dr. Sujatha J
Dr. Ramesh
Dr. Suresh Durai
Dr. Renu G'Boy Varghese

REPORT ON PAST EVENTS ORGANIZED UNDER TNPCIAPM

It is my great pleasure and order to address you as the honorary secretory of the Tamilnadu and Pondicherry chapter of IAPM. The tenure of we three, the President Dr. Sandya Sundaram, Secretary Dr.K. Chandramouleeswari and the treasurer Dr. Tele Flo started in the month of July 2021 when we three took over the office with humble feelings and great respect to our previous office bearers after a formal election by the then execute Committee members. Dr.BH Srinivas was elected as the advisor.

We sincerely expressed our thanks to the past president and secretary, Dr. Aruna Latha and Dr.Padmavathi for awakening the association from an interim slumber and reviving it. The work began in full swing after that. We started attending the IAPM Meeting within 2 days of taking the posts. The zones which were created by the previous team dividing the state medical colleges into different groups to enable better cooperation and contribution was continued. Active representatives were chosen from each zone and an executive community was constituted a fresh with by 23 members. Advisory board also was created comprising of 6 members with Dr. BH Srinivas as the chief advisor. Dr. Tele Flo who took the post as treasurer got down to work and drafted membership programmes increasing the membership with a huge leap by an immediate 100 more members within 2 months' time. A team for newsletter was created under the stewardship of Dr. Renu and Dr. Barathi Vidya Jayanthi created a dynamic team which brought out the first and foremost Newsletter of the association.

CME programmes were organised all over the state under the aegis of the TNPCIAPM amounting to nearly 40 in the past 2 years. All of them were compiled efficiently and posted on the website by Dr.Priyadharshini and posted to the National Chapter by Dr. B.H. Srinivas. The numbers of academic programmes rose exponentially and the popularity of the Tamilnadu chapter rose correspondingly in the IAPM to the extent that we were named as the most active State chapter after Karnataka chapter. The yearly event, TAPCON 2022, was organised by the Tirunelveli Medical College successfully followed by CMC Vellore wanting to take up the mantle for 2023. To top it all, the prestigious Dr.Panchanadam Madanagopalan Oration was delivered by Dr. Kanchana last year. The year, Dr.Elilvizhi Alavandars name has been proposed for the same.

TNPCIAPM Newsletter

TN and Pondicherry Chapter of Indian Association of Pathologist and microbiologist

All work and no play, makes Jack a dull boy**.** Hence a thanks giving was organised in the Hotel Ramada with fun time over lunch for all the members in February 2023. Following this in the March, a cancer awareness Marathon was also conducted eventfully with fun and fanfare at the Elliots beach, Besant Nagar by Dr. Kala, Dr. Lexmipriya and her team. It received appreciation with participation from members all over including seniors and students. The happiness there was palpable and camaraderie shared by the Pathologists was evident for everyone to see.

And the work keeps continuing still with the cooperation from all the members of our Dear Association and I am sure it will given the enthusiasm displayed at every juncture by our Fellow Pathologists. This newsletter which comes just before TAPCON 2023 meets and greets you all with a big thank you for all the contributions made and the most endearing heart felt welcome to the TAPCON 2023 CMC Vellore chapter.

Dr.K. Chandramouleeswari
SECRETARY
TNPCIAPM

TNPCIAPM Newsletter

TN and Pondicherry Chapter of Indian Association of Pathologist and microbiologist

UPCOMING EVENTS TO BE ORGANIZED UNDER TNPCIAPM

July 2023

ANNUAL CONFERENCE OF TNPC-IAPM

DEPARTMENT OF GENERAL PATHOLOGY AND DEPARTMENT OF TRANSFUSION MEDICINE AND IMMUNOHAEMATOLOGY

TAPCON 2023

20TH TO 22ND JULY 2023

PRE CONFERENCE WORKSHOP
20TH JULY 2023
(FISH/ PCR/ TRANSPLANT IMMUNOLOGY/ COAGULATION)

CONFERENCE
21ST & 22ND JULY

HOST: CHRISTIAN MEDICAL COLLEGE, VELLORE
EMAIL: admin@tapcon2023.in

TIME	20 JULY 2023 : PRE CONFERENCE WORKSHOP	VENUE
9:00 TO 5:00 PM	FISH WORKSHOP	JACOB CHANDY HALL, PAUL BRAND BUILDING
	PCR WORKSHOP	DEPARTMENT OF PATHOLOGY, ASHA BUILDING THIRD FLOOR
	COAGULATION WORKSHOP	SEMINAR ROOM, SECOND FLOOR, ASHA BUILDING
	HLA WORKSHOP	CK JOB HALL, PAUL BRAND BUILDING
	21 JULY 2023- DAY 1	
TIME	EVENT	
7:30TO 8:50 AM	REGISTRATION	
8:50 TO 9:00 AM	PRAYER AND INAUGURATION	
9:00 TO 9: 50 AM	PRESIDENTIAL ORATION	
9: 50 TO 10:00 AM	COFFEE BREAK	
	SESSION 1: UROPATHOLOGY	
TIME	TOPIC	FACULTY
10:00 TO 10: 50 AM	CRIBRIFORM LESIONS OF PROSTATE	DR. VIKRAM RAJ G
10: 50 TO 11:00 AM	RECENT WHO UPDATES IN RENAL CELL CARCINOMA	DR. SANDHYA SUNDARAM
11:00 TO 11:50 AM	INTERESTING CASES (4 IN NUMBER)	DR.K VALARMATHI/ DR. SHEBA JACOB DR. HEMANTH KUMAR R/ DR. SHIVASHANGARI
	SESSION 2: HAEMOCYTOMORPHOMETRY	
11:50 TO 11:50 AM	WHAT IS HAEMOCYTOMORPHOMETRY? - BRINGING SPECIFICS IN NATURE INTO CELL COUNTING	DR. SUKESH C NAIR
11:50 TO 12:10 PM	MANAGEMENT OF ANAEMIA AND THROMBOCYTOPENIA ARE MORE RELIABLE USING CELL COUNTER DATA THAN SMEAR	DR. NITTY S MATHEWS
12:10 TO 12: 50 PM	CAN CELL COUNTER PATTERNS AND ITS OBJECTIVE MEASURES BE BETTER THAN INFECTIOUS DISEASE SEROLOGY FOR ACUTE FEBRILE ILLNESS?	DR. JOY MAMMEN
12:50 TO 1:00 PM	CASES FOR DISCUSSION	
1:00 TO 2:00 PM	LUNCH AND POSTER PRESENTATION	
2:00 TO 3:00 PM	FREE PAPERS	
3:00 TO 3:50 PM	TEA	
	SESSION 3: HAEMATOPATHOLOGY	
3:50 TO 4:00 PM	APPROACH TO LYMPHOMAS	DR. ELANTHENRAL S
4:00 TO 4:50 PM	INTERESTING CASES (4 IN NUMBER)	DR.S. SHANTHAKUMARI/DR. KANCHAN MURHEKAR/ DR. SANTHOSH R/ DR. NIRMAL D
4:50 TO 5:00 PM	LYMPHOMA DIAGNOSIS FOR THE CLINICALLY ALIGNED PATHOLOGIST: LESSONS LEARNT FROM LYMPHOMA ONCOLOGY	DR. GIREESH VENKATARAMAN
5:00 TO 6:00 PM	QUIZ-"COGNITAIRE 2023'	DR. R THAMILSELVI/ DR. KALAIVANI/ DR. ESWARI/ DR. VENKATRAGHAVAN/ DR SARA GRACE PRIYADHARSHINI
6:00 TO 7:00 PM	GENERAL BODY MEETING	
7:30 PM	DINNER (EDEN GARDEN)	
	22 JULY 2023- DAY 2	
	SESSION 1: NEPHROPATHOLOGY	
8:50 TO 9:00AM	INTERPRETATION OF RENAL NATIVE BIOPSY	DR.SANJEET ROY
9:00 TO 9:50 AM	INTERPRETATION OF RENAL ALLOGRAFT BIOPSY	DR. MARIAM PRIYA ALEXANDER
9:50 TO 10:00 AM	INTERESTING CASES (4 IN NUMBER)	DR. SHANMUGA PRIYA S /DR. BHARATHI G/ DR. RAGAPRIYA D/ DR. SAMUEL PRAMOD PAUL
10:00 TO 10:50 AM	TEA	
	SESSION 2: TRANSFUSION MEDICINE	
10:50 TO 11:00 AM	BLOOD GROUPS AND MORE-THE ART AND SCIENCE OF IMMUNOHEMATOLOGY	DR. SITALAKSHMI
11:00 TO 11: 50 AM	CLINICAL LABORATORY INTERFACING- THE MAGIC TO ENSURING APPROPRIATE USE OF BLOOD	DR. DOLLY DANIEL
11:50 TO 12:00 PM	CASES FOR DISCUSSION	DR. JOHN GNANARAJ/ DR. GAYATHRI C
12:00 TO 1:00 PM	LUNCH AND POSTER PRESENTATION (EXAM HALL)	
1:00 TO 2:00 PM	FREE PAPERS	
2:00 TO 3:50 PM	POTPOURRI OF CASES	DR. CHANDRAMOULEESWARI/ DR.REVATHI
3:50 TO 4:00 PM	TEA	
4:00 TO 5:00 PM	VALEDICTORY FUNCTION	

Student-Centric Teaching-Learning Methods for Active Learning of Pathology among Undergraduate Students: Our Experience

As one of the newly formed departments at JIPMER Karaikal, we intended to provide an integrated, holistic learning experience for our learners where they understand the role of Pathology in clinical decision-making. Since we had 50-60 students per batch, we were motivated to try innovative and engaging small-group learning methods that would create interest in Pathology. The following teaching-learning methods made positive student responses for the past two years.

Problem-based learning (PBL):

For PBL, we prepared a 'Problem/ case scenario' as 2-3 triggers that are progressively disclosed to the students in two classes. Trigger 1 would start with the patient's medical history and examination findings, followed by triggers 2 & 3 with investigation reports, biopsy images, treatment etc. The structure of the problem was built as a story format in a realistic way to give the learners a near-to-real-life experience. Students would brainstorm on each trigger, form hypotheses, identify what they don't know (called 'learning issues'), assign & do self-directed learning, and return and share to reframe the hypothesis. PBL is an iterative process until they learn all the learning issues in each trigger. (Fig1) We, the teachers, acted as a facilitator, guided them with a few probing questions, and took the discussion in the right direction. Each PBL Problem included 'Affective domain/ medical humanities' by introducing the patient's social background, emotional status, ethical issues etc.., into the narrative to give a holistic learning experience to the learners. Creating a PBL problem is a time-consuming collaborative process that requires training & internal motivation.

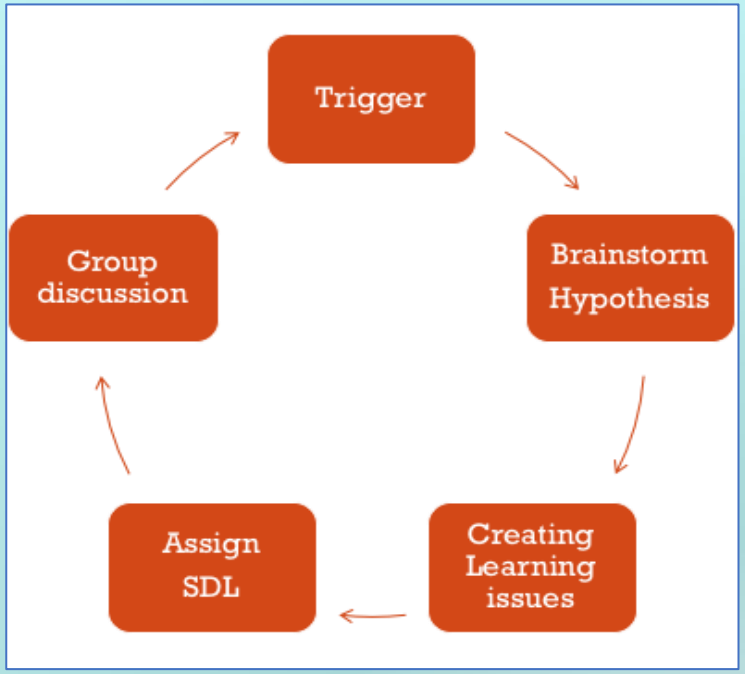


Fig:1 The iterative process in Problem-based learning (PBL)

We conducted twelve PBL sessions last year on topics like Inflammation, Hemolytic anaemia, and breast carcinoma by integrating with clinical & preclinical disciplines. Students expressed that the PBL sessions gave them the confidence to analyse patients' clinical details and arrive at a reasonable differential diagnosis during their clinical postings. We faced initial difficulties with students identifying the learning issues and analysing the problems on their own along with a few non-participatory & non-cooperative peers, which improved in the later PBL sessions as they became familiar with the PBL process. Conducting anonymous peer evaluation would help in assessing and improving the group dynamics in future.

Team-based learning (TBL):

TBL session consists of self-directed learning, individual Readiness Assurance Test (iRAT), group Readiness Assurance Test (gRAT) & Problem-solving exercises (Fig 2). After completing a difficult topic, like 'Neoplasia', we would announce an assessment so that students come to the TBL session prepared. We create a set of 15 to 20 MCQs on the assigned topic to check the level of basic understanding and recall memory. Students would undergo two tests via google forms, one 'individually' and another as a 'team' where they could collectively work on the questions & clarify each other's queries. Reviewing each team's response, we would discuss the incorrect responses, where any team can appeal and clarify their queries. Following this discussion, the same teams would be given a set of problem-solving exercises/ case scenarios to check the application knowledge.

TBL is ideal for a tutorial session as a revision after completing the lecture classes. However, we also conducted a TBL session on Self-directed learning topics such as nutritional deficiencies. This technique helps identify the conceptual difficulty among students, allowing us to clarify. On feedback, students felt the TBL process to be engaging and opined that a team consisting of different ideas & mindset enabled their learning. Some team members not contributing to the discussion hindered the learning for a few. Some students suggested that the facilitators' in-depth discussion of case scenarios would help them further.

Fig: 2 Steps involved in the Team-based learning (TBL) process

Jigsaw method/ Cross-grouping:

This technique encourages students to teach and learn from their peers. We slightly modified the conventional process of the jigsaw method. To begin with, we created small groups and assigned each of them a Problem or a set of case scenarios related to a common topic. These small groups work on those different problems and become experts in that topic. Later on, the groups were re-grouped; some members were removed and merged with the other groups. This new group consists of students who teach others what they have learnt in the previous group and learn from peers. For example, we created four groups and assigned different problems of hemolytic anaemia, such as Thalassemia to one group, sickle cell anaemia to another group and autoimmune hemolytic anaemia & hereditary spherocytosis to two other groups respectively. After learning from the assigned case scenario, they were re-grouped so that each new group consisted of students who knew each of the hemolytic anaemia. They teach others what they have learnt previously. So eventually, they learned about all four cases of hemolytic anaemia from their peers.

We have conducted ten cross-grouping sessions in the last two years. This technique created a camaraderie learning dynamics where students felt free to raise and clarify doubts among their peers. Students thought they did a lot of self-directed learning before cross-grouping and were confident enough to teach their peers. This method also motivated their drive to learn. However, some students' poor preparation and non-uniformity of the learning contents were the drawbacks.

Game-based learning:

Game-based learning is one of the fun-filled learning activities in our classroom. Some games which received a great response were crosswords, puzzles, card matching, connections, dumb charades etc.

Some game sessions were conducted at the end of PBL modules to assess the learning. We included questions from other disciplines related to the assigned topic to give a holistic learning environment. Students enjoyed competing and winning as a group, motivating them to learn before these sessions. But larger group size and less time were some of the constraints opined by some students.

For each of the above learning methods, pre & post-intervention test results were encouraging. With feedback collected through questionnaires and focus group discussions, we gained insights into the learners' perception and learning process in the above techniques. We would strive to improve the above learning techniques with consistent student feedback.

Bibliography:

1. Azer SA, Peterson R, Guerrero AP, Edgren G. Twelve tips for constructing problem-based learning cases. Med Teach. 2012;34(5):361-7.
2. Franklyn-Miller AD, Falvey EC, McCrory PR. Patient-based not problem-based learning: an Oslerian approach to clinical skills, looking back to move forward. J Postgrad Med. 2009;55(3):198-203.
3. Wald HS, McFarland J, Markovina I. Medical humanities in medical education and practice. Med Teach. 2019;41(5):492-6.
4. Roossien L, Boerboom TBB, Spaai GWG, de Vos R. Team-based learning (TBL): Each phase matters! An empirical study to explore the importance of each phase of TBL. Med Teach. 2022;44(10):1125-32.
5. Goolsarran N, Hamo CE, Lu WH. Using the jigsaw technique to teach patient safety. Med Educ Online. 2020;25(1):1710325.
6. van Gaalen AEJ, Brouwer J, Schönrock-Adema J, Bouwkamp-Timmer T, Jaarsma ADC, Georgiadis JR. Gamification of health professions education: a systematic review. Adv Health Sci Educ Theory Pract. 2021;26(2):683-711.

Dr. Niraimathi Manickam
Dr. Balamurugan M
Dr. Arun Kumar K
Department of Pathology, JIPMER, Karaikal

PLAN [Pathology residents Linked Across Net]

A WEB BASED POSTGRADUATE LEARING FORUM IN PATHOLOGY

The purpose of Postgraduate education is to create specialists who would provide high quality health care and advance the cause of science through research & training.

The post graduate student in pathology should be trained in handling and processing histopathology, clinical pathology, microbiology, biochemistry and transfusion medicine samples with knowledge of general principles and methodology.

Postgraduate training in pathology requires participation of the trainee in most of the laboratory diagnostic methodologies, management of safe laboratory practices patient care and to be updated in recent improvements in laboratory science with lot of emphasis in self-directed learning.

To achieve this we organize theory seminars, journal club discussions, morbid anatomy discussions, grossing sessions, slide seminars, clinicopathological conferences, case-based discussions, technical discussions and audit.

These formal teaching learning activities are constrained by the following factors

a) Competing demands of laboratory activities
b) Postings in various laboratories
c) Done within the official working hours
d) Special postings to other institutes
e) Involvement of PG residents in undergraduate teaching /learning programme

It is very clear that education and not technology, is the prime goal of better healthcare and patient outcomes. Serendipity often adds to the excitement of teaching and learning.

The use of technology in support of education requires creativity and adaptability in response to the specific and changing contexts in which it is used.

PLAN is a E learning forum based on the theory that learning is facilitated by independent problem solving skills, collaboration between students fosters learning and the proven educational cycle of practice, feedback, and reflection is integral to the interrelated domains of skill development and personal awareness.

The PLAN model is a synergistic online learning activity integrated with regular postgraduate teaching programme.

Methodology:

An exclusive Google group will be created with all the PG residents and the Faculty. The PG residents will select topics for discussion. The senior resident will give an introduction to the topic and post few triggering questions. Relevant articles will also be shared for more reading. All the other residents started responding for the questions. The interaction pattern of the residents will be followed by the faculty. The faculty will contribute their expertise in the topic as the discussion goes on. At the end of the week, the junior PG summarises the responses and post an executive summary

The platform will also be used to share

- Interesting microphotographs
- Monographs on various topics
- Slide quiz
- Data on laboratory reports

PLAN & Self-Directed Learning:

The main advantage of this learning forum was that the topic for discussion were selected by the postgraduate residents in consultation with the faculties from the prescribed curriculum. This approach was very helpful as it contributed to self-directed learning in which the students become responsible for their own learning.

The National Medical Commission has emphasized the importance of Self-directed learning for the postgraduate residents. The document states that ***"The training programme should be designed to enable the student to acquire a capacity to learn and investigate, to synthesize and integrate a set of facts and develop a faculty to reason. The curricular programmes and scheduling of postings must provide the student with opportunities to achieve the above broad objectives. Much of the learning is to be accomplished by the student himself. Interactive discussions are to be preferred over didactic sessions."***

The postgraduate residents formulated learning objectives for each of the topics. This was in turn edited by the concerned faculty.

Formulation of learning objectives was another very important element of this programme. This had many advantages. The evaluation of the learning was based on these objectives and assessment planning was done based on the list of objectives. All the key elements on learning objectives were taken into consideration while they framed them.

PLAN AND RESOURCE SHARING:

Sharing of resources was another key element of this learning programme. This exercise helped the students to browse the net and look for suitable resources by using proper key words. Sharing of the resources created a health learning environment among the residents and it worked on the philosophy of "Let us learn together".

Strength of this learning forum:

1. Good user interaction
2. Able to apply the concepts into reality
3. Ability to learn more about team learning
4. Ability of know about sharing learning resources
5. Flexibility and convenience to complete the learning.
6. Ease of use
7. The feedback was quick and encouraging.
8. Frequent slide quizes
9. Reinforcement of the concepts
10. Overall learning environment.
11. Motivation effect of the new intervention, self regulated by the participants

Overall, the results of this study suggest that, according to students, this form of blended learning which consisting of online preparation and regular postgraduate teaching programme is an effective educational strategy for postgraduate students.

As this was a highly motivated group of postgraduate students, who take ownership of their learning the online courses are well-received by them.

Limitations of this learning forum

1. Certain topics were too long and the discussion was not focused.
2. No new information was given on certain topics.
3. Technical problems in navigating the web
4. Slow internet at times
5. Difficulty in accessing the shared resources
6. Screen loads were too slow at times.
7. Too long assignments which consumed lot of time.
8. Unclear directions in certain topics.

9. Certain discussions were dominated by few residents.
10. Poor quality of the slide images.
11. The faculty members who were not willing or motivated were excluded from the study. This would have enhanced the positive findings.

An online discussion forum is a ubiquitous communication tool within an online learning environment and significantly shapes the types of communication that takes place. Discussion forums have frequently been used successfully as communication tools in online learning environments to facilitate interaction between learners to share knowledge. Discussion forums also provide an effective opportunity to exchange ideas and share knowledge amongst learners and instructors..

There are many reasons behind the wide adoption of online discussion forums, but the major attribute of a discussion forum is its asynchronous nature that enables learners and instructors to communicate with each other at anytime of the day, and without having to find the time for person-to-person interaction. In addition, posting on a forum enables the discussion to be public and accessible by all other learners in their own time.

Online discussions if conducted following appropriate protocols have greatest potential on the impact of learning. The participant's reflection clearly revealed that this format of online discussion helped them to socialize with their counterparts, get accustomed with the online learning environment, promoted interactivity in their communication, acquired improved information processing and thereby attained higher levels of cognition.

THE WAY FORWARD

E-learning is an upcoming modality of teaching and learning in medical education in India The major stake holders like the institutions and teachers have to be prepared to accept the change, The institutions must put-in the required resources in the form of manpower or time or money for the conduct of E learning programmes.

The faculty must be motivated for this new technology and they must undergo necessary training in the various parts of the

E learning programme like designing the content, designing and implementation of the process and evaluation of the programme. The major factor is the learner. Since it is a form of self directed learning the learner must have the following attributes

- ✓ motivation and self-discipline
- ✓ ability to study independently
- ✓ schedule study time
- ✓ understanding the entire e–learning process

The institute must provide adequate equipment and dedicated work space/support for the successful implementation of the programme.

Finally it is the medical educators and administrators to incorporate these modalities into the existing curriculum and teaching learning process. It is mandatory that necessary research and evaluation happens at every level of the programme.

Dr.K.Swaminathan MD M.Phil
Professor and Head, Department of Pathology
Tirunelveli Medical College, Tirunelveli.

The Bone Marrow Microenvironment: An Interplay of Niches, Cells, and Markers in Health and Disease

Introduction

The bone marrow microenvironment, also known as the hematopoietic niche, plays a pivotal role in regulating hematopoiesis and maintaining hematopoietic stem cells (HSCs). Understanding the intricate interplay between the bone marrow microenvironment and hematopoietic cells is crucial for advancing our knowledge of hematopoiesis and developing novel therapeutic strategies for hematological disorders.

The bone marrow microenvironment serves as a specialized niche that provides the necessary signals and physical support for the regulation of hematopoiesis. It consists of a complex network of cellular components and extracellular matrix proteins that create a unique microenvironment for HSCs and their progenitors. The **Figure 1** is a schematic representation of the microenvironment.

Niches in the Bone Marrow Microenvironment

The bone marrow microenvironment can be classified into two major niches: endosteal and vascular. The **endosteal niche** is situated near the bone surface and is characterized by osteoblasts, osteoclasts, and other stromal cells. These cells secrete various factors such as osteopontin, stem cell factor (SCF), and angiopoietin-1, which contribute to HSC maintenance and quiescence in their hypoxic environment. The **vascular niche**, closely associated with blood vessels, comprises endothelial cells, perivascular cells, and mesenchymal stromal cells. It provides a dynamic microenvironment rich in cytokines, chemokines, and extracellular matrix components that regulate HSC proliferation, differentiation, and mobilization (**Figure 1**).

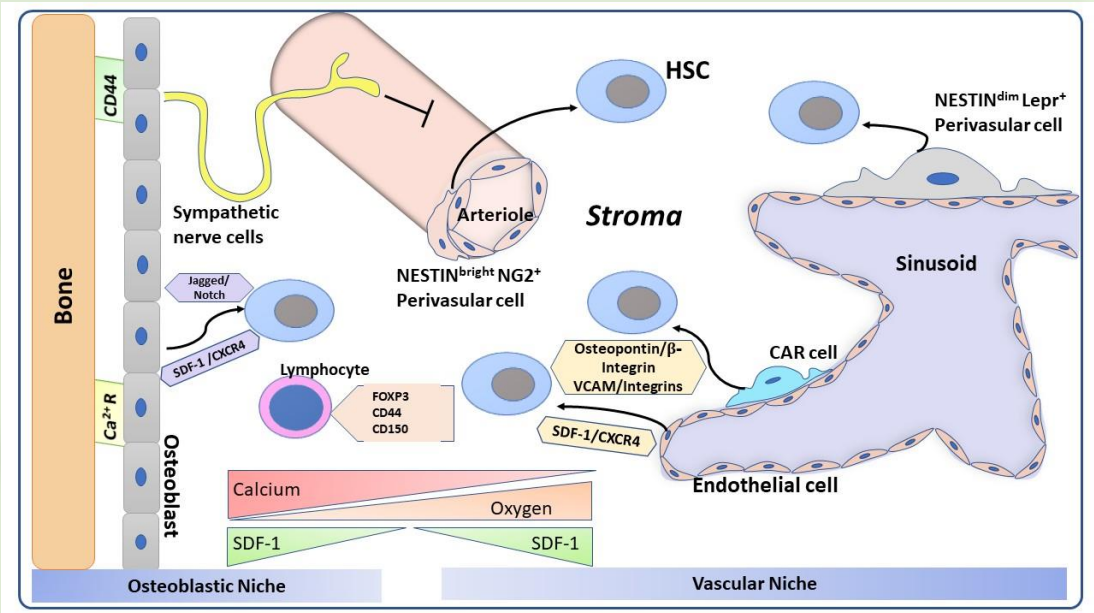


Figure 1: Bone marrow microenvironment: osteoblastic niche with hypoxic environment leads to quiescence and maintenance of HSCs whereas the oxygen-rich vascular niche handles proliferation, differentiation and maturation of HSCs. In sinusoids, endothelial cells, CAR cells, Nestin-dim Lepr+ perivascular cells promote HSC maintenance, and Nestin-bright NG+ perivascular cells adjacent to arterioles support HSCs. Sympathetic nerve cells contribute to HSC maintenance by directly regulating CXCL12 expression by MSCs

HSC: Hematopoietic Stem cells, MSC: Mesenchymal stem cellCAR Cell: CXCL12-abundant reticular cells, SDF: Stromal derived factor, Lepr: Leptin receptor

[This figure is adaption from the article: Mukaida N, Tanabe Y, Baba T. Chemokines as a Conductor of Bone Marrow Microenvironment in Chronic Myeloid Leukemia. Int J Mol Sci. 2017; 18:1824]

Cellular Components of the Bone Marrow Microenvironment in Health and Disease

a. Hematopoietic Stem and Progenitor Cells (HSPCs): HSCs are multipotent cells capable of self-renewal and differentiation into various blood cell lineages. They reside in specific niches close to the arterioles within the bone marrow microenvironment and are regulated by signals from surrounding cells and extracellular matrix components. Hematopoietic stress leads to its proliferation and differentiation and then HSCs will be distributed away from the arterioles. Dysregulation of HSC function can lead to hematological disorders, including leukemia and bone marrow failure syndromes.

b. Mesenchymal Stromal Cells (MSCs): MSCs, also known as marrow stromal cells, constitute a heterogeneous population of cells that provide physical support and secrete factors critical for HSC maintenance. Alterations in MSC function can disrupt the bone marrow microenvironment, contributing to abnormal hematopoiesis observed in diseases such as myelodysplastic syndrome (MDS) and myelofibrosis.

c. Endothelial Cells: Endothelial cells form the inner lining of blood vessels within the bone marrow microenvironment. They play a crucial role in regulating HSC trafficking, proliferation, and differentiation through the secretion of various cytokines and chemokines. Dysfunctional endothelial cells have been implicated in bone marrow fibrosis and impaired hematopoiesis observed in diseases like MDS & myeloproliferative neoplasms (MPNs).

d. Osteoblasts and Osteoclasts: Osteoblasts are responsible for bone formation, while osteoclasts are involved in bone resorption. These cells contribute to the maintenance of HSCs by secreting various factors and providing physical support in the endosteal niche. Dysregulation of bone remodeling and imbalance in osteoblast/osteoclast activity can lead to bone marrow disorders such as osteoporosis and multiple myeloma

Markers of the Bone Marrow Microenvironment in Health and Disease

a. Stromal Cell-Derived Factor-1 (SDF-1)/CXCL12: SDF-1 is a chemokine produced by various cell types within the bone marrow microenvironment. It acts as a key chemoattractant for HSCs, promoting their homing to the bone marrow and regulating their quiescence and retention within the niche. Dysregulated SDF-1 signaling has been implicated in hematological malignancies, bone marrow failure syndromes, and mobilization of HSCs for transplantation.

b. Stem Cell Factor (SCF)/Kit Ligand: SCF is a growth factor produced by stromal cells, including osteoblasts and MSCs. It binds to the c-Kit receptor on HSCs and plays a vital role in HSC survival, proliferation, and differentiation. Dysregulated SCF signaling has been associated with aberrant hematopoiesis, leukemic transformation, and the development of HSC-related diseases.

c. Angiopoietin-1 (Ang-1): Ang-1 is an angiogenic factor secreted by osteoblasts and stromal cells in the endosteal niche. It promotes HSC quiescence and regulates bone marrow vascularization. Altered Ang-1 expression has been implicated in the pathogenesis of hematological disorders, including MPNs and MDS.

d. Additional Markers: Other markers such as vascular cell adhesion molecule-1 (VCAM-1), osteopontin, and N-cadherin are involved in HSC-niche interactions and play crucial roles in hematopoiesis. Dysregulated expression of these markers can contribute to the development and progression of hematological diseases.

Conclusion

The bone marrow microenvironment, with its niches, cellular components, and markers, exerts a profound influence on hematopoiesis in both health and disease. Understanding the dynamic interactions within the bone marrow microenvironment is vital for elucidating the pathogenesis of hematological disorders and developing targeted therapeutic interventions. Advancements in our knowledge of the bone marrow microenvironment will pave the way for personalized medicine approaches that target specific components and markers, leading to improved treatment outcomes for patients with hematological diseases. Further research focusing on niche-specific interactions and markers will undoubtedly provide valuable insights into the mechanisms underlying hematopoietic regulation and open new avenues for innovative therapeutic strategies.

Suggested Reading

1. Morrison SJ, Scadden DT. The bone marrow niche for haematopoietic stem cells. Nature. 2014;505:327–34.
2. Park D, Sykes DB, Scadden DT. The hematopoietic stem cell niche. Front Biosci Landmark Ed. 2012;17:30–9.
3. Kumar R, Godavarthy PS, Krause DS. The bone marrow microenvironment in health and disease at a glance. J Cell Sci. 2018;131:jcs201707.

Dr. Sreerag Kana, PhD Scholar, Dept. of Pathology, JIPMER, Puducherry
Dr. Debdatta Basu, Professor of Pathology, MGMCRI, Puducherry

In the Era of Automation and Molecular Techniques, is Peripheral Blood Smear Examination Getting Redundant?

Dr. Debdatta Basu,
Department of Pathology,
MGMCRI, Puducherry, India

Article published in: International Journal of Advanced Medical and Health Research ¦ Volume 9 ¦ Issue 1 ¦ January-June 2022

Basu D. In the era of automation and molecular techniques, is peripheral blood smear examination getting redundant? Int J Adv Med Health Res 2022;9:1-3.

In the Era of Automation and Molecular Techniques, is Peripheral Blood Smear Examination Getting Redundant?

With the advances in automation in blood cell analyzers, the number of blood samples needing peripheral blood smear examination has decreased over the years.[1] Sophisticated cell counters provide not just counts but also differentials, scatter plots, and histograms, all of which aid in diagnostics with a much shorter turnaround time and lesser consumption of human resources.[2] The manual blood smear examination, which is still a very important diagnostic tool, is recommended to validate, and not replace, automated methods.[3] The examination is usually performed by an experienced and trained, medically qualified hematologist or pathologist. Hence, when compared to automated blood counts, blood smear examination needs expertise, is labor intensive, and must be used judiciously.

Requests for blood smear examination can be made at the laboratory end or by the physicians. At the laboratory end, smears are made either in response to an abnormal count or due to "flags" generated by an automated instrument. "Flags" are machine-generated messages when the values are not in the reference ranges and the machine suggests the possible changes, a type of artificial intelligence.[3] Making a smear from the same blood sample also means avoiding taking another blood sample just for this purpose. Consensus criteria for laboratory-initiated review of peripheral blood smears based on the results of the automated blood count have been published by the International Society for Laboratory Hematology (available at www.islh.org).[4] Based on these guidelines, protocols for examination of blood smears must be there in all laboratories. It constitutes about 10%–15% of the total number of samples received in the laboratory.[1] In general, when all parameters, including counts, differentials, histogram, and scatter plots, are normal in the cell counter, a peripheral smear examination is not necessary.[2]

Often, a physician initiates a request for a blood smear. This is usually based on certain clinical features or on an abnormality shown in a previous complete blood count.[1] Some clinical situations that merit a blood smear examination are:

- Anemia and/or unexplained jaundice raising doubts of hemolytic anemia
- Sickle cell disease – limb, chest, or abdominal pain with anemia and jaundice, especially in children
- Petechiae and other mucocutaneous bleeds suggestive of thrombocytopenia
- Unexpected or severe infection and fever suggesting neutropenia
- Lymphadenopathy, splenomegaly, or a mediastinal mass on radiology suggesting a lymphoproliferative disorder
- Splenomegaly, ruddy cyanosis, itching, bone pain, or weight loss indicating a myeloproliferative disorder
- Features of disseminated intravascular coagulation
- Recent-onset renal failure, particularly in a child
- Suspicion of infections with hemoparasites such as malaria or filaria.

With regard to anemia, automated cell counters can provide valuable information. Apart from red cell count and red cell indices, they provide newer variables with information that can predict certain specific blood smear findings.[3,4] These include red cell distribution width, which refers to the degree of anisocytosis, and hemoglobin distribution width which refers to the percentages of hypochromic and hyperchromic cells. Increased numbers of hyperchromic cells on a cell counter reflect spherocytes. Large normochromic cells could mean true macrocytes whereas hypochromic macrocytes could mean dual deficiency anemia or reticulocytes. Histograms and scatter plots also give a visual representation of features of red blood cells (RBCs). Despite this abundance of information, there are many morphologic abnormalities that can be demonstrated only in the peripheral blood smear examination and which are crucial in differentiating causes of anemia.[1] Some such important clinical situations are detailed below.

Schistocytes or fragmented red cell indicating microangiopathic hemolytic anemia (MAHA) is clinically very significant. Schistocytes are seen in hemolytic–uremic syndrome or thrombotic thrombocytopenic purpura; two clinical scenarios necessitating urgent diagnosis and management. MAHA is also seen in pregnancy-associated hypertension and disseminated intravascular coagulation. In MAHA, examining the blood smear helps to countercheck the platelet count, since fragmented RBCs and platelets may have very similar sizes and automated cell counters may not be able to differentiate the two.[1,4,5]

Spherocytes, although not specific, may be seen in hereditary spherocytosis, autoimmune hemolytic anemia, hemolytic disease of the newborn, or a delayed transfusion reaction. However, the presence of spherocytes in the peripheral blood smear, along with clinical features and the results of Coombs test, generally points to the correct diagnosis.[1] Microspherocytes are red cells that are small in size, hyperchromic, and are characteristic of burns and MAHA.

Peripheral blood smear examination is crucial in the diagnosis of acute hemolysis due to oxidant damage. The presence of "bite" cells and "blister" cells are characteristic. Oxidant-induced hemolysis is seen in glucose-6-phosphate

dehydrogenase (G6PD) deficiency or when normal G6PD levels get overwhelmed by a very severe oxidant exposure. G6PD deficiency is common in India. There are two reasons why a blood smear is important in this scenario. First, the results are available far more quickly than the results of a G6PD assay permitting a provisional diagnosis and initiation of therapy. Second, a blood smear can pick up G6PD deficiency even if the assay is normal. This is because immediately after an episode of acute hemolysis, reticulocytosis (G6PD levels are higher in reticulocytes than mature red cells) may falsely result in normal G6PD levels. In such a circumstance, presence of bite cells in blood smear clinch the diagnosis and the assay may be repeated once the acute hemolytic episode is over.[1,4]

In hereditary elliptocytosis, the blood smear is so distinctive that no other test is needed for diagnosis.[1] Red cell agglutinates or rouleaux formation usually indicates cold agglutinins or hypergammaglobulinemia, respectively. Detection of red cell inclusion often gives a clue to the diagnosis. Howell–Jolly bodies, which are nuclear fragments, are an important indicator of functional hyposplenism; in contrast, the absence of Howell–Jolly bodies and other changes of splenectomy in the smear from a patient who has undergone splenectomy, may indicate the presence of a residual splenic tissue, like an accessory spleen. Pappenheimer bodies, which are hemosiderin-containing granules, and basophilic stippling which reflect altered ribosomes are subtle clues which aid in the diagnosis of sideroblastic anemia, thalassemia, and lead poisoning. In emergency situations, especially when a child presents with features of jaundice and sickling, and other crises, detecting sickle cells is often very useful.[1]

Examination of the blood smear is useful when there is macrocytic anemia, reflected by a high mean corpuscular volume (MCV) in the cell counter. Deficiency of Vitamin B12 or folic acid manifests with oval-shaped macrocytes and hypersegmented neutrophils in the peripheral blood smear. Although serum Vitamin B12 and folic acid assays are available these days, the blood smear can provide a provisional diagnosis and appropriate treatment in severely anemic patients while awaiting results of the assays or in those who cannot afford the costly assays. In elderly patients, an important cause of macrocytosis is myelodysplastic syndrome (MDS). Features such as hypogranular or hypolobated neutrophils (Pelger–Huet cells), occasional blasts, and large or hypogranular platelets point to MDS. MCV may also be high because of hemolysis or acute blood loss due to the ensuing reticulocytosis; in that case, the blood smear shows many polychromatophils.[1,5] In microcytic anemia, examination of the blood smear is, in general, less important. Red cell indices and serum ferritin levels, interpreted in the clinical context, allow diagnoses in most cases. However, the presence of target cells and basophilic stippling are clues to thalassemia trait than iron-deficiency anemia. The presence of teardrop cells along with nucleated RBCs is an indicator of fibrosis in the marrow resulting in a leukoerythroblastic blood picture in myelophthisic anemia.

In the context of white blood cells, blood smears must always be examined in unexplained leukocytosis or leukopenia. Whether it is lymphocytosis, monocytosis, or when the flags are raised suggesting the presence of blasts, examination of smear is mandatory. The presence of many nucleated red cells often increases the leukocyte count reported by the counter, necessitating correction. The variations from normal white blood count (WBC) scatter plot are a good indicator of the presence of an abnormal WBC in the peripheral smear, necessitating morphological evaluation.[2] Toxic granules in the cytoplasm of neutrophils are often an indicator of ongoing bacterial infection.[2] Low counts may suggest aplastic anemia, hairy cell leukemia, subleukemic leukemia, or bone marrow infiltration. Peripheral blood examination in leukemia and lymphoma provides a morphologic basis for rational use of immunophenotyping and other sophisticated investigations. Detection of Auer rods in blast cells is an indicator of its myeloid nature. Examination of blood smear in acute promyelocytic leukemia with faggot cells with stacks of Auer rods and in Burkitt lymphoma with its deeply basophilic and vacuolated cytoplasm, is of particular significance, because it facilitates not just rapid diagnosis but also institution of specific treatment, failing which both the diseases can be life threatening.[1]

A blood smear should always be examined in low platelet counts, both to confirm the thrombocytopenia and to look for underlying causes. Falsely reduced platelet counts can be due to the presence of small clots, platelet clumps, and satellitism or abnormally large platelets.[1,3,5] Immature and regenerating platelets are large and the counters, especially those relying on impedance method of counting, count them as RBCs. This creates a falsely lowered count in critical situations where immature platelets are seen as in recovery following chemotherapy or dengue fever or idiopathic thrombocytopenic purpura. Ethylenediaminetetraacetic acid-induced pseudothrombocytopenia, often causes low counts on the cell counter, but the smear shows large clumps of platelets. Fibrin strands in the smear indicate that the thrombocytopenia is false and due to clots in the sample. Underlying causes of thrombocytopenia that may be picked up in the blood smear include MAHA and acute leukemia.[1] Similarly, thrombocytosis should be confirmed microscopically with a blood smear; spurious high counts may be due to fragmented red cells in MAHA or fragments of blasts as can be seen in tumor lysis syndromes.

Morphological assessment of peripheral smear needs training, experience, and time. In this era of advancements and automation, there is an ever-increasing pressure on laboratory services to improve the quality and speed of reporting. It is important to reduce workload judiciously and improve turnaround time. At the same time, important diagnostic information must not be missed by entirely relying on automated cell counters. As seen above, automation cannot provide all the answers that are needed for the physician. Sometimes, it is possible for a precise and quick diagnosis

to be made only from a blood smear, as in detecting malaria. Physicians should order a blood smear only when there are reasonable clinical indications and pathologists should examine a blood smear whenever the results of the complete blood count indicate the need for validation or for further workup of a detected abnormality. Even in the age of automation and molecular analysis, peripheral blood smear remains an important diagnostic tool.

Debdatta Basu

Department of Pathology, JIPMER, Puducherry, India

Address for correspondence: Dr. Debdatta Basu, Department of Pathology, JIPMER, Puducherry - 605 006, India.
E-mail: ddbasu@gmail.com

References

1. Bain BJ. Diagnosis from the blood smear. N Engl J Med 2005;353:498-507.
2. Gupta T, Basu, D. Utility of scatterplot patterns of automated hematology analysers in white blood cell disorders – A comparative study with peripheral blood smears. Asian J Med Sci 2020;11:29-34.
3. Asad S, Ahmed I, Ali N. Utility of peripheral film findings and its correlation with automated analyzer – An audit from tertiary care hospital. J Lab Physicians 2017;9:1-4.
4. Barnes PW, McFadden SL, Machin SJ, Simson E. The international consensus group for hematology review: Suggested criteria for action following automated CBC and WBC differential analysis. Lab Hematol 2005;11:83-90.
5. Jain M, Dolai TK. ABC of the peripheral smear. J Indian Med Assoc 2020; 118:19-23.

Access this article online

Quick Response Code:

Website: www.ijamhrjournal.org

DOI: 10.4103/ijamr.ijamr_104_22

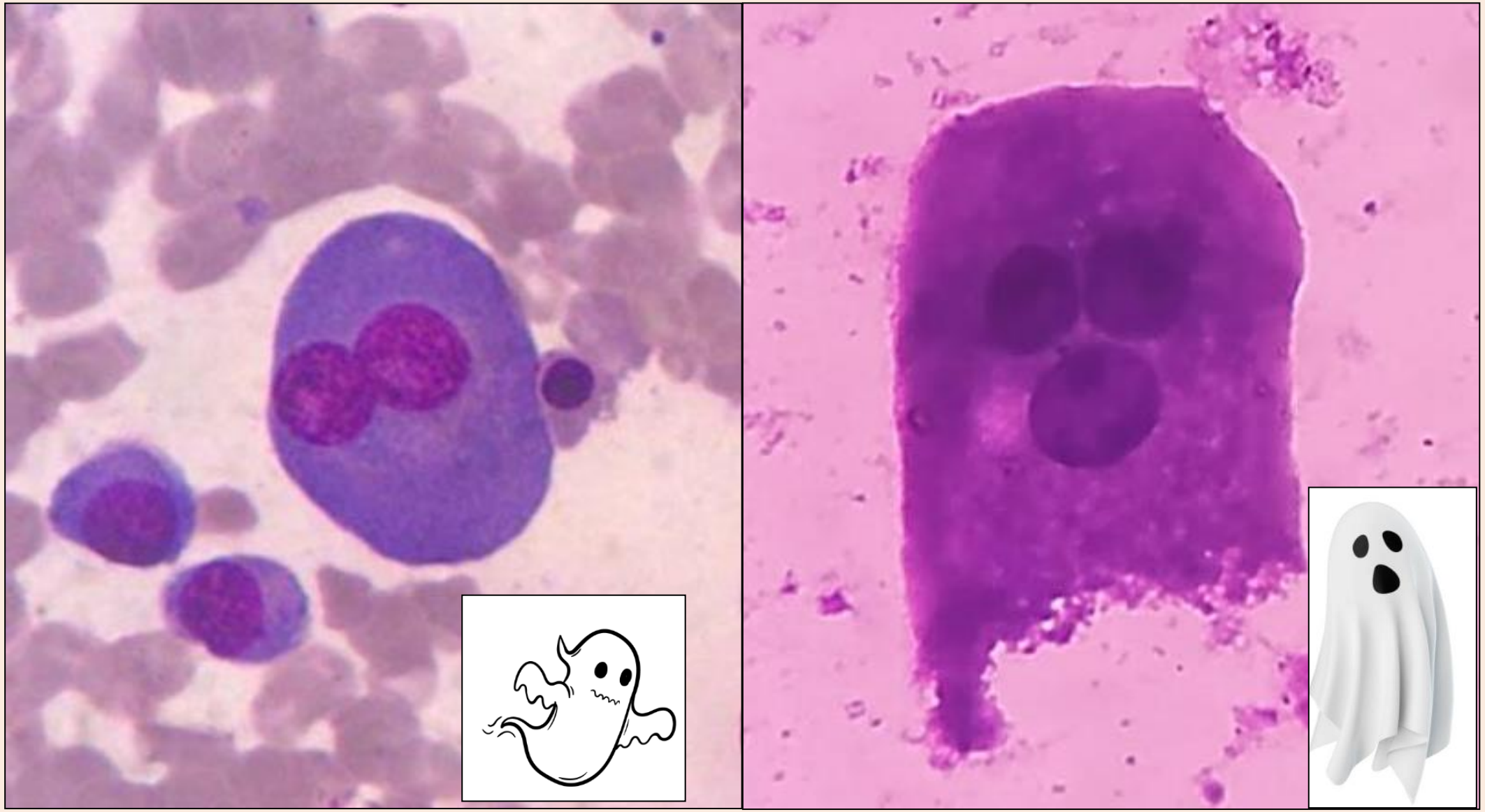
How to cite this article: Basu D. In the era of automation and molecular techniques, is peripheral blood smear examination getting redundant? Int J Adv Med Health Res 2022;9:1-3.

Submitted: 09-05-2022, **Accepted:** 16-05-2022, **Published:** 30-06-2022

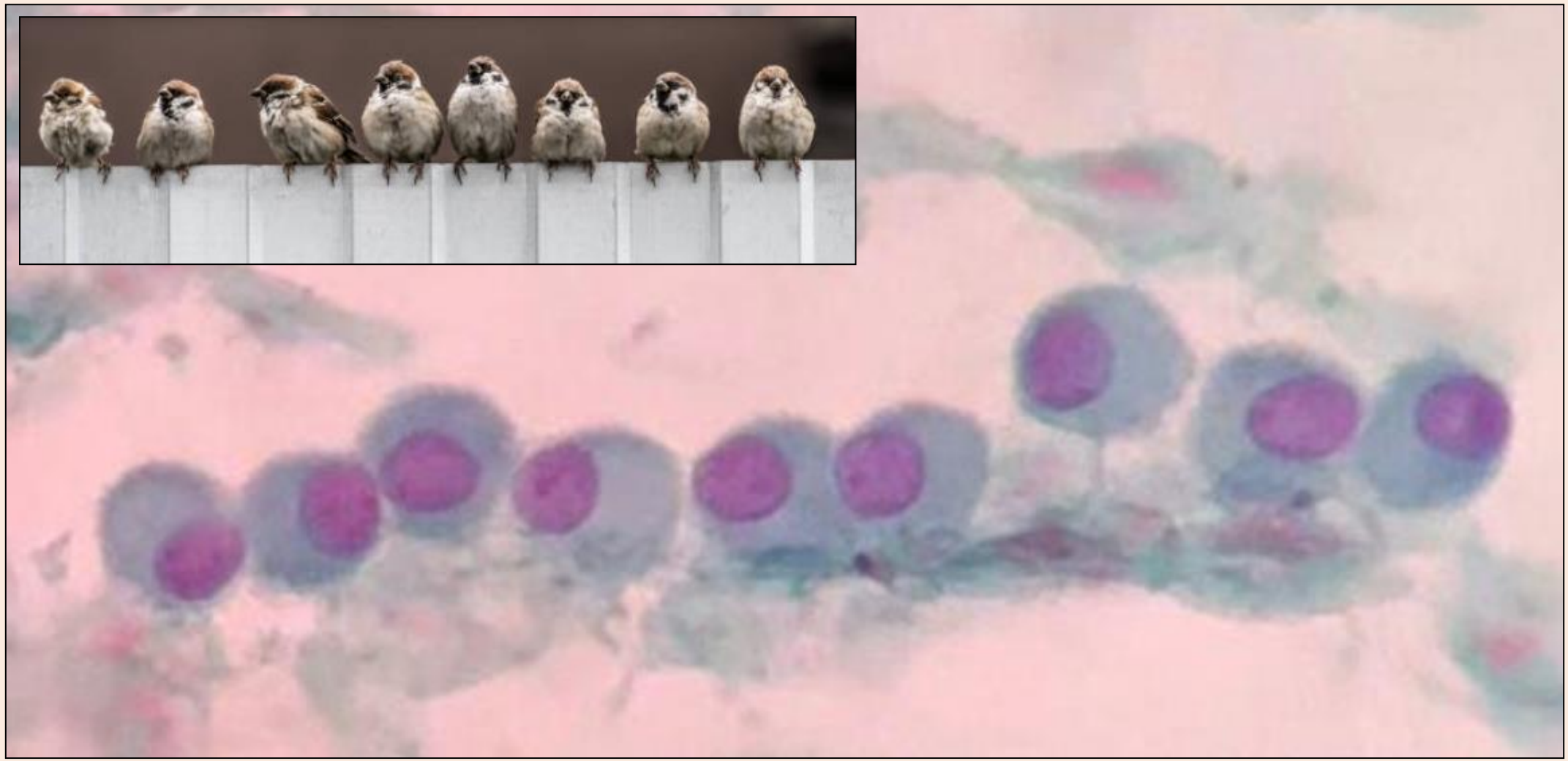
I always thought during my undergraduate days that pathology is just Pink and blue and I wondered how pathologists see those pink and blue tissue without getting bored. I hardly knew before joining residency that there is many more fascinating things to see from those slides. During my three years of residency, I started loving those slides which made me find some really interesting things which i have shared here

Dr. Roobashri M
Senior Resident
MGMC&RI, Puducherry

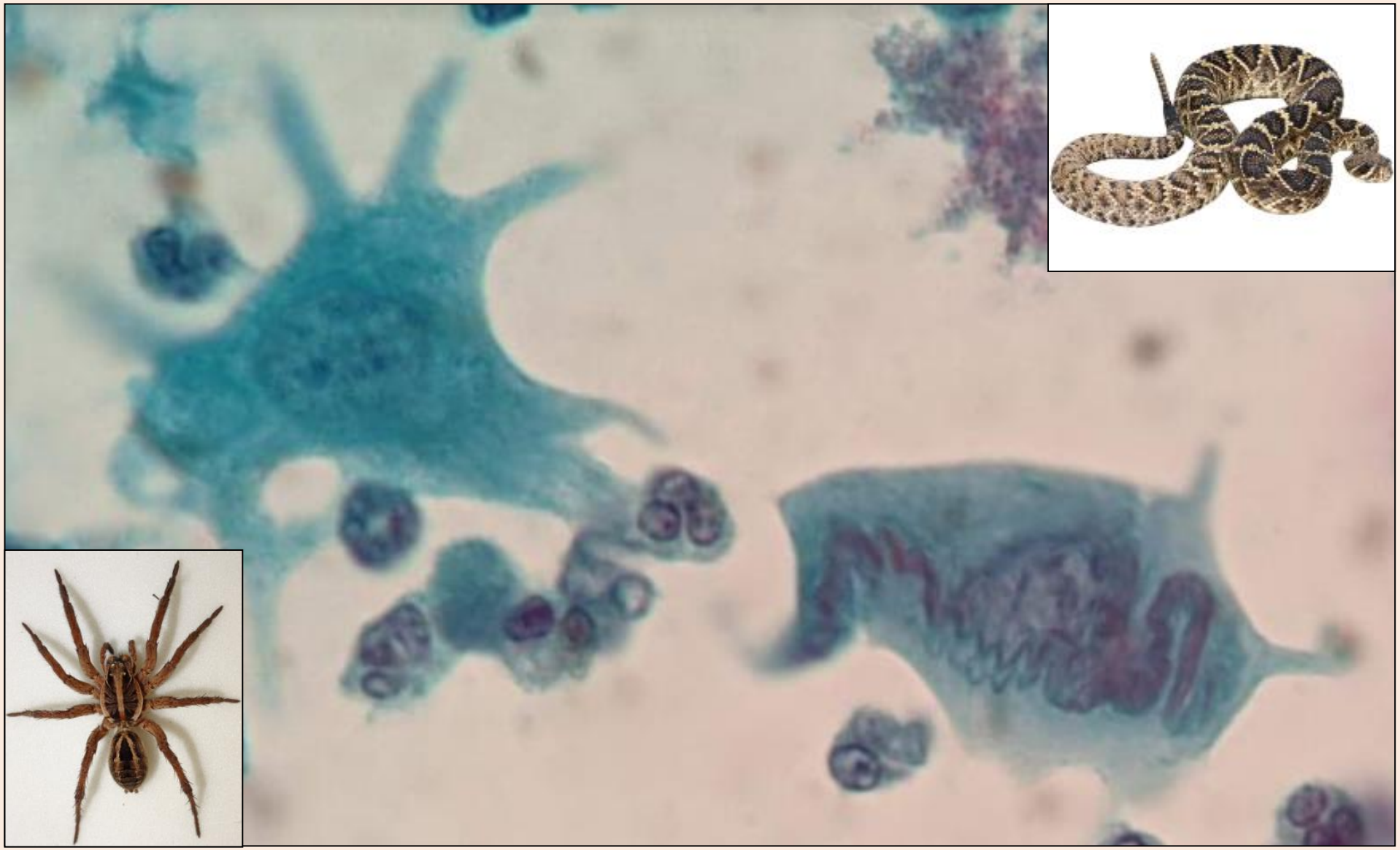
Path-arts



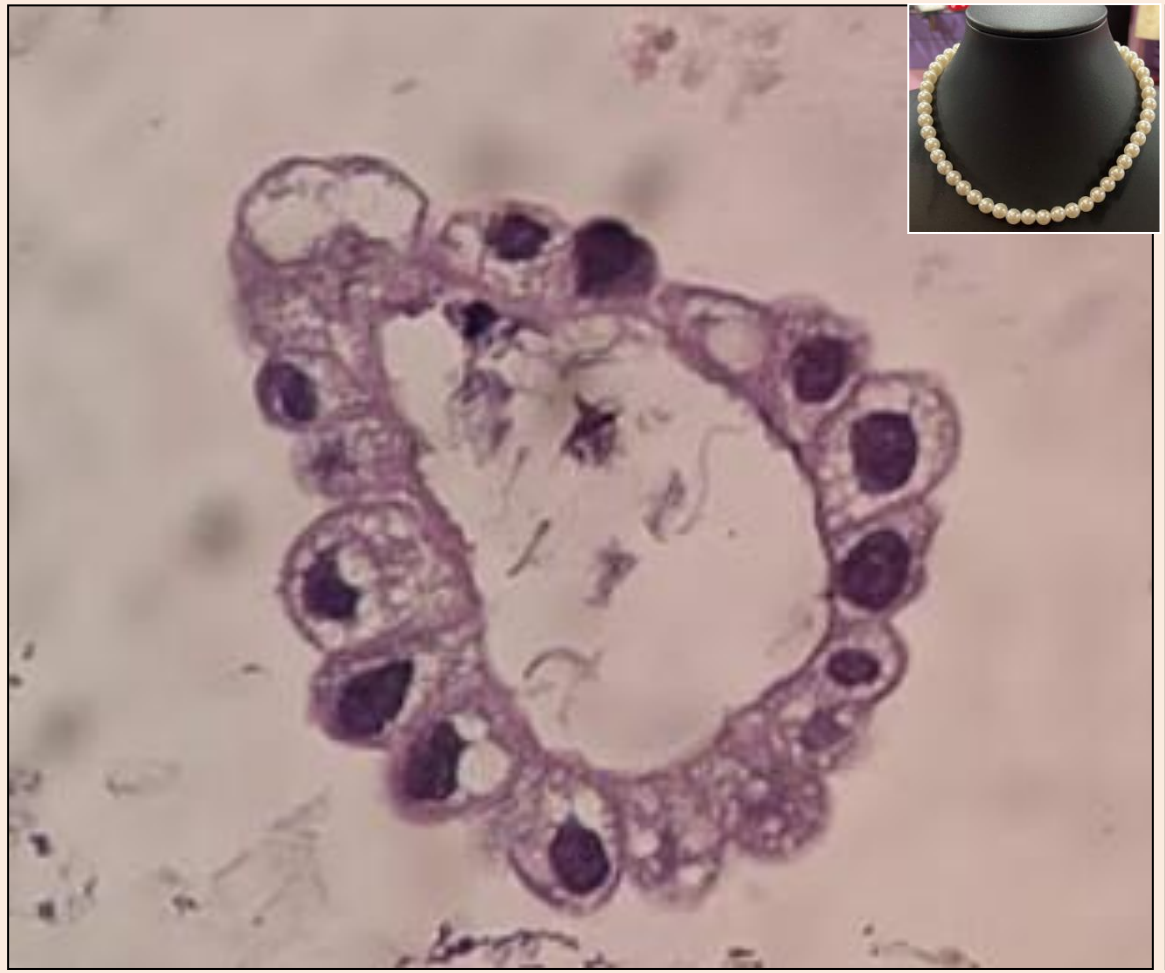
Plasma cell and urothelial cell resembling a ghost



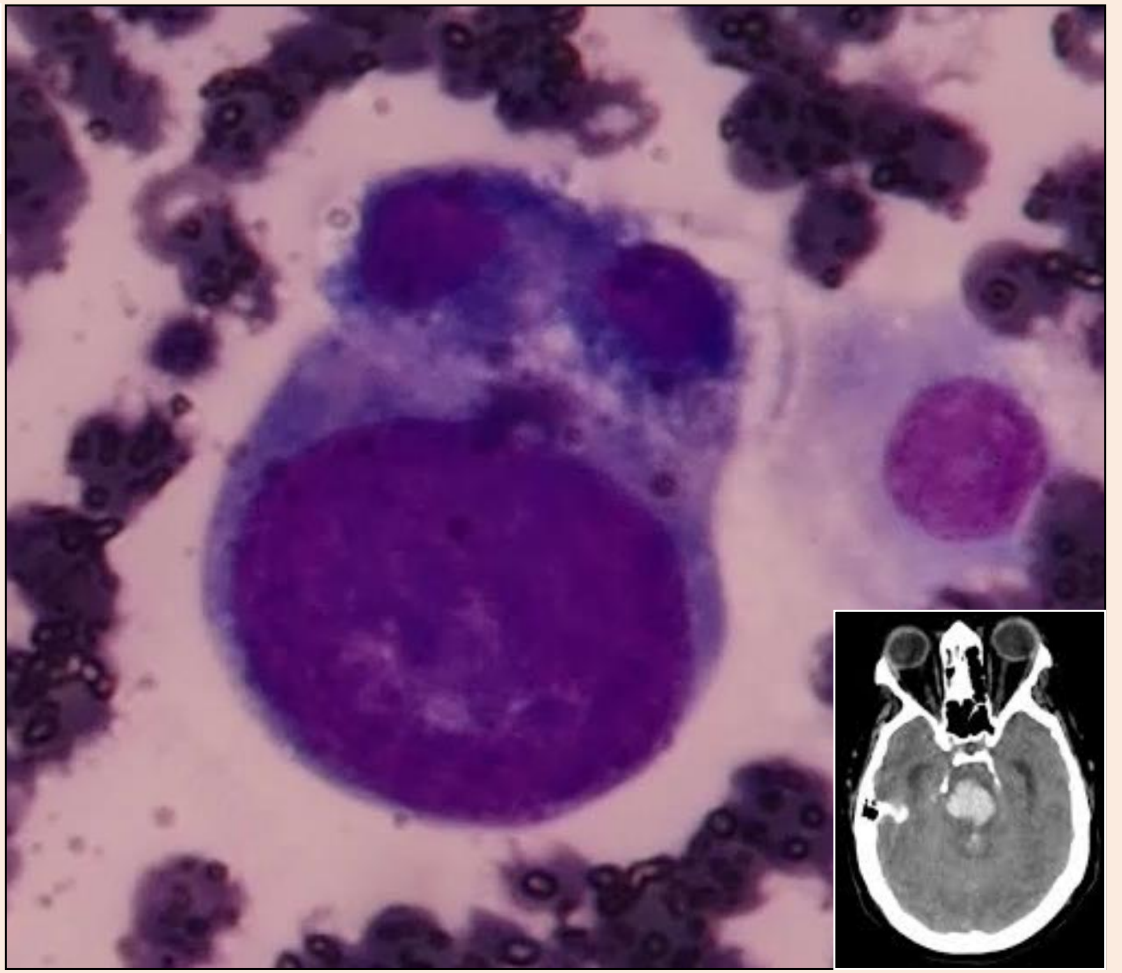
Mesothelial cells resembling birds sitting on a fence



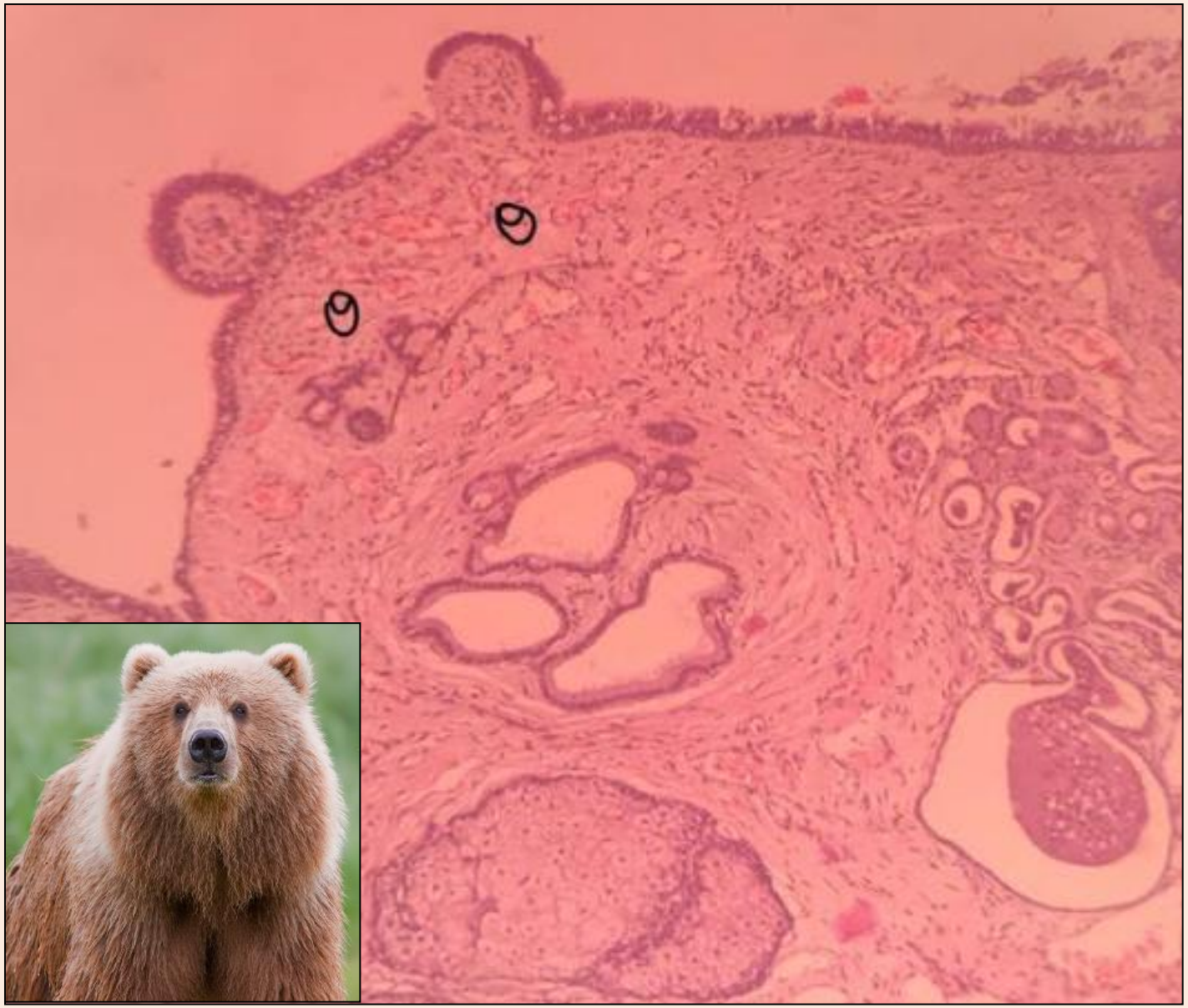
Metaplastic squamous cells in a cervical smear resembling a spider and a snake



Adenocarcinoma glands in cell block resembling a necklace.



Tumour cell cluster resembling a CT head image.



Teratoma of ovary on H & E resembling a bear

Riddles in Pathology

1. I am inside the platelet
I am larger & appear pale gray
Bleeding can occur,
Whenever I am not there.
What can my absence cause?

2. I am dominant with MYH9 gene mutation
My name starts with May
Some of the cells in the blood are large because of me
The policeman have large inclusions in them!!
Who am I?

3. I have shining stars
I have translocations
Microbes that cause me,
Cause a swollen jaw!
Who am I?

4. I am recessive,
And make platelets less sticky
Except with ristocetin
I delay bleeding and clot retraction
Who am I?

5. I cause a necklace like swelling,
Microbes can cause me
If you cut me, I look like a cut potato,
Owl eyes are common in me
Who am I?

6. I have a vacant staring look,
Like a cartoon character
In places, I look like eggs in a basket
I am in the front of the neck
But am mean like a crab
Who am I?

Answers to Riddles in Pathology

1. Gray platelet syndrome
2. May – Hegglin anomaly.
3. Burkitt's Lymphoma
4. Glanzmann thrombasthenia
5. Hodgkin's Lymphoma
6. Papillary carcinoma of thyroid

Dr.R.Thamilselvi.,MD.,
Prof & Head,
Department of Pathology,
Vinayaka Mission's Kirupananda Variyar Medical College, Salem.

HEMATOLOGY PUZZLE 1

1. Unscramble the jumbled words to make meaningful words related to Hematology

2. Then use the encircled letters and the clue and arrive at the final answer

T H I N P E E R

T I N B O W E R

L O L R A P

U L I K E M A E

CLUE: I AM RED WHEN YOUR HAIR IS BLACK, YELLOW WHEN ITS WHITE

_ _ _ _ _ _ _ _ _ _ _

Anagrams

HEMATOLOGY PUZZLE 2

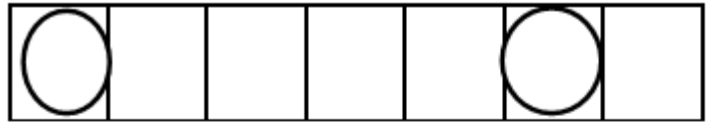
1. Unscramble the jumbled words to make meaningful words related to Hematology

2. Then use the encircled letters and the clue and arrive at the final answer

P I B A L O S H

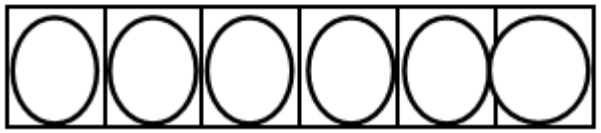
T R I C E

D E M I L O Y



B L I N G O

CLUE: IMAGES BECOME A STAIN



HEMATOLOGY PUZZLE 1

1. TREPHINE
2. WINTROBE
3. PALLOR
4. LEUKEMIA

BONE MARROW

HEMATOLOGY PUZZLE 2

1. BASOPHIL
2. RETIC
3. MYELOID
4. GLOBIN

GIEMSA

Answers for the Anagram

Memories from TAPCON 2022

WELCOME RANGOLI.

INAUGURATION BY ALL DIGNITARIES

WORKSHOP ON LIQUID BIOPSY TECHNIQUE

WORKSHOP ON EXPERIMENTS WITH ZEBRA FISH

RELEASE OF THE SOUVENIR

HONOURING FORMER HODS FOR LIFE TIME ACHIEVEMENT

PART OF THE DELEGATE

POSTGRADUATE QUIZ PROGRAMME

STALLS BY THE VENDORS

STALLS BY THE VENDORS

SLIDE SEMINAR BY DR. DEBDATTA BASU

GUEST LECTURE BY DR. K.R. ANILA

GUEST LECTURE BY DR. SANDHYA SUNDARAM

SLIDE SEMINAR BY DR. SHANTAKUMARI

E POSTER PRESENTATION SESSION

PROFERRED PAPER PRESENTATION SESSION.

THE ORGANIZING TEAM OF TAPCON 2022 TIRUNELVELI MEDICAL COLLEGE.

Best wishes!!

Newsletter team

Dr. Bharathi Vidhya Jayanthi
Dr. Renu G'Boy Varghese
Dr. K. Swaminathan
Dr. V. Eswari
Dr. A. Dhanalakshmi
Dr. S. Dhanalakshmi
Dr. K. Meenakshisundaram
Dr. R. Thamilselvi
Dr. K.S. Sunil Kumar
Dr. R.Vijayashree
Dr. K. Rajeswari
Dr. Niraimathi Manickam
Dr. J. Prabhavati