Non-Gynecological cytology
Part I

Cell Block

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Leaning Objectives

EXPLAIN THE PRINCIPLE OF CYTOTECHNIQUE

CYTOLOGY SAMPLES CLASSIFICATION

DISCUSS CYTOLOGY PREPARATION TECHNIQUES

DISCUSS LMITATIONS OF FNAC

EXPLAIN BODY FLUIDS

EXPLANE SMEAR PREPRATION METHODS

DISCUSS COMMON PROBLEMS WITH PREPARATION

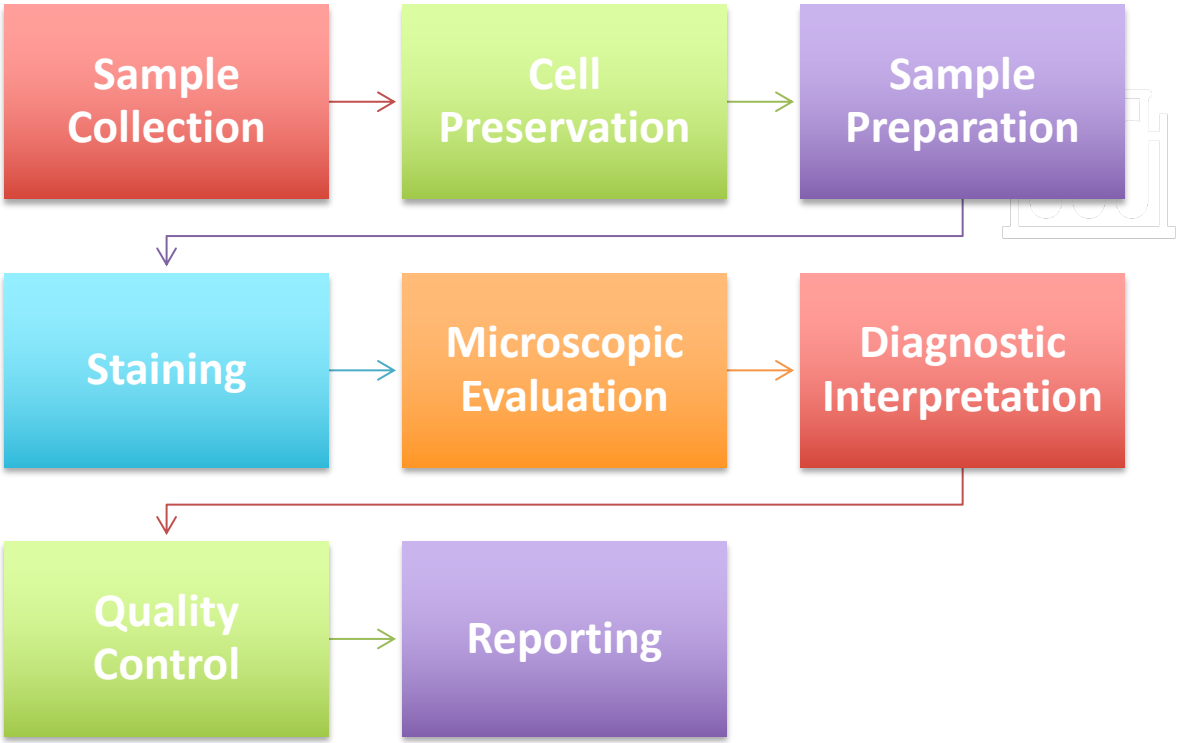
Cytotechnique

Cytotechnique is a critical component of clinical pathology and is used for the early detection, diagnosis, and monitoring of diseases, including cancer and infectious diseases.

The Principle of Cytotechnique

- **To reduce the specimen to a Cellular presentation that can be interpreted and diagnosed.**

Outline of the principles involved in cytotechnique



Cytology Samples Classification

Cytology samples can be classified based on the source of the sample, the method of collection, and the purpose of the test

1.Exfoliative Cytology

2.Brushings and Washings

3. Others: Scrapings and Body Surface Samples

4. Imprint cytology

5. Fluid Cytology

6. Fine Needle Aspiration (FNA) Cytology

Cytology Samples Classification

Each sample type has its indications, advantages, limitations, and preparation techniques and is used to diagnose various conditions, from infections to malignancies.

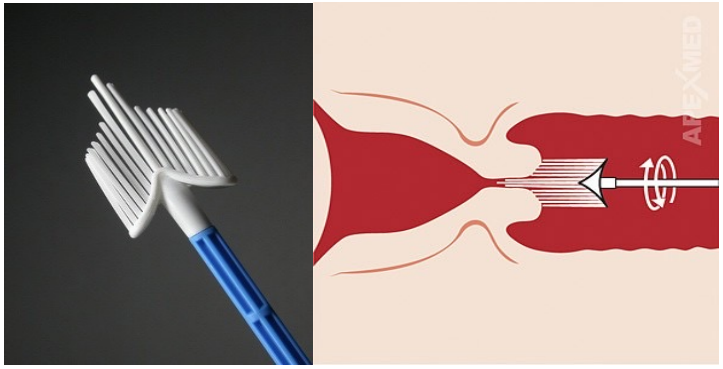
The choice of cytology sample type often depends on:

- The suspected diagnosis
- The lesion's site
- The patient's condition.

Cytology Samples Classification

1.Exfoliative Cytology:

1. **Spontaneously Exfoliated Cells:** These are cells that shed naturally into body fluids. Examples include urine for bladder cancer screening and sputum for lung cancer screening.
2. **Mechanically Exfoliated Cells:** These are cells obtained by **scraping or brushing**, such as Pap smears from the cervix or endometrial brushings.

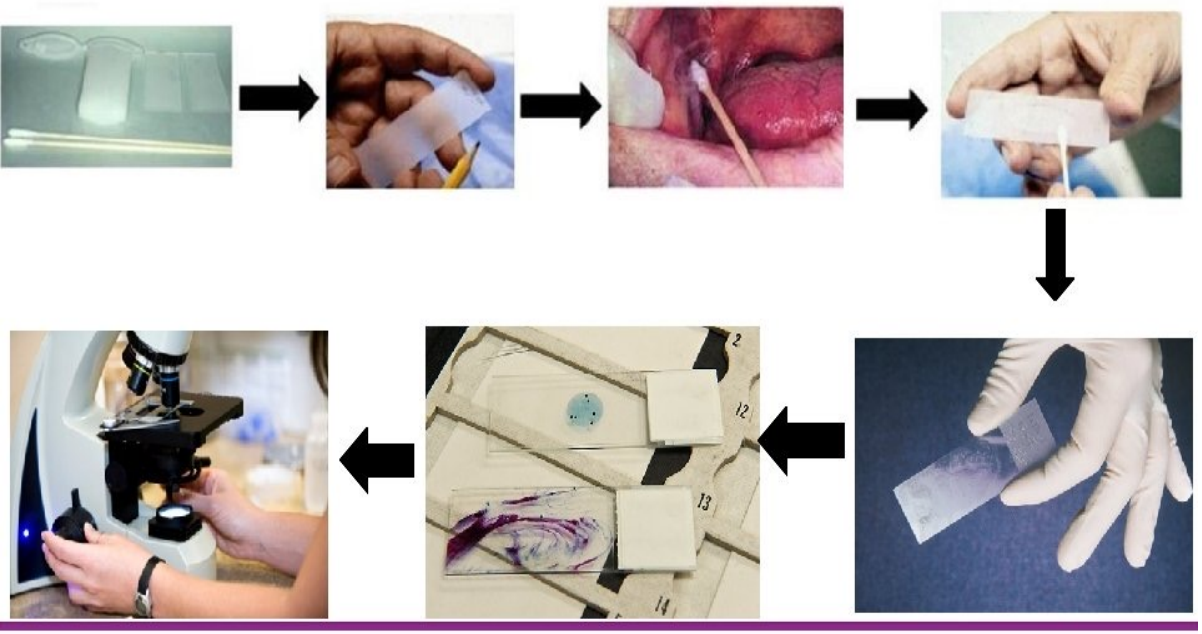


PAP smear

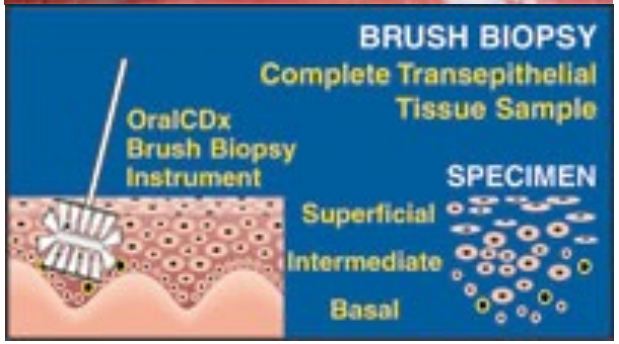
Sputum

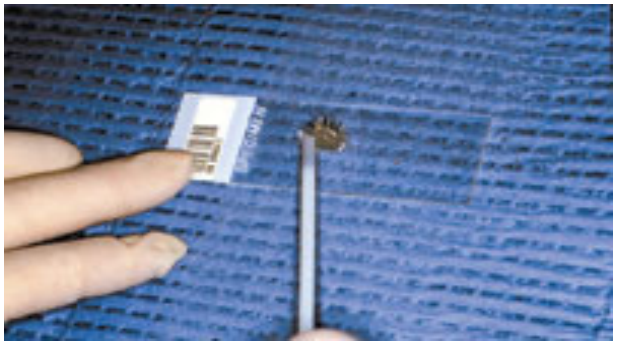
Urine

Mechanically Exfoliated Cells



Brushing

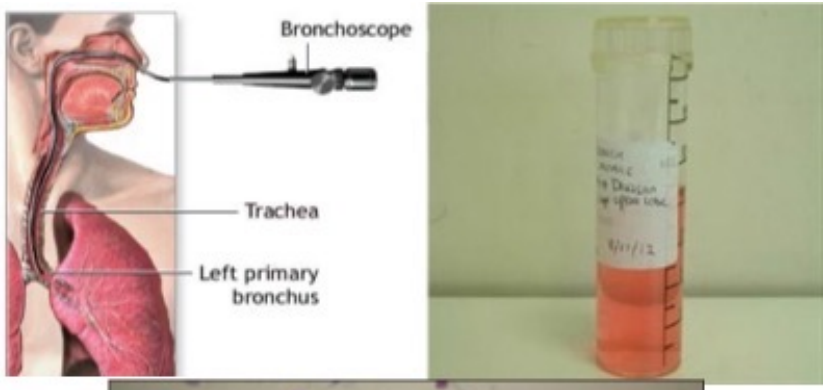




Cytology Samples Classification

2. Brushings and Washings:

1. **Respiratory Tract:** Including bronchial brushings and washings for respiratory tract lesions.
2. **Gastrointestinal Tract** includes brushings from esophageal, gastric, or colonic lesions.



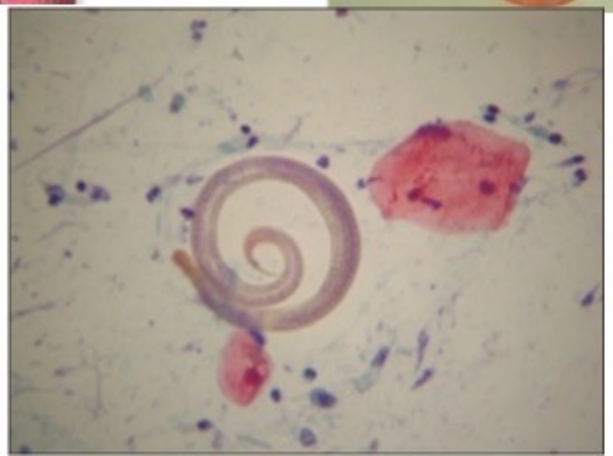
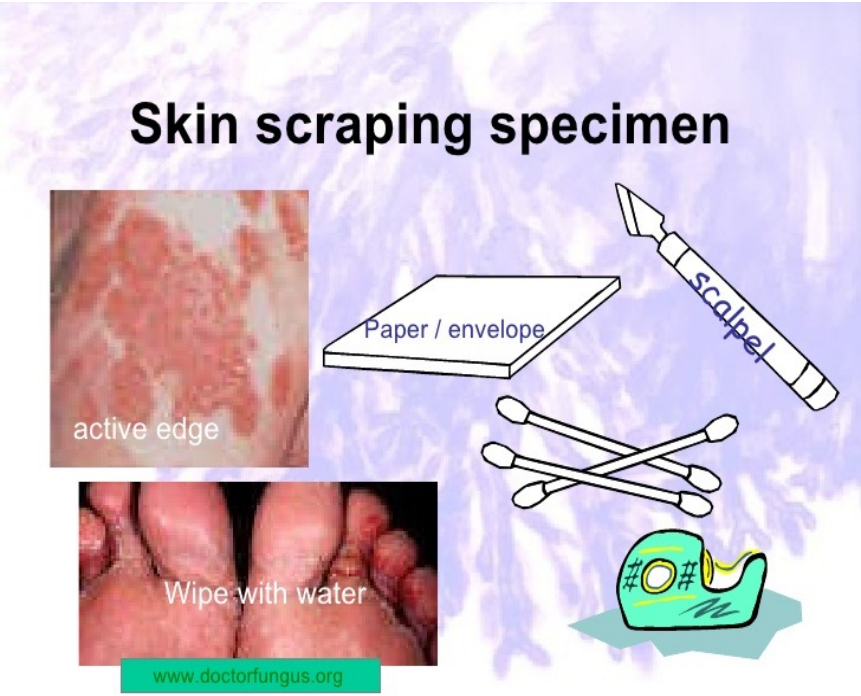


Figure 1: Cytologic examination of the bronchial wash showed a stercoralis worm in a background containing cellular debris (Papanicolaou stain ×400).

Cytology Samples Classification

3. Others:

1. **Scrapings:** Such as skin or mucosal scrapings for diagnosing infections or lesions.
2. **Body Surface Samples:** Such as nipple discharge or skin lesions.



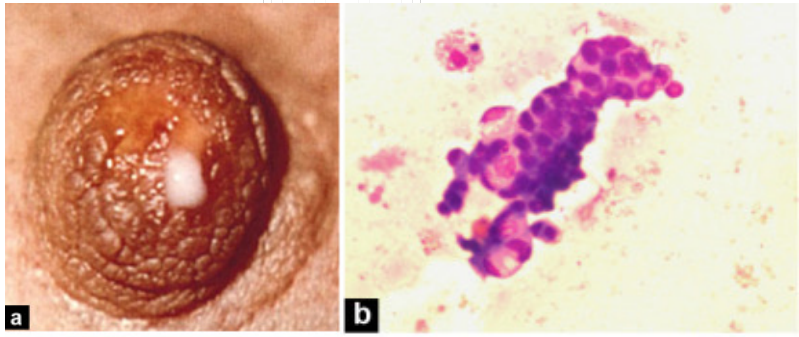
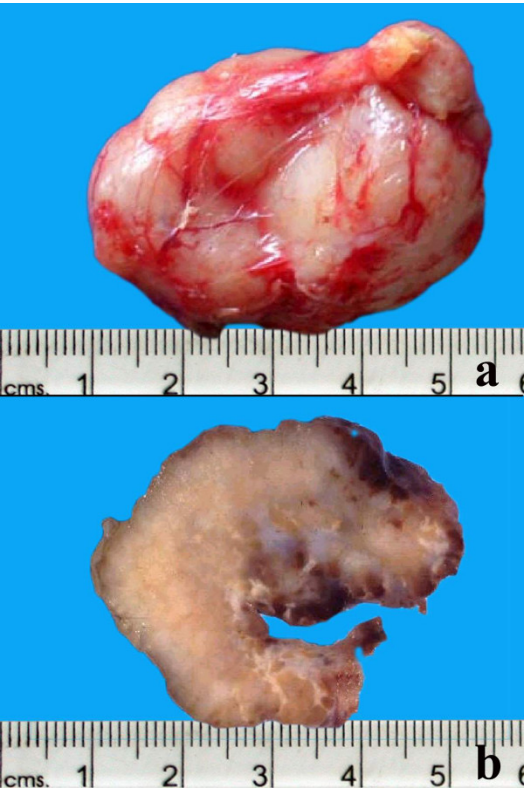


Figure1:The discharge smear. a: illustration of a technique for performing the smear; b: cytology of a hemorrhagic single pore nipple discharge after staining. A clump of papillary cells is present with a few atypical changes on a blood-stained background.

Imprint Cytology

3. Imprint Cytology:

- A diagnostic technique used to evaluate the presence and type of cells on the surface of organs, tissues, or implants.
- It involves the transfer of cells from the tissue surface directly onto a microscope slide, which can then be stained and examined.



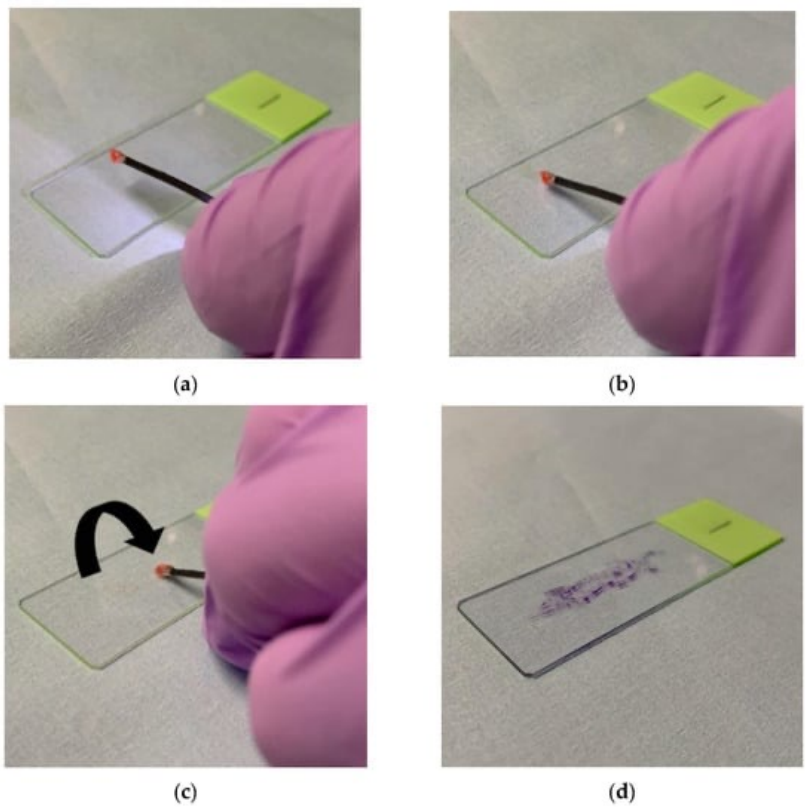
Sample Collection

- Cut mass in half
- Blot dry
- Remove blood/tissue fluid from the surface
- Use sterile gauze or other absorbent material
- Touch the slide to the blotted surface
- Stain

Imprint cytology

Cells are often taken from an organ or tissue surface during surgical procedures.

https://youtu.be/prggfKrNlbI

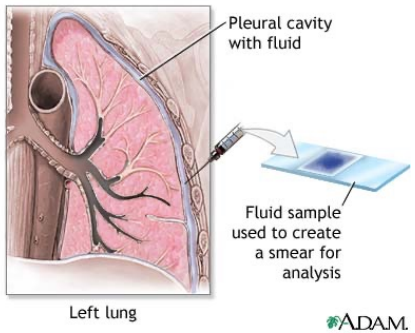


Rapid on-site evaluation of touch imprint cytology was used in this study. (**a**) A cryobiopsy specimen is attached to the cryoprobe. (**b**) The specimen is imprinted onto a slide glass without being thawed in saline. (**c**) Then, the specimen is rotated and stamped repeatedly such that the entire surface of the spherical specimen can be attached to the slide glass. (**d**) Finally, the slide glass is stained with modified Giemsa (Diff-Quik; Sysmex Ltd., Kobe, Japan) and evaluated by a bronchoscopist with sufficient experience in pulmonary cytopathology. (Yutaka Muto. et al,2022)

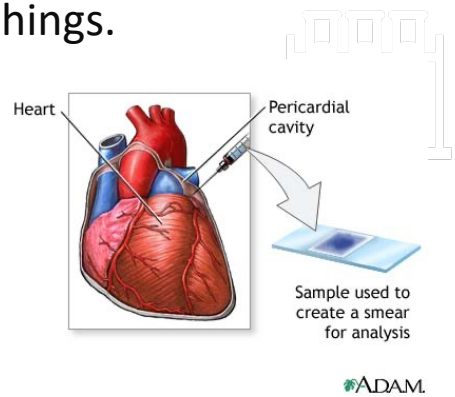
Cytology Samples Classification

5. Fluid Cytology:

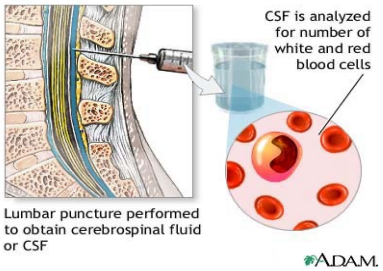
1. **Naturally Occurring Fluids:** Examining cells found in fluids that naturally accumulate in body cavities, such as pleural, peritoneal, or pericardial fluids.
2. **Induced Fluids:** Examining cells from artificially introduced fluids and collecting from body cavities, such as bronchial or gastric washings.



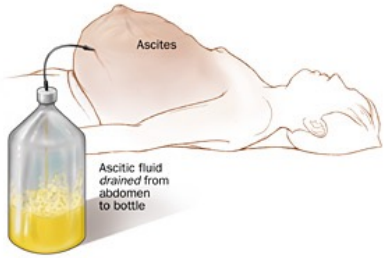
Pleural fluid



Pericardial fluid



CSF



Ascitic fluid

Evaluation of specimen

Collection

Fresh sample

- pH
- Protein content
- Enzymatic activity
- Bacteria +/-
- Cell concentration

Preparation

Pre-fixation of material

Appearance during collection EDTA to prevent clotting

Staining

keep one or two slides in reserve, especially if visible clumps of cells

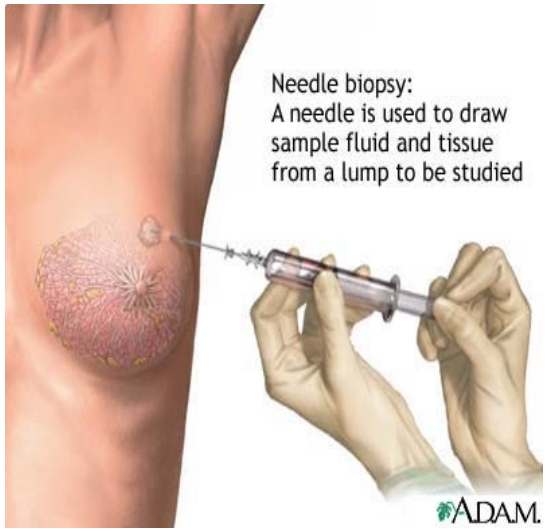
Fresh material

↑↑ mucus	•Sputum •Bronchial aspirates •Mucocele fluid	12 to 24 hrs if refrigerated
↑↑ protein	•Pleural •Peritoneal •pericardial	24 to 48 hrs Without refrigeration
Low mucus or protein	•Urine •CSF	1 to 2 hour delay even if refrigerated

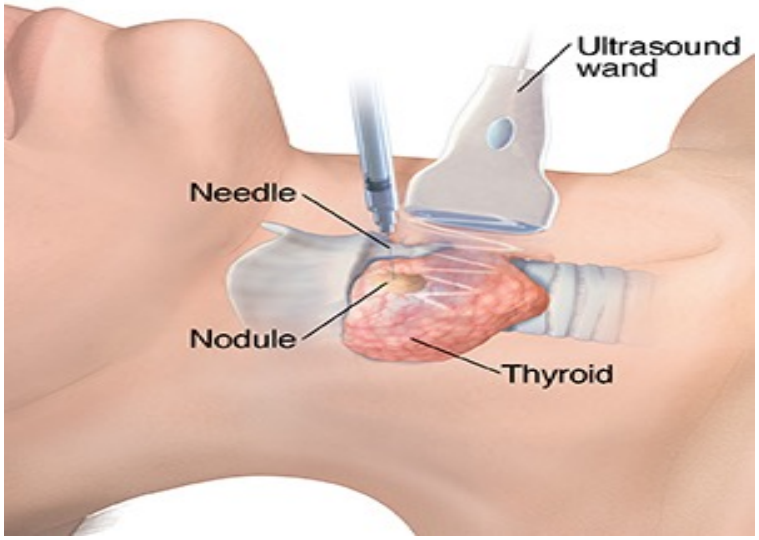
Cytology Samples Classification

6. Fine Needle Aspiration (FNA) Cytology:

1. **Superficial Masses:** Aspiration of cells from palpable lesions, such as those found in the thyroid, breast, or lymph nodes.
2. **Deep-Seated Masses:** Aspiration of cells from non-palpable lesions guided by imaging techniques like ultrasound or CT scans.



Palpable lesions
Superficial nodules and organs



Non-Palpable lesions
Deep organs use CT or ultrasound guidance

Fine Needle Aspiration Cytology (FNAC)
Interventional / Aspiration Cytology

This is the branch in which samples are obtained by clinical procedures or surgical intervention.

It is also known as Aspiration Cytology.

The most famous ones are FNA, fine needle aspiration biopsy (FNAB), and needle aspiration biopsy cytology (NABC)

FNA cytology is less invasive than traditional surgical biopsies and can often provide a rapid diagnosis.

FNAC APPLICATIONS

Applied in diagnosis PALPABLE as well as NON-PALPABLE lesions

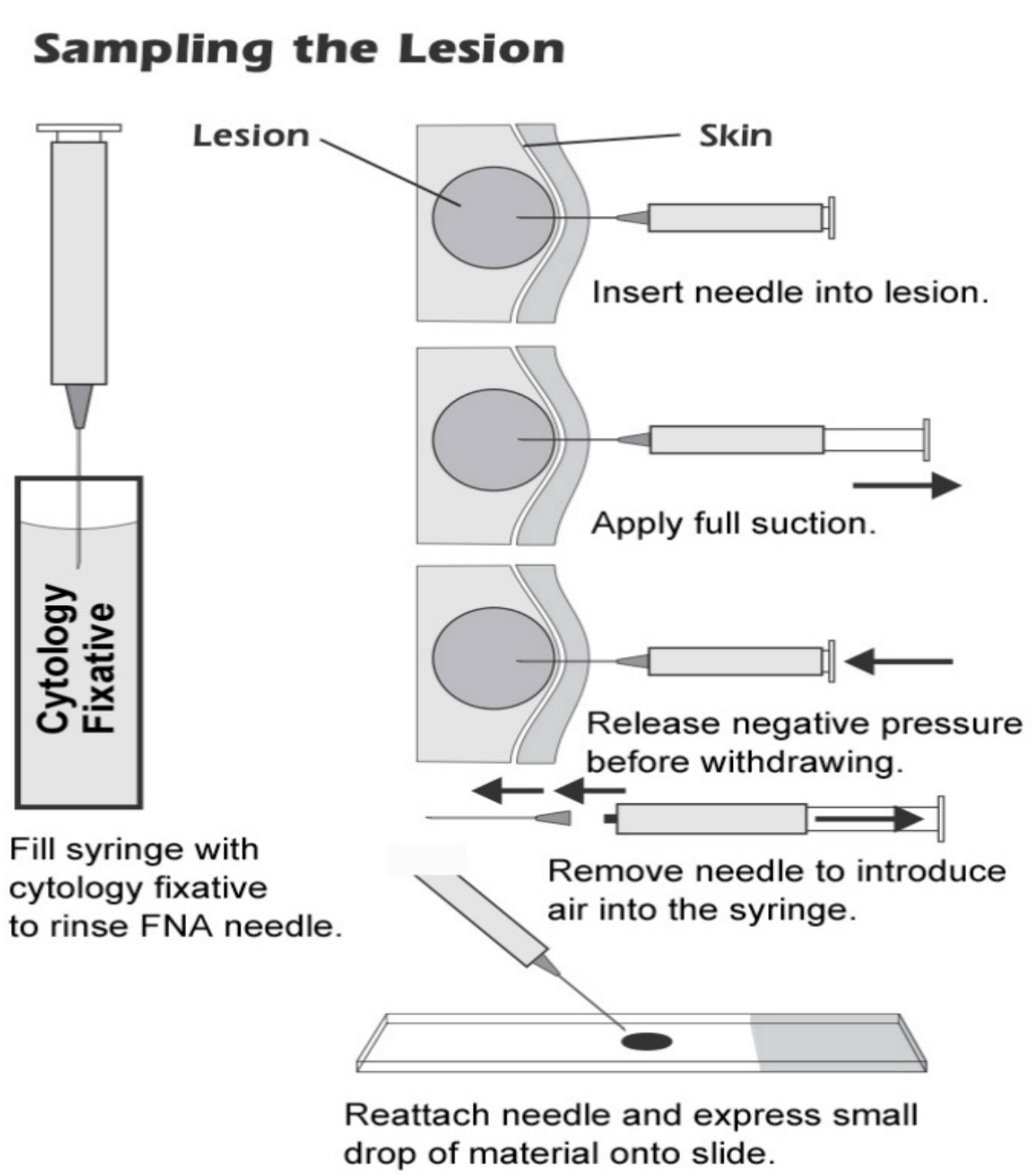
PALPABLE MASS LESION

- Lymph node
- Breast (duct carcinoma)
- Thyroid
- Salivary gland
- Soft tissue masses
- Bones

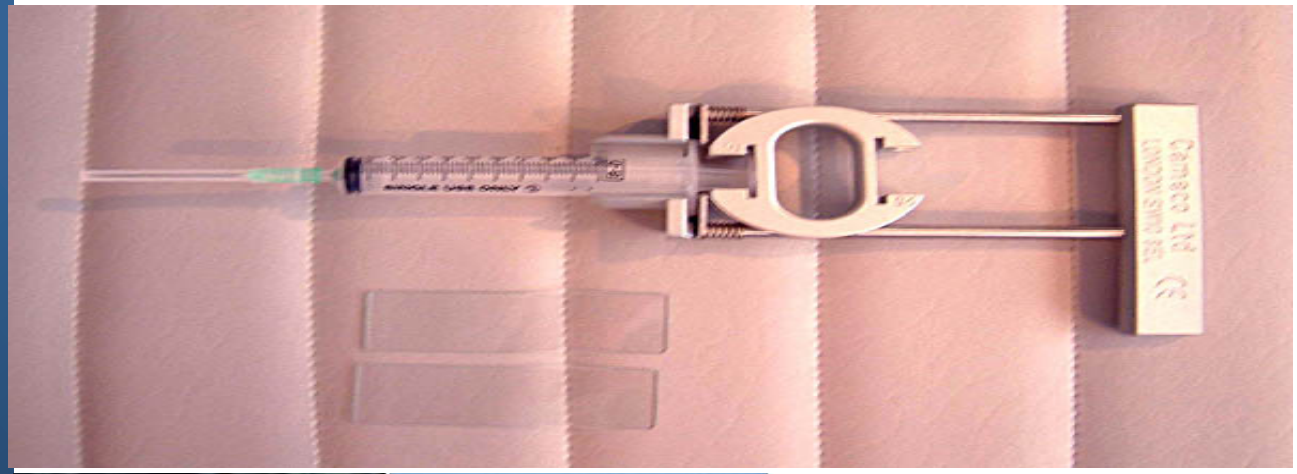
NON-PALPABLE MASS LESION

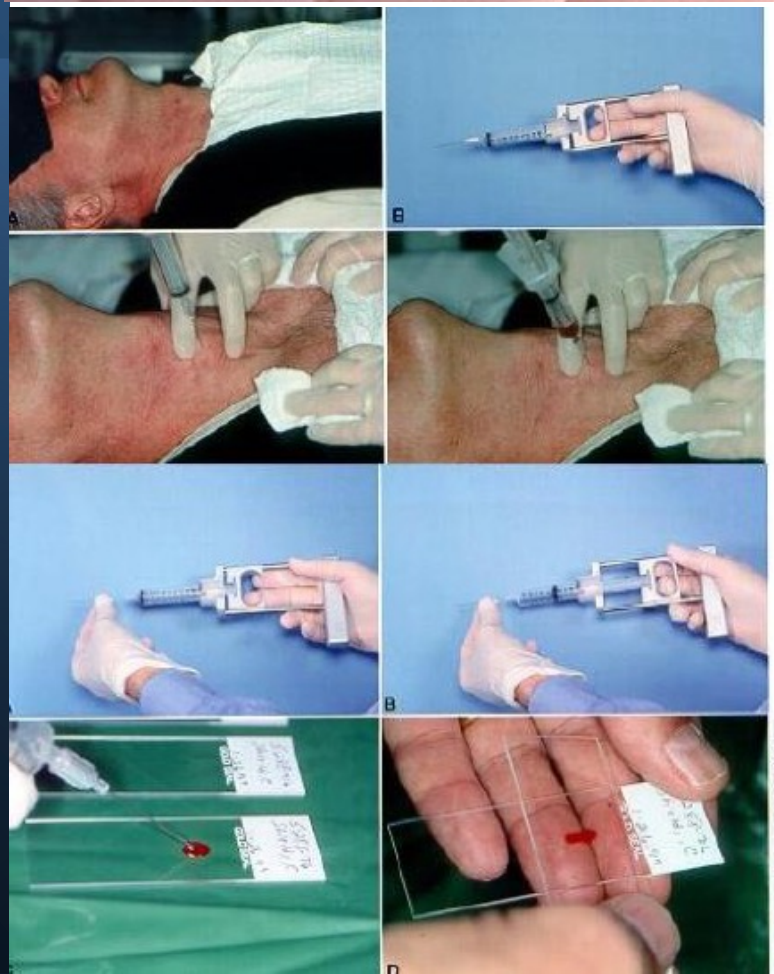
- Abdominal cavity
- Thoracic cavity
- Retroperitoneum

Taking Palpable Mass in FNAC

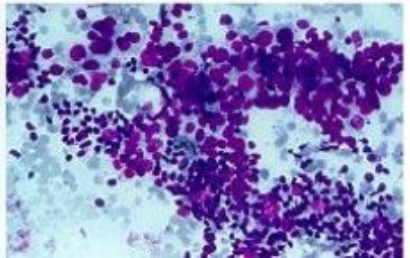


Fine Needle Aspiration Cytology (FNAC)



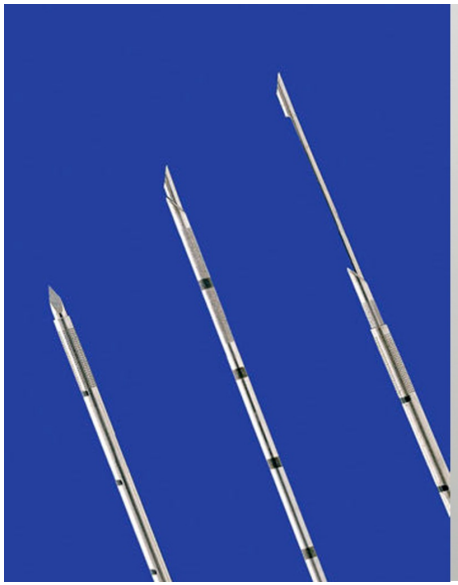


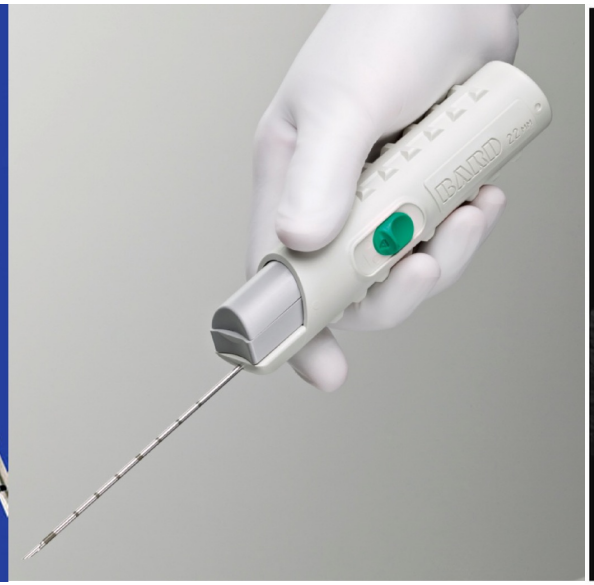
Fine Needle Biopsy

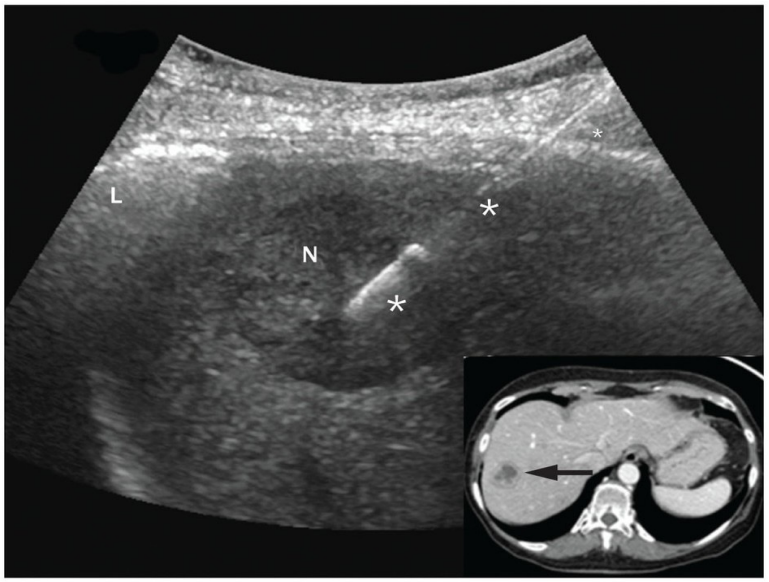


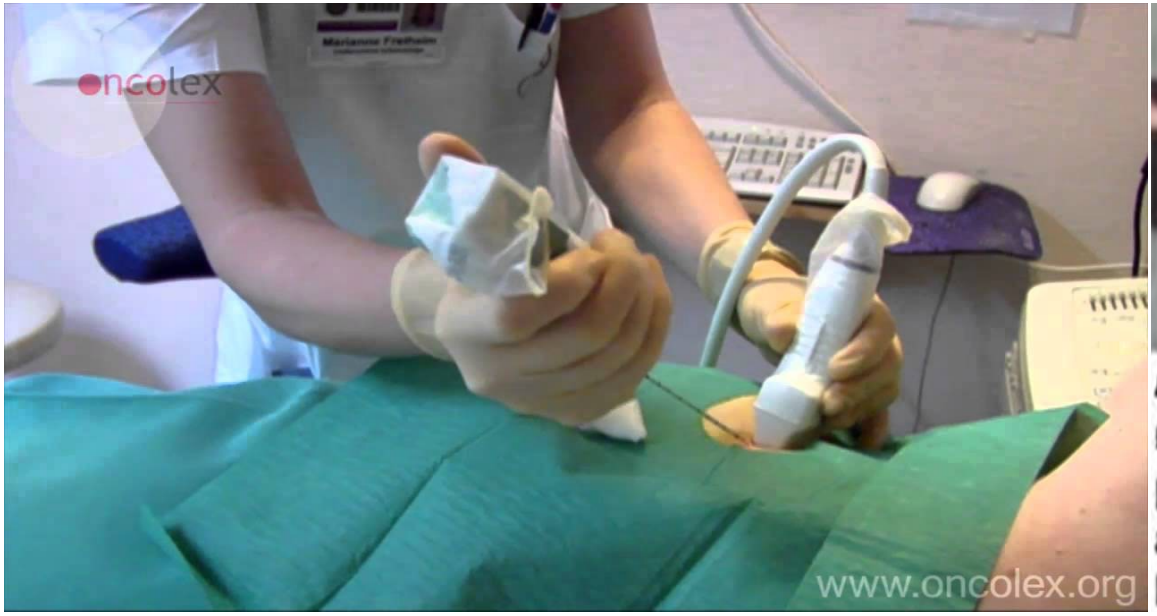
Dr. Aziza Alrafiah

Non-Palpable lesions









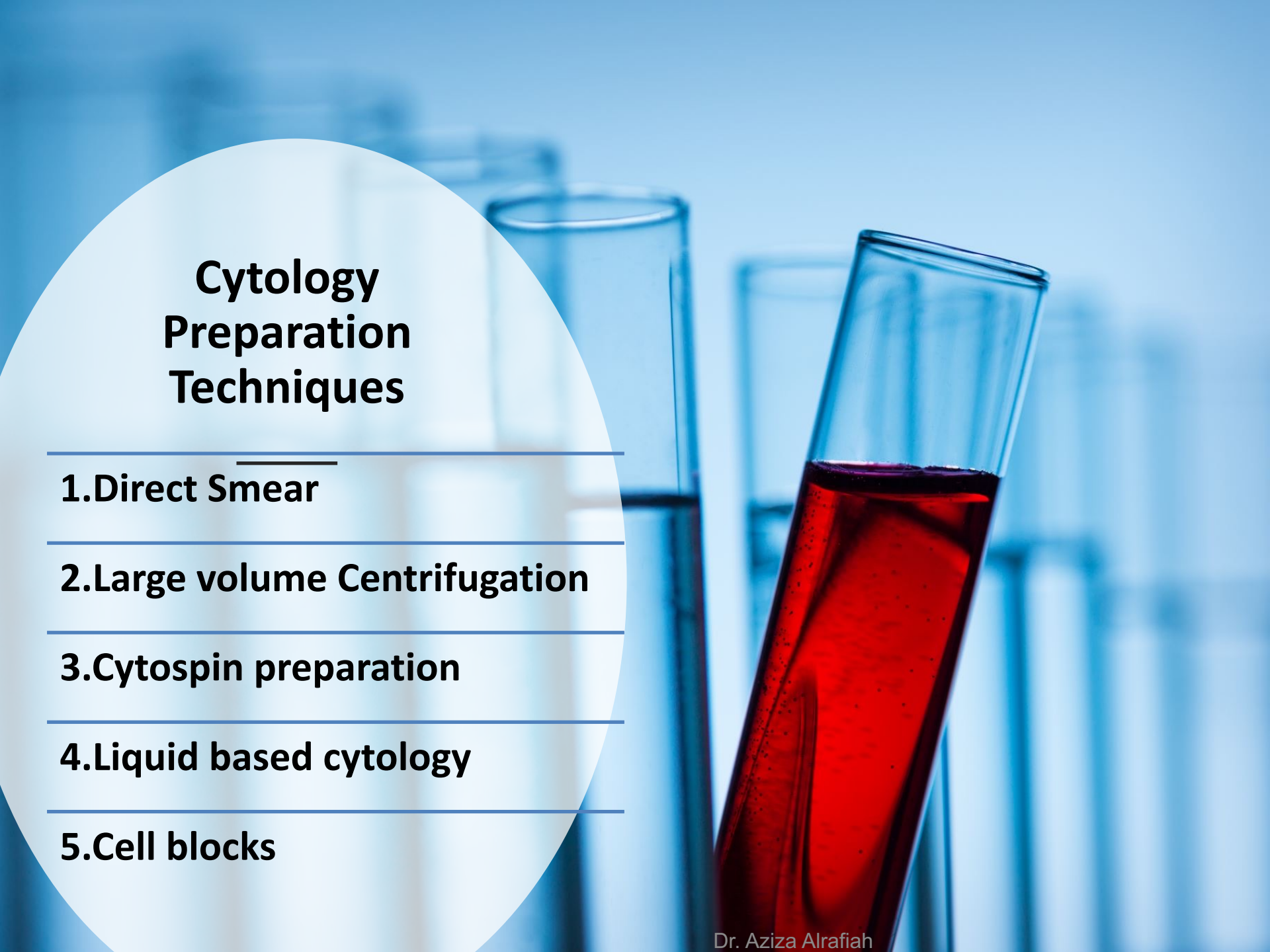
A core needle biopsy allows more tissue to be removed from the breast. This allows the pathologist to give a histological diagnosis as against a cytological diagnosis obtained by FNAC

Limitations & Common Problems with FNA

- Insufficient material for a definitive diagnosis
- Some lesions do not exfoliate cells well.
- The needle may miss the site of the lesion
- Using too large needle gauge
- Blood contamination
- The accuracy of the diagnosis can be affected by the experience of the clinician performing the aspiration

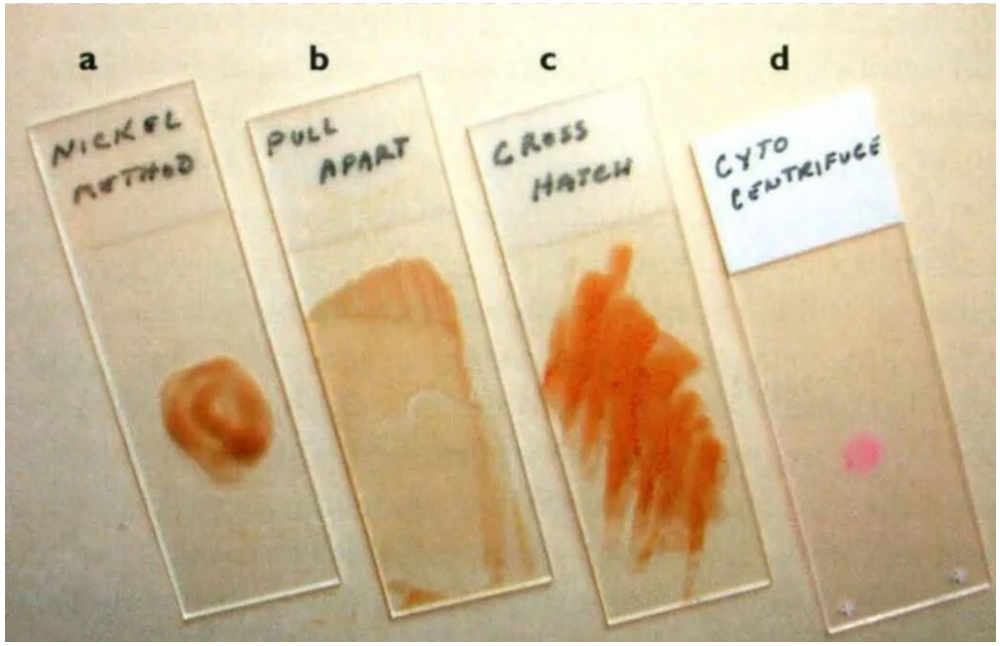
Cytology Preparation Techniques

1. Direct Smear
2. Large volume Centrifugation
3. Cytospin preparation
4. Liquid based cytology
5. Cell blocks

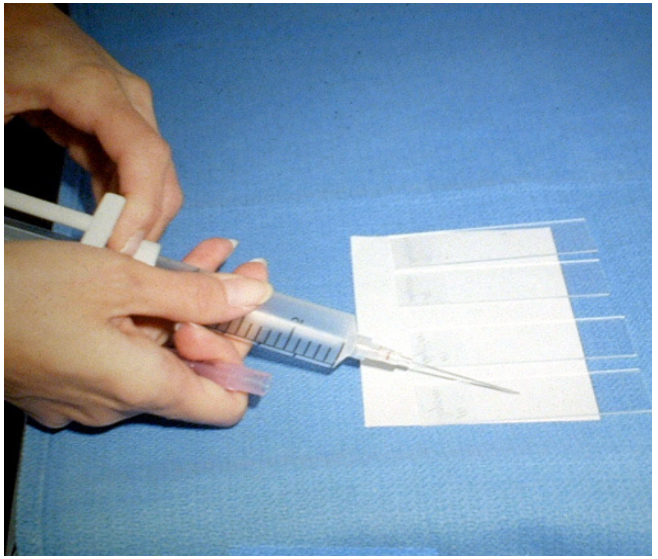


Direct Smears Preparation Methods

- Spreading Method
- Pull Apart Method
- Toch smear
- Squash prep method
- Blood smear method
- Streaking Method

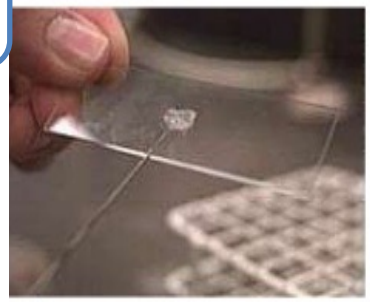


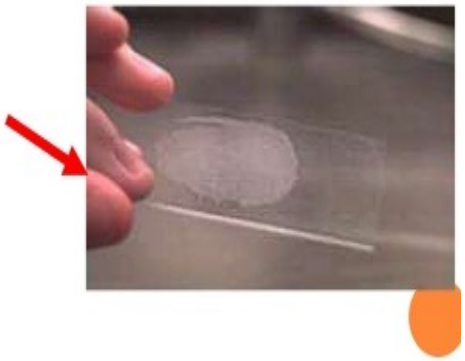
Spreading Method



Spread aspirate on the slide with the tip of a needle or the edge of another slide.

Pull the sample out into several projections (starfish appearance).

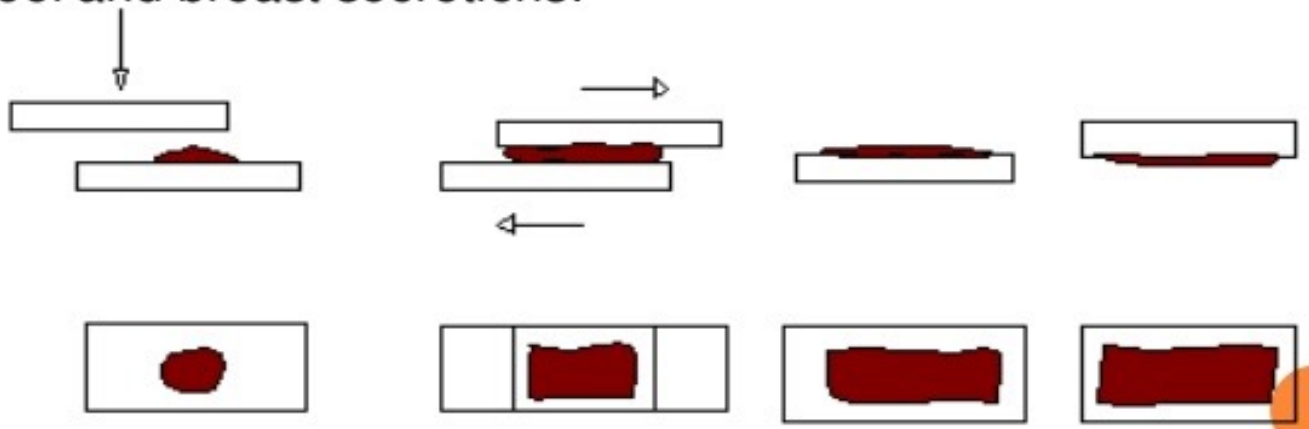




Pull Apart Method

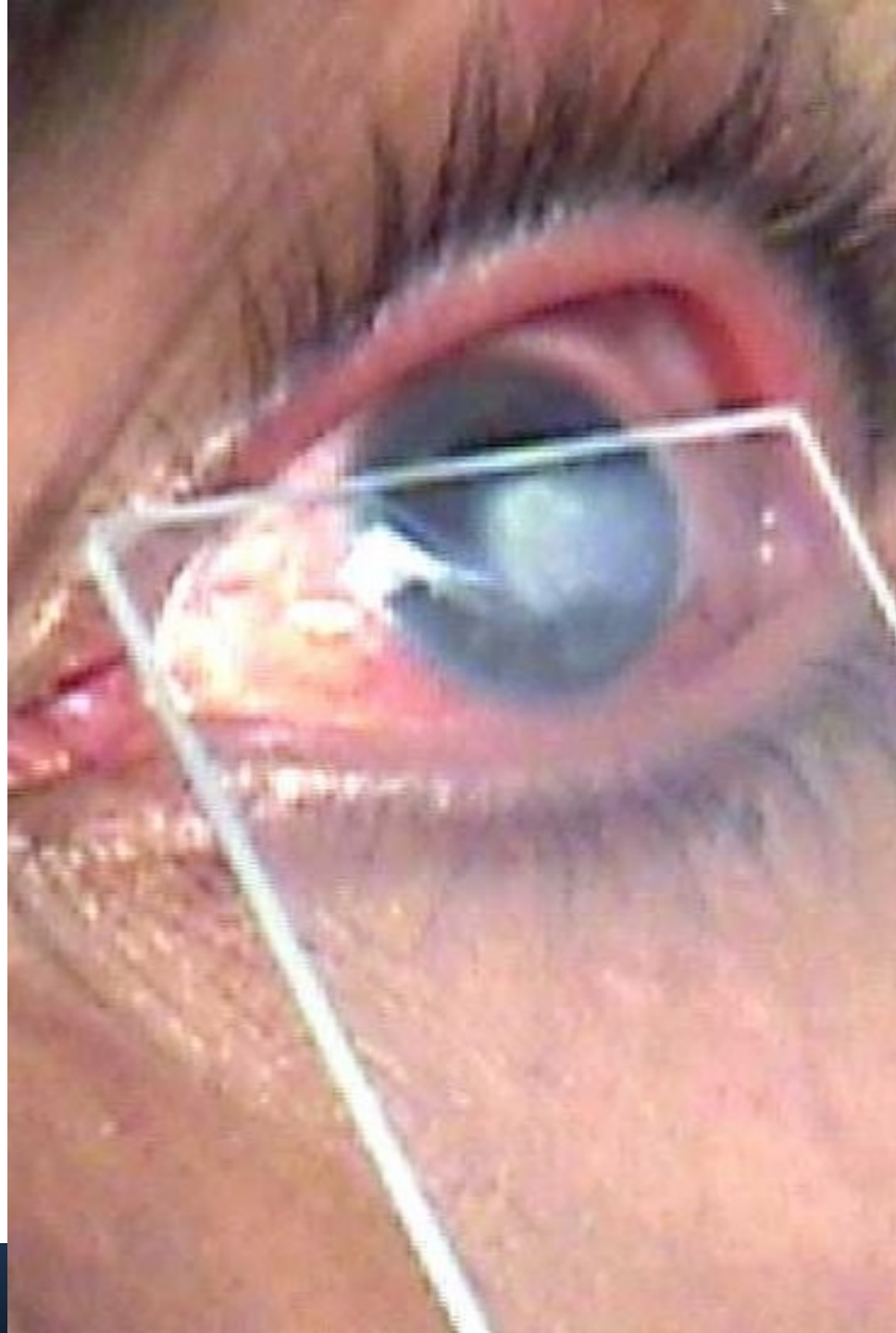
- In the pull-apart technique, a new, fresh, clean microscope slide is gently stacked on top of the sample on the sample slide; then, the slides are pulled apart vertically

- for serous fluids, concentrated sputum, and enzymatic lavage form the GIT, smears of urinary sediment, vaginal pool and breast secretions.

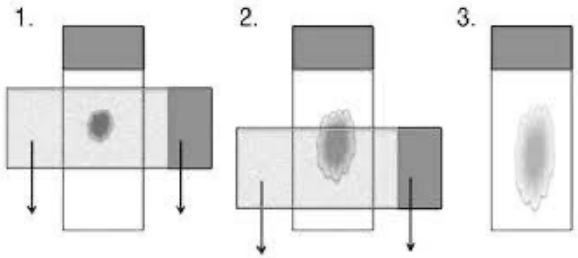


Touch smear

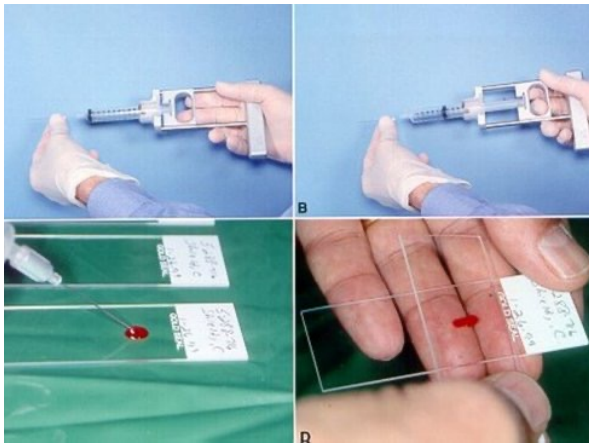
- The touch preparation (TP) technique is a tissue preparation method in which fresh tissue will exfoliate cells on a glass slide after touching that slide.



Squash Preparation

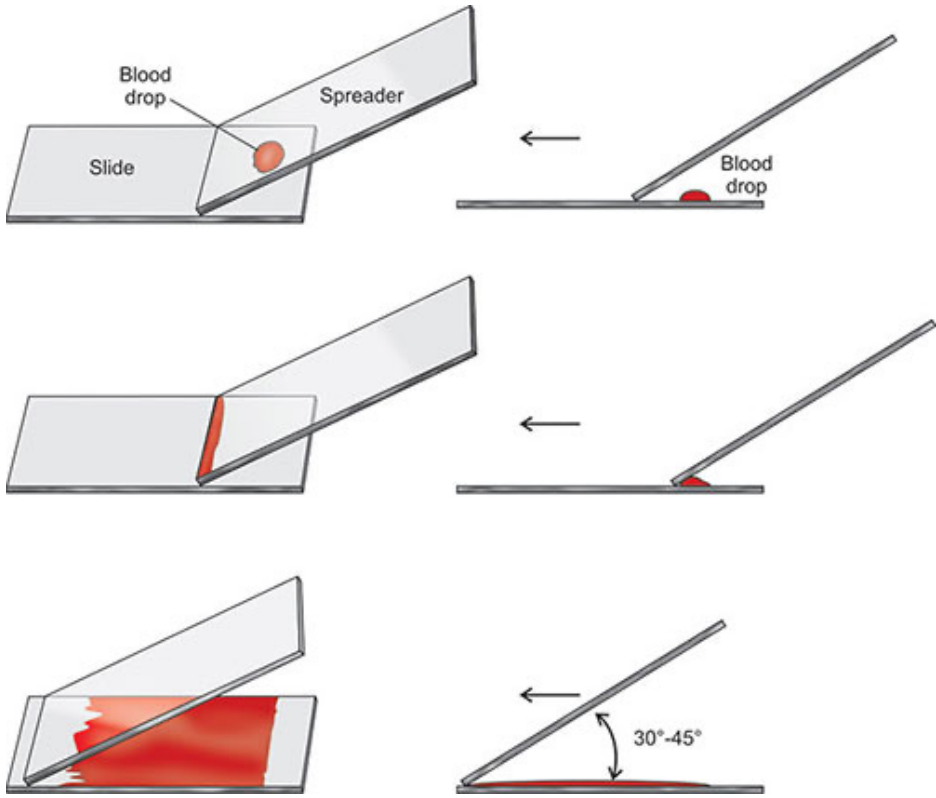


- Aspirated material is placed in the center of the slide
- A second slide is placed over the sample to form a cross.
- Carefully slide apart from the first slide (Put down on and pick up to move).
- Do not place excessive downward pressure on the first slide because will cause distorted ruptured cells



Blood Smear Technique

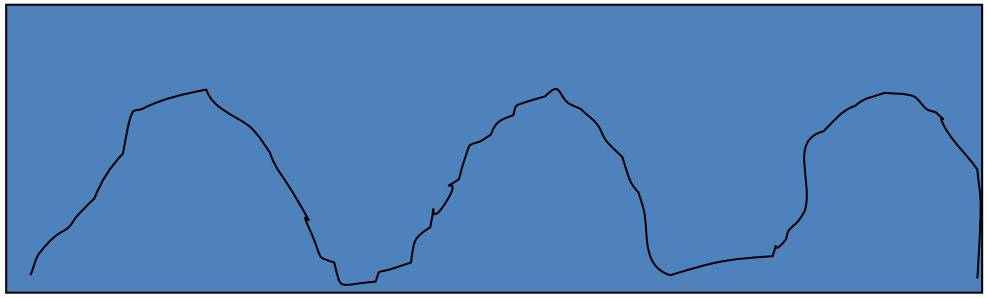
- After the material is expelled on the slide, the second slide is held at 30-40˚angle.
- The second slide is pulled backward until it contacts the fluid
- Rapidly move forward like a blood smear.



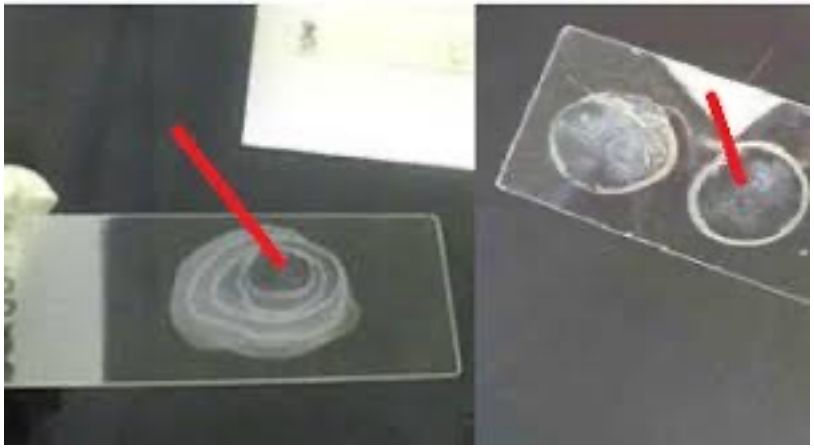
Streaking Method

- Used for preparing mucoid secretions, vaginal secretions, sputum, and gastric content

- Use a spatula, dissecting needle, or applicator stick, and streak in a zigzag fashion



Common Problems with Smear Preparation



- Insufficient sample volume or cell concentration, leading to a poor representation of the specimen.
- Overly thick smears, which can cause cells to overlap and make it difficult to identify individual cells.
- Contamination of the smear with foreign material, which can interfere with the microscopic examination.
- Improper fixation of the smear, potentially causing cell degradation or morphological distortions.

Useful videos

- Buccal Swab Sample

- https://youtu.be/tmRa8uTG7eQ

- Bone marrow
- https://youtu.be/NkdsLHBCreI

- How to Prepare a Slide for a Cytology Evaluation
- https://youtu.be/LQF_ihRA_pA

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