

Cytology

DIAGNOSTIC CYTOLOGY

Diagnostic cytology

is the science of interpretation of cells that are either **exfoliated from epithelial surfaces** or removed from various tissues.

❖ It is now a widely accepted method for mass screening in asymptomatic population.

❖ Many european countries have achieved reduction in incidence of cervical cancer by **systematic pap smear** screening of the population.

History of Cytodiagnosis

The first area:

19 century

Exfoliated had been described in all types of samples.

- 1861
- Pharyngeal secretion
- Post mortem
- Squamous cell carcinoma

The second area:

of development and expansion

[George N Papanicolaou](#) introduced cytology as a tool to detect cancer and pre-cancer in 1928.

Screening of cervical cancer

History of Cytodiagnosis

The third area:

- Of consultation
- Technique of FNAC.

The fourth area:

- ❖ Bethesda system

2017 Bethesda System for Reporting Thyroid Cytopathology

Diagnostic Category	ROM if NIFTP not cancer	ROM if NIFTP is cancer	Management
Nondiagnostic/unsatisfactory Cyst fluid only Acellular specimen Other: Obscuring factors	5–10%	5–10%	Repeat fine needle aspiration under ultrasound guidance
Benign Benign follicular nodule Chronic lymphocytic (Hashimoto) thyroiditis, in proper clinical setting Granulomatous (subacute) thyroiditis	0–3%	0–3%	Clinical and US follow-up until two negative
Atypia of undetermined significance/ follicular lesion of undetermined significance	6–18%	10–30%	Repeat FNA, molecular testing, or lobectomy
Follicular neoplasm/ suspicious for a follicular neoplasm (Specify if Hürthle cell type)	10–40%	25–40%	Molecular testing, lobectomy
Suspicious for malignancy	45–60%	50–75%	Lobectomy or near-total thyroidectomy
Malignant Papillary thyroid carcinoma Medullary thyroid carcinoma Poorly differentiated carcinoma Undifferentiated (anaplastic) carcinoma Squamous cell carcinoma Carcinoma with mixed features Metastatic malignancy Non-Hodgkin lymphoma Other	94–96%	97–99%	Lobectomy or near-total thyroidectomy

Based on the above, the execution of a correct cytological sampling cannot disregard **three basic steps**:

(a) The choice of the lesion to be sampled

(b) The choice of the sampling method most suitable for that particular lesion

(c) Proper preparation of the slide

The advantages of diagnostic cytology are that it is

-
- ❑ a non-invasive, quick and easy,
 - ❑ simple procedure,
 - ❑ Helps in faster reporting,
 - ❑ is relatively inexpensive,
 - ❑ Involve little or No risk to the patient
 - ❑ has high population acceptance and
 - ❑ facilitates cancer screening in the field.

❖ Must be able to **identify normal cells** from abnormal cells, and inflammatory from non-inflammatory cells.

❑ **Disadvantage** may be that some tumors do not exfoliate cells well and therefore may not provide an adequate sample to examine.

Collection and Preparation of Material for Cytodiagnosis

Accurate interpretation of cellular material is dependent on the following factors:

- **Methods of specimen collection.**
- **Fixation and fixatives.**
- **Preservation of fluid specimens prior to processing.**
- **Preparation of material for microscopic examination.**
- **Staining and mounting of the cell sample.**

Cytologic Interpretation

- May be able to diagnose
- Identify the disease process
- Help form a prognosis
- May determine what diagnostic procedures should be performed next
- May help with therapy options

Methods of specimen collection

TYPES OF CYTOLOGY SAMPLES

**Exfoliative
cytology**

**Aspiration cytology Fin
e Needle Aspiration Cyto
logy (FNAC)**

Body fluids

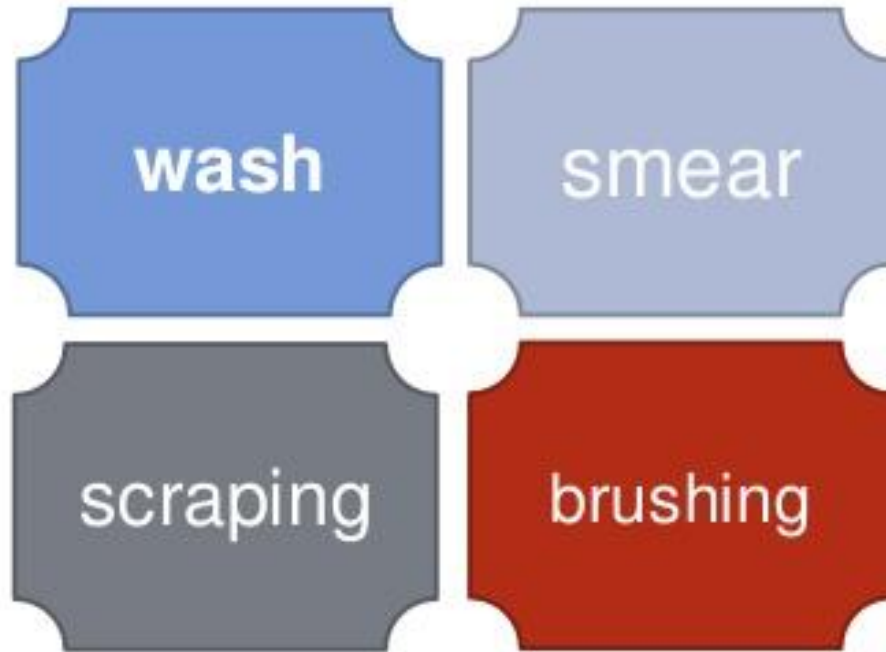
1- Exfoliative cytology

is the study of cells that have been shed or removed from the epithelial surface of various organs.

- Cells from all organs, which communicate with the exterior of the body, are suitable for study.
- These cells can be recovered either from natural secretions such as urine, sputum and vaginal or prostate fluids or by artificial means such as paracentesis or lavage.
- ❖ The cells can be collected from the epithelial surfaces by lightly **scraping the surface**, by swabbing, **aspirating** or **washing the surfaces**.

EXFOLIATIVE CYTOLOGY

- It is the study of cells that have been **shed** or removed from the epithelial surface of various organs.



Female Genital Tract (FGT)

- The cytological specimens collected from FGT include **cervical smear, vaginal smear, aspiration from posterior fornix of vagina (vaginal pool smear) and endometrial smear.**

Cervical smear: Cancer of the uterine cervix is the commonest cancer in the FGT.

- Almost all cancers of the cervix are used.
- Early detection even at **the preinvasive stage** is possible by doing cervical smear (Pap Smear Test).

Advantages of Pap Smear:

- It is painless and simple
- Does not cause bleeding
- Does **not need anesthesia**
- Can **detect cancer and precancer**
- Can **identify non-specific and specific inflammations**
- Can **be carried out as an outpatient procedure**

The disadvantages

are that the method may occasionally **be traumatic** to the patient, and the tip of spatula that does not fit the external os may fail to remove some of the valuable material from the squamo-columnar junction.

Vaginal smear

Introduce an unlubricated speculum, scrape the lateral vaginal wall at the level of cervix with a spatula. The broad and flat end of Ayre's spatula is used for this purpose. The cellular material is rapidly but gently smeared on a clean glass slide and the smears are fixed immediately. If no spatula is available a cotton swab dipped in normal saline can be used.

Vaginal pool smear

Endometrial aspiration smear

Respiratory Tract

Respiratory tract malignancies can be detected mainly by sputum cytology or by bronchoscopic material.

Sputum Cytology: Sputum specimen can be obtained from the patient either spontaneously or by aerosol – induced method.

Bronchoscopic Specimens: Specimens that are obtained by bronchoscopy are secretions (bronchio-alveolar lavage), direct needle aspirate from suspicious area and bronchial brushing and washings. Post bronchoscopic sputum is one of the most valuable specimens for the detection of pulmonary lesions.

Other Sites

Oral lesions: Scrape the lesion with a tongue depressor, spread material on a clean slide and fix immediately.

Nasopharynx: Cotton tipped applicator is used to obtain material for cytological examination.

Larynx: A cotton swab smear of larynx may be a useful adjunct to clinical diagnosis if biopsy is not contemplated.

Other Sites

Oesophagus: Oesophageal washing and brushing are usually recommended for collecting cytology sample from oesophagus. To collect a good specimen for cytology one should first localize the suspicious lesion by oesophagoscopy .

Stomach: Cytology specimen can be collected from the surface of the lesion by scraping (abrasion) under direct vision of a flexible endoscope. The cells collected can be directly smeared on a glass slide. Gastric lavage is also recommended for cytological investigations.

Scraping

- ❑ Scrapings Done on **freshly cut surfaces**
- ❑ Scrap lesion/tissue with clean scalpel blade
- ❑ Place material collected on a slide and spread

Advantage: May collect more cells.

Disadvantage: More difficult to collect and only able to collect superficial lesions.

Imprints May be prepared from external lesions (ulcers)

- ❖ May be prepared from tissues excised

during surgery or necropsy.

- ❖ Easy to collect

- ❖ **Disadvantage:** May only collect few cells

and may contain contamination

Solid Mass imprints Cut mass in half Blot dry

- ❖ Need to remove blood/tissue fluid from surface
- ❖ Use sterile gauze or other absorbent material
- ❖ Excess blood/fluid inhibits cells from spreading and assuming normal size and shape
- ❖ Touch the slide to the blotted surface
- ❖ Stain

Imprint Cytology

Advantages

- Simple / cheap / rapid

- Interpretation of cytological / nuclear details available

- Avoid tissue loss

- Can be complemented by IHC

Disadvantages

- Size and area of metastatic focus not detectable

- More indeterminate / deferred diagnoses

- Need special training to interpret

- Can not differentiate between micro and macrometastases