

# *CYTOPATHOLOGY*

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# Principles in cytopathology

- ***CYTOPATHOLOGY:***

- Is the study of the normal and diseased altered cells obtained from various sites of the body (i.e., through the detection of abnormal morphologic characteristics of the examined cells).

# ***TYPES OF CYTOPATHOLOGY:***

## ***1. Exfoliative cytopathology:***

Spontaneously shed cells in the body fluids e.g. serous effusion, urine & CSF and sputum cytopathology.

## ***2. Abrasive cytopathology:***

Dislodges cells from body surfaces e.g. Pap smear (cervical smear), bronchial washing & brushing.

## ***3. Fine Needle Aspiration (FNA):***

e.g. FNA of breast, FNA of thyroid, lymph node.

# *Stains used in cytopathology:*

## *1. Papnicolaou stain:*

- Mainly used in Exfoliative cytopathology.
- Good & better demonstration of nuclear details.

## *2. Hematoxyline & Eosin (H& E):*

- Mainly used in FNA.

## *3. Leishman & Giemsa stains:*

- Mainly in FNA.

## *Characteristics of ideal stain in cytopathology:*

1. Evaluation of architectural pattern of tissue fragments.
- 2. *Proper evaluation of nuclear morphology (most important characteristic).***
- 3. *Proper evaluation of cytoplasmic morphology.***
4. Evaluation of background (blood, secretions, mucin.....)

# *Fixatives used in Cytopathology:*

- 1. 95% ethyl alcohol** (for Pap smear & FNA).
- 2. Spray fixatives** (does not result in lysis of RBC & better preserved of nuclear details).
- 3. Carnoy's fixative** (lysis of RBC).
- 4. Other (Formalin, Glutaraldehyde).**

# *Staining methods in Cytopathology:*

## *1. Air – dried Giemsa staining:*

- Air drying follows *by staining with Giemsa.*
- *Well demonstrated cytoplasmic details.*
- Exaggerated cells & nuclear size.
- *Poorly seen individual cells.*

## *2. Wet –fixed Pap staining:*

- Alcohol fixation follows *by staining with Pap or H & E.*
- *Excellent demonstration of nuclear details.*
- Normal size of cell & nucleus.
- *Clearly seen individual cells.*

# *Cytopathology can be further subdivided into:*

- 1. Gynecological Cytopathology**, include cervicovaginal cytopathology.....etc.
- 2. Non gynecological Cytopathology** include cytopathology of all other organs.
- 3. Fine Needle Aspiration (FNA):** include FNA of breast, FNA of thyroid.....etc.



# *Gynecological cytopathology:*

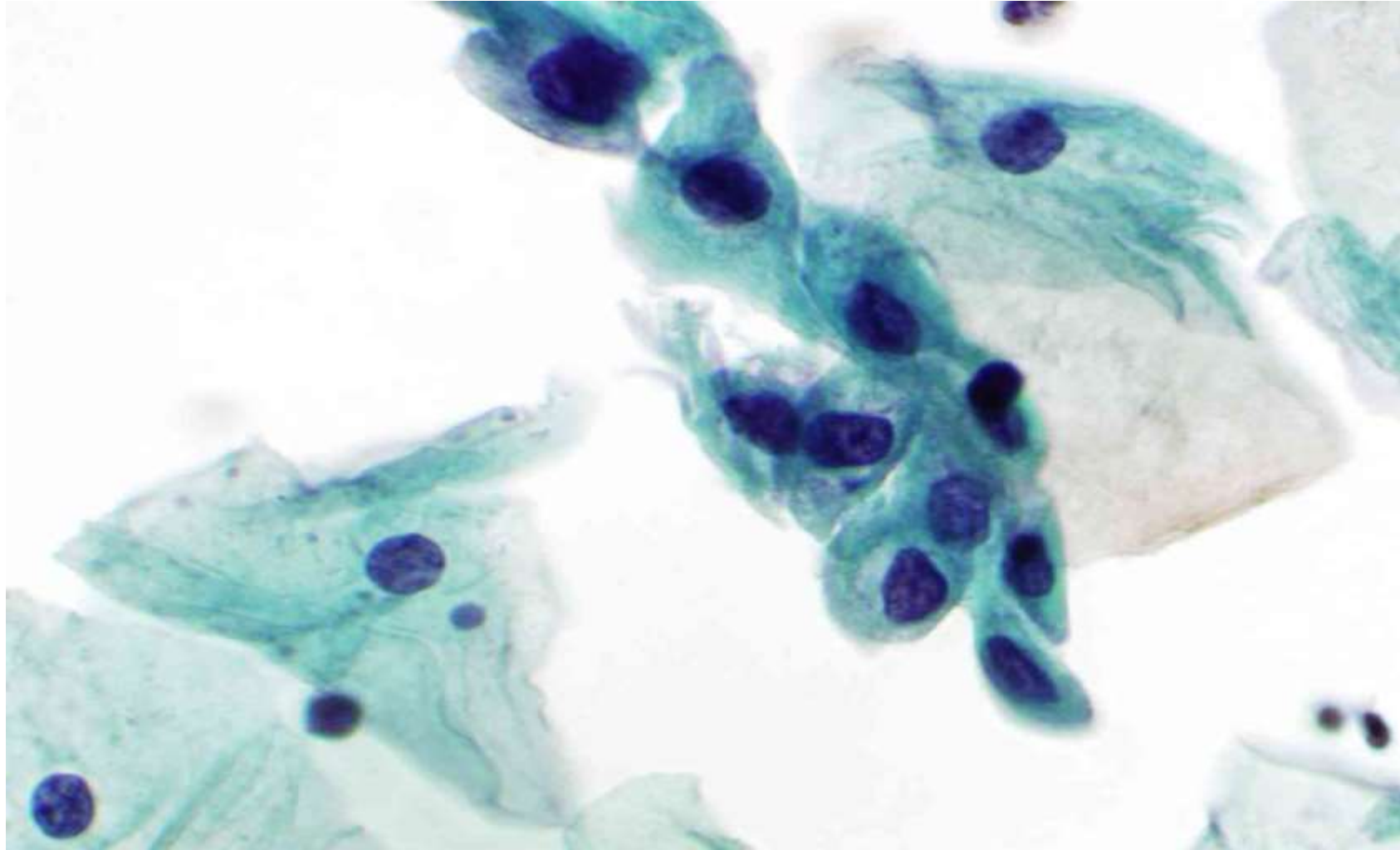
- **Normally two types of epithelial cells** are present in female genital organs
  1. **Columnar epithelium:** lined uterus, fallopian tubes & endocervix.
  2. **Squamous epithelium:** lined ectocervix & vagina.
  
- *Squamous Metaplasia of endocervical epithelium (columnar) into Squamous epithelium is usual process occurring in all women, as a result of hormonal effects.* For reporting of cervico- vaginal cytology, ***Bethesda system (2014)*** is currently used.

characteristics	Normal Squamous cells	Metaplastic Squamous cells	Malignant Squamous cells
<b>Cell arrangement</b>	Exfoliated singly	Cohesive sheets or groups	Singly or dyscohesive sheets. Variable size & shape of cells.
<b>Cytoplasmic characteristics</b>	<ul style="list-style-type: none"> <li>• Abundant cytoplasm</li> <li>• Well defined cell borders</li> </ul>	Either pale to dense cytoplasm. Cytoplasmic processes. Poor defined cell borders.	Scant cytoplasm
<b>Nuclear characteristics</b>	Centrally located nucleus. Absent nucleoli. Low N/C ratio.	Larger nuclei than normal. With or without nucleoli.	Variable size & shape. High N/c ratio. Prominent nucleoli.

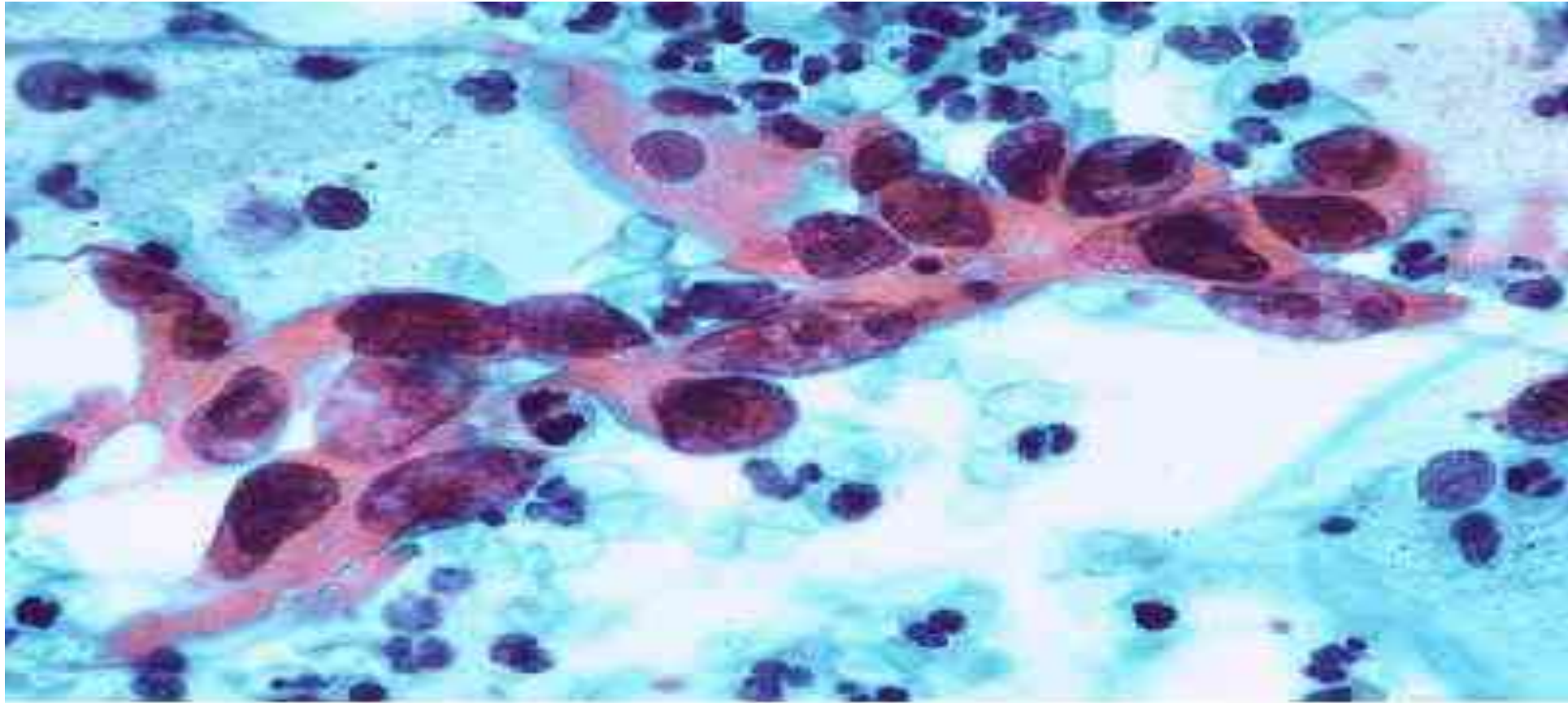


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**Normal squamous cells**



**Squamous metaplastic cells**



**Squamous cell carcinoma**

# *Non-Gynecological cytopathology*

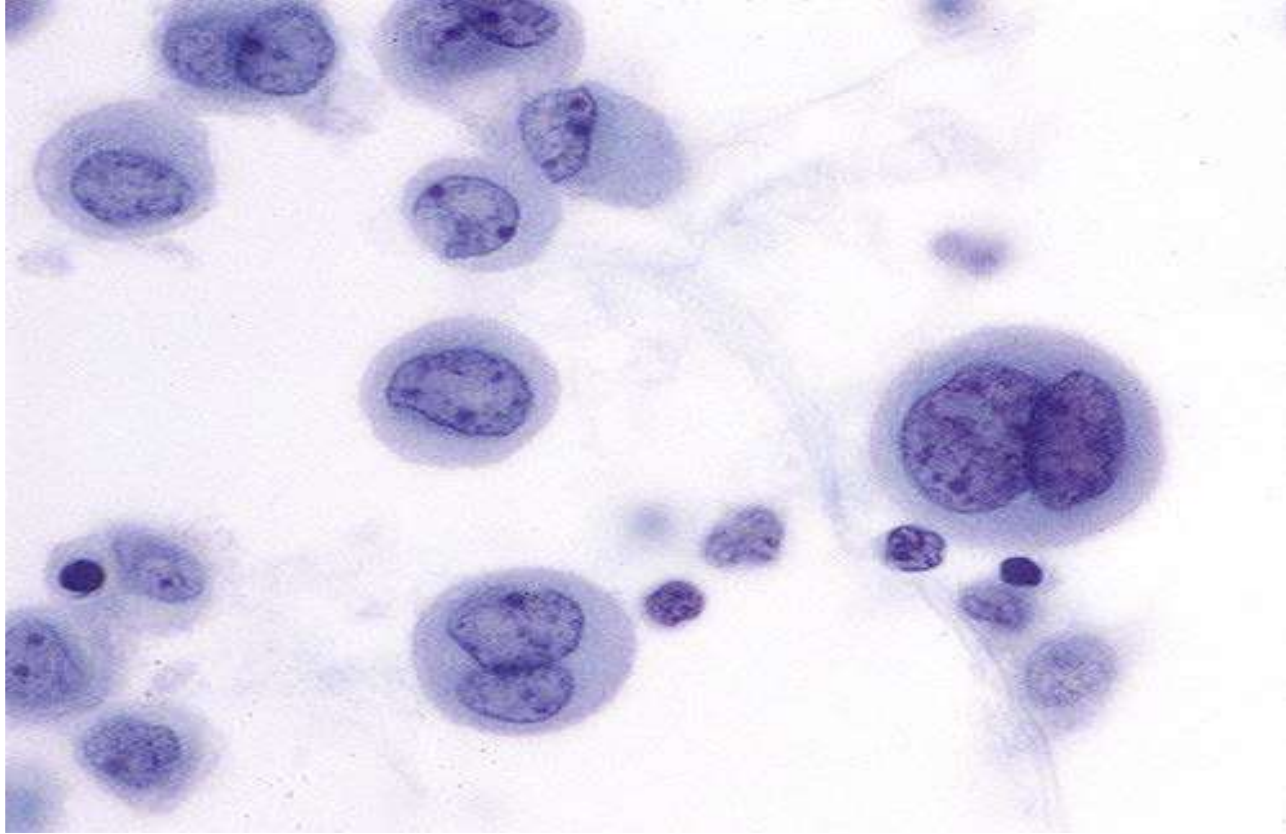
## *Non-Gynecological cytopathology:*

Include cytological examination of all other organs (e.g. respiratory system cytopathology, urine cytopathology.....)

## *1. Serous effusions cytology:*

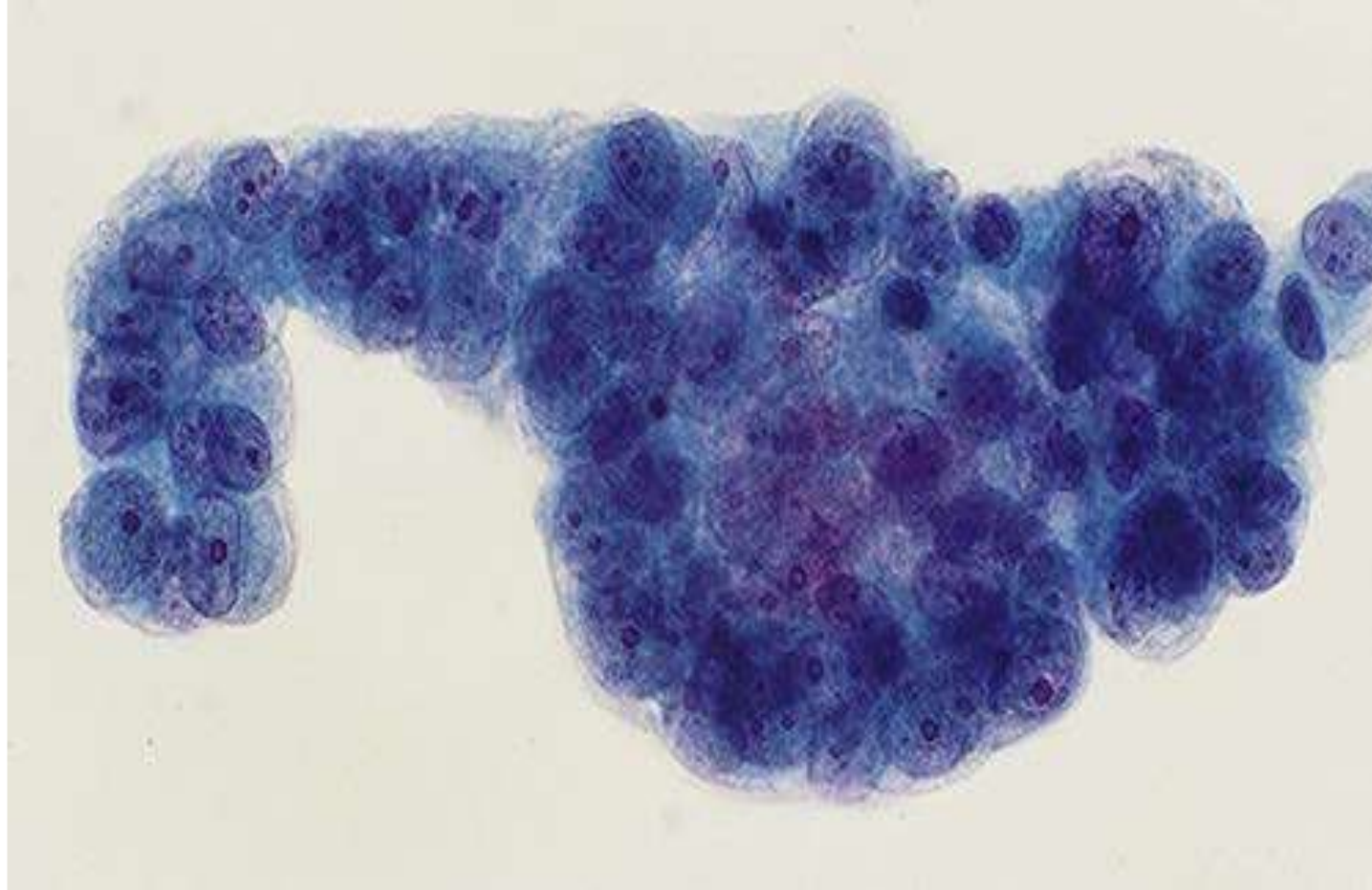
- Accumulation of fluid in serous cavities (pleura, peritoneum...) is abnormal & can result from many causes (inflammation, cancers....).
- *Cytological examination of serous effusions is performed mainly to establish the presence or absence of malignancy (either primary mesothelioma or metastatic carcinoma to these sites).*
- *Metastatic carcinomas to the serous surfaces are from lung, breast, colon, stomach & ovary.*
- *Better to differentiate between mesothelioma & metastatic carcinoma by using special stains & immunohistochemistry.*

<u>Characteristic</u>	<u>reactive mesothelial cells</u>	<u>Malignant mesothelioma</u>	<u>Adenocarcinomas (metastatic)</u>
<b>Fluid characteristics</b>	Clear, turbid	Always hemorrhagic	Hemorrhagic
<b>Cells arrangement</b>	Singly mainly, less as tissue fragments. Ill-defined cell borders.	Small to large complex sheets of cells. Well defined cell borders.	Acinar (gland like formation). Well defined cell borders.
<b>Cytoplasmic characteristics</b>	Moderate to abundant cytoplasm.	Scant to moderate amount.	Scant to moderate amount. Presence of cytoplasmic vacuoles & signet ring cells.
<b>Nuclear characteristics</b>	Variable in number & shape. Normal N/C ratio Multiple micronucleoli.	Same Increase N/C ratio	Single, macronucleoli, coarse chromatin. Increase N/C ratio

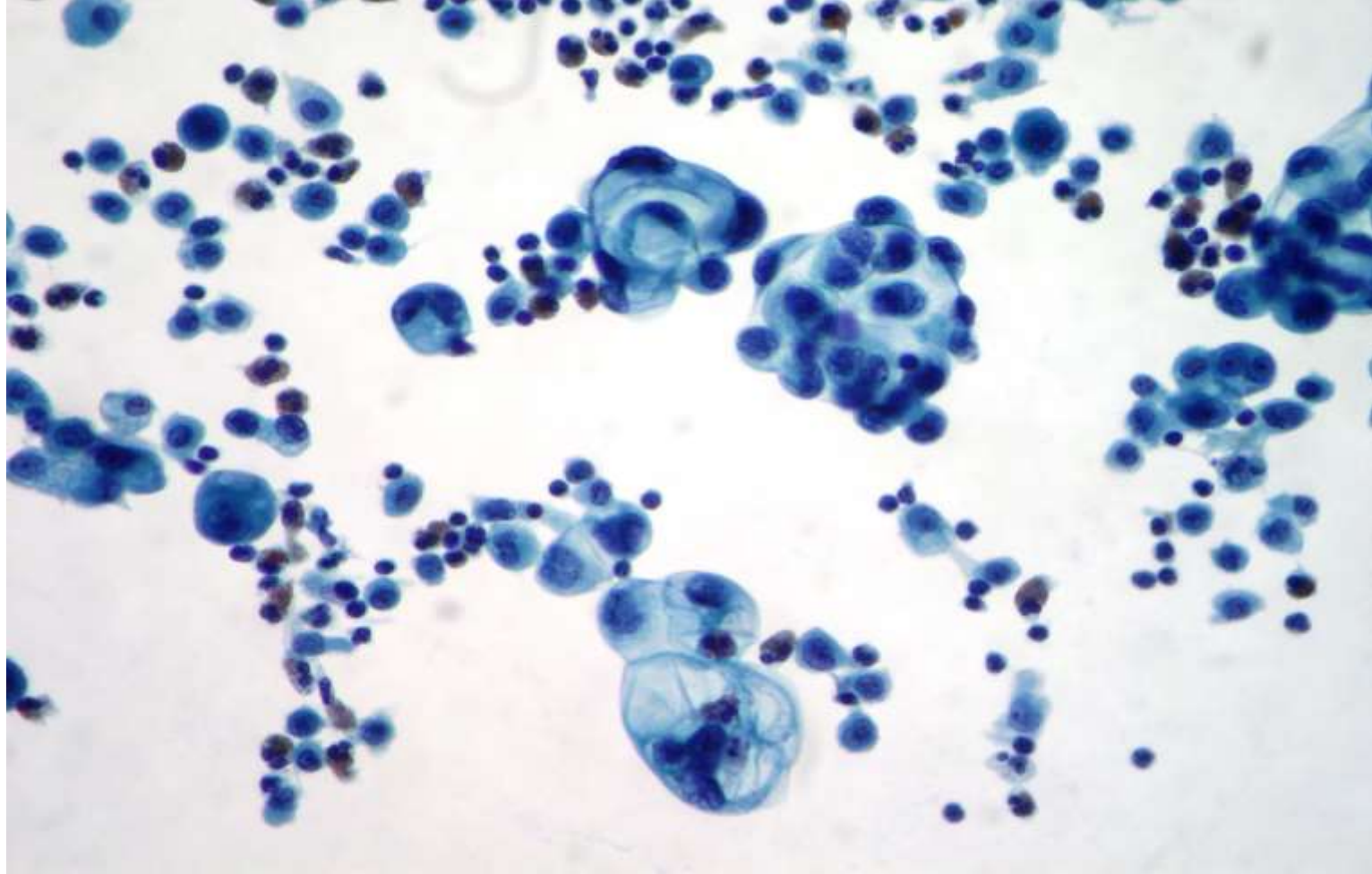


**Reactive mesothelial cells**





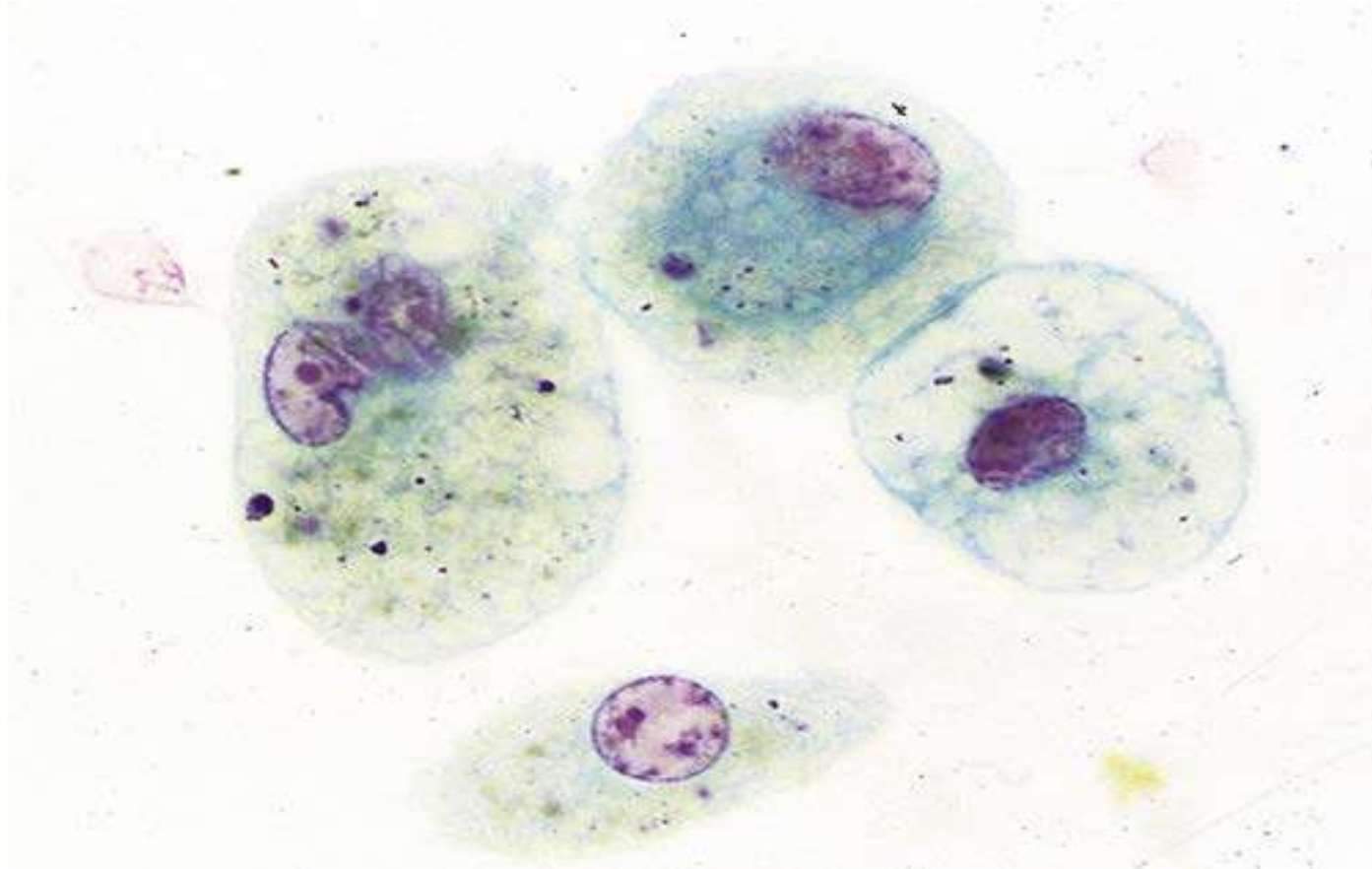
**Malignant mesothelial cells (mesothelioma)**



Metastatic malignant cells (adenocarcinoma)

## 2. Sputum Cytology:

- Offers highly diagnostic values for *diagnosis of centrally located lung cancer (Squamous, small cell cancers of lung)*.
- *Three to five consecutive daily sputum examinations* is advisable to increase the rate of detection of cancers.
- Sputum may *spontaneously coughed or induced*.
- Sputum sample is *fixed with Saccomanno fixative (2% polyethylene glycol With 50% ethyl alcohol)*.
- Sputum sample is considered *satisfactory when it contains alveolar macrophages*.

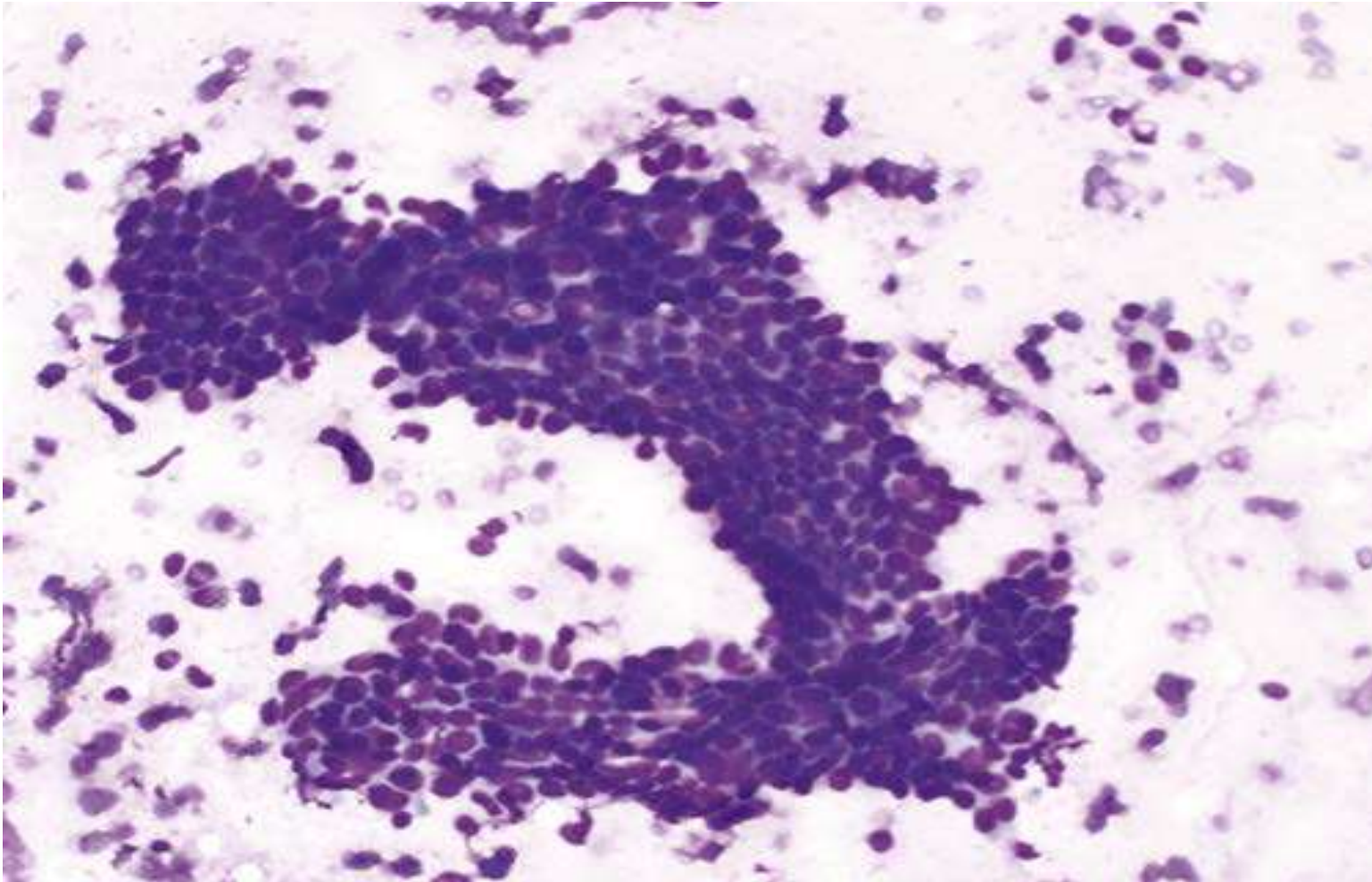


**Alveolar macrophages**

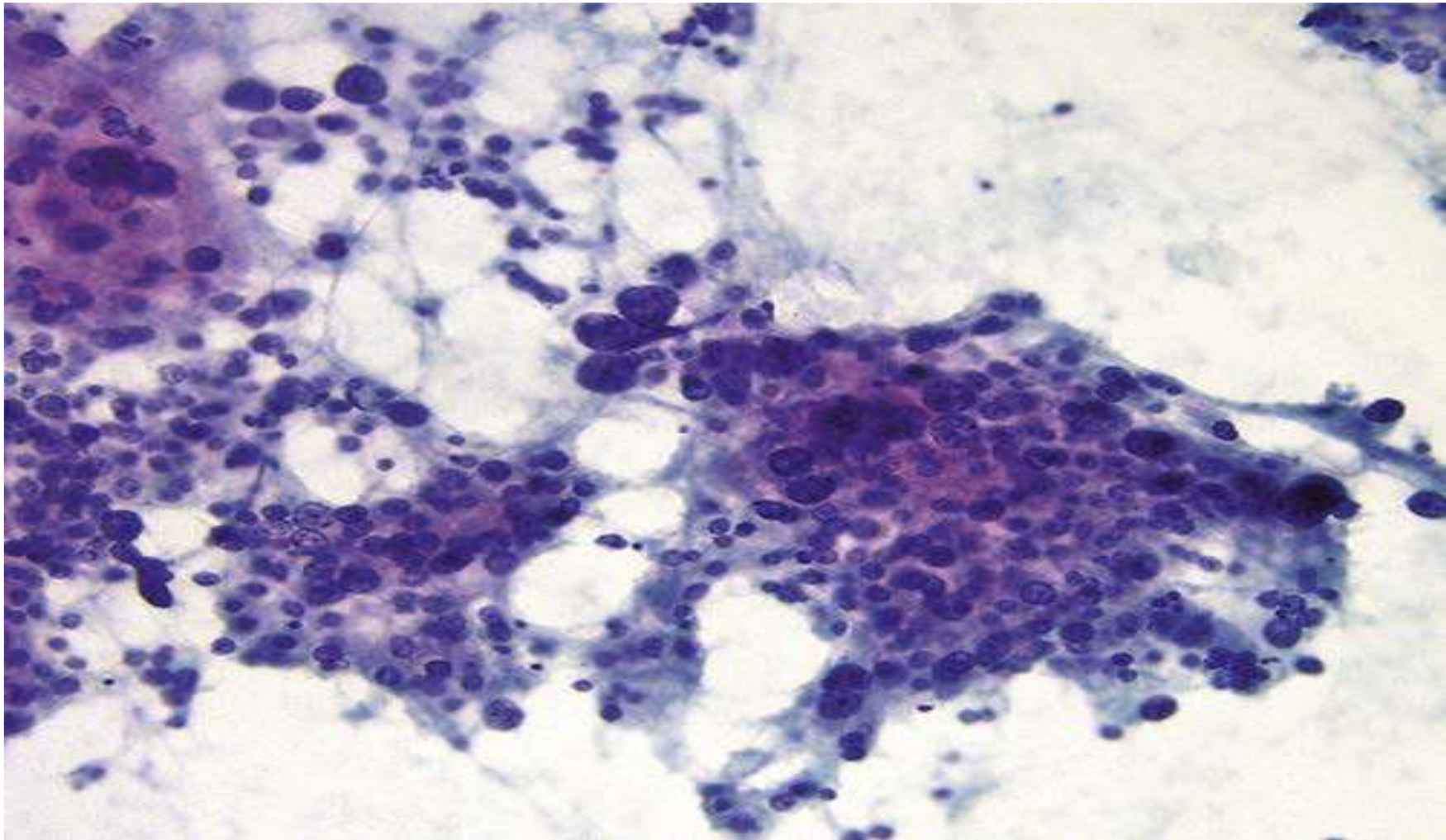
## *FNA of Breast:*

- FNA is by far the most popular , simple, cost effective, reliable & diagnostic procedure in cytological diagnosis of breast lesions.
- FNA is important part in triple screening for early detection of breast carcinoma (physical examination, mammography & FNA).

<u>Characteristics</u>	<u>Benign pattern</u>	<u>Malignant pattern</u>
<b>Cellularity</b>	Almost low cellularity	High cellularity
<b>Cells arrangements</b>	Sheets of uniform ductal cells (cohesive)	Single, variable size malignant cells. (poorly cohesive)
<b>Single bare nuclei</b>	FREQUENT	ABSENT
<b>Nuclear characteristics</b>	Uniform size	Enlarged, atypical nuclei.



**Fibroadenoma of breast**



**Malignant cells of breast aspirate**



*Thank you*