

# Respiratory System

Lung tumors



# LUNG TUMORS:

- 90% carcinoma,  
5% carcinoid,  
5% others.
- Bronchogenic CA - 13 % of newly diagnosed cancer cases in USA.
- Age - 40-70 years
- Death rate ♀ > ♂ (1/3 of all the cancer death in both sexes)

Types - Small cell > Non small cell

# Etiology:

1. Tobacco smoking. (90% cases). cigarette, cigar, pipe, Passive smoking. filter tip.

8% of lung cancer – in active smoker

CA risk ↑ 10 times,

40 cigarette / day = ↑ 20 times.

10 yrs. for incomplete reversal after leaving smoking.

Smoking also causes CA of pharynx, larynx esophagus, pancreas, cervix, kidney, ureter.

Pipe & cigar – low risk than cigarette smoker

Cigarette has 1200 carcinogens..

- Initiator – PAH, nitrosamine
- Promoter – phenol derivatives
- As, Ni, additives

Smoker with Vit A def. may have increased incidence of Bronchogenic ca

## 2. Industry - Atomic Bomb (Japan)

Radon gas in environment. miners

Uranium radiation from soil, miners,

### **Asbestos Inhalation -**

1/5 cases die of bronchogenic CA,

1/10 mesothelioma,

1/10 GIT CA.

- 3.Genetic.
  - Risk increase in cancer relatives – 2 – 3 times
- 10-20 mutations occur before cancer .

| Genetic changes    | Small cell CA | Non small cell CA |
|--------------------|---------------|-------------------|
| Dominant oncogenes | Cmyc, bcl2    | K ras             |
| Deletion           | Rb, p53, 3p   | P53, 3p           |

# Classification of Lung tumors:

Epithelial – benign or **MALIGNANT**

1. Squamous cell carcinoma

2. Small cell CA (oat cell) - combined SCC

3. Adeno CA - acinar, papillary

• bronchioloalveolar, solid with mucin,  
mixed

4. Large cell CA - LC neuroendocrine

5. Adenosquamous CA.

6. CA with pleomorphic, sarcomatoid / sarcomatous element.

7. Carcinoid - typical / atypical.

8. CA of bronchial glands

Adenoid cystic & Mucoepidermoid

9. Miscellaneous. (Soft tissue)

PLEURA - Mesothelioma. Benign or malignant



# Bronchogenic Carcinoma

- Classified in Three groups
  - Small cell Ca – 20 – 25%
  - Non small cell Ca – 70 -75% (include Sq. cell Ca, Adenoca & large cell Ca)
  - Combined / mixed pattern (5 – 10%)

# Precancerous lesions

- squamous metaplasia & dysplasia → CA in situ (Invasive Sq. cell CA)
- >90% of smoker have these changes in respiratory tract
- Adenomatous hyperplasia (Adeno CA)

- **Hilar type** – originate from main bronchus or one of the segmental bronchus. Thickening, scarring, nodule formation, cavitation –C/S – Yellow white with necrosis & H'age – Sq. CC, SCC
- **Peripheral type** - Adenoca. – originated from terminal bronchus (exact site not clear) – single or multiple nodular lesion C/S - greyish & mucoid

# Morphology:

1. Squamous cell CA - (25-40%),  
smoker, Men

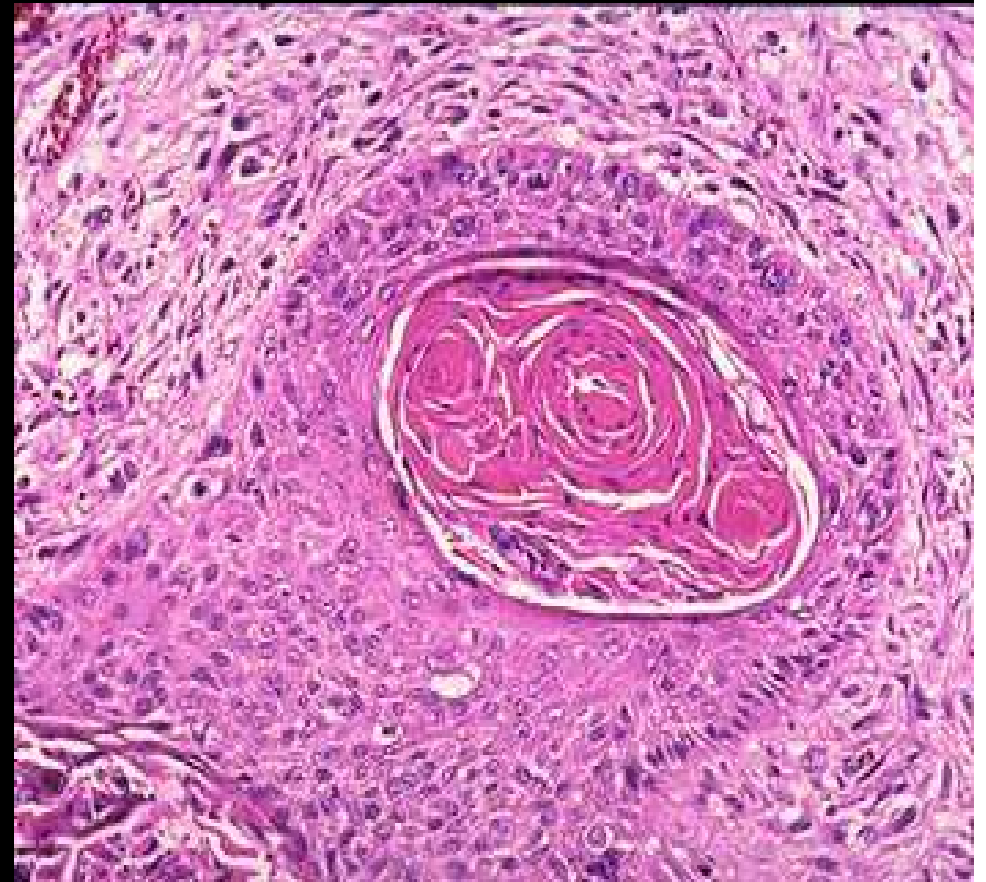
Preinvasive lesions,

central, nodule, irregular gray white tumor,  
necrosis, cavitations,

- Sheets of malignant squamous cells,  
polyhedral, coarse chromatin, nucleoli +,  
intracellular bridges, keratin pearls.

Parathormone like substance ( $\uparrow$  Ca $^{++}$ )

# Sq. cell CA. central cavitating lesion, keratin pearls.



# Morphology:

## 2. Small cell CA...(20-25%)

Highly malignant  
smokers,

small round cell clusters, scanty cytoplasm, fine granular chromatin, no nucleoli. molding of nuclei.

2/3 cases show neurosecretory granules  
chromogranin+, synaptophysin+.

No preinvasive stage, Metastasis wide

**Oat cell carcinoma,  
Intermediate cell carcinoma  
Combined**

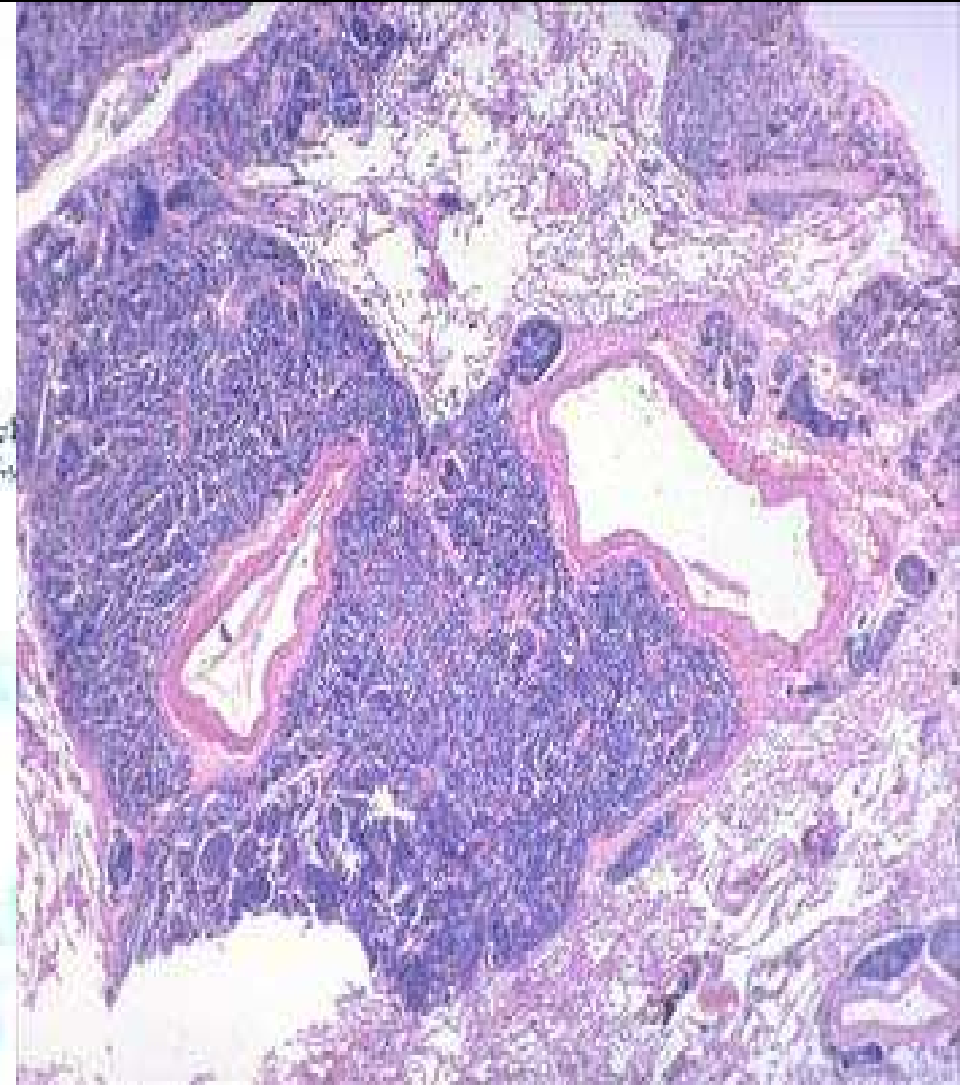
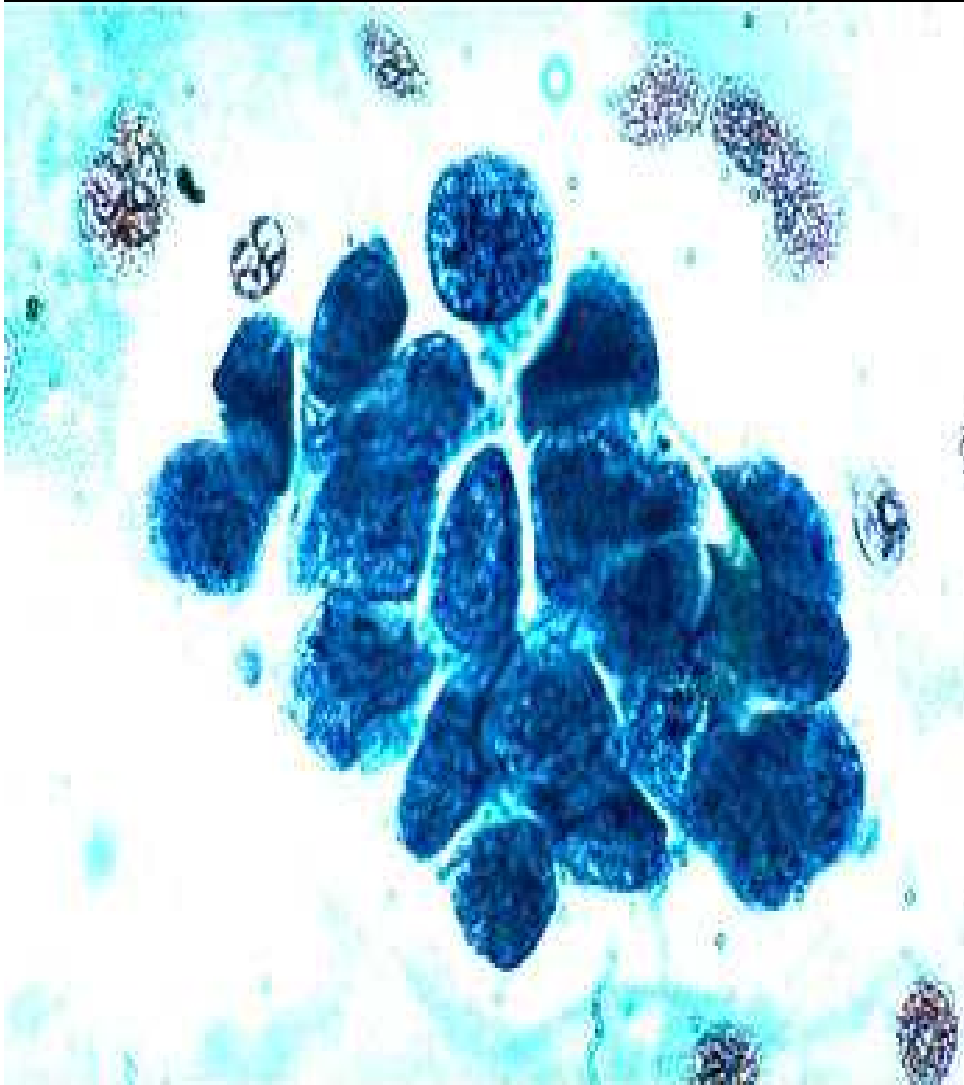
## Small cell CA. Genetic changes

- Dominant Oncogenes .. cmyc, bcl2
- Deletion of genes..... Rb, p53, 3p

- Para neoplastic syndrome.

ACTH, ADH, calcitonin, gastrin

Small cell CA.  
Cyto - nuclear molding.  
Histo - small dark cells, scanty cytoplasm

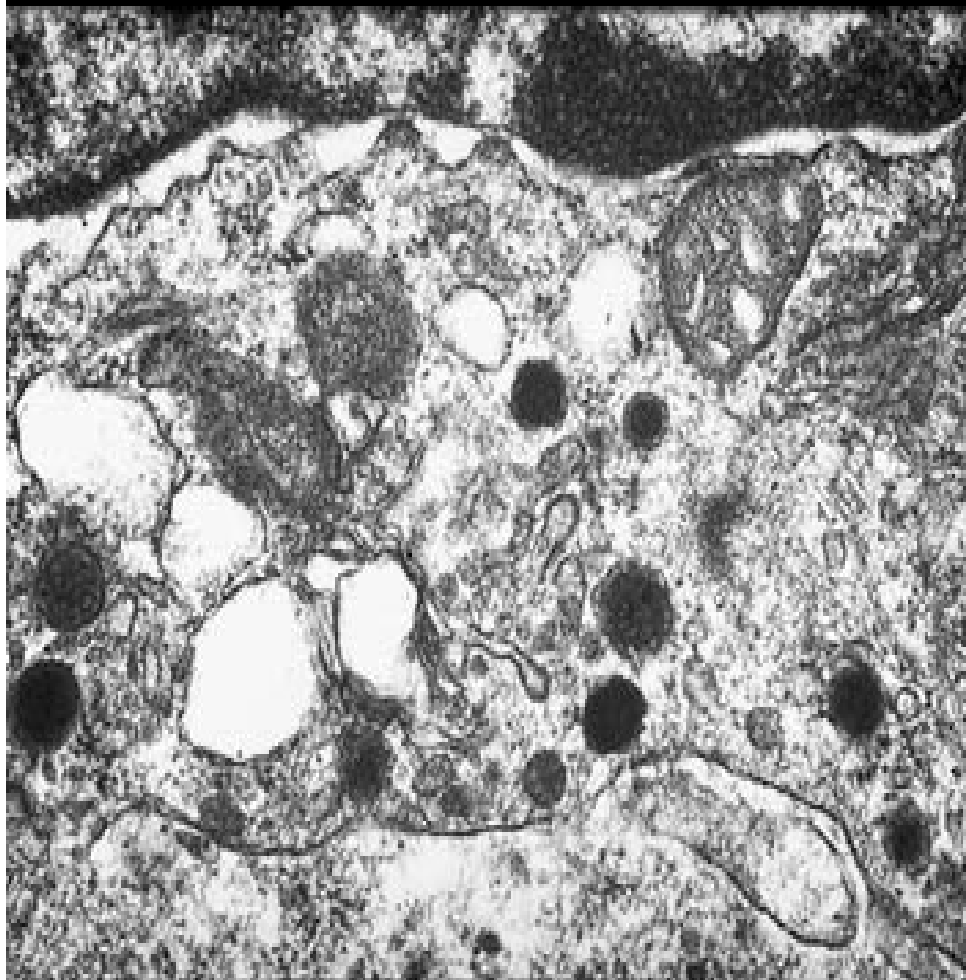




# Small cell CA

EM - dense coarse granules.

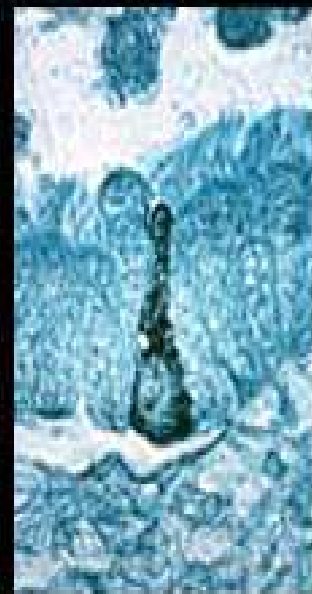
Immuno - chromogranin, leu7, NSE.



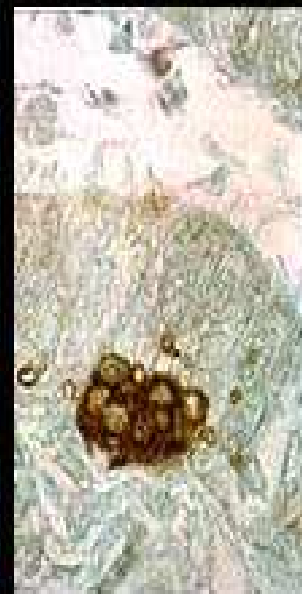
Chrom A



Leu-7



NSE



# Morphology:

3. AdenoCA (25-40%)

peripheral lesion, scar.

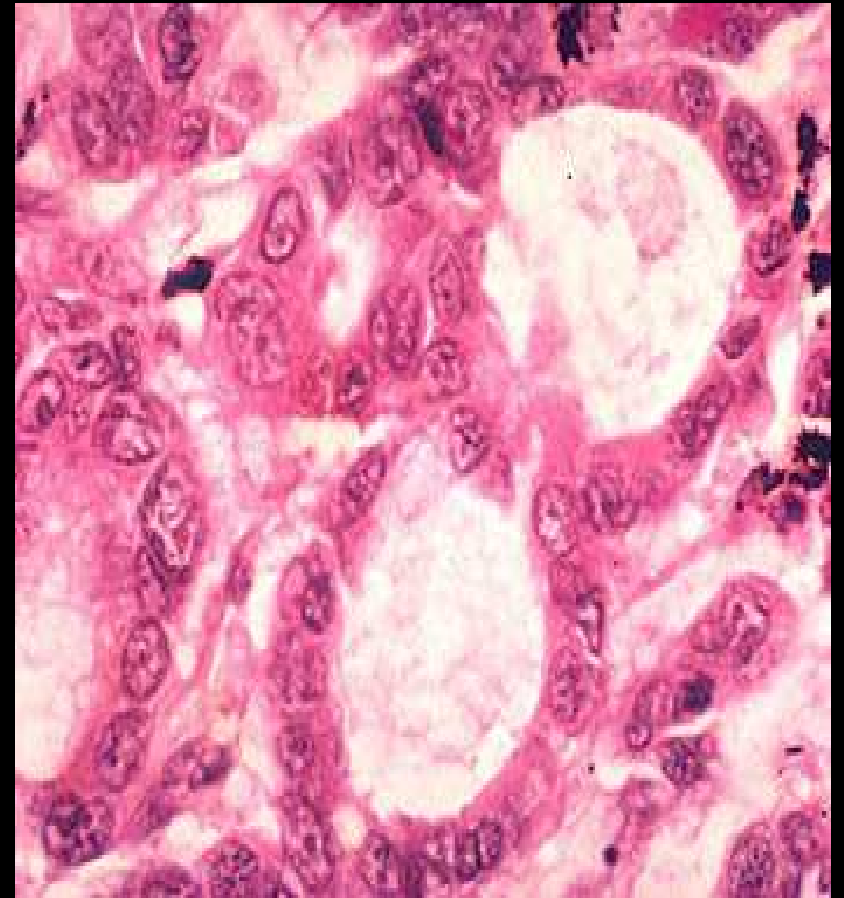
50% nonsmoker, ♀ > ♂, GLANDS, MUCIN

Precancerous - Atypical adenomatous hyperplasia

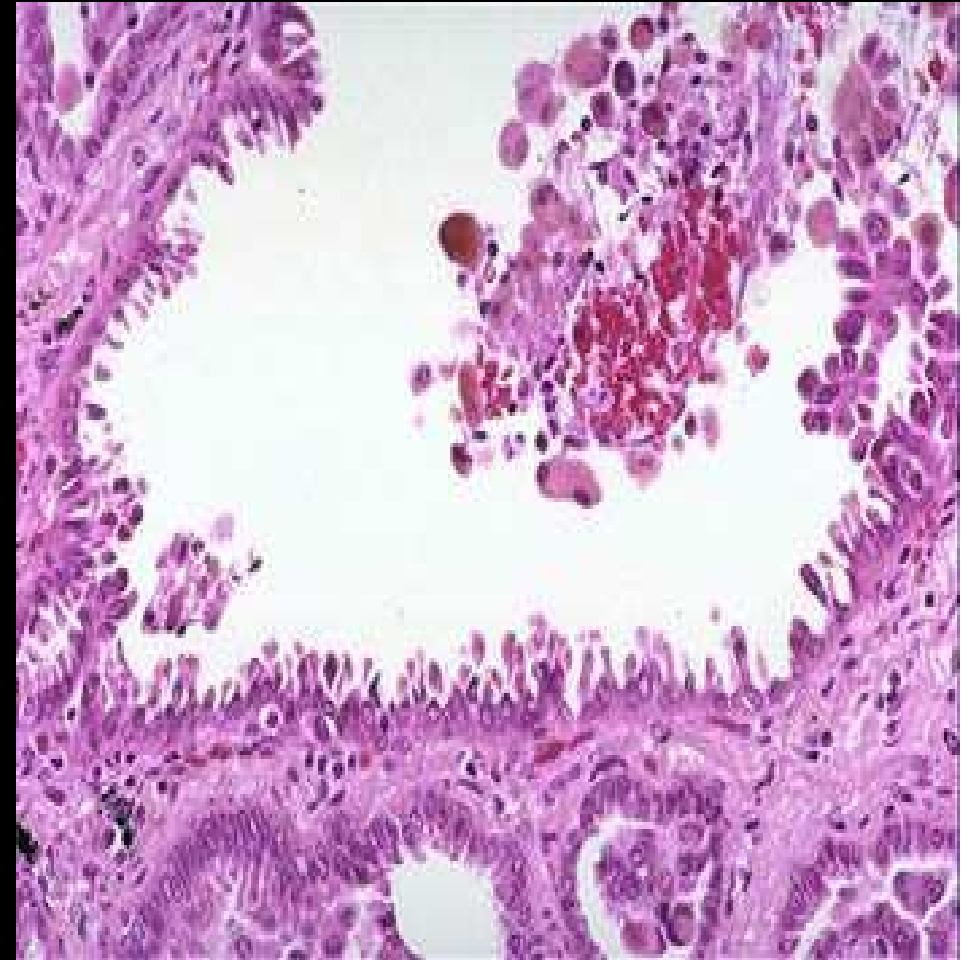
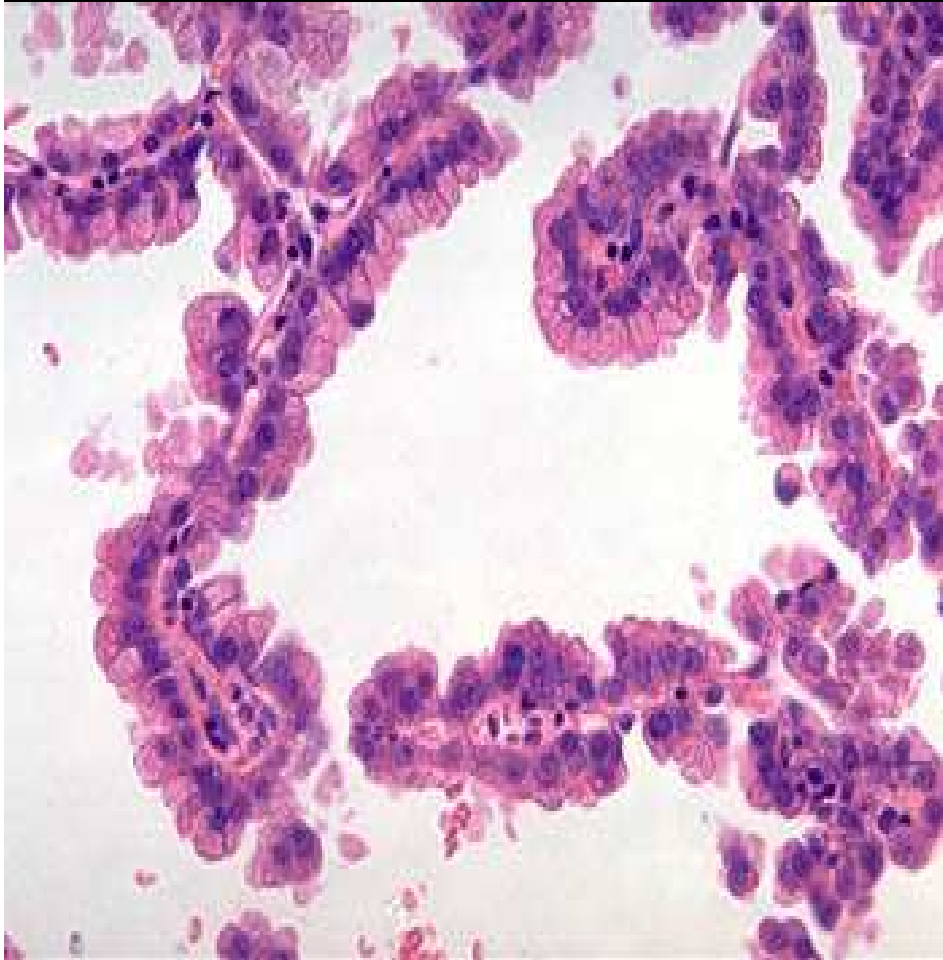
4 Types - acinar, papillary, solid, Bronchioloalveolar (grow along septa, present as consolidation, mucin / nonmucin

Genetics - Kras mutation, p53, Rb, p16 deletion

# Adeno Ca. peripheral lesion on CT, histology- glands and mucin



# Adenocarcinoma - papillary growths in alveoli.



# Morphology:

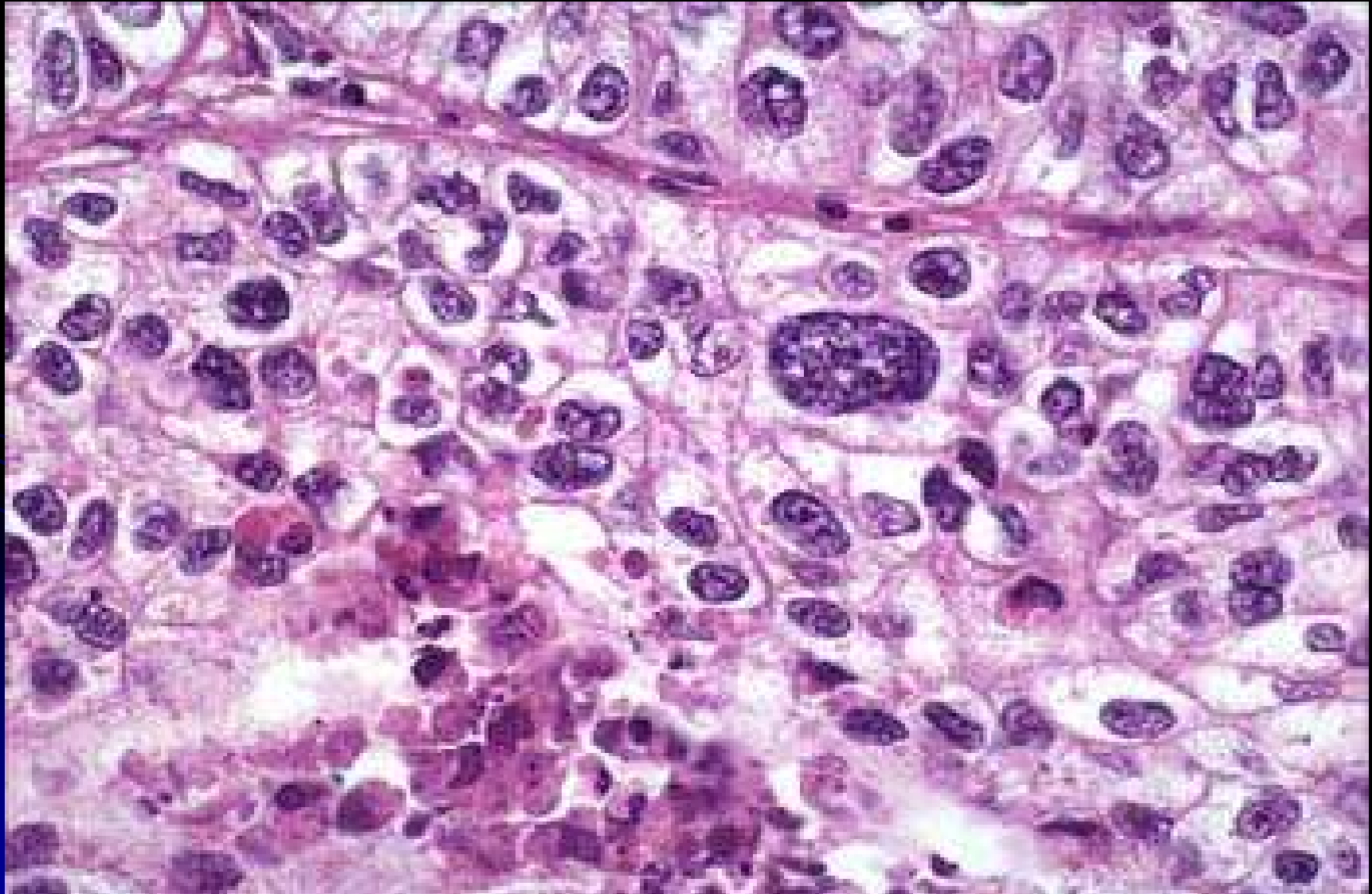
4. Large cell CA (10%).

large nucleus, nucleoli,

It is Undifferentiated adenoCA or squamous cell CA.

5. Combined.

# Large cell carcinoma, giant cells



# Spread

- Direct spread – to wall of bronchus – destroy lung tissue – spread to other lung. Involve pericardium & myocardium. Peripheral lesion at apex involve the rib cage – brachial plexus & sympathetic chain – causing pain & sensory disturbance – **Pancoast syndrome**
- Lymphatic spread – Hilar, mediastinal cervical, paraaortic
- Hematogenous spread – liver, adrenal, bone, pancreas, brain, opposite lung, kidney, thyroid

# Sign & Symptoms

cough, dyspnoea, chest pain. Hemoptysis

Sec.changes in lung due to bronchial obstruction

pneumonia,

abscess,

atelectasis,

pleural effusion,

bronchiectasis,



Sec. changes due to metastasis

Hoarseness (recurrent laryngeal nerve)

Dysphagia (esophagus),

Diaphragm paralysis (phrenic nerve)

Chest pain (rib destruction),

- SVC syndrome

Horner's syndrome (pancoast tumor) ptosis,

Miosis, anhidrosis ipsilateral

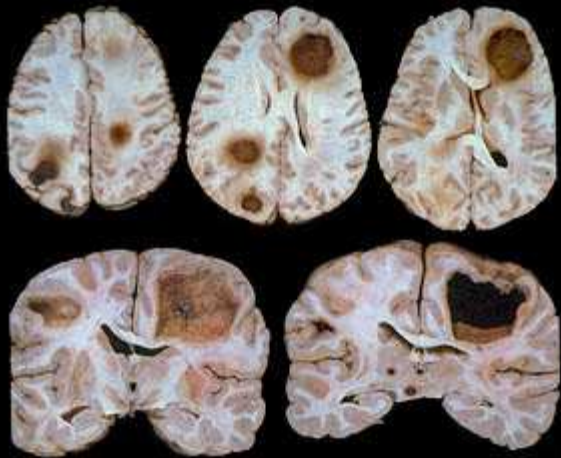
# Paraneoplastic syndrome..

Hormones / subs Secreted by tumor cells.

- ADH - ↓ Na+
- ACTH - Cushing's syndrome
- PTH like subs - ↑ Ca<sup>++</sup>
- Calcitonin - ↓ Ca<sup>++</sup>
- Gonadotrophin - gynaecomastia
- Serotonin - carcinoid syndrome

- Neuropathy
- Myopathy
- Skin - Acanthosis nigricans
- Bone - hypertrophic osteoarthropathy
- Blood - Leukemoid reaction

# Cancer sec in brain, hypertrophic osteoarthropathy



# Staging

T1 - Tm.<3cm.,

T2 - Tm.>3cm.,

T3 - chest wall

T4 - visceral,  
cranial.

N0 – No LN

N1 - Ipsilateral hilar,

N2 - Ipsi. mediastinal,

N3 - contralat. hilar,  
mediastinal /  
suprclavicular

M0 - no metastasis

M1 - metastasis

# Stages

- Occult - Cell in bronchial secretion no evidence of primary or sec
- Stage I - < 3cm, no node no met,
- Stage II - >3 cm ipsi lateral node no met
- Stage III – Any size adjacent structure, contra lateral node, no met
- Stage IV – any size contra lateral LN, Adjacent structures, metastasis

# Prognosis

- Dismal prognosis
- 5 yrs survival – 9% with surgery combined & radiotherapy
- Localized Adeno & SCC – resectable better prognosis
- Small cell Ca – worst prognosis – surgery ineffective although Tm is sensitive to radiotherapy & chemotherapy

# CARCINOID TUMORS (1-5%):

Tm of low grade malignancy, locally invasive,  
capacity to metastasize

Kulchitsky cells, neuroendocrine tumor.

Age < 40yrs, both sexes, 40% nonsmokers.

Typical - no mutation, ↓ mitosis .

Atypical – mutation - p53, bcl2, 3p loss.

↑ mitosis, necrosis.

- Site - central/peripheral, in lumen - less in wall,  
finger like / nodule, covered with intact mucosa,  
collar button lesion (in wall),  
C/S yellow tan in color



- Cell trabeculae, ribbon, rosette, separated by fine vascular septa.

- Regular round uniform nuclei, eosinophilic cytoplasm, dense core granules

IHC -serotonin, NSE, bombesin, calcitonin

- **s/s** – cough ,hemoptysis, sec. changes.

Carcinoid syndrome - diarrhea, flushing & cyanosis, asthma.

# Metastatic carcinoma lung

Most common site

through, blood, lymph, direct

- Multiple discrete nodules (cannon ball), scattered in all lobes at periphery of lung.

Single nodule. Pneumonia,

- Breast, thyroid, kidney, prostate, GIT, testis, ovary. etc. are primary sites

# Metastasis to lung from renal cell CA. peripheral multiple nodules



# Mesothelioma

- Benign – solitary, not related with asbestos
- Solitary circumscribed, small firm mass
- <3 cm
- C/S – whorled dense fibrous tissue
- M/E – whorls of collagen fibers & reticular fiber in between - fibroblast

# Malignant Mesothelioma

Shipping industry on coasts of USA,  
Canada, UK, S. Africa.

Asbestos exposure for 25 to 45 yrs.  
increases risk by 10 %,  
smoking added increase risk.

(asbestos + smoke. Causes lung CA).

Asbestos bodies in alveoli & pleural plaques

Genetic - gene deletion, SV40 virus.

- Morphology - lung ensheathed by soft gelatinous, gray pink, tumor.

1. Epithelial type - tubules lined by cuboidal cells.

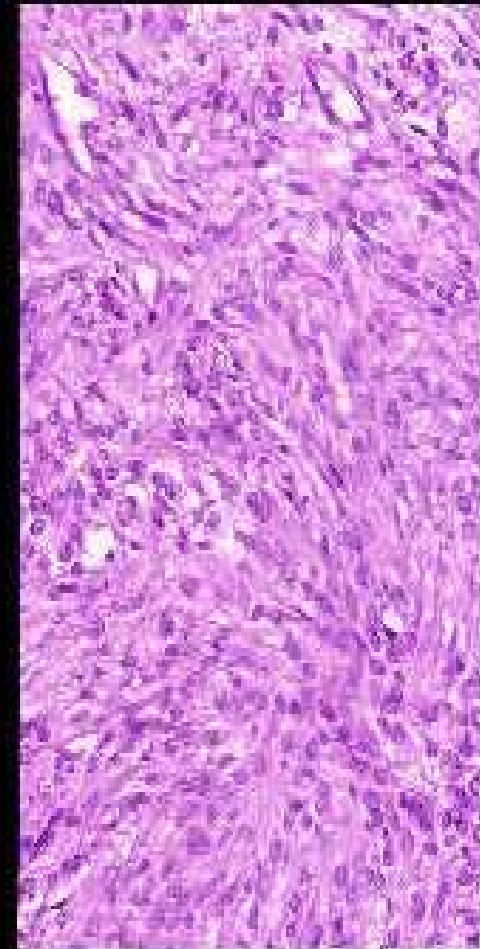
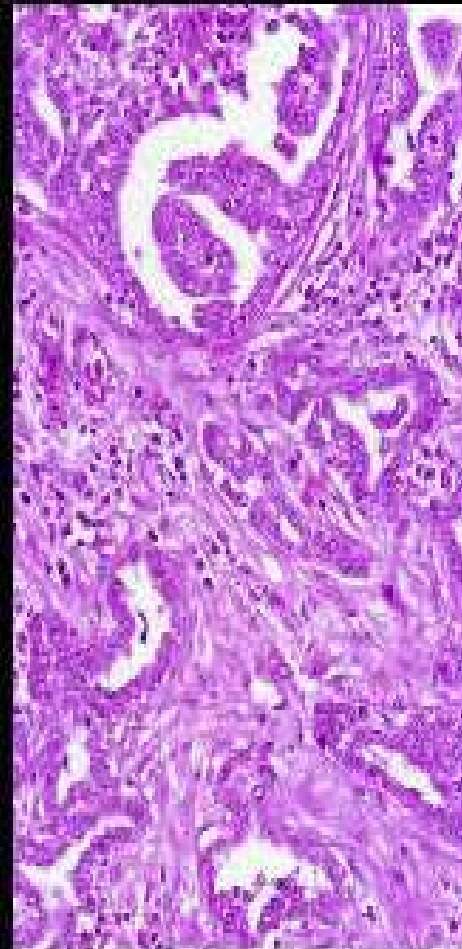
Hyaluronidase resisitant,  
acid mucopolysaccharidase +

EM - long microvilli. absent rootlets.

2. Sarcomatoid type - spindle cells

3. Mixed

# Malignant mesothelioma on base of lung, malignant glands and stroma



- **s/s** - chest pain, dyspnoea, pleural effusion,
- metastasis



# Pleural effusion

## Inflammatory.

1. Serofibrinous - TB, pneumonia, infarct, abscess, rheumatoid arthritis, SLE, uremia.
2. Empyema - pyogenic
3. Hemorrhagic - bleeding disorders, Rickettsi
4. carcinoma.

- Non inflammatory;

1. Hydrothorax - CHF, Nephrotic syndrome, cirrhosis liver.

2. Chylothorax - (milky) trauma.

3. Pneumothorax - emphysema, asthma, TB, spontaneous pneumothorax (blebs)