ODONTOGENIC TUMORS

Introduction

- Group of lesions arising from the tooth producing apparatus or its remnants
- May originate from epithelial and/or ectomesenchymal odontogenic tissues
- 1% of all jaw tumors

Classification of Odontogenic Tumors

WHO Histological Typing of Odontogenic Tumor, 1992

1.	**Neoplasms and other tumours related to the odontogenic apparatus**
1.1.	**Benign**
1.1.1.	*Odontogenic epithelium without odontogenic ectomesenchyme*
1.1.1.1.	Ameloblastoma
1.1.1.2.	Squamous odontogenic tumour
1.1.1.3.	Calcifying odontogenic tumour (Pindborg tumour)
1.1.1.4.	Clear cell odontogenic tumour

1.1.2.	*Odontogenic epithelium with odontogenic ectomesenchyme, with or without dental hard tissue formation*
1.1.2.1.	Ameloblastic fibroma
1.1.2.2.	Ameloblastic fibrodentinoma (dentinoma) and ameloblastic fibro-odontoma
1.1.2.3.	Odontoameloblastoma
1.1.2.4.	Adenomatoid odontogenic tumour
1.1.2.5.	Calcifying odontogenic cyst
1.1.2.6.	Complex odontoma
1.1.2.7.	Compound odontoma

1.1.3.	*Odontogenic ectomesenchyme with or without included odontogenic epithelium*
1.1.3.1.	Odontogenic fibroma
1.1.3.2.	Myxoma (odontogenic myxoma, myxofibroma)
1.1.3.3.	Benign cementoblastoma (cementoblastoma, true cementoma)

1.2.	**Malignant**
1.2.1.	Odontogenic carcinomas
1.2.1.1.	Malignant ameloblastoma
1.2.1.2.	Primary intraosseous carcinoma
1.2.1.3.	Malignant variants of other odontogenic
1.2.1.4.	epithelial tumours
1.2.2.	Malignant changes in odontogenic cysts
1.2.2.1.	*Odontogenic sarcomas*
1.2.2.2.	Ameloblastic fibrosarcoma (ameloblastic
1.2.3	sarcoma)
	Ameloblastic fibrodentinosarcoma and
	ameloblastic fibro-odontosarcoma
	Odontogenic carcinosarcoma

Ameloblastoma

Definition

Ameloblastoma is a true neoplasm of odontogenic epithelial origin, which does not undergo differentiation to the point of enamel formation

Robinson's definition

*Ameloblastoma is a tumor that is usually **Unicentric, Nonfunctional, Intermittent in growth, Anatomically benign and Clinically persistent***

Histogenesis

Resemblence of tumor epithelium to enamel organ

Ameloblastoma arises from dental epithelium

- Precise point of origin → unknown

- Enamel organ
  - Points in favor
    - Histological similarity
    - Site → most common in the areas of presence of supernumerary teeth
    - Often missing tooth at the site of lesion
    - Association with unerupted tooth
  - Points against
    - Age

- Cell rests (Serre, Mallasez)
  - Points in favor
    - Age
  - Points against
    - Site → occurrence of ameloblastoma in between roots of teeth is rare

- Oral mucosa
  - Points in favor
    - May show connection to overlying epithelium
    - Occurrence of extraosseous lesions
    - Histological similarity to basal cell carcinoma
  - Points against
    - Connection to overlying epithelium may be incidental or secondary
    - Extraosseous lesions are rare
    - Radiation response is opposite to that of basal cell carcinoma

- Cysts of dental origin
  - Points in favor
    - Cases that clinically and radiographically diagnosed as cysts but histopathologically as ameloblastoma
  - Points against
    - Evidence is debatable

Epidemiology

- 17-58% of odontogenic tumors
- Second most common odontogenic neoplasm after odontoma
  - Many recent studies show ameloblastoma to be the most common odontogenic neoplasm

Clinical features

- Age and gender distribution
  - Age
    - Age range → 4-92 years
    - Median age → 35 years
    - Maxillary ameloblastomas → higher age (45.6 years)
    - Extraosseous ameloblastoms → older age
  - Gender
    - Males → 53%
    - Females → 47%

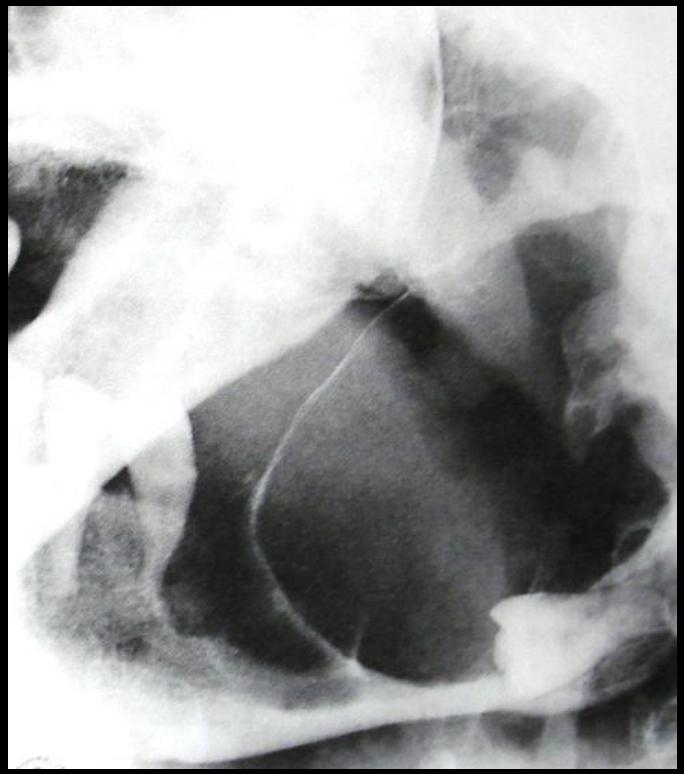
- Site distribution
  - Mandible : Maxilla = 5:1
    - Mandible → 81%
      - Molar ramus area → 70%
    - Maxilla → 19%
      - Molar area → 47%
      - Antrum and floor of nose → 20%

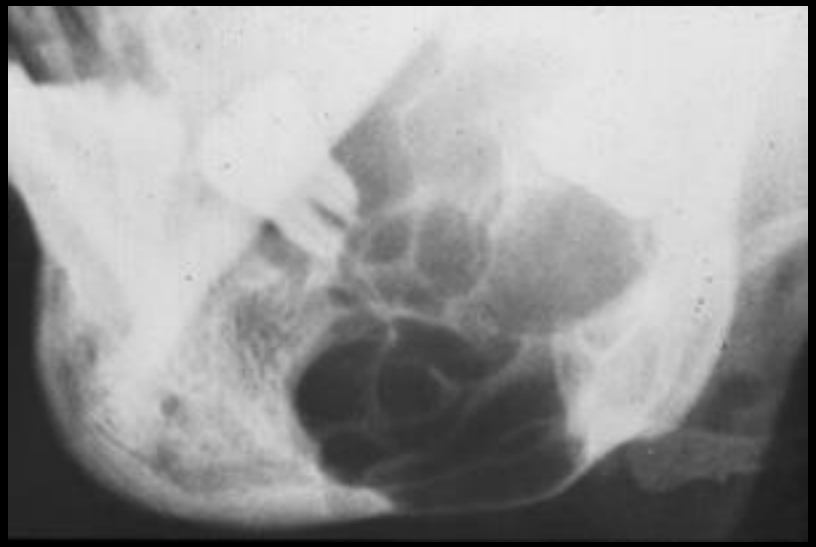
- Clinical presentation
  - Usually slow growing and asymptomatic
  - Most common presentation → swelling and facial asymmetry
    - Slow growth → reactive bone formation → gross enlargement and distortion
  - Later stages
    - Thinning of bone → egg shell crackling
  - If untreated → perforate bone → spread to soft tissues → excision difficult
  - Average size → 4.3 cm
  - Pain → not usual symptom (25% cases)

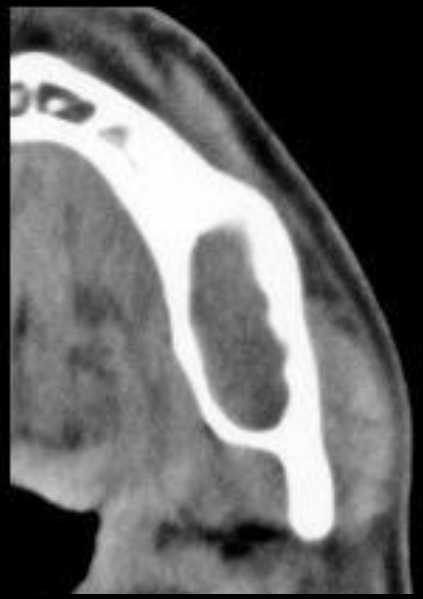
- Other symptoms
  - Displacement, mobility and resorption of teeth
  - Paresthesia
  - Occlusal alterations
  - Failure of eruption

- Radiographic features
  - Multilocular, cyst like radiolucent areas with well defined margins
    - Honeycomb pattern
    - Soap bubble appearance
  - Few radiolucent areas with small daughter cysts
  - Bony margins → typically scalloped

- May be associated with impacted tooth
- Roots of adjacent teeth → resorption or displacement
- May perforate
  - Periosteum is rarely perforated







- Desmoplastic ameloblastoma
  - Small size
  - Irregular radiolucent areas having irregular calcifications
  - Indistinct margins
    - May resemble fibro-osseous lesion

Histopathological features

- Six histopathological subtypes
  - Follicular
  - Plexiform
  - Acanthomatous
  - Basal cell
  - Granular cell
  - Desmoplastic

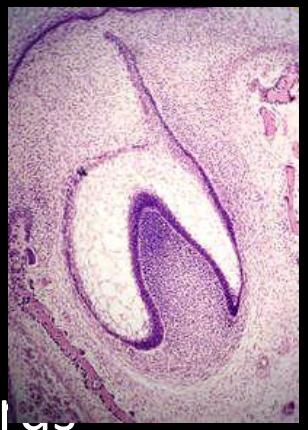
- Mixtures of different patterns is common
- Most tumors show predominance of one pattern
- Few lesions are composed of purely one subtype
- Lesions are subclassified according to the most predominant pattern

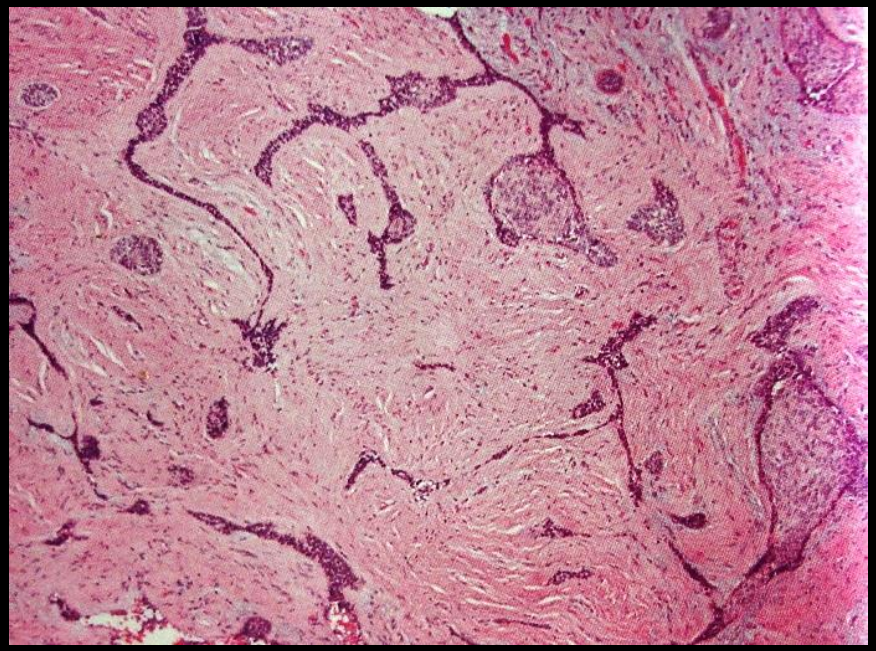
- Histologic subtype may have prognostic implications for recurrence

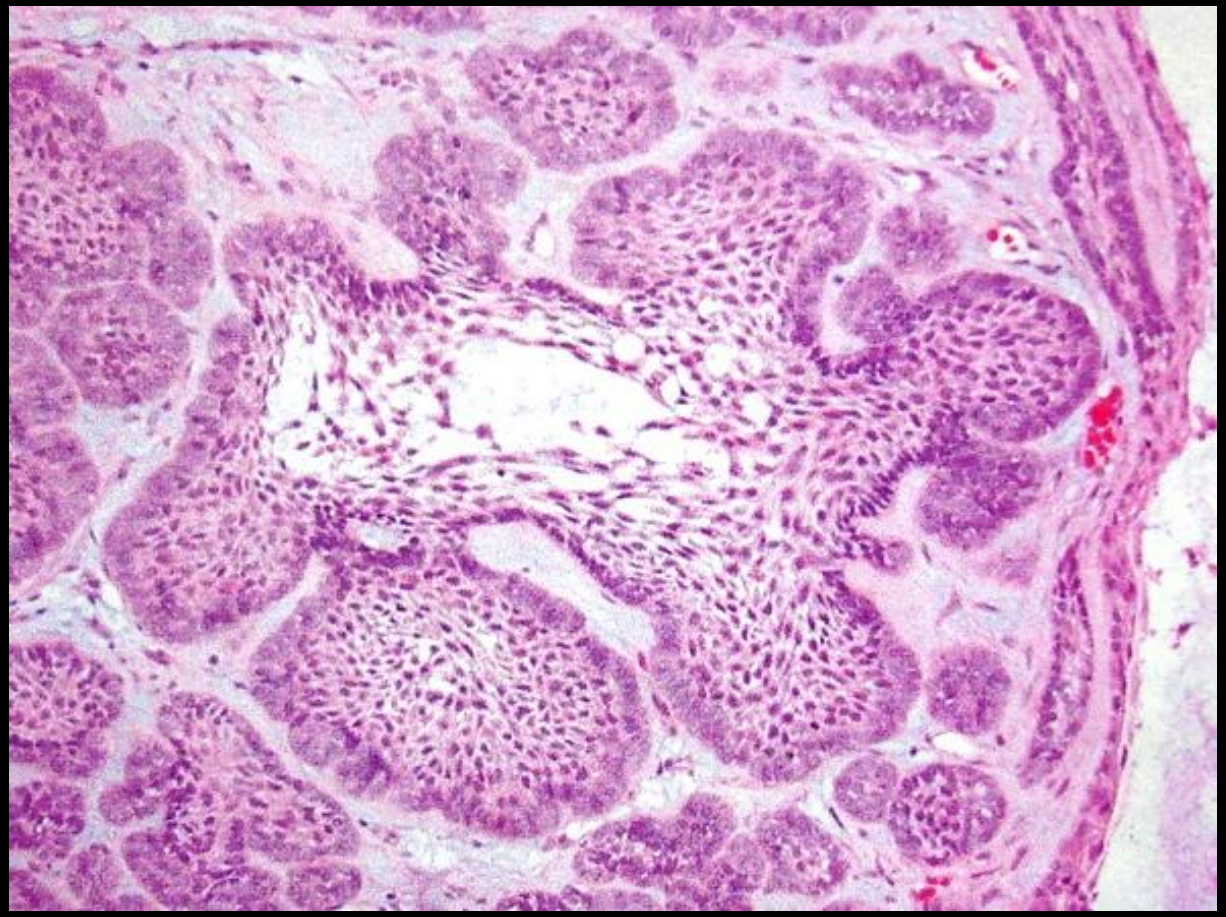
Follicular	29.5%
Plexiform	16.7%
Acanthomatous	4.5%

- Background stroma
  - Characteristically composed of fibrous connective tissue
  - Moderately to densely collagenized
  - Produces a typical eosinophilic background
  - Fibroblastic cells → parallel orientation of nuclei
  - Fascicular arrangement of collagen

- Epithelial component
  - Disconnected islands, stands and cords



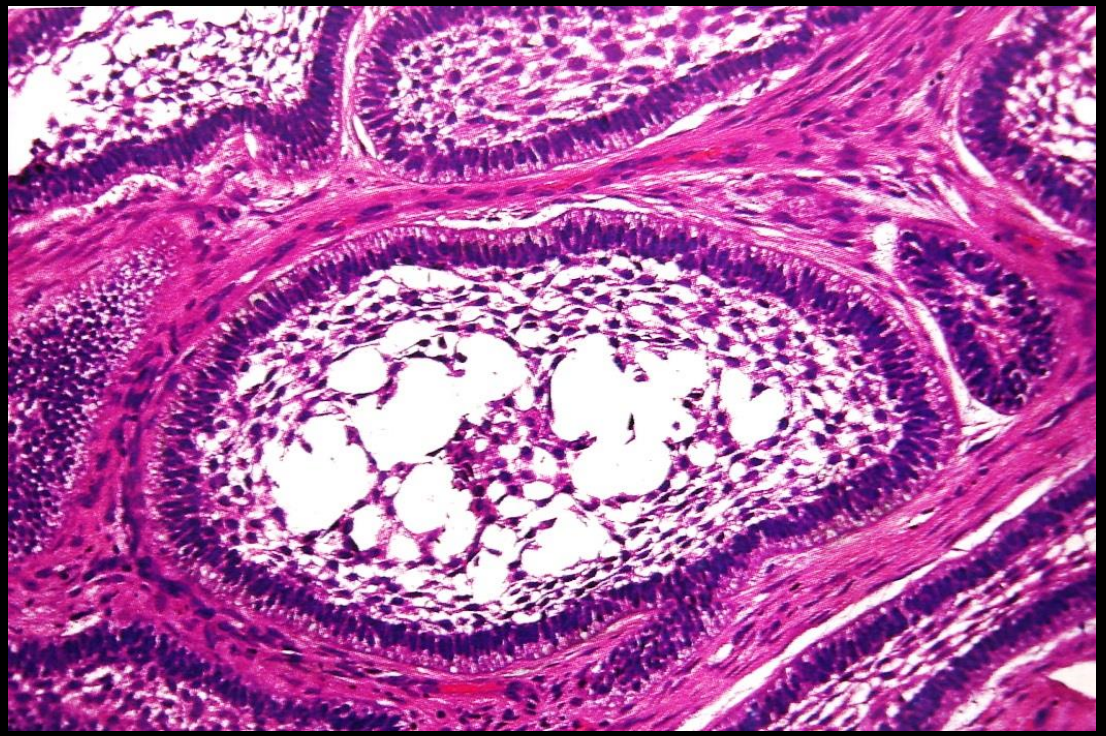




- A prominent budding growth pattern and rounded extensions of epithelium recapitulating enamel organ morphology

- Islands tend to show a prominent colour gradation between peripheral and central cells

- Colour seen in the central portion depends on the subtype

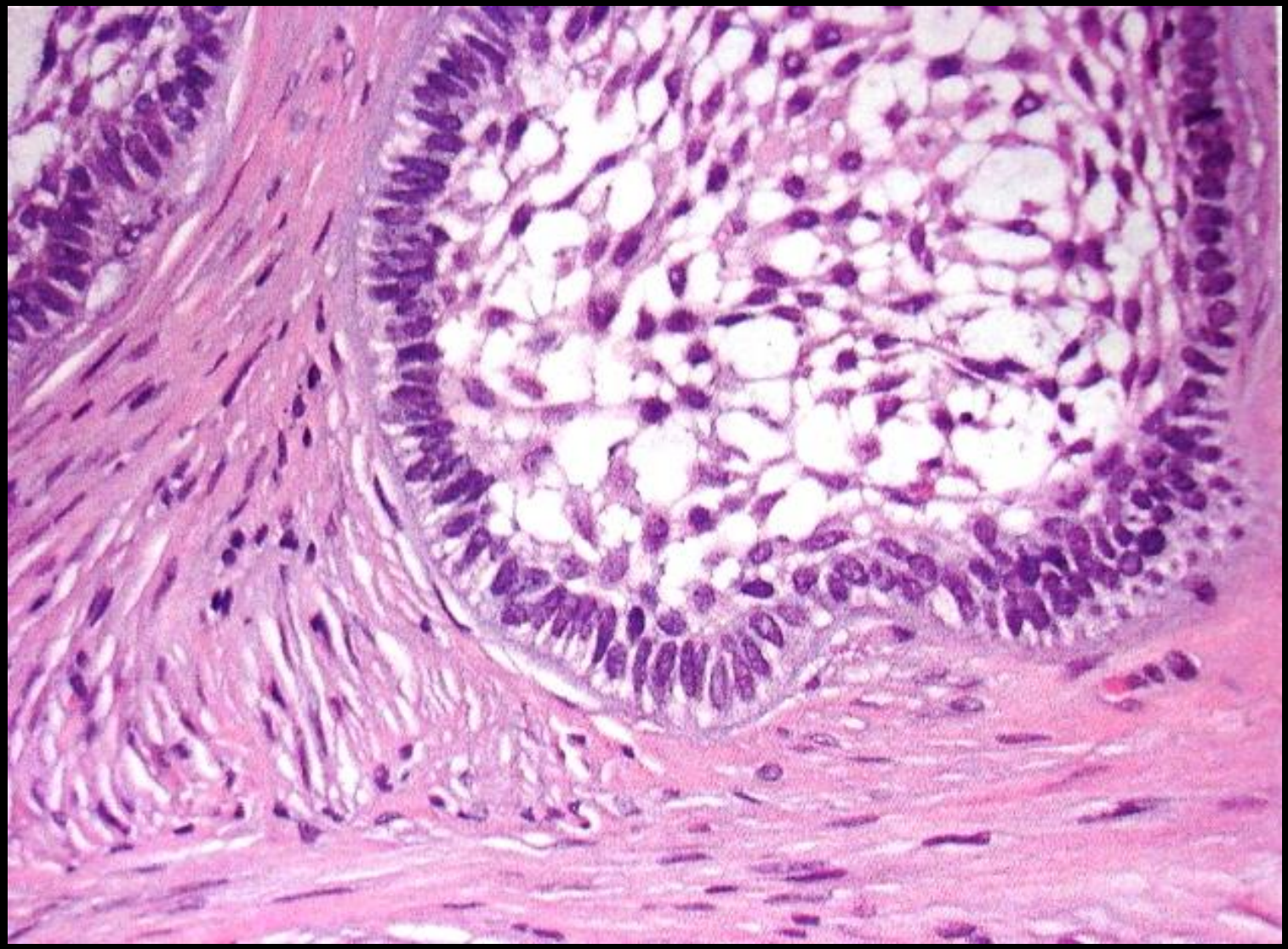


- Peripheral layer
  - Tall columnar cells
  - Nuclei
    - Hyperchromatic
    - Round to oval
    - Roughly same location within the cytoplasm → palisaded appearance
    - Away from basement membrane and separated from it by a small clear vacuole → reverse polarity

- Mimic the normal embryonic development of the tooth bud at the stage of enamel matrix production

- Classical features of ameloblastoma (Vickers and Gorlin)

1. Peripheral layer of tall columnar cells with hyperchromasia
2. Reverse polarity of nuclei
3. Subnuclear vacuole formation



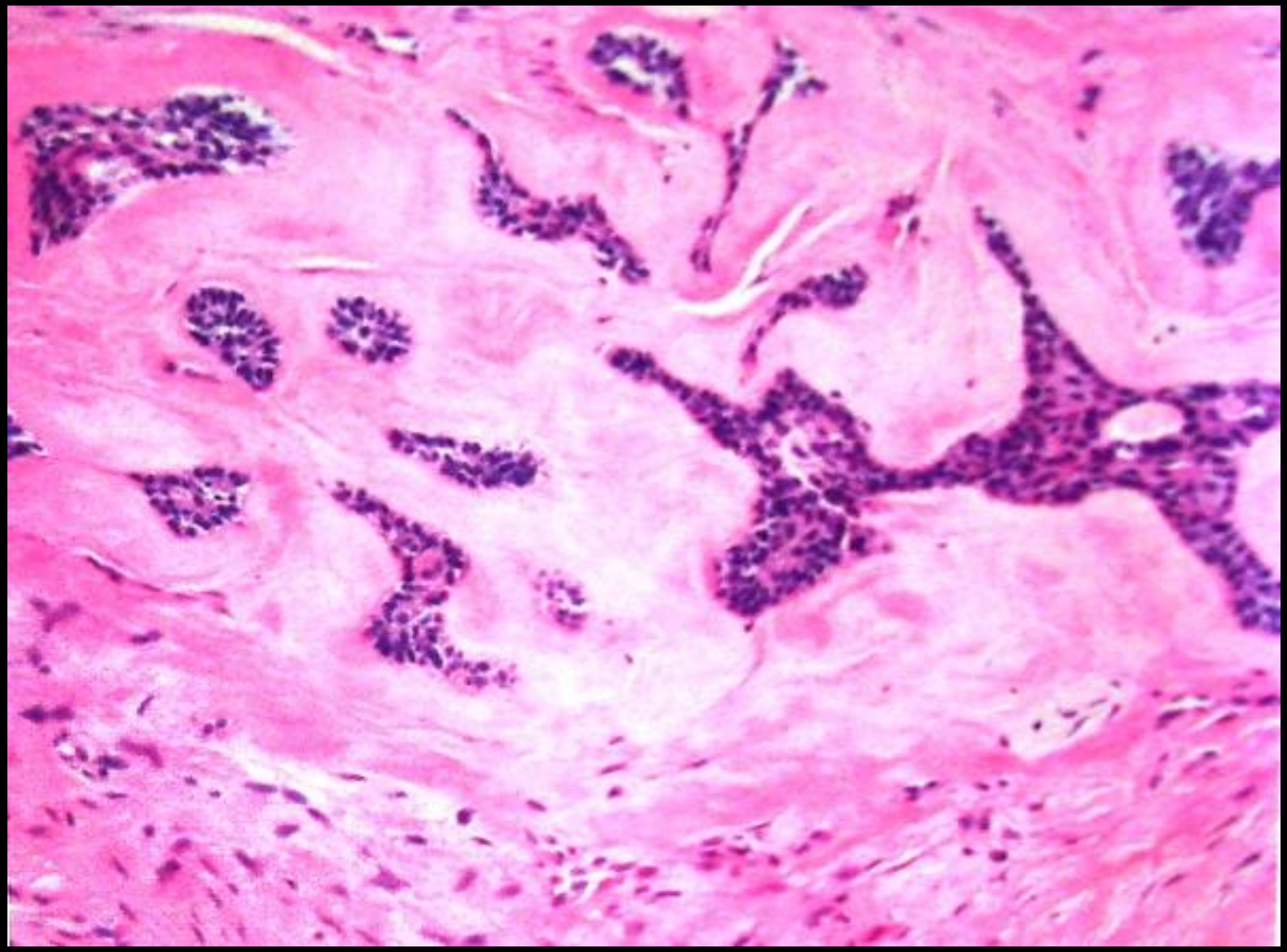
Proliferating epithelium

↓

Exerts an inductive effect on surrounding connective tissue

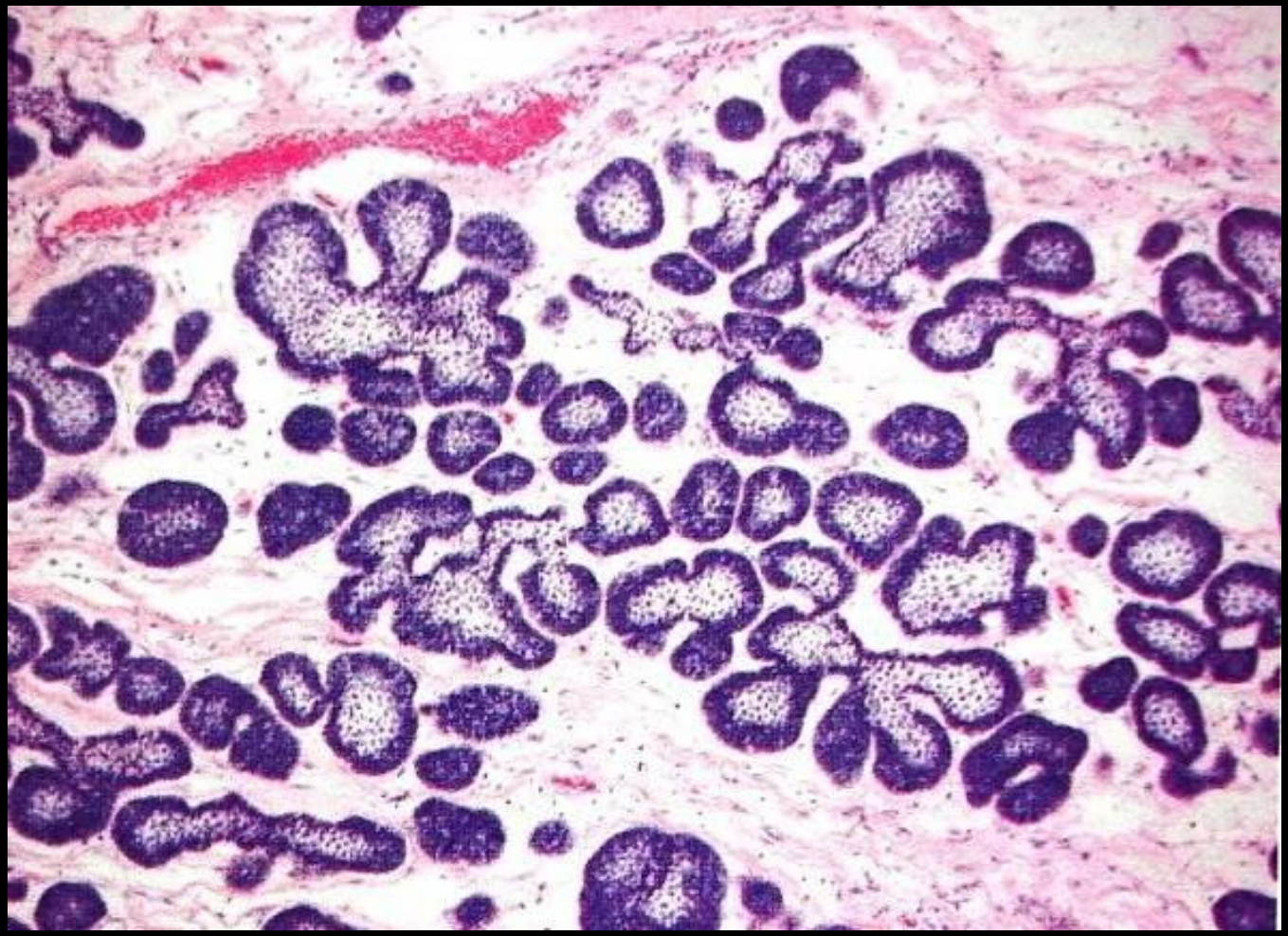
↓

Zone of hyalinization of collagen immediately adjacent to the epithelium



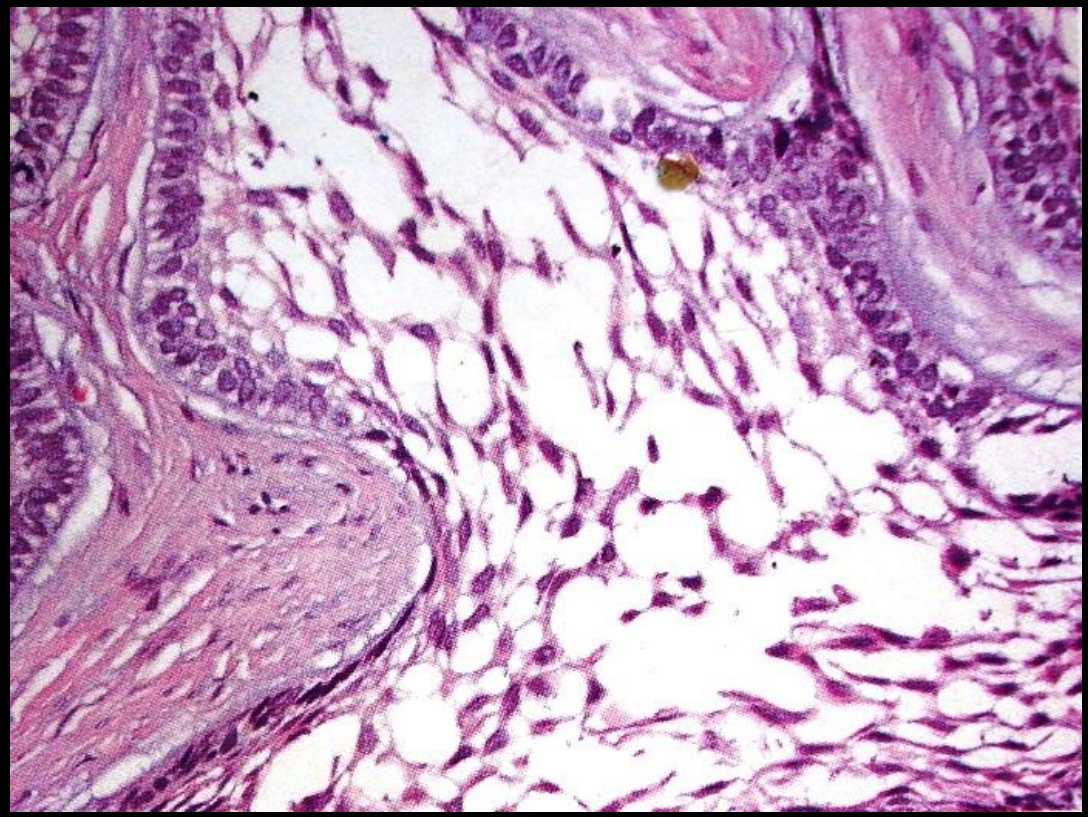
- Inductive effect of epithelium the surrounding connective tissue

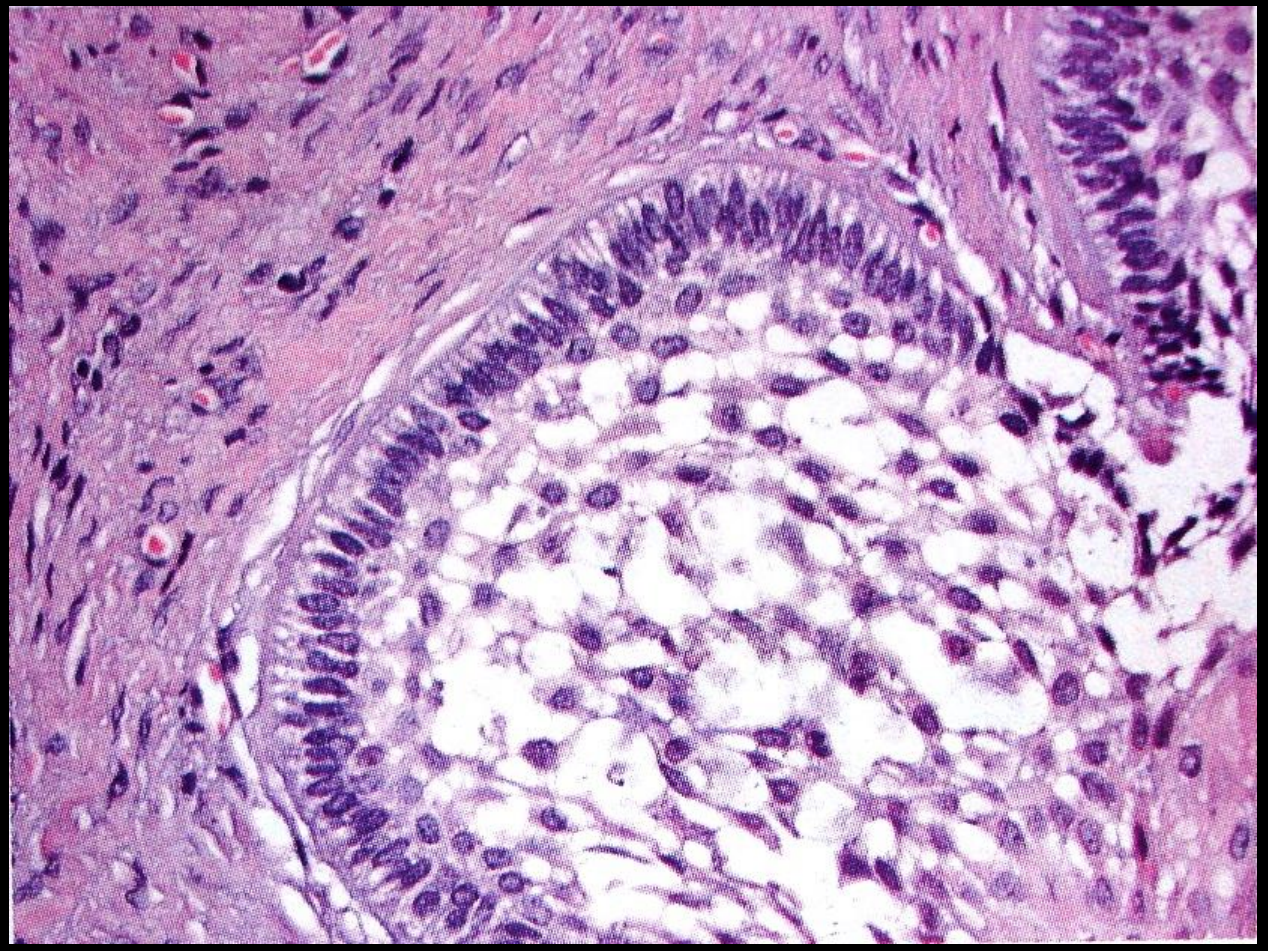
- Follicular ameloblastoma
  - Most commonly encountered variant
  - All the core features
  - Grows mainly in islands



- Follicular ameloblastoma

- Central cells
  - Typically polyhedral to spindle shape
  - Angular nuclei
  - Poorly defined cytoplasm with delicate fibrilar processes that connect adjacent cells
  - Stellate reticulum like appearance

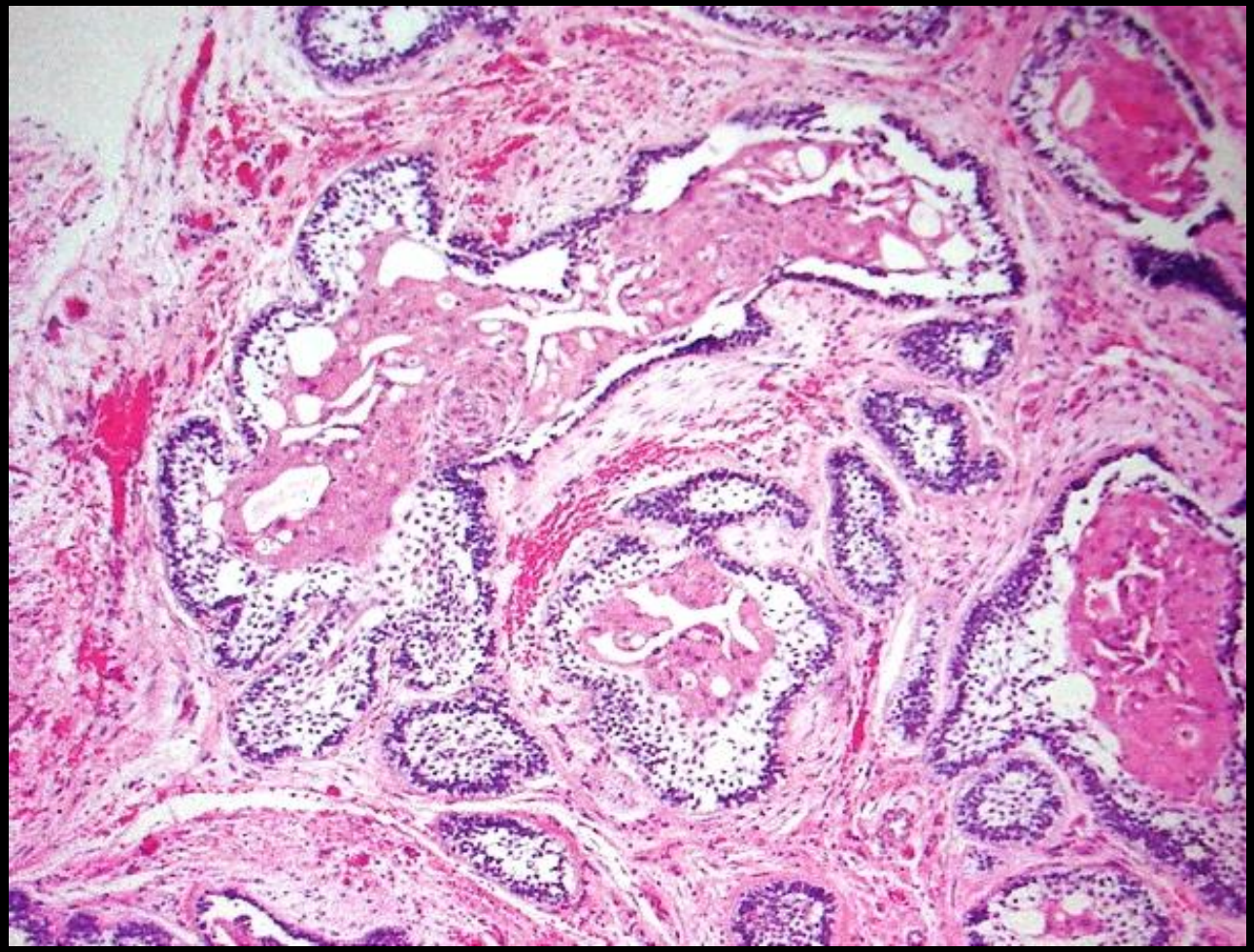




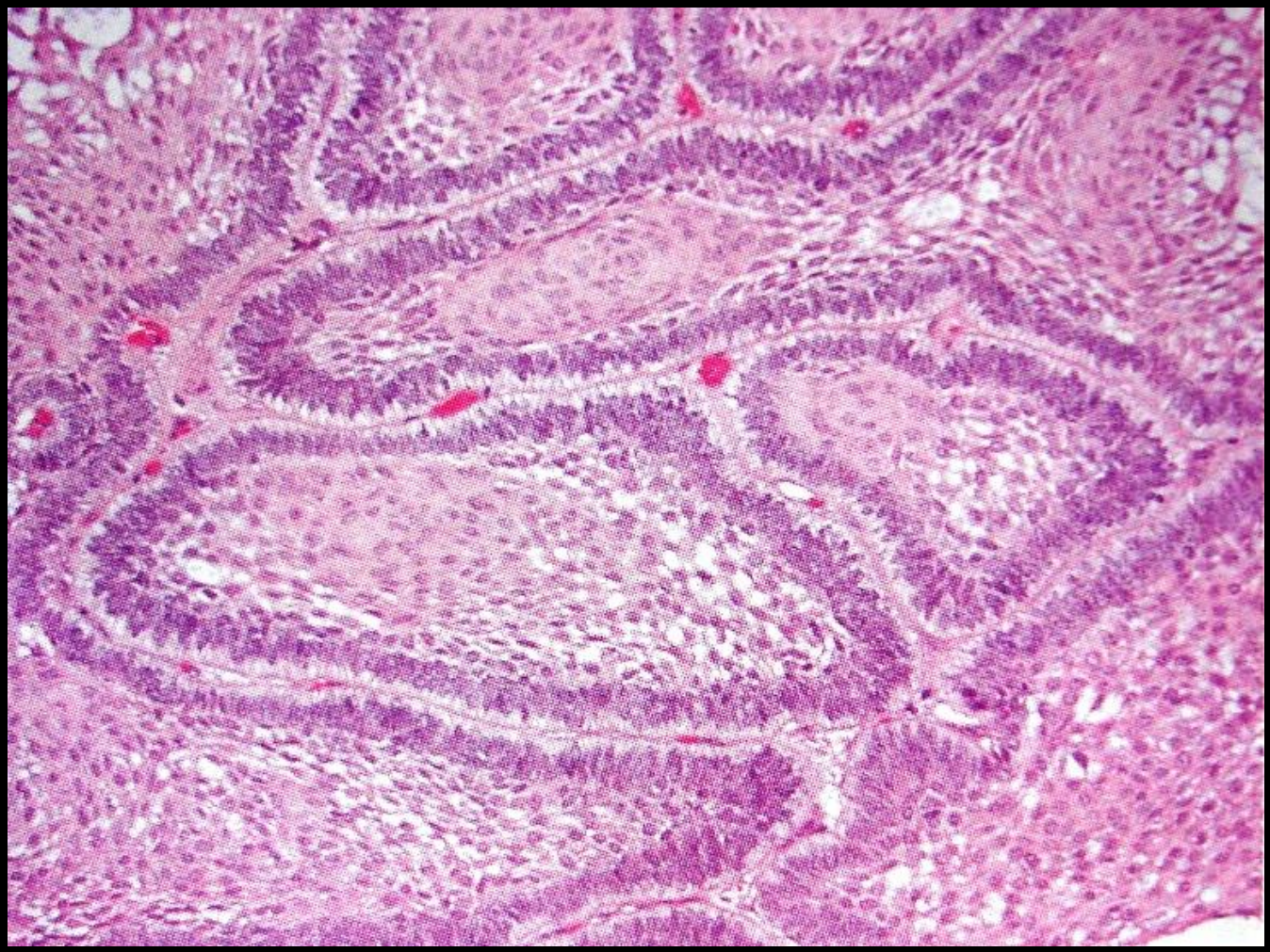
- Tumor islands closely simulate enamel organ

- Enlarged islands with cystic degeneration

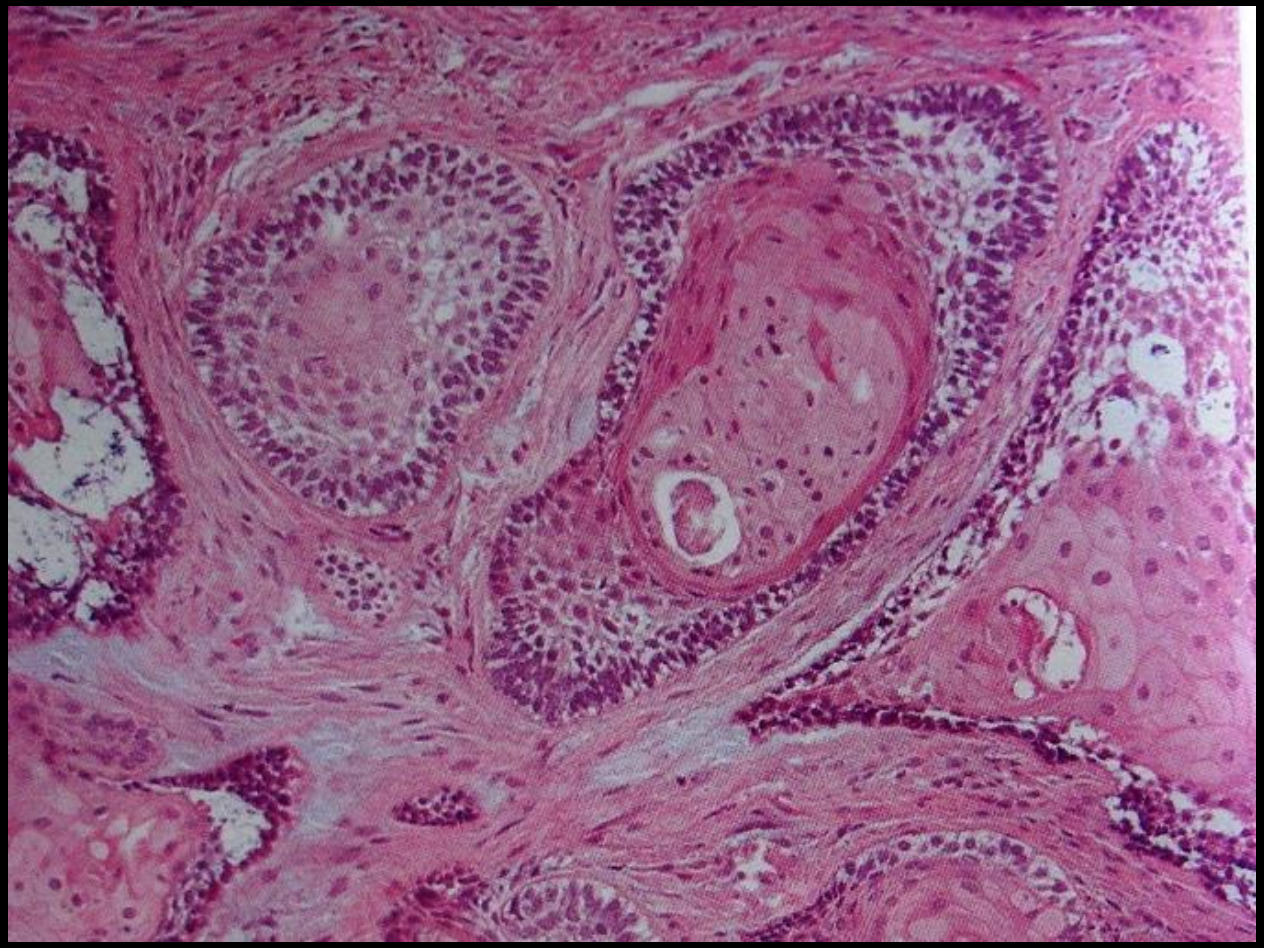
- Acanthomatous ameloblastoma
  - Closely resembles follicular type
  - Shows core features common to most ameloblastomas
  - Grows primarily in island like pattern



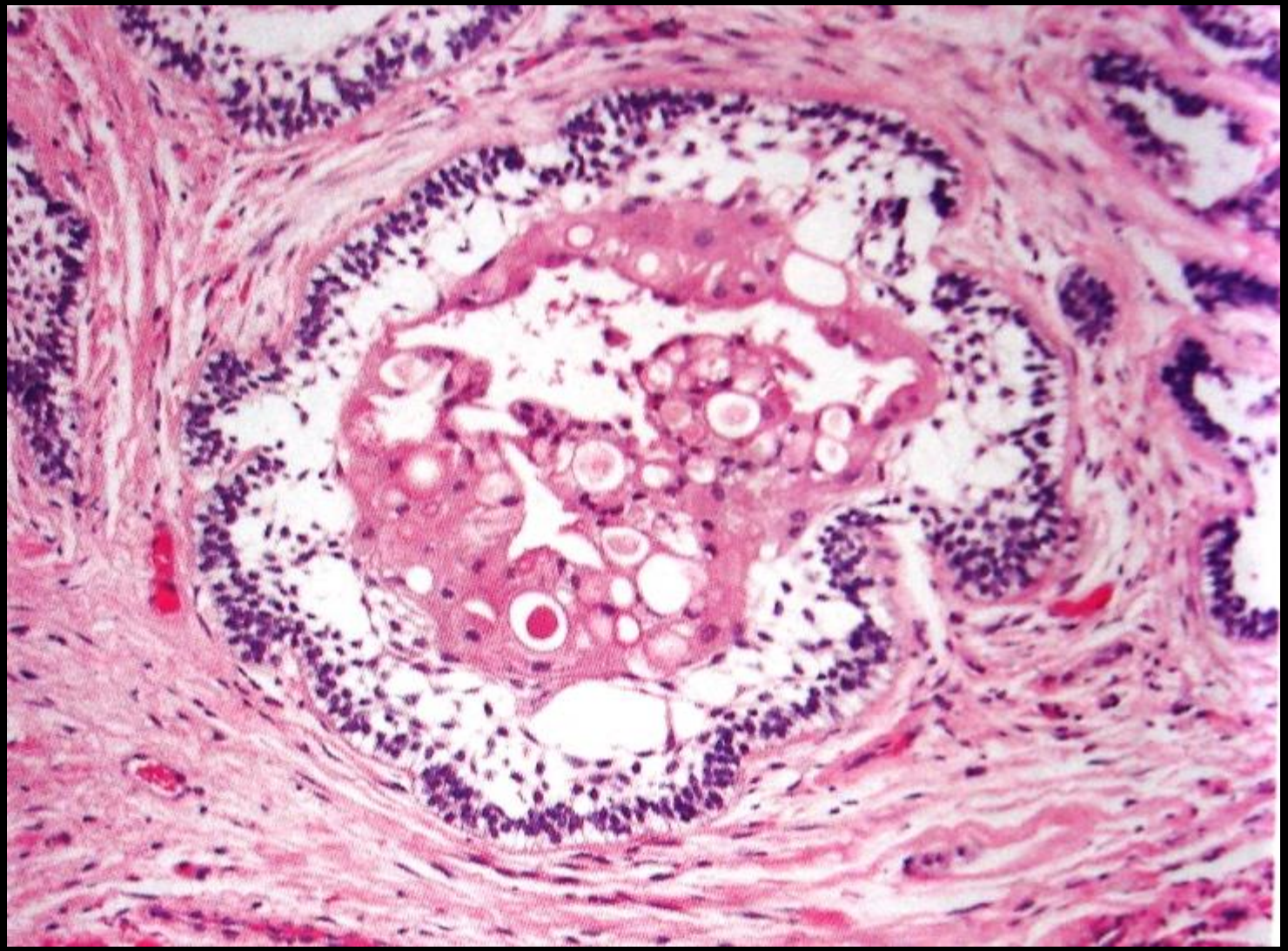
- Acanthomatous ameloblastoma



- Squamous cells replace stellate reticulum like cells

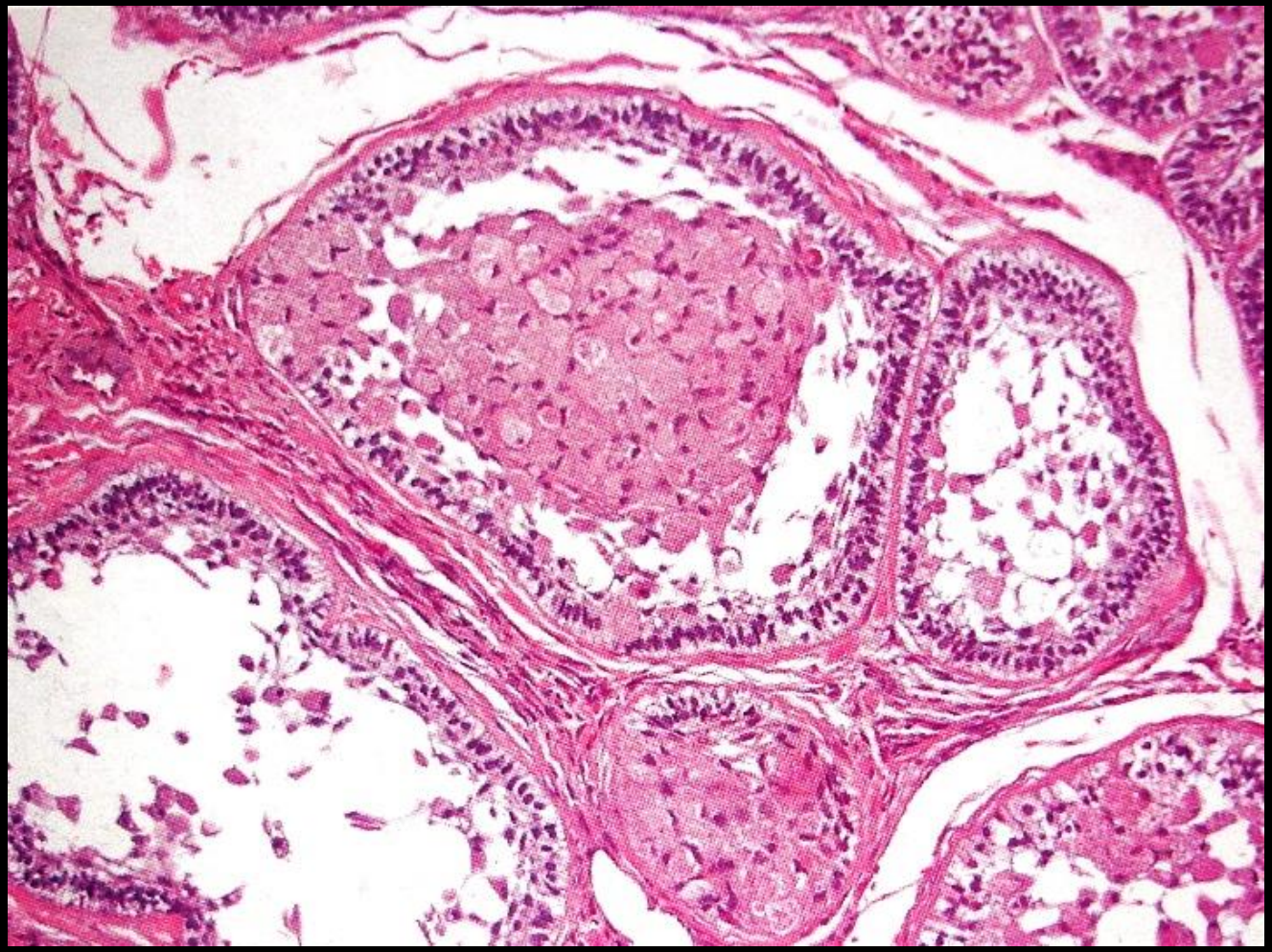


- Tendency to keratinize in the most central portions
- Typically parakeratin



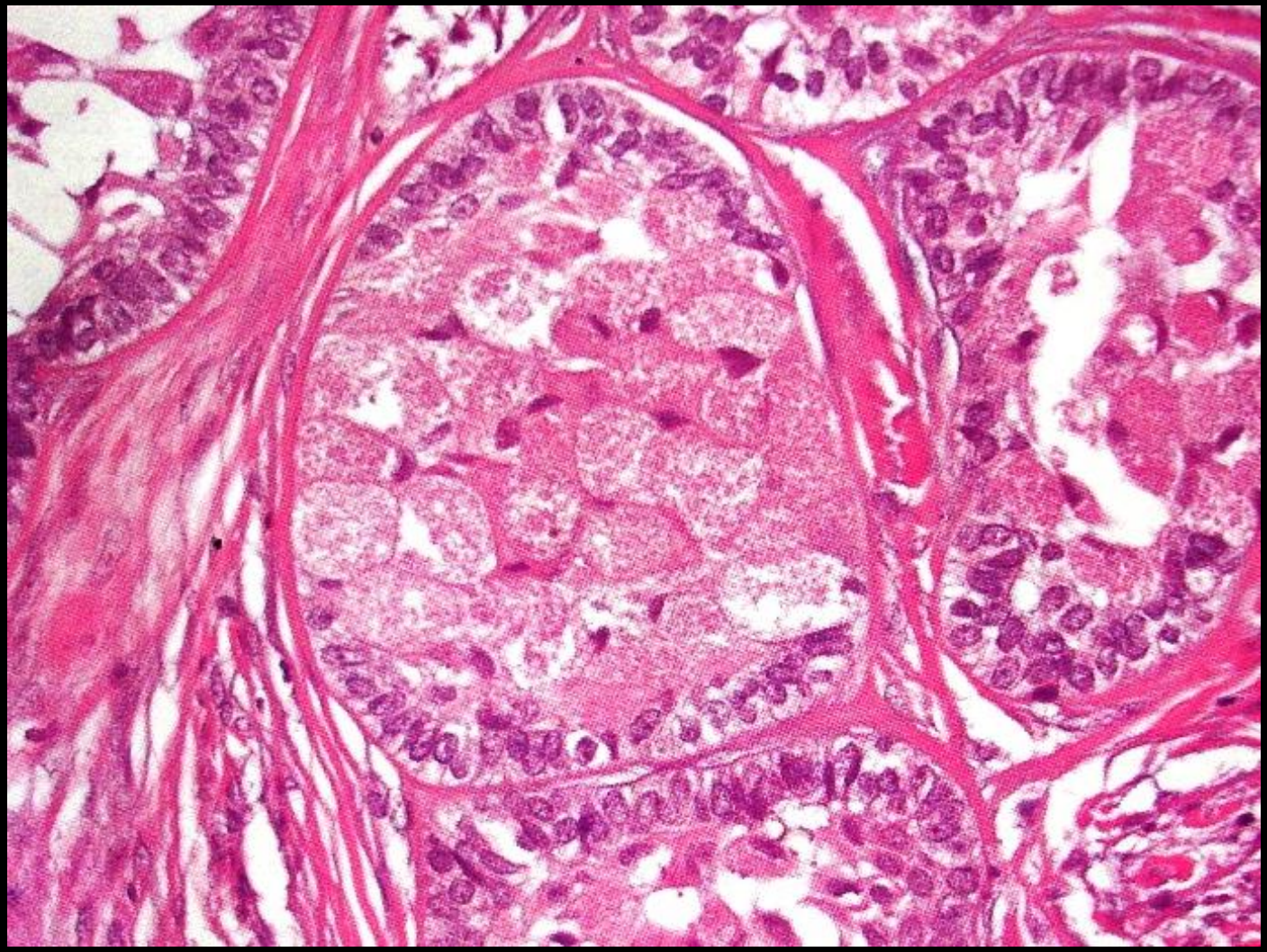
- Triple layer colour pattern

- Granular cell ameloblastoma
  - Relatively rare subtype
  - Found as an admixture with other patterns (particularly follicular)
  - Shows the core histologic features

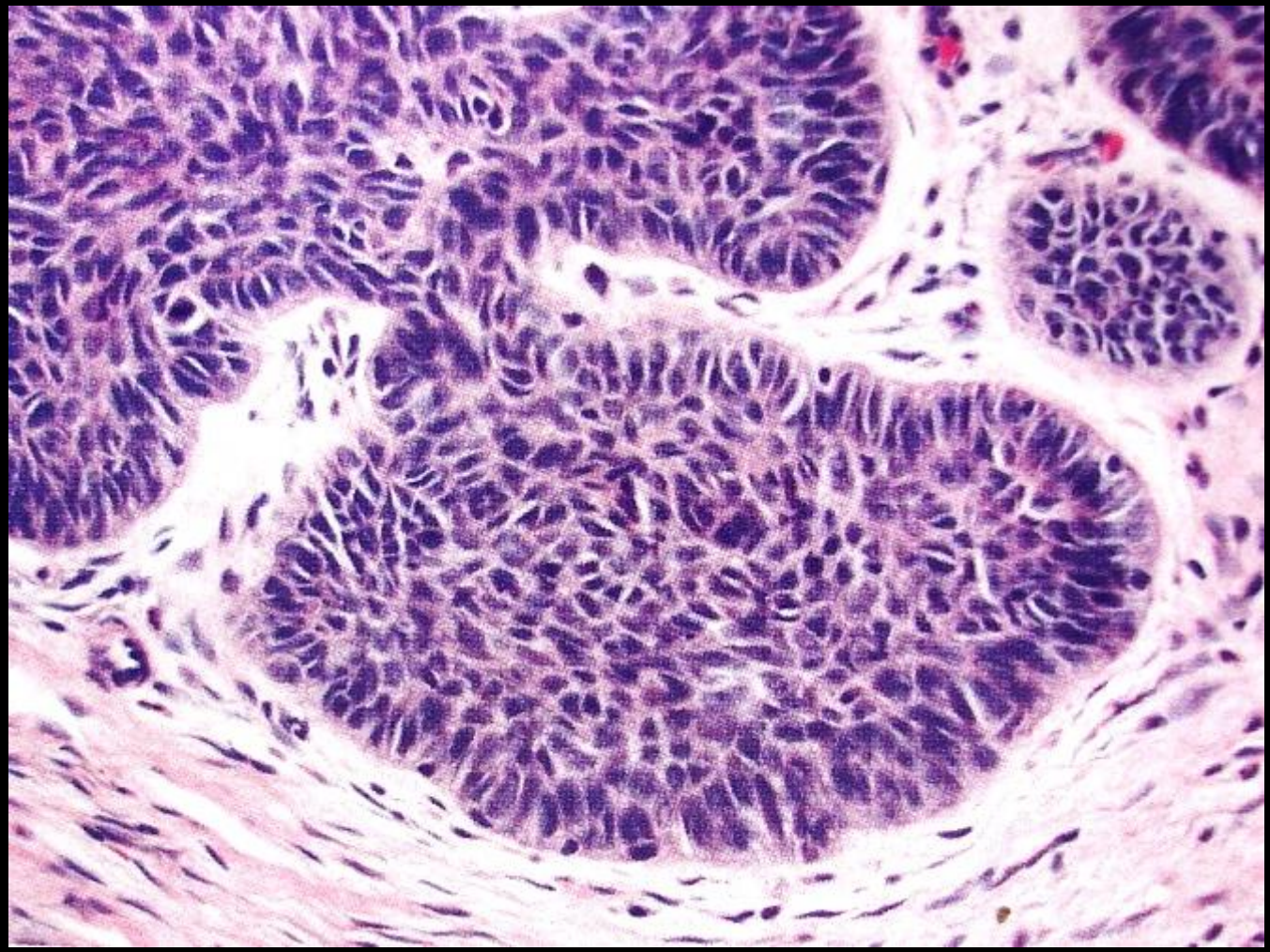


- Granular cells in the central portion of epithelial islands, strands and cords.

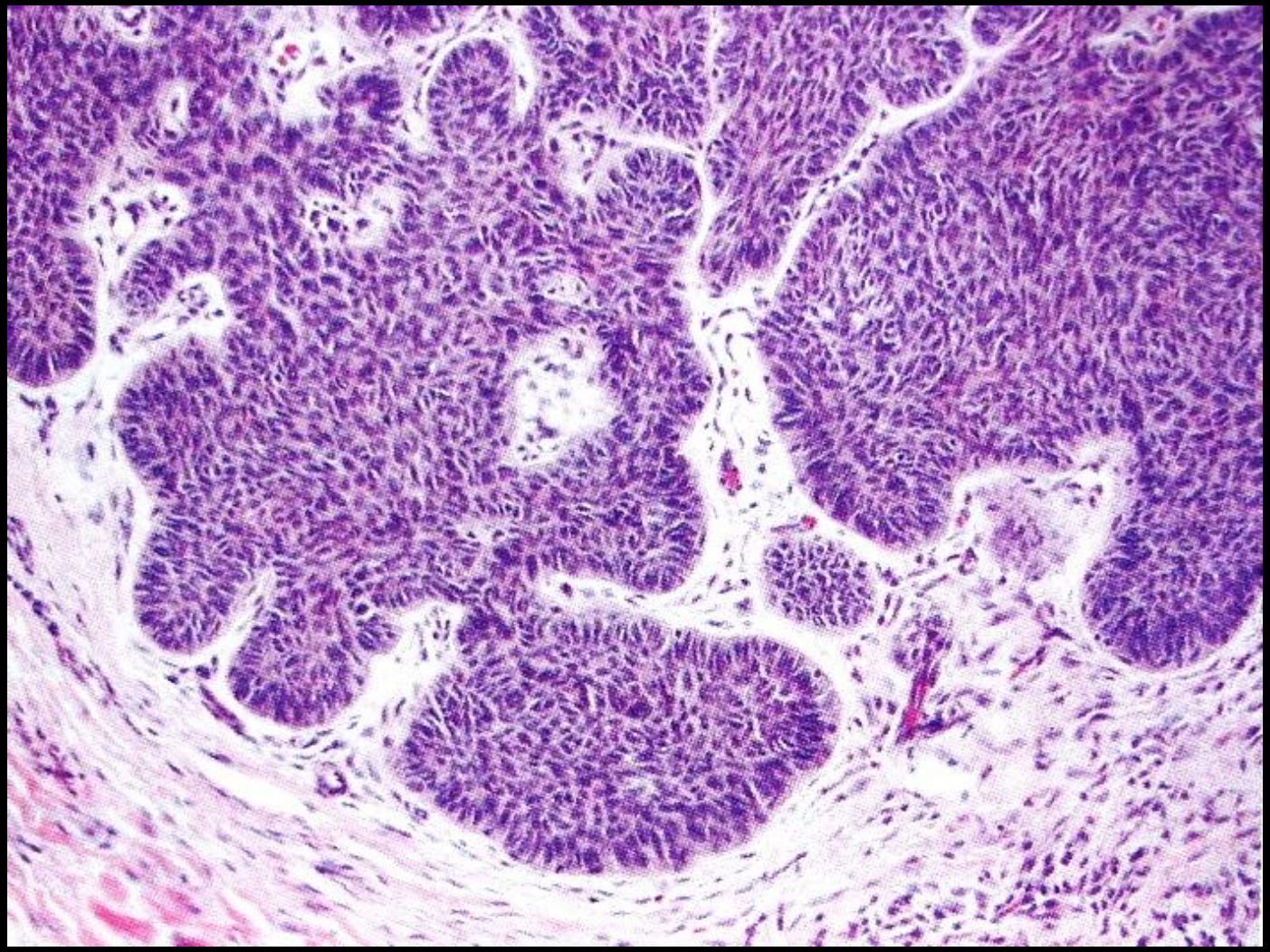
- Cells are
  - Large with oval to polygonal outline
  - Nucleus displaced to the periphery
  - Cytoplasm → distended and packed with numerous coarse granules and stains weakly eosinophilic
  - Cell membranes poorly demarcated



- Basal cell ameloblastoma
  - Rarest histologic subtype
  - Occurs primarily in extraosseous lesions
  - Basaloid appearing cells occupy the central portions of the islands



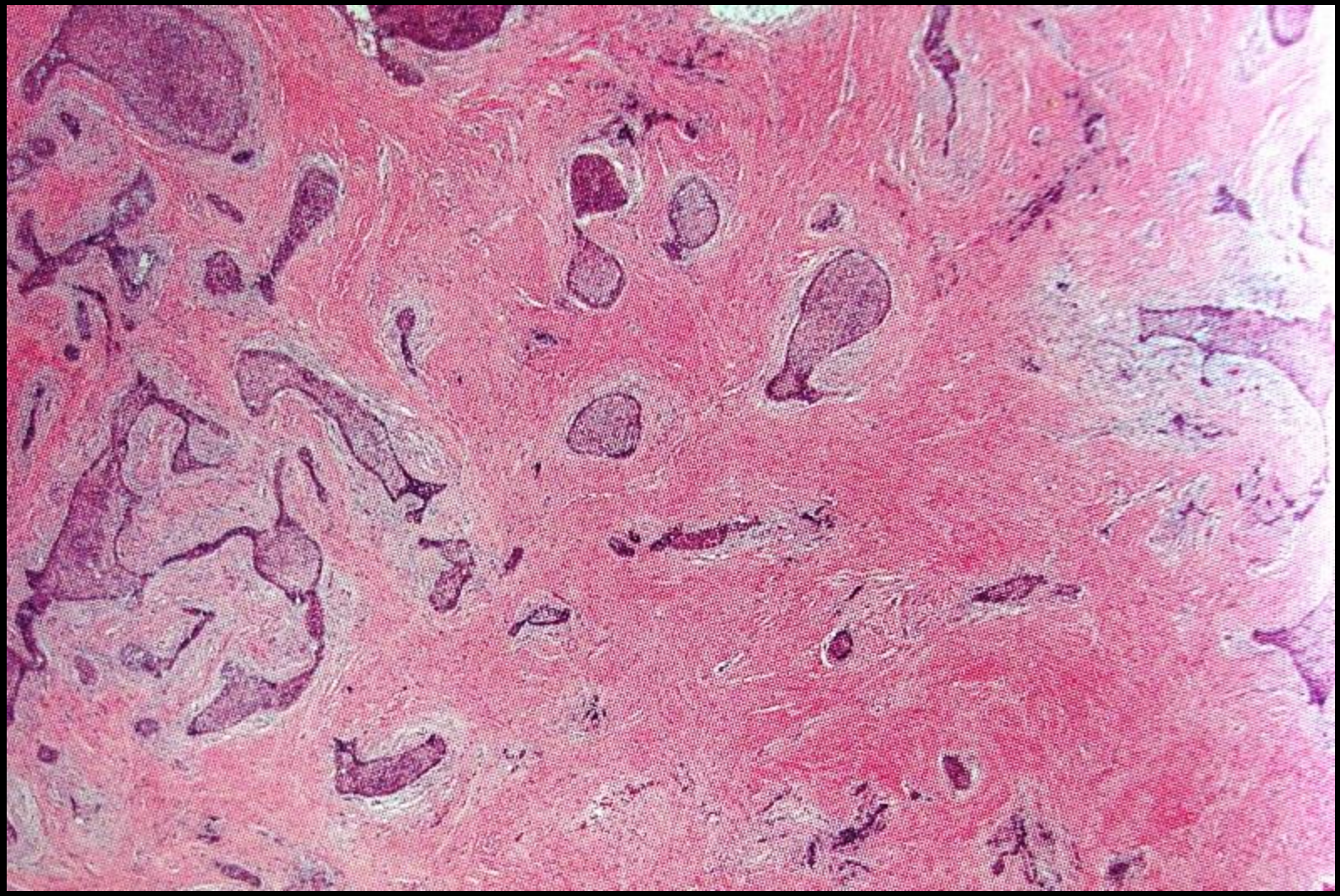
- Basaloid cells in place of stellate reticulum like cells



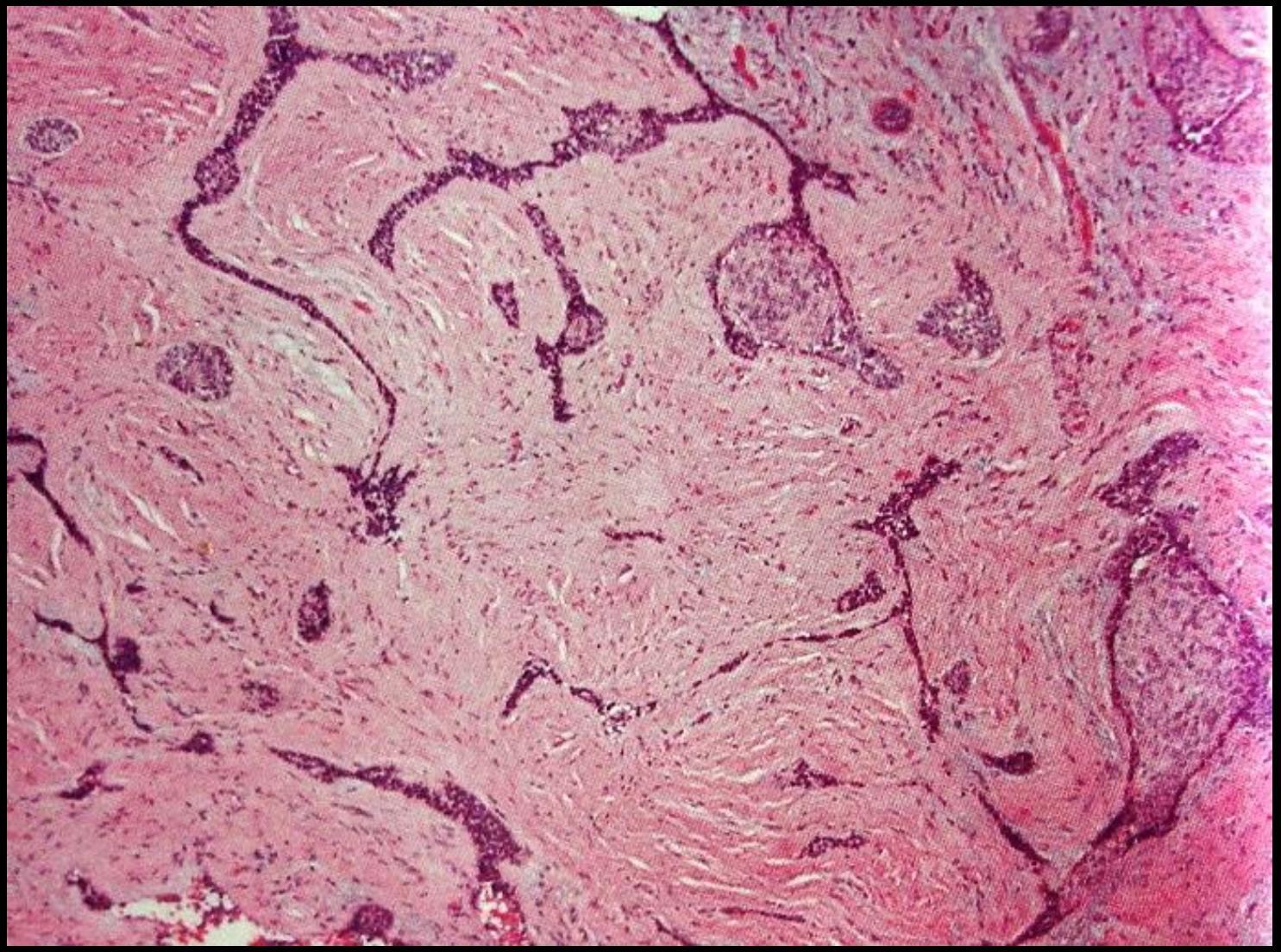
- Characteristic colour gradation difficult to appreciate

- Peripheral cells tend to be low columnar or cuboidal
- Often do not demonstrate reverse polarity with subepithelial vacuole
- Hyperchromatism and peripheral palisading are retained

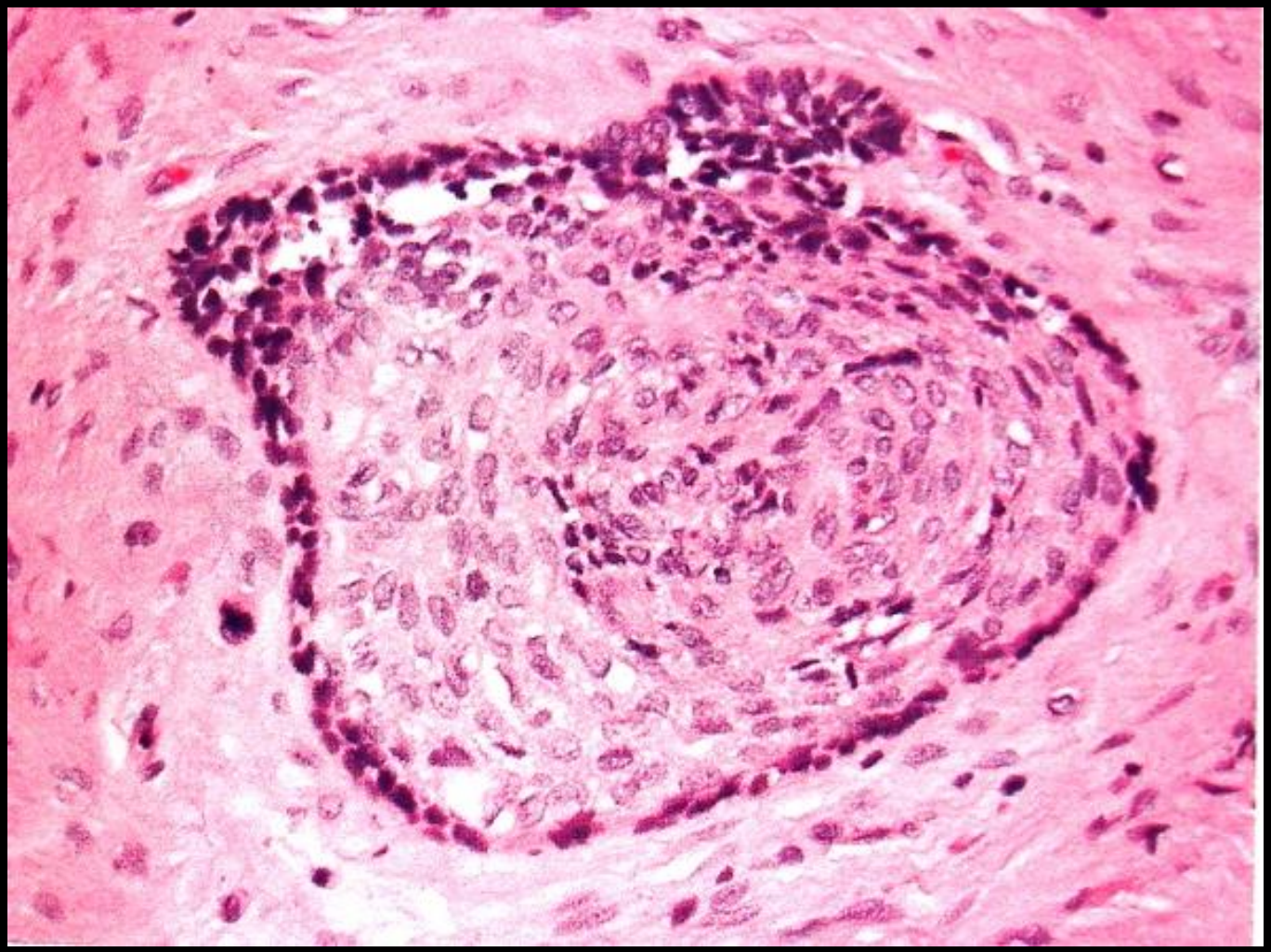
- Desmoplastic ameloblastoma
  - Shows some variation from core features
  - Dense collagenous stroma
    - Hyalinized and hypocellular



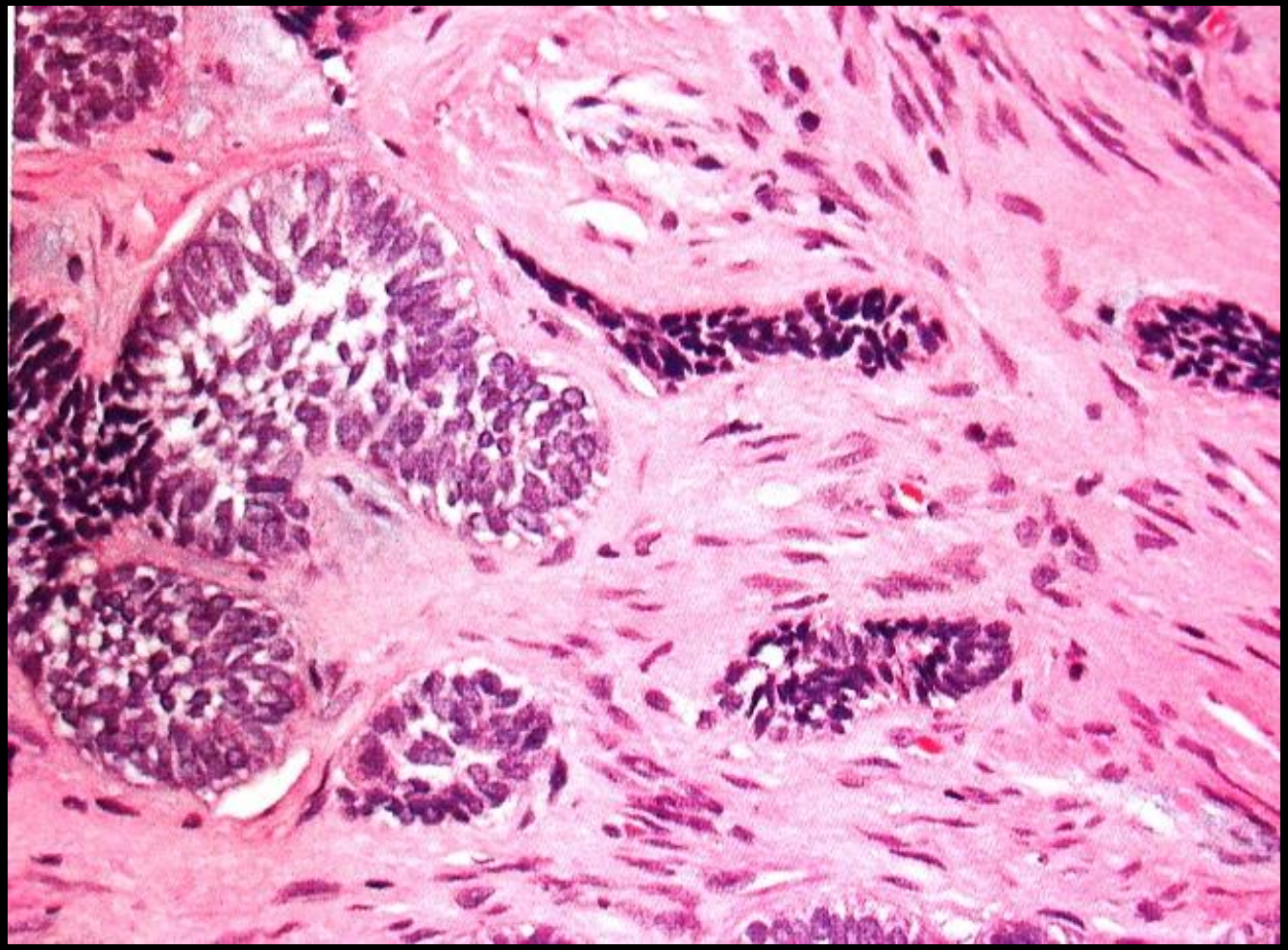
- Desmoplastic ameloblastoma



- Greater tendency to grow in thin strands and cords

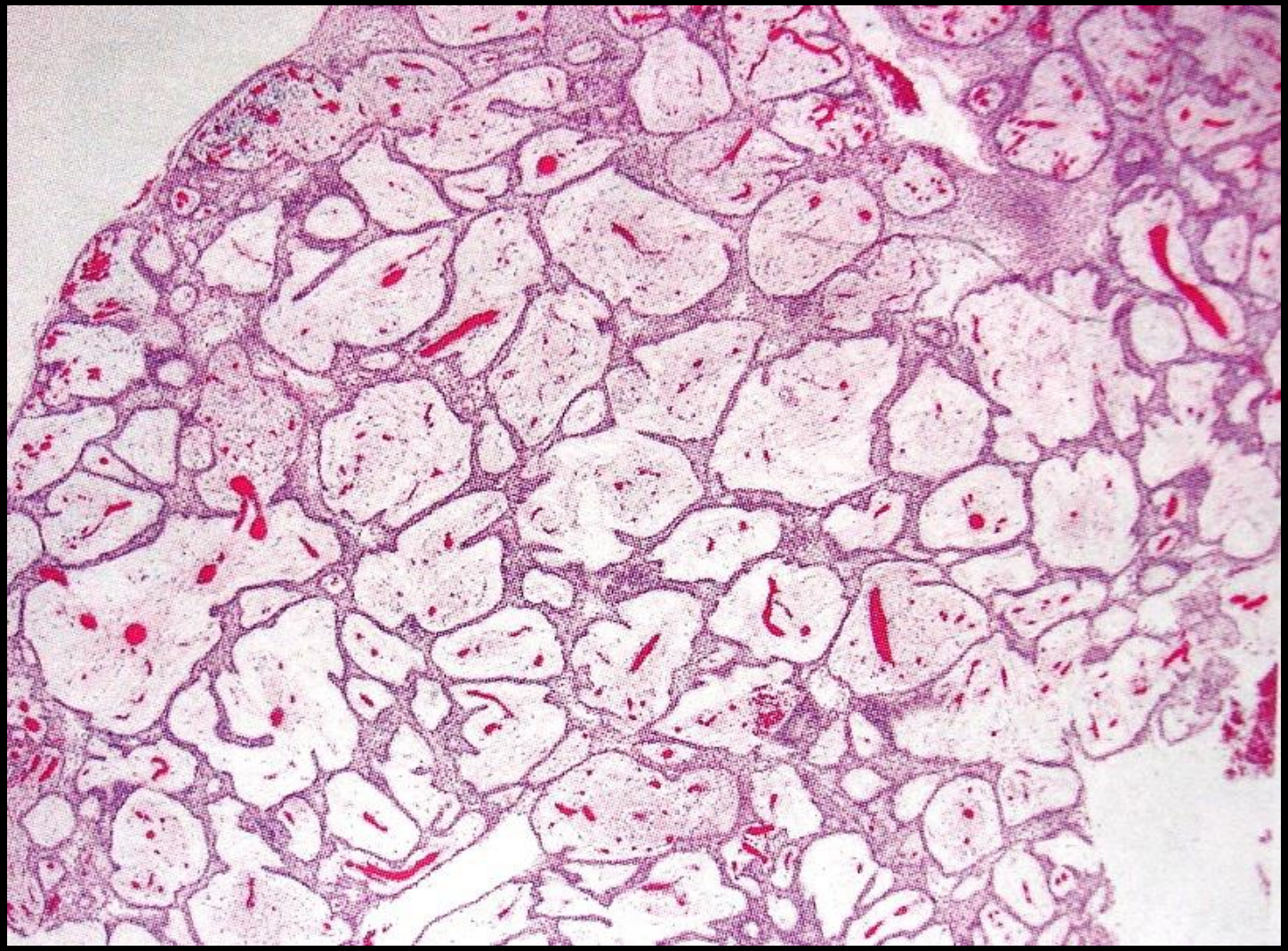


- Peripheral cells are often flattened or cuboidal

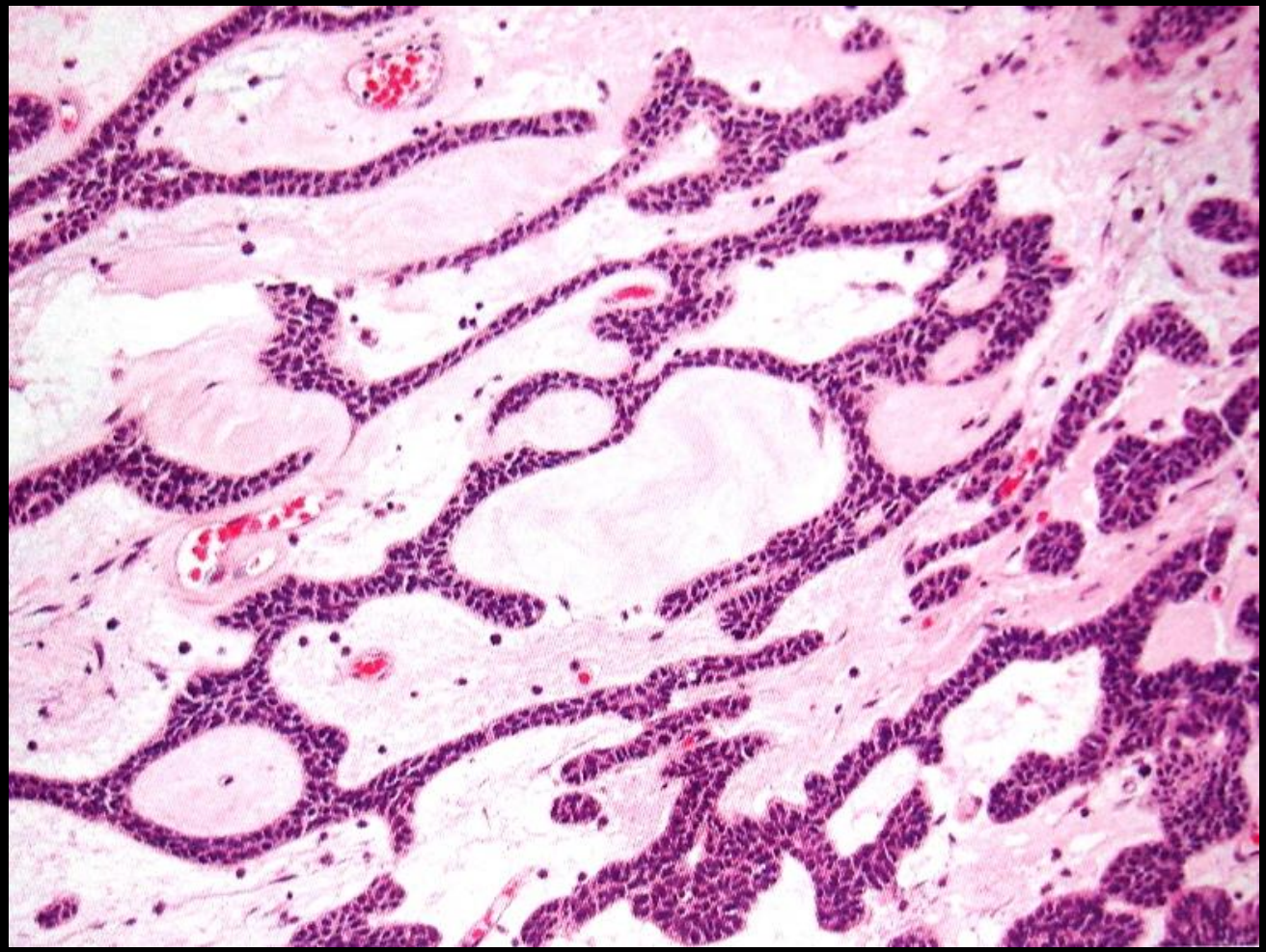


- Occasional classic islands of follicular ameloblastoma

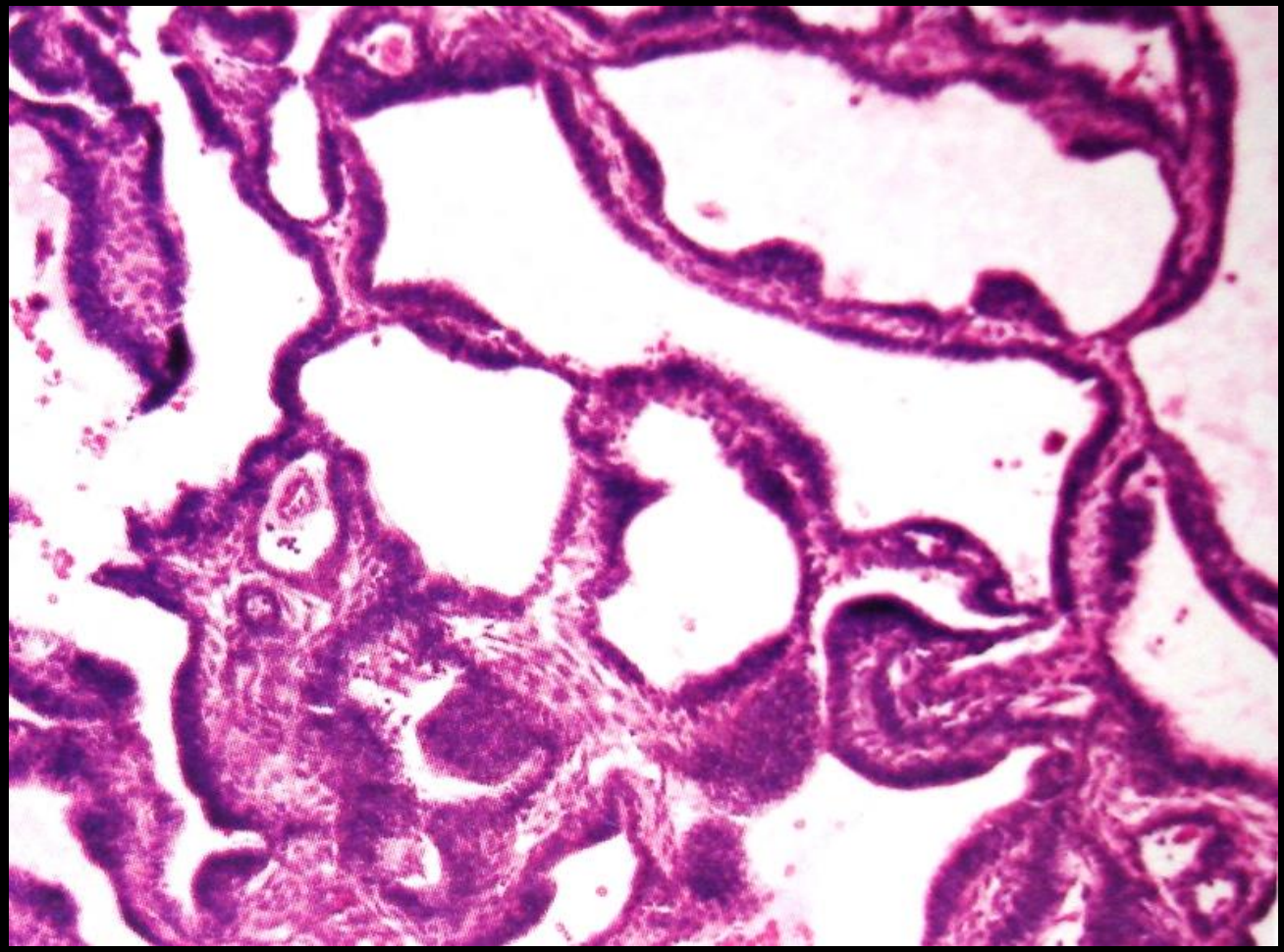
- Plexiform ameloblastoma
  - Distinct from other histologic subtypes
  - Often lacks many of the core histopathological features
  - Sparse fibrous connective tissue stroma
    - Often loose and myxoid
  - Predominance of strand like growth pattern
  - Strong tendency for interconnection



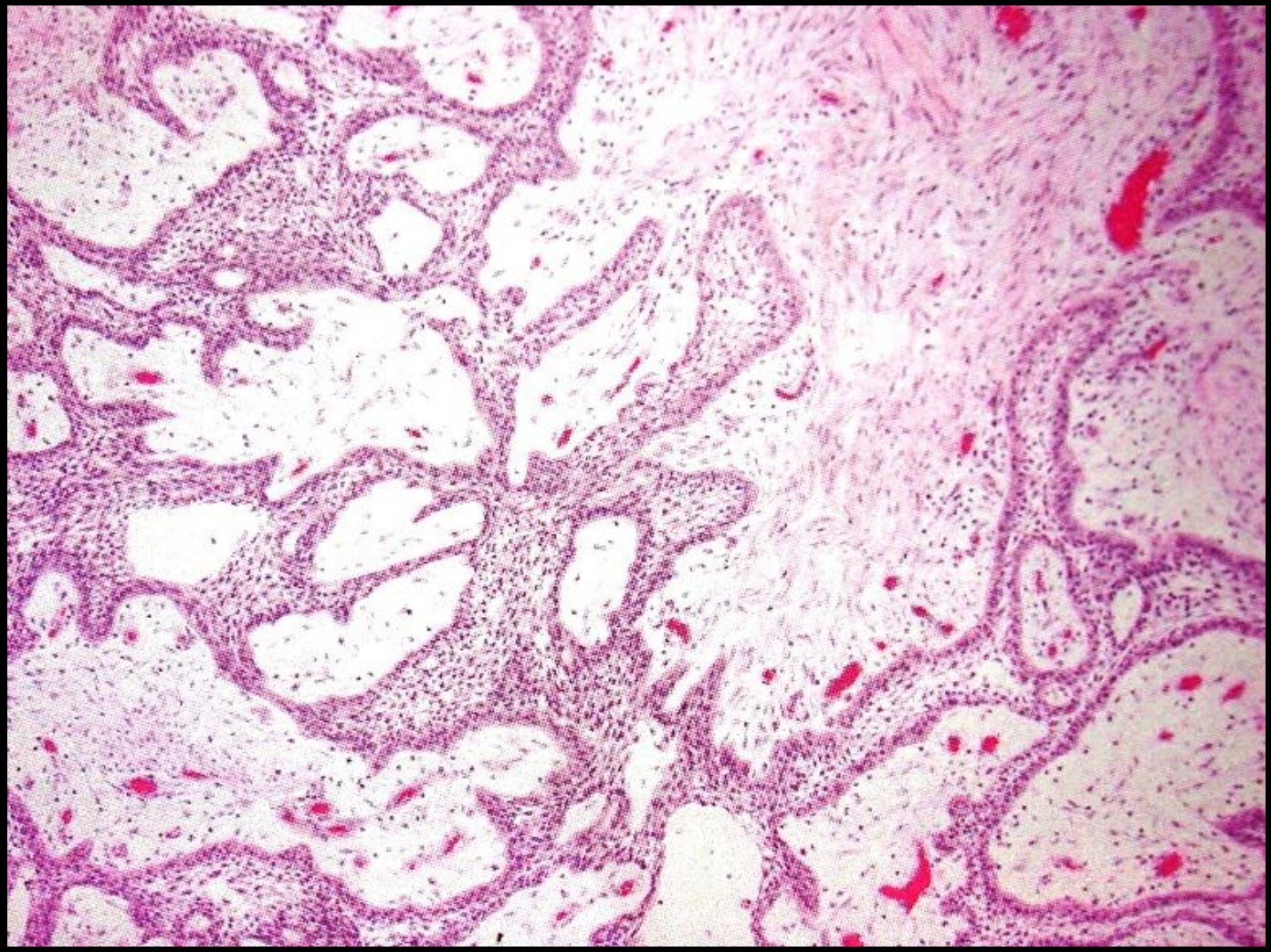
- Plexiform ameloblastoma



- Cellular growth pattern closely simulating dental lamina stage
  - Strands composed of bilayer of cuboidal cells



- Rounded nodules of epithelium proliferating off the dental lamina like strands
  - Differentiation towards Bud stage of odontogenesis



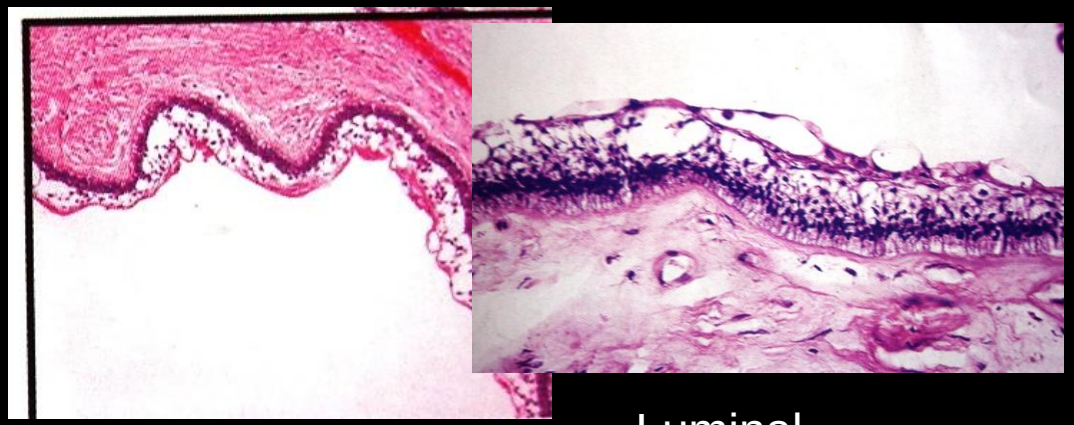
- Strands may expand because of proliferation of cells → resembling stellate reticulum

Unicystic ameloblastoma

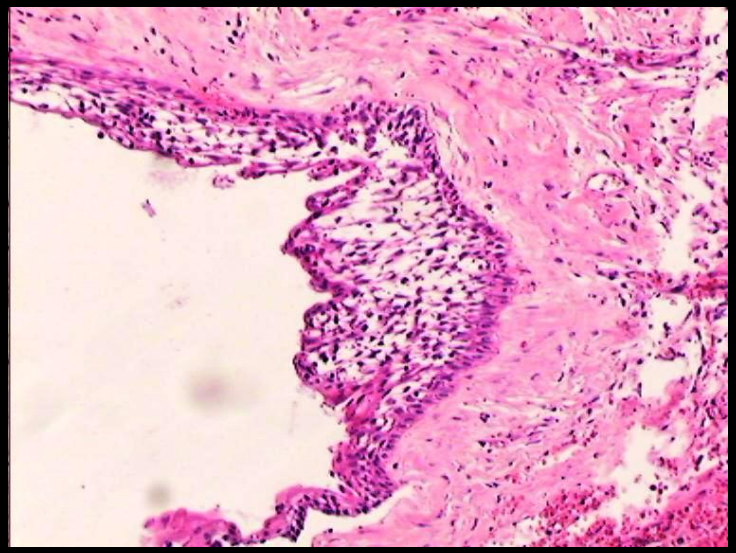
- First documented by Robinson and Martinez
- Accounts for 10-15% of all intraosseous ameloblastomas
- Can originate as
  - De novo as a nepolasm
  - Neoplastic transformation of non-neoplastic cysts

- Clinical features
  - Younger age group (Avg.→ 22.1years)
  - Mandible (90%)
    - Posterior region
  - Higher percentage associated with impacted teeth

- Histopathological features

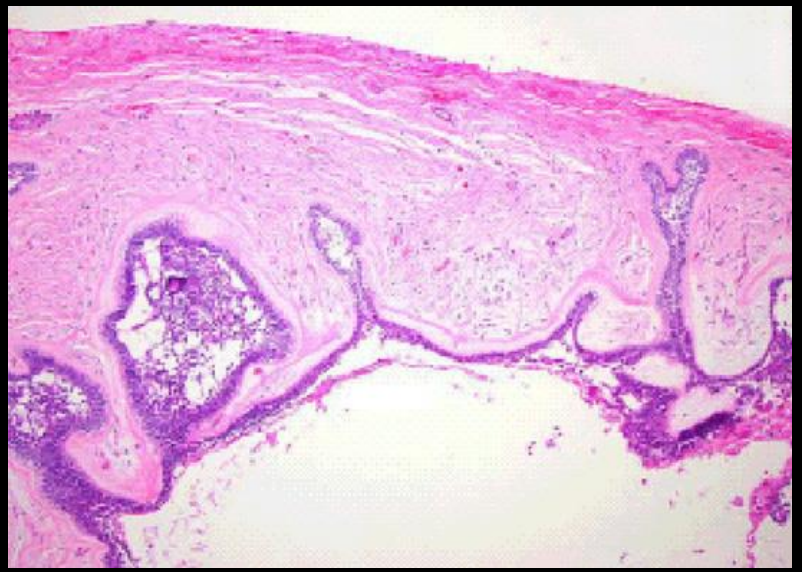


Luminal



Intraluminal

Islands occurring isolated in the connective tissue wall

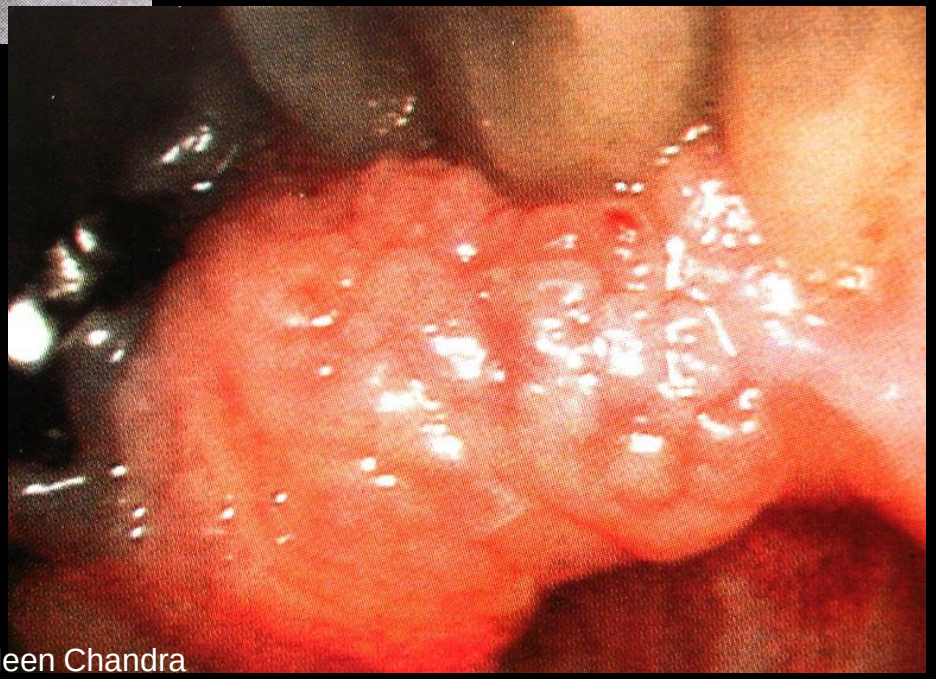


Mural

Peripheral (extraosseous) ameloblastoma

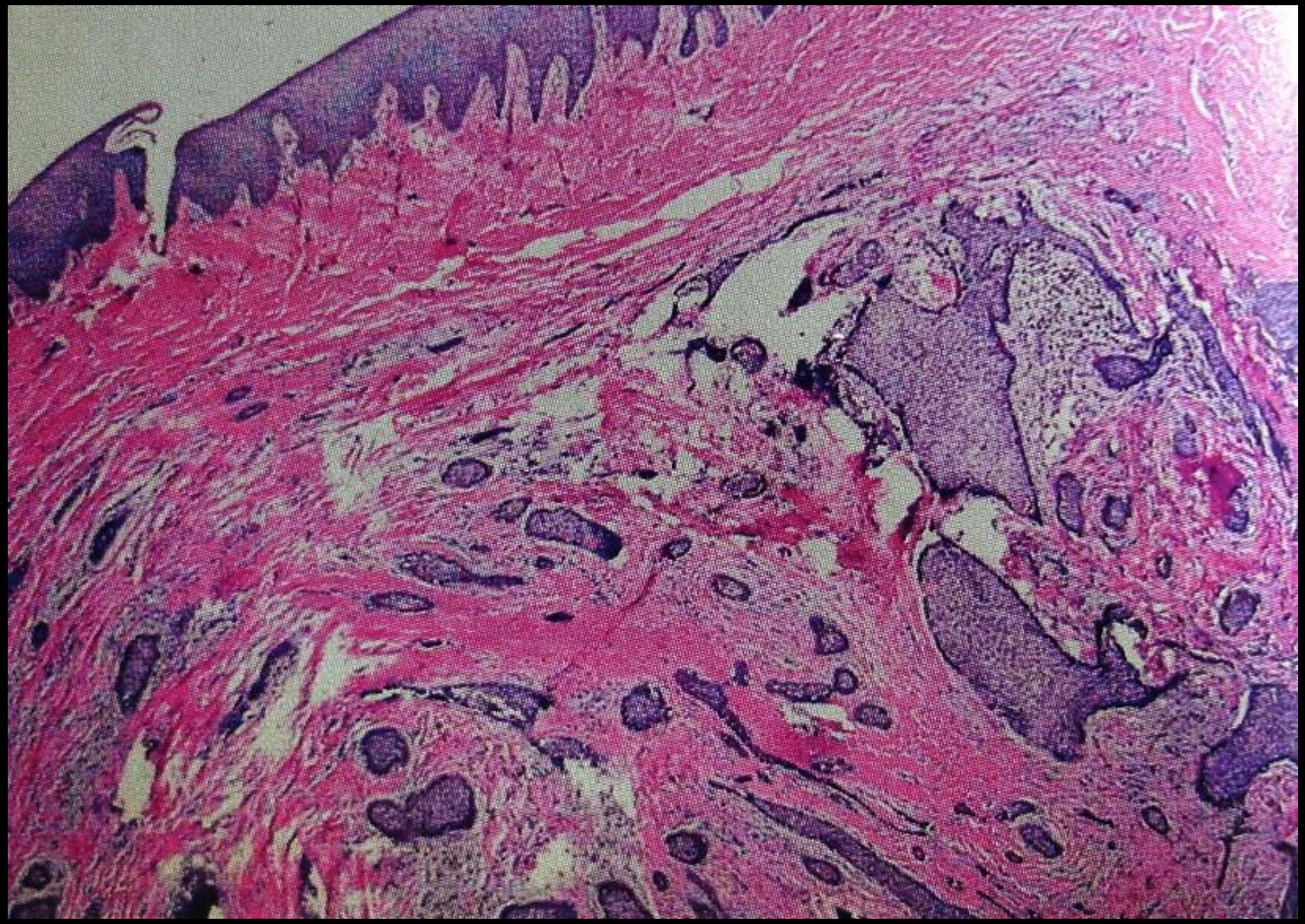
- Uncommon (1% of all ameloblastomas)
- Originates either from remnants of dental lamina or surface epithelium

- Clinical features
  - Middle age (mean → 52 years)
  - Slight male predilection
  - Mandible : maxilla = 2:1
  - Gingival and alveolar mucosa
  - Painless, non-ulcerated, sessile/pedunculated
  - 3mm-2cm on size



Prof. Shaleen Chandra

- Histopathological features
  - Islands of ameloblastic epithelium in lamina propria underneath the surface epithelium
  - Plexiform/follicular pattern most common
  - Connection with overlying epithelium → 50%



- Peripheral ameloblastoma

Malignant ameloblastoma and ameloblastic carcinoma

- Malignat behaviour in ameloblastoma → 1%

- Matastases
  - Lung
  - Cervical lymph nodes
  - Vertebrae
  - Bones
  - viscera

- Histopathological findings
  - Malignant ameloblastoma → same as non-metastasizing ameloblastoma
  - Ameloblastic carcinoma → cytologic atypia
    - ↑ N/C ratio
    - Nuclear hyperchromatism
    - Presence of mitosis
    - Necrosis in tumor islands
    - Areas of dystrophic calcifications

Squamous odontogenic tumor

- Rare benign epithelial odontogenic tumor
- First described by Pullon et al (1975)
- Previously reported as
  - Benign epithelial odontogenic tumor
  - Acanthomatous ameloblastoma
  - Acanthomatous ameloblastic fibroma
  - Hyperplasia and squamous metaplasia of residual odontogenic epithelium
  - Benign odontogenic tumor, unclassified

Histogenesis

- Rests of Malassez
  - Lesions associated with alveolar process
- Remnants of dental lamina
  - Lesions associated with unerupted teeth
- Surface epithelium or rests of Serre
  - Extraosseous lesions

Clinical features

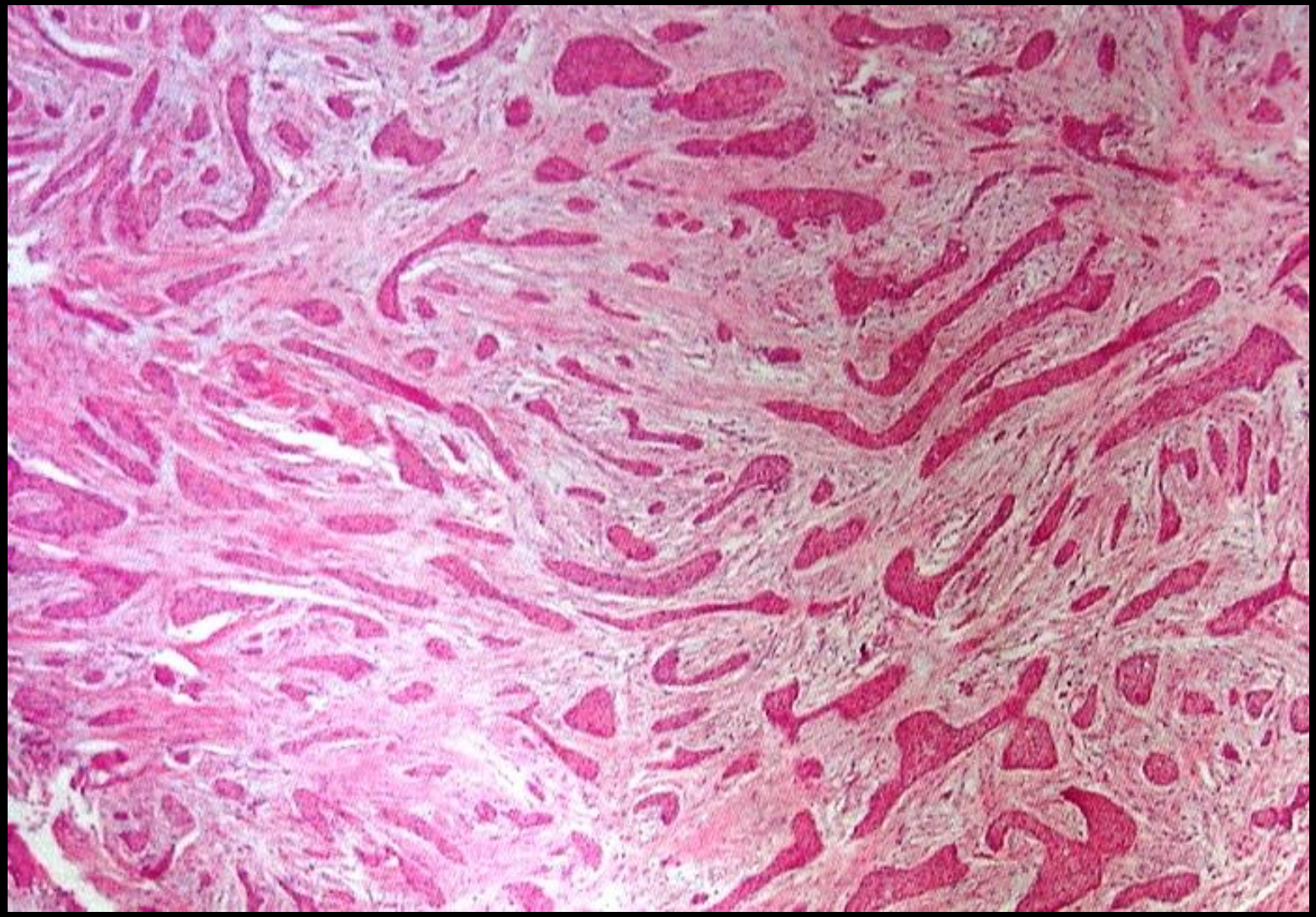
- Age
  - Wide age range
  - Peak → 3rd decade
- Slight male predilection
- Mandible more common
- Multiple and familial lesions have been reported

- Radiographic features

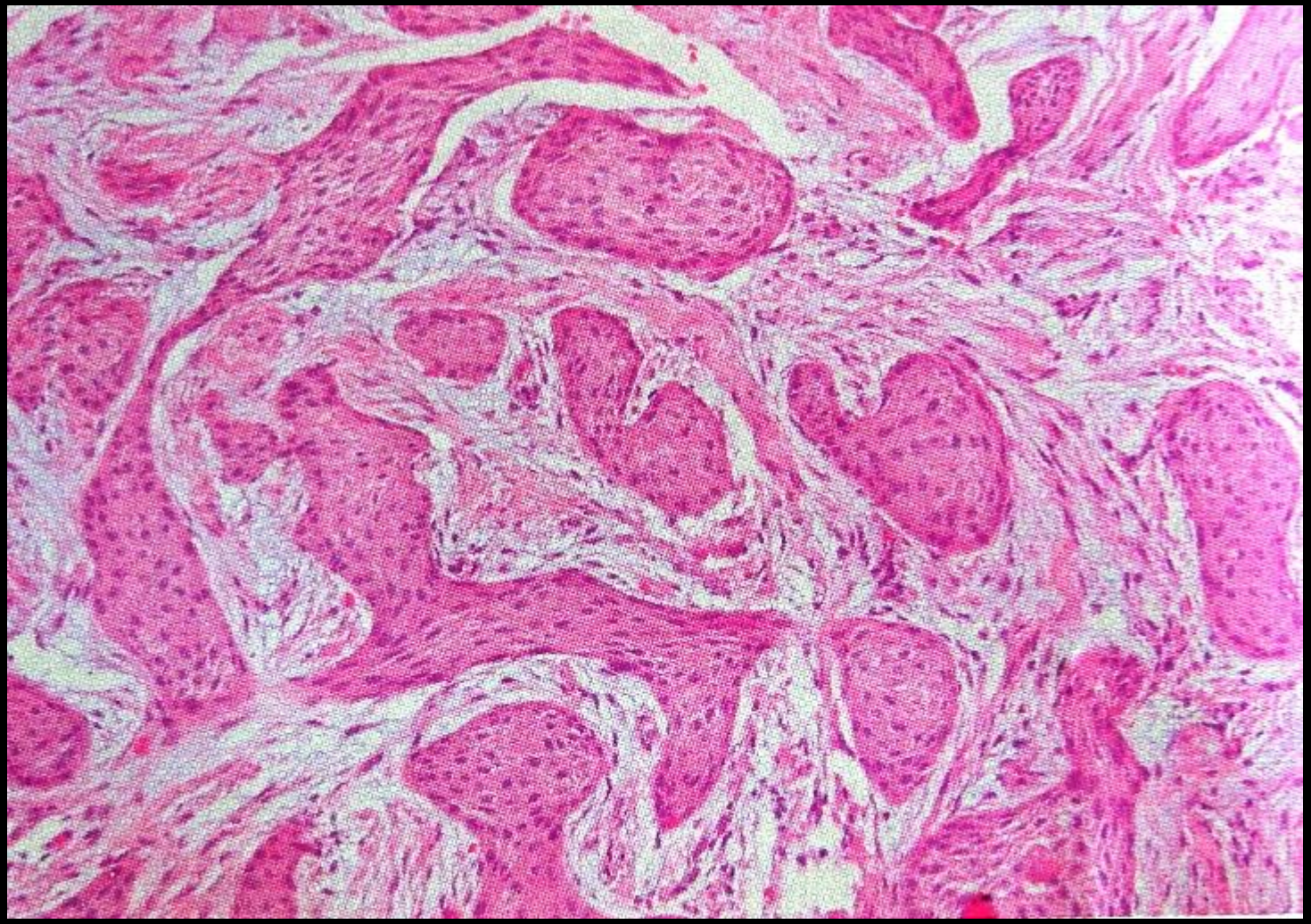
  - Triangular or semicircular radiolucency located in alveolar bone along the lateral surface of roots
  - Apex towards alveolar crest
  - Hyperostotic border may be present
  - May mimic chronic peridontitis
  - Pericoronal in some cases
  - Peripheral lesions → saucerization of bone

Histopathological findings

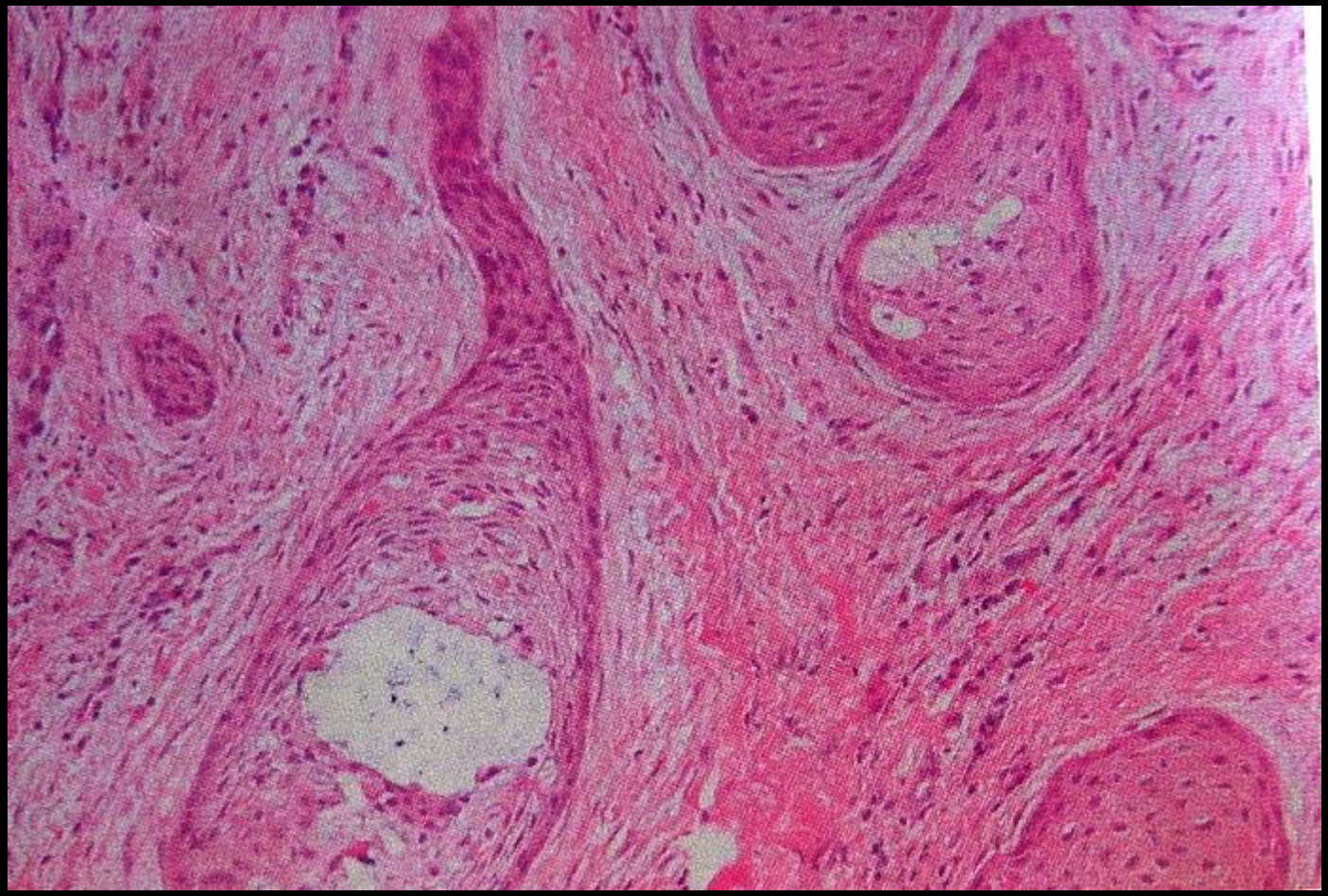
- Islands and broad strands of well differentiated squamous epithelium
- Mature fibrous connective tissue
- Islands are well demarcated from surrounding connective tissue



- Squamous odontogenic tumor



- Basal layer of flat cells
- Internal cells exhibit squamous differentiation



- Vacoulization and microcyst formation

- Little variation in cell shape, size and staining quality
- Intraepithelial calcification is often seen
  - Irregular or lamellar
- Keratin production may be seen

Differential diagnosis

- Ameloblastoma
  - Ameloblastic changes in the peripheral cells
- Well differentiated SCC
  - SOT islands → well defined
  - Cells lack variation in cell shape, size and staining quality
  - Mitotic figures → rare

- SOT like proliferations in dentigerous and radicular cyst
  - Non-neoplastic reactive process
  - Seldom form microcysts
  - Do not contain intraepithelial calcifications

Calcifying epithelial odontogenic tumor

- Uncommon benign odontogenic neoplasm that is exclusively epithelial in origin
- First described and named by Pindborg (1955)
  - Pindborg tumor
- Less that 1% of odontogenic tumors

Histogenesis

- Earlier thought to be type of ameloblastoma or odontome
  - Pindborg showed that there were no ameloblast like cells
- Pindborg suggested
  - Reduced enamel epithelium
  - Stratum intermedium
- Amyloid deposition → immunologic response to stratum intermedium cells

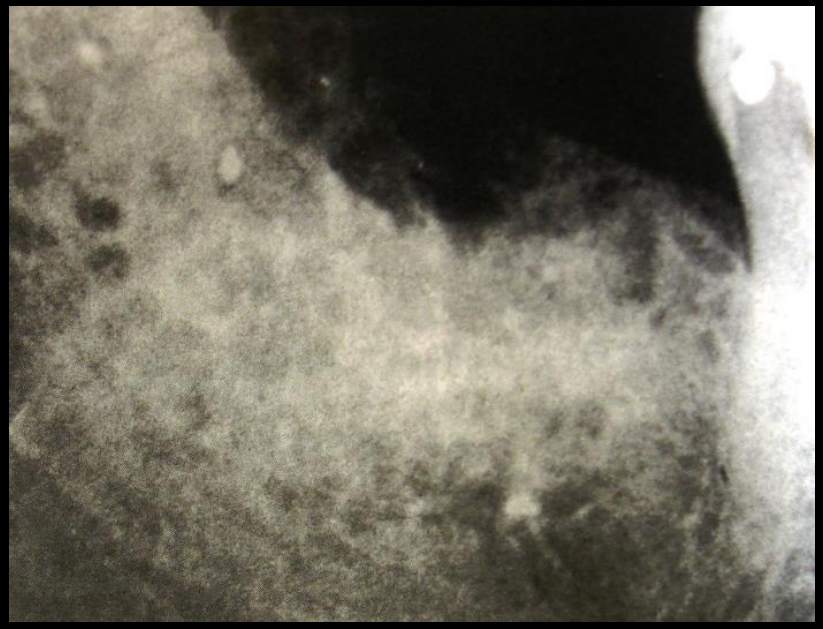
Clinical features

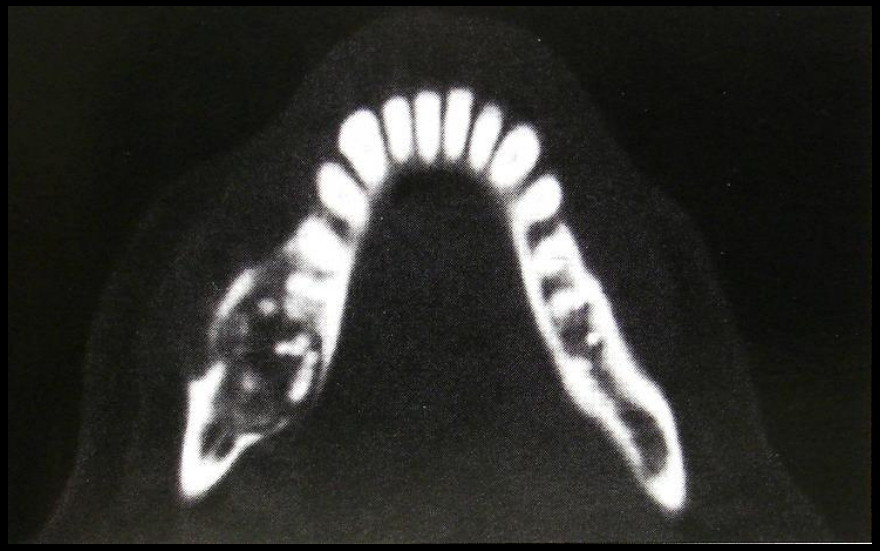
- Age
  - 30-50 years
- No gender predilection
- Mandible : maxilla = 3:1
- Posterior region

- Asymptomatic
- Painless, expansile, hard, bony swelling
- Egg shell crackling and perforation
- Tooth tipping, rotation, migration, mobility, root resorption

Radiographic features

- Radiolucent → mixed → radiopaque
  - Mixed → 65%
  - Radiolucent → 32%
  - Radiopaque → 3%
- *Wind driven snow* appearance
- May be unilocular or multilocular

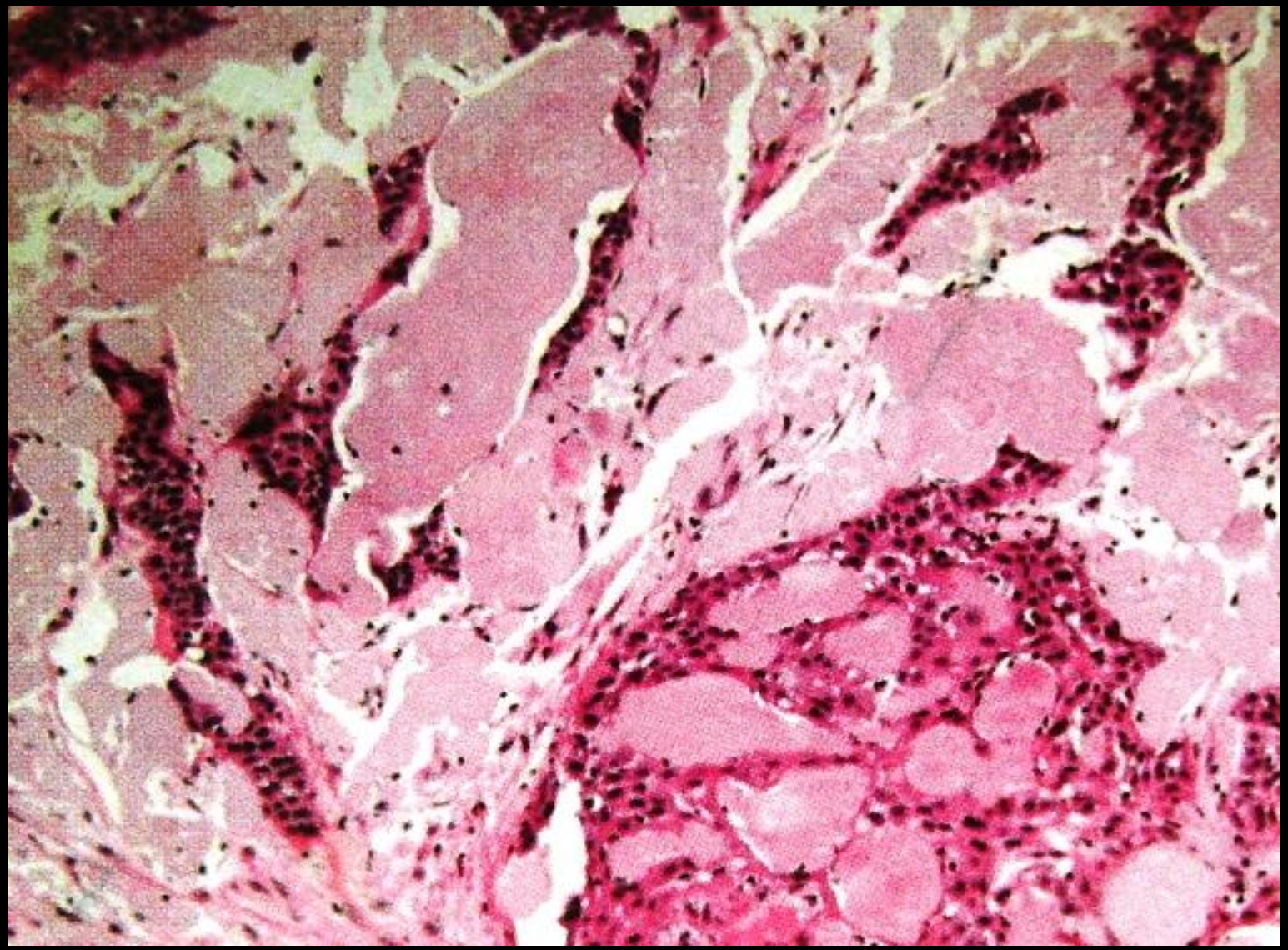




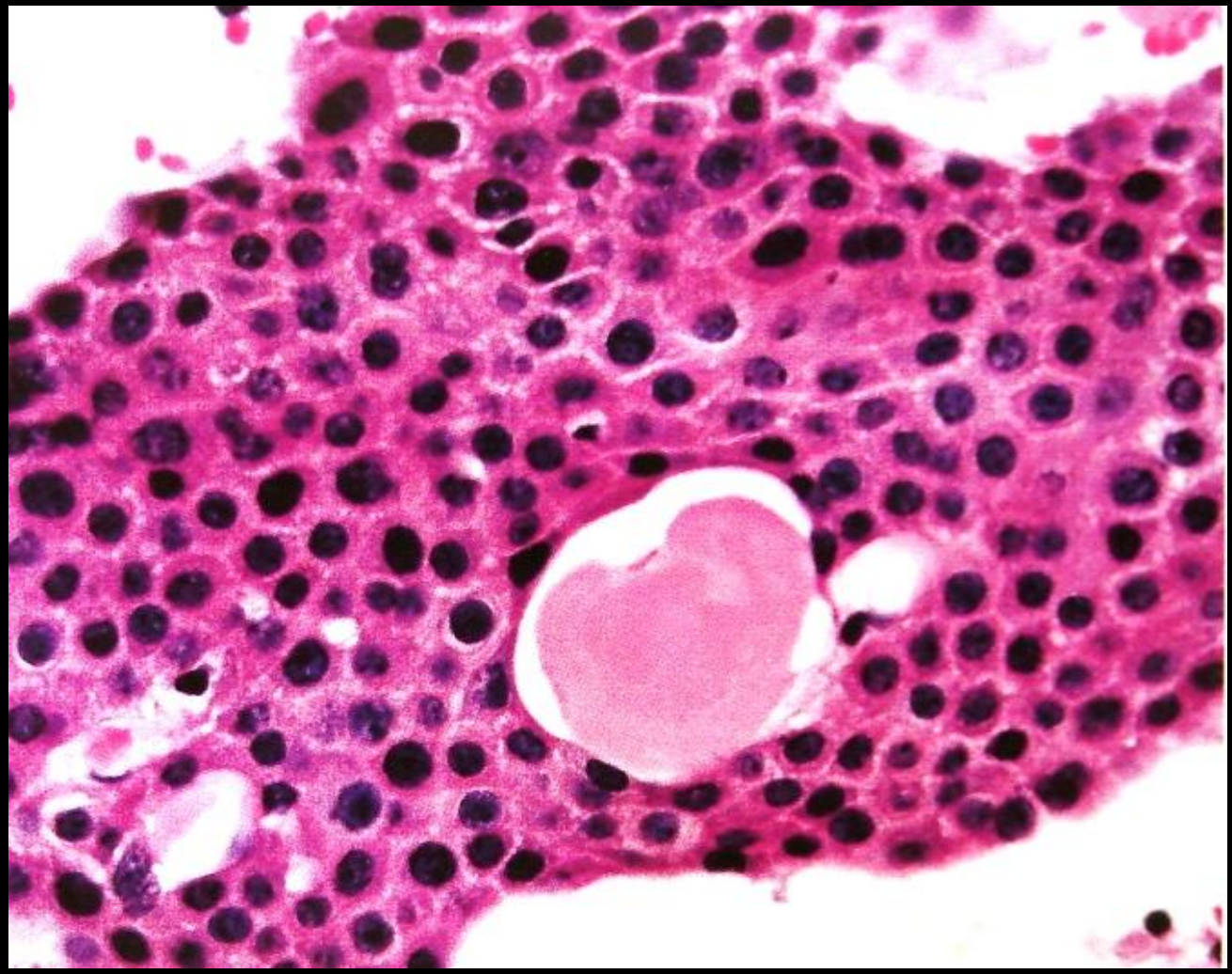
Histopathological features

- Proliferation of well defined squamous odontogenic epithelium in form of sheets, islands, cords and strands

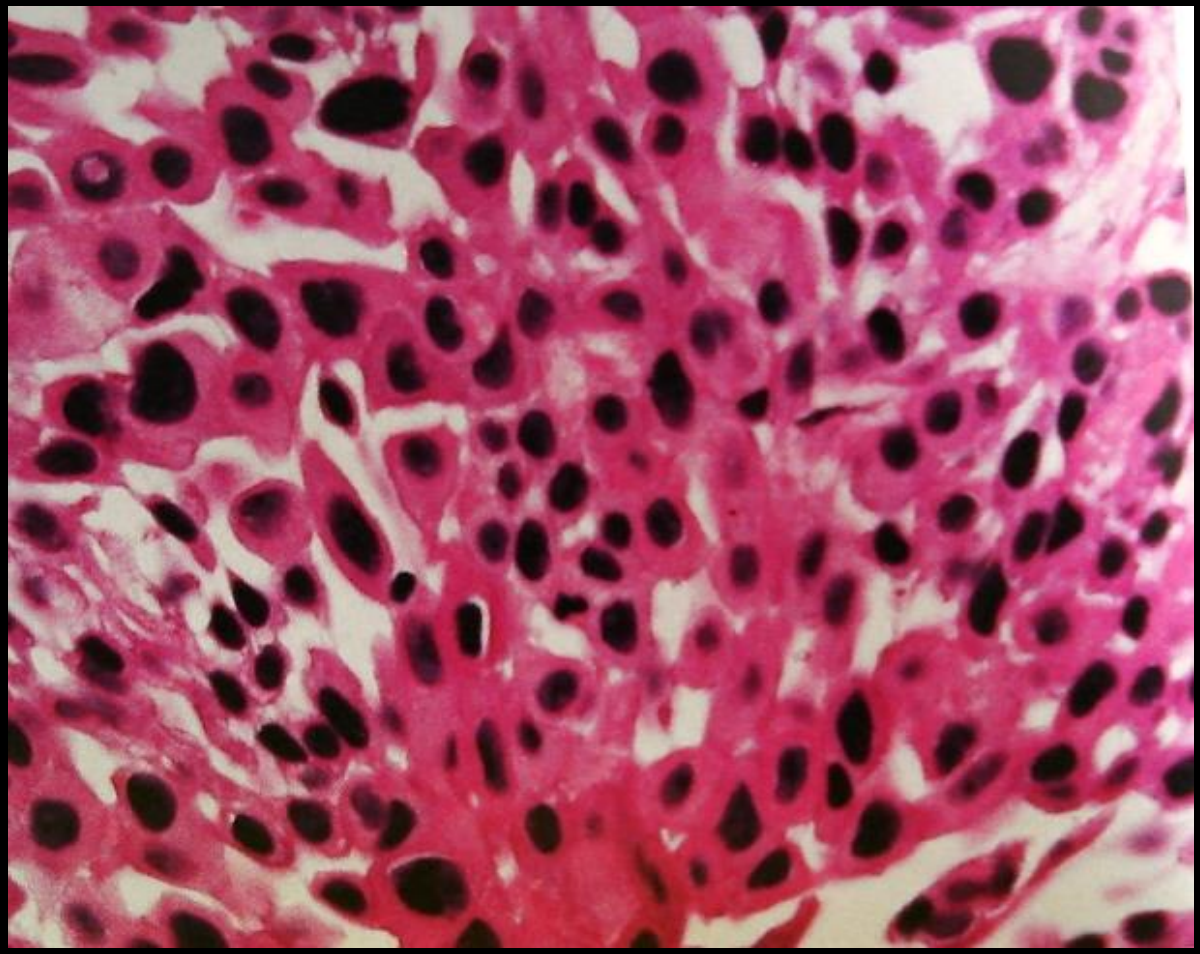
- Well defined individual cell morphology and intercellular bridges



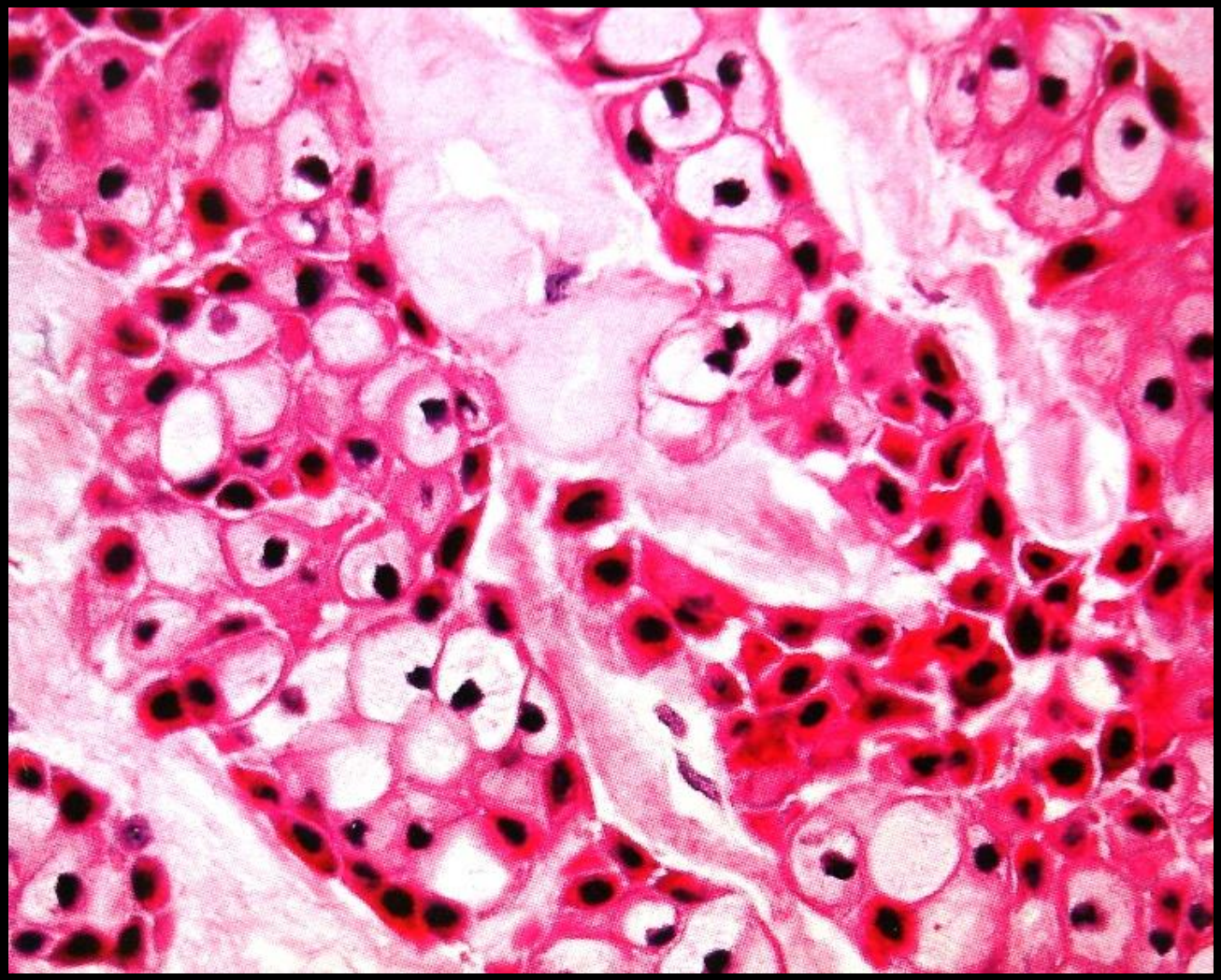
- Cell shape
  - Polygonal to round to oval
  - May be highly irregular and pleomorphic
- Cell size
  - Normal squamous cells similar to oral mucosa cells
  - Much larger irregular cells as seen in epithelial dysplasia
- Cytoplasm
  - Richly eosinophilic
  - Occasional glycogen rich clear cells
- Nuclear morphology
  - Highly variable
  - Single to multinucleated



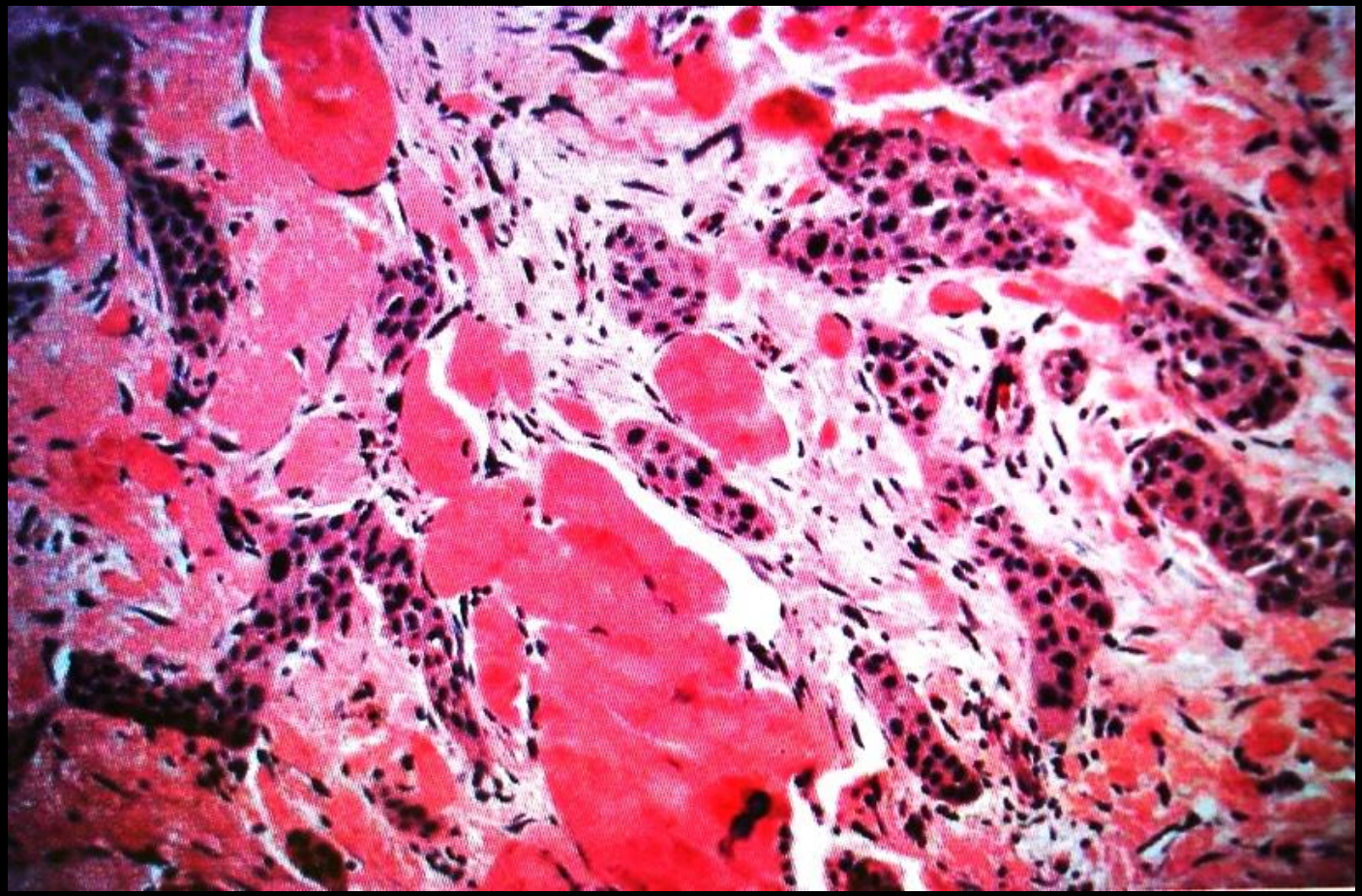
- Tumor cells with large centrally located hyperchromatic nuclei



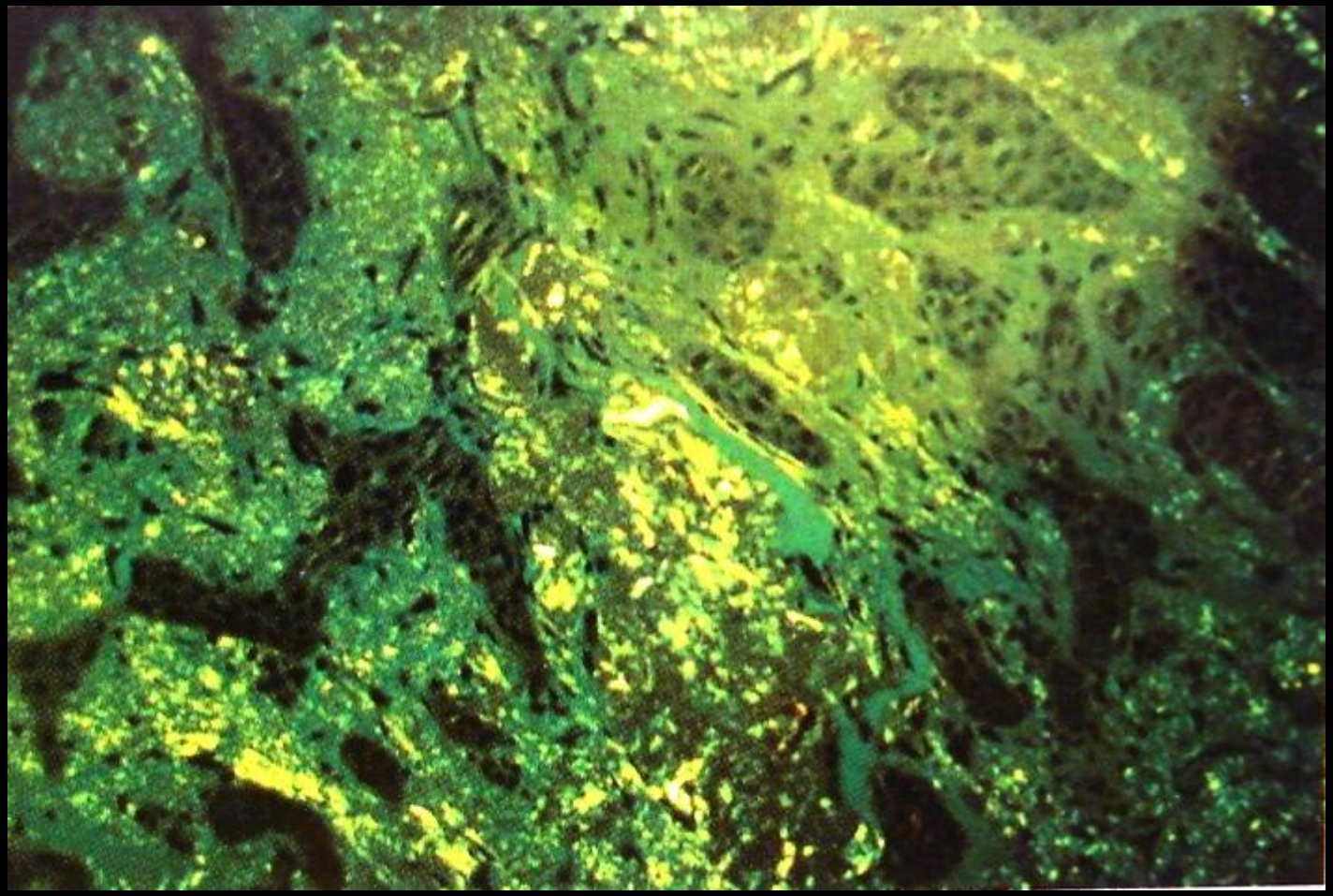
- Tumor cells with variability in nuclear size, shape and staining



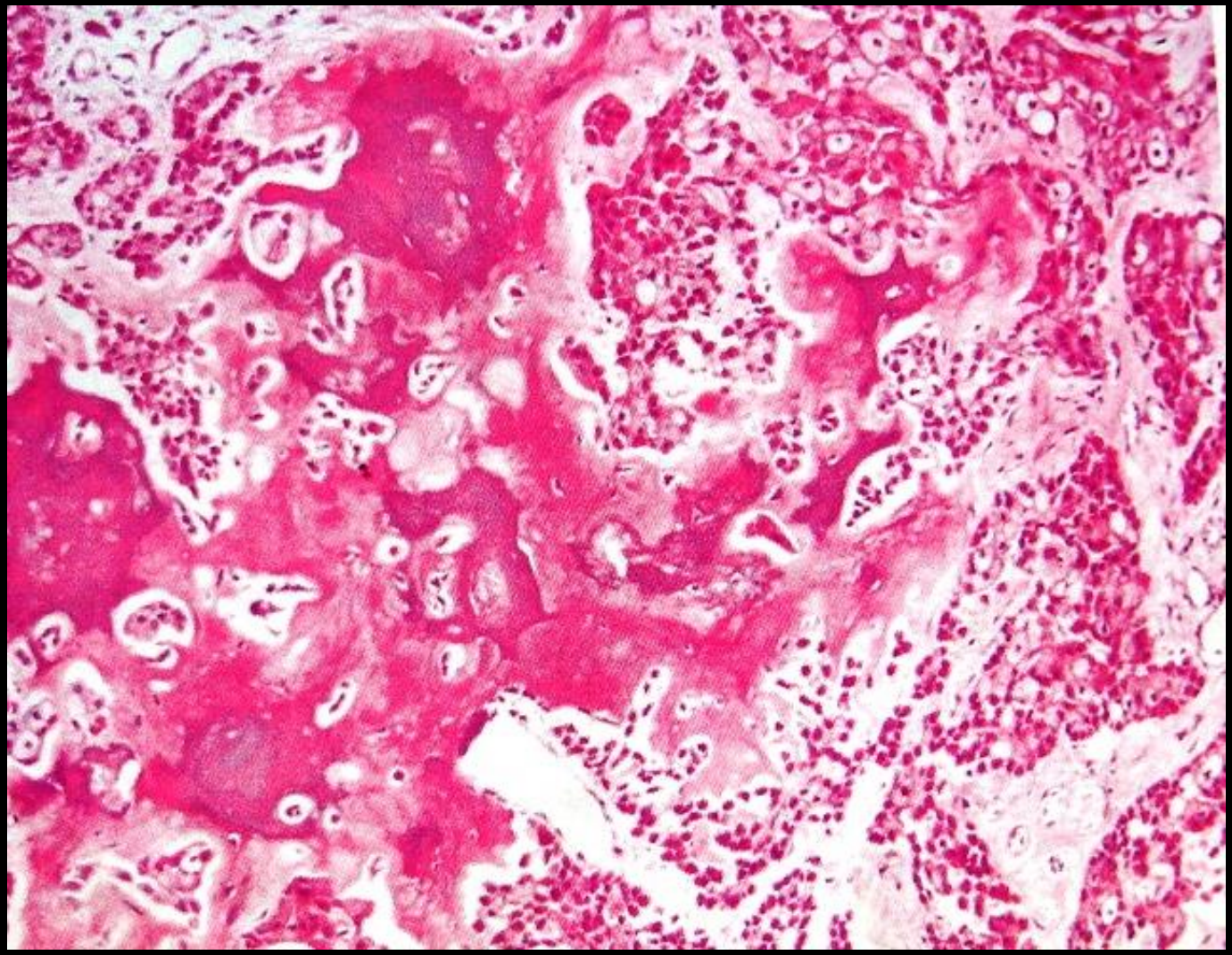
- Clear cell change



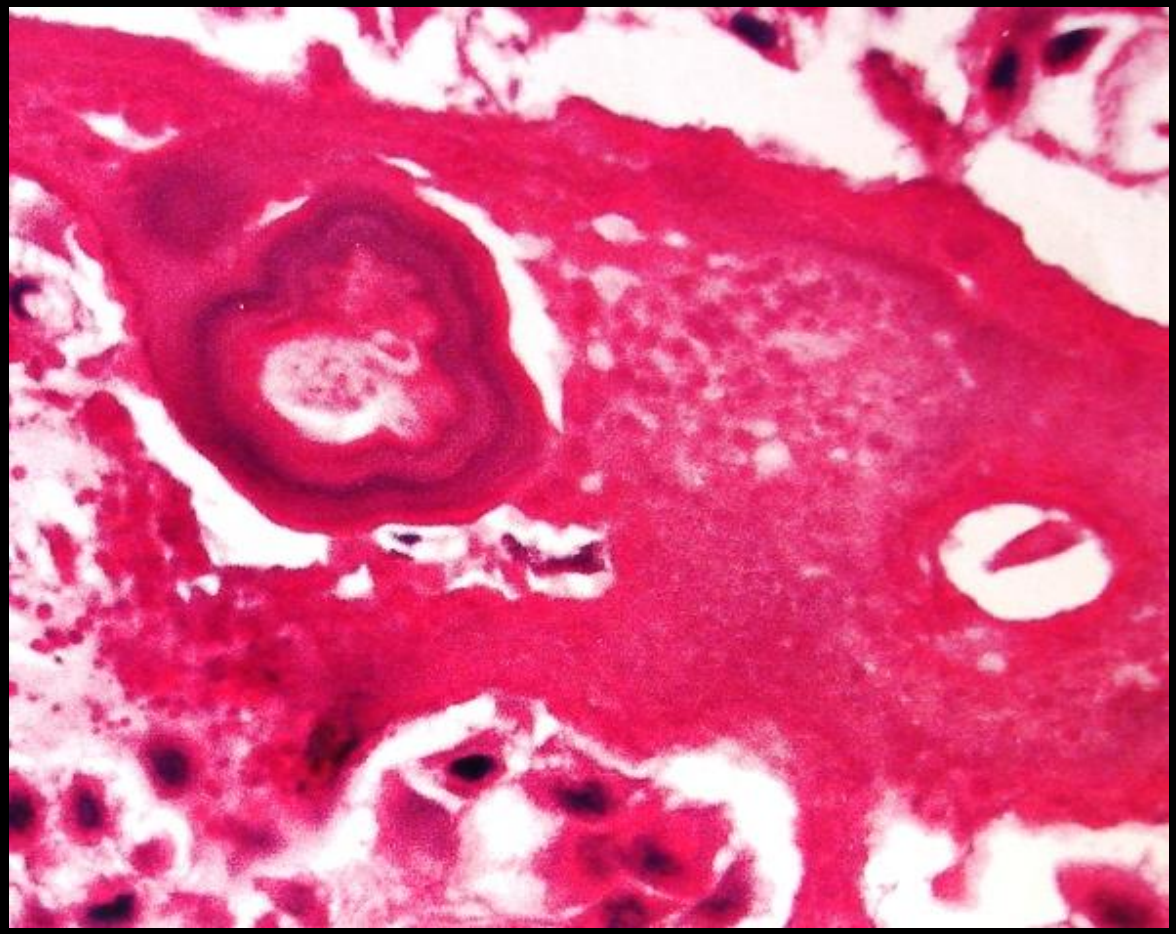
- Fibrous connective tissue stroma containing hyalinized deposits of congo red positive amyloid



- Apple green birefringence under polarized light



- Calcification of amyloid material



- Concentric layers of calcification within amyloid material → Liesegang rings

- Special stains for amyloid material
  - Congo red
    - Bright orange-red
    - Apple green birefringence in polarized light
  - Crystal violet
    - Metachromatic staining
  - Thioflavin T
    - Blue fluorescence

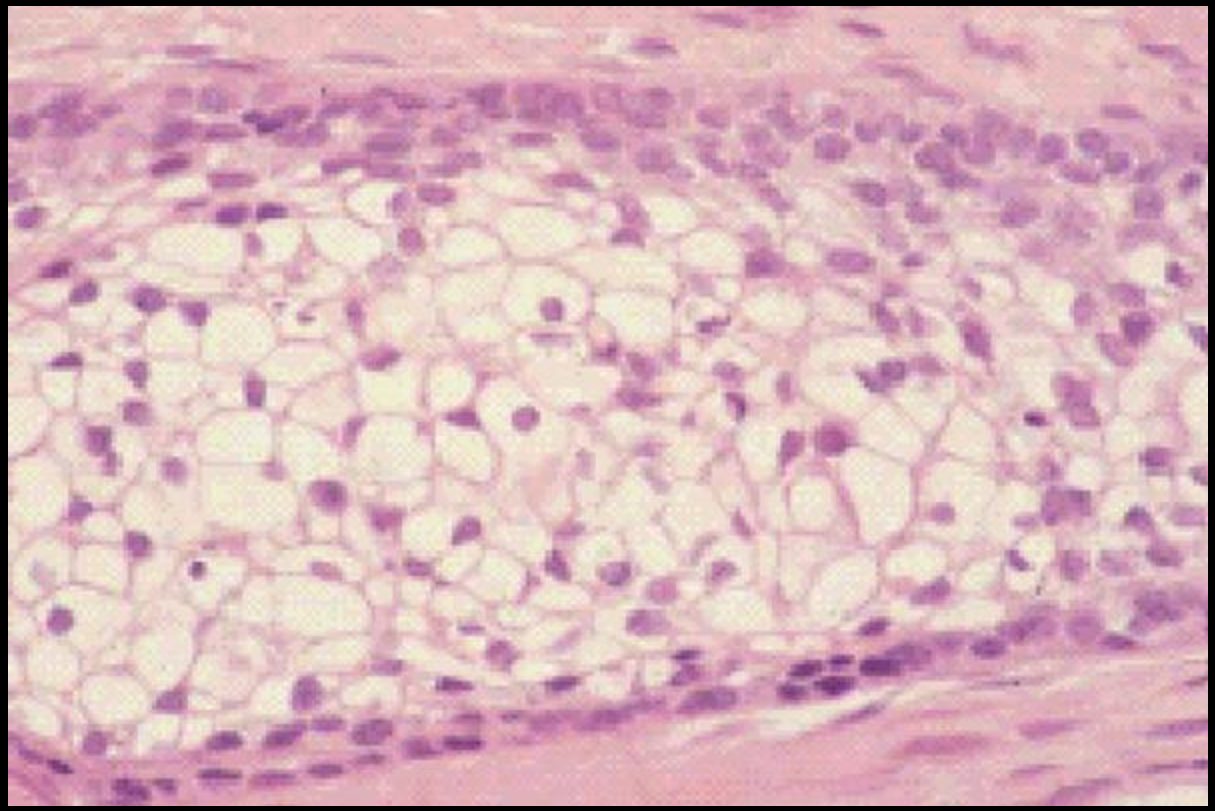
Clear cell odontogenic tumor/carcinoma

- Low grade carcinoma of odontogenic origin
- First described by Hansen et al as *clear cell odontogenic tumor with aggressive potential*
- Renamed as *clear cell odontogenic carcinoma*
- Also known as
  - Clear cell ameloblastic carcinoma
  - Clear cell ameloblastoma
- Extremely rare

- 90% cases arise in mandible
- Female predilection (70%)
- Wide age range
- Expansion of jaw with loosening of teeth and pain
- Ragged area of radiolucency

Histopathological features

- Poorly circumscribed
- Sheets or islands of cells with abundant clear cytoplasm
- Cells
  - Uniform in size
  - Central or eccentrically placed nuclei
  - Well defined cell membrane
  - Some nuclear pleomorphism
  - Mitosis not prominent
  - PAS positive granules may be present in some cells



Ameloblastic fibroma
and
Ameloblastic fibro-odontoma

- *“Neoplasms composed of proliferating odontogenic epithelium embedded in a cellular ectomesenchymal tissue that resembles the dental papilla, with varying degrees of inductive change and dental hard tissue formation”*

(WHO defn, 1992)

- Ameloblastic fibroma was first reported by Kruse in 1891

- Lesions with similar morphology with dental hard tissue formation
  - Ameloblastic fibrodentinoma
  - Ameloblastic fibro-odontoma

- Cahn and Blum, 1952
  - AF → AFO → Odontoma
  - Continuum representing different stages of evolution

Ameloblastic fibroma

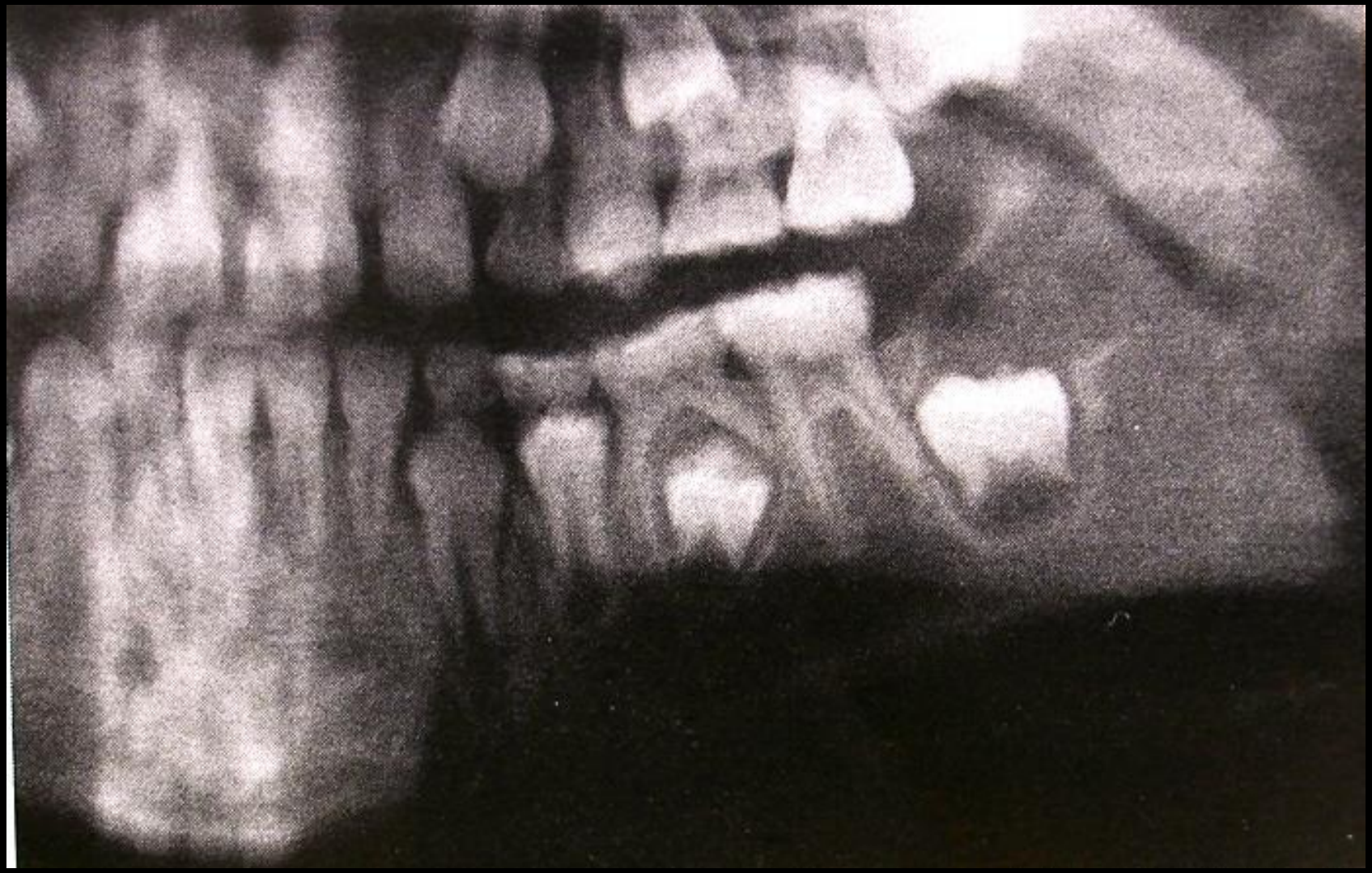
Clinical features

- Age
  - Children and young adults
  - Second decade
- Gender
  - No predilection
  - Slight male predilection
- Site
  - Posterior mandible
  - First molar-second premolar area → 80% cases

- Clinical presentation
  - Painless, slow growing, expanxile lesion
  - Pain
  - Tenderness
  - Mild swelling
  - 75% cases → associated with impacted tooth

Radiographic features

- Well defined, unilocular or multilocular radiolucency
- Smooth, well defined outline
- Sclerotic border
- 1-8 cm in size
- May mimic dentigerous cyst

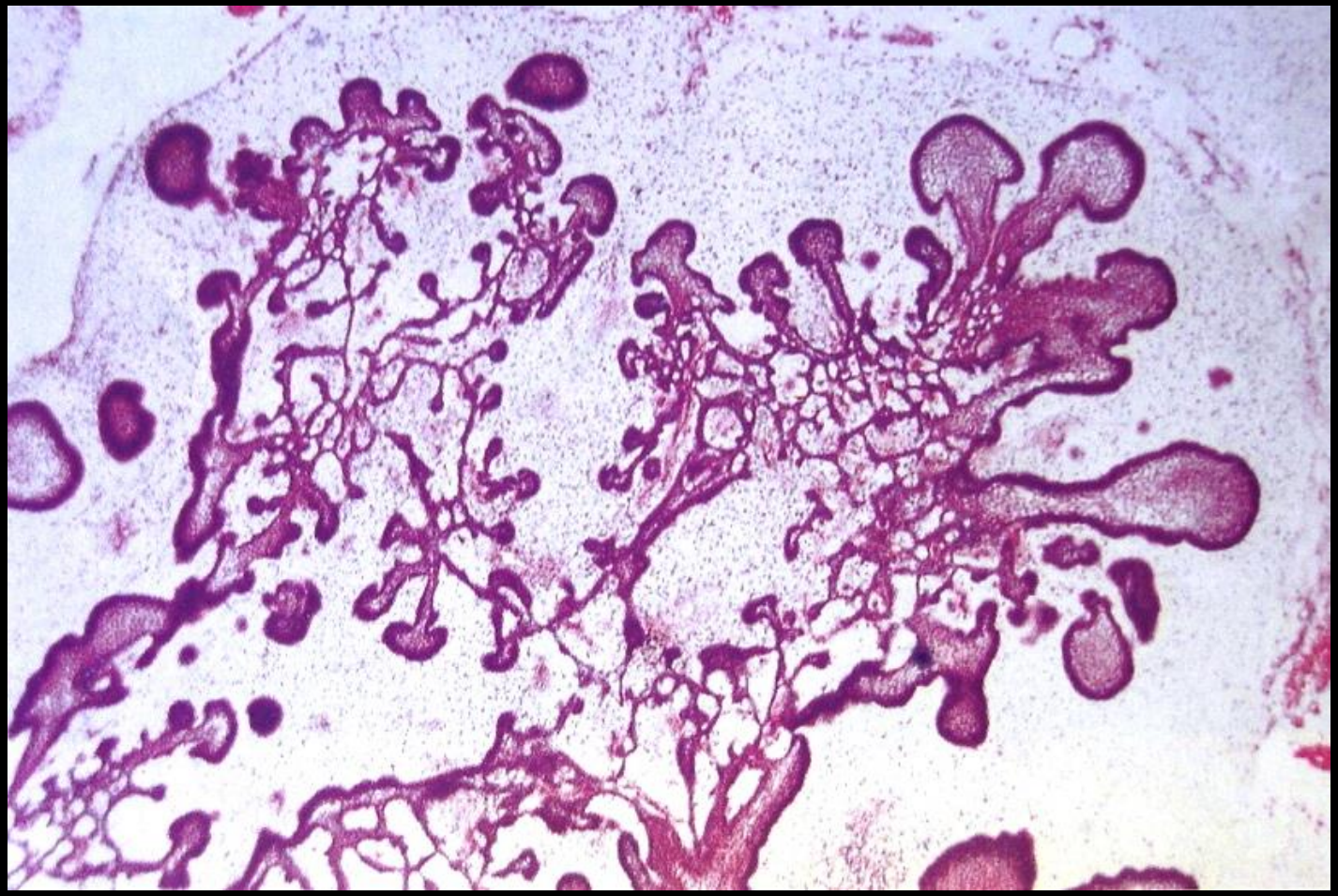


Histopathological features

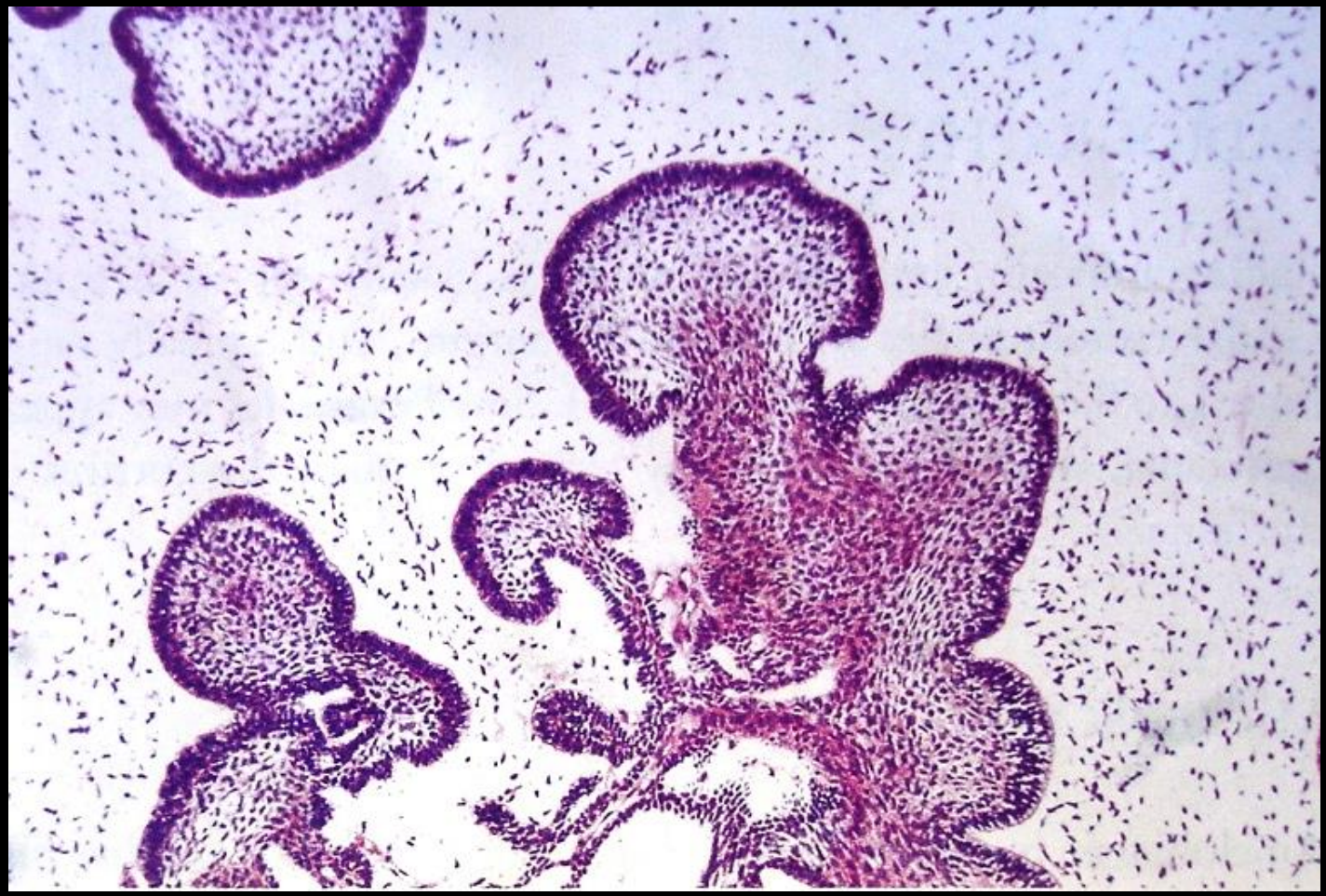
- Gross
  - Smooth surface and often exhibits a lobulated configuration
  - Well defined capsule may not be present

- Light microscopic features
  - **Epithelial component** characterized by proliferating islands, cords, and strands
  - Peripheral layer of cuboidal or columnar cells and central area resembling stellate reticulum
  - Mitosis is rare
  - Cystic degeneration usually not seen

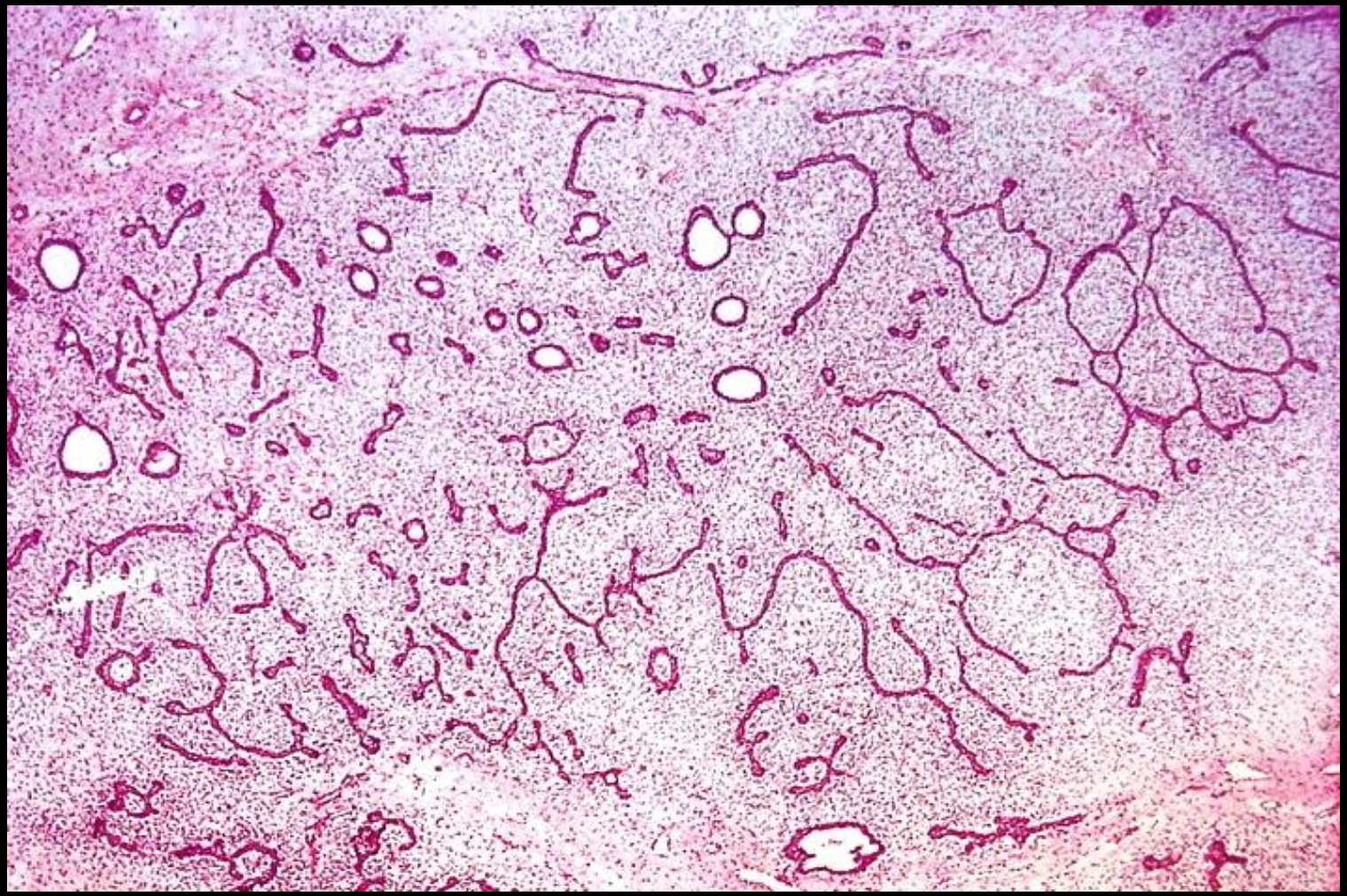
- **Ectomesenchymal component** → embryonic, cell-rich mesenchyme that mimics dental papilla
- Cells are round or angular and are fibroblast like
- Very little collagen
- Degree of cellularity varies within the same tumor and different tumors
- Cell free zone of hyalinization may be found around the epithelial-connective tissue interface



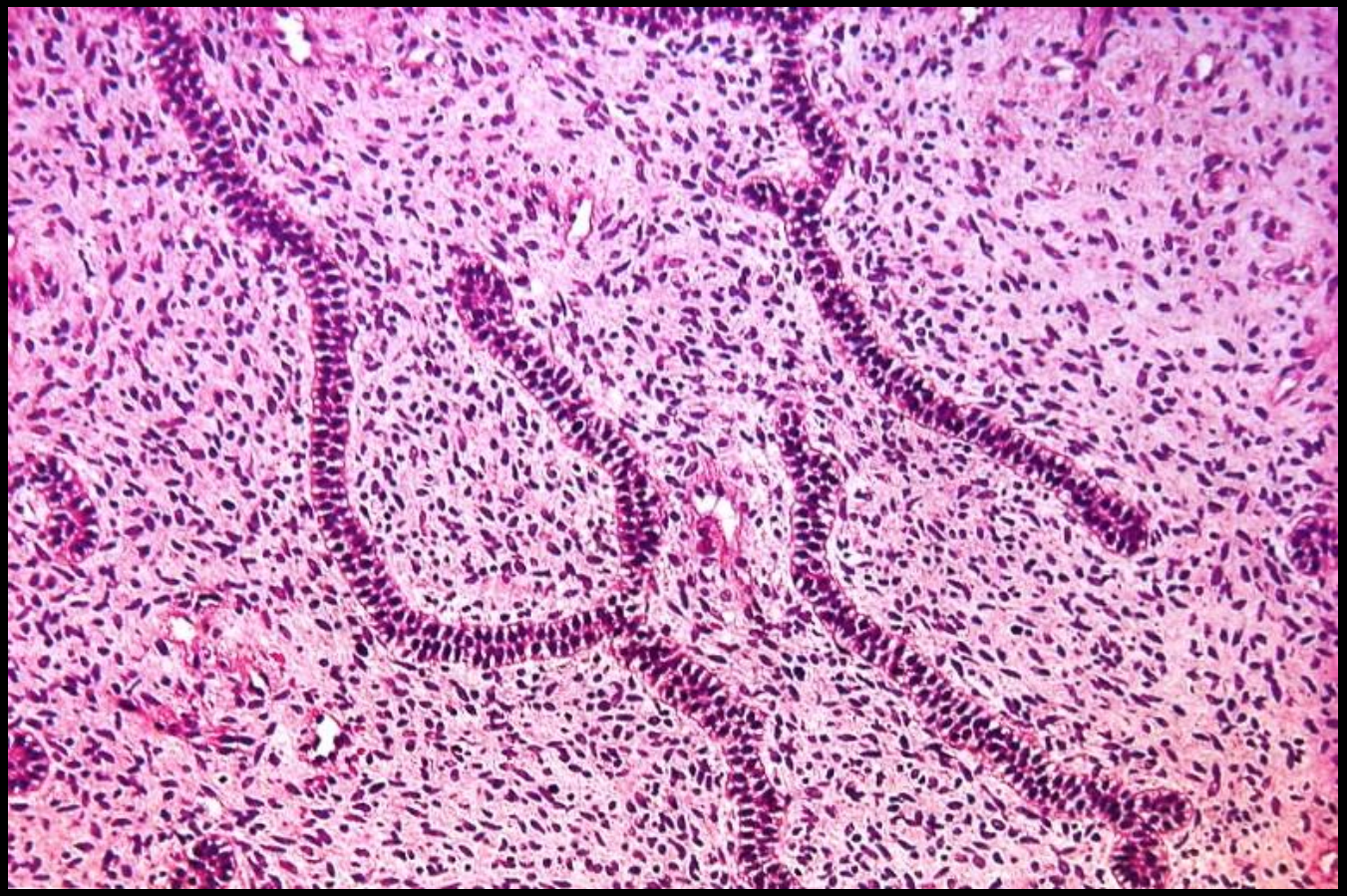
- Islands of odontogenic with peripheral ameloblast-like cells and ectomesenchymal stroma resembling dental papilla



- High power view showing central stellate reticulum like cells



- Slender strands of odontogenic epithelium lacking stellate reticulum like cells



- Higher power showing double layer of columnar cells and more cellular stroma

Ameloblastic fibro-odontoma

"A lesion similar to ameloblastic fibroma, but showing inductive changes that lead to formation of dentin and enamel

(WHO Defn)

- First delineated by Hooker, 1972

- 1-3% of all odontogenic tumors
  - 7% in age less than 16

Clinical features

- Age
  - First two decades of life (98%)
  - Average age → 9 years
- Gender
  - Slight male predilection
- Site
  - Posterior mandible
  - Posterior maxilla
  - Exclusively intraosseous

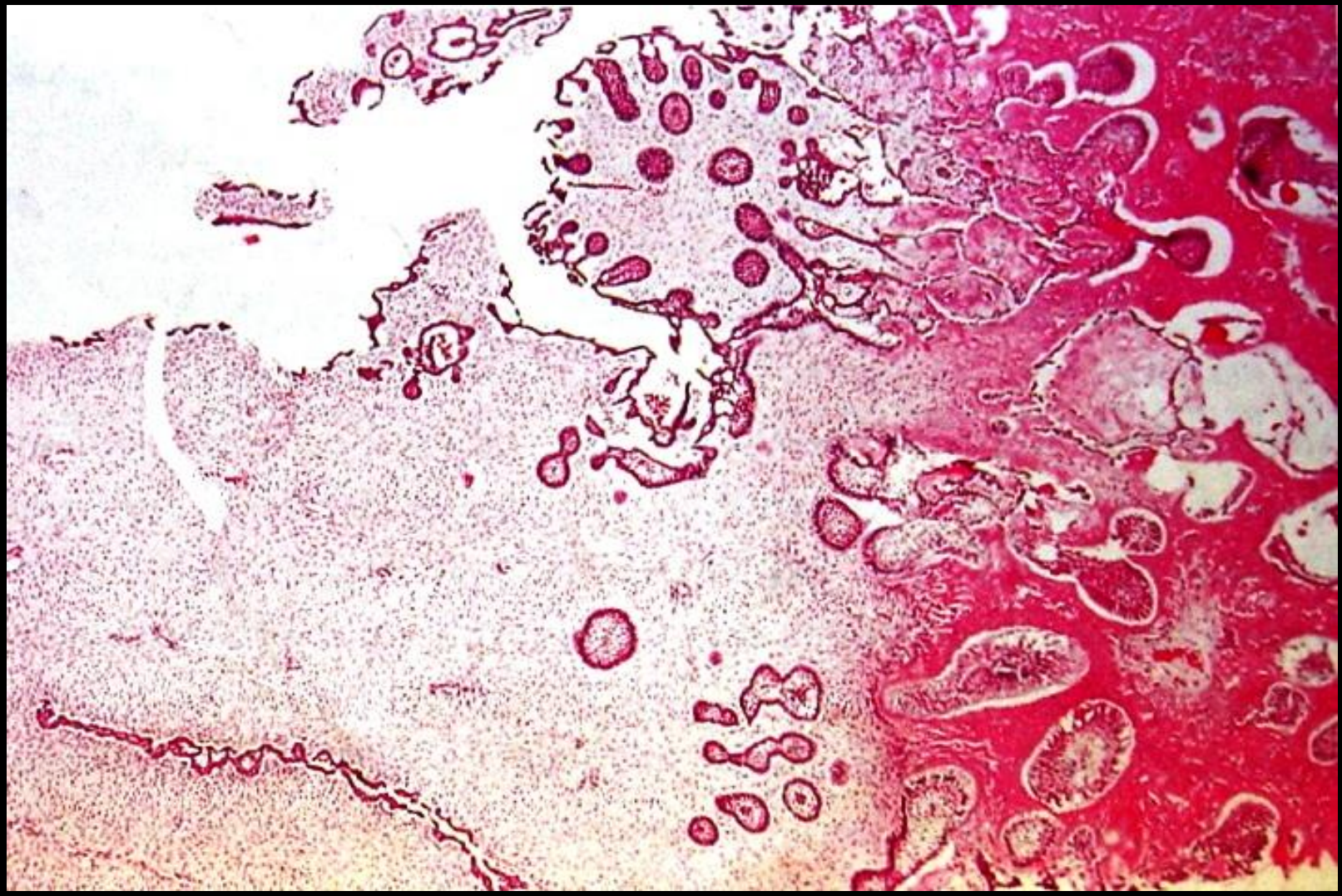
- Clinical presentation
  - Painless, slow-growing, expansile
  - Swelling
  - Failure of tooth eruption
  - Most AFOs associated with unerupted tooth

Radiographic features

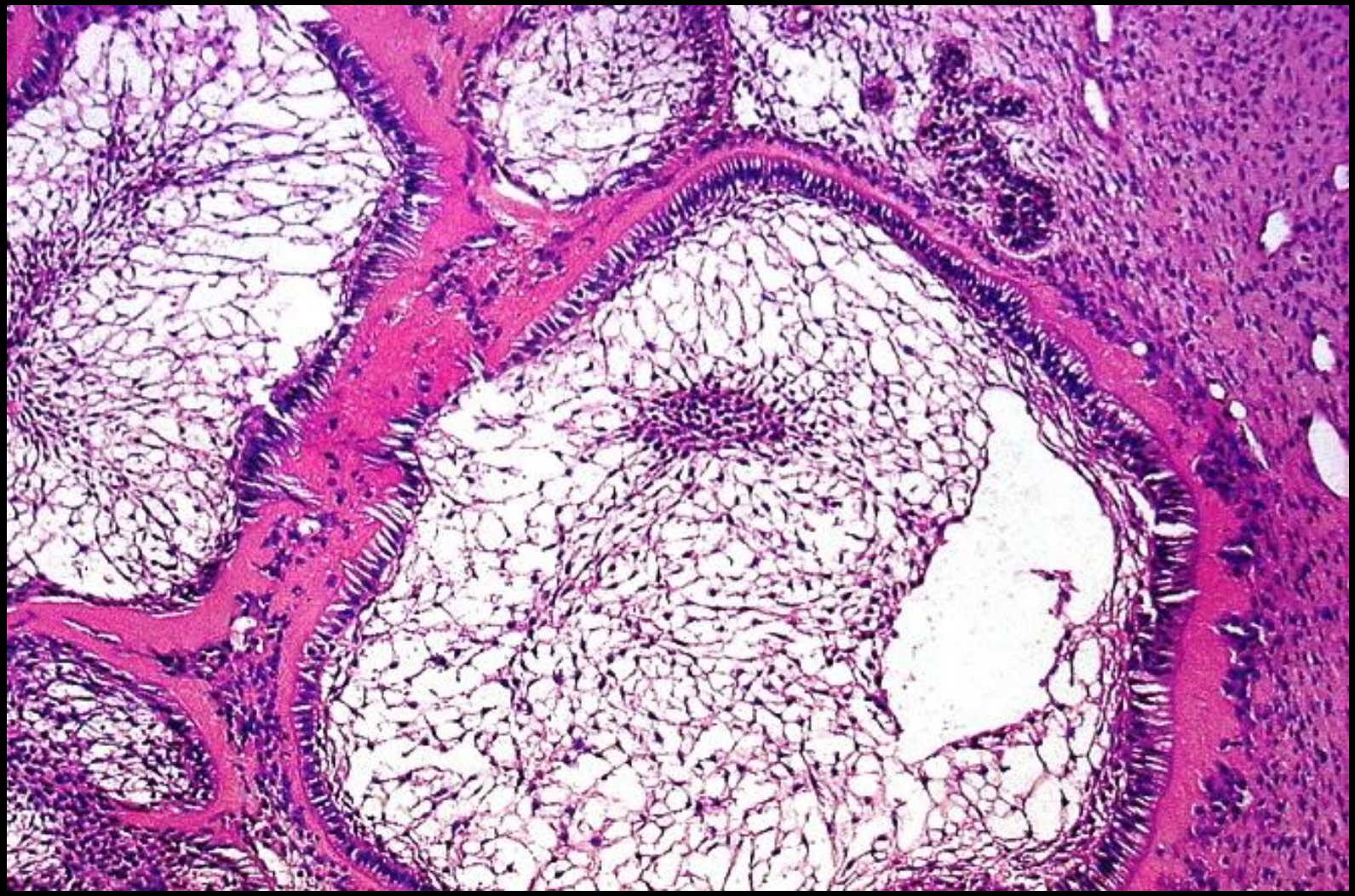
- Well circumscribed, expansile radiolucency
- Solitary or multiple, small radiopaque foci
- Most lesions 1-2 cm in size

Histopathological features

- Strands, cords and islands of odontogenic epithelium
- Cell-rich, dental papilla like ectomesenchymal stroma
- Varying amounts of dentin-like material and osteodentin
- Occasionally enamel matrix



- Typical ameloblastic fibroma like area merging with odontoma like area



- Induction of thin layer of atubular dentin in the stroma by the ameloblast like cells

Ameloblastic fibrosarcoma

- Malignant counterpart of ameloblastic fibroma
- May arise de novo or malignant transformation of ameloblastic fibroma

Clinical features

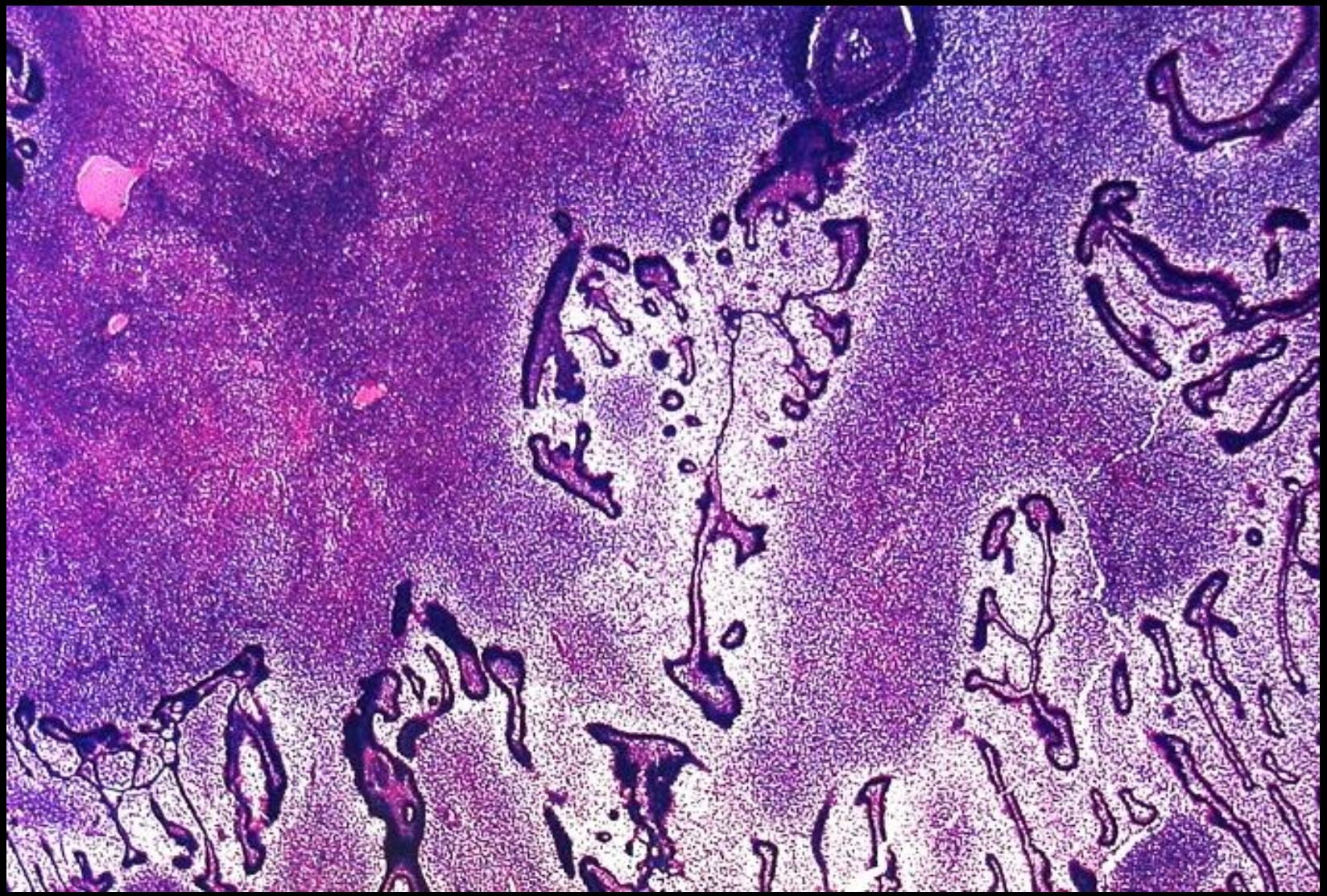
- Young patients
- Females (1.5:1)
- Mandible > maxilla
- Pain, swelling
- Rapid growth
- Destruction of bone and loosening of teeth
- Ulceration and bleeding

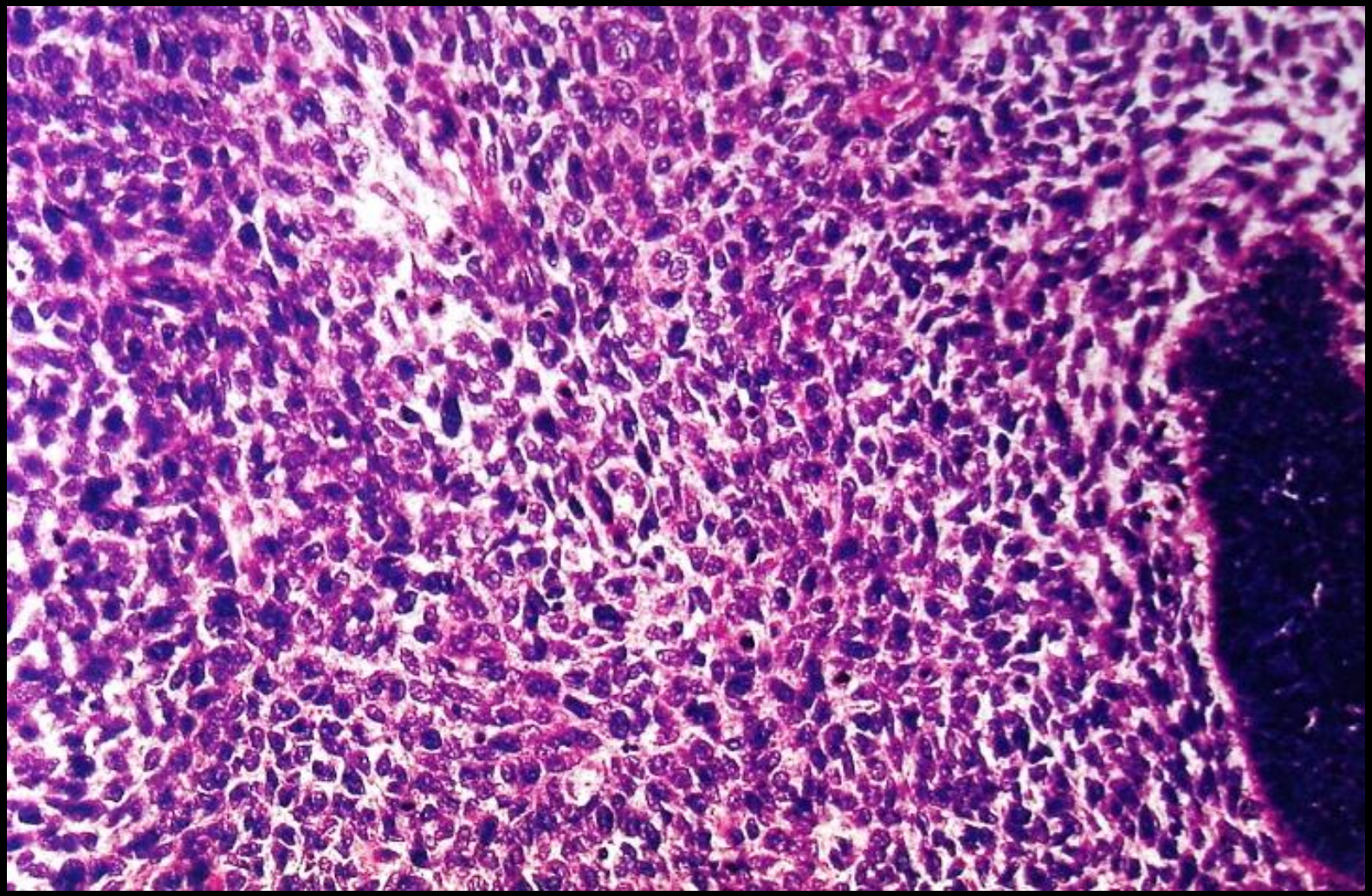
Radiographic features

- Unilocular or multilocular radiolucency
- Severe bone destruction
- Poorly defined margins

Histopathological features

- No apparent change in odontogenic epithelium
  - Less prominent
- Mesenchymal component
  - Highly cellular
  - Hyperchromatism and pleomorphism
  - Mitosis is prominent
- Dysplastic dentin or small amounts of enamel may be formed





Odontoma

- Any tumor of odontogenic origin !!!
- First coined by Broca, 1866
  - Tumor formed by overgrowth of complete dental tissue
- Thoma and Goldman → tumors composed of well-differentiated tooth structure
- Hamartomatous malformation of dental tissues or true neoplasm ???

- Three types (WHO classification)
  - Complex odontoma
  - Compound odontoma
  - Odontoameloblastoma

- Complex odontoma
  - Malformation in which all of the dental tissues are represented, and individual tissues are well formed but occur in disorderly pattern

- Compound odontoma
  - Malformation in which all the dental tissues are represented in a more orderly pattern than in complex odontoma so that the lesion consists of many tooth like structures

- 0.5 % of all oral biopsies
- 40-60% of all odontogenic tumors
- Compound odontoma > complex odontoma

Etiology

- Unknown
- Local trauma and infection
- Inherited or due to genetic mutation

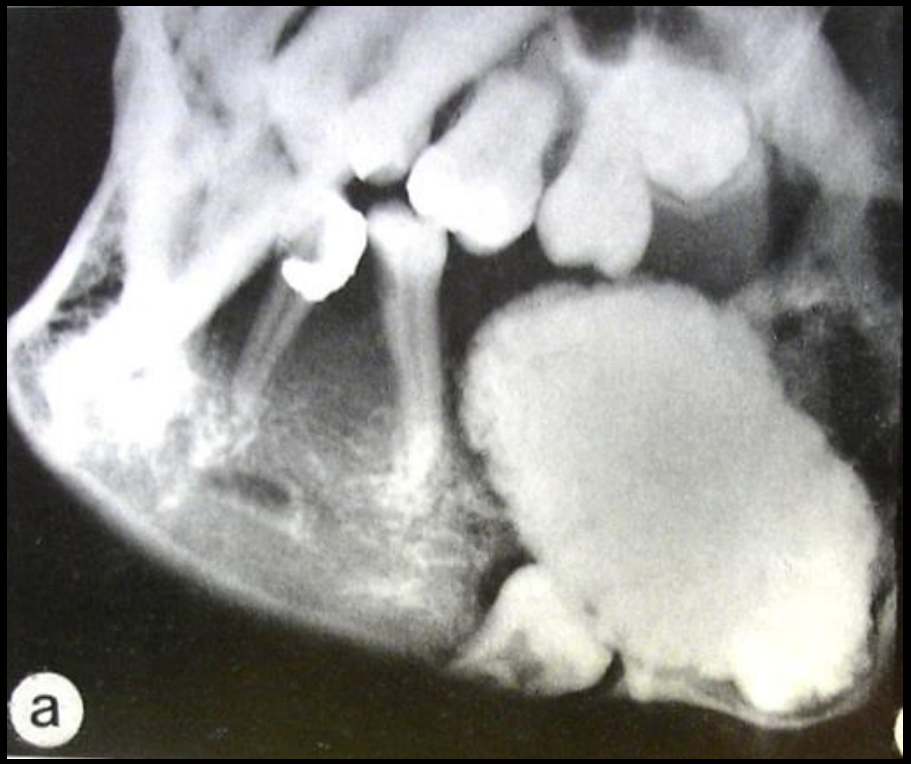
Clinical features

- Age
  - 2nd decade most common
  - Average age 19 years
- Gender
  - Equal frequency
- Site
  - Compound → anterior maxilla
  - Complex → posterior mandible > anterior maxilla
  - Deciduous
    - Rare
    - Incisor-canine area

- Clinical presentation
  - Hard, painless masses, usually small
  - Impacted permanent or retained deciduous tooth
  - Swelling
  - Complex odontoma → may become large → facial asymmetry

Radiographic features

- Densely radiopaque mass of varying size
- Usually associated with unerupted or impacted teeth
- Surrounded by a radiolucent line → cystic follicle
- Often encased by a rim of sclerotic bone
- Compound odontomas → collection of tooth like structures of various sizes
- Developing odontoma → radiolucent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Histopathological findings

- Gross
  - Outer surface is smooth and lobulated
  - Cut section is solid like osteoma
  - Striated appearance with radially arranged markings

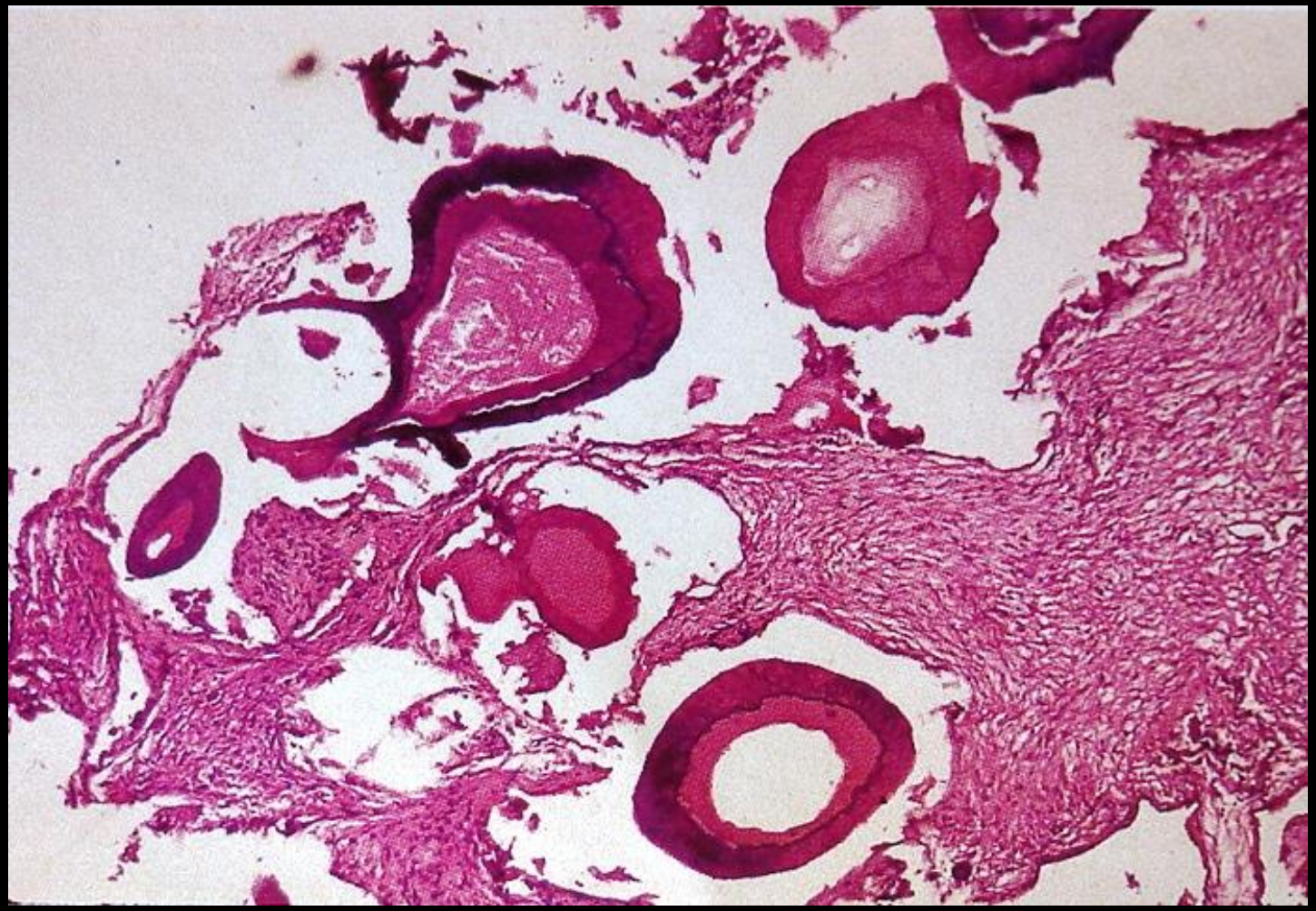
- Microscopic appearance
  - Fibrous capsule
  - Dentin and enamel matrix
  - Pulp tissue, enamel organ and cementum are also seen in most cases
  - Lesions in active phase may show ameloblastic epithelium

- Fully calcified enamel → empty spaces

- Enamel matrix
  - Faintly hematoxyphilic
  - Fibrillar or whorled appearance → enamel prisms
  - Cross section → fish scale or hexagonal pattern

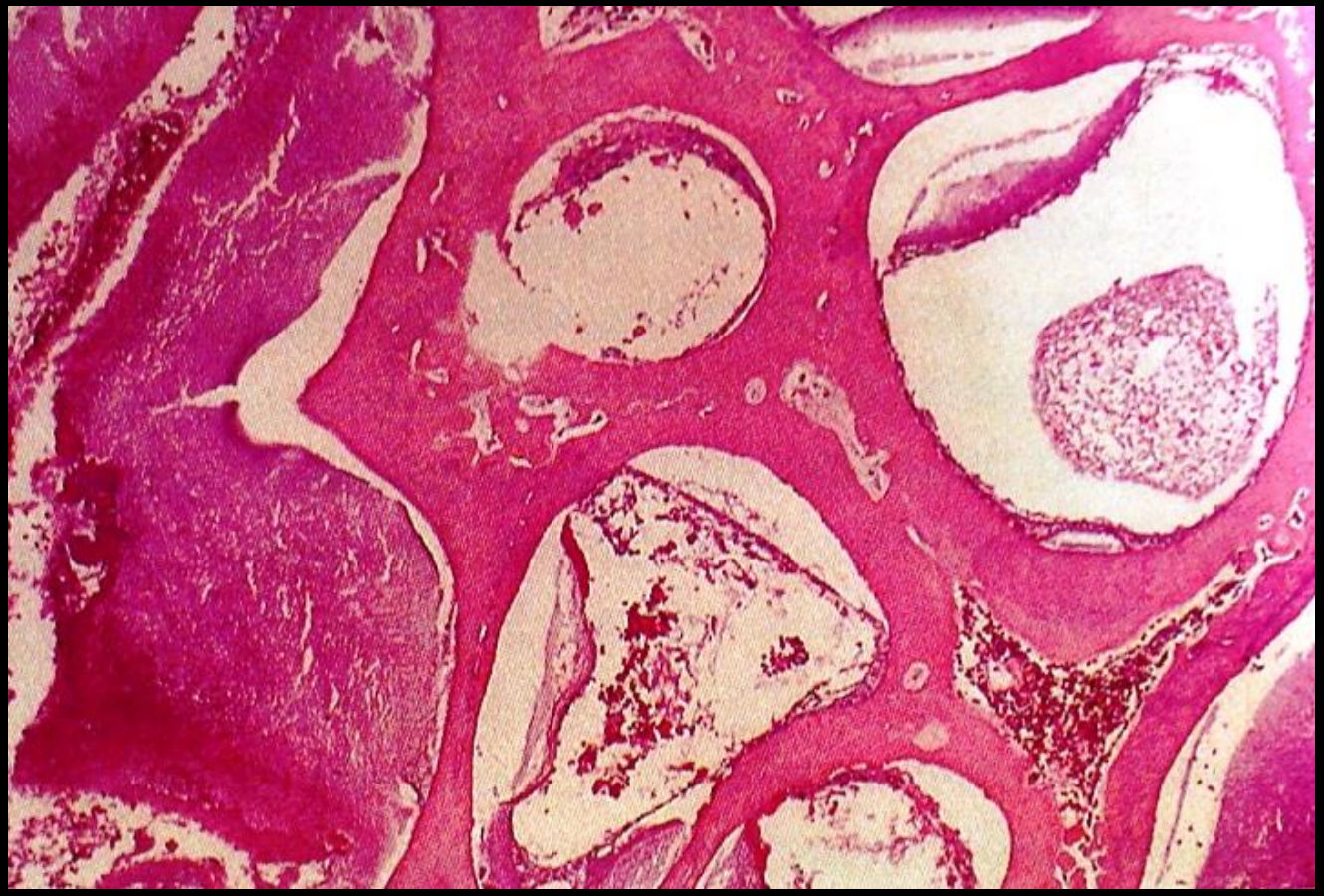
- Dentin is present in large quantities → forms the bulk of tumor

- Usually well formed with regular tubules

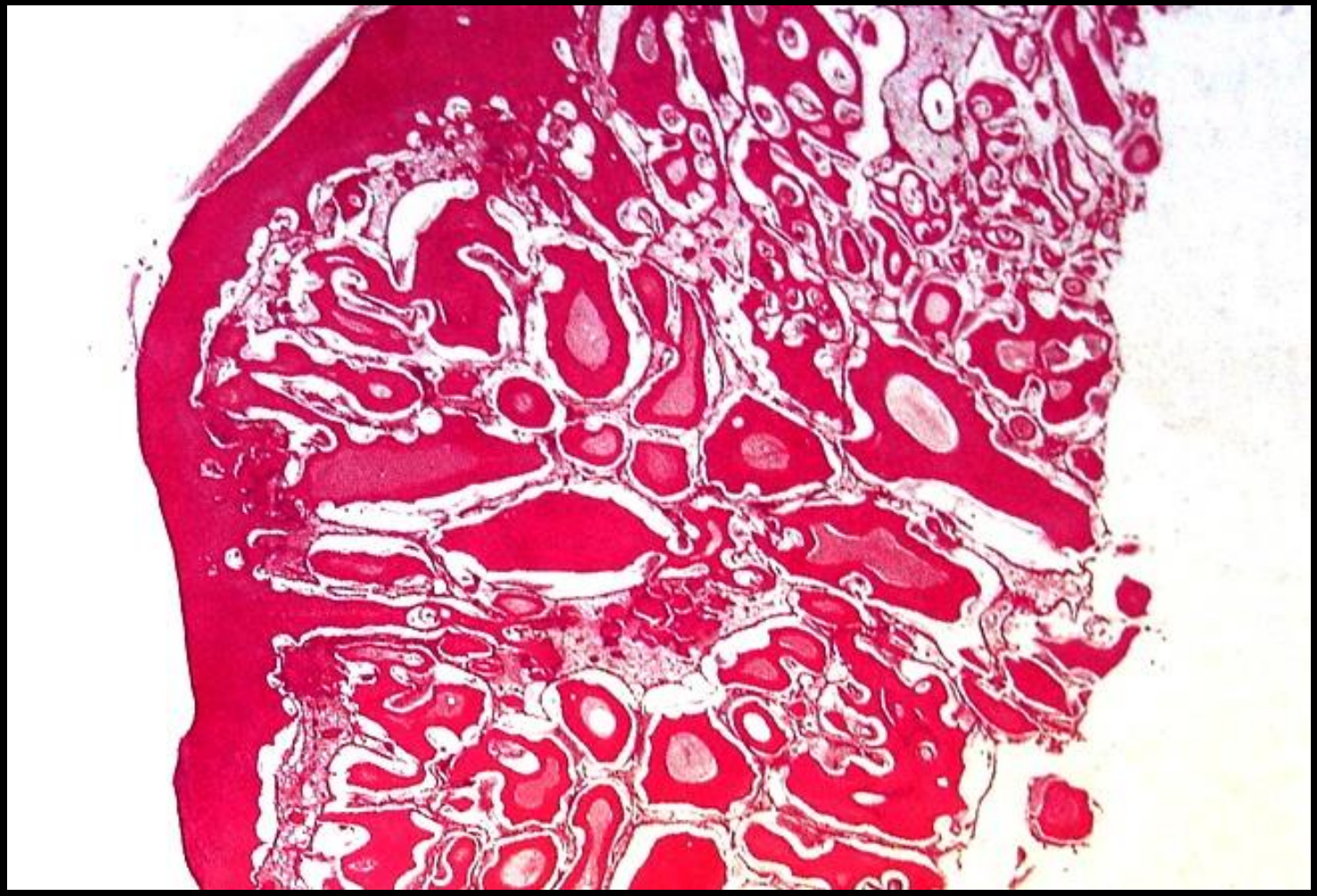


- Compound odontoma with tooth like structures composed of dentin and enamel matrix supported by dense fibrous connective tissue

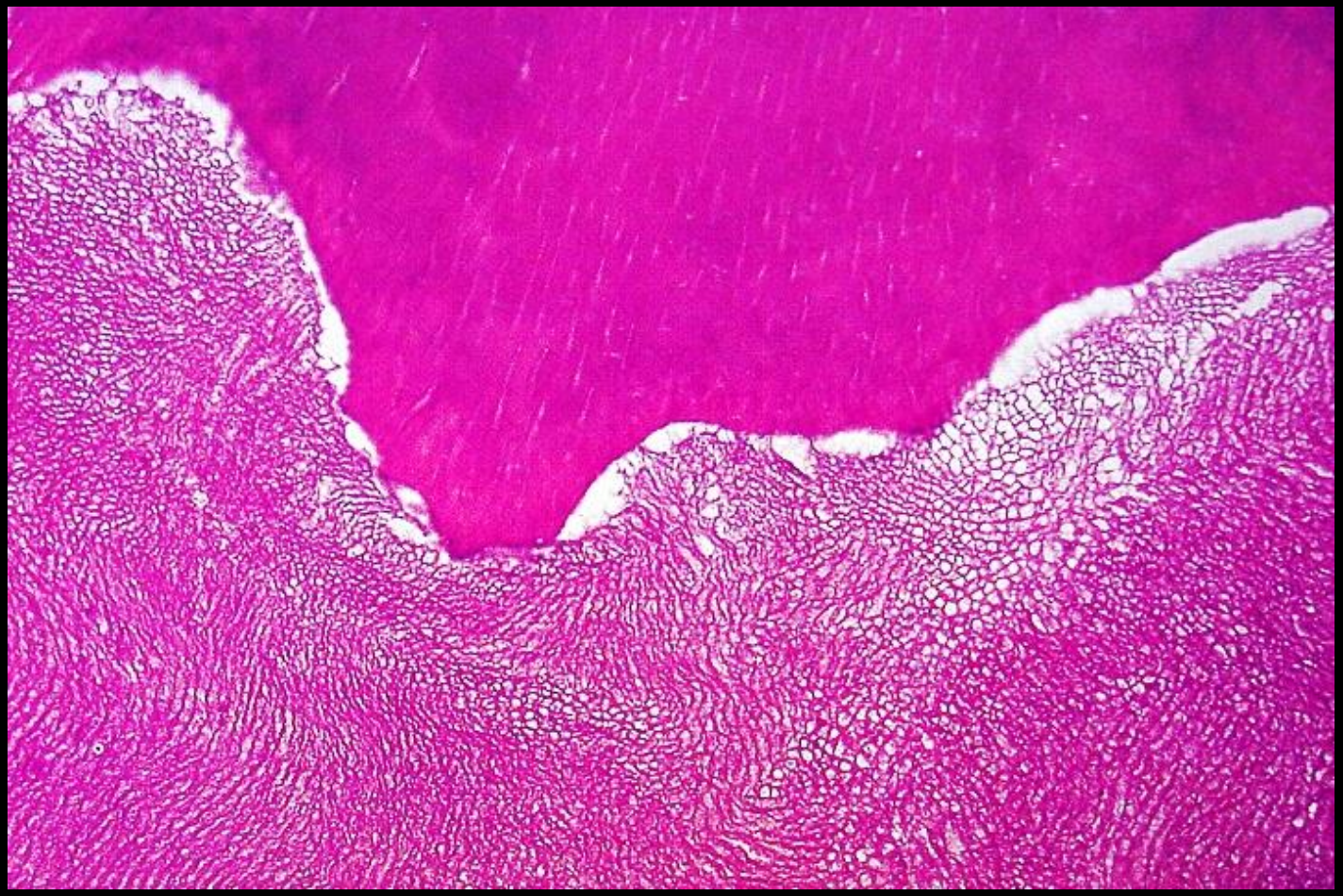
- Compound odontoma → cross section of multiple small tooth like structures



- Complex odontoma consisting of sheets of tubular dentin and enamel spaces



- Complex odontoma → totally irregular arrangement of dental tissues



- Odontoma showing tubular dentin and enamel matrix with prismatic structure

- Complex odontoma with ghost cells

Odontoameloblastoma

- Extremely rare odontogenic tumor
- Consists of simultaneous occurrence of ameloblastoma and composite odontome
- Relatively undifferentiated neoplastic tissue associated with a highly differentiated tissue

Clinical features

- Any age but more frequent in children
- Mandible > maxilla
- Slowly expanding lesion
- Produces considerable destruction of bone and facial asymmetry

Radiographic features

- Central destruction of bone with expansion of cortical plates
- Numerous small radiopaque masses
  - May or may not bear resemblance to teeth
- Single irregular mass of calcified tissue

Histopathological features

- Complex distribution of
  - Columnar, squamous and undifferentiated epithelial cells, ameloblasts, stellate reticulum like cells
  - Enamel, enamel matrix, dentin, osteodentin
  - Dental papilla like tissue, cementum, stromal connective tissue and bone

- Many structures resembling typical and atypical tooth germ

- Sheets of typical ameloblastoma
  - Follicular
  - Plexiform
  - Basal cell

Treatment and prognosis

- Controversial
- Radical resection
- Recurrence after curettage

Adenomatoid Odontogenic Tumor

Clinical features

- Age
  - Predilection for young patients
  - 69% cases in second decade
  - Pericoronal AOT → younger age

- Gender
  - Female to male ratio = 2:1
  - In patients above 30 years of age → female to male ratio = 1:2
  - Gingival lesions → female to male ratio = 14:1

- Site
  - Maxilla > mandible
  - Before age of 30 → max to mand = 2:1
  - After age of 30 → max to mand = 1:2

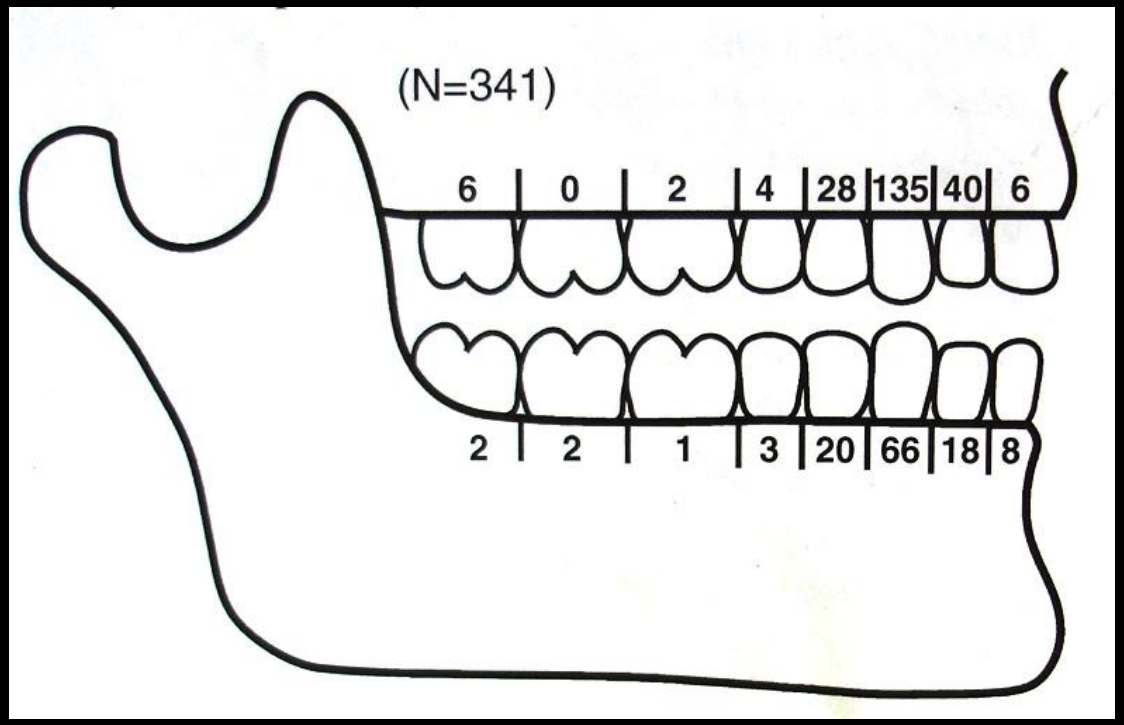
  - Peripheral lesions → max to mand = 10:1

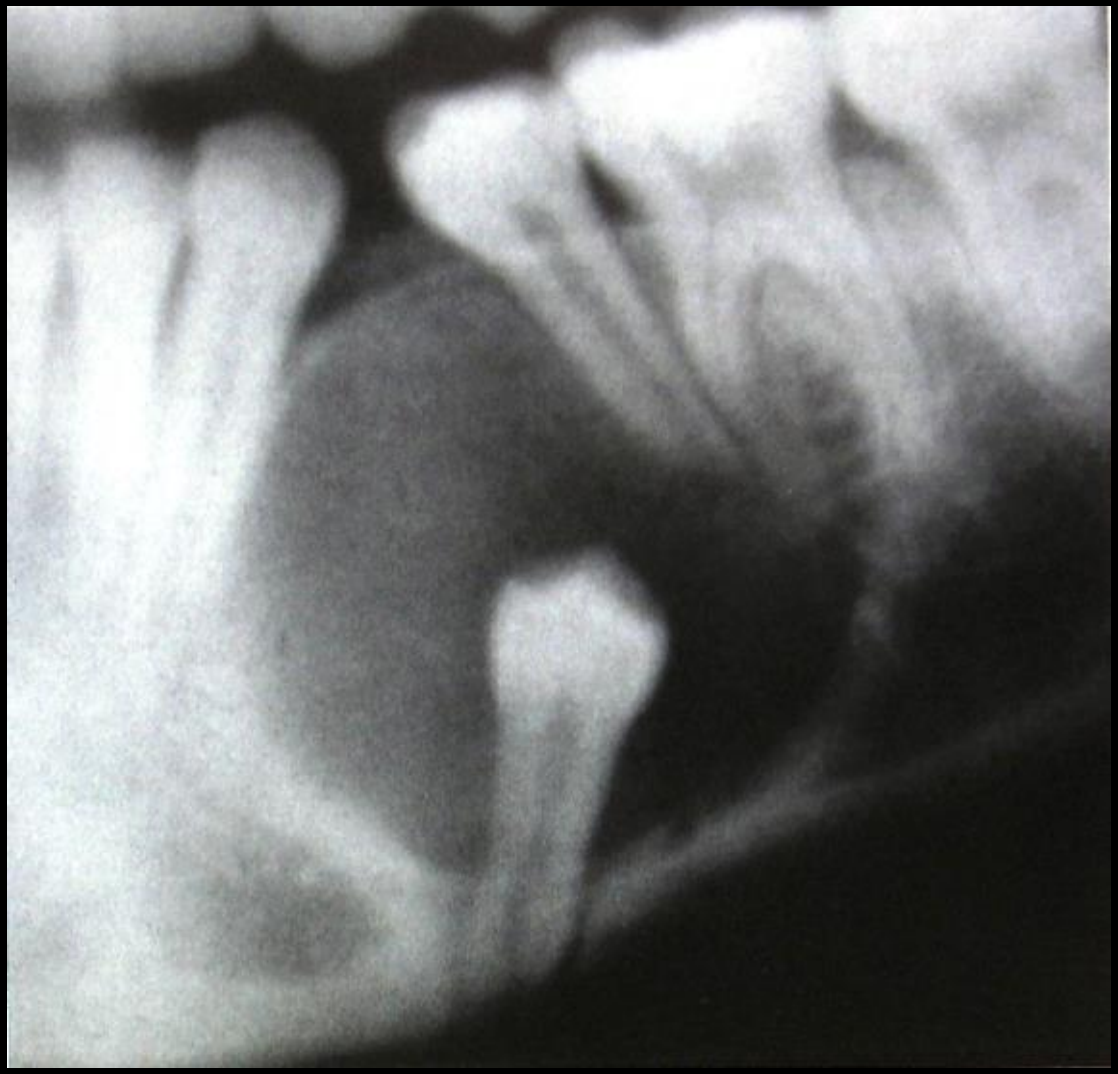
- Clinical presentation
  - Usually asymptomatic
    - Most lesions discovered on routine radiographic examination
  - Delayed eruption
  - Slow growing bony expansion
  - Infrequent presentations
    - Mobility of teeth
    - Facial asymmetry
    - Fracture of mandible
    - Nasal obstruction

Radiographic presentation

- Well demarcated, unilocular radiolucency
- Smooth corticated or sclerotic border
- Most cases are 1-3 cm in size
- Faint radiopaque foci (65%)
  - Better visualized in periapical view
- Displacement of teeth

- Pericoronal radiolucency (71%)





- Radiolucency does not “respect” the CEJ

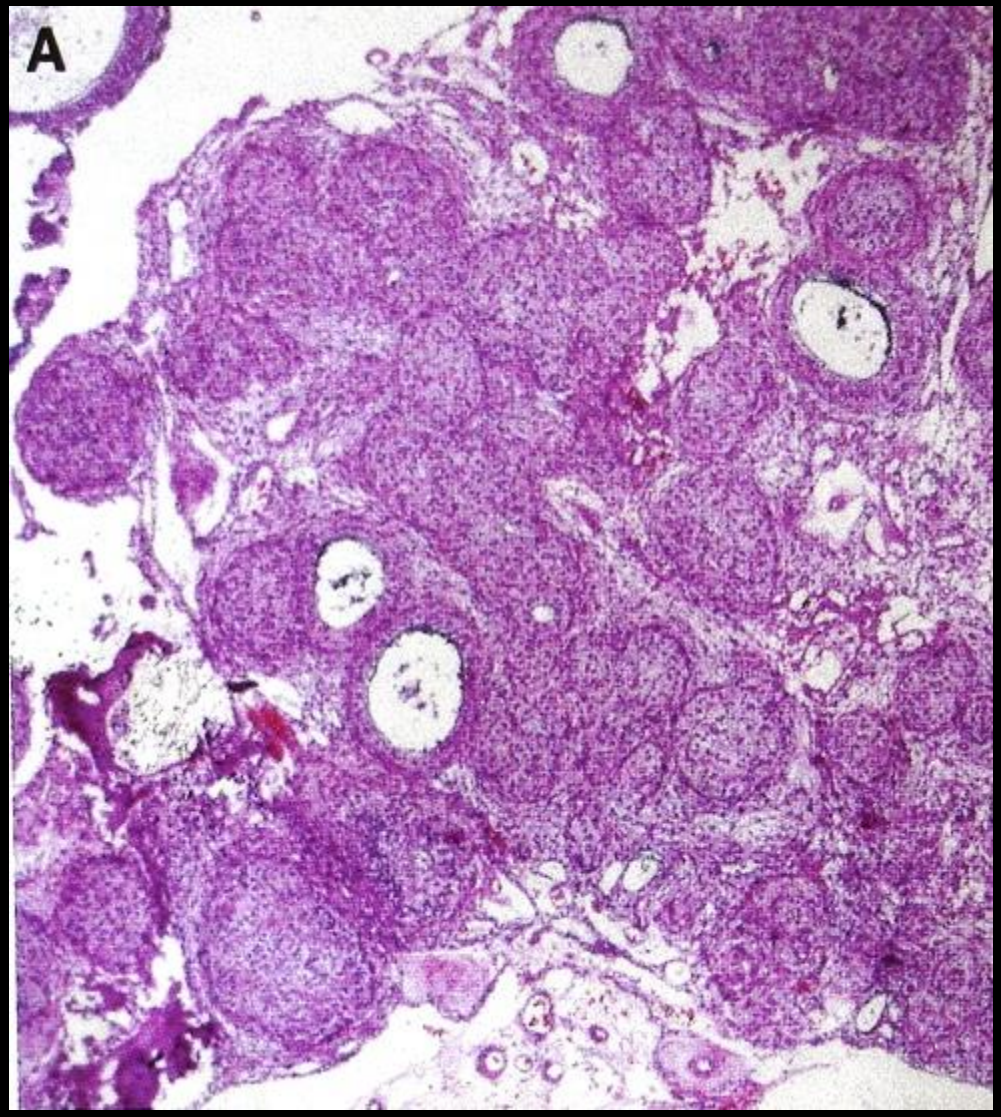
Histopathological features

- Gross
  - Soft, roughly spherical mass
  - Fibrous capsule
  - Cut surface
    - White to tan
    - Solid to crumbly
    - Cystic spaces of varying sizes
    - Minimal yellow brown fluid to semisolid material
    - Calcified masses

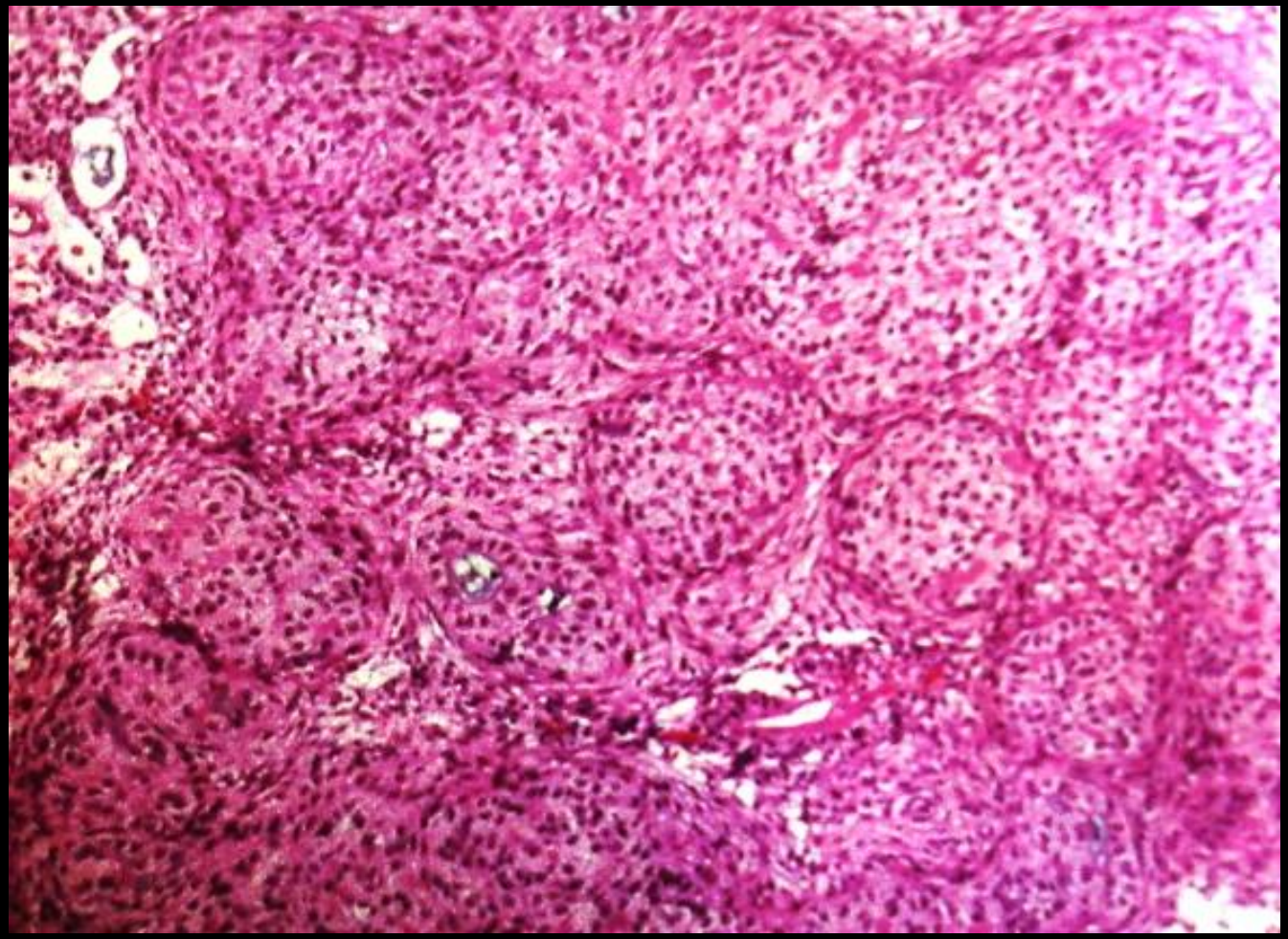
- Dentigerous specimens
  - Tooth embedded in solid tumor mass
  - Tooth projecting into a cystic cavity

- Light microscopic features
  - Cellular multinodular proliferation of spindle, cuboidal and columnar cells
  - Scattered duct like structures
  - Eosinophillic material
  - Calcifications in various forms
  - Loose, fibrovascular supporting stroma that may show considerable dialatation and congestion of vascular component
  - Fibrous capsule of variable thickness

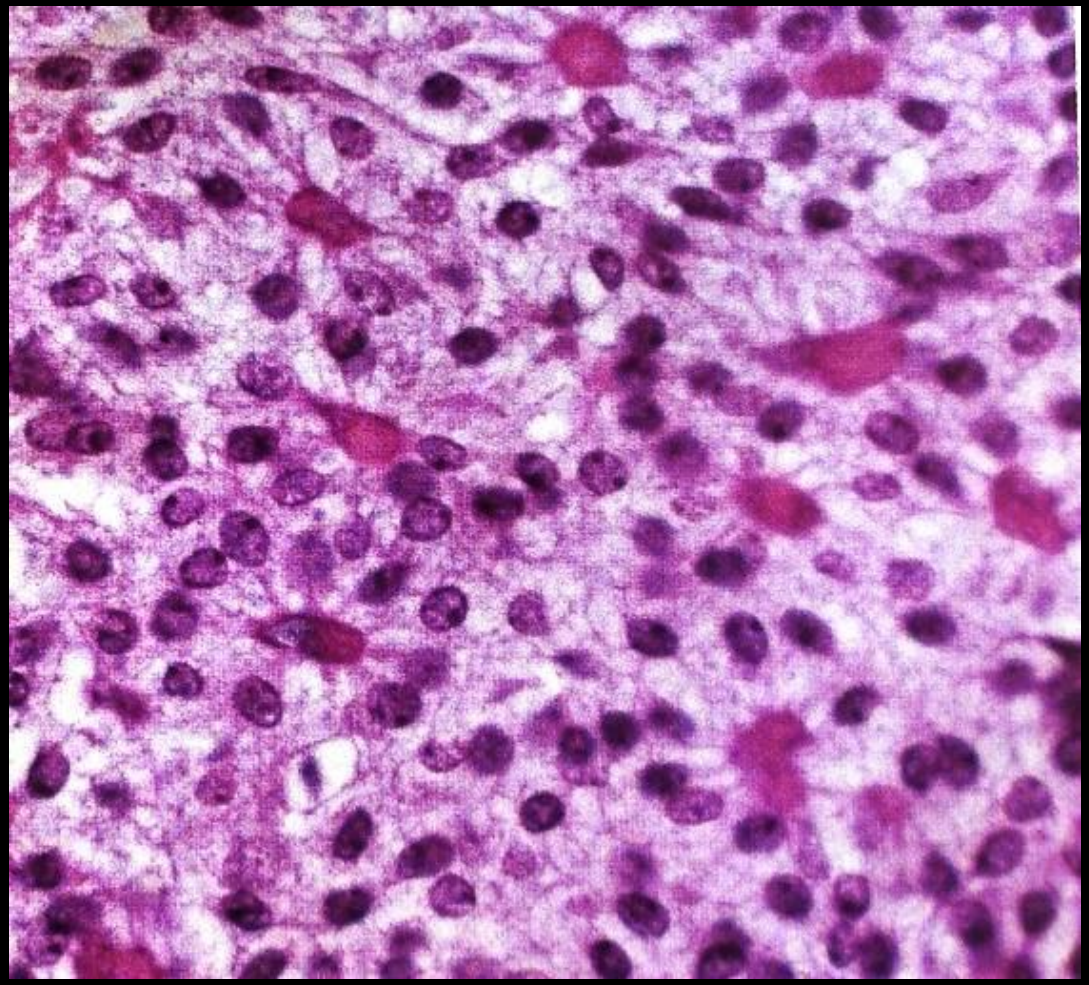
- Cell rich epithelial nodules
  - Variably sized, cell-rich nests or nodules
  - Composed of spindle to cuboidal to polygonal epithelial cells



- Characteristic cell rich nodules

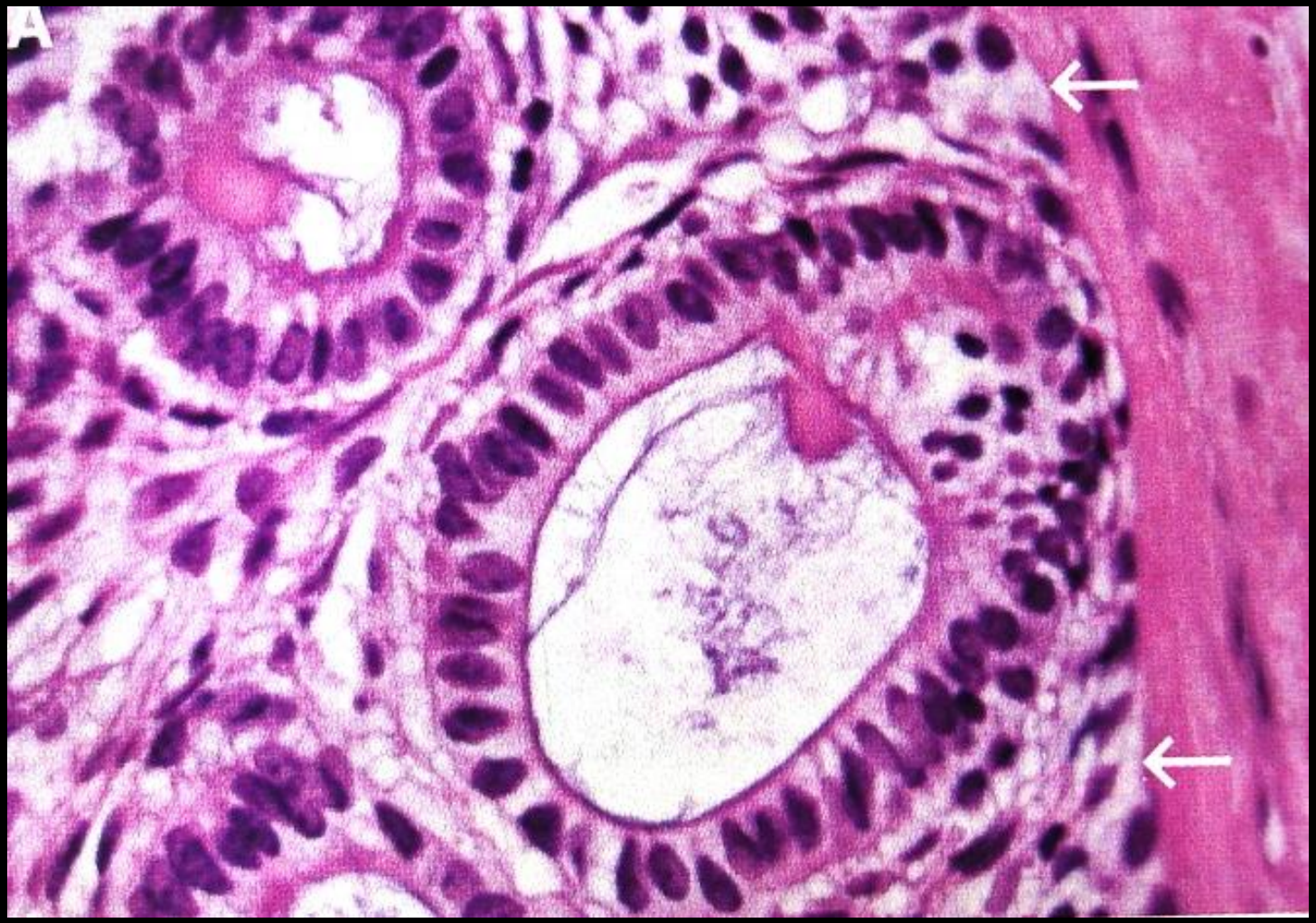


- Concentric layering of juxtranodular spindle cells

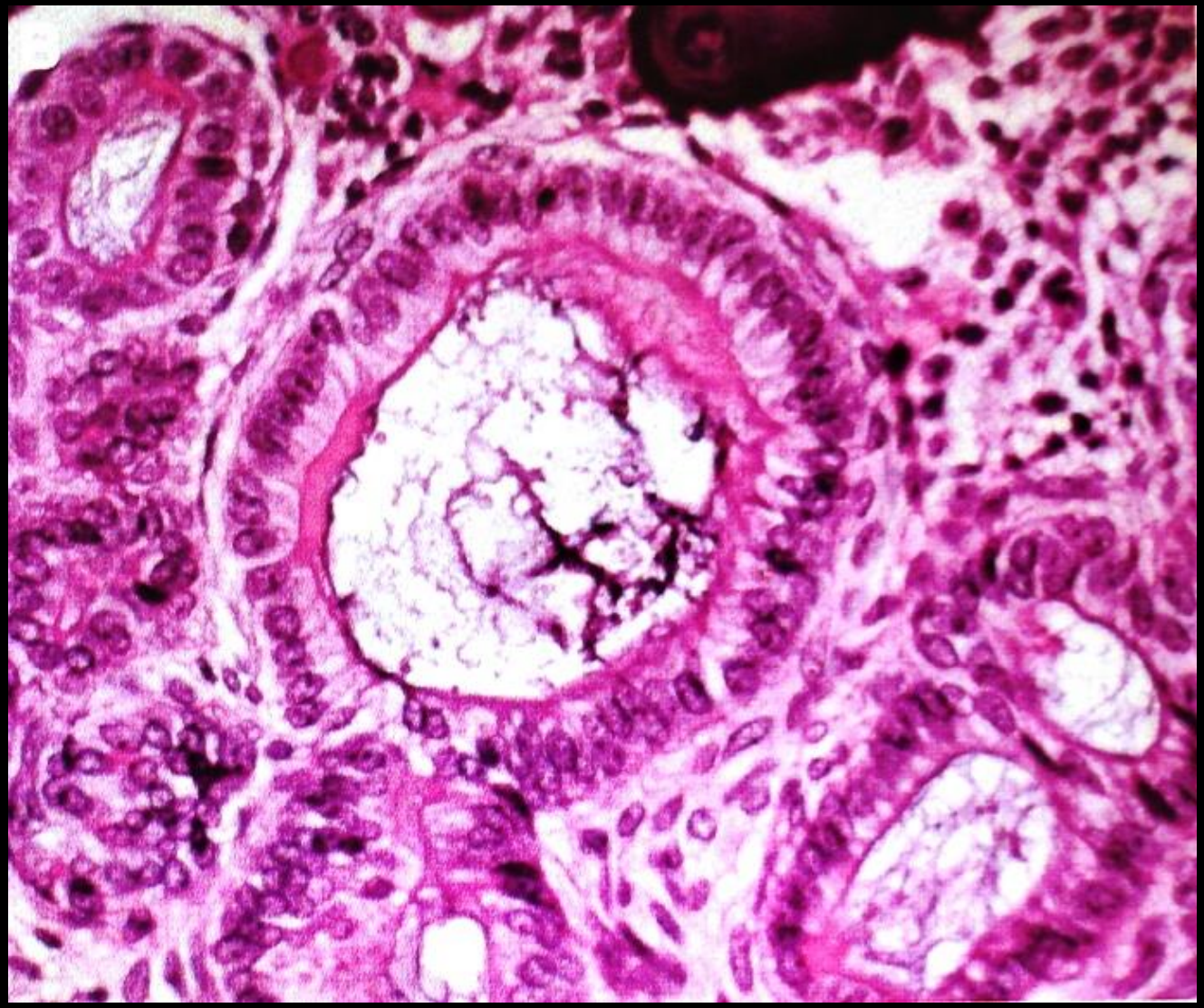


- Droplets of eosinophilic material seen between epithelial cells
- Clustering of tumor cells around the droplets

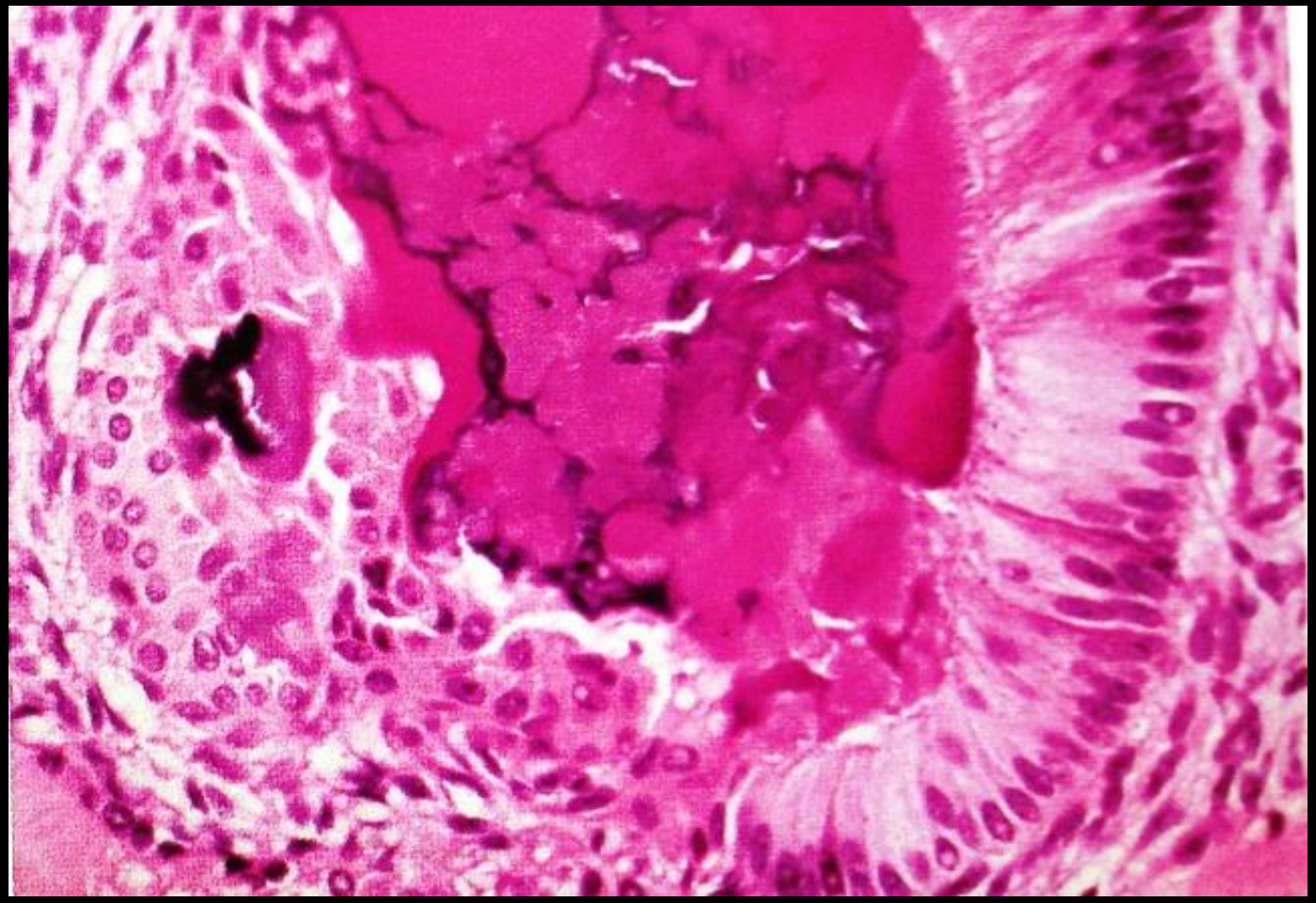
- Microcysts
  - Varying numbers of duct-like structures with lumina of varying sizes
  - Lumen lined by a single layer of cuboidal or columnar cells
    - Nuclei polarized away from the lumen
  - Not present in all the cases



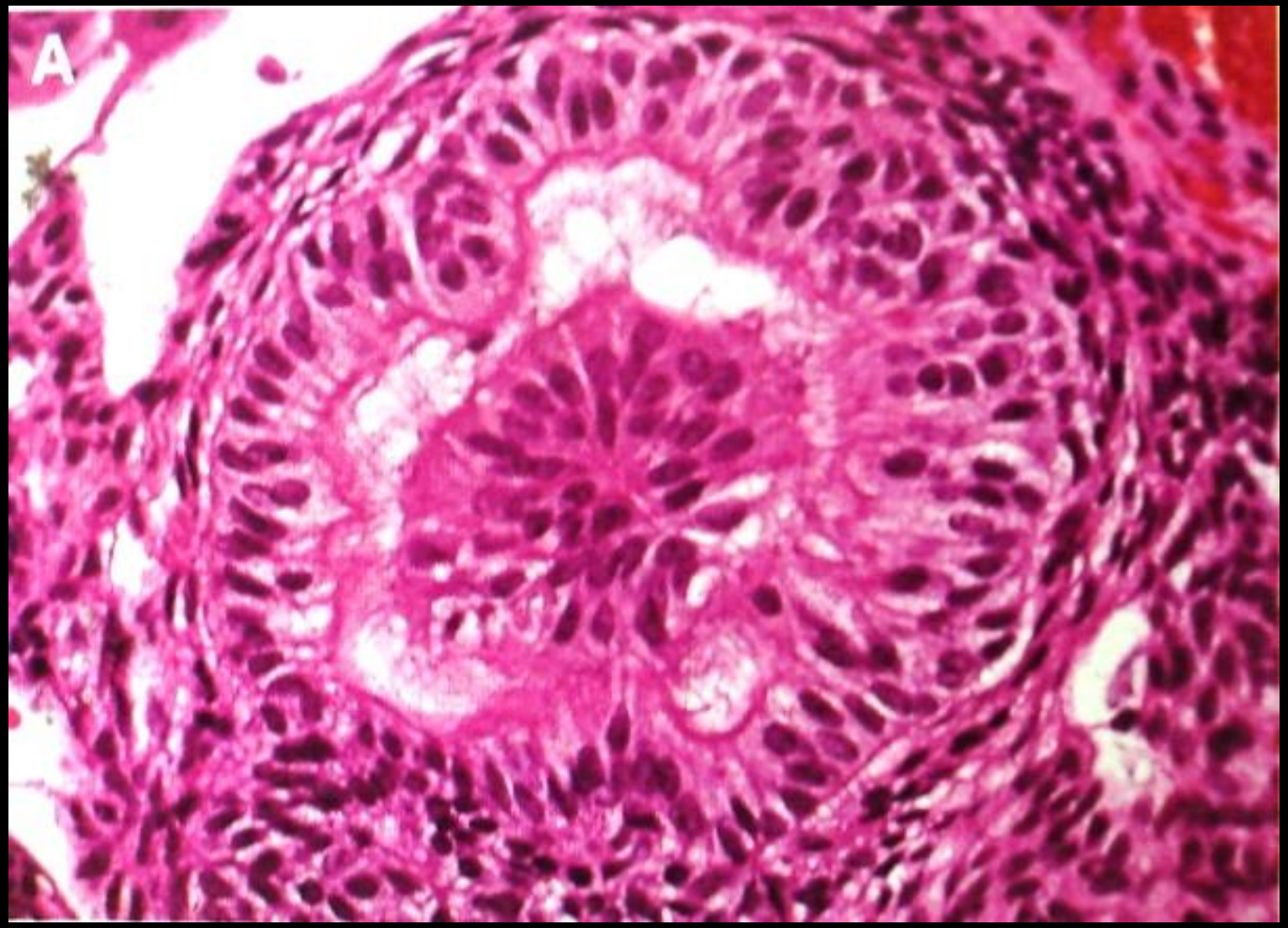
- Microcysts lined by cuboidal to columnar cells with pale basophilic flocculant material and residual droplet of eosinophilic material



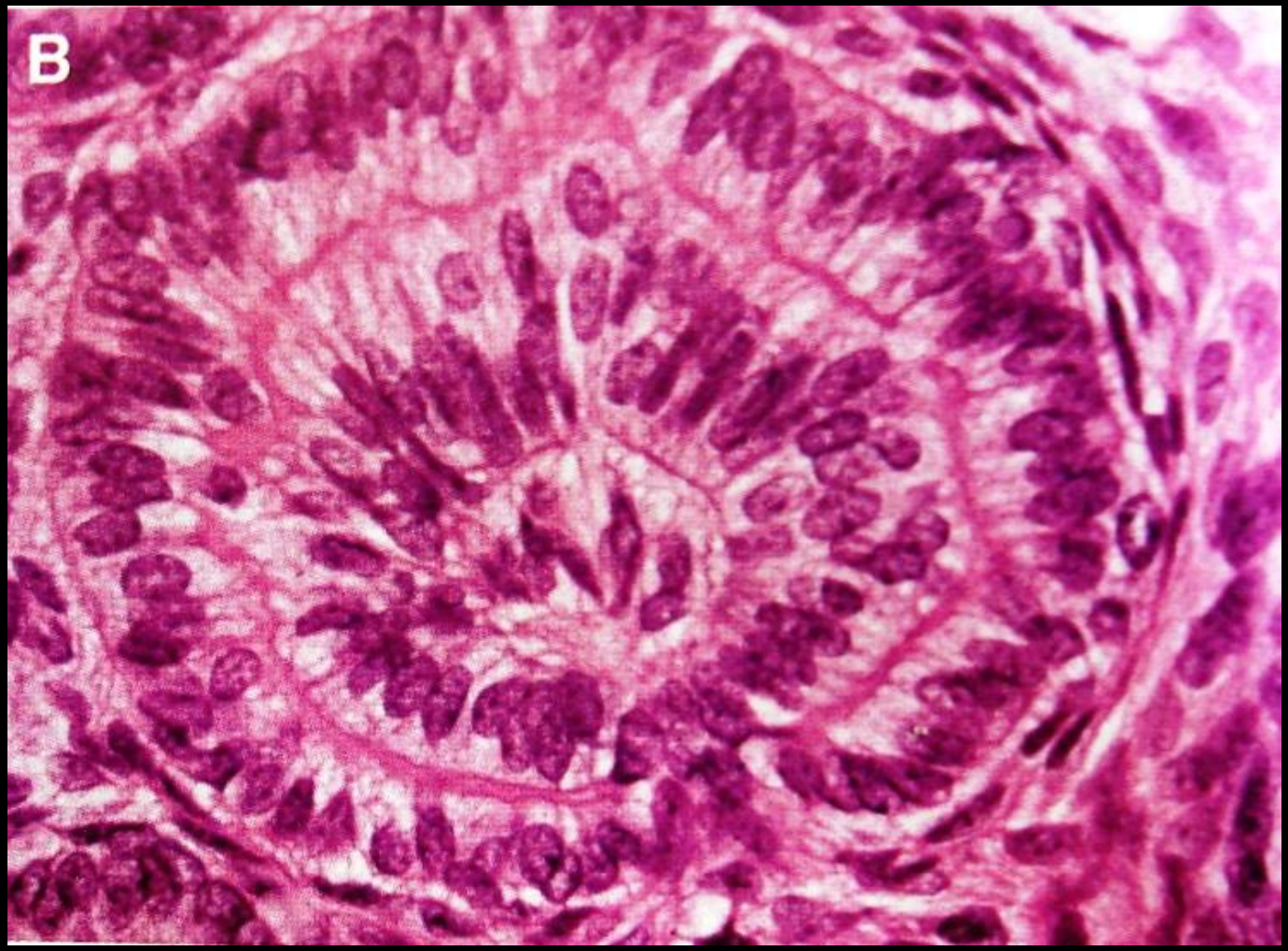
- Lumen lined by an eosinophilic rim of varying thickness (“hyaline ring”)



- Extremely tall columnar cells with intensely eosinophilic cytoplasm and markedly polarized nuclei
- Abut solid, partially calcified masses

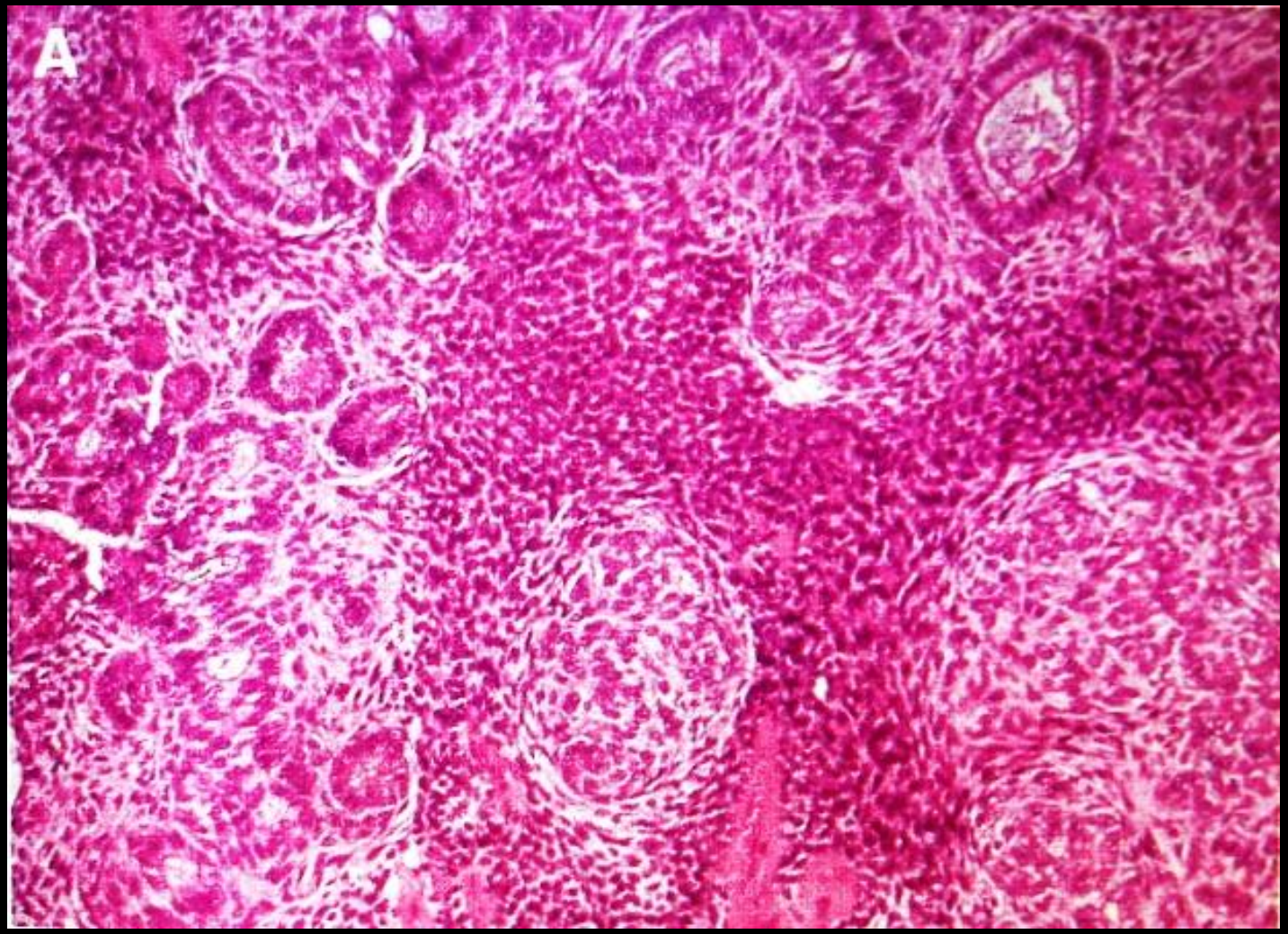


- Columnar cells in form of rosette

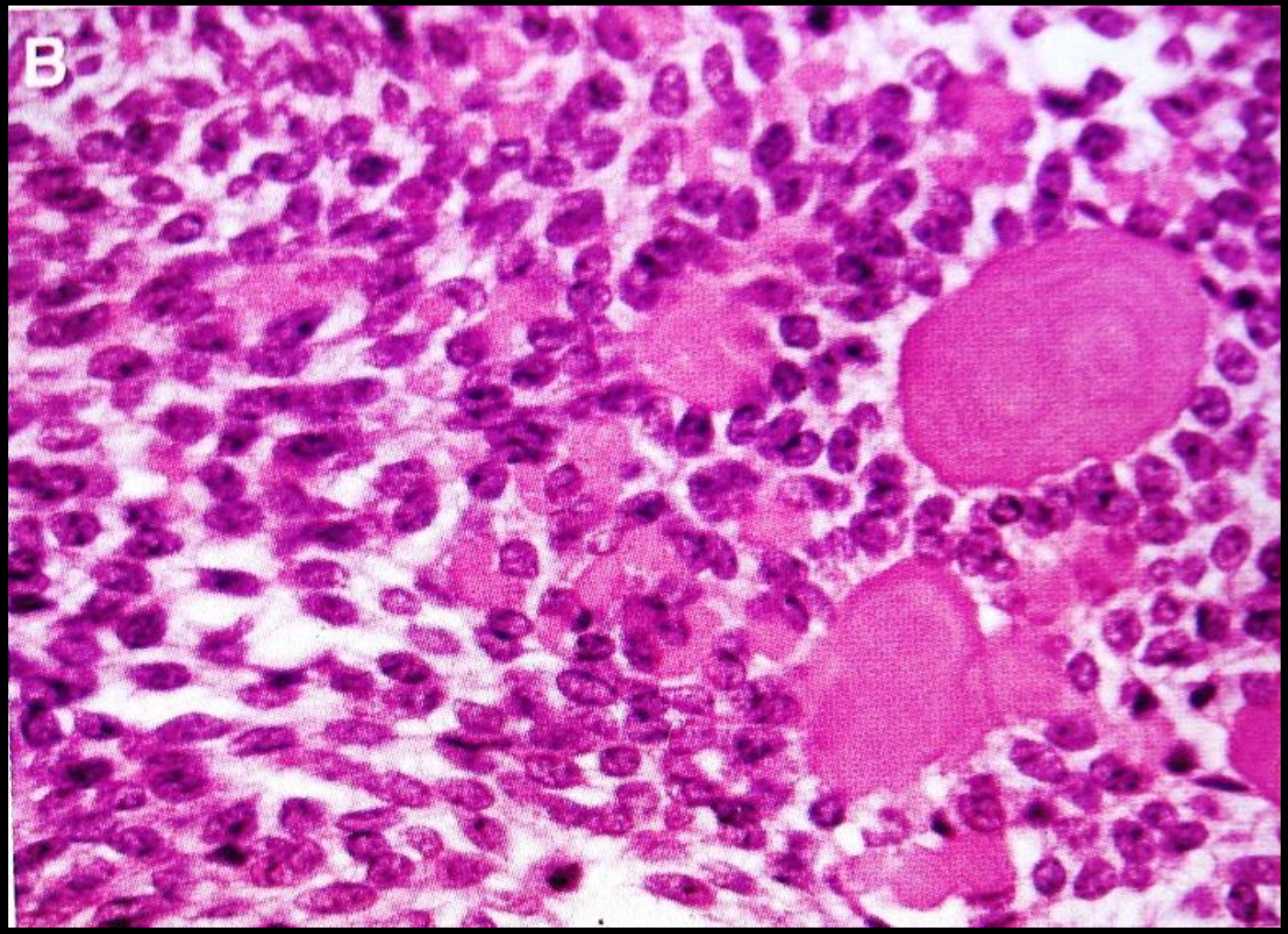


- Columnar cells arranged in convoluted double row with a band of eosinophilic material between two rows

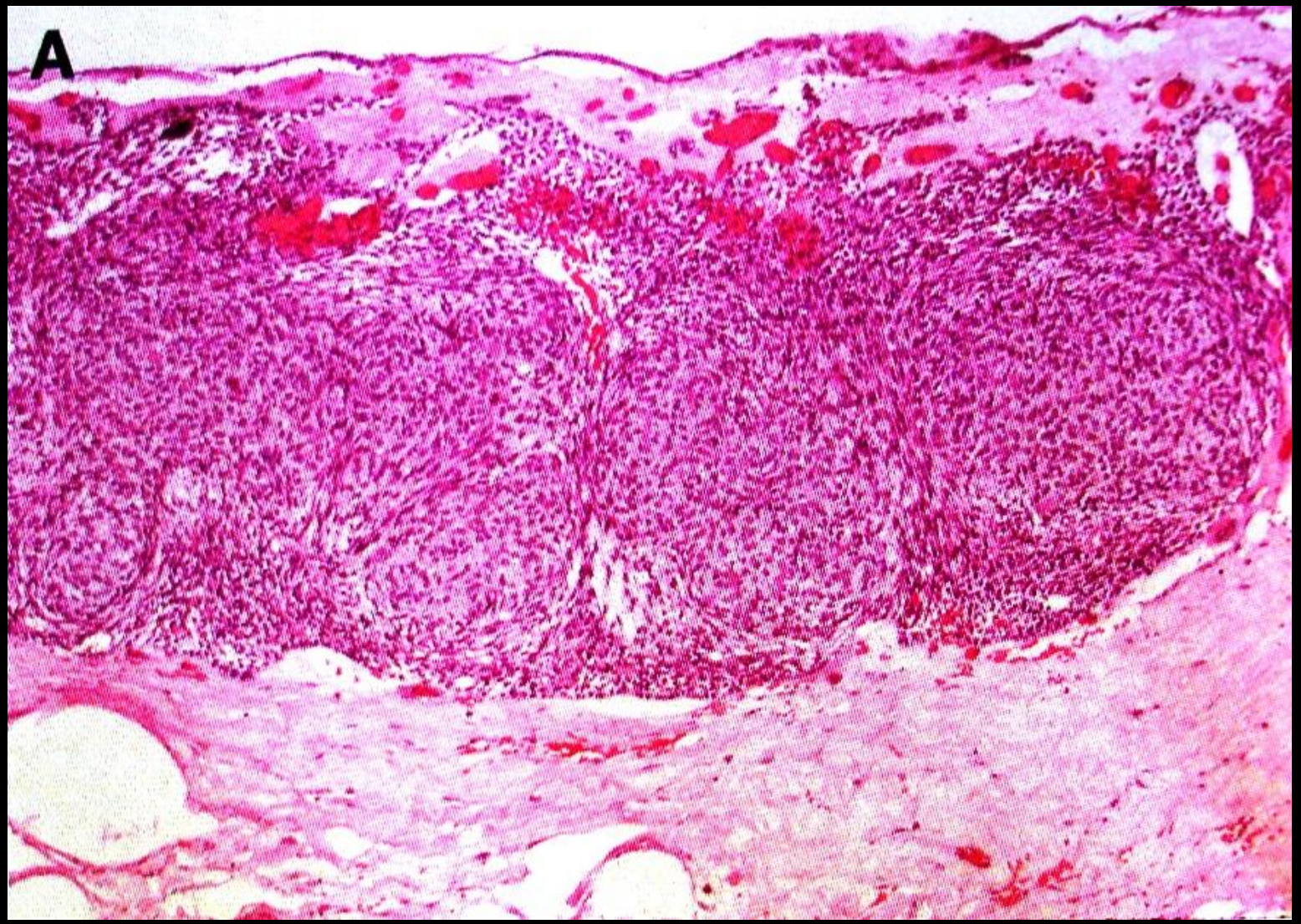
- Internodular epithelial cells
  - Swirling steams of stellate reticulum like spindle cells to round or polygonal cell
  - Demonstrate zones of intense basophilia
  - Small amount of eosinophilic deposits or calcifications may be present



- Stellate reticulum like spindle cells between cell rich nodules and microcysts with areas of intense hyperchromasia



- Small droplets of eosinophilic material and more basophilic calcifications



- Cystic AOT

Association of AOT with other odontogenic cysts and tumors

- Dentigerous cyst
- AOT with CEOT like foci
- Odontoma
- Ameloblastoma
- Calcifying Odontogenic Cyst

Tumors of odontogenic ectomesenchyme

Central Odontogenic fibroma

- WHO has defined central odontogenic fibroma as

"Fibroblastic neoplasm containing variable amounts of apparently inactive odontogenic epithelium"

- Simple type of COdF
  - Composed of delicate fibrous and myxoid tissue with scant inactive appearing odontogenic epithelium

- WHO type or complex type
  - Composed of cellular mature fibrous tissue containing numerous islands and strands of odontogenic epithelium, without palisading, reverse polarization, or stellate reticulum

Clinical features

- Age
  - Wide age range
  - Rare in first decade
- Gender
  - Female predilection (2.8:1)
- Site
  - Maxilla = mandible
  - Anterior to first molar (specially in maxilla)

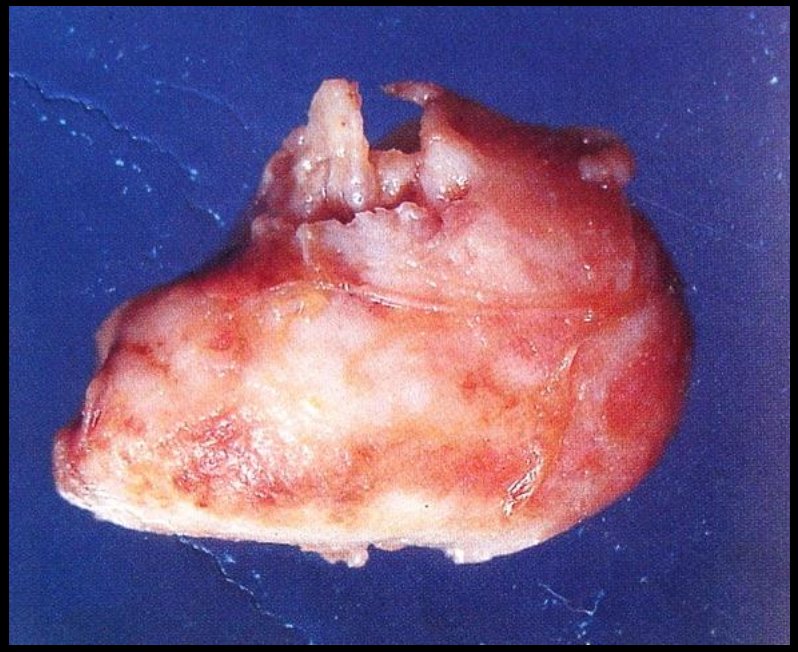
- Clinical presentation
  - May be asymptomatic
  - Mild tenderness, sensitivity or paresthesia
  - Slow growing
  - Progressive enlargement
  - Presence of cleft or depression in the palatal gingiva and palatal mucosa
  - May perforate the palatal bone

Radiographic features

- Unilocular or multilocular radiolucency
- Loculated or scalloped periphery
- Well defined, often sclerotic borders
- Expansion or perforation of cortex
- Root resorption

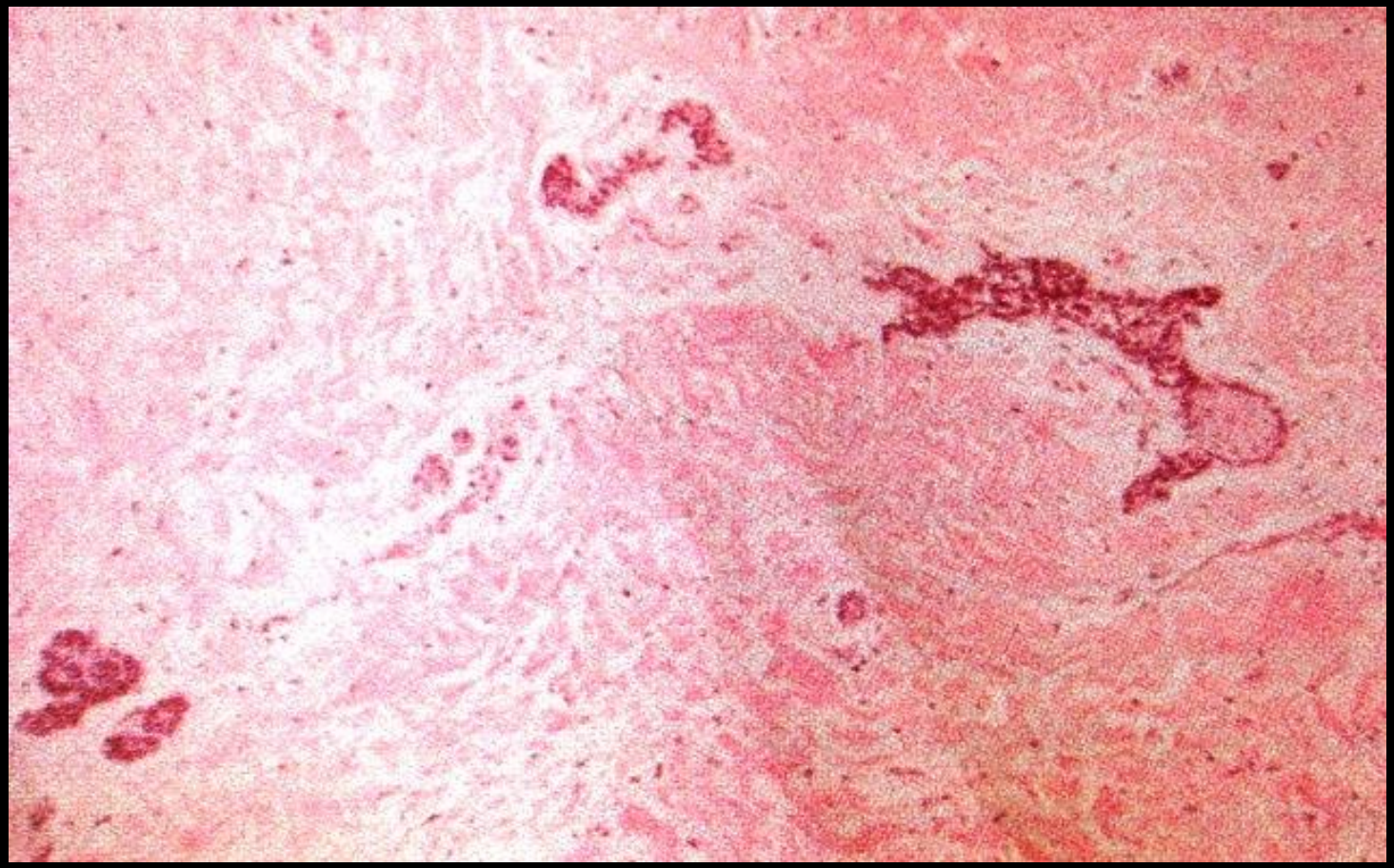
Histopathological features

- Gross
  - Smooth well circumscribed mass
  - Lesions tend to shell out easily and completely from the surrounding bone



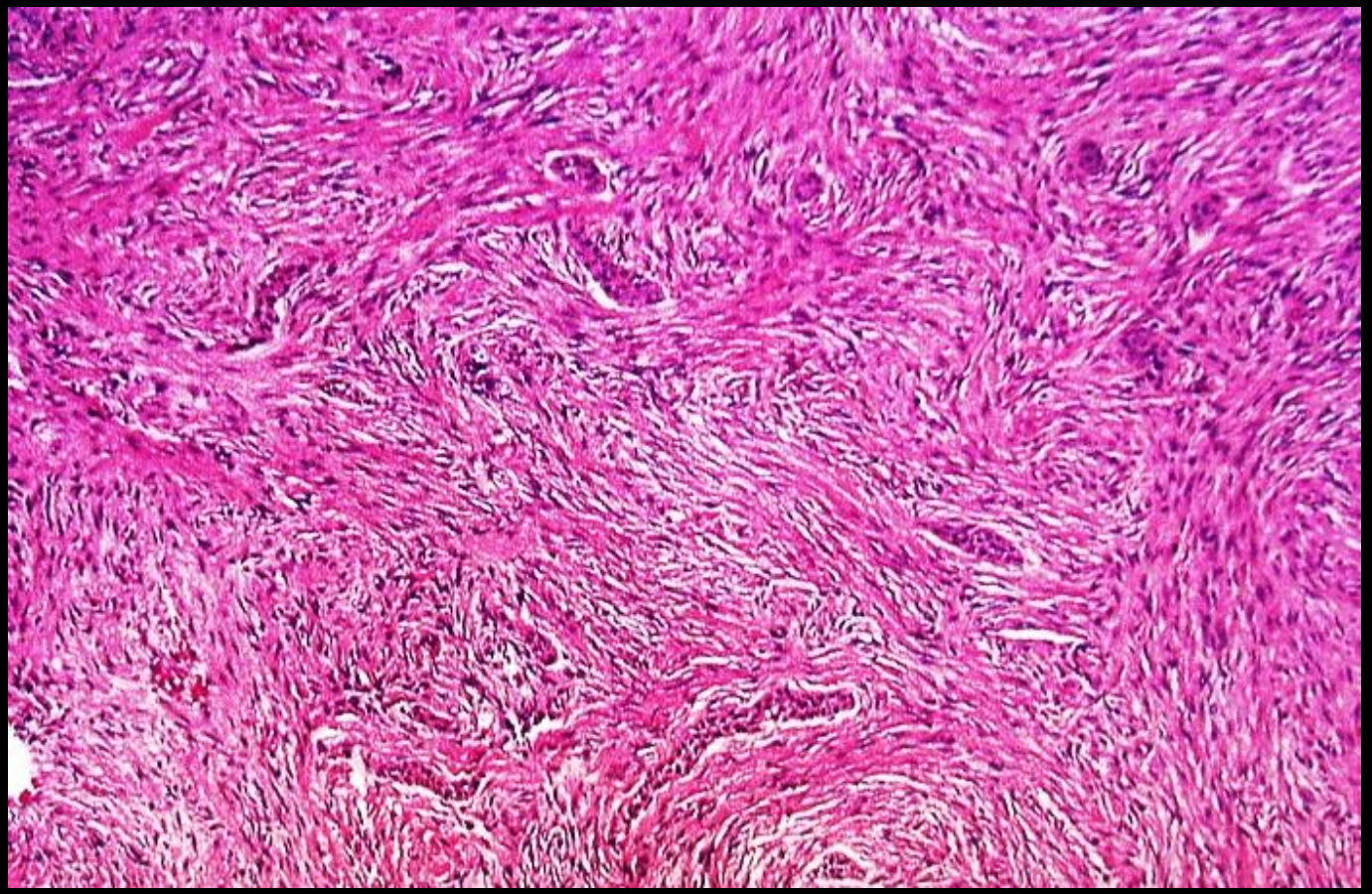
- Microscopic findings
  - Fibous tissue of variable cellularity and density
  - Variable amount of inactive appearing odontogenic epithelium
  - Variable presence of calcifications resembling dysplastic dentin, cementum like tissue, or bone

- Mesenchymal component
  - Loosely to well collagenized
  - With or without myxoid areas
  - Sparse to moderate to dense cellularity



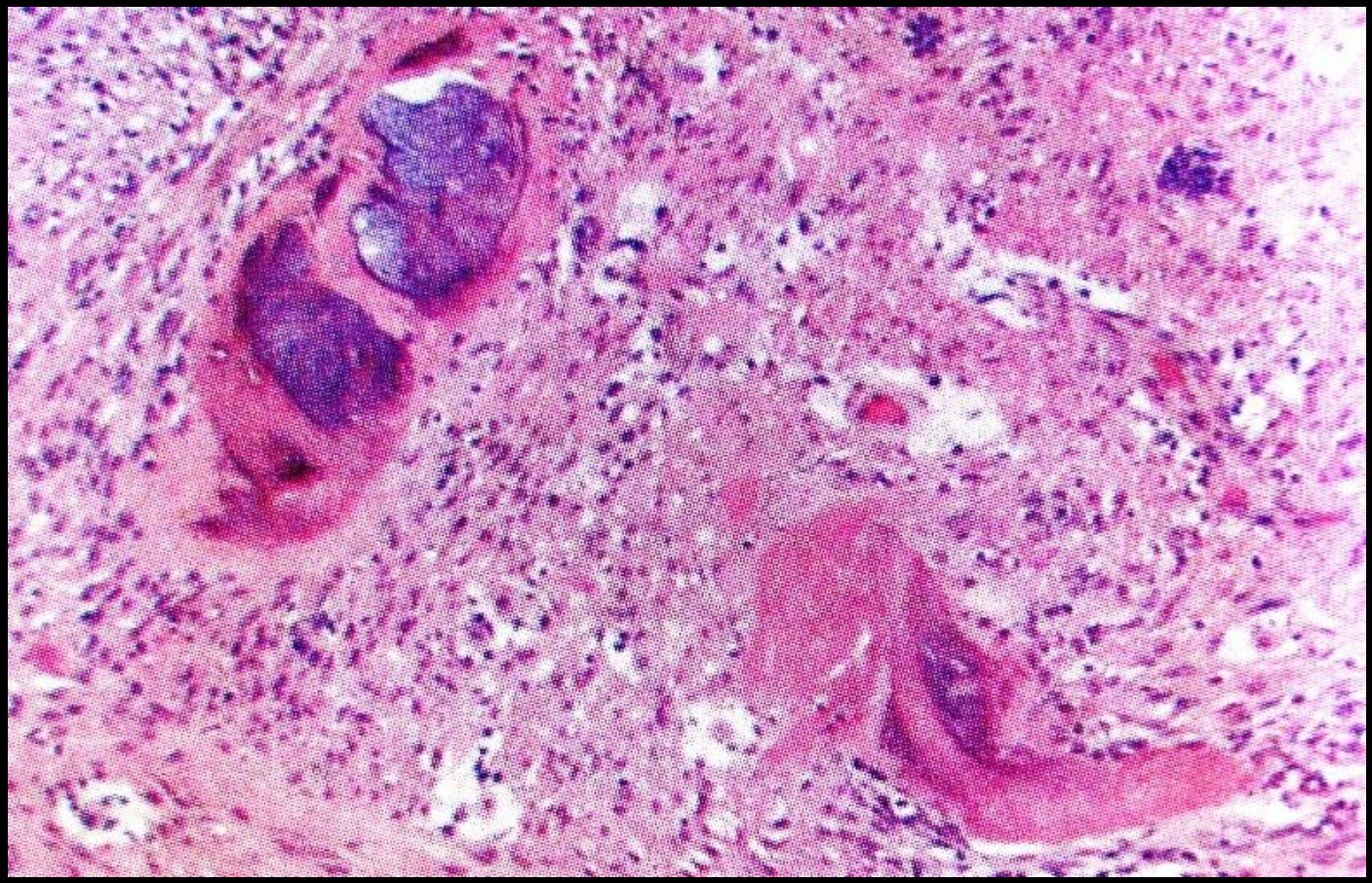
- Islands and cords of epithelium in densely fibrous stroma

- Epithelial component
  - Islands or cords
  - Few to numerous
  - Inactive appearing



- Serpentine strands of inactive odontogenic epithelium surrounded by a fibrous tissue with a fascicular configuration

- Calcifications
  - Focal to florid
  - Cementum like
  - Dentin
  - Osteoid
  - Woven bone



- Foci of calcification

Peripheral odontogenic fibroma

- Uncommon tumor
- Soft tissue counterpart of COdF
  - Odontogenic gingival hamartoma
  - Peripheral ameloblastic fibrodentoinoma

Clinical features

- Wide age range
- No sex predilection
- Mandible > maxilla
  - More common on the fascial gingiva
- Slow growing firm and sessile gingival mass
  - 0.5-1.5 cm in diameter
- Normal overlying mucosa
- May be multifocal

Histopathological features

- Same as COdF

Odontogenic myxoma/ fibromyxoma

- WHO definition of odontogenic myxoma

"a locally invasive neoplasm consisting of rounded and angular cells that lie in an abundant mucoid stroma"

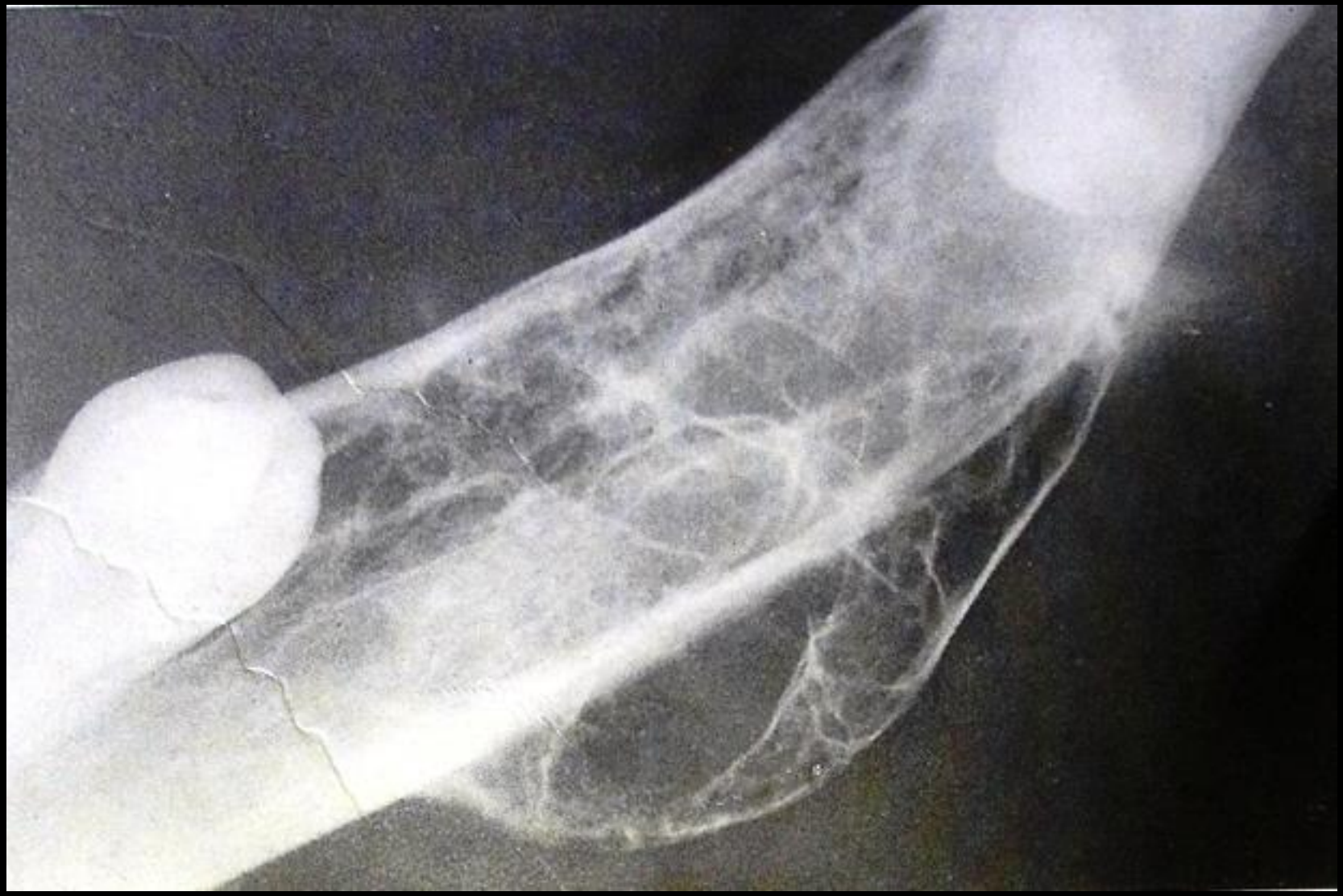
Clinical features

- Age
  - 2^{nd} - 4^{th} decades (75%)
- Gender
  - Slightly more common in females (1.5:1)
- Site
  - Mandible (2:1)
  - Molar premolar area

- Clinical presentation
  - Cortical expansion and perforation are common
  - Maxilla → extension into the sinus

Radiographic features

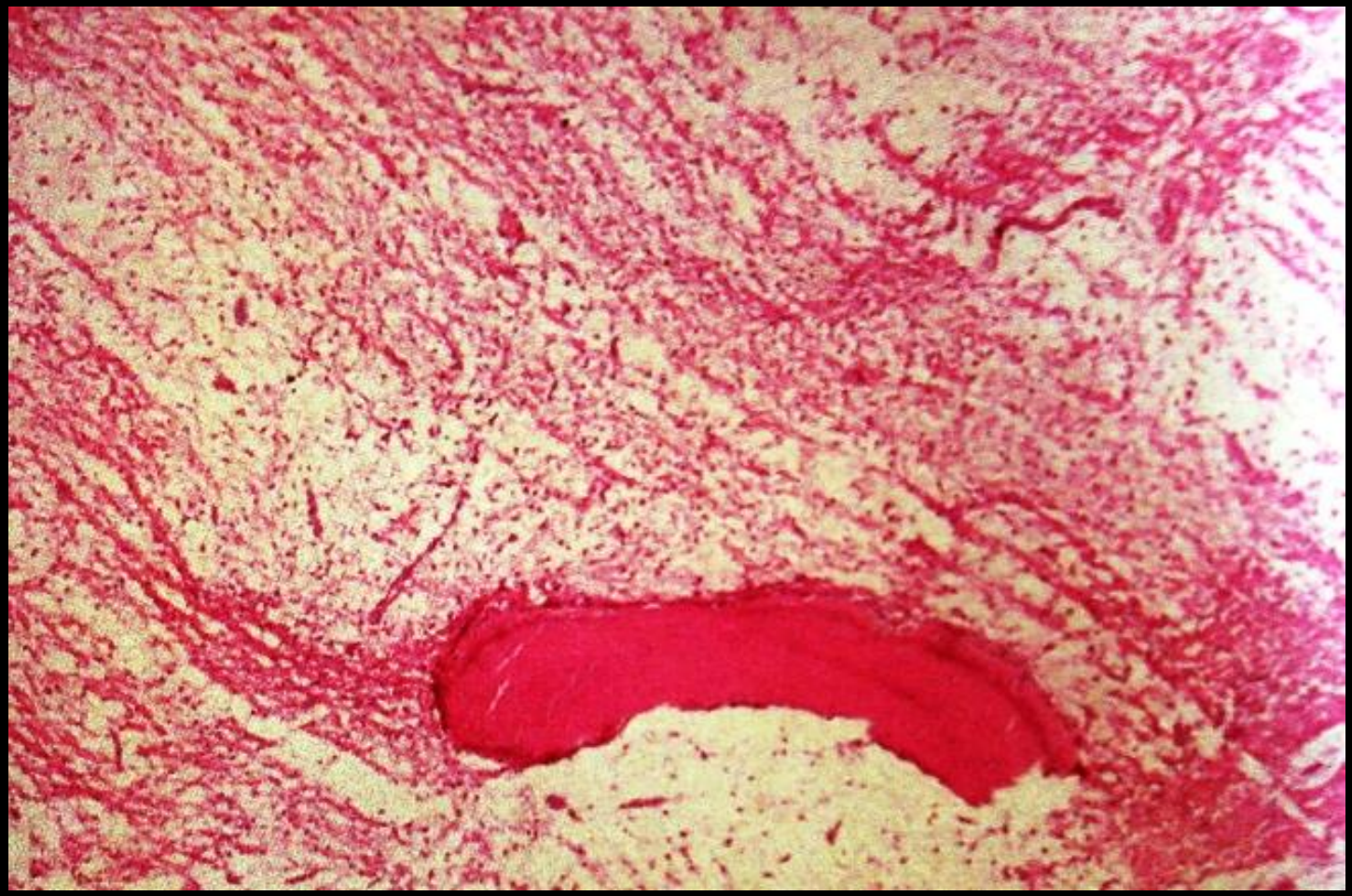
- Unilocular or multilocular radiolucency
  - Honeycomb
  - Soap bubble
  - Tennis racket
  - Spider web
- Displacement of teeth
- Resorption of roots
- Mixed radiopaque – radiolucent lesions (12%)



Histopathological features

- Gross
  - Well delineated but uncapsulated
  - Gray-white to tan-yellow
  - Rubbery, soft, or gelatinous
  - Cut surface is glistening, translucent and homogenous

- Microscopic findings
  - Loosely arranged, evenly dispersed, spindle shaped, rounded, and stellate cells
    - Light eosinophilic cytoplasm
  - Myxoid intercellular matrix
  - Mild atypia and hyperchromatism
  - Occasional mitosis
  - Fine network of reticulin fibers
    - More collagen → fibromyxoma
  - Inconspicous vascularity



Central granular cell odontogenic tumor

- Rare benign odontogenic neoplasm that contains variable amounts of large eosinophilic granular cells and apparently inactive odontogenic epithelium

- Also known as
  - Central granular cell odontogenic fibroma
  - Granular cell ameloblastic fibroma
  - Central granular cell tumor of the jaws

Clinical features

- Older adults
  - More than half of the cases between 6^{th} to 8^{th} decade
- Females (3:1)
- Mandible (3:1)
  - Premolar molar area

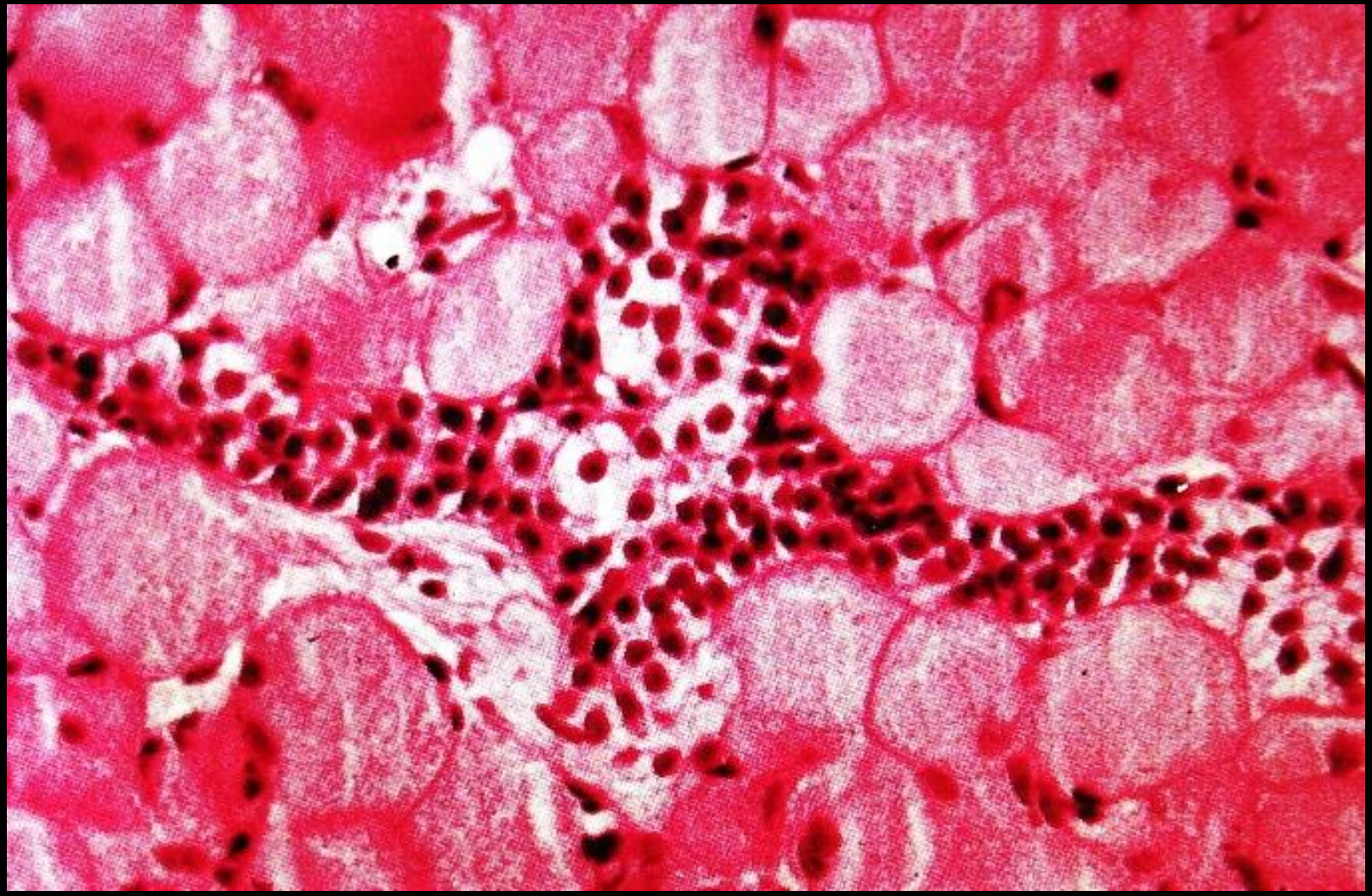
- Locally aggressive
  - Cortical expansion and perforation
  - Facial swelling
  - Displacement of teeth
  - Maxillary sinus involvement

Radiographic features

- Unilocular or multilocular radiolucency
- Sclerotic border
- Mixed density

Histopathologic features

- Sheets or lobules of round to polygonal cells
  - Eosinophilic granular cytoplasm
  - Round to oval nuclei
- Cords and nests of odontogenic epithelium
  - Often have clear cytoplasm
  - No stellate reticulum like cells
- Thin septae of fibrous connective tissue
- Scattered, small, cementum like dystrophic calcifications



- Ultrastructural and immunohistochemical studies show that granular cells are non-epithelial in origin