CENTRAL NERVOUS SYSTEM

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Reaction Neuron to injury

- Acute neuronal injury
  - Menggambarkan akibat hipoksia/iskemia CNS secara akut, dimana tejadi kematian sel, baik nekrosis maupun apoptosis
  - Red neurons → gambaran HE dalam 12-24 jam setelah hipoksia/iskemia yang irreversible.
  - Morfologi : sel mengecil, inti piknosis, nukeloli menghilang, substansia Nissl menghilang, adanya gambaran eosinophilia pada sitoplasma
- Subacute dan Chronic neuronal injury
  - Kematian neuronal yang terjadi akibat proses penyakit yang berjalan pelan/progressive, contoh: Amyotropic Lateral Sclerosi (ALS)
  - Degenerasi → hilangnya sel, baik secara grup neuron maupun didapatkan gliosis reactive

Reaction Neuron to injury

- Axonal reaction
  - Reaksi yang terjadi pada badan sel axon, yang mengindikasikan adanya adanya regenerasi pada axon
  - Ditandai dengan pembesaran sel, sel semakin membulat, nucleolus membesar, substansi Nissl terpisah dari sentral ke tepi (central cromatolysis)
- Neuronal inclusion
  - Manifestasi dari usia
  - Terjadi akumulasi lipid (liposfuscin), protein, atau karbohidrat pada intrasiotplasmik

Reaction Astrocyte to Injury

- Gliosis (Astrogliosis)
  - Ditandai dengan hypertrofi dan hyperplasia
  - Inti sel bulat-oval, besar, kromatin pucat, vesikuler, terkadang letak eksentrik, nucleoli prominent, sitoplasma pink terang

Reaction Other Glial cell

- Olygodendrocyte
- Ependymal cell
  - Kedua sel tidak menunjukkan gambaran/reaksi yang spesifik
- Microglia
  - Proliferasi
  - Rod cell (inti elongated) → neurosyphilis
  - Pembentukan agregat akibat nekrosis jaringan → microglial nodule
  - Gambaran sel mati yang berkumpul → neuronophagia

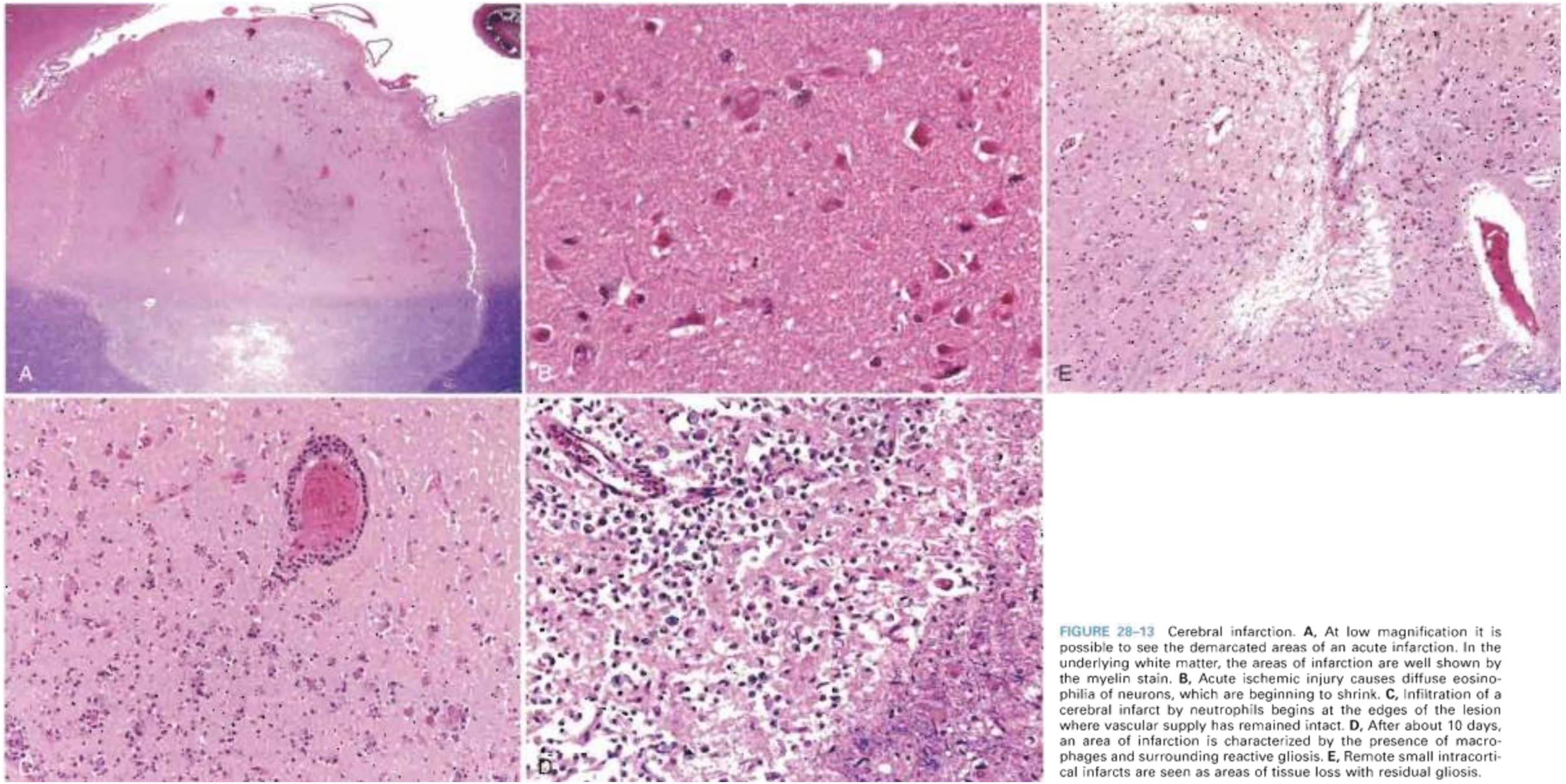


FIGURE 28–13 Cerebral infarction. **A,** At low magnification it is possible to see the demarcated areas of an acute infarction. In the underlying white matter, the areas of infarction are well shown by the myelin stain. **B,** Acute ischemic injury causes diffuse eosinophilia of neurons, which are beginning to shrink. **C,** Infiltration of a cerebral infarct by neutrophils begins at the edges of the lesion where vascular supply has remained intact. **D,** After about 10 days, an area of infarction is characterized by the presence of macrophages and surrounding reactive gliosis. **E,** Remote small intracortical infarcts are seen as areas of tissue loss with residual gliosis.

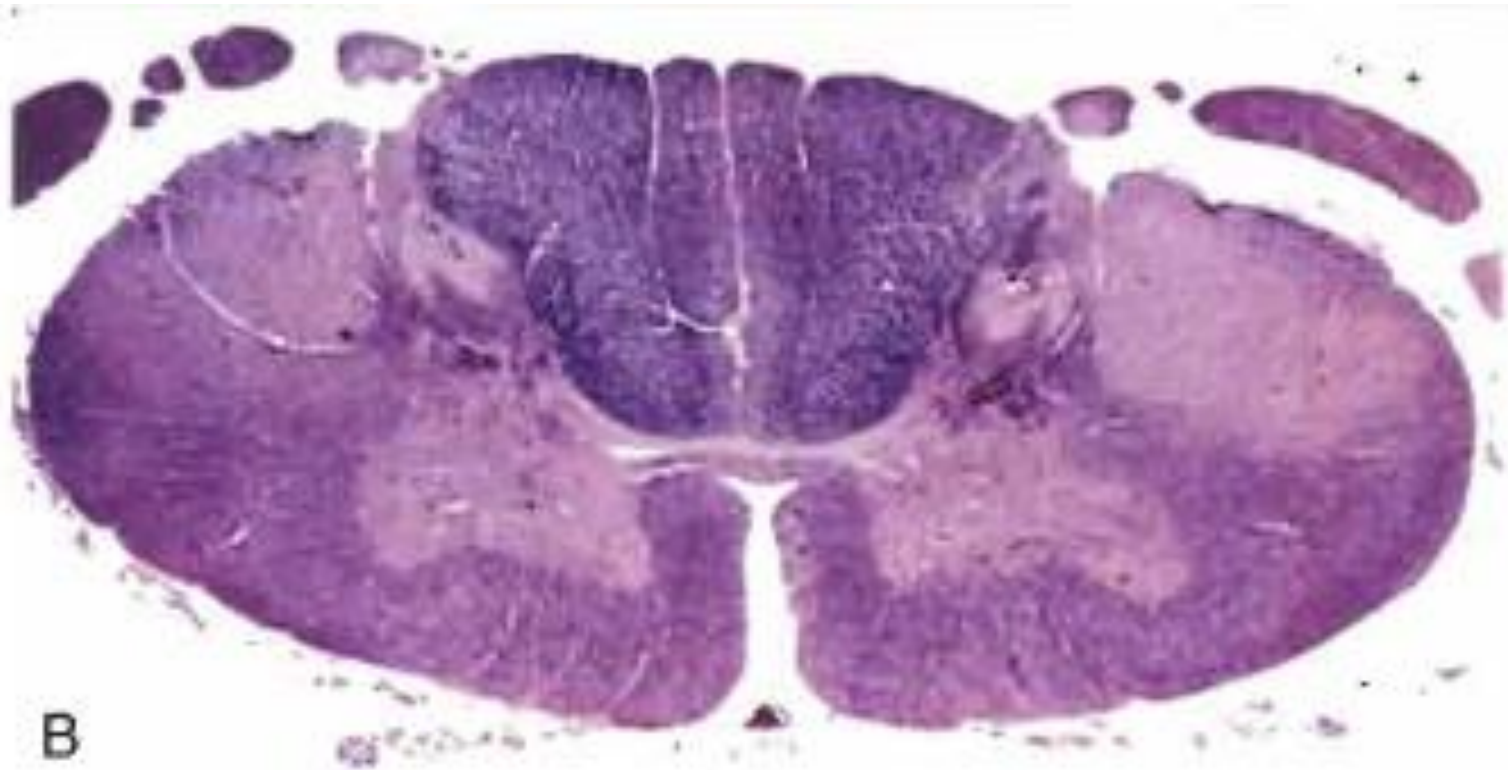


FIGURE 28–42 Amyotrophic lateral sclerosis. **A,** Segment of spinal cord viewed from anterior *(upper)* and posterior *(lower)* surfaces showing attenuation of anterior (motor) roots compared to posterior (sensory) roots. **B,** Spinal cord showing loss of myelinated fibers (lack of stain) in corticospinal tracts as well as degeneration of anterior roots.

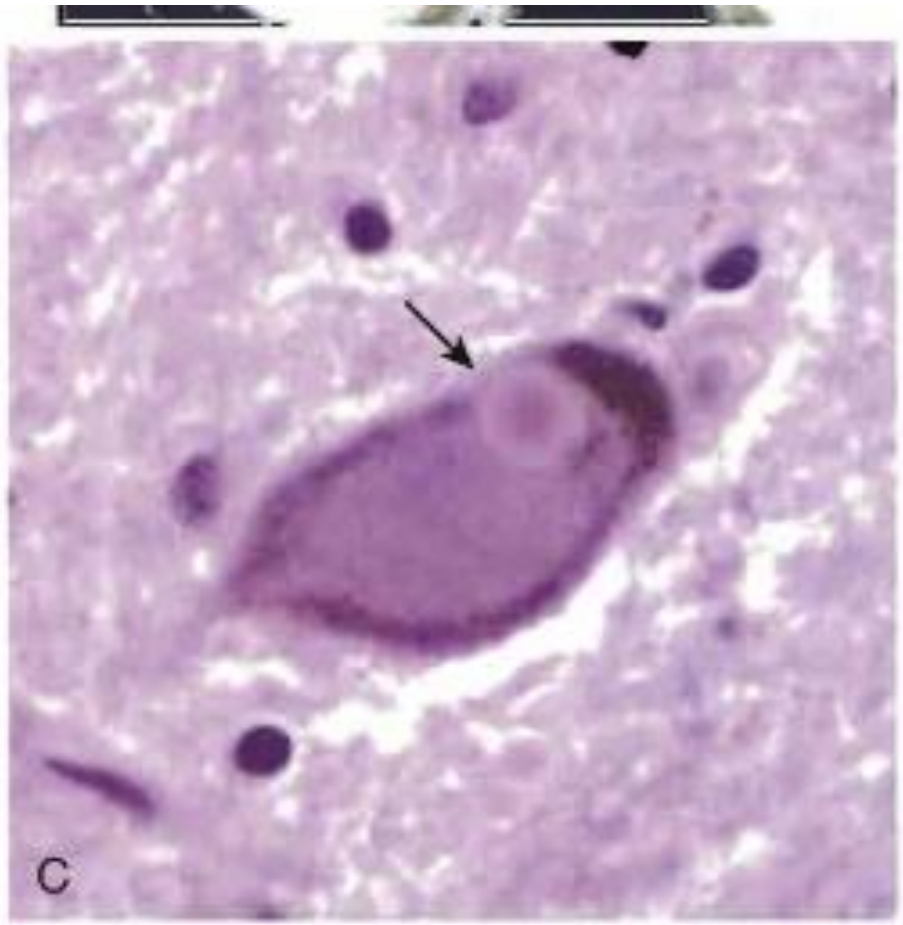
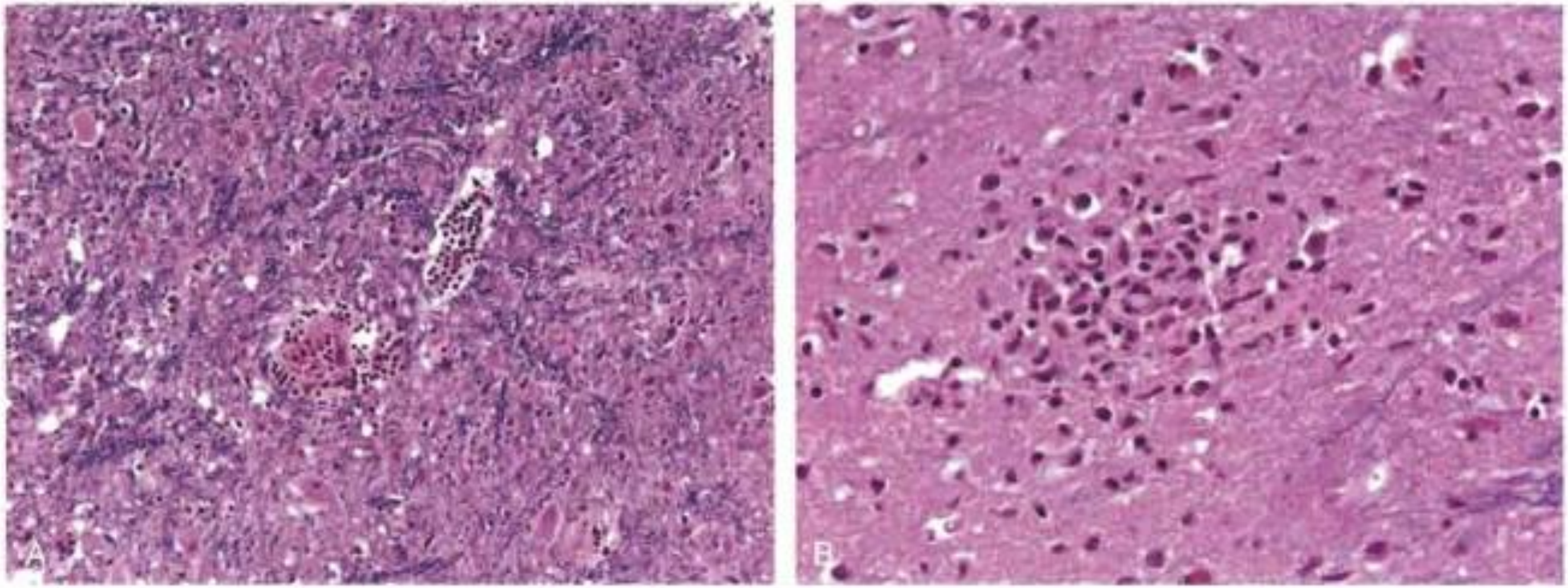


FIGURE 28–40 Parkinson disease. **A,** Normal substantia nigra. **B,** Depigmented substantia nigra in idiopathic Parkinson disease. **C,** Lewy body in a substantia nigra neuron, staining bright pink *(arrow).*



GURE 28-23 Characteristic findings of viral encephalitis include perivascular cuffs of lymphocytes (**A**) and microglial nodules (**B**

MENINGIOMA

Definition & Incidence

- Meningioma:
  - Tumor jinak yang berasal dari sel meningothelial dari arachnoid
- Incidence:
  - 13% - 26% of primary intracranial tumors.
  - Annual incidence rate: 6 / 100.000 pop.
  - Most common in middle aged and elderly patients, with female predominance
  - female-male ratio: 3:2 or 2:1.

Localization

- Meningioma dapat timbul di:
  - Intracranial: pada daerah convexitas, sering berhubungan dengan falx cerebri
  - Ventrikel (berasal dari sel stroma arachnoid dari plexus choroideus)
  - Intravertebral cavities (sepanjang medulla spinalis)
  - Lain: olfactory grooves, sphenoid ridges, parasellar regions, optic nerve, petrosus ridges, tentorium cerebelli, posterior fossa
  - Diluar cranio spinal: orbita, sinonasal.

Clinical Features

- Slow growing mass.
- Neurological signs and symptoms are due to the compression of adjacent structures.
- Dapat menginfiltrasi dura --- skull --- kulit – tampak sebagai massa extracranial.

Morphology

- Macroscopy :
  - Tumor bentuk bulat / berbenjol, batas jelas, melekat pada duramater (tetapi dapat dilepas)
  - Konsistensi: padat kenyal. Jika mengandung banyak kalsifikasi: berbutir kasar.
  - Tumor dapat mengifniltrasi dura dan melibatkan skull --- memberikan gambran hiperostosis pada skull.
  - Varian: meningioma dapat tumbuh sebagai massa yang flat --- disebut MENINGIOMA EN PLAQUE, sering dijumpai pada sphenoid wing.

Morphology

- Microsocpy
  - Terdapat berbagai macam bentuk:
    - Meningotheliomatous / syncytial
    - Fibroblastic
    - Transisional
    - Psammomatous
    - Secretory
    - Microcystic
    - Angiomatous
  - Tipe tersering:

    Meningothelial, Fibrous, Transisional.

Meningotheliomatous Meningioma

- Sel tumor bentuk bulat oval, uniform , batas antar sel tidak jelas, tersusun dalam sinsitium, membentuk lobulus, dikelilingi oleh septa kolagen.

Fibroblastic Meningioma

- Sel tumor bentuk spindle (memanjang) seperti fibroblast, tersusun dalam berkas, dengan stroma kolagen disekitarnya.

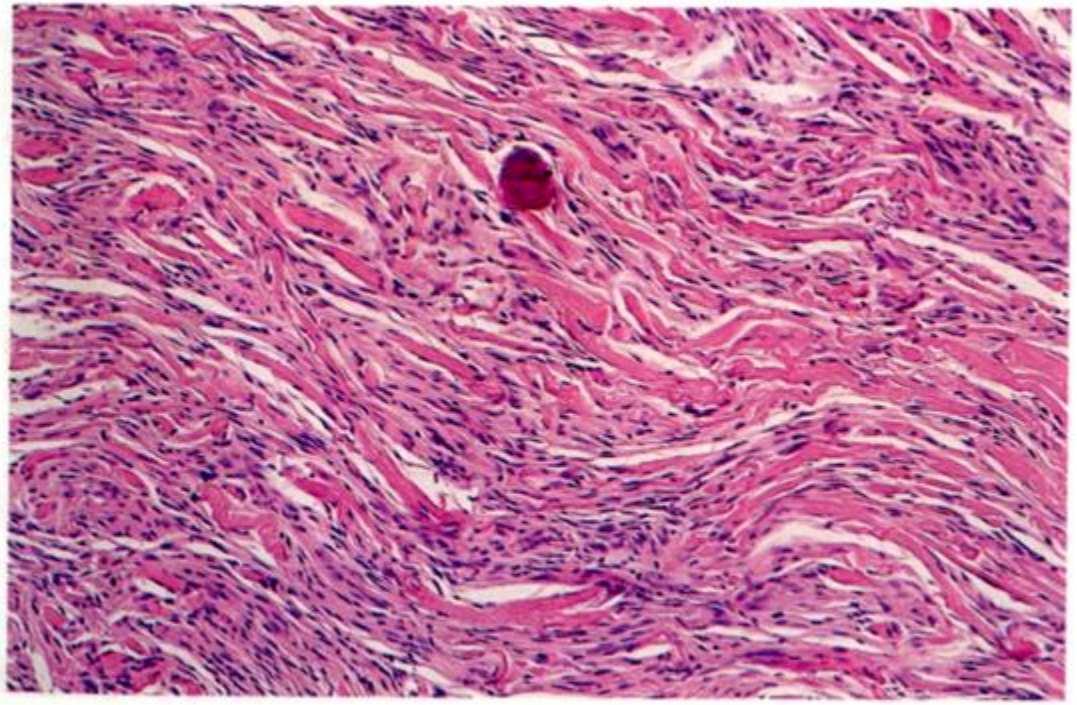
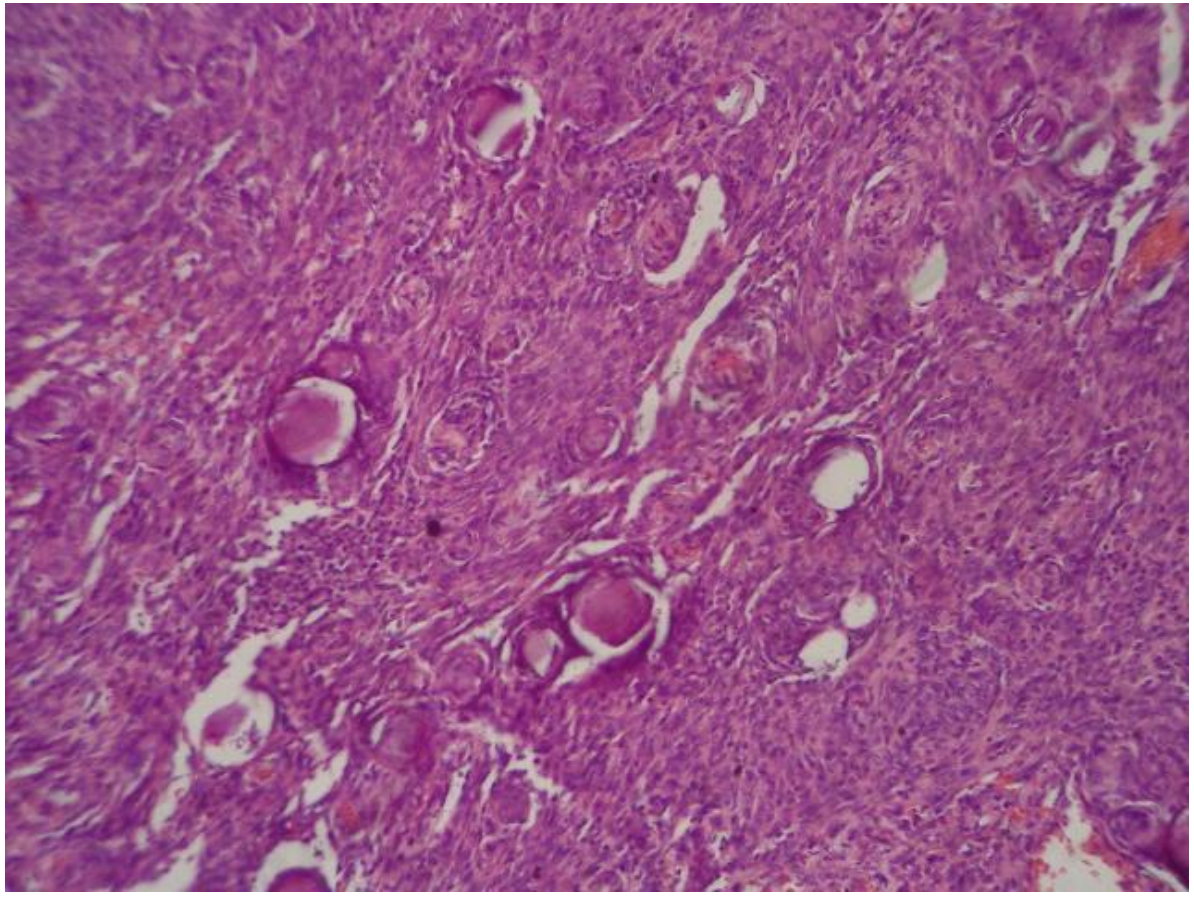
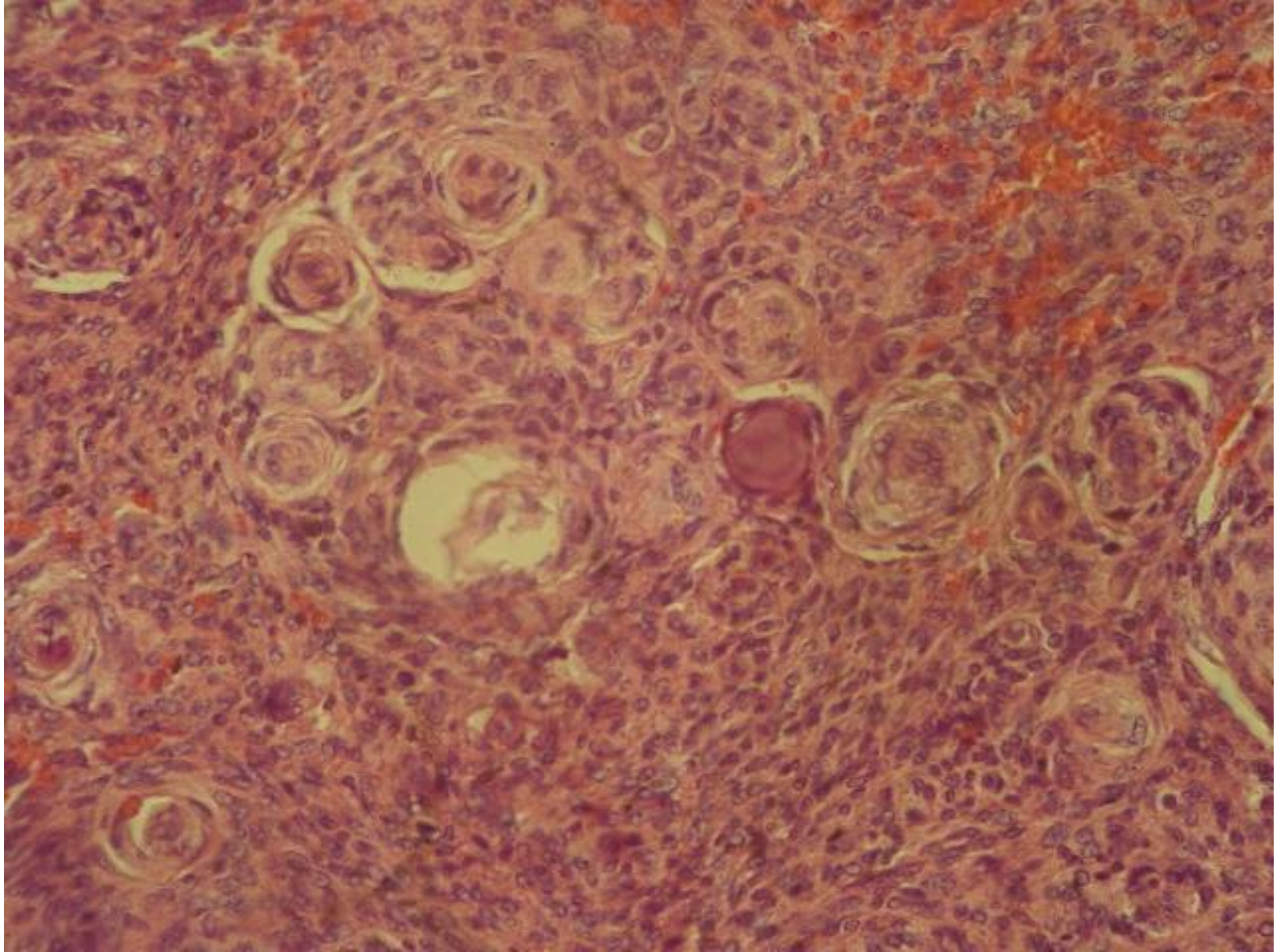


Fig.76. *Fibrous meningioma*. Parallel and interlacing bundles of fibroblast-like tumour cells with extensive collagen deposition

Transisional Meningioma

- Susunan campuran syncytial dan fibroblastic.
- Terdapat susunan seperti pusaran (whorl) dan psammoma bodies (tetapi tidak banyak)





Psammomatous Meningioma

- Seperti tipe transisional, tetapi banyak psammoma bodies.

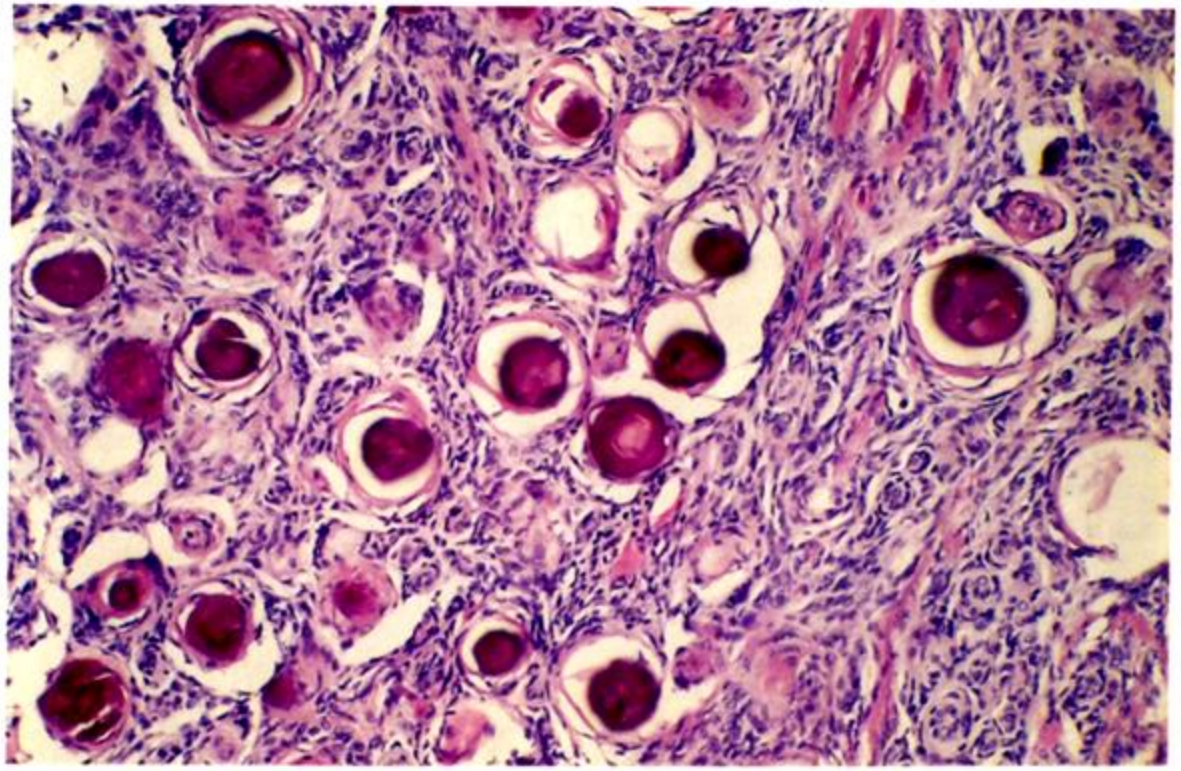
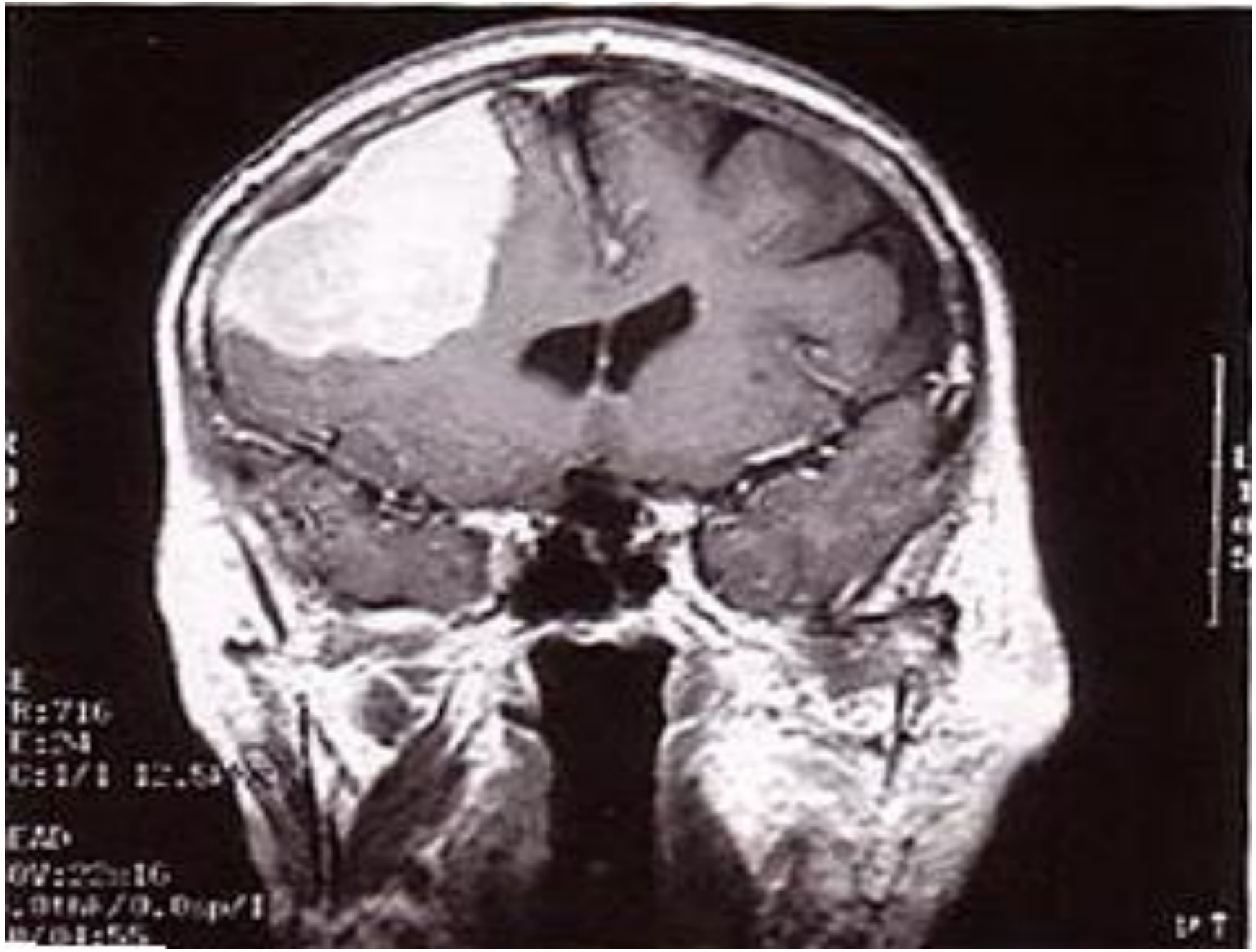


Fig.78. *Psammomatous meningioma.* Meningioma of the transitional type with abundant, often calcified psammoma bodies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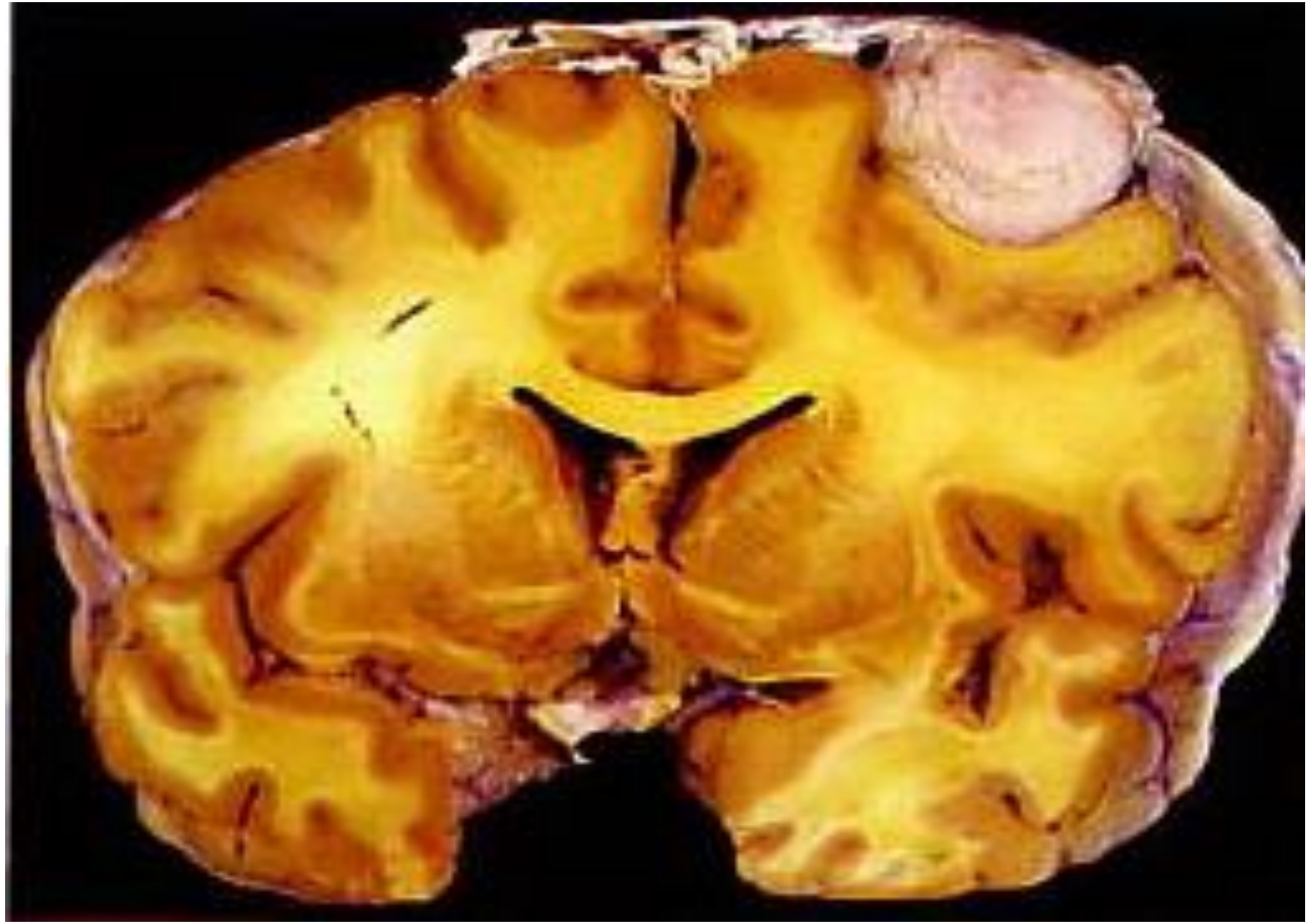
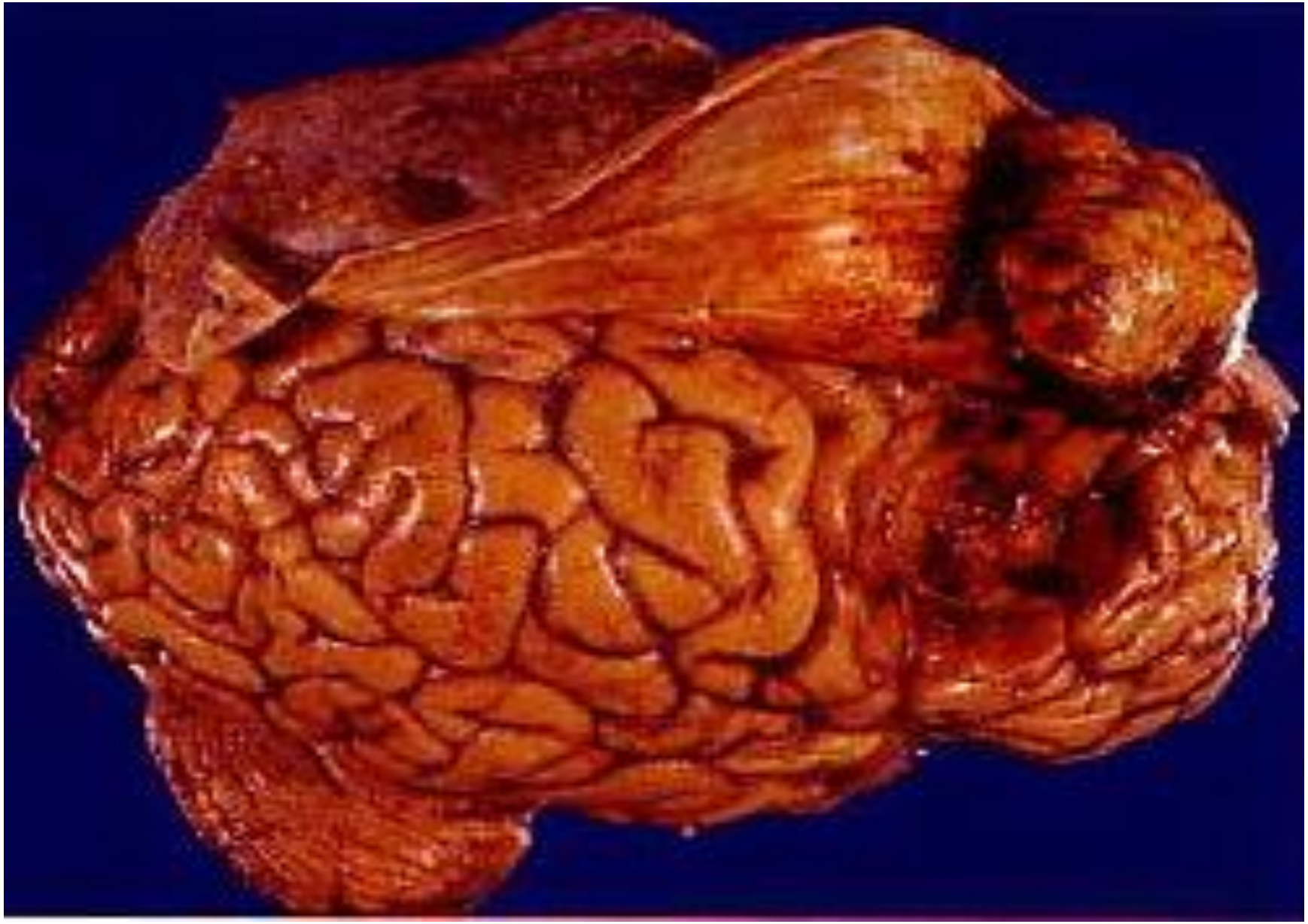
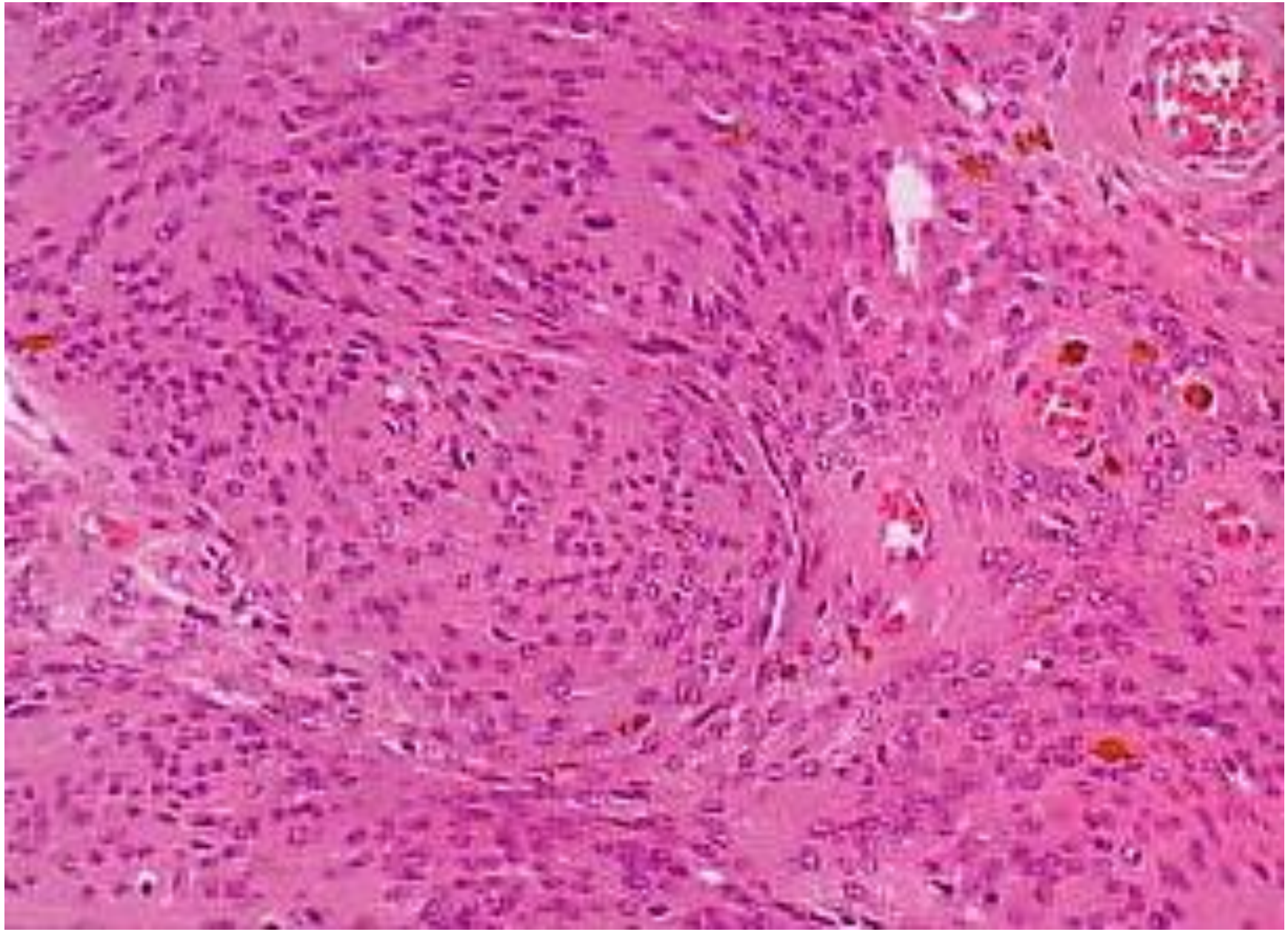






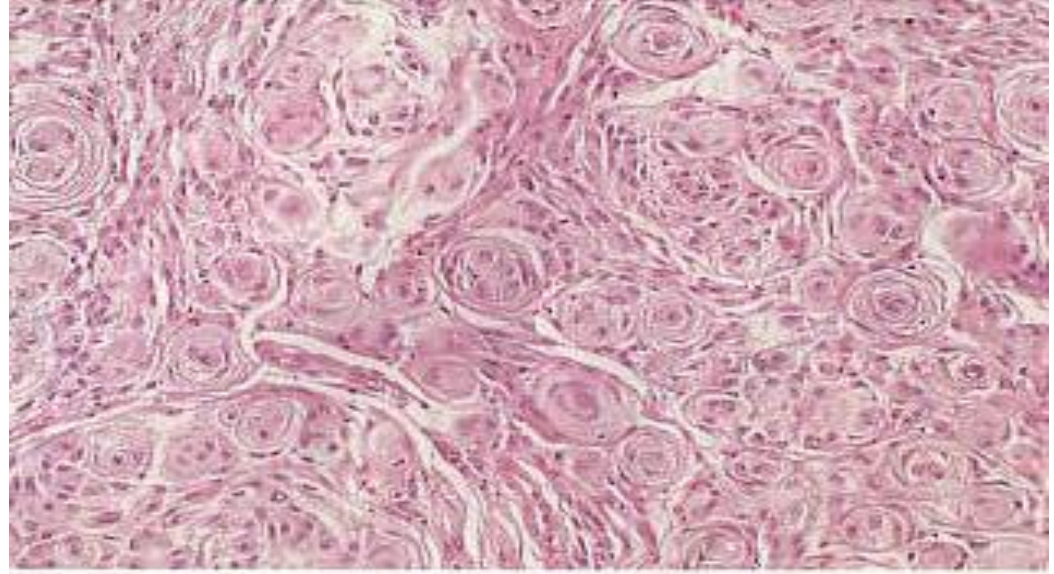


Fig.77. *Transitional meningioma.* Extensive whorl formation in a meningioma with meningothelial and fibrous features

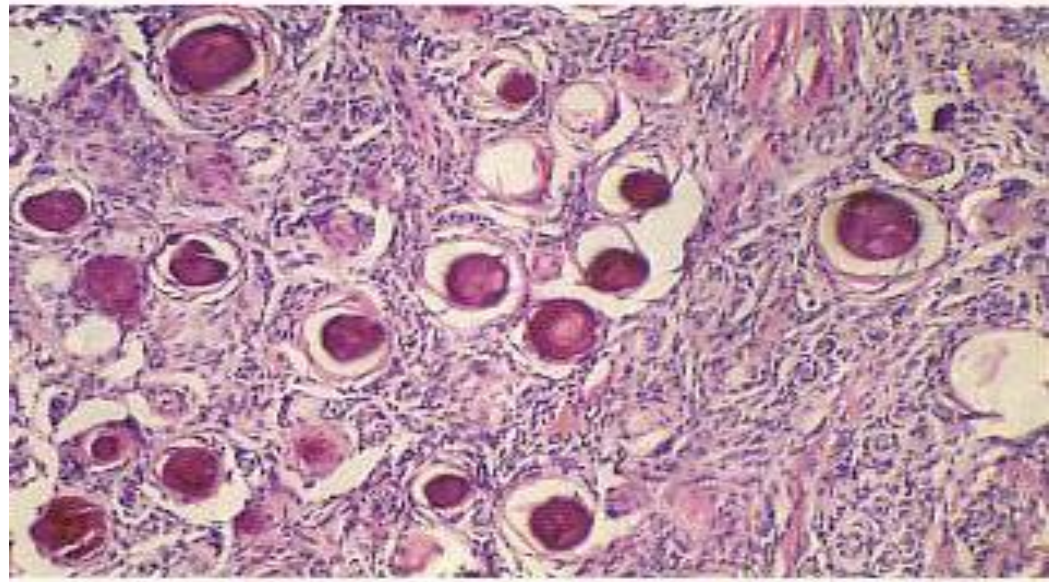


Fig.78. *Psammomatous meningioma.* Meningioma of the transitional type with abundant, often calcified psammoma bodies

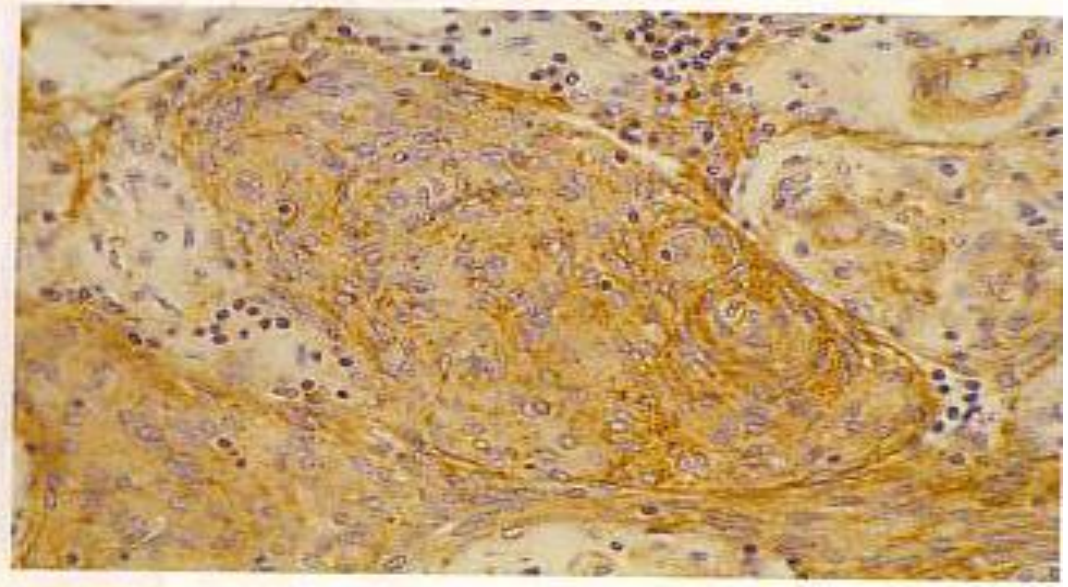


Fig.75. *Meningothelial meningioma.* Solid lobules of meningothelial cells with ill-defined cell membranes and marked expression of epithelial membrane antigen (EMA)

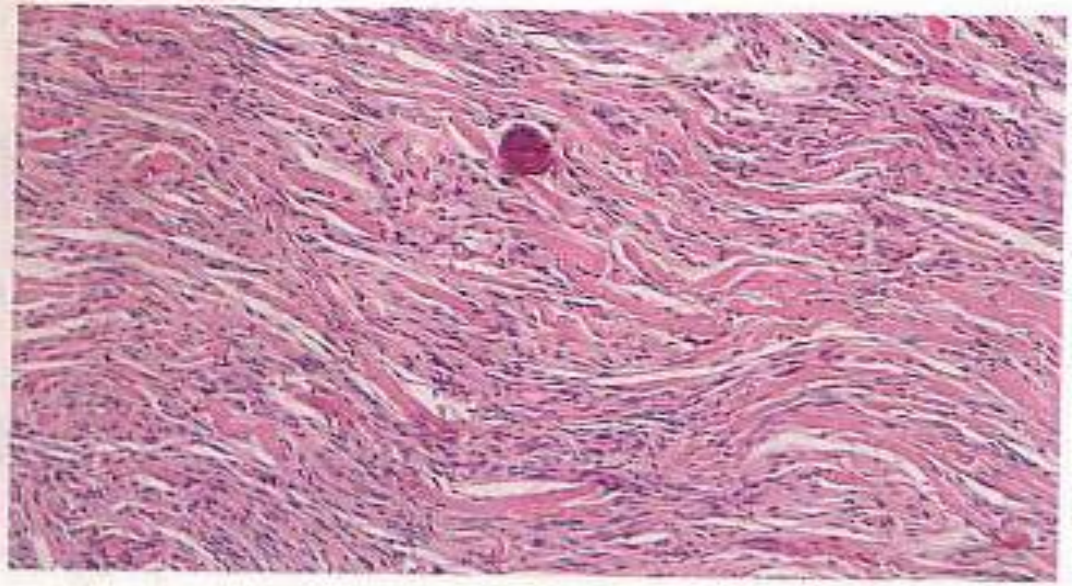


Fig.76. *Fibrous meningioma.* Parallel and interlacing bundles of fibroblast-like tumour cells with extensive collagen deposition

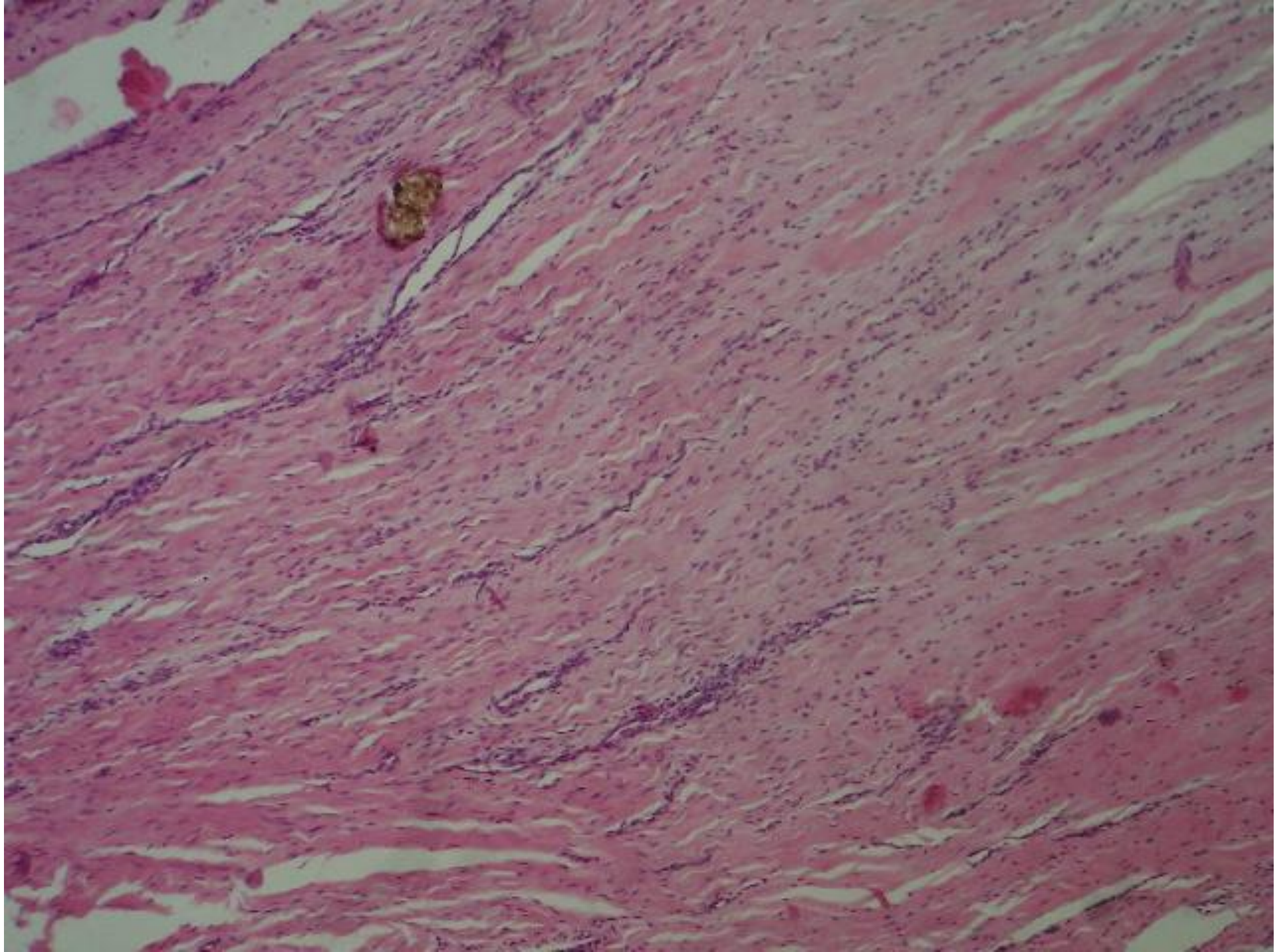
NEUROFIBROMA

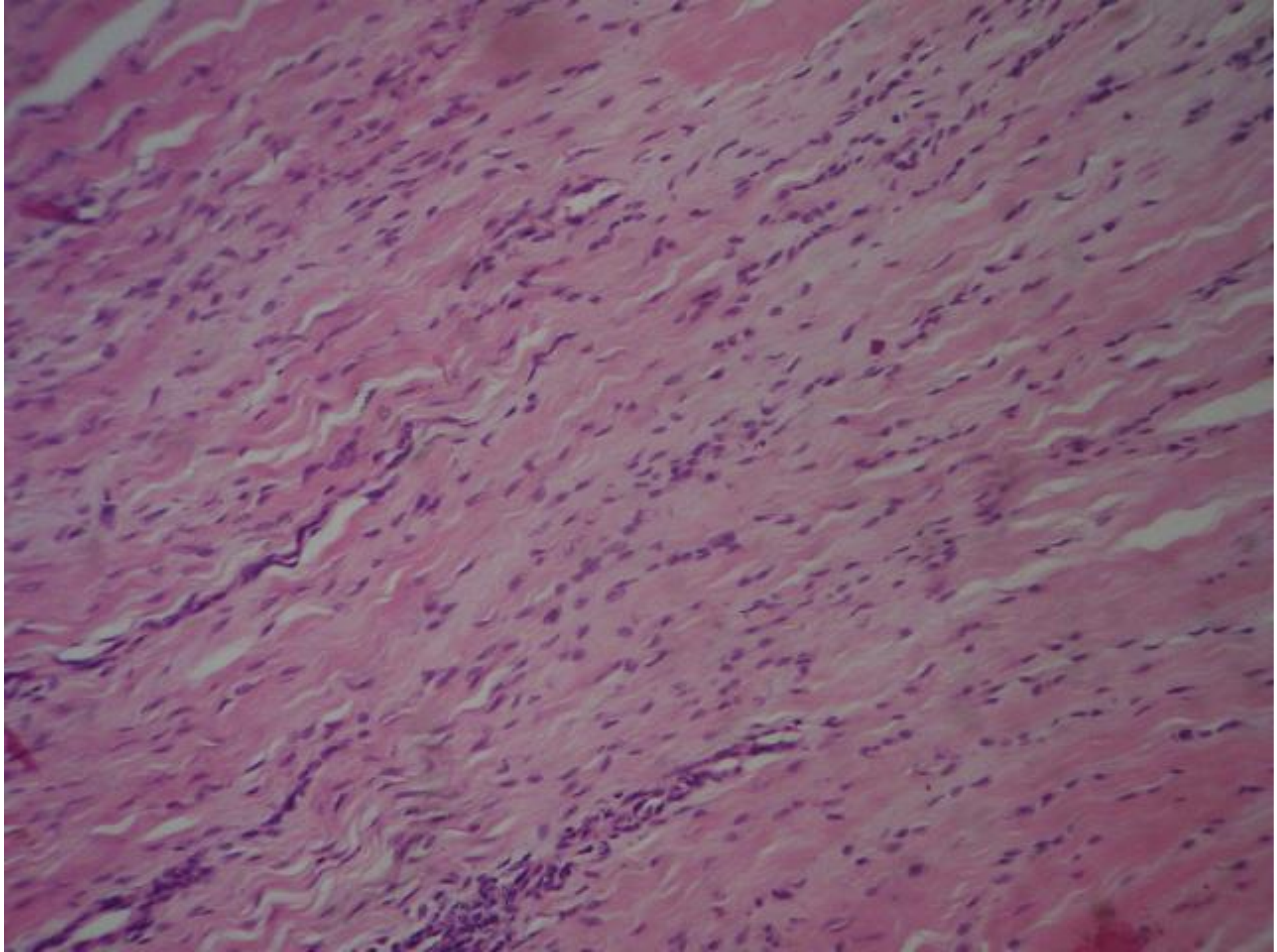
- Neurifibroma: tumor jinak berasal dari proliferasi semua element peripheral nerve (axon, sel Schwann, fibroblast, perineurak cell).
- Lokasi:
  - Superficial: tumor kecil, pedunculated pada kulit --- disebut cutaneous neurofibroma
  - Deep

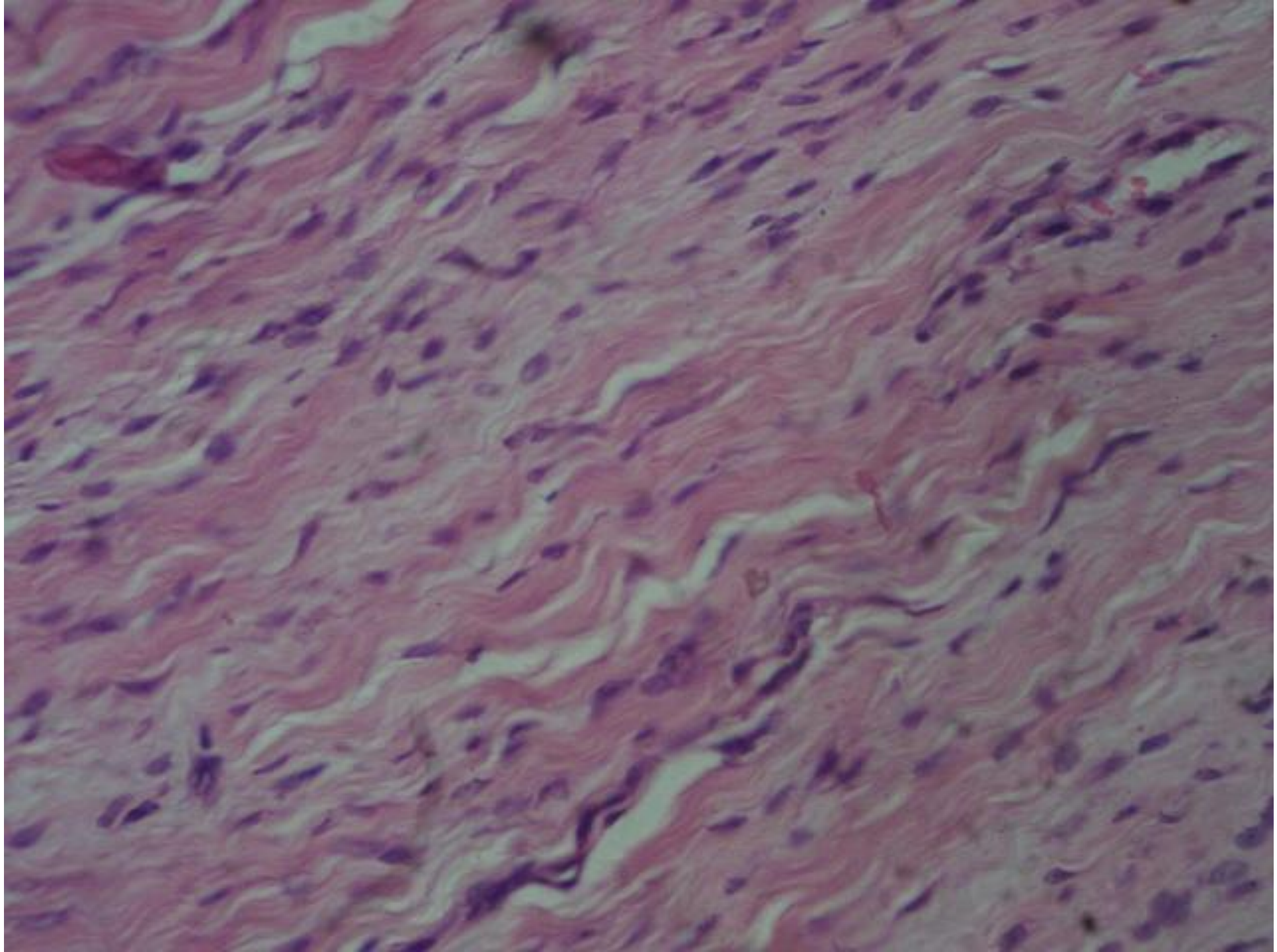
- Jenis:
  - Cutaneous Neurofibroma
    - Terdapat dalam dermis / lemak subcutan.
    - Berbatas jelas, tidak berkapsul
  - Plexiform Neurofibroma
    - Berupa pembesaran saraf perifer, yang berlekuk-lekuk.

morphology

- Macroscopy:
  - Tumor padat, tidak berkapsul
- Microscopy:
  - Tumor terdiri dari proliferasi sel schwann yang berinti spindle & bergelombang, dan sel fibroblast.
  - Stroma diantara sel tumor mengandung banayak sabut kolagen dan massa myxoid







Neurofibromatosis

- NF tipe 1
  - Autosomal dominant
  - Sering berupa plexiform neurofibroma, dengan cafe au laits spots.
  - Kadang dijumpai congenital malformation: megacolon, lesi pembuluh darah.
- NF tipe 2
  - Kelainan pada kromosom 22
  - Sering disertai kelainan saraf perifer lain: bilateralacoustic neuroma, meningioma, astrocytoma.

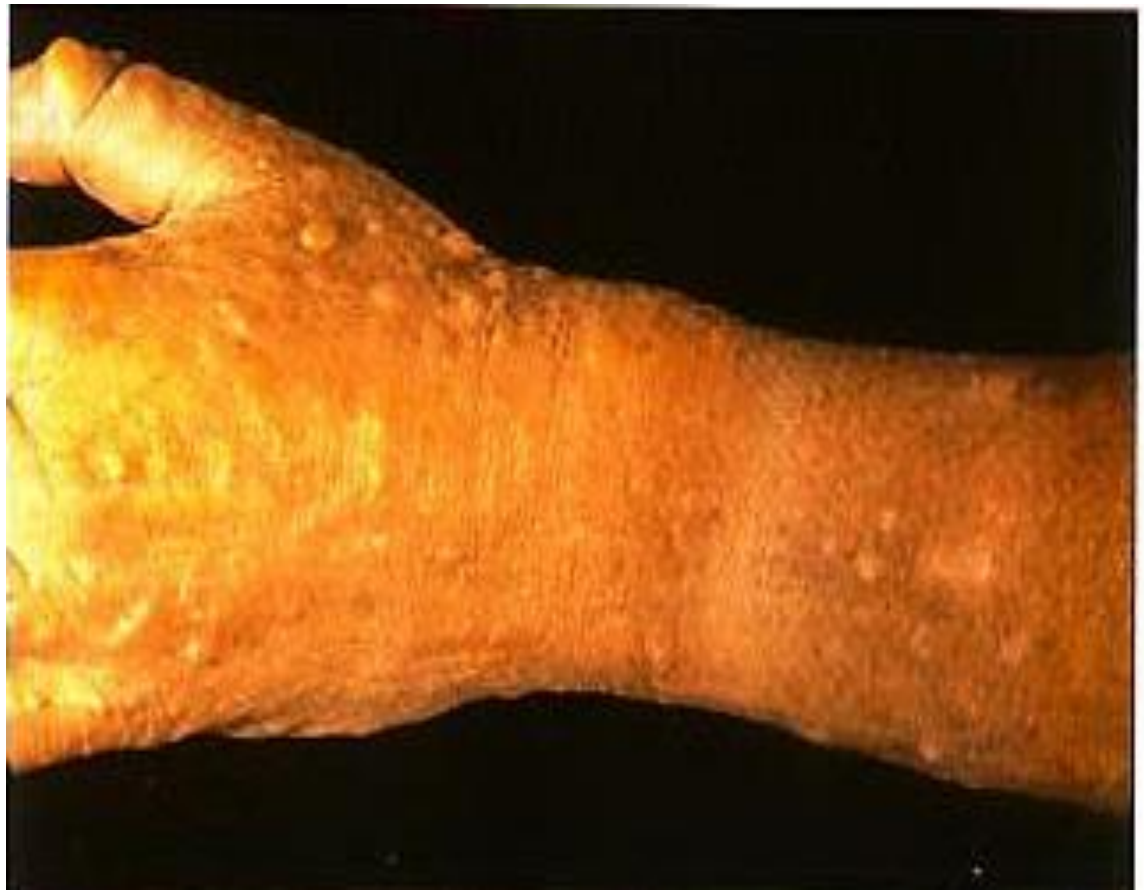


FIGURE 19–141 Neurofibromatosis, gross

Seen here are multiple nodules on the skin surface of the forearm and hand of a patient with neurofibromatosis type I (NF1). There is loss of function of the *NF1* tumor suppressor gene and its protein product neurofibromin, which has a guanosine triphosphatase-activating protein function. The yellow-orange staining of the skin is povidone-iodine (Betadine) solution applied in surgery (this is an amputation specimen) because a neurofibrosarcoma was present in the deep soft tissue of the wrist. The presence of pale brown macules on the skin, known as *café-au-lait spots*, particularly when there are six or more of these spots that are 1.5 cm or larger, is highly indicative of NF1.

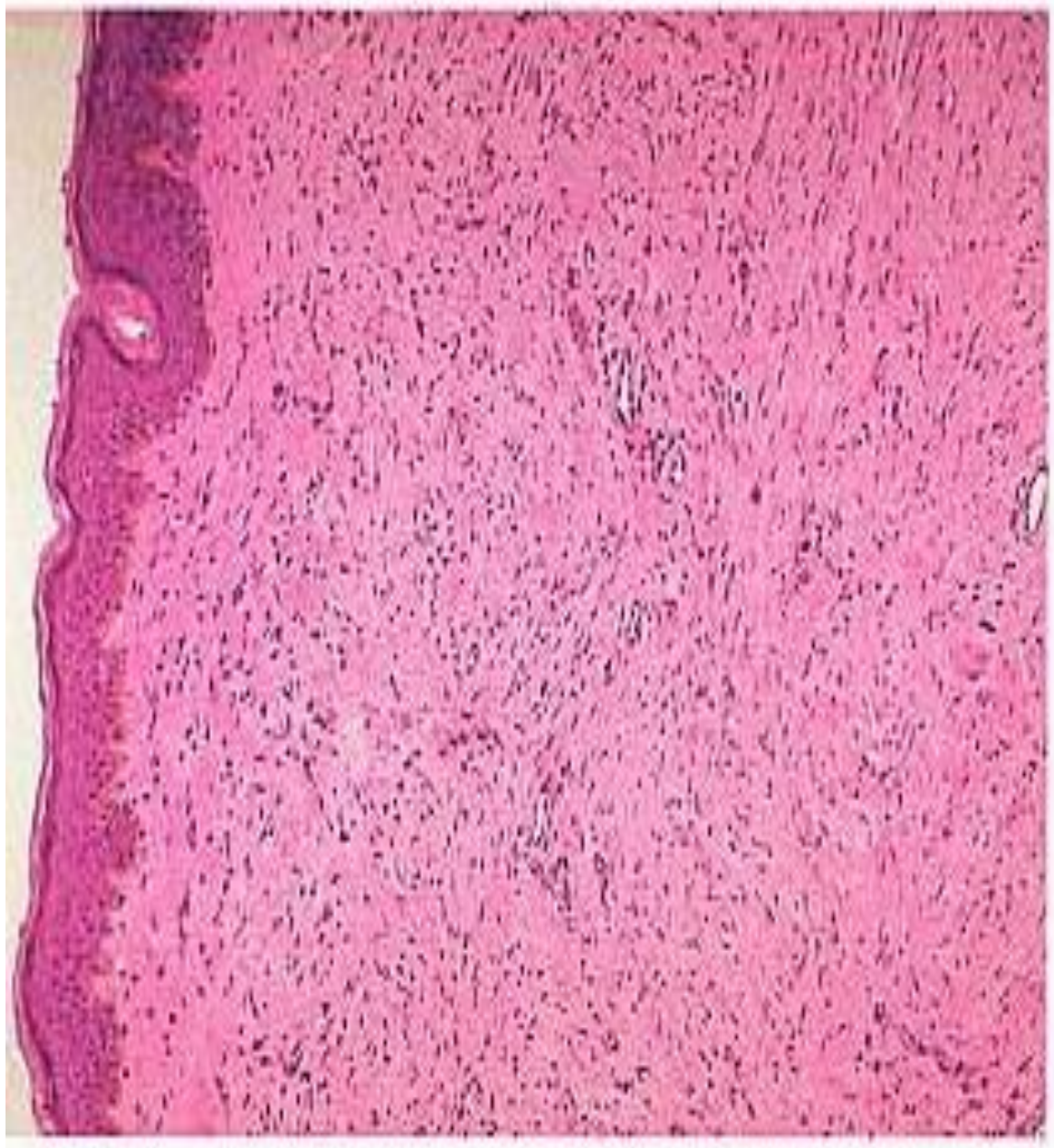
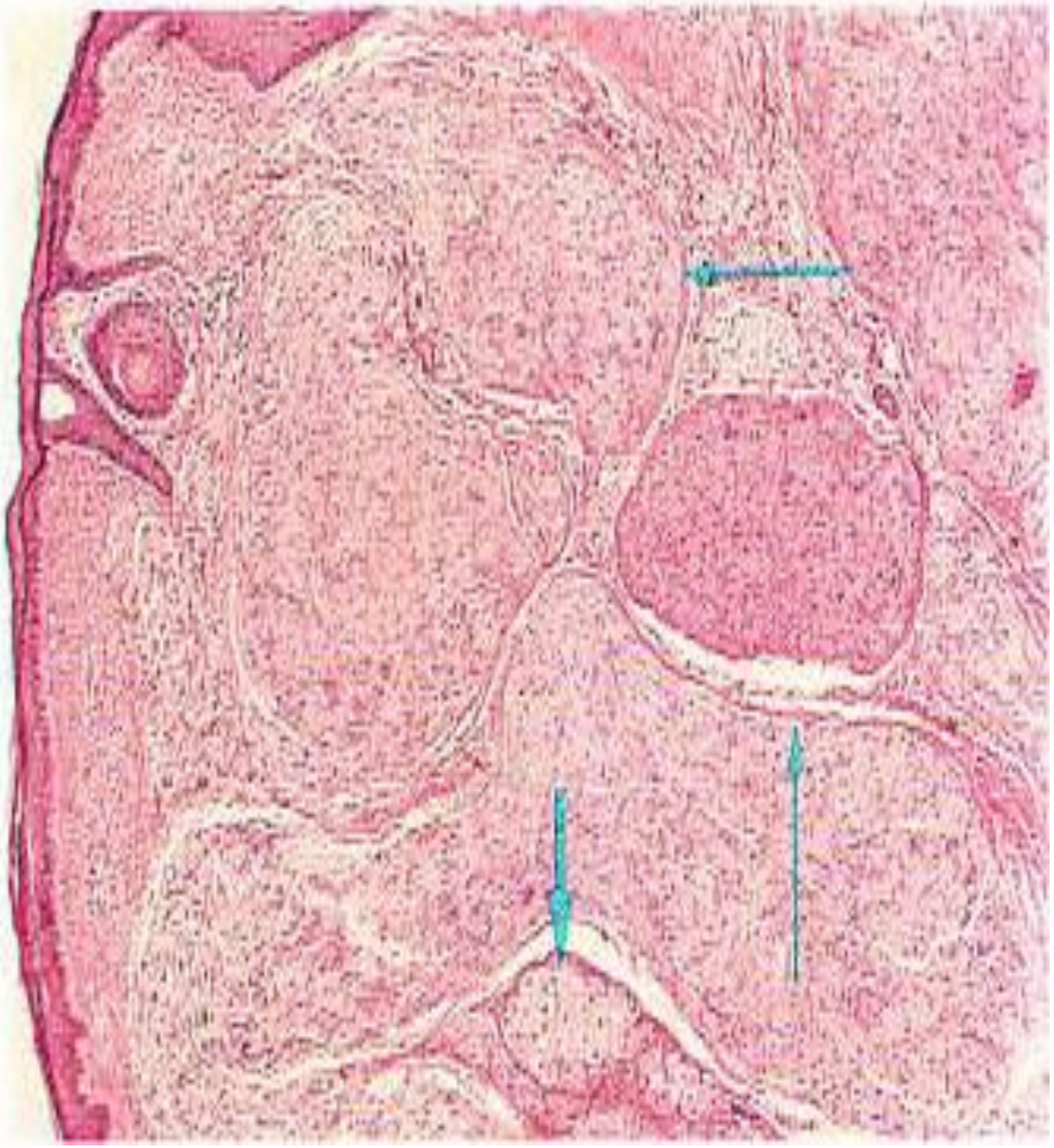


FIGURE 19–142 Neurofibroma, microscopic

The skin overlying a cutaneous neurofibroma may show some hyperpigmentation, but the actual lesion is in the dermis. This most common type of neurofibroma consists of bundles of wavy, elongated spindle cells with small, dark, oblong nuclei and a lot of intervening pink collagen. This lesion is benign and may occur sporadically or in association with NF1. Patients with NF1 may develop the plexiform type of neurofibroma in large nerve trunks. With NF1, there is an increased risk for development of malignant neoplasms, including malignant degeneration of neurofibromas, malignant peripheral nerve sheath tumors, and gliomas.

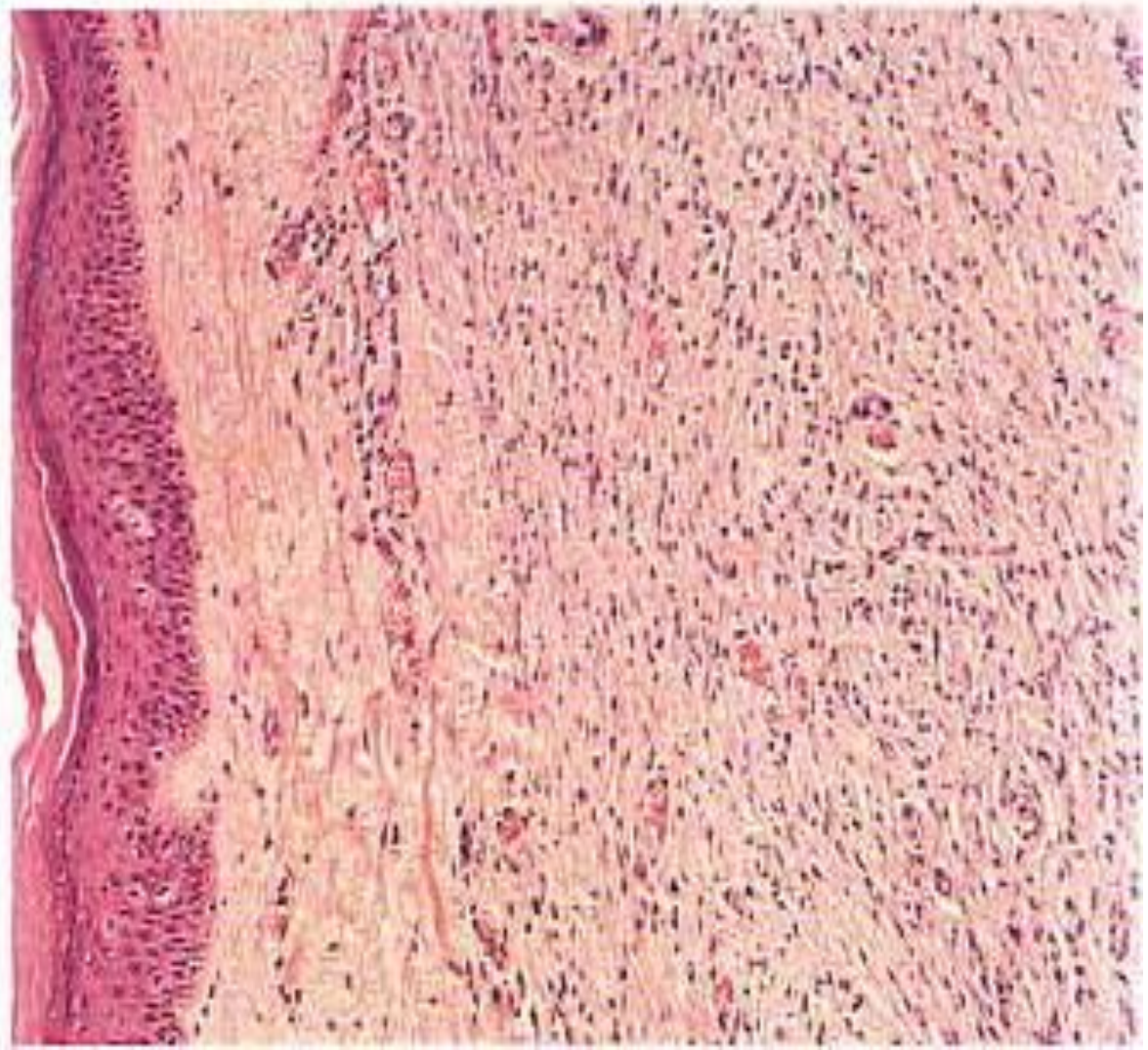
14.73 Neurofibroma: skin

Neurofibroma arises from the connective tissue of the peripheral nerve sheaths, probably from Schwann cells. It may be a single lesion in the skin, usually in adult life; or it may be one of many in neurofibromatosis (von Recklinghausen's disease) which is usually manifest in childhood. The lesion is generally well-circumscribed but it is not encapsulated. This is a plexiform neuroma which consists of thickened tortuous nerves and is typically large, pendulous and flabby. This one, however, was a small lesion in the upper lip of a woman of 22. The epidermis (left) is stretched over a plexus of enormously thickened small nerves. The sheaths (thin arrows) of the nerves are intact but each nerve is greatly expanded by the presence of pale-staining myxoid connective tissue produced by the Schwann cells. A sebaceous gland (thick arrow) is present. HE ×70



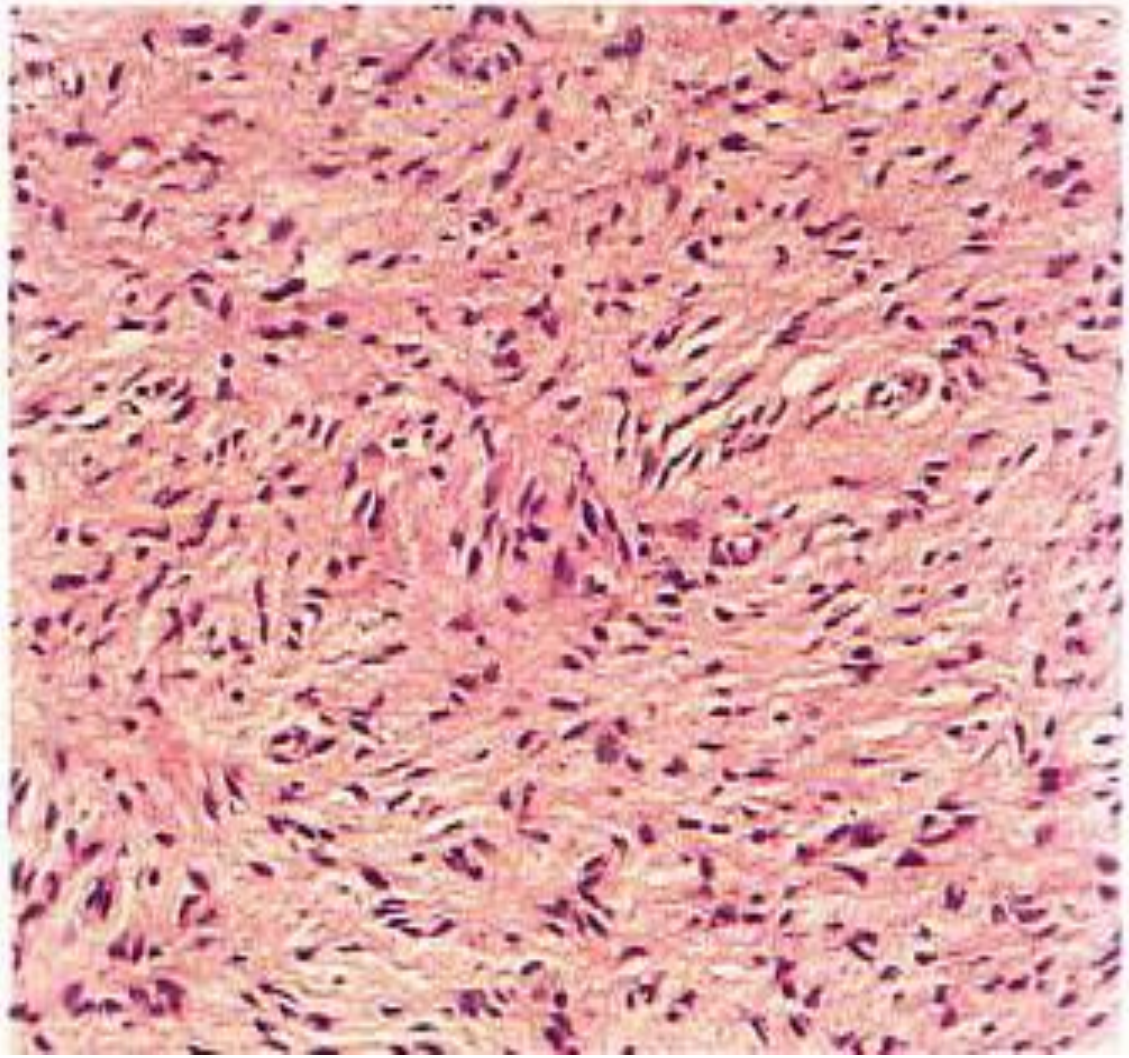
14.74 Neurofibroma: skin

This lesion has the structure of the more common type of neurofibroma. The epidermis is hyperkeratotic and the papillary dermis is spared. In the deeper dermis the lesion consists of cells with ovoid or spindle-shaped nuclei of fairly uniform size and shape. There is no mitotic activity. The cells lie randomly in a loosely-textured connective tissue. Special stains showed the presence of considerable amounts of delicate connective tissue (reticulin) but little collagen. There is no fibrous capsule. Nerve fibres are present in most neurofibromas but require special stains for their demonstration. HE ×150



14.75 Neurofibroma: skin

This was one of two subcutaneous nodules each 1cm dia in the subcutaneous tissues of the chest wall of a man of 34. Histologically they were identical, consisting of irregular spindle-shaped cells in an abundant loose extracellular matrix. There is no mitotic activity. Neither lesion was encapsulated and some dermal appendages were caught up in both. HE ×235



Schwannoma

FIGURE 19–139 Schwannoma, gross

In this view of the base of the brain, there is a mass lesion (▶) arising in the vestibular branch of the eighth cranial nerve at the cerebellopontine angle on the right. This is best termed a *schwannoma* (a so-called acoustic neuroma). Patients often present with hearing loss or tinnitus. Other intracranial sites of involvement can include branches of the trigeminal nerve and dorsal roots. These benign neoplasms can be removed. Extradural schwannomas tend to arise in large peripheral nerve trunks. Some cases are associated with neurofibromatosis type 2.

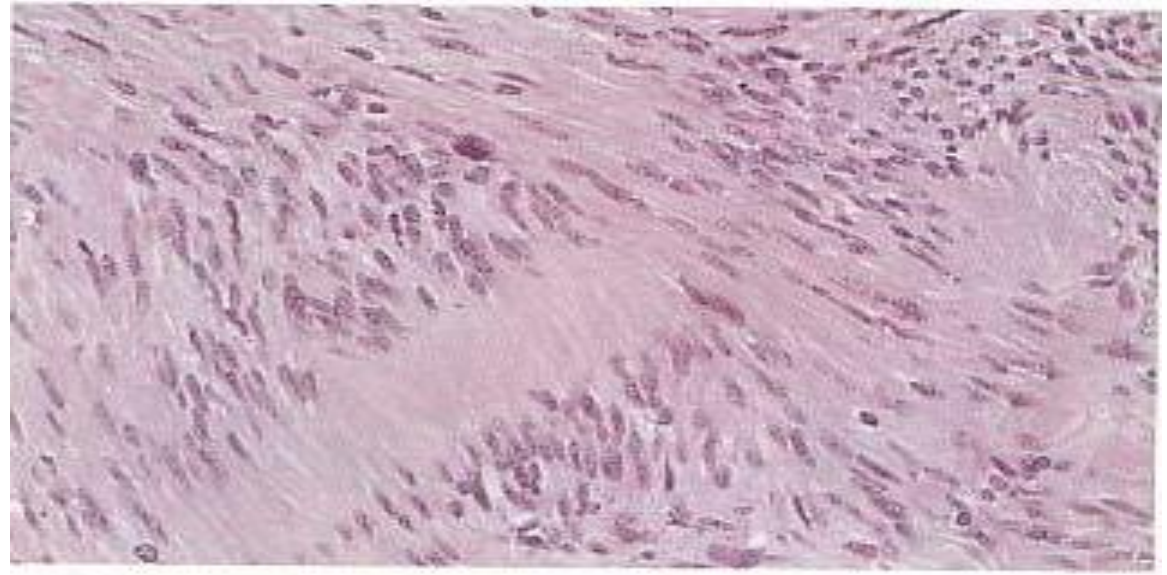


Fig.67. *Schwannoma.* Neoplastic Schwann cells organized in a typical palisading pattern

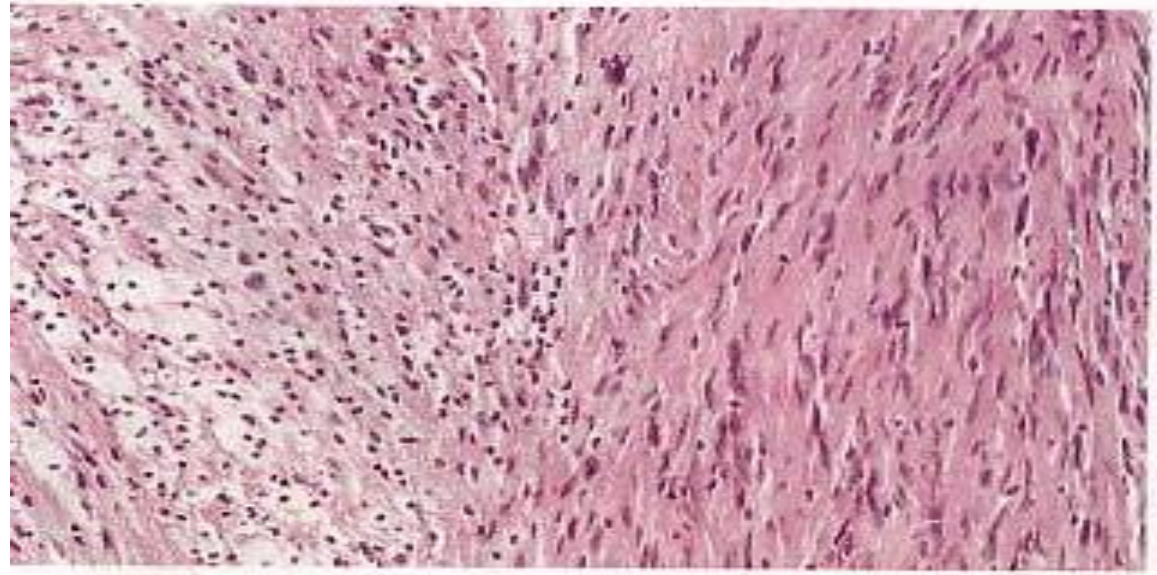


Fig.68. *Schwannoma* of the acoustic nerve. Areas with compact elongated neoplastic Schwann cells (Antoni A) alternate with a less cellular pattern characterized by marked lipidization (Antoni B)

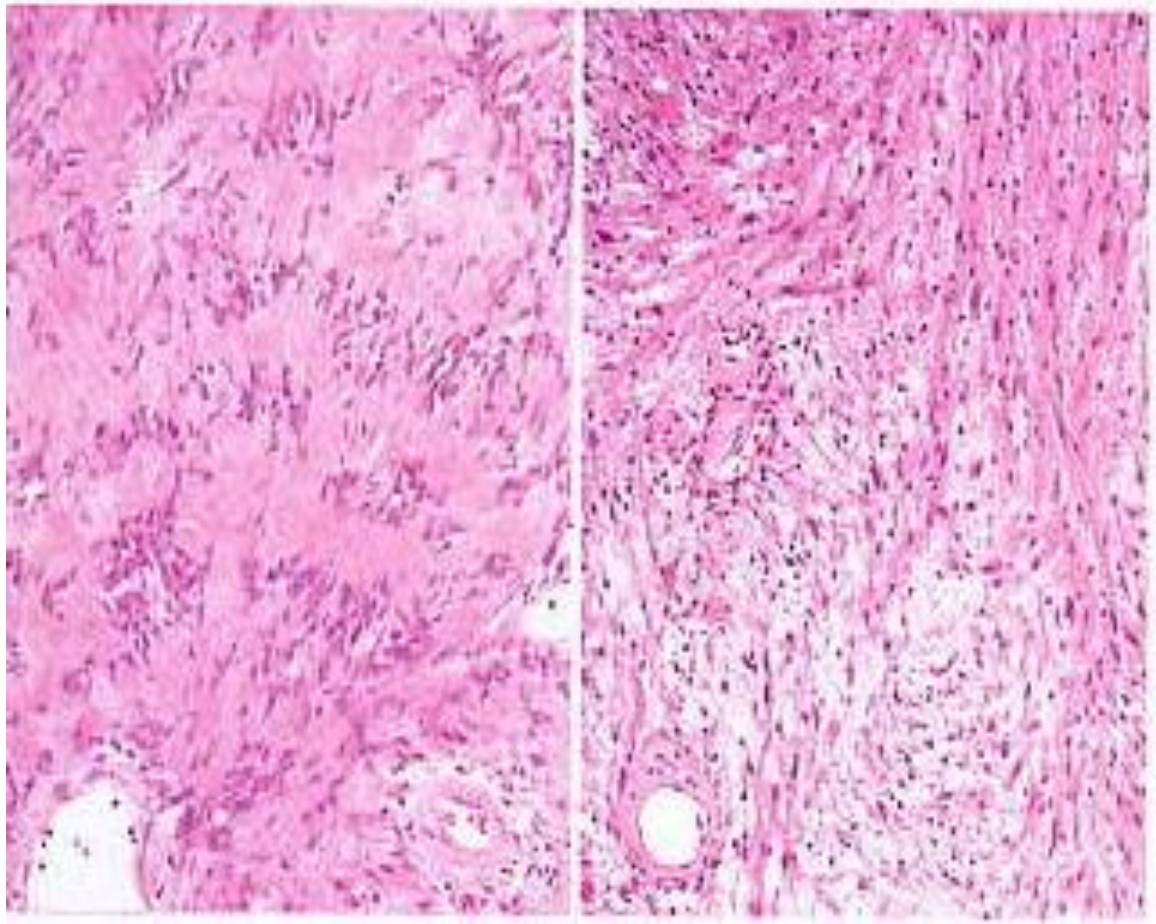


FIGURE 19–140 Schwannoma, microscopic

These are the classic microscopic appearances of a benign schwannoma. Note the more cellular "Antoni A" pattern in the left panel with palisading nuclei surrounding pink areas (Verocay bodies). Shown in the right panel is the "Antoni B" pattern with a looser stroma, fewer cells, and myxoid change. *NF2* gene mutations are typically present in the sporadic occurrences of this neoplasm. Immunohistochemical staining for S100 protein is usually positive in these cells.