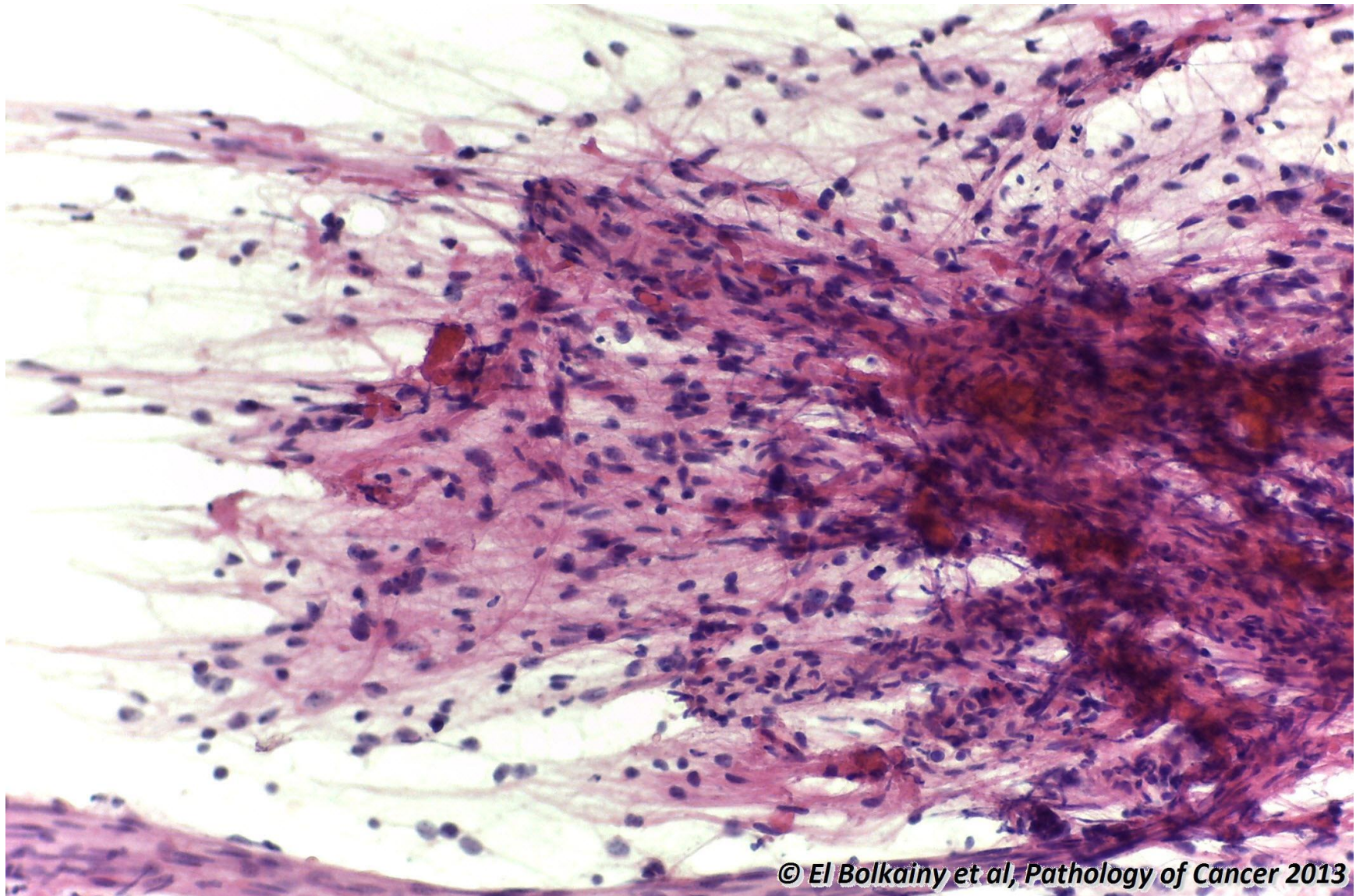


## Chapter 23

# Tumors of central nervous system

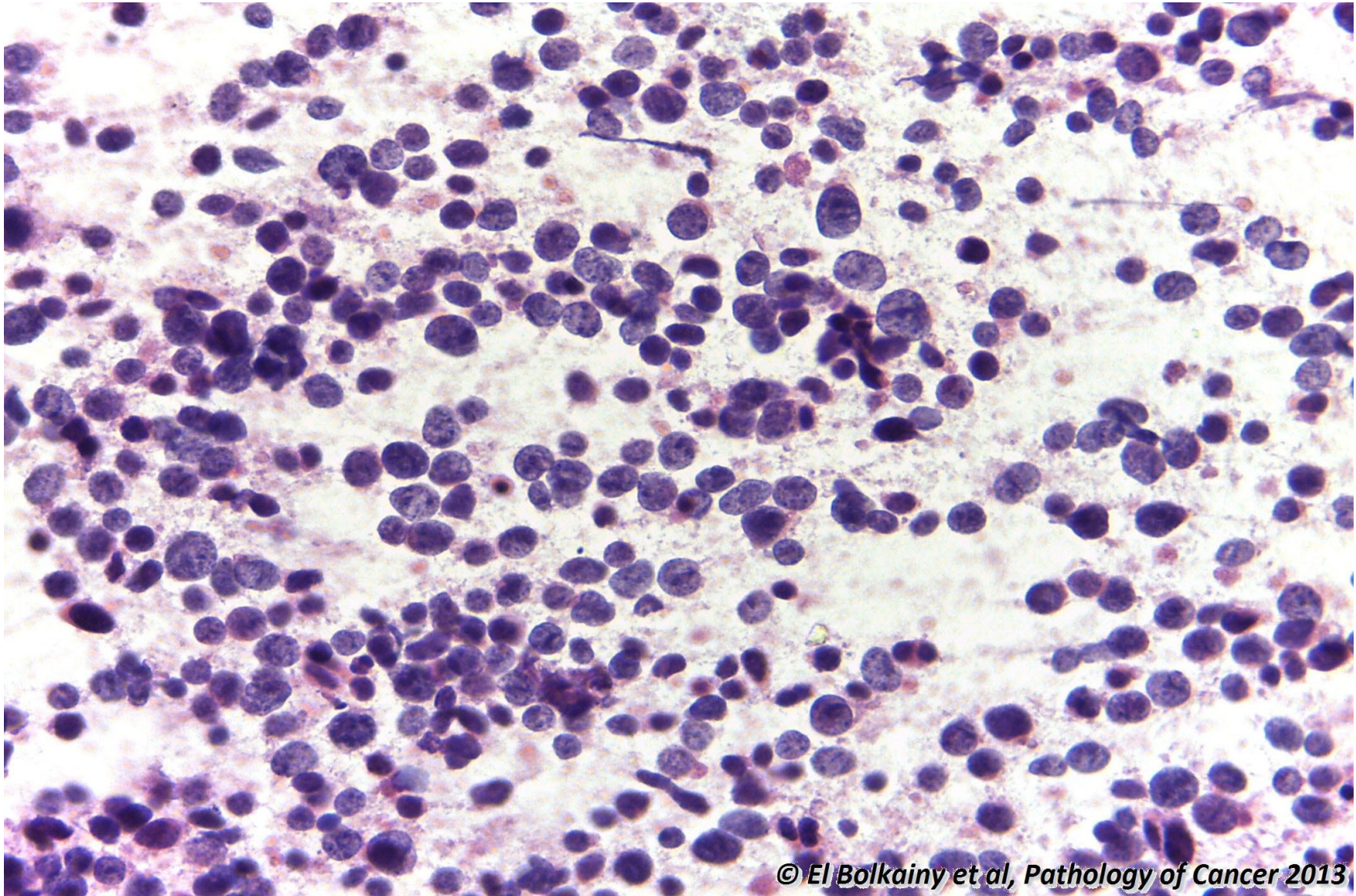
## 23.1 Pilocytic astrocytoma



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**Picture 23-1** Pilocytic astrocytoma, cytology smear showing spindle cells with uniform nuclei, fibrillary processes, eosinophilic bodies and Rosenthal fibers

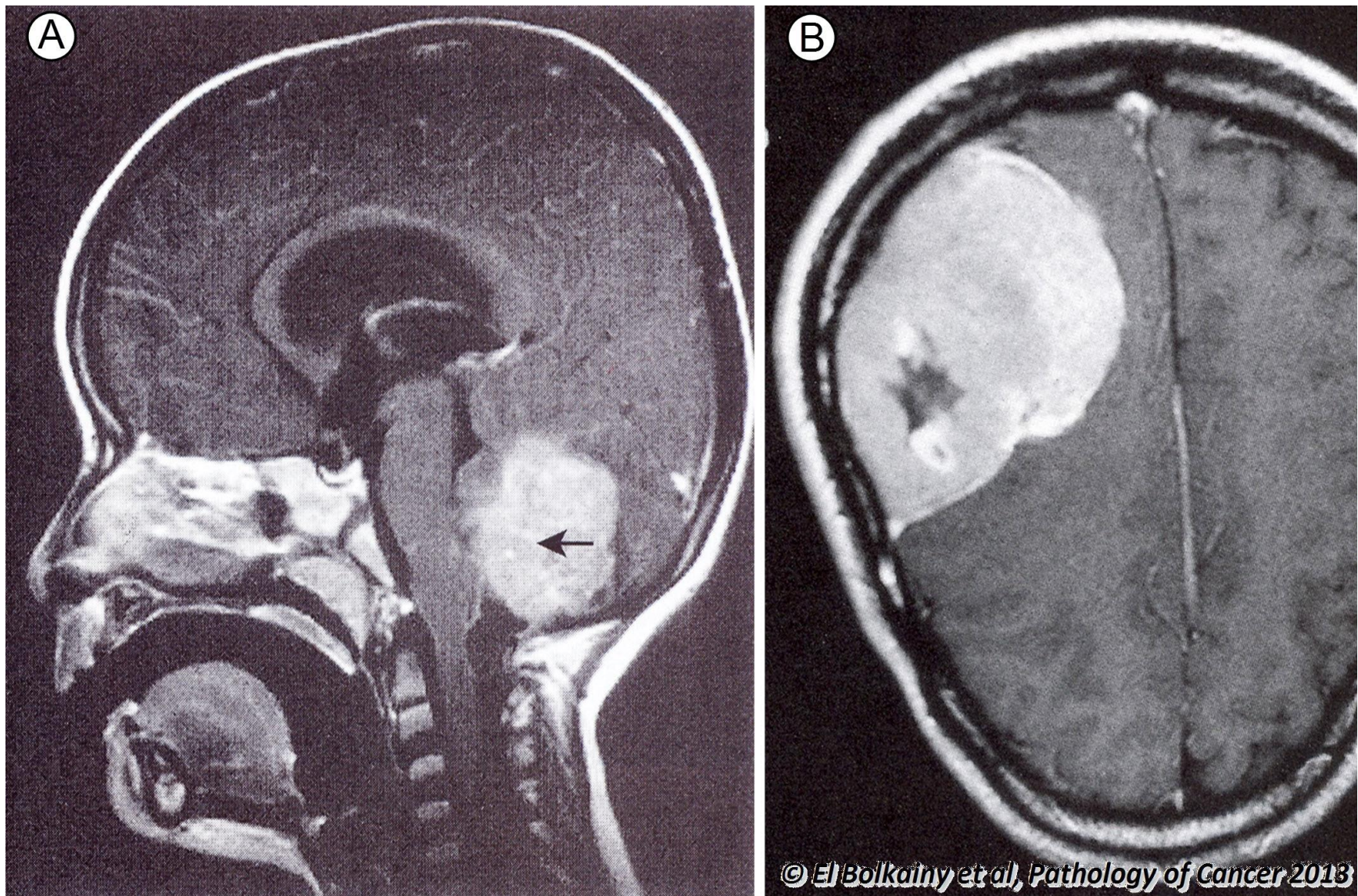
## 23.2 Medulloblastoma



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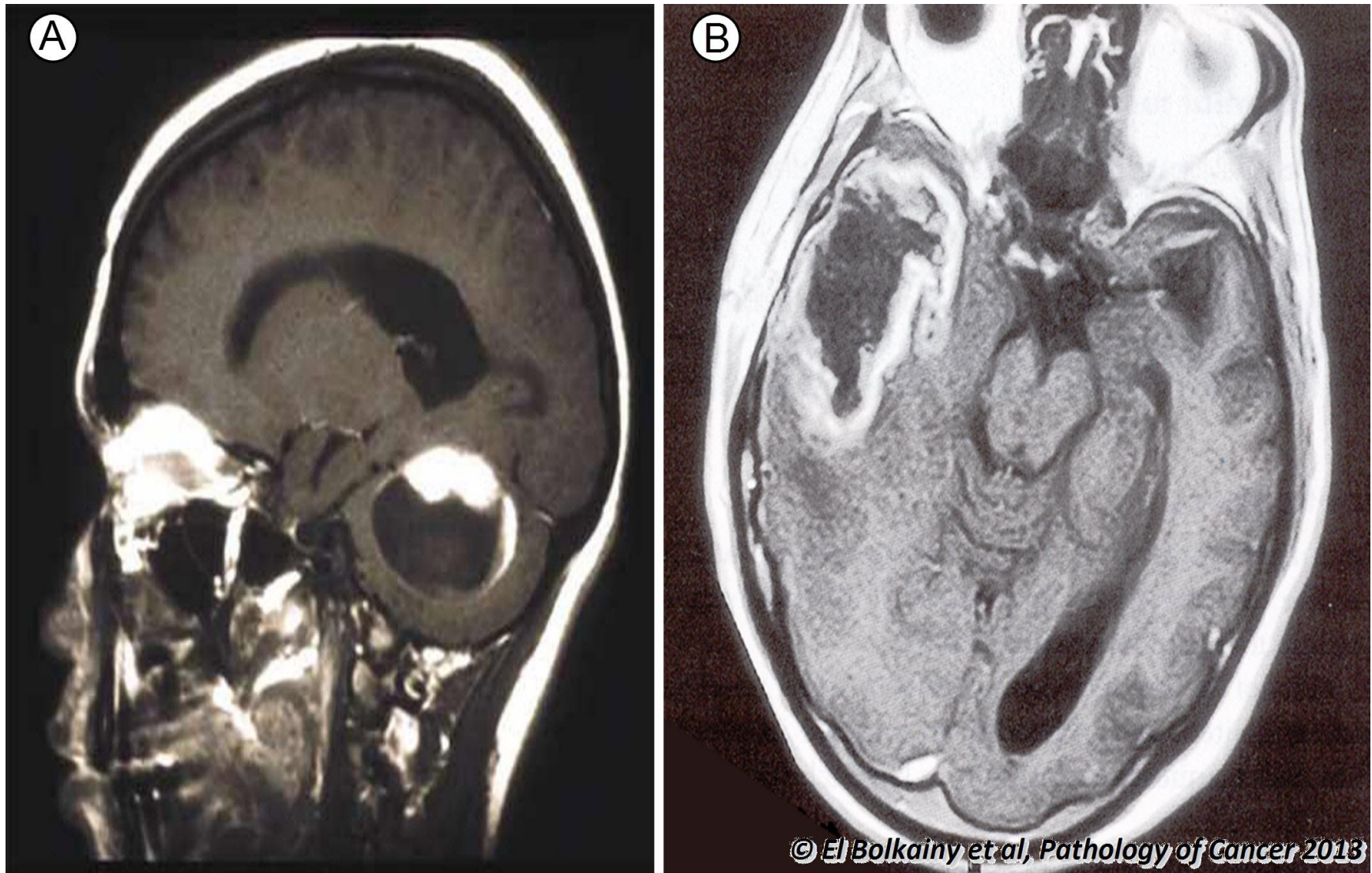
**Picture 23-2** Medulloblastoma, cytology smear, note hypercellularity, cellular pleomorphism and lack of fibrillary processes in the background.

23.3 MRI neuroimaging, tumor localization.



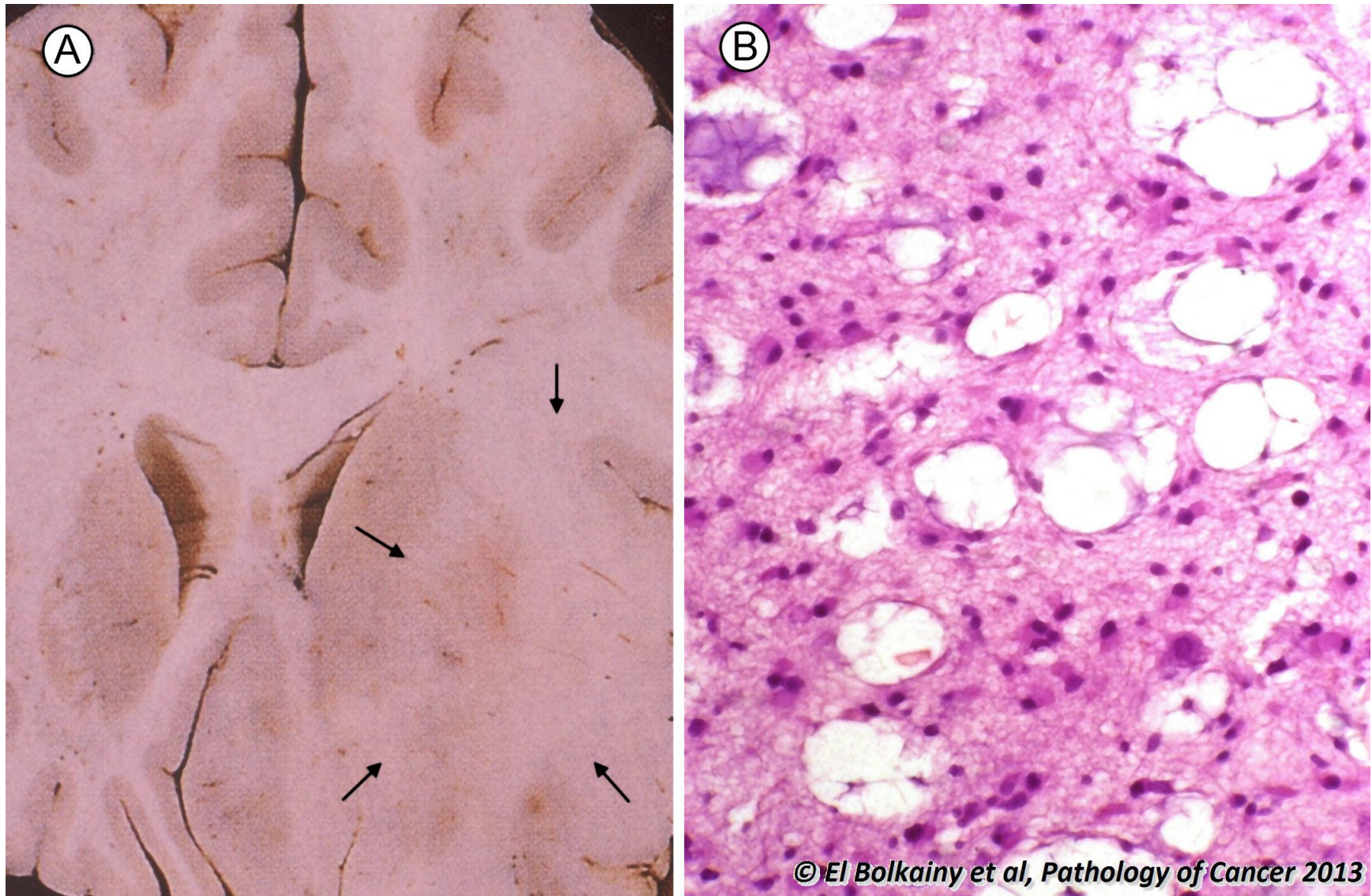
**Picture 23-3** MRI neuroimaging, tumor localization. **A** T2 image of infratentorial cerebellar astrocytoma. **B** T2 image of meningioma showing characteristic paraxial location and intimate relation to meninges.

23.4 MRI neuroimaging, tumor morphology.



**Picture 23-4** MRI neuroimaging, tumor morphology. **A** A FLAIR image of cerebellar cystic pilocytic astrocytoma with a mural nodule. **B** T2 Post-contrast image of glioblastoma showing central degeneration, peripheral contrast enhancement and peritumoral edema.

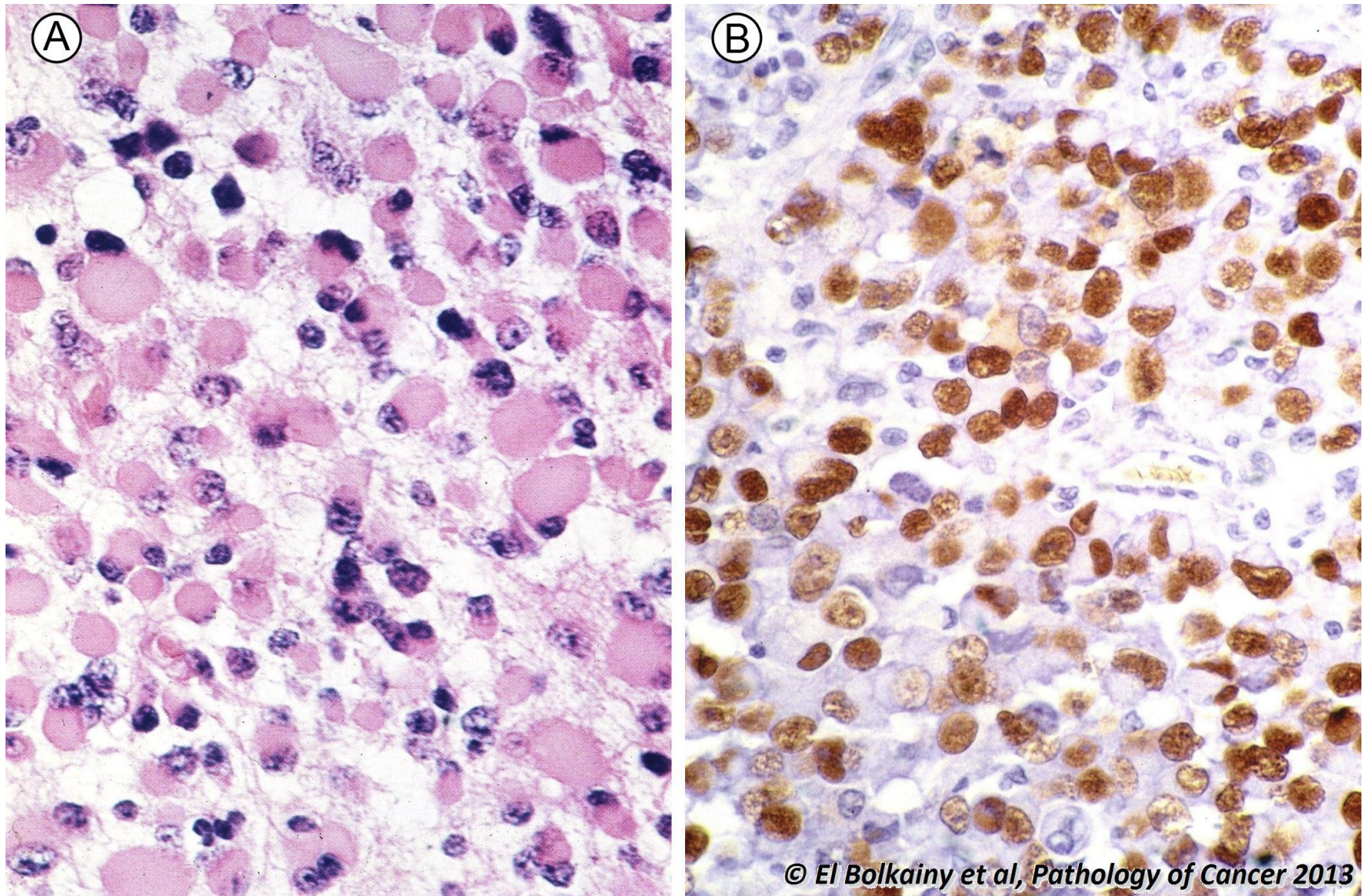
23.5 Diffuse astrocytoma.



**Picture 23-5**

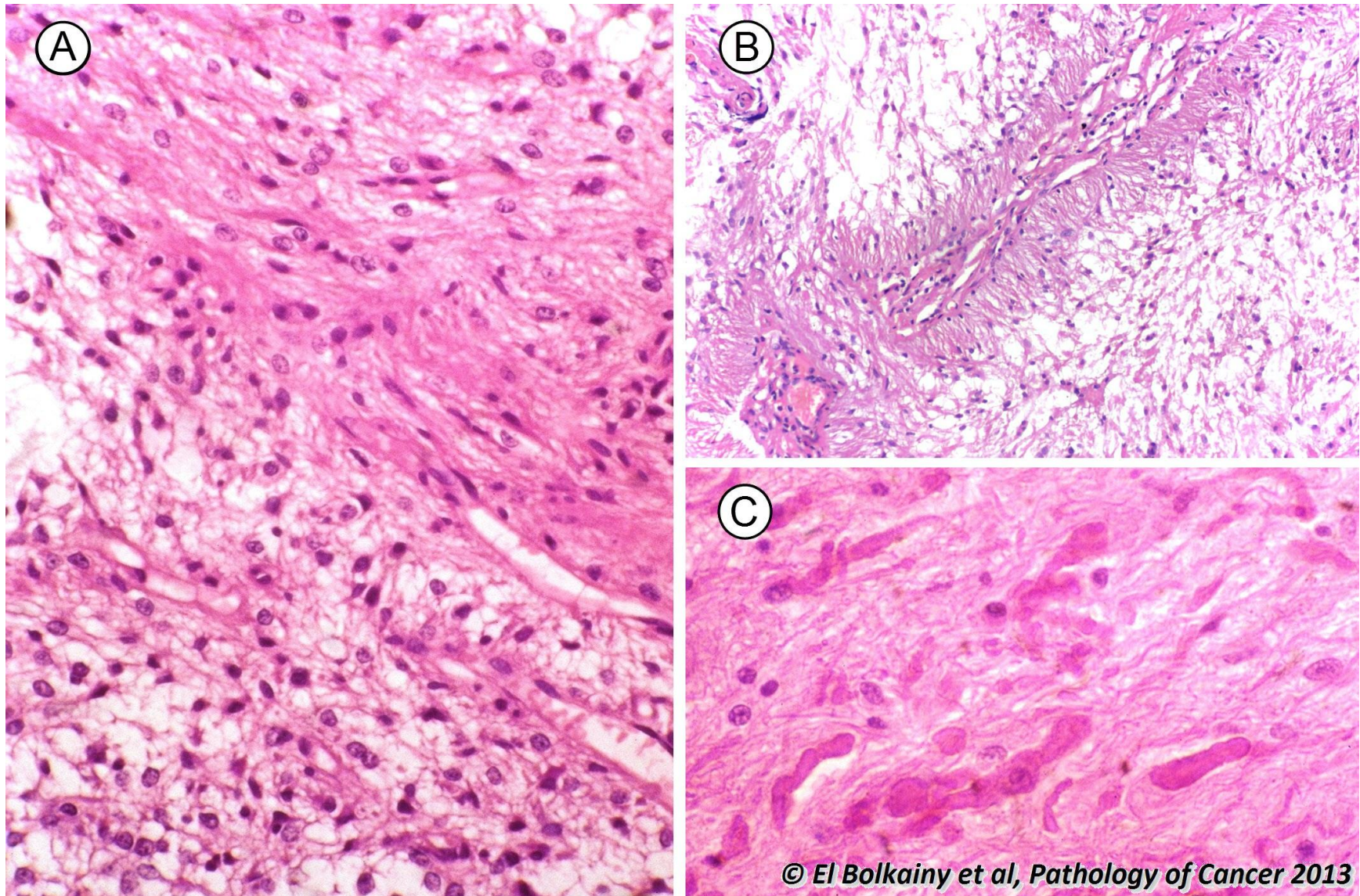
**Diffuse astrocytoma.** **A** Gross appearance, ill-defined gray white mass displacing midline structures, no hemorrhage or necrosis. There is compression of Rt. lateral ventricle (mass effect). **B** Histology, grade II hypercellular astroglial cells with nuclear contact, fibrillary stroma with microcystic change.

23.6 Gemistocytic astrocytoma, WHO grade II histology and immunophenotyping.



**Picture 23-6** Gemistocytic astrocytoma, WHO grade II histology and immunophenotyping. **A** Neoplastic astrocytes have abundant eosinophilic cytoplasm and eccentric nuclei. **B** Nuclei are immunoreactive for p53.

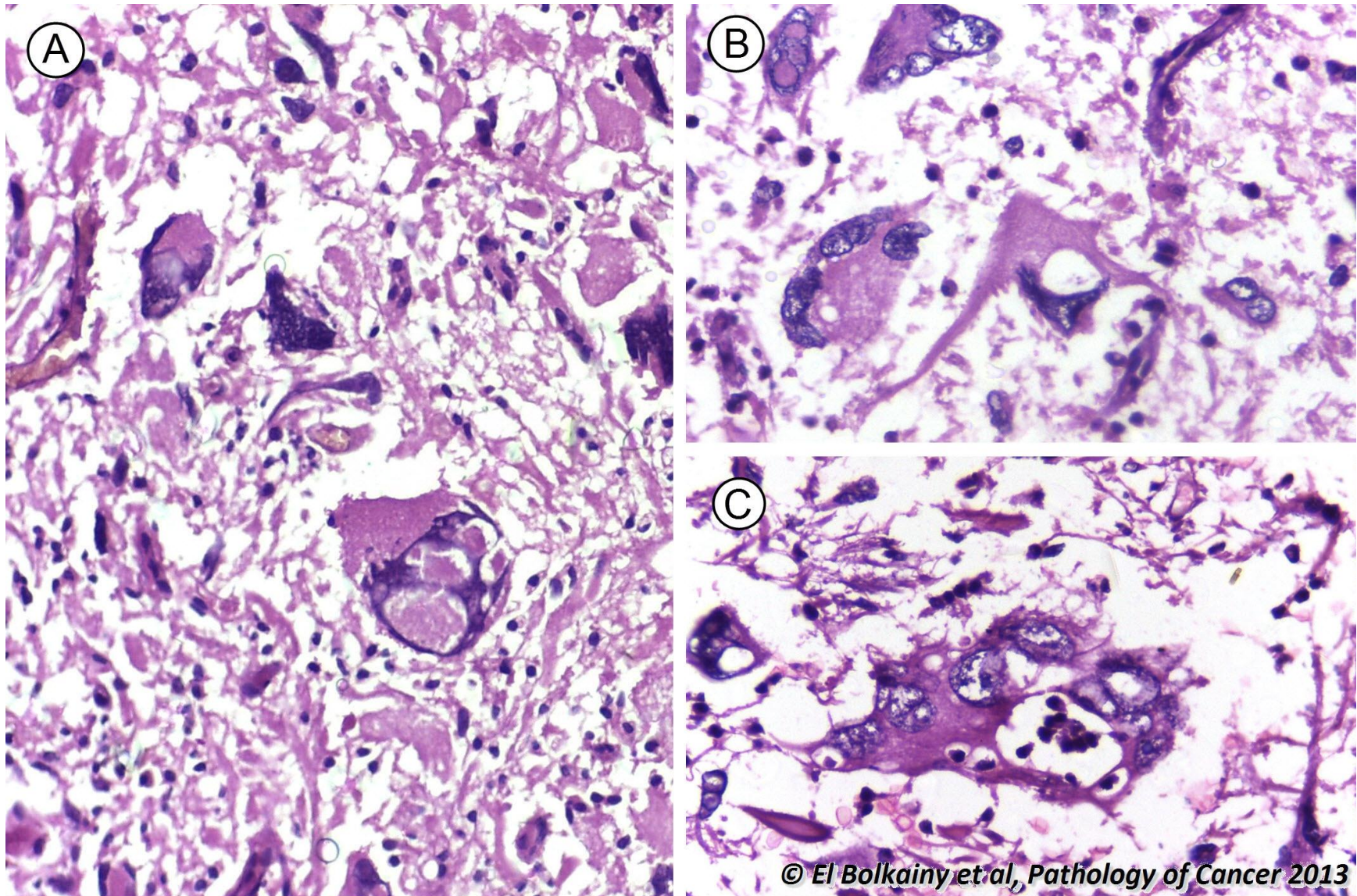
## 23.7 Pilocytic astrocytoma, histology.



**Picture 23-7** Pilocytic astrocytoma, histology. **A** Biphasic pattern of spindle cells alternating with loosely arranged cells. **B** The vascular elements in the tumor (in contradistinction with glioblastoma vessels) are lined by single endothelial cell layer. **C** Rosenthal bodies (eosinophilic carrot-shaped structure).

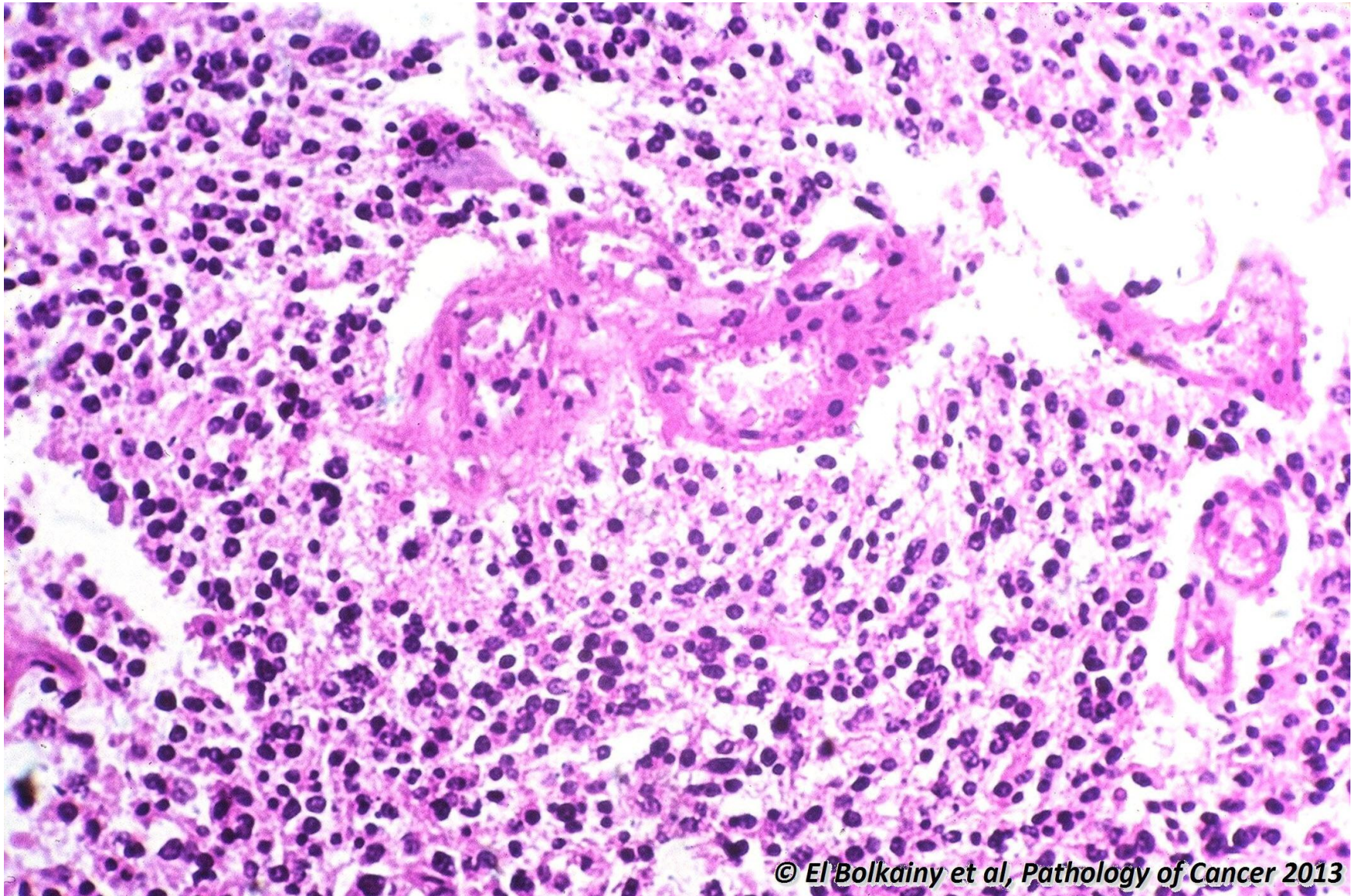


23.8 Pleomorphic xanthoastrocytoma, WHO grade II, histology.



**Picture 23-8** Pleomorphic xanthoastrocytoma, WHO grade II, histology. **A** Tumor cells display marked pleomorphism, multinucleated giant cells and nuclear inclusions. **B** and **C** Lipid vacuoles in cytoplasm are characteristic. The stroma is rich in reticulin, tumor margin well-defined and there is lack of mitosis, necrosis or angiogenesis.

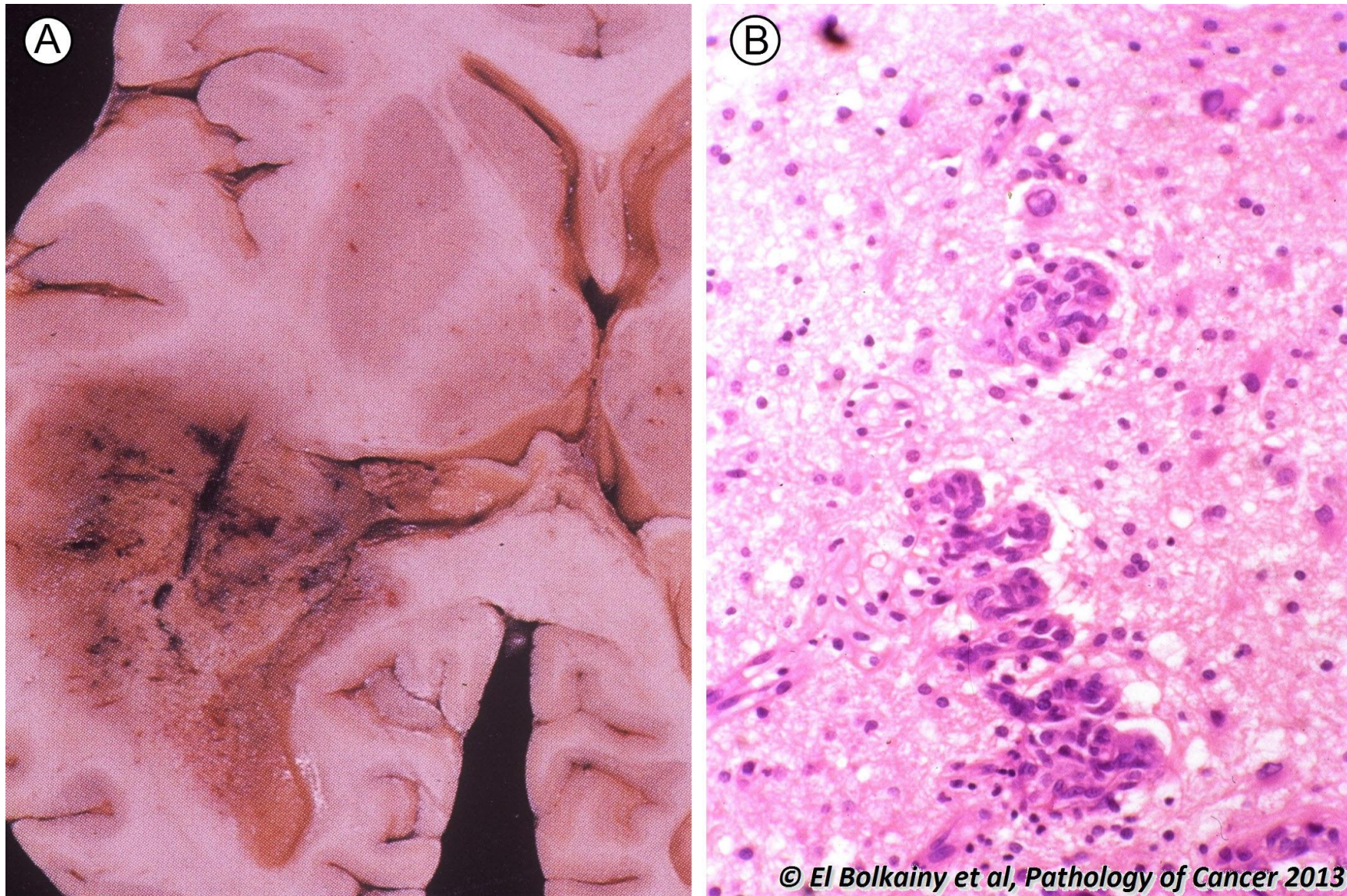
23.9 Anaplastic astrocytoma, WHO grade III, histology.



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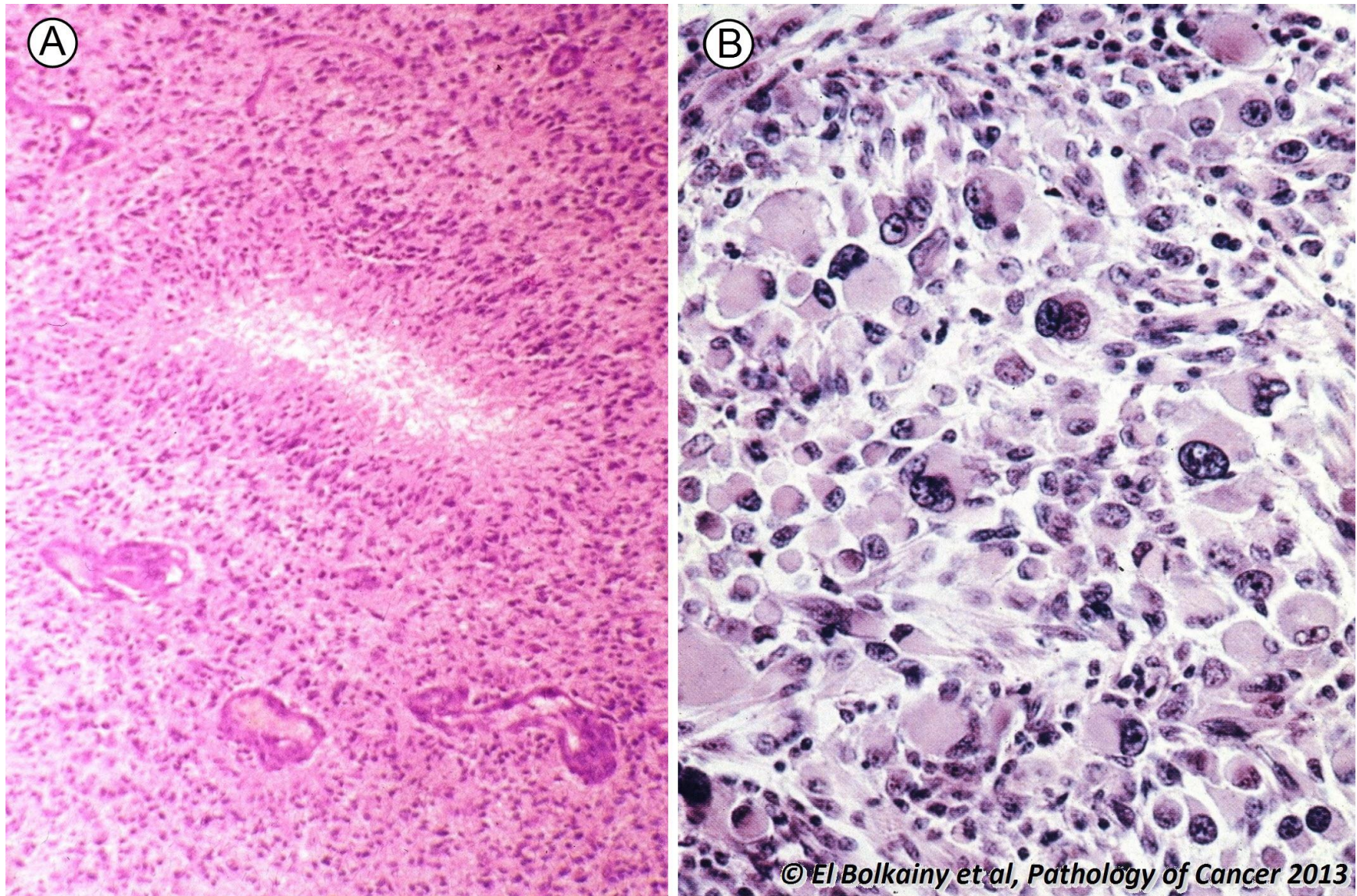
**Picture 23-9** Anaplastic astrocytoma, WHO grade III, histology. There is marked hypercellularity, mitotic activity and minimal cellular pleomorphism.

23.10 Glioblastoma multiforme, WHO grade IV.



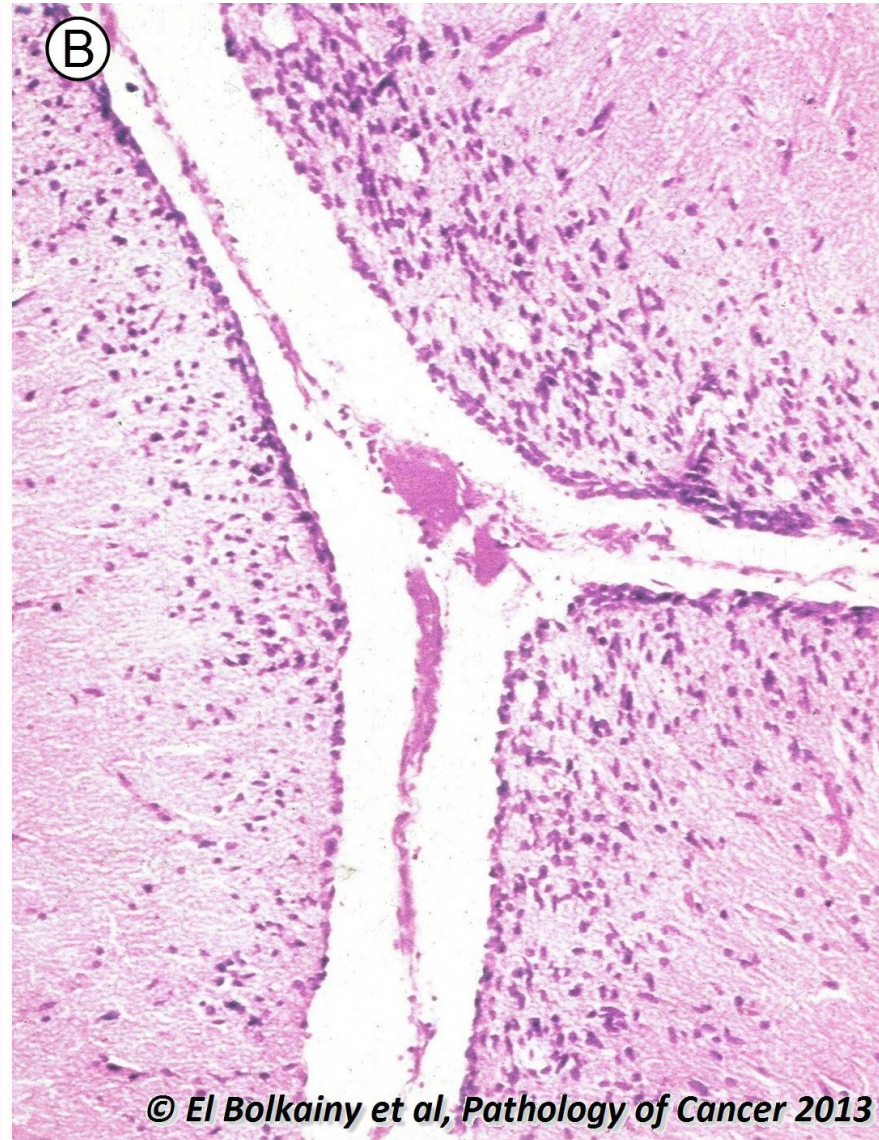
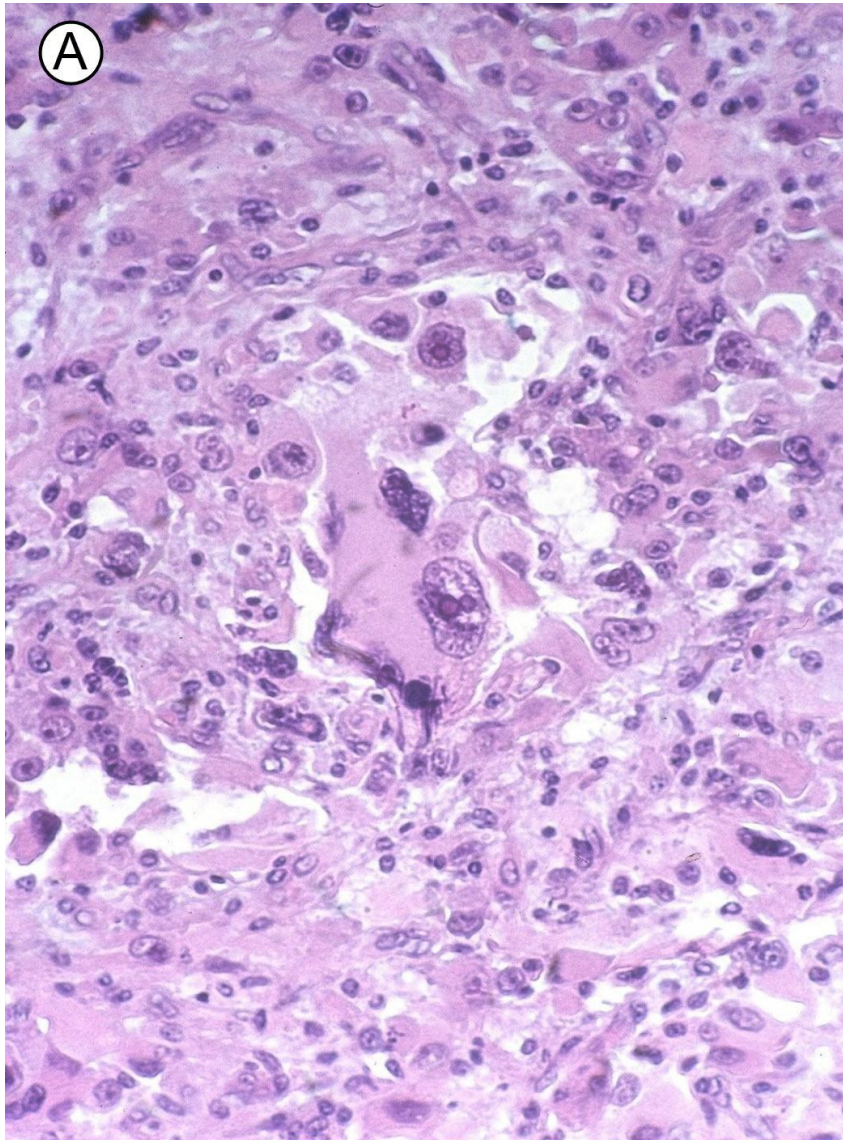
**Picture 23-10** Glioblastoma multiforme, WHO grade IV. **A** Grossly, the tumor is necrotic and hemorrhagic with well-defined margin. **B** Marked vascular proliferation with multilayered endothelial cells.

23.11 Glioblastoma multiforme, WHO grade IV.



**Picture 23-11** Glioblastoma multiforme, WHO grade IV. **A** Histology, focal necrosis with peripheral palisading of spindle shaped glial cells. **B** Giant cells are numerous.

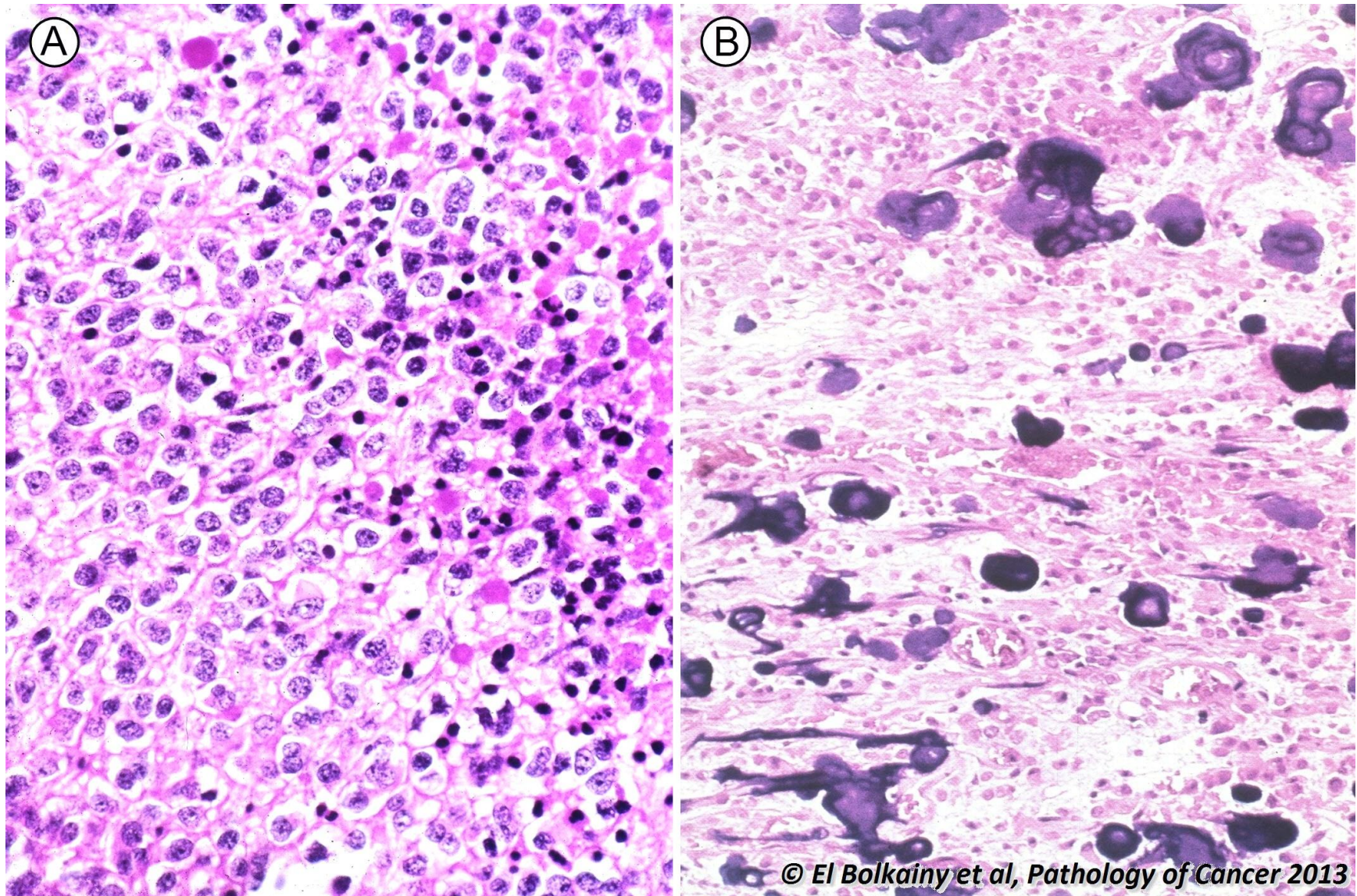
23.12 Other high grade astrocytomas.



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**Picture 23-12** Other high grade astrocytomas. **A** Giant cell glioblastoma, WHO grade IV, displays marked pleomorphism and giant cells. **B** Gliomatosis cerebri, WHO grade III, this variant displays elongated atypical astrocytes which diffusely infiltrate along myelinated axons.

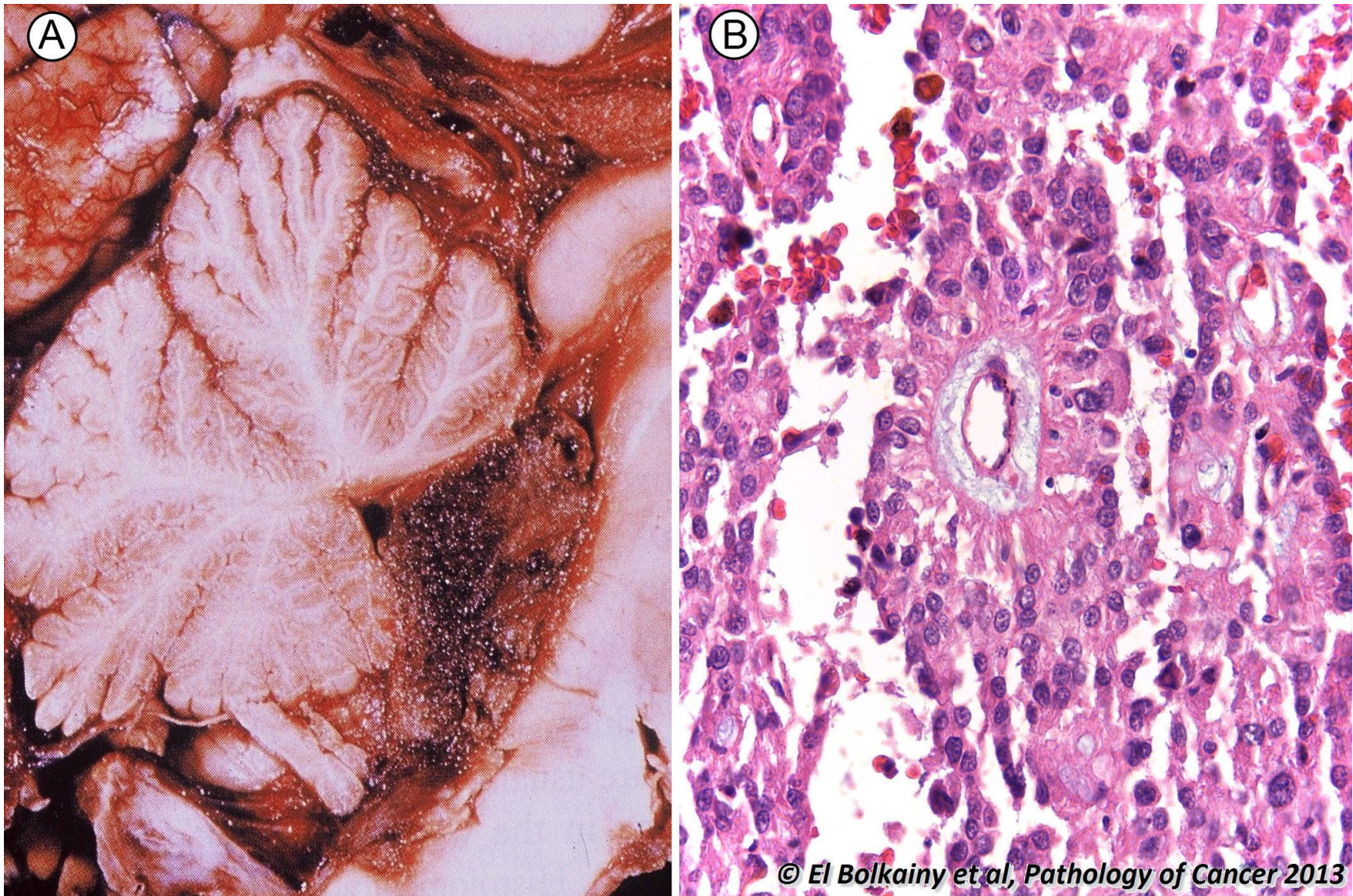
23.13 Oligodendroglioma, WHO grade II, histology.



**Picture 23-13** Oligodendroglioma, WHO grade II, histology. **A** Uniform cell population of round nuclei with perinuclear halos (fried-egg appearance). **B** Microcalcification is common

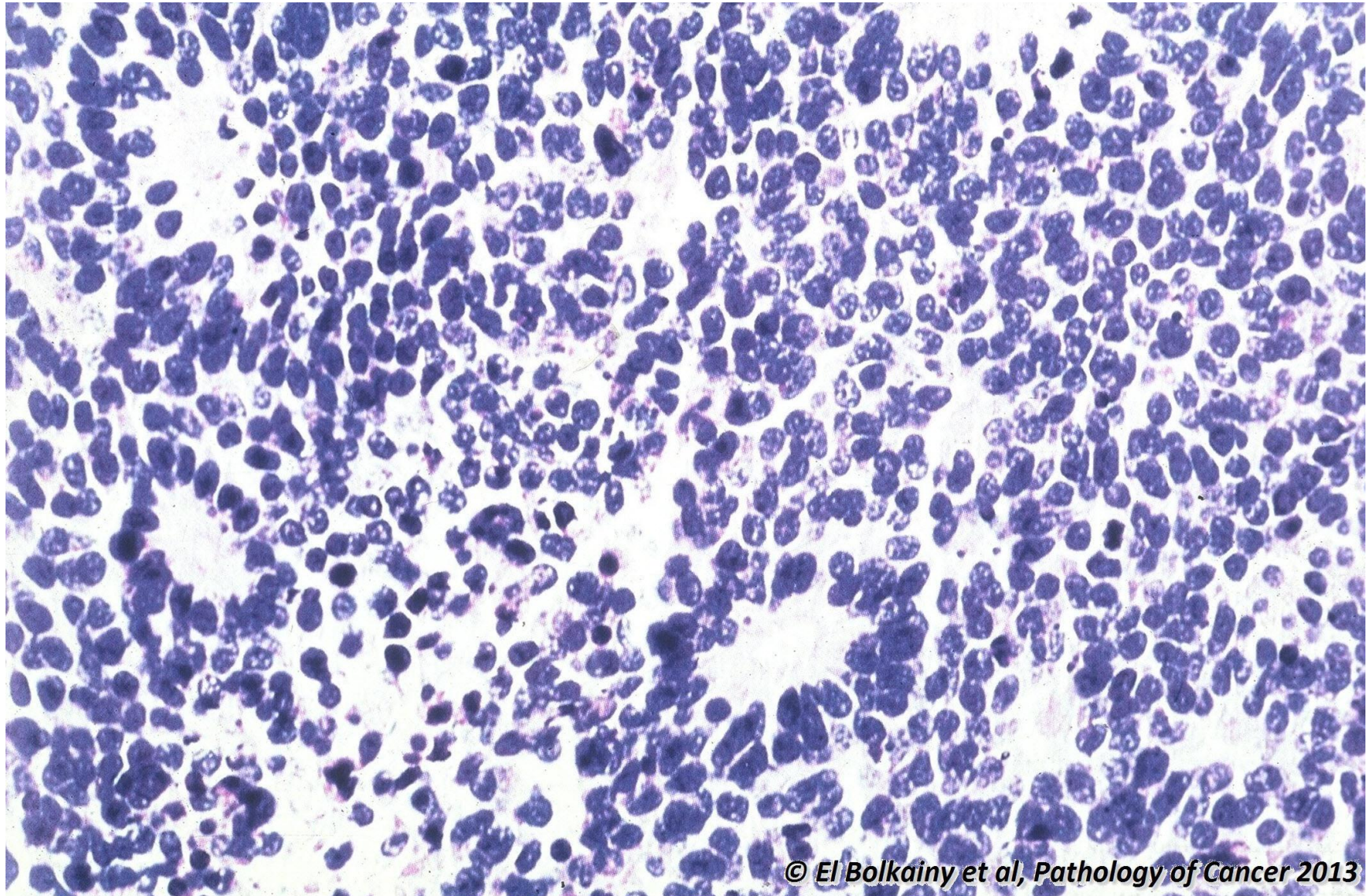
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23.14 Ependymoma, WHO grade II.



**Picture 23-14** Ependymoma, WHO grade II. **A** Gross picture of ependymoma at roof of 4th ventricle . **B** Classic diagnostic pattern of perivascular pseudorosettes. The nuclei are arranged away from basement membrane (suprabasal location).

23.15 Anaplastic ependymoma, WHO grade III, IV, histology.



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**Picture 23-15** Anaplastic ependymoma, WHO grade III, IV, histology. Highly cellular tumor with active mitosis and perivascular multi-layered pseudorosettes.

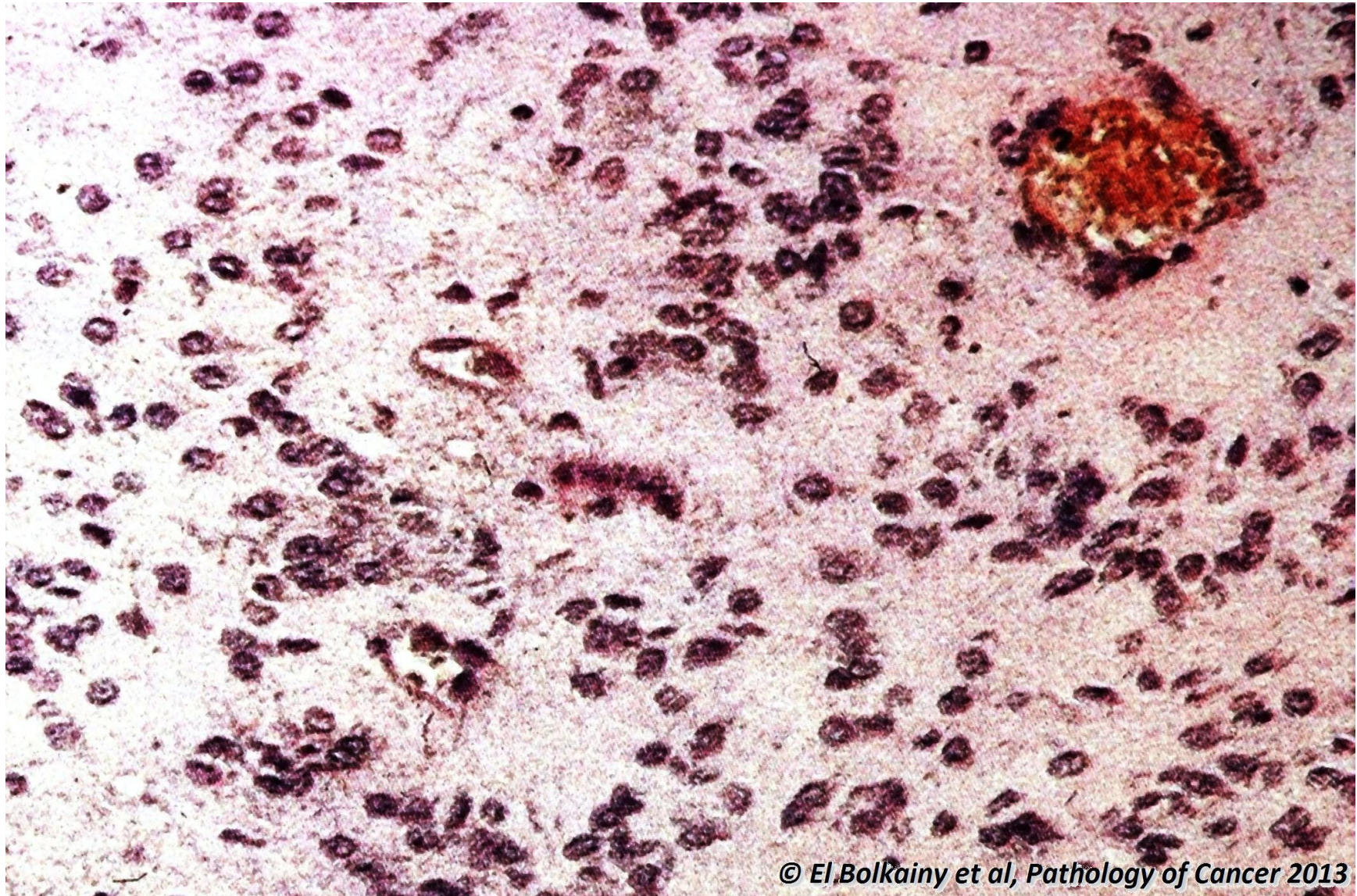


23.16 Ependymoma, electron microscopic features.



**Picture 23-16** Ependymoma, electron microscopic features. The presence of microvilli with cilia is characteristic.

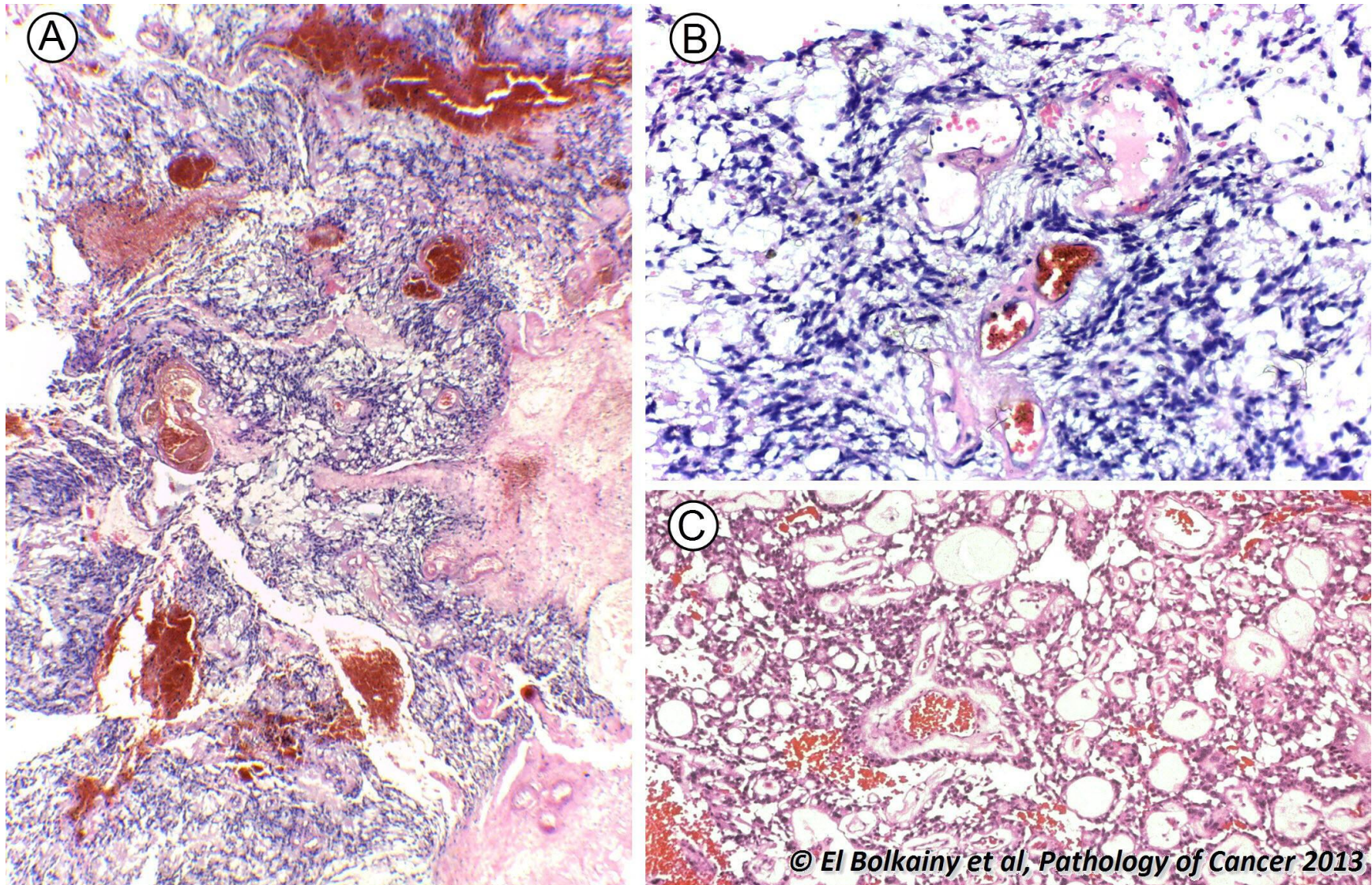
23.17 Subependymoma, WHO grade I, histology,



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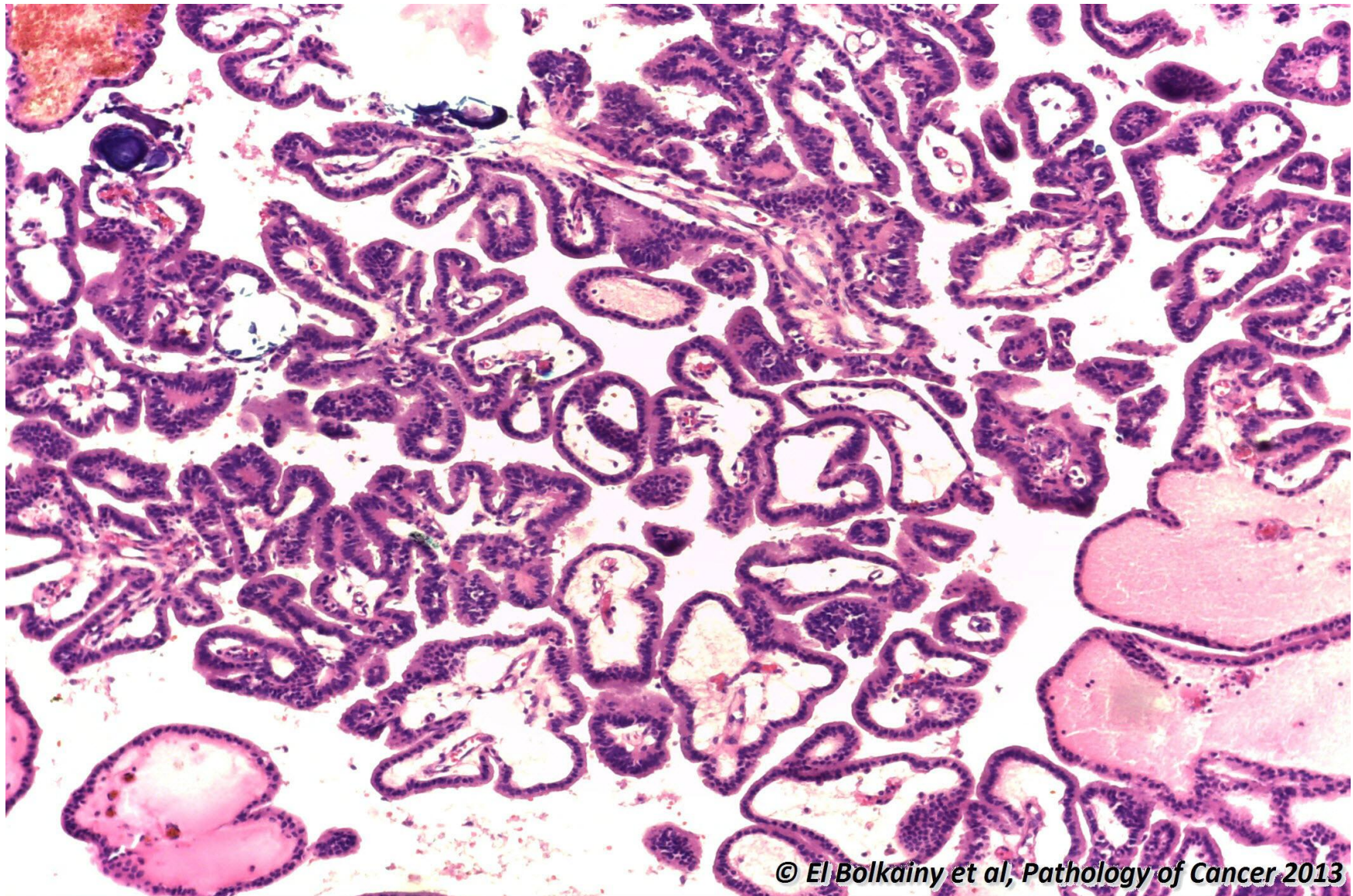
**Picture 23-17** Subependymoma, WHO grade I, histology. Typically located in ventricular wall, displays a lobular pattern of ependymal cells in a fibrillary stroma showing microcystic change.

23.18 Myxopapillary ependymoma, WHO grade I.



**Picture 23-18** Myxopapillary ependymoma, WHO grade I. Typical location is cauda equina. Histology displays radial perivascular arrangement of ependymal cells with marked myxomatous degeneration in the stroma. **A** Low power. **B** and **C** High power.

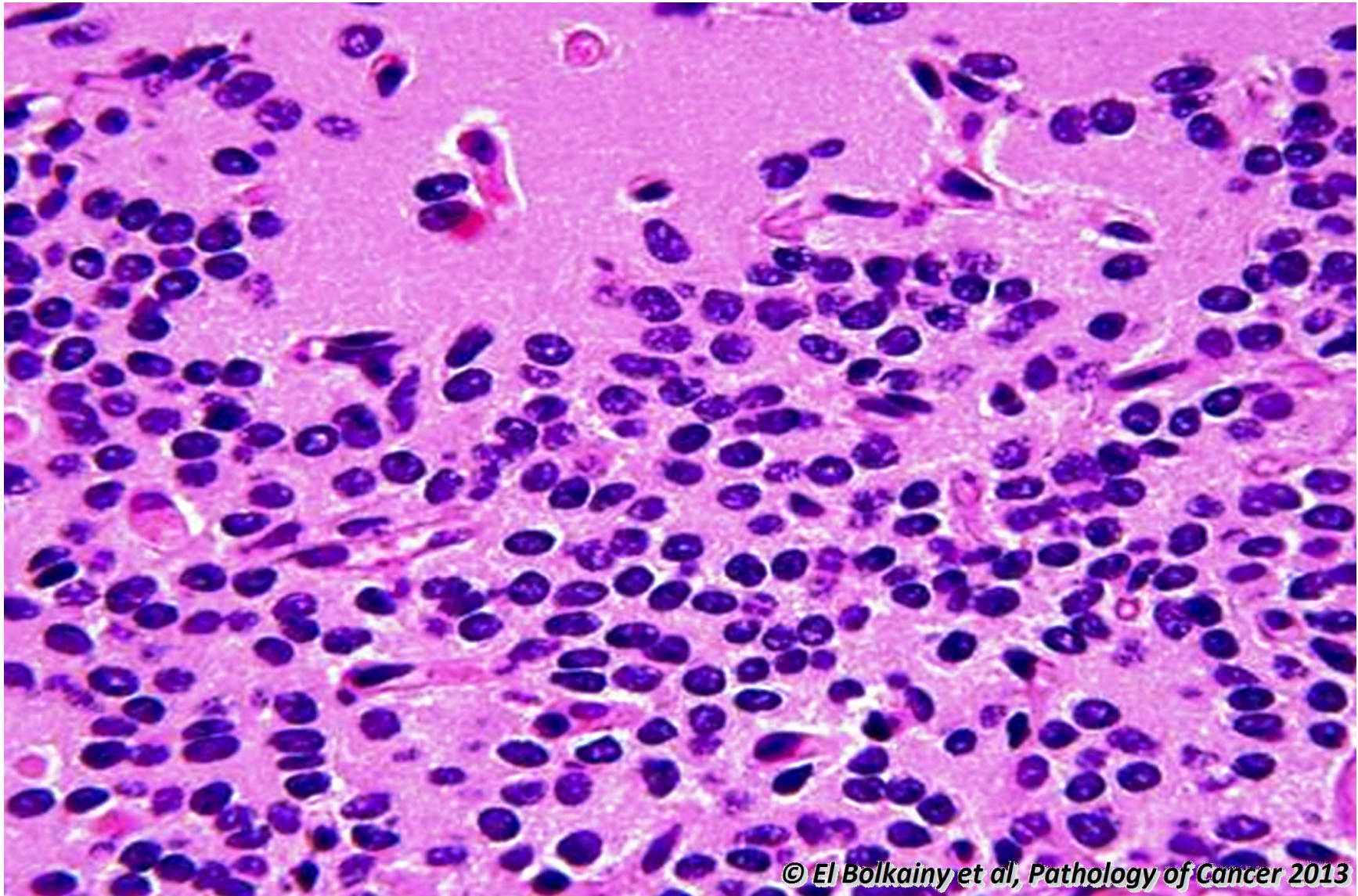
23.19 Choroid plexus papilloma.



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**Picture 23-19** Choroid plexus papilloma. A benign tumor with papillary pattern, composed of cuboidal or columnar cells with bland nuclei and vascular fibrous stroma.

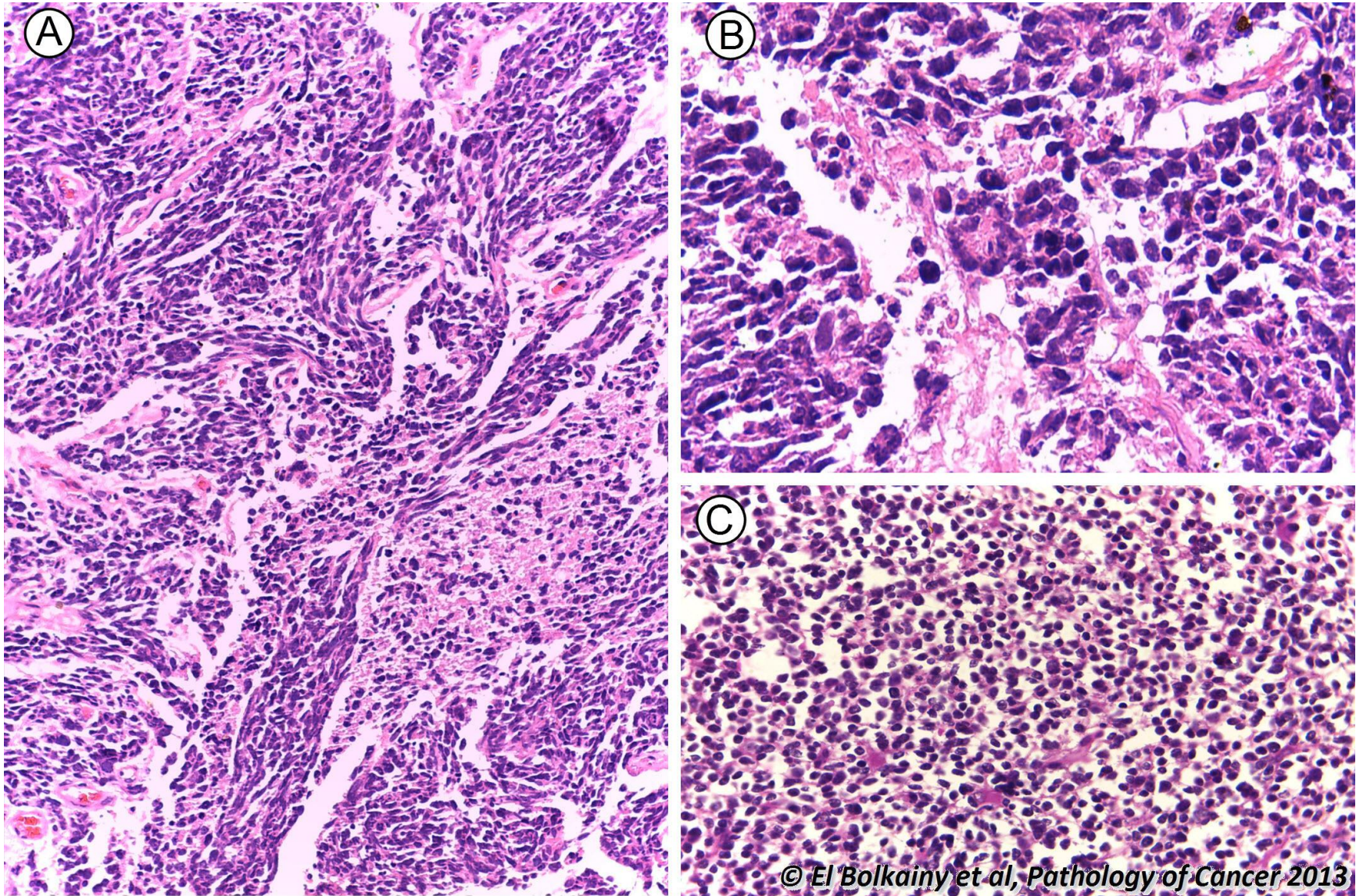
23.20 Neurocytoma, WHO grade II.



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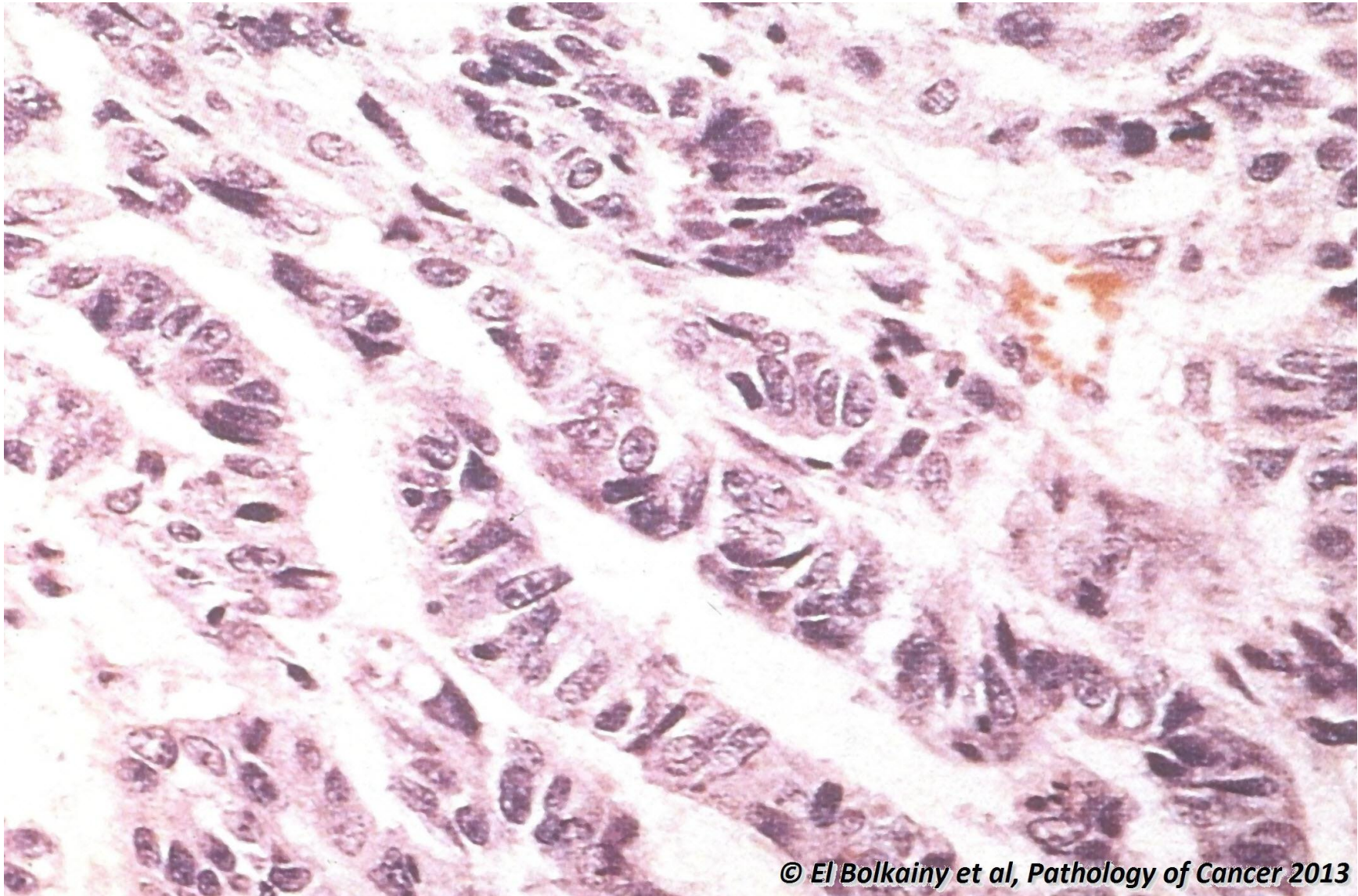
**Picture 23-20** Neurocytoma, WHO grade II. It is composed of cellular areas of uniform nuclei, and acellular areas with fibrillary matrix.

23.21 Medulloblastoma, classic type, WHO grade IV, histology.



**Picture 23-21** Medulloblastoma, classic type, WHO grade IV, histology. **A** It is composed of closely packed round to oval undifferentiated cells with micronodular or trabecular pattern. **B** and **C** Homer-Wright pseudorosettes denotes neural differentiation.

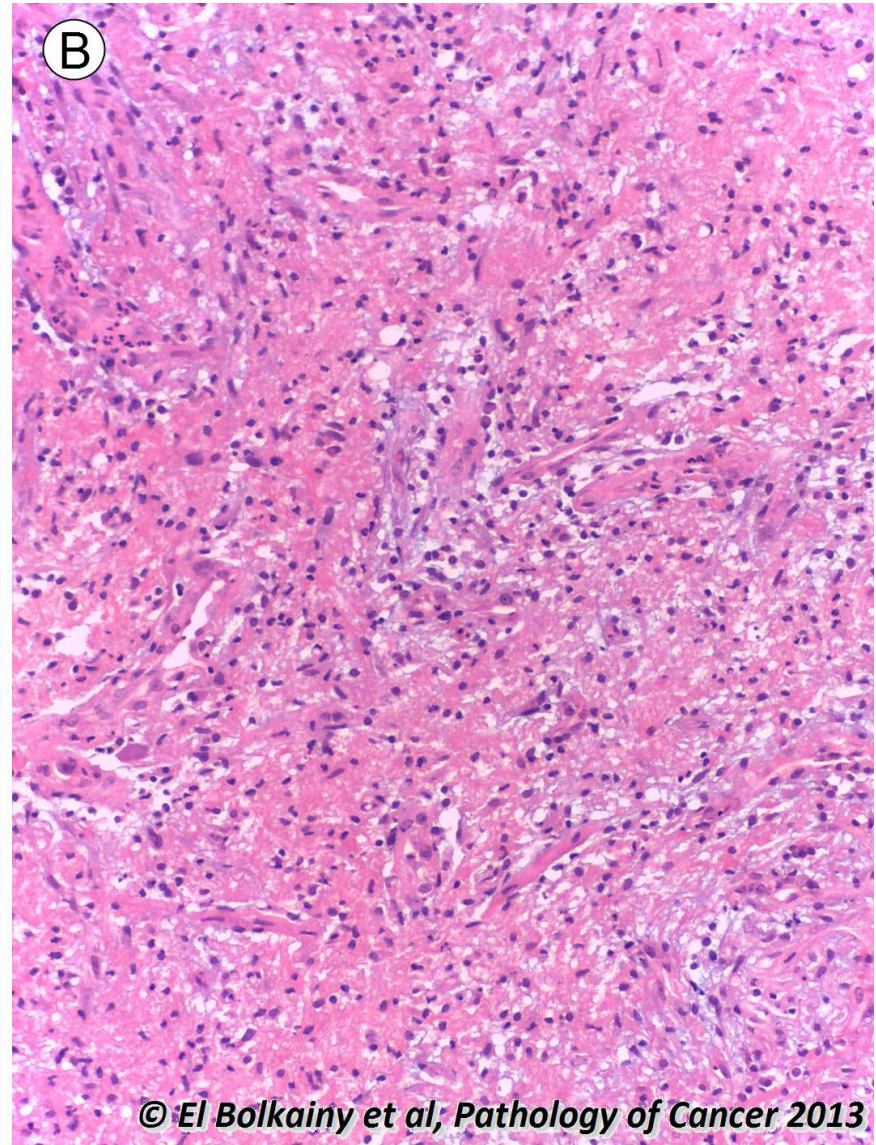
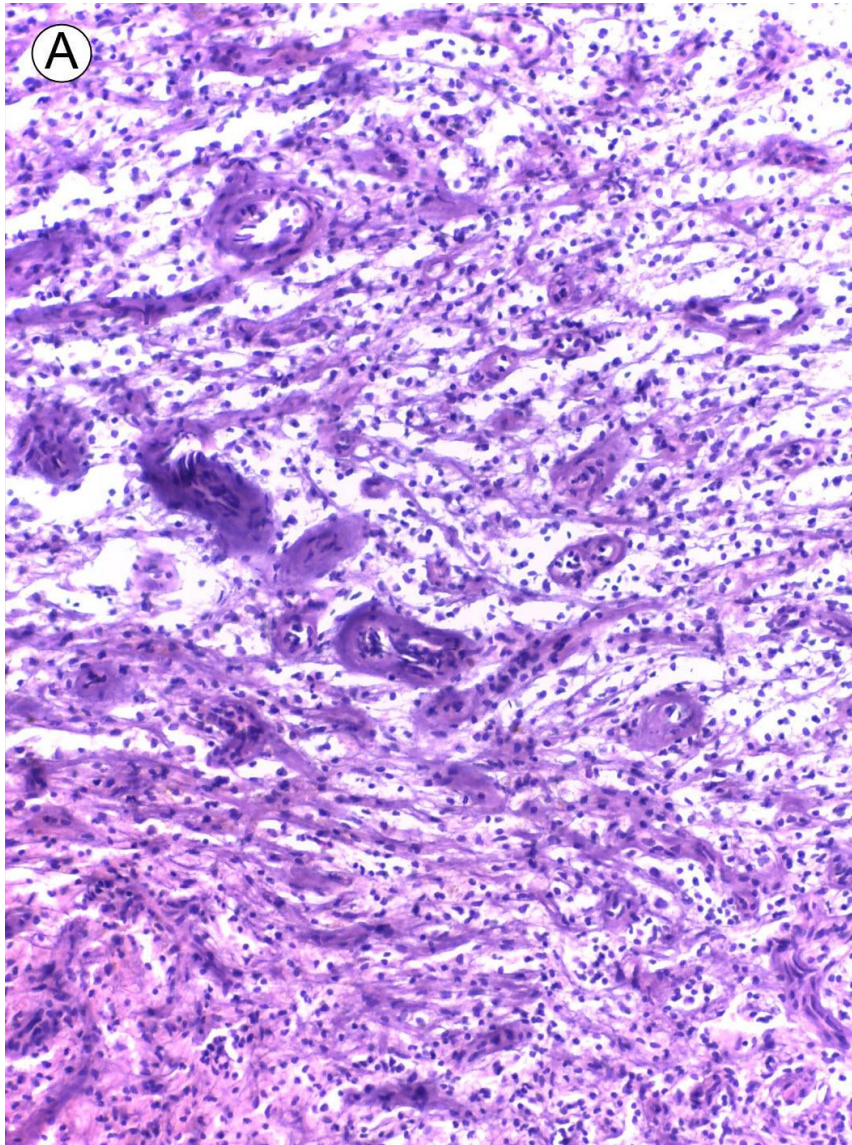
23.22 Medulloepithelioma, WHO grade IV, histology.



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**Picture 23-22** Medulloepithelioma, WHO grade IV, histology. It shows a papillary and tubular structures lined by pleomorphic stratified epithelium (neural tube differentiation).

23.23 Gliosis, histology.

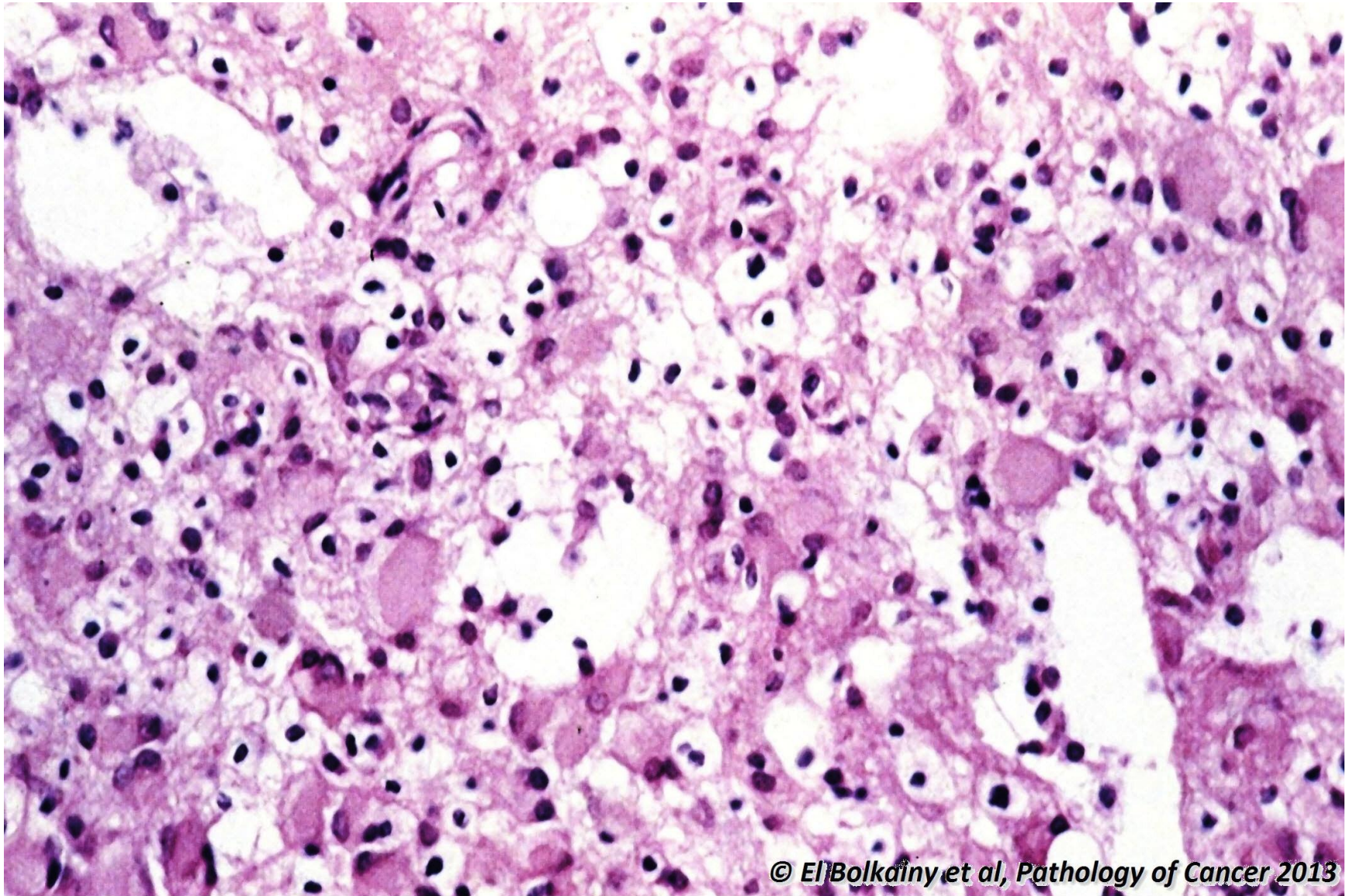


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**Picture 23-23** Gliosis, histology. A and B Reactive astrocytes are evenly distributed, with bland nuclei, low Ki-67 (less than 2%), and associated microglia (CD 68 positive).



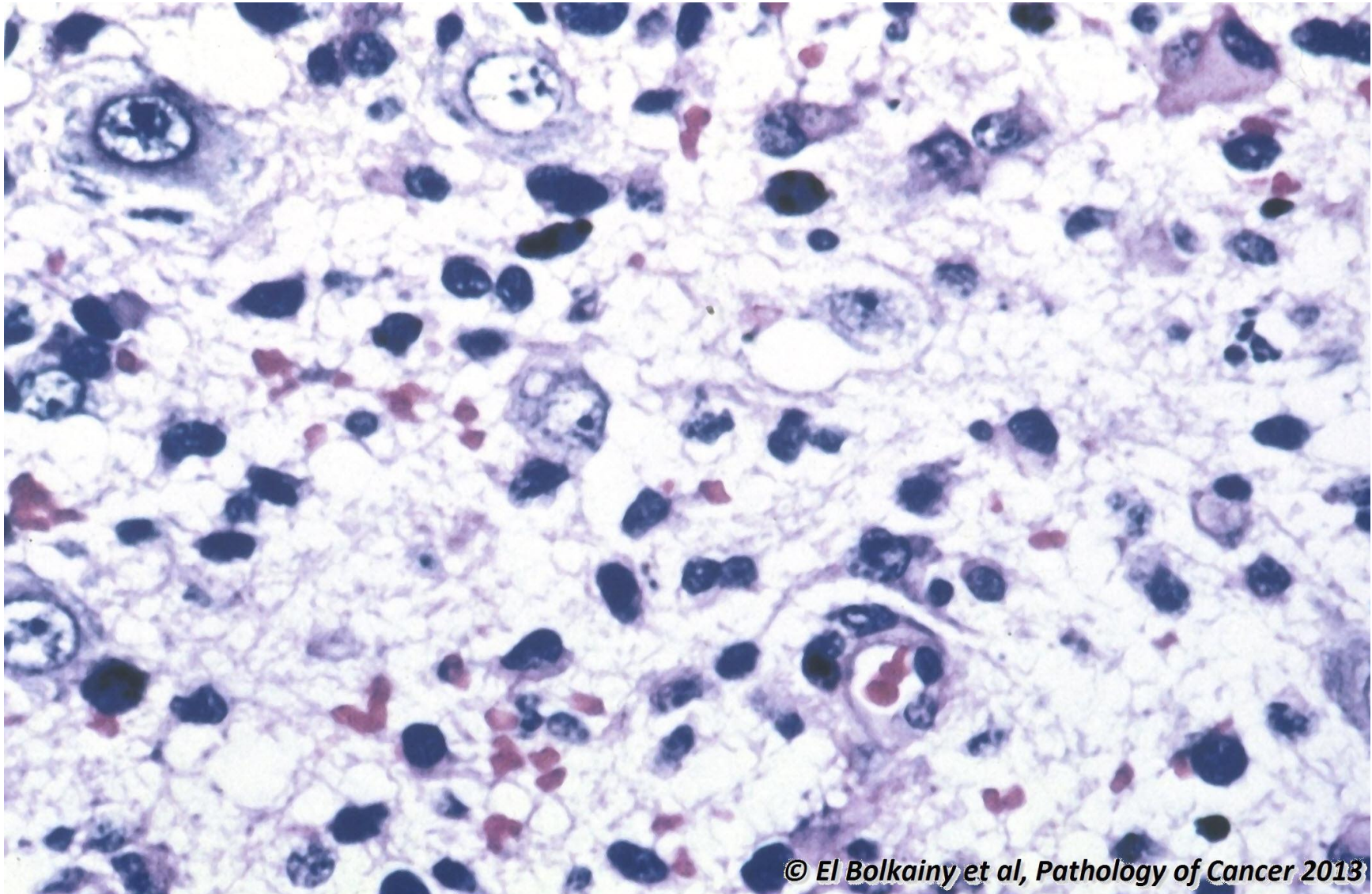
23.24 Mixed glioma, oligoastrocytoma, low grade, WHO grade II.



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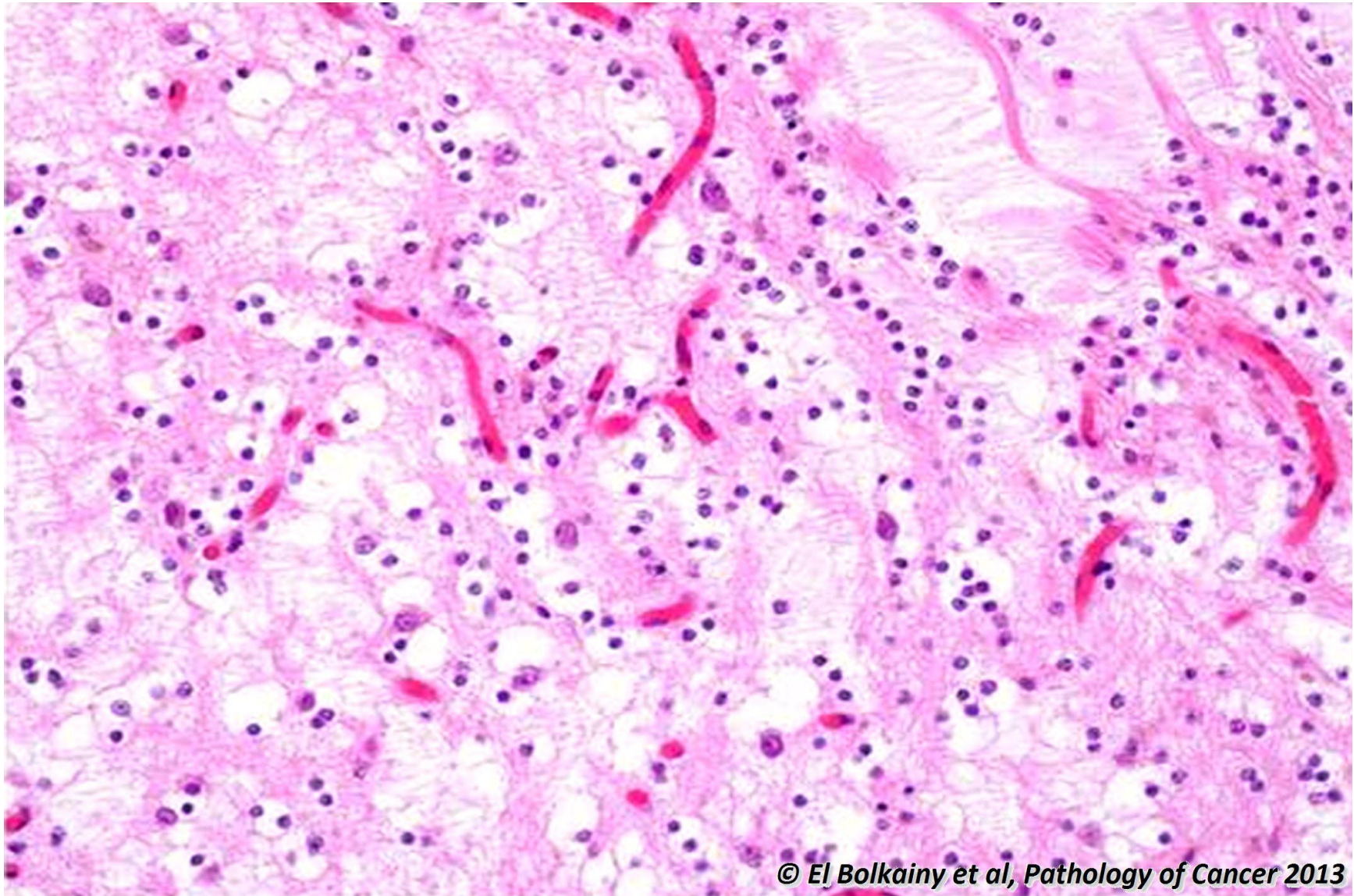
**Picture 23-24** Mixed glioma, oligoastrocytoma, low grade, WHO grade II. A biphasic tumor composed of morphologically distinct astroglial cells and oligodendroglial cells (markers offer no help). High-grade tumors show anaplasia and high proliferation rate (> 6%). The 10-year survival is 32% in low grade and 9% in high grade tumors.

23.25 Ganglioglioma, histology.



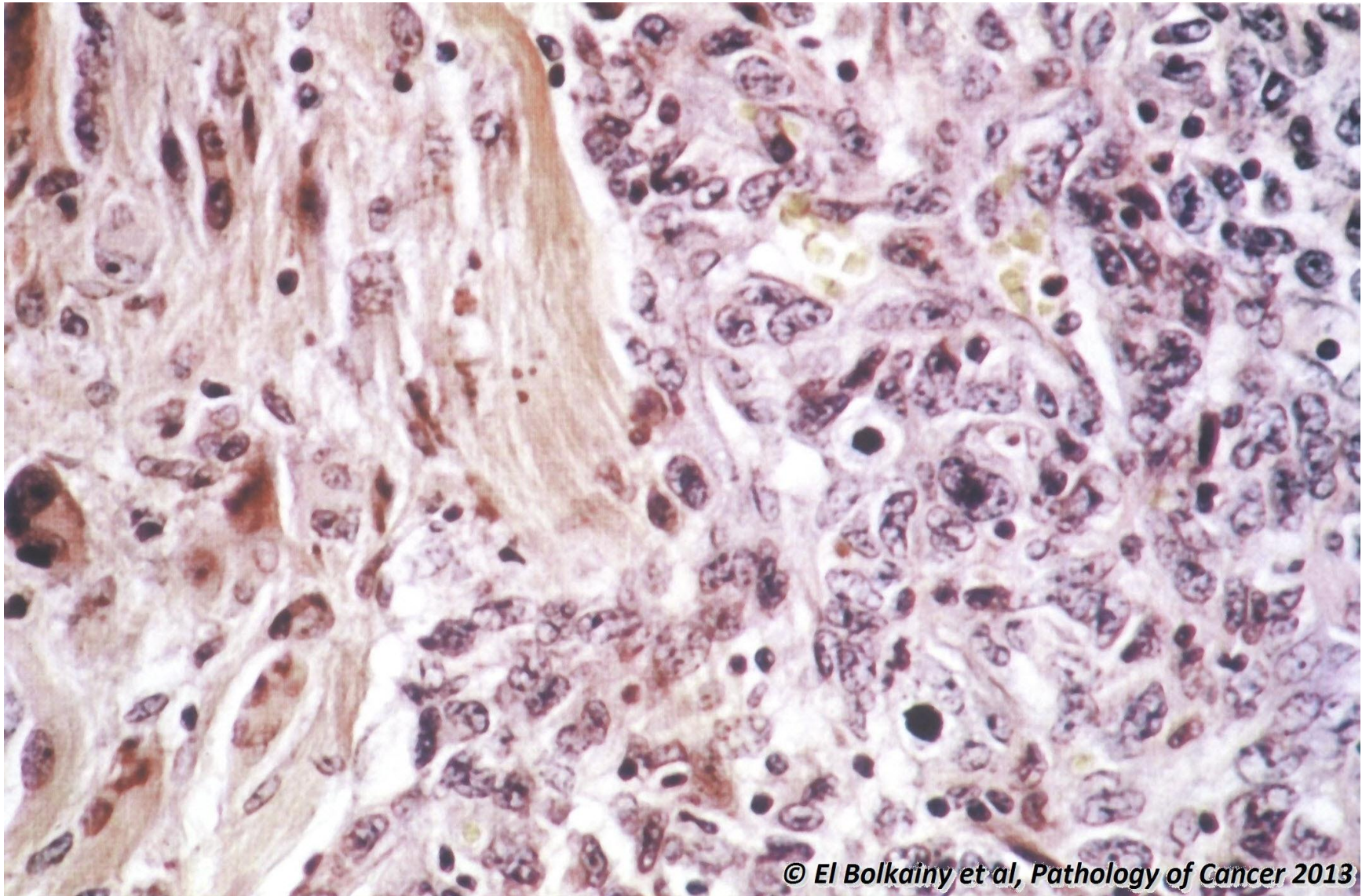
**Picture 23-25** **Ganglioglioma, histology.** This is a WHO grade I biphasic tumor showing two cellular components: astroglial cells (GFAP+) as well as, neuronal cells (positive for MAP2, NeuN, neurofilaments and synaptophysin).  
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23.26 Dysembryoplastic neuroepithelial tumor, WHO grade I, histology.



**Picture 23-26** Dysembryoplastic neuroepithelial tumor, WHO grade I, histology. Biphasic neuronal and oligodendroglial columns. The tumor is typically cortical in location.

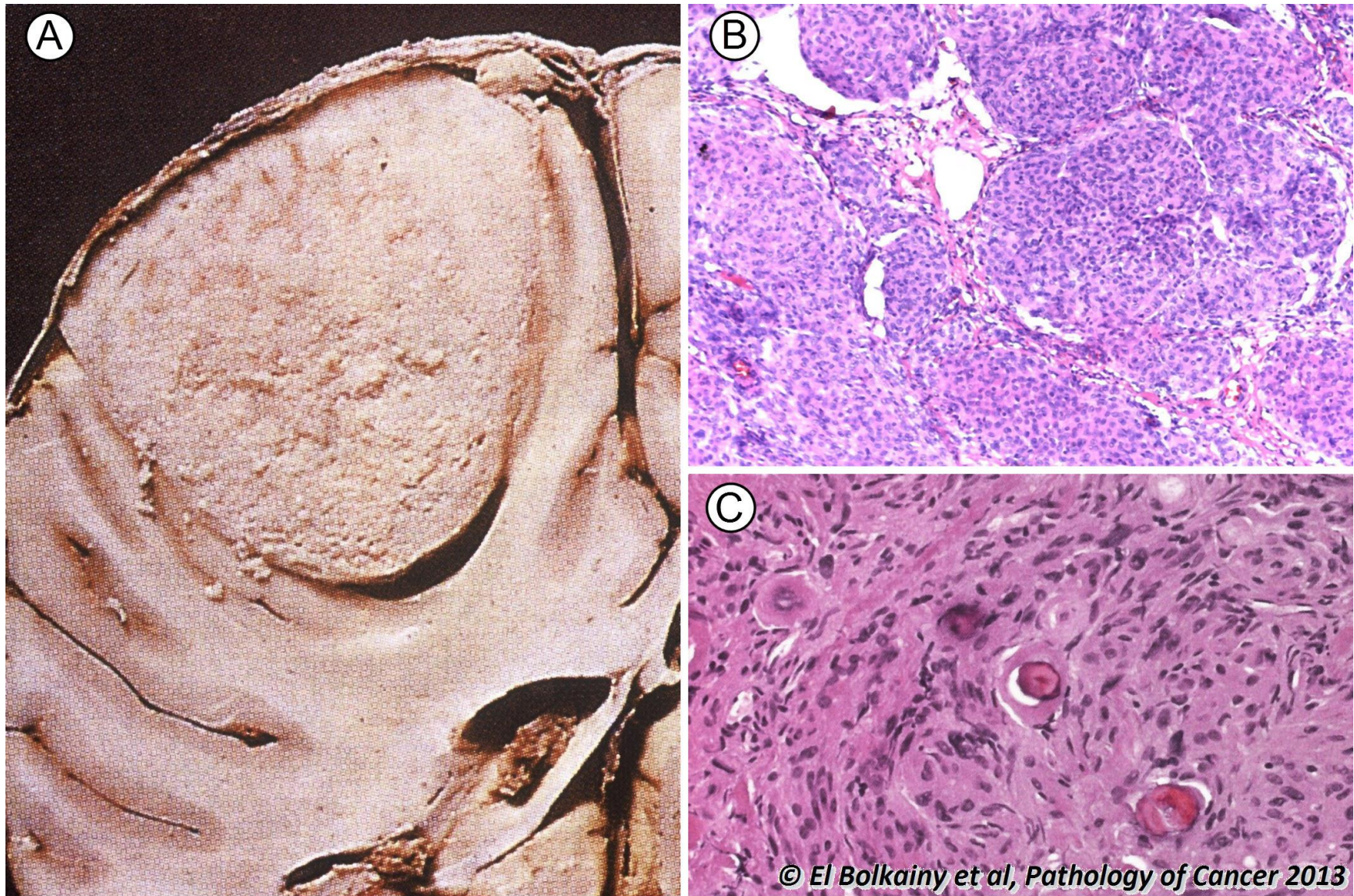
23.27 Mixed glioma, gliosarcoma, histology.



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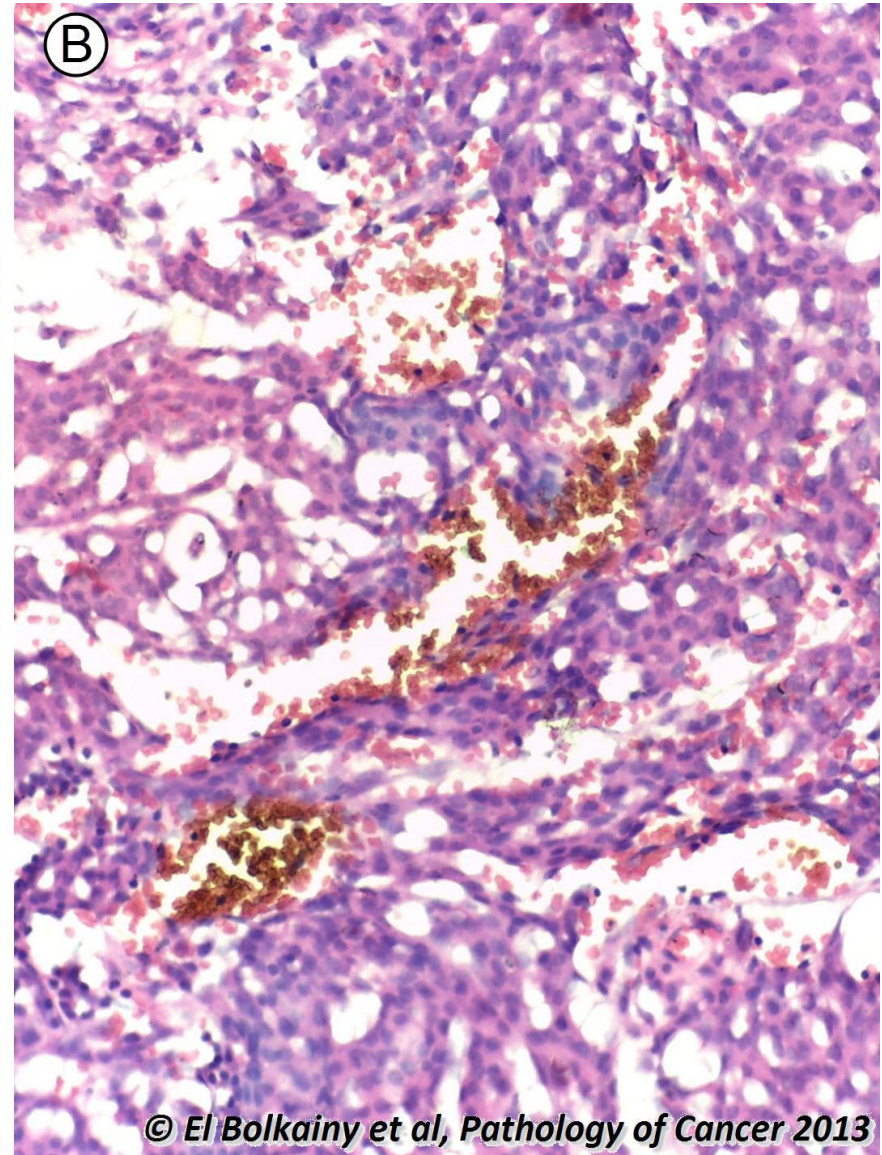
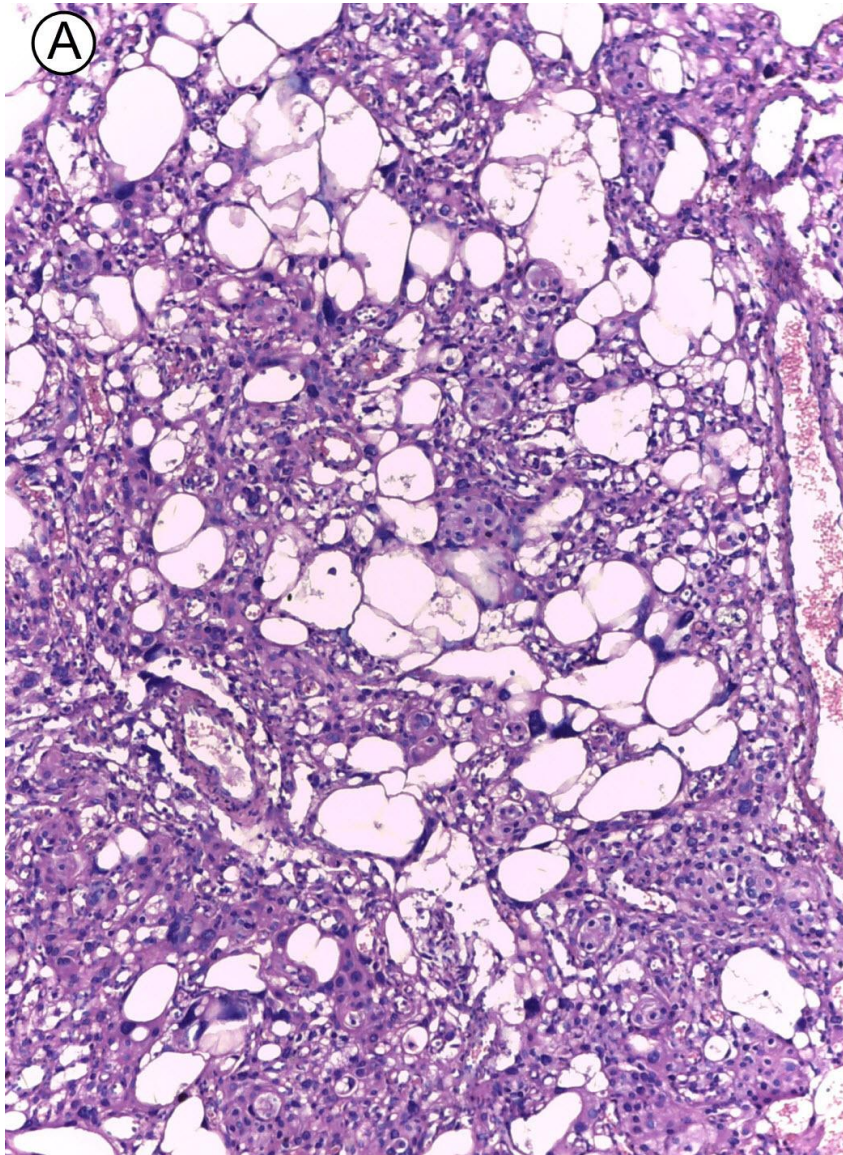
**Picture 23-27** Mixed glioma, gliosarcoma, histology. A biphasic tumor composed of alternating areas displaying both glial (GFAP+) and mesenchymal differentiation (reticulin-rich and desmin+).

23.28 Meningioma.



**Picture 23-28** Meningioma. A Gross features, a paraxial well defined mass related to meninges. B Histology of grade I meningothelial meningioma showing characteristic whorled pattern. C Histology of Psammomatous meningioma with psammoma bodies.

23.29 Other grade I meningiomas.

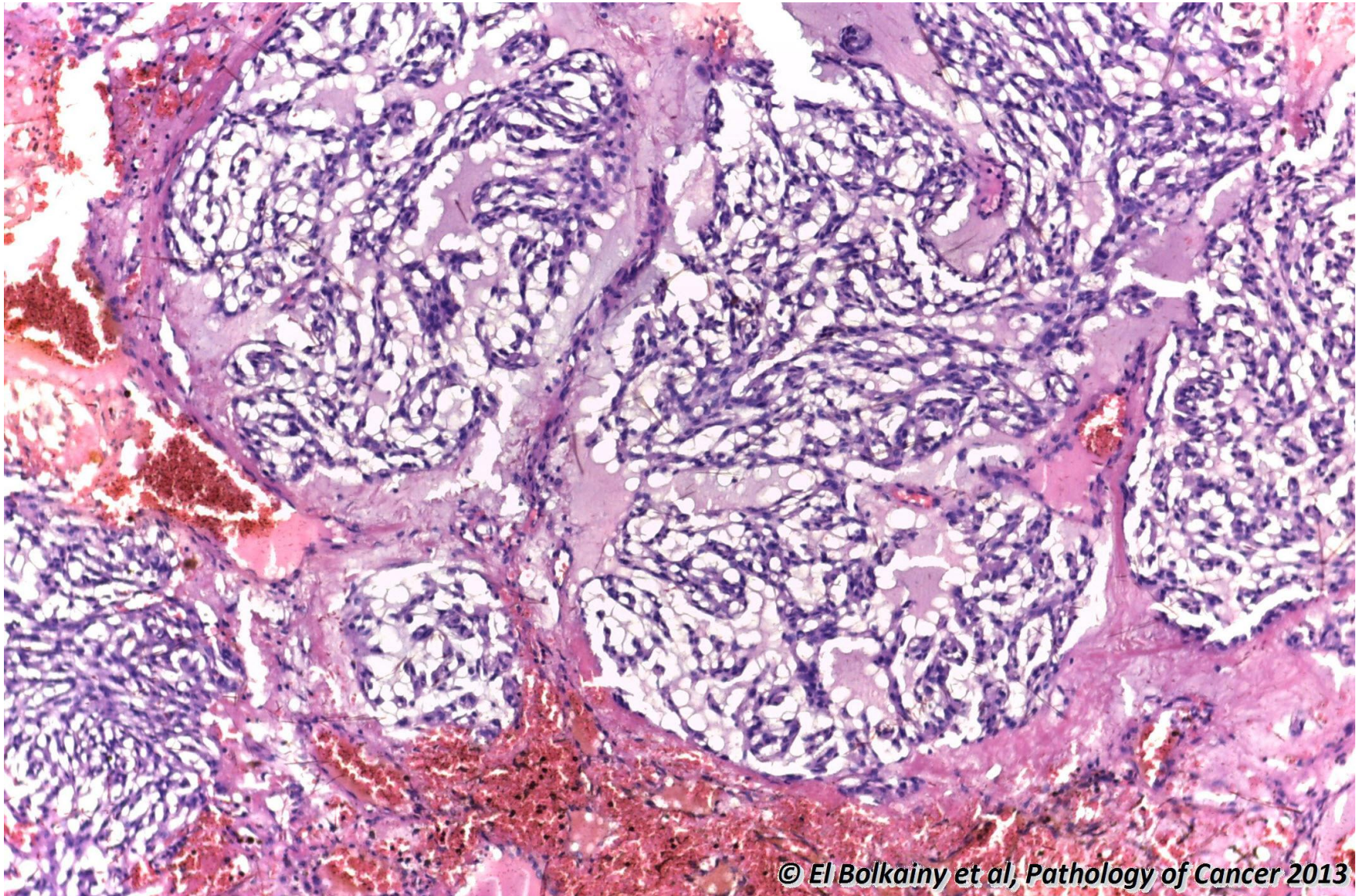


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**Picture  
23-29**

**Other grade I meningiomas. A** Metaplastic lipomatous meningioma and **B** vascular meningioma.

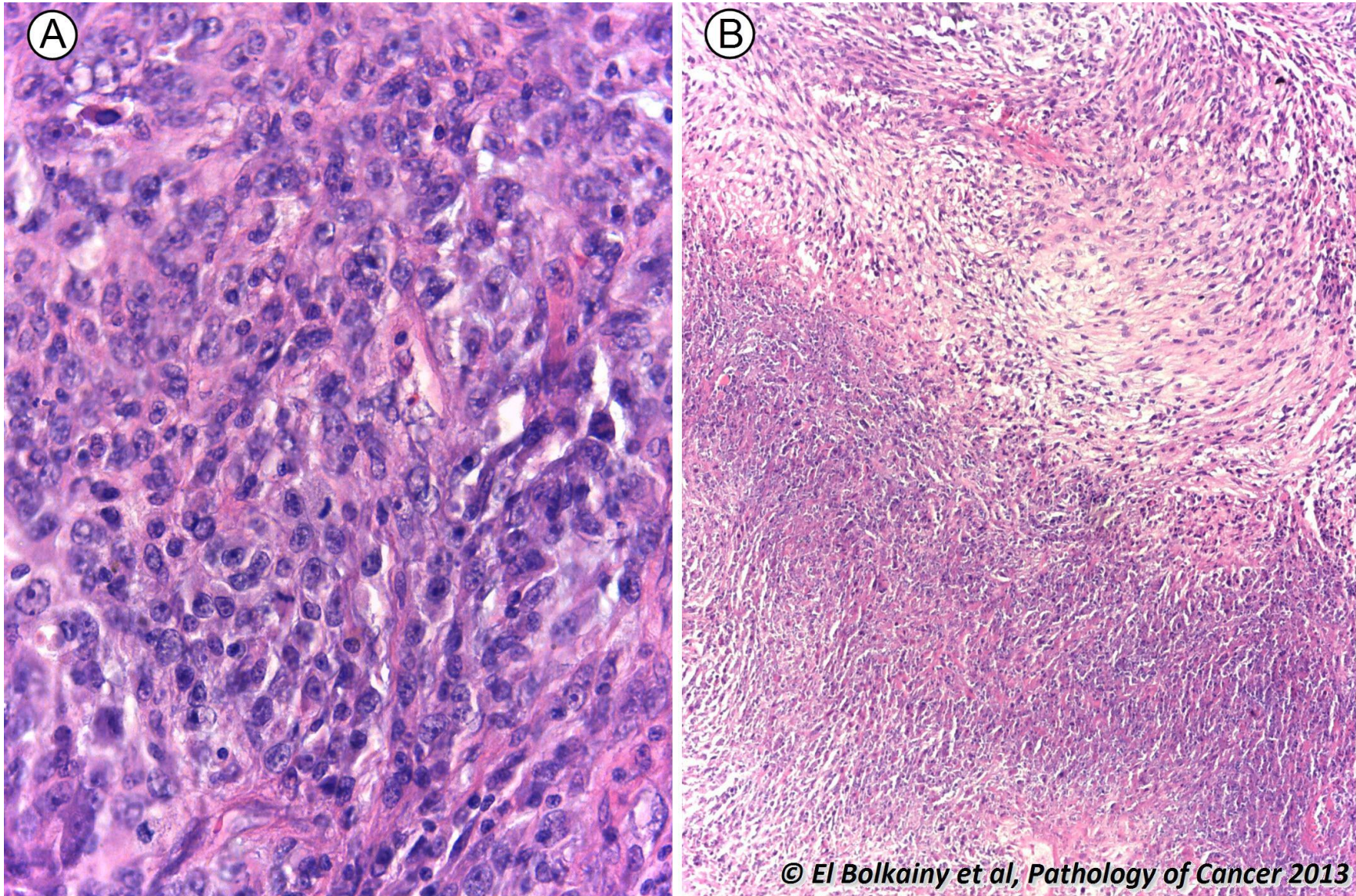
23.30 Chordoid meningioma, WHO grade II, histology.



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**Picture 23-30** Chordoid meningioma, WHO grade II, histology. It is composed of columns of neoplastic meningothelial cells with eosinophilic cytoplasm arranged in a mucin-rich matrix.

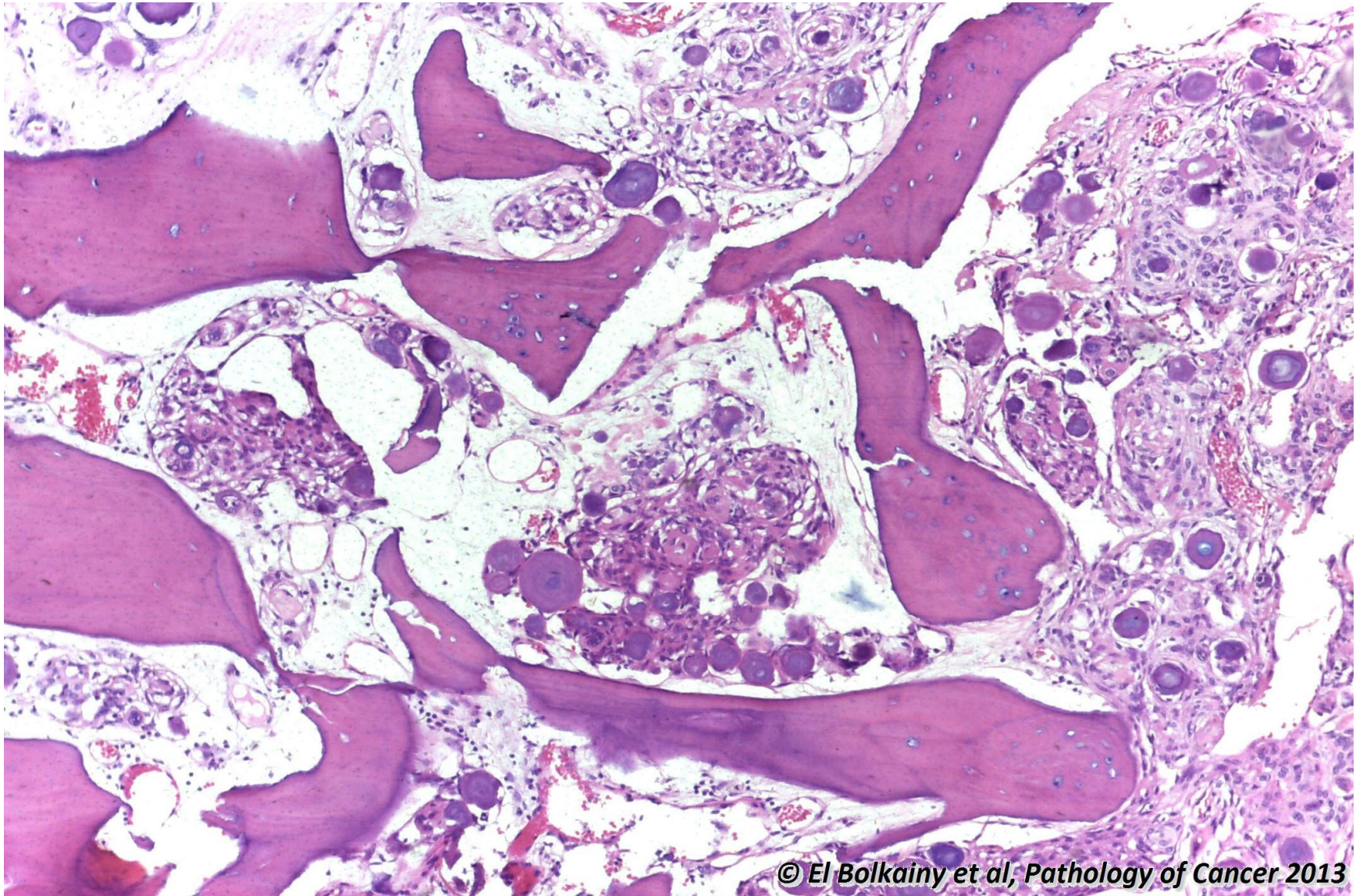
23.31 Malignant meningioma, WHO grade III, histology.



**Picture 23-31** Malignant meningioma, WHO grade III, histology. **A** There is loss of whorled pattern, spindle cell morphology with active mitosis. **B** Focal necrosis, invasive margin with infiltration of the brain.



23.32 Meningioma invading bone, histology.

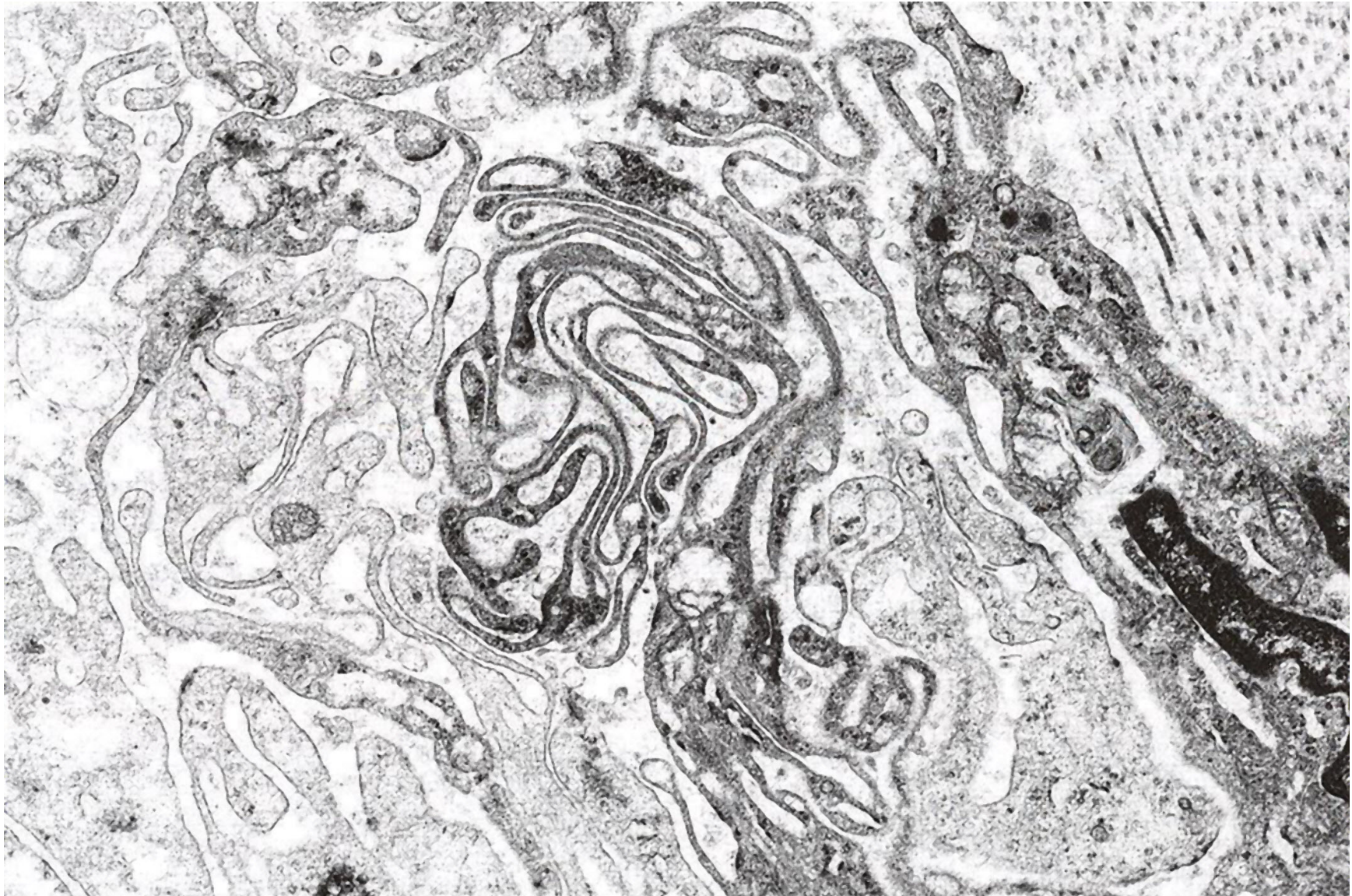


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**Picture  
23-32**

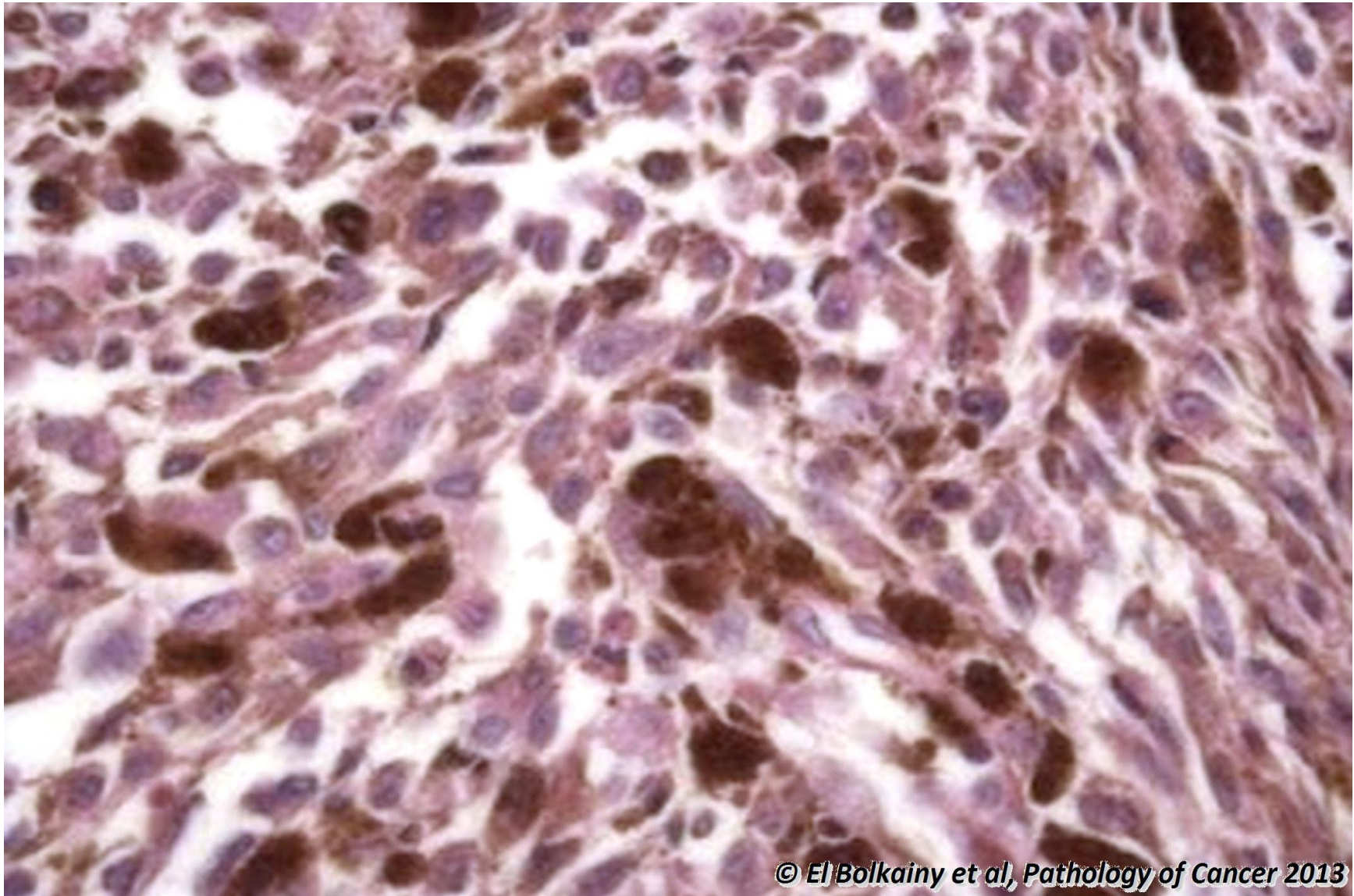
**Meningioma invading bone, histology.** Conventional meningioma may invade the bone, which is not indicative of malignancy.

23.33 Meningioma, electron microscopic features.



**Picture 23-33** Meningioma, electron microscopic features. Cytoplasmic processes are long, tend to curve and branch forming a complex filigree pattern. (Reproduced with permission, Fletcher CD, 2007).

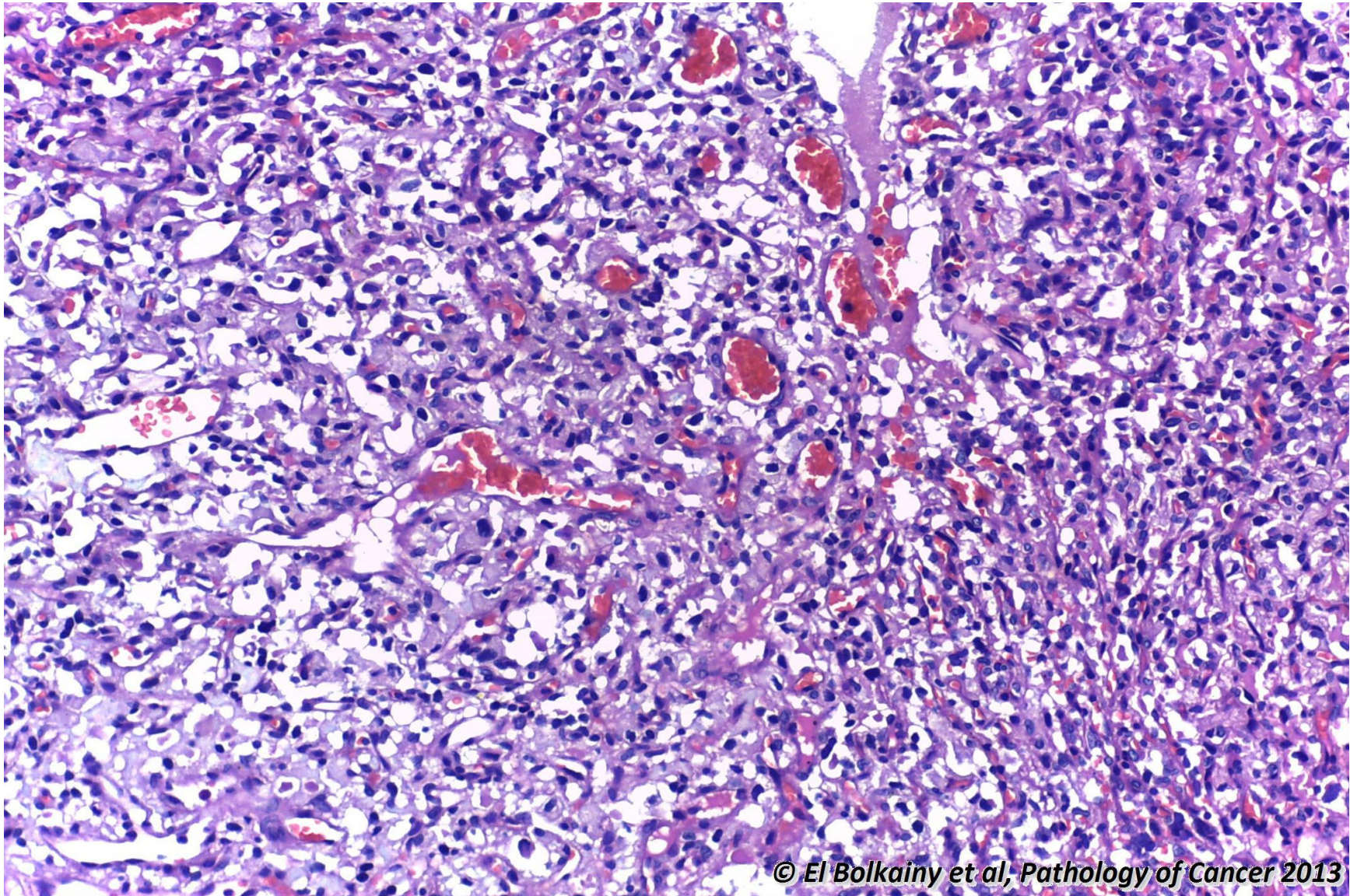
## 23.34 Melanocytoma



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**Picture 23-34** Melanocytoma, a low grade tumor composed of a mixture of spindle shaped melanocytes and macrophages containing melanin pigment in cytoplasm.

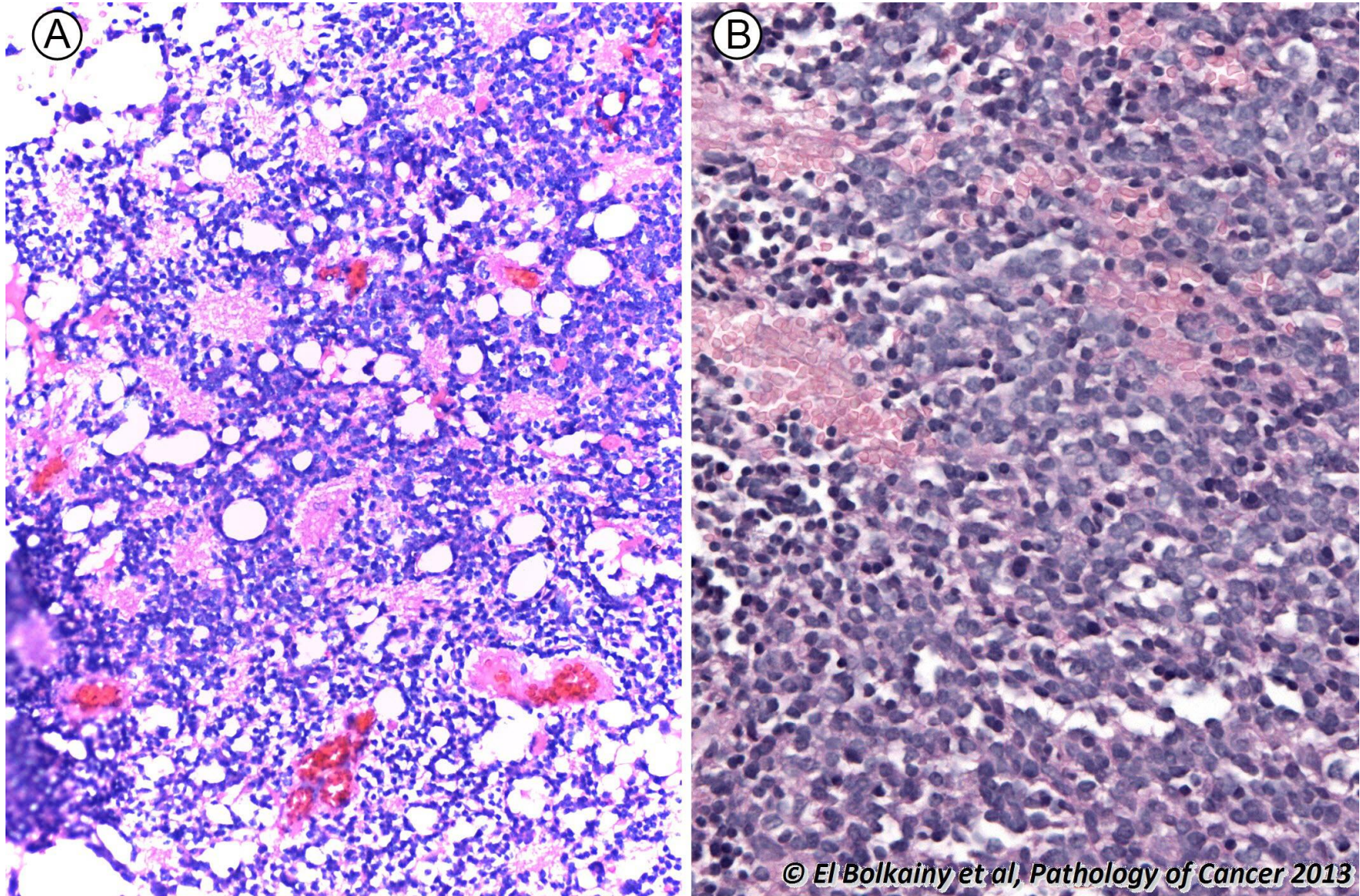
23.35 Hemangioblastoma, WHO grade I, histology.



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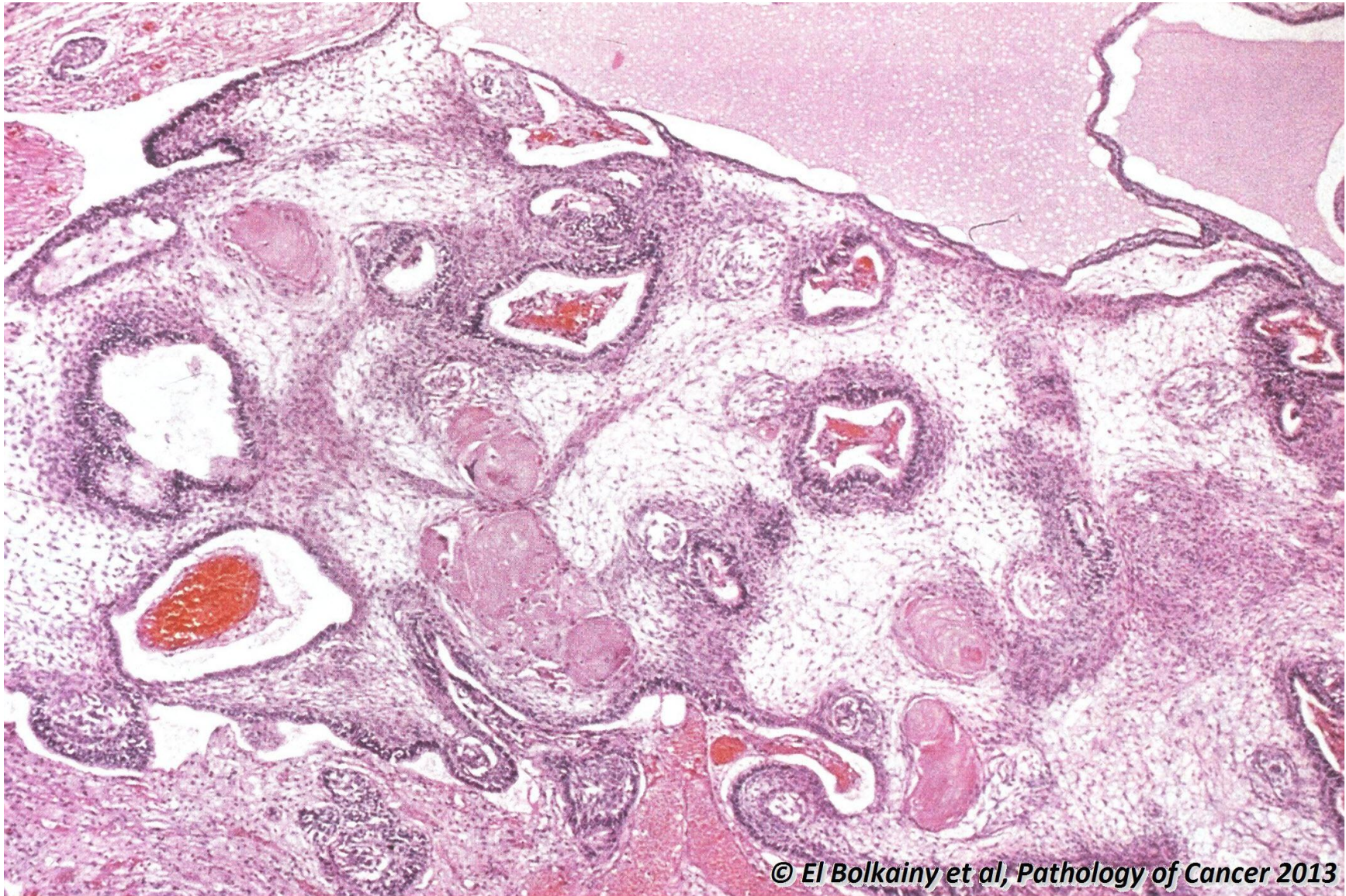
**Picture 23-35** Hemangioblastoma, WHO grade I, histology. It shows two cell components; stromal cells and capillary endothelial cells. Both hemangioblastoma and metastatic clear cell renal carcinoma show perivascular clear cells rich in lipid, but the latter is cytokeratin positive.

23.36 Pineal tumors, histology.



**Picture 23-36** Pineal tumors, histology. **A** Pineocytoma, a low grade tumor of adults, composed of oval cells forming fibrillary rosettes. **B** Pineoblastoma, a high grade tumor of children composed of solid patternless sheets of cells with malignant nuclei.

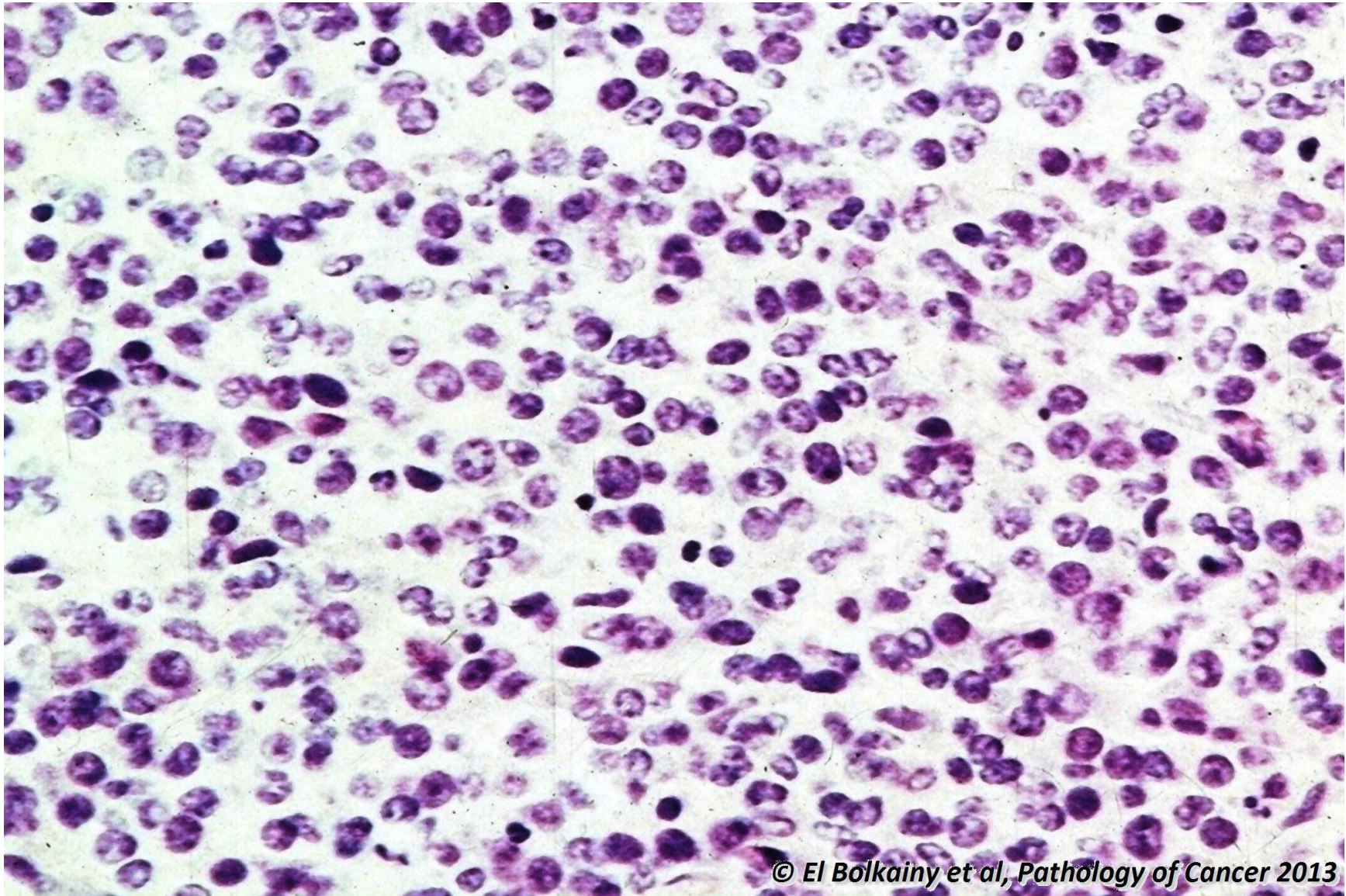
23.37 Craniopharyngioma, histology.



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**Picture 23-37** Craniopharyngoma, histology. It simulates ameloblastoma with nests of solid tumors having central stellate cells and peripheral palisade of columnar cells. Cystic change and squamous differentiation may be observed.

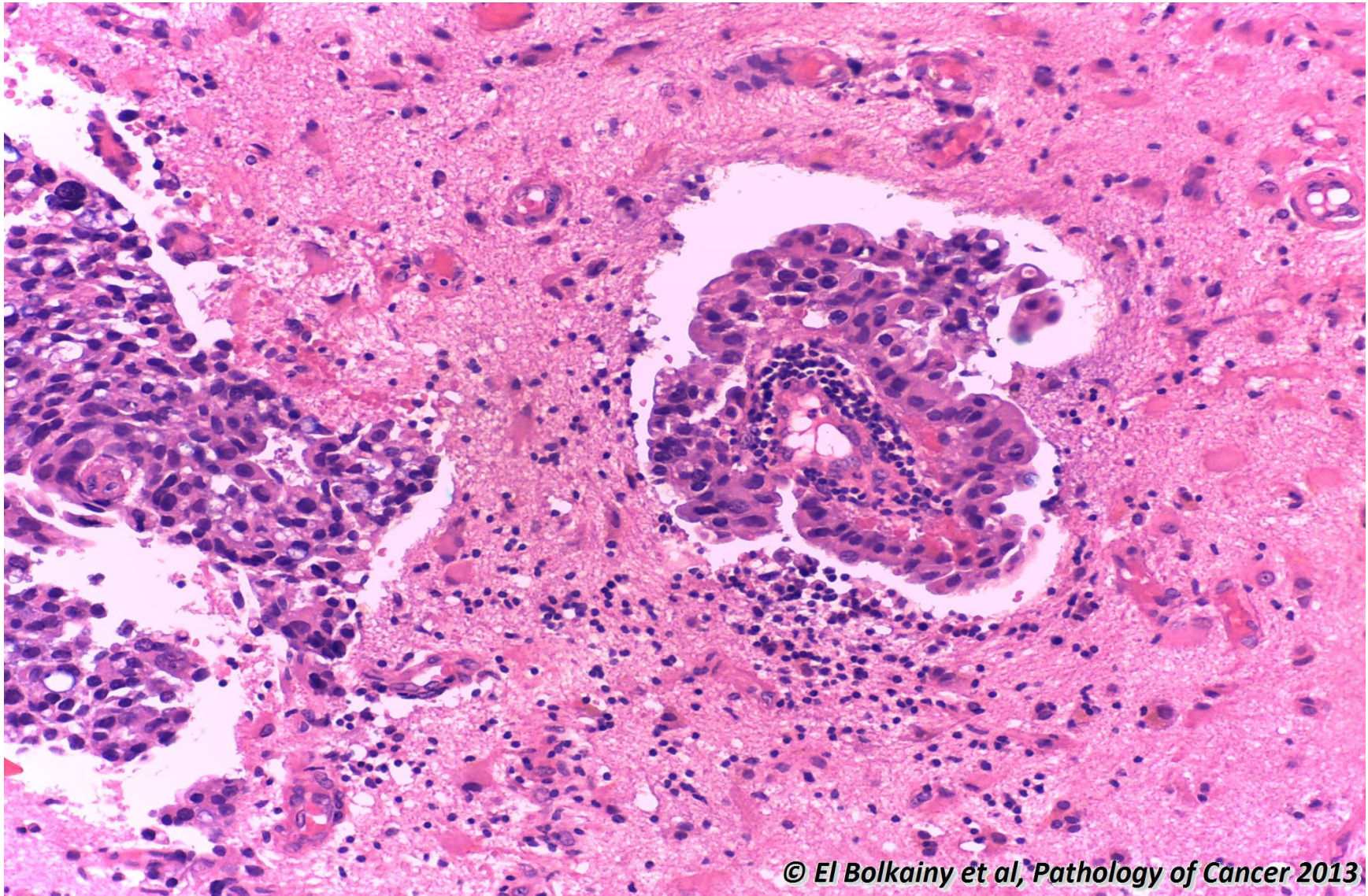
23.38 Primary lymphoma of brain, histology.



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**Picture 23-38** Primary lymphoma of brain, histology. Tumors are commonly multifocal large cell NHL, B phenotype and may be associated with AIDS. The prognosis is most unfavorable.

23.39 Metastases.



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**Picture 23-39** **Metastases.** Characteristic histologic features are multifocality, distinction from brain tissue with retraction artifact and CK positivity. It differs from choroid tumors in being located away from ventricles.