Chapter 2
Nasal Cavity and Paranasal Sinuses

INTRODUCTION

Included in this chapter are nasal cavities, frontal sinus, ethmoid complex, sphenoid sinus, and maxillary sinuses. These cavities and sinuses are lined by Schneiderian mucosa, consisting of pseudostratified columnar ciliated epithelium with interspersed goblet cells. The roof of the nasal cavity is the cribriform plate, a specific location for olfactory neuroblastoma. The sinonasal Schneiderian (inverted type) papilloma appears to be a precursor of a sinonasal squamous cell carcinoma. Because of the intimate anatomic relationship with the brain, some intracranial lesions/tissues can be seen and the details will be discussed in Chapter 6.

MAJOR DIAGNOSTIC CONSIDERATIONS

- Schneiderian papilloma including inverted, oncocytic, and exophytic patterns. Most inverted papillomas originate from the respiratory mucosa of the lateral nasal wall and paranasal sinuses. Schneiderian papillomas can present with mixed inverted and exophytic patterns.
- Squamous cell carcinoma arising from papilloma
- Nasopharyngeal carcinoma (typical histologic type is lymphoepithelioma-like carcinoma)
- Sinonasal undifferentiated carcinoma
- Fungal ball in the setting of a progressive sinusitis, identification of fungal microorganisms is important; resection of the involved tissue and debridement will be performed.
- Wegener's granulomatosis

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- Minor salivary gland tumors do occur in these organs because minor salivary glands exist in the submucosa throughout the aerodigestive tract.
- Possibility of a lymphoma, including B- or T-cell type.

Common Small Round Blue Cell Malignant Tumors in This Area

- Olfactory neuroblastoma/esthesioneuroblastoma
- Rhabdomyosarcoma
- Small cell carcinoma
- Ewing's sarcoma
- Mesenchymal chondrosarcoma
- Lymphoma (except large cell types)

WHAT SURGEONS NEED TO KNOW INTRAOPERATIVELY TO CHOOSE THE OPTIMAL IMMEDIATE SURGICAL MODALITY

- Distinguish benign from malignant lesions
- Establish a differential diagnosis for small blue cell tumors
- Assessment of the resection margins
- Debridement of the necrotic tissue in the presence of inflammation
- Identify the origin of the tissue specimen
- Determine if the lesion is infectious. If granulomata are present, additional fresh and noncontaminated tissue should be requested for culture
- Determine if lymphoid proliferation is present; if yes, then pathologist needs to decide if the tissue is sufficient for additional analysis

SPECIMEN HANDLING AND GROSS DIAGNOSIS

- If a larger resection specimen is presented and the margins are of concern, then orientation and appropriate inking are critical. In some institutions, margins may be obtained from the procedure beds.
- For small biopsies, a smear preparation can be useful before exhausting the tissue by freezing all the fresh tissue, which might be needed for further studies.
- Papillomas may present with some frond-like structures. We should make sure that the sections are oriented to show the surface, so that the growth pattern can be appreciated.

USEFUL DIAGNOSTIC PEARLS

- Changes associated with radiation or chemotherapy should be kept in mind; communication with the surgeon is essential regarding the therapeutic history, since some malignant lesions would receive a preoperative therapy.
- Reviewing previous material when available is very helpful, since many tumor types, each with a wide histologic spectrum, exist in this region.

- Schneiderian papilloma can grow in different patterns, including exophytic, oncocytic, and inverted. Theses papillomas are lined by ciliated respiratory epithelium; they should have more than ten cell layers and central fibrovascular cores holding the finger-like structures. Presence of some mucocytes is indicative of Schneiderian origin. Since they grow downward, inverted papillomas can be challenging to diagnose, and their structure can be complex. Thus, a low power view is more important and allows easier appreciation of the relationship with the surface epithelium (Figs. 2.1 and 2.2).
- Make sure that the complex structure is not misinterpreted as an invasive process. On the other hand, it is not uncommon to see malignant transformation in the keratinized epithelium of an inverted papilloma. In cases like these, inverted papillomas are the precursor lesions. The histologic criteria to evaluate dysplasia arising in a papilloma are cellular disorganization (loss of horizontal arrangement in the superficial layers), cellular immaturity with increased nuclear cytoplasmic ratio, increased mitotic figures, and often atypical mitoses (Fig. 2.3). Sampling the specimen cautiously and sectioning the frozen chuck at multiple levels can be useful to avoid an underdiagnosis.

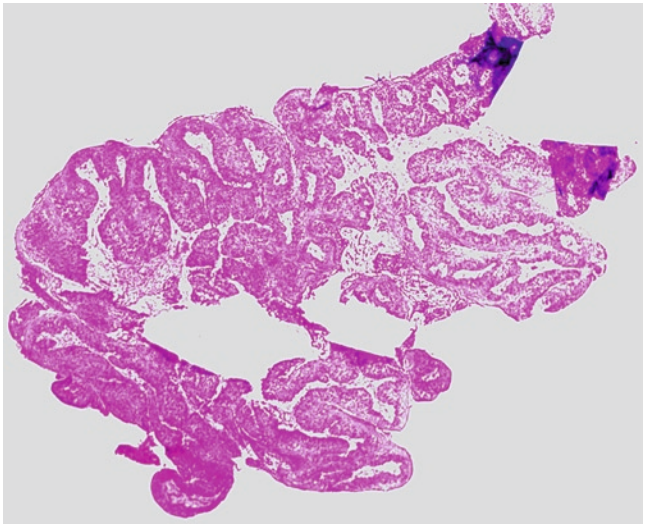

FIG. 2.1 Inverted papilloma low power view. The outer contour of the lesion is the original surface epithelium, and the papillary structures grow downward into the lamina propria by invagination or direct extension into the underlying minor salivary glands forming complex structures.

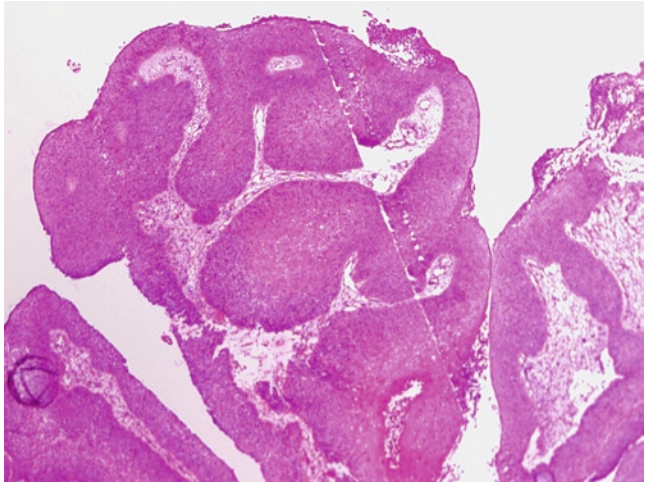

FIG. 2.2 Higher power of the inverted papilloma showing the thickened epithelium with more than ten cell layers. The epithelium shows maturation with no marked cytologic atypia.

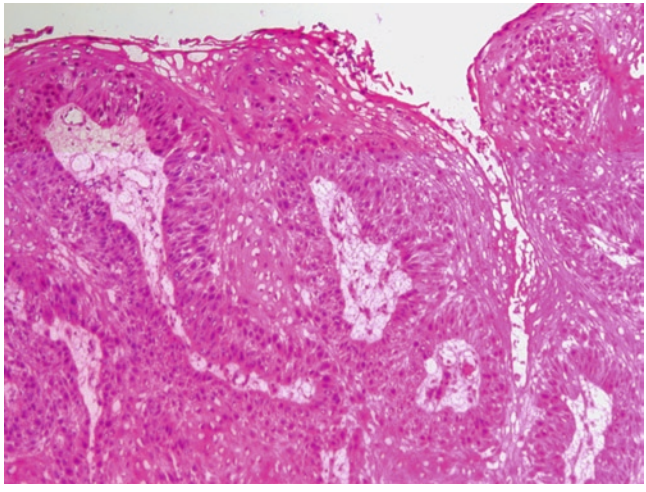

FIG. 2.3 Inverted papilloma with squamous carcinoma in situ, characterized by marked cellular disturbance and nuclear pleomorphism.

- Lymphoepithelioma-like carcinoma still maintains some basic features of carcinoma, such as cohesive tumor cells. In this particular entity, the tumor cells demonstrate a syncytial look and

are buried within a lymphoid background (Figs. 2.4 and 2.5). Thus, it can be mistaken for a germinal center, composed of a mixed cellularity.

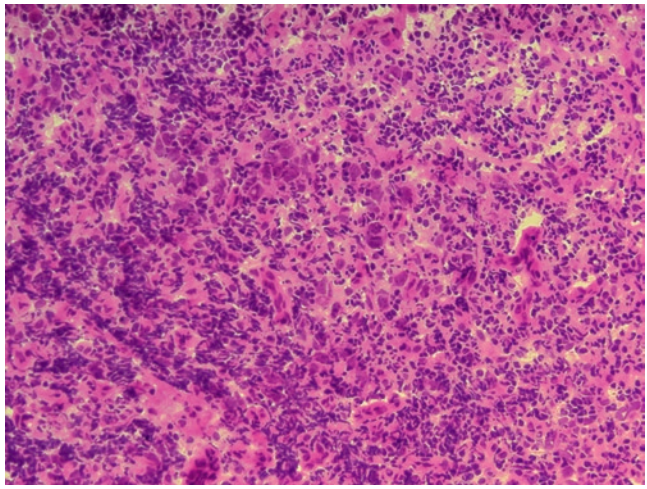

FIG. 2.4 Low power of a lymphoepithelioma-like carcinoma. Nasopharyngeal carcinoma, islands of tumor cells intimately admixed with lymphocytes and plasma cells. Do not confuse the tumor nests with a germinal center.

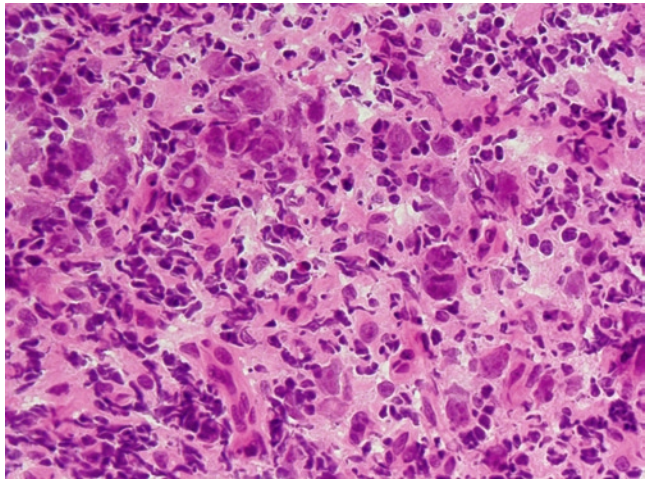

FIG. 2.5 Syncytial carcinoma cells exhibit indistinct cell borders, pale chromatin, and distinct nucleoli while the lymphocytes are mingled within carcinoma cell islands.

- For the small blue cell tumors, there are overlapping histologic features. Most of the time, immunostains are needed to separate them. The lymphoma specimen will show discohesion; small cell carcinoma shows cellular molding; olfactory neuroblastoma is lobulated with a fibrillary matrix/stroma; Ewing's sarcoma tumor cells are so monotonous that individual cells appear to be identical; rhabdomyosarcoma often shows plasmacytoid features. The location of the tumor is critical. If the tumor is from the cribriform plate and shows this morphology, olfactory neuroblastoma should be considered first (Figs. 2.6 and 2.7).
- Mucosal melanoma can be seen and the previous diagnosis might not be available at the time of frozen section. The melanocytic tumor cells are less cohesive than carcinoma cells, but more cohesive than lymphoma cells (Fig. 2.8).
- Geographic necrosis combined with a vasculitis is highly suspicious of Wegener's granulomatosis. Clinical and laboratory tests such as antineutrophil cytoplasmic antibodies (ANCAs) are useful for the diagnosis.
- If a lymphoid proliferation is clinically suspicious, a frozen section may not be necessary, especially when the tissue is scanty; a touch preparation is necessary and it should be made certain that adequate fresh tissue is available. If not, a request for additional fresh tissue should be communicated with the

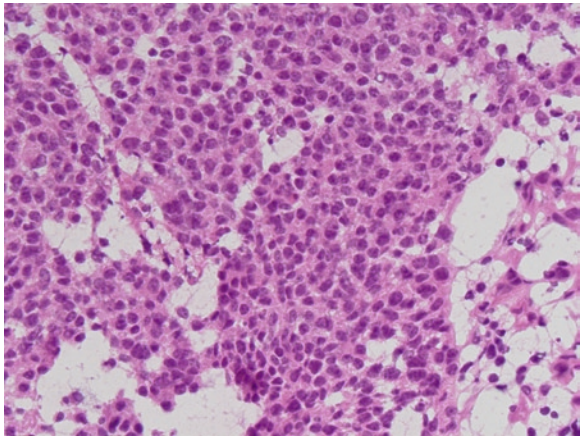

FIG. 2.6 Olfactory neuroblastoma/esthesioneuroblastoma. Nesting/lobular tumor cells with neuroendocrine appearance. The cells are not cohesive.

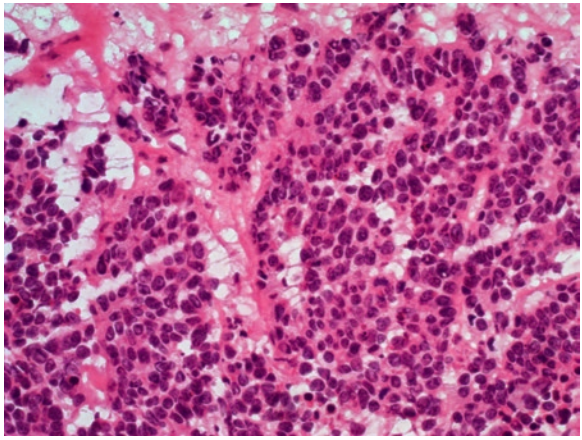

FIG. 2.7 Small cell carcinoma shows nuclear molding and scanty cytoplasm.

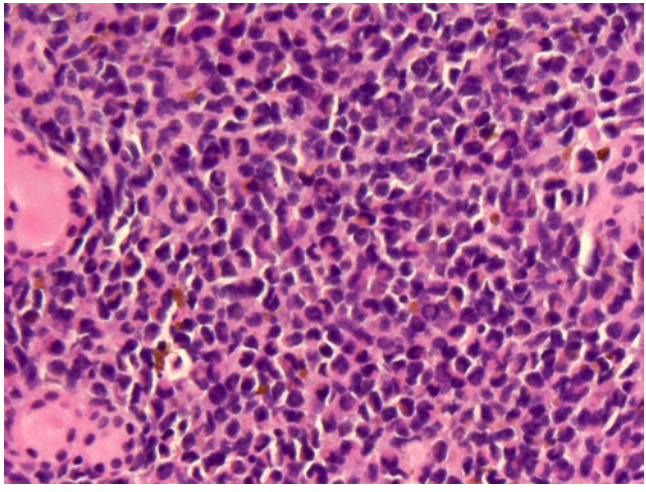

FIG. 2.8 Plasmacytoid cytology and pigment within the tumor cells are indicative of a melanocytic tumor (mucosal melanoma). Although final diagnosis needs ancillary tests such as immunohistochemistry, these histologic features can essentially rule out a lymphoma.

surgeon. It is important to inform the surgeon that this is a lymphoproliferative process; therefore, the surgeon will not chase a clear resection margin (Figs. 2.9 and 2.10).

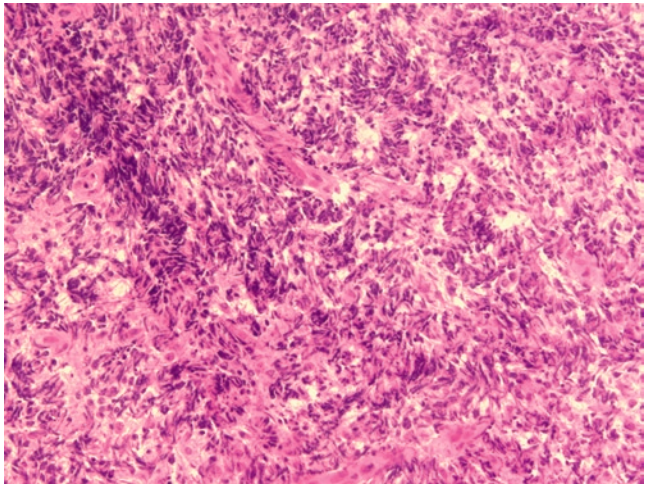

FIG. 2.9 Lymphoma with marked crush artifact. This kind of artifact is most often seen in both small cell carcinoma and lymphoma, since tumor cells from these two entities are fragile.

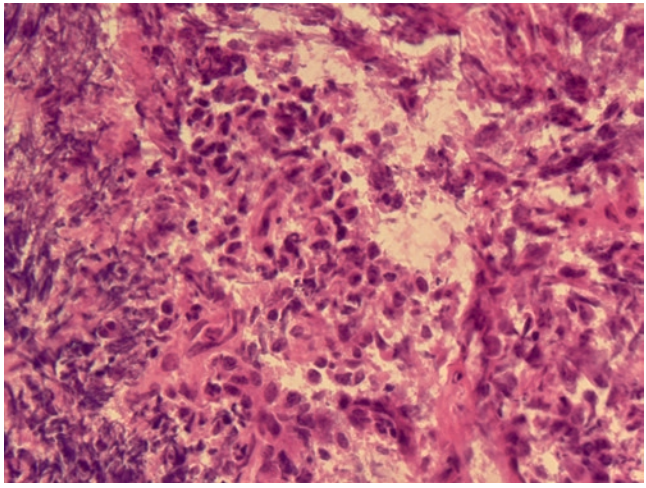

FIG. 2.10 Higher power of a different area with a less distorted histology, tumor cells are discohesive. A possible lymphoma needs to be worked up.

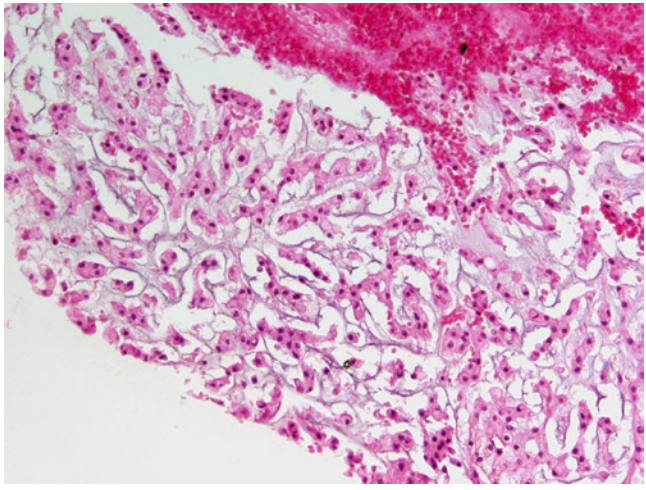

FIG. 2.11 Relatively bland chordoma tumor cells show a lobular configuration in a mucinous background; the tumor cells form typical cord structures mimicking liver plates.

- Chordoma predominantly occurs in the midline of the human body. In the head and neck area, chordomas can involve the spheno-occipital region, including the posterior nasal cavity, sphenoid sinus, nasopharynx, and base of the skull. Low power shows a lobular configuration with mucinous background. Higher power shows relatively bland tumor cells with typical cord-like structures mimicking liver plates (Fig. 2.11).
- Fungal balls can be recognized on frozen section with confidence (Fig. 2.12).

COMMON DIAGNOSTIC PITFALLS

- Extensive fibrosis and granulation tissue with reactive epithelioid endothelial proliferation, which may mimic malignant neoplasm
- Distinction among the small blue cell tumors may require permanent and immunohistochemical studies and should not be attempted on frozen section evaluation
- Reactive hyperplasia of squamous and respiratory epithelia can be difficult to distinguish from papilloma

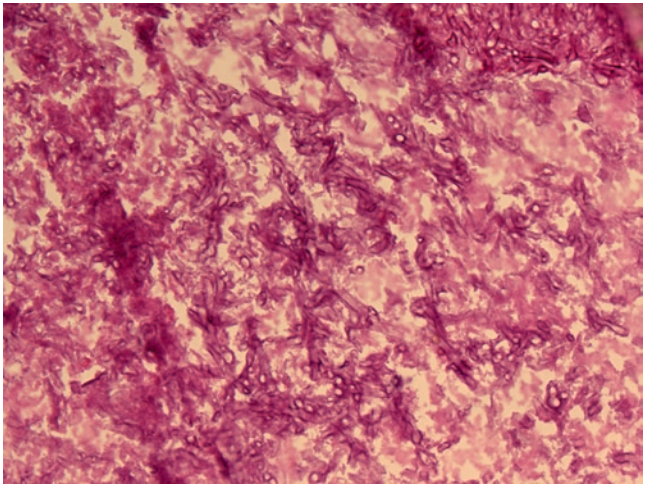

FIG. 2.12 Fungal ball consisting of septate hyphae with acute-angle branching and features consistent with *Aspergillus*.

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