



Intraoperative Frozen Section for Adnexal Tumors: An Unreliable Diagnostic Tool

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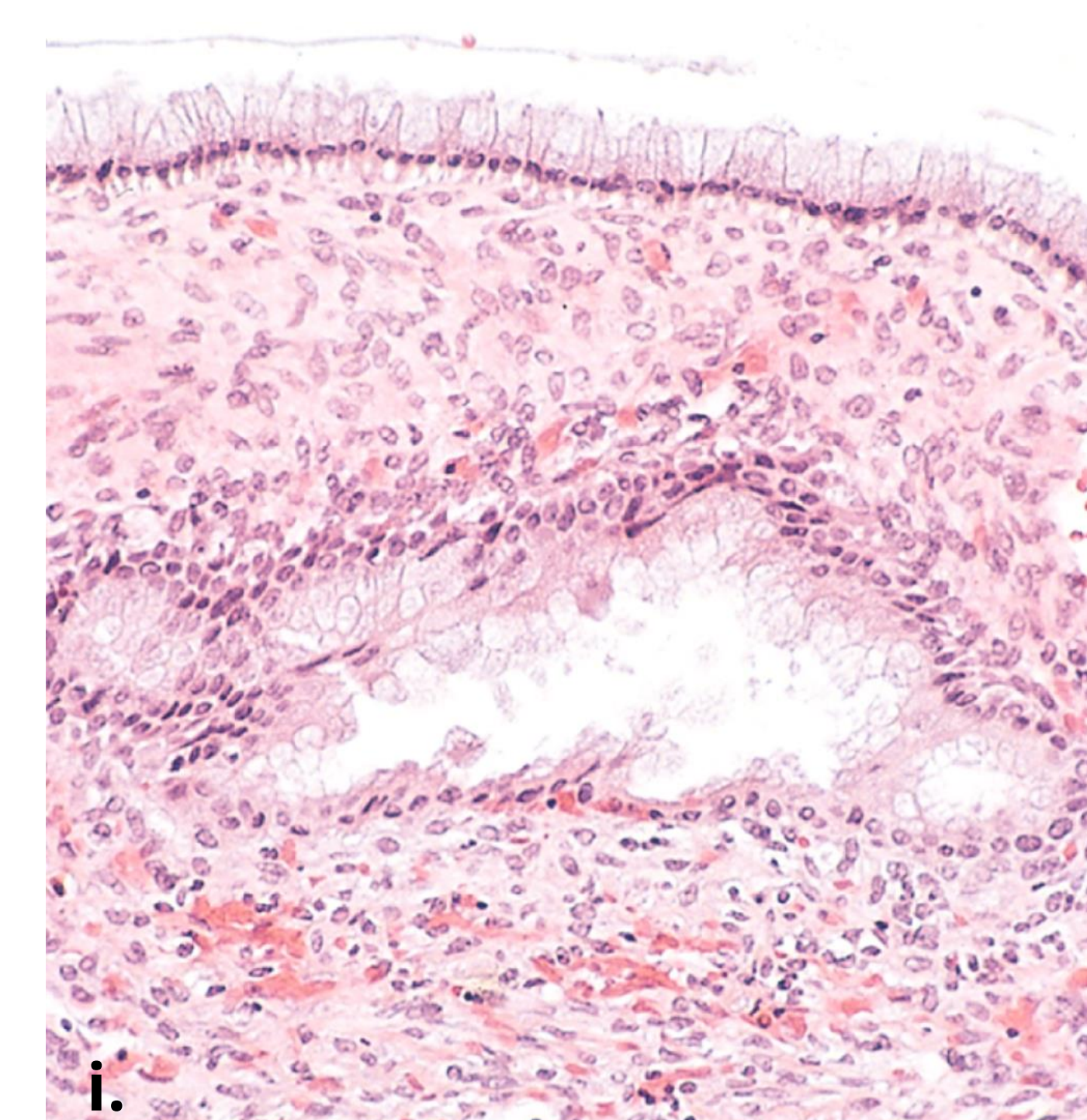
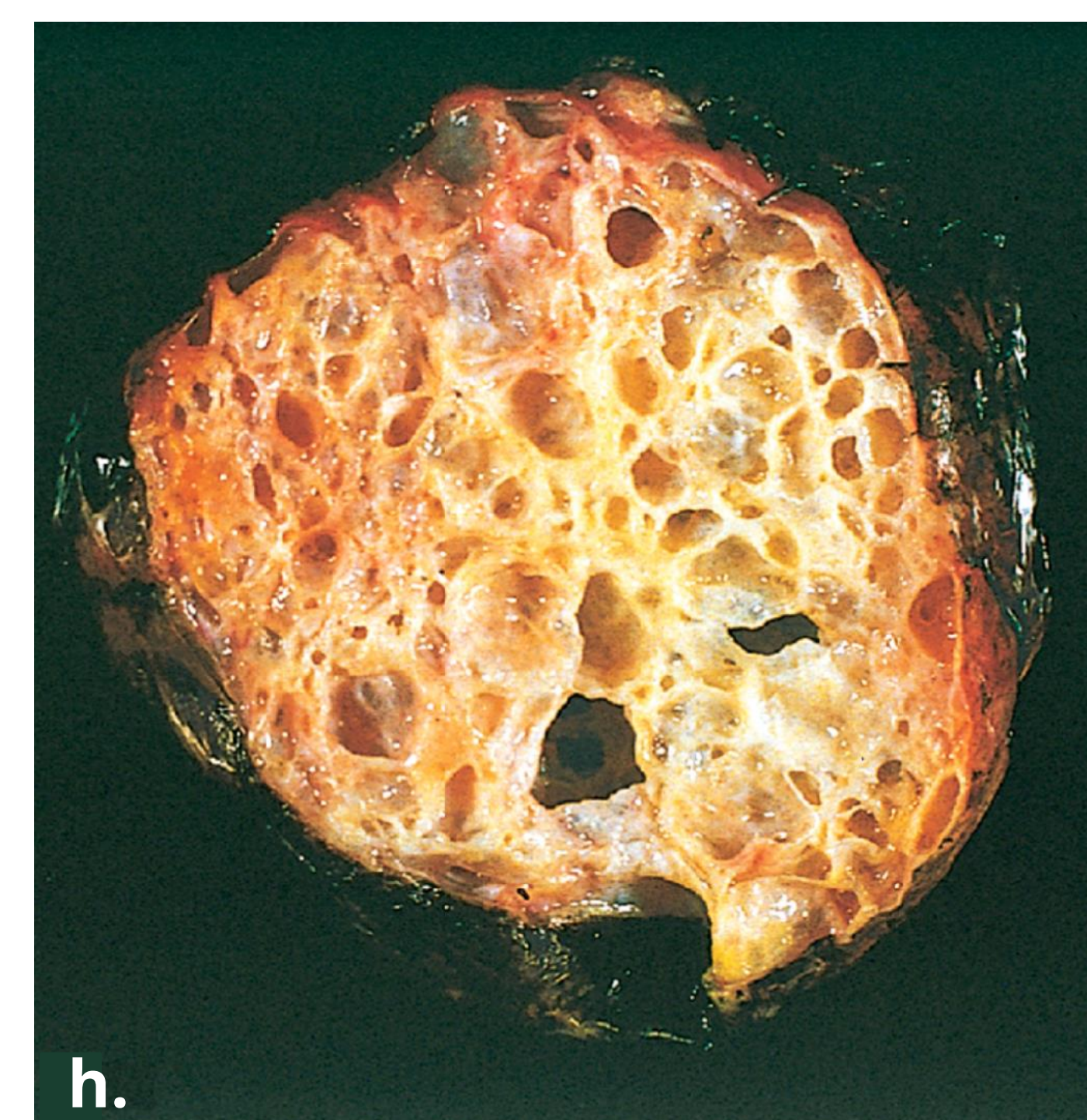
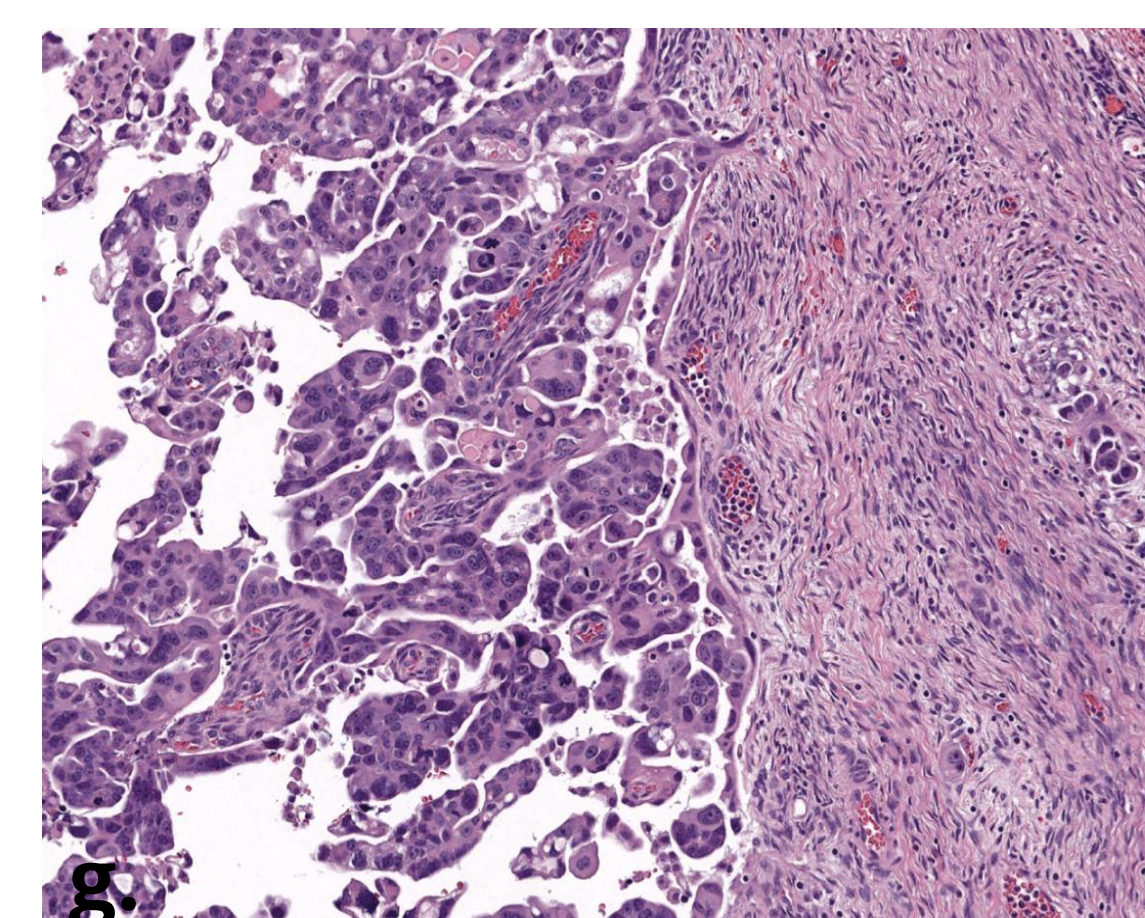
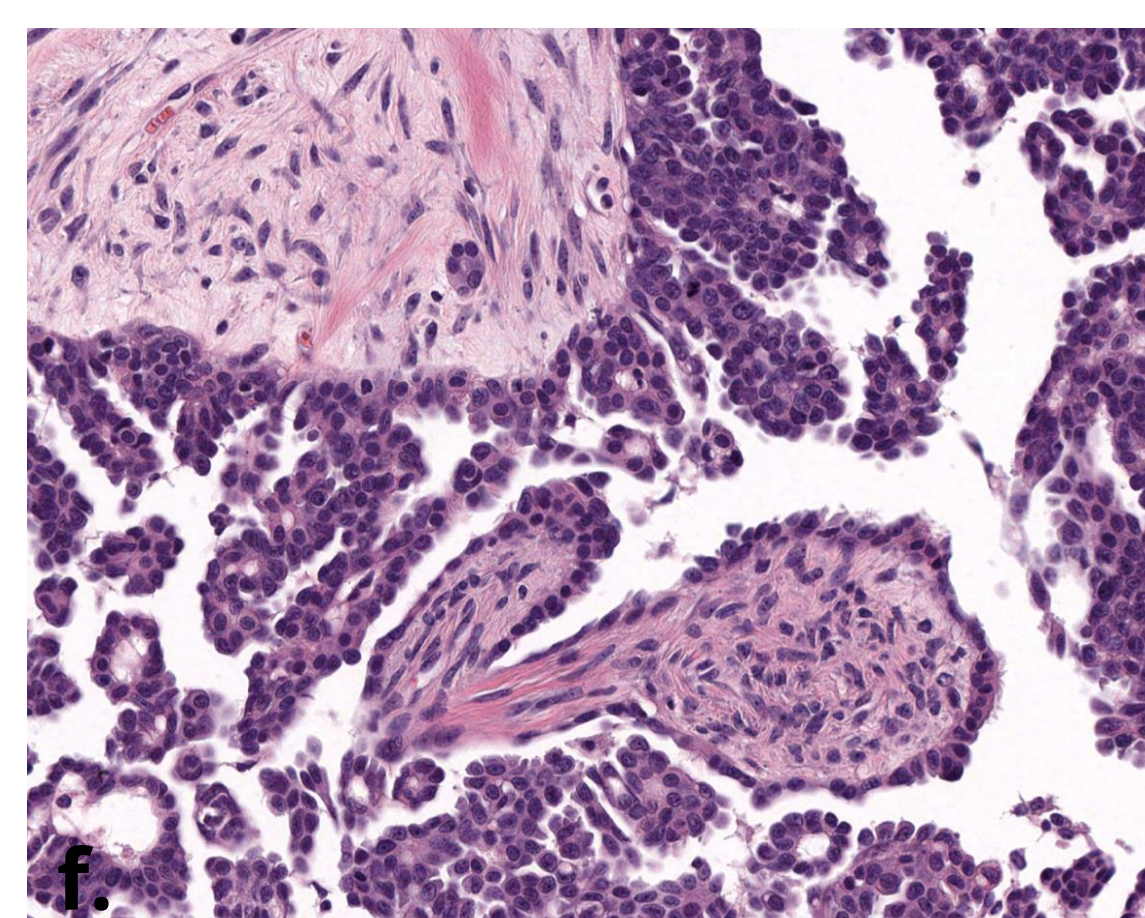
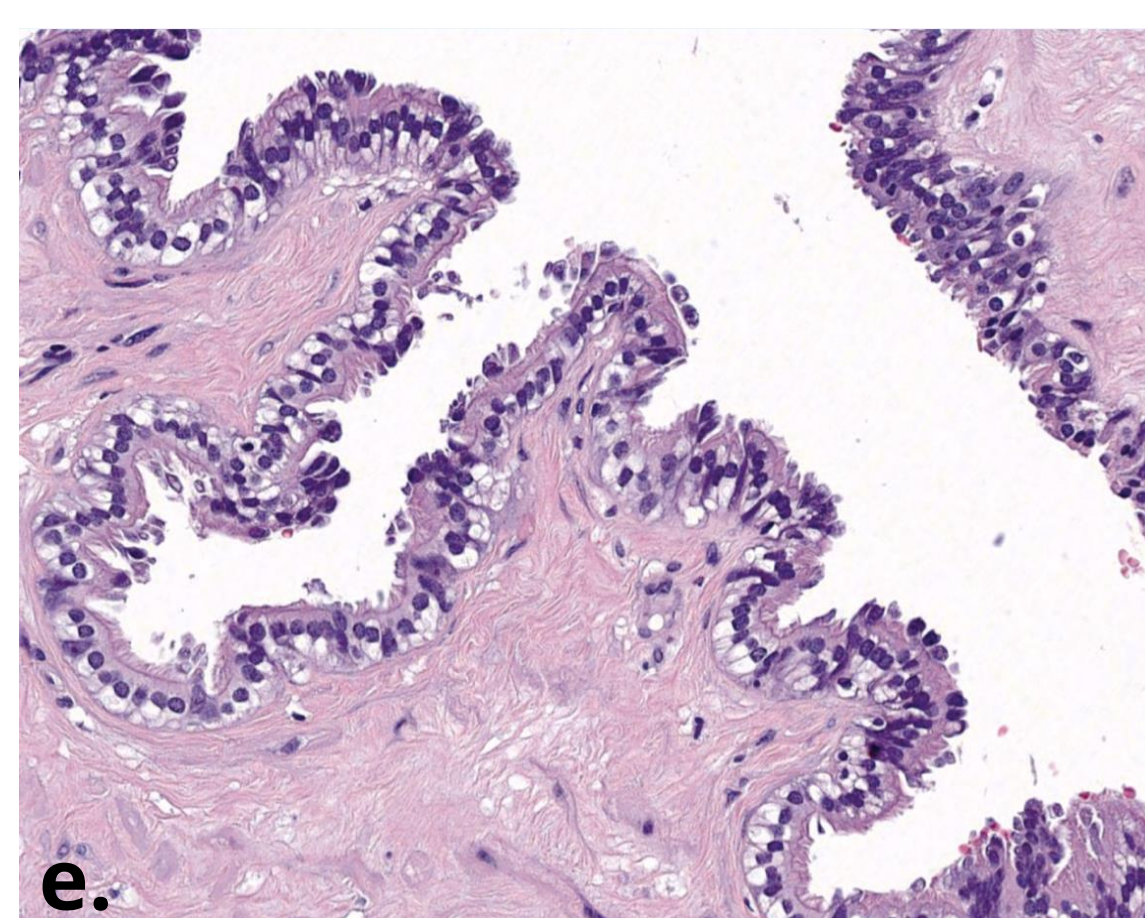
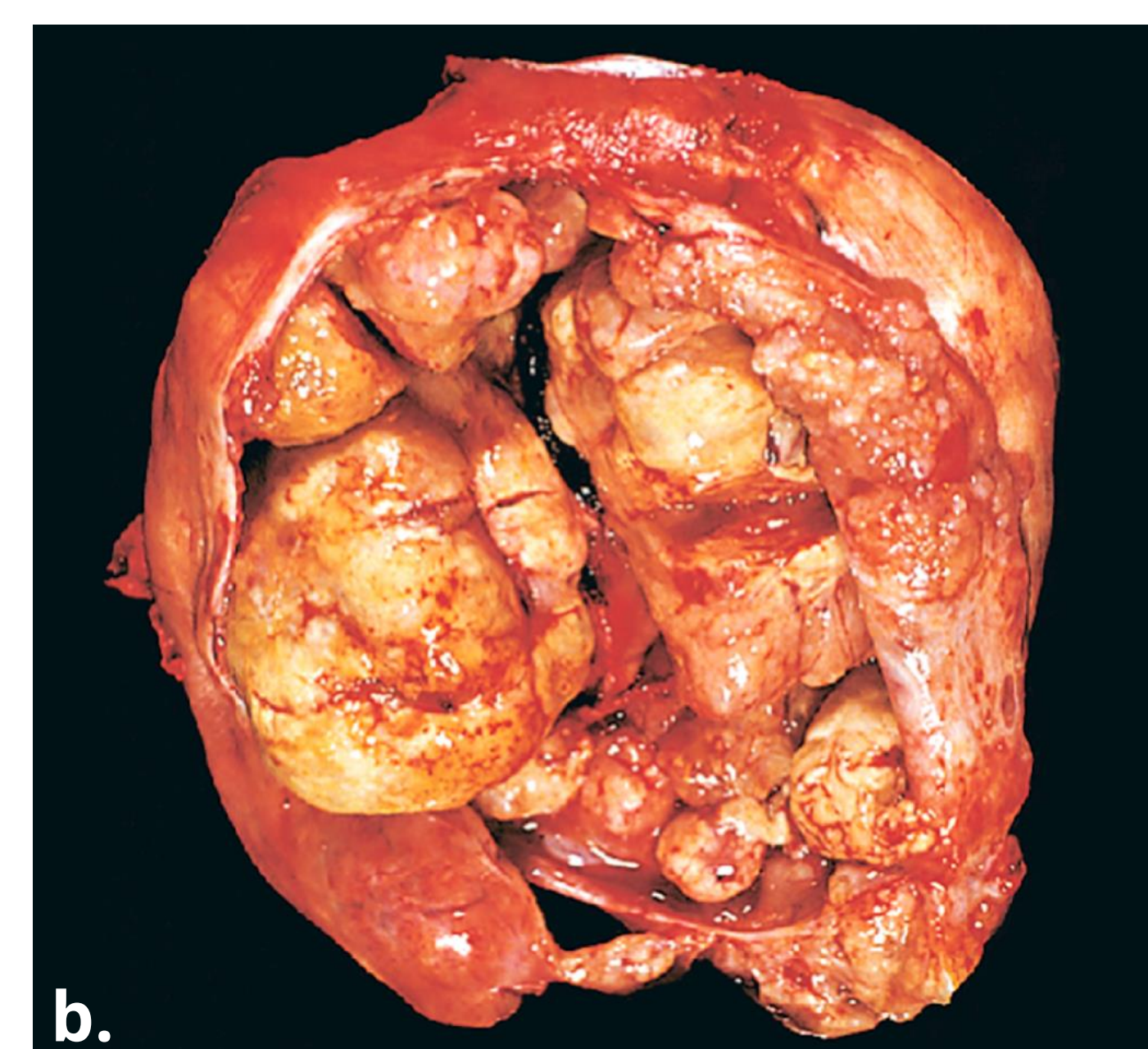
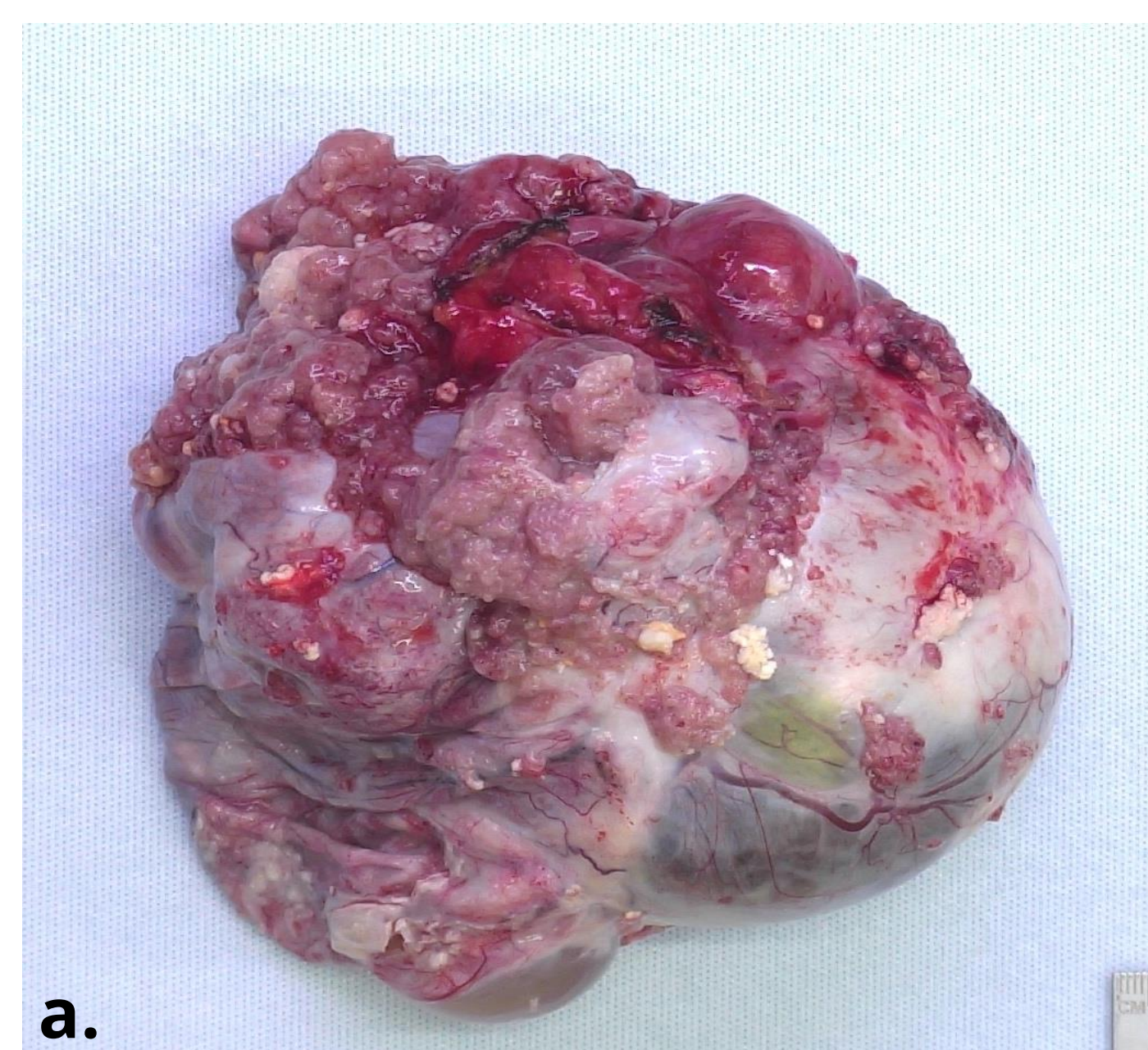
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Background

In the United States, ovarian cancer is the leading cause of gynecological cancer death. Ovarian tumors arise from multiple cell types, and are classified as either benign, borderline, or malignant. Borderline tumors are those of indeterminate malignancy which occur at older ages. Borderline tumors may behave in a benign manner but can also progress to carcinoma.¹ Diagnosis of ovarian tumors can only be made with exploratory surgery, and intraoperative frozen section is often performed to determine the classification of the tumor.² However, intraoperative frozen section has not proven to be a reliable diagnostic method for adnexal tumors. When frozen section shows a borderline or malignant tumor, surgeons perform the optimal procedures – thus, frozen section reduces surgical morbidity by negating any need for a second procedure. However, if the frozen section is benign and the final paraffin section result is malignant, patients need to undergo further surgery. Additionally, if the frozen section is misinterpreted as malignant, patients may have undergone unnecessary procedures that increase morbidity and terminate fertility.^{3,4} The goal of this literature review is to analyze the accuracy of intraoperative frozen section diagnosis compared to final paraffin section in ovarian tumors and identify factors that increase the likelihood of misdiagnosis in order to improve patient outcomes and enhance diagnostic methods.

Results

A review of seven studies was performed, each analyzing patient populations with ovarian tumors to determine the accuracy of intraoperative frozen section compared to final paraffin section diagnosis. All the studies found that borderline ovarian tumors were the most likely to be misdiagnosed on frozen section compared to benign and malignant tumors, due to the borderline histology often appearing questionably malignant. Multiple studies found that tumors diagnosed borderline on frozen section were more likely to be upgraded to malignant than downgraded to benign.^{2, 3, 5, 6, 7} Tissue sampling error was a commonly cited reason for frozen section misdiagnosis.³ Another study failed to diagnose any borderline tumors on frozen section; all patients with a final diagnosis of borderline tumor were initially reported as benign.⁸ The remaining studies found a propensity for borderline tumors to be downgraded to benign tumors. In both the upgraded and downgraded borderline tumors, mucinous histology was a frequent cause. Mucinous tumors tend to be large and contain cystic spaces, unlike their serous counterparts.⁶



a. Serous borderline tumor. Duke University School of Medicine
b. Serous ovarian tumor¹
c, d. Serous borderline tumor. Duke University School of Medicine
e-g: Benign, borderline, malignant serous ovarian tumor histology
h. Mucinous ovarian tumor¹
i. Mucinous ovarian tumor histology¹

Additionally, mucinous tumors can have solid components, another factor implicated in misdiagnosis. Mucinous tumors can also contain benign, borderline, and malignant histologic components within one tumor.⁶ Larger tumor size, combined with the varying histology found in borderline mucinous tumors, presents significant challenges for obtaining tissue for frozen section that will be representative of the entire mass.

Discussion & Conclusions

A review of the literature suggests that intraoperative frozen section is an unreliable tool for diagnosis of ovarian tumors, especially for borderline mucinous tumors. Misdiagnosis of a borderline tumor as malignant results in unnecessary surgical procedures that terminate fertility and increase morbidity, but misdiagnosis of a borderline tumor as benign necessitates future surgical procedures that also increase morbidity, while also placing emotional and financial strain on the patient. This review identified borderline tumors as prone to underdiagnosis – that is, the final diagnosis is upgraded – more often than overdiagnosis, meaning patients need to undergo additional procedures after final diagnosis. Further research is needed into diagnostic markers that may increase accuracy of frozen section, as well as updating frozen section sampling criteria to better represent larger tumors that may have varying histology. Future directions should also include studying patient outcomes in over- and under-staged tumors, and counseling patients on how intraoperative frozen section diagnosis may affect their care. The role of the Pathologists' Assistant in furthering this work involves meticulously following frozen section guidelines to ensure tissue quality, and sampling all irregular areas of a tumor such as solid components when doing a frozen section. Additionally, the Pathologists' Assistant is crucial in evaluation of appropriate sections for final paraffin slide diagnosis, and potentially assisting in development of guidelines that would allow more accurate diagnosis of borderline ovarian tumors by intraoperative frozen section.

- References:
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