

3rd Edition

CYTOPATHOLOGY REVIEW

Fang Fan



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CHAPTER

4

Effusions and Peritoneal Washings

Fang Fan

QUESTIONS

- Q1. Which of the following features favors an exudate over a transudate in an effusion specimen?**
- A. Low fluid protein level
 - B. Low cell counts
 - C. Low fluid specific gravity
 - D. High fluid glucose
 - E. High lactate dehydrogenase (LDH)
- Q2. Which of the following is not a typical feature for reactive mesothelial cells?**
- A. Binucleation and multinucleation
 - B. Irregular nuclear membrane
 - C. Mitosis
 - D. Cytoplasmic vacuoles
 - E. Large three-dimensional clusters
- Q3. All of the following cytologic features favor a diagnosis of malignant effusion except:**
- A. "Second population" of cells
 - B. Large cell clusters
 - C. Smooth community borders of cell clusters
 - D. "Lacunae" around cell groups in cell block sections
 - E. Mitosis
- Q4. Which of the following statements is true regarding malignant effusions?**
- A. Most cases have a known malignancy
 - B. Most cases do not change in prognosis
 - C. Most cases respond to systemic chemotherapy
 - D. Most cases respond to local radiation therapy
 - E. Most cases do not recur after thoracenteses/paracenteses
- Q5. Which of the following represents the most common cause of so called eosinophilic pleural effusions?**
- A. Malignancy
 - B. Tuberculosis
 - C. Churg–Strauss syndrome
 - D. Parasitic infections
 - E. Pneumothorax or hemothorax

Q6. The finding of lymphocytosis in a pleural effusion is most characteristic of which of the following conditions?

- A. Effusion in renal failure
- B. Effusion in congestive heart failure
- C. Rheumatoid pleuritis
- D. Lupus pleuritis
- E. Tuberculosis

Q7. A pleural fluid reveals multinucleated giant cells and large elongated epithelioid histiocytes in a granular, "sandy" necrotic background. These cytologic findings are characteristic of which of the following conditions?

- A. Acute serositis
- B. Renal failure
- C. Systemic lupus erythematosus
- D. Tuberculosis
- E. Rheumatoid pleuritis

Q8. In differentiating metastatic adenocarcinoma from malignant mesothelioma in a pleural fluid, which of the following positive stains favors the diagnosis of malignant mesothelioma?

- A. Pancytokeratin +
- B. Vimentin –
- C. Moc-31 +
- D. B72.3 +
- E. D2-40

Q9. What is the most common occult primary tumor that causes malignant pleural effusion in women?

- A. Lung carcinoma
- B. Gastric carcinoma
- C. Pancreatic carcinoma
- D. Breast carcinoma
- E. Lymphoma/leukemia

Q10. A patient with human immunodeficiency virus (HIV) infection presents with a large pleural effusion. There is no evidence of lymphadenopathy or organomegaly. The effusion cytology demonstrates dispersed large cells with irregular nucleus and prominent nucleoli. Positive immunohistochemical stain to which of the following antigens is essential for establishing the diagnosis of primary effusion lymphoma in this patient?

- A. CD20
- B. CD19
- C. CD3
- D. Human herpes virus 8 (HHV-8)
- E. Parvovirus

Q11. Hematoxylin body is a large glassy homogenous intracytoplasmic body in neutrophils or macrophages. The identification of hematoxylin body in a pleural effusion is indicative of which of the following conditions?

- A. Viral infection
- B. Tuberculosis infection
- C. Lupus pleuritis
- D. Rheumatoid pleuritis
- E. Renal failure

Q12. Which of the following organs is the most common site of tumors causing malignant pleural effusions in women?

- A. Breast
- B. Lung
- C. Ovary
- D. Gastrointestinal tract
- E. Lymphoma or leukemia

Q13. Cytogenetic analysis is considered highly sensitive and specific in the distinction between reactive mesothelial cells and mesothelioma. Which of the following chromosomal aberrations occur most commonly in mesothelioma?

- A. Point mutation
- B. Amplification
- C. Deletion
- D. Translocation
- E. Microsatellite instability

Q14. What is the clinical significance of identifying positive tumor cells in the peritoneal washing specimen of a patient with an ovarian serous borderline tumor?

- A. It converts the borderline diagnosis to carcinoma
- B. It upstages the borderline ovarian tumor
- C. It mandates postoperative radiation therapy
- D. It mandates postoperative chemotherapy
- E. It mandates intraperitoneal chemotherapy

Q15. All of the followings are indications for peritoneal washings except:

- A. Excluding an occult cancer in patients with hysterectomy for leiomyomata
- B. Excluding an occult cancer in patients with BRCA mutations having prophylactic salpingo-oophorectomy
- C. Staging for endometrial cancer
- D. Staging for fallopian tube cancer
- E. Staging for ovarian cancer

Q16. When differentiating metastatic high-grade ovarian serous carcinoma from mesothelioma in an abdominal fluid specimen, which of the following positive stains support metastatic serous carcinoma?

- A. CK5/6
- B. PAX-8
- C. PanCK
- D. WT-1
- E. Vimentin

Q17. A diagnosis of metastatic gastric adenocarcinoma is made in an abdominal fluid specimen. Test for which of the following genes/protein may be performed to guide further therapy?

- A. ALK
- B. eGFR
- C. ER
- D. HER2
- E. Microsatellite instability (MSI)

Q18. A 55-year-old woman presented with ascites. Further inquiry discovered a previous history of right ovarian "tumor". The fluid cytology showed abundant three-dimensional cell groups with bland cell morphology. Immunohistochemical stains demonstrated the cells being positive for WT-1 and Calretinin; negative for CK5/6 and D2-40. Cells are also positive for inhibin. What is the correct diagnosis?

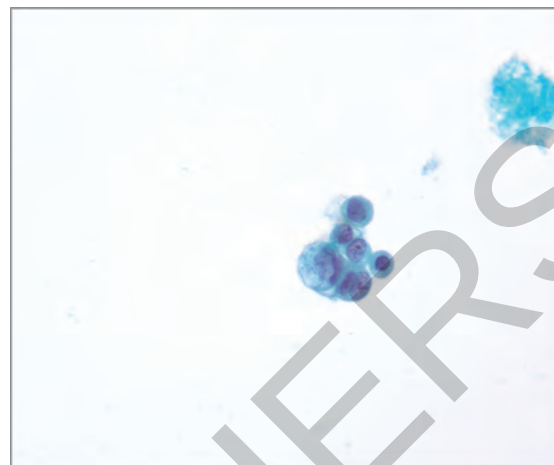
- A. Endometriosis
- B. Mesothelioma
- C. Metastatic granulosa cell tumor
- D. Metastatic serous carcinoma
- E. Metastatic transitional cell carcinoma

Q19. A pleural effusion specimen contains groups of small cells with nuclear molding and abundant apoptosis. Immunohistochemical stains show that these cells are positive for chromogranin and synaptophysin. They are negative for CK7 and positive for CK20. What is the correct diagnosis?

- A. Metastatic colonic adenocarcinoma
- B. Metastatic melanoma
- C. Metastatic Merkel cell carcinoma
- D. Metastatic small cell carcinoma
- E. Metastatic urothelial carcinoma

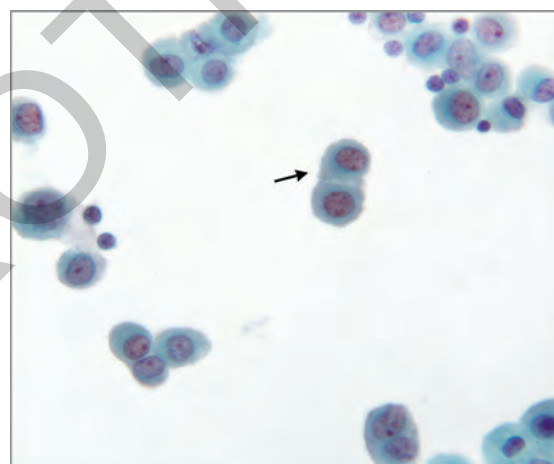
Q20. This cell group is seen in a smear from abdominal fluid. Which of the following immunohistochemical stains supports the diagnosis of metastatic adenocarcinoma?

- A. Pancytokeratin +
- B. WT-1 +
- C. Claudin-4 +
- D. Calretinin +
- E. Podoplanin (D2-40) +



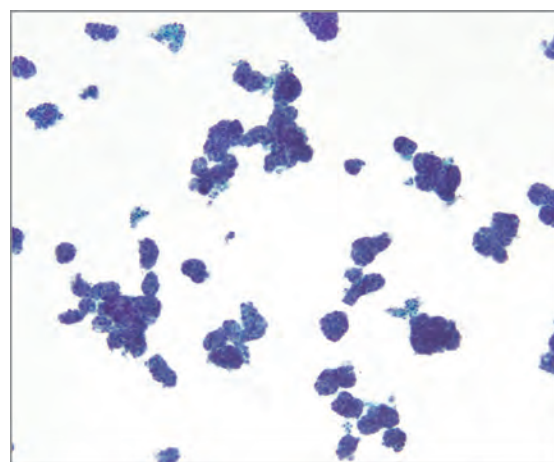
Q21. This image represents a pleural effusion specimen from a 43-year-old man with pneumonia. What are these cells indicated by an arrow?

- A. Histiocytes
- B. Lymphocytes
- C. Mesothelial cells
- D. Squamous cells
- E. Fibroblasts



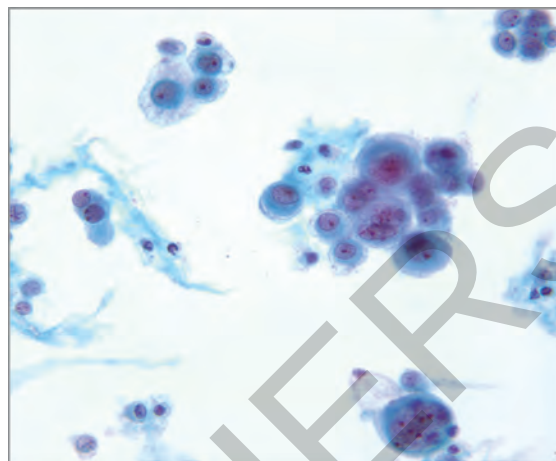
Q22. This image was taken from a smear prepared from a pleural effusion of a 43-year-old woman with a clinical history of breast carcinoma. What is the correct diagnosis?

- A. Reactive mesothelial cells
- B. Mesothelioma
- C. Metastatic breast carcinoma
- D. Granulomas
- E. Lymphoma



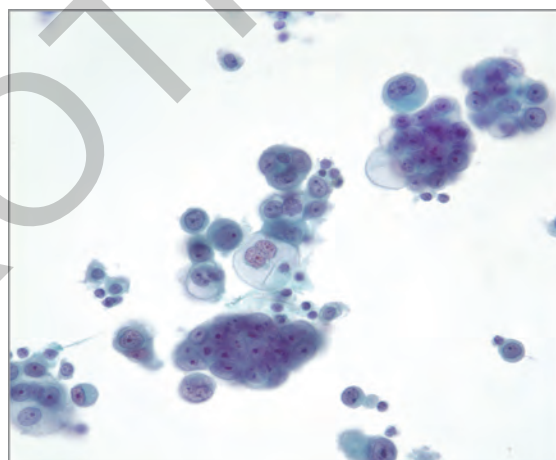
Q23. A 78-year-old man with hepatitis C and liver cirrhosis developed ascites. The effusion cytology is shown here. What do these cells represent?

- A. Reactive mesothelial cells
- B. Metastatic lung adenocarcinoma
- C. Metastatic renal cell carcinoma
- D. Metastatic hepatocellular carcinoma
- E. Metastatic squamous cell carcinoma



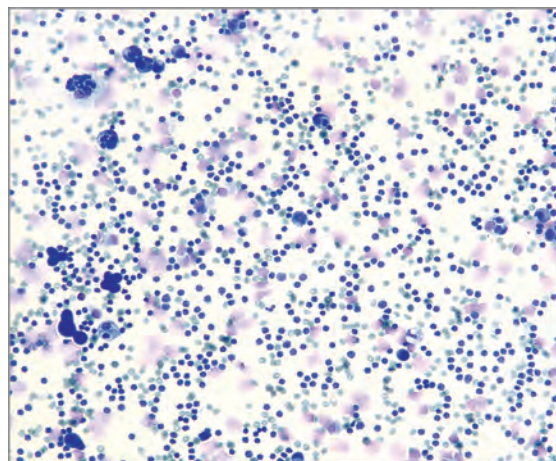
Q24. This image represents a large right-sided pleural effusion specimen from a 58-year-old smoker who has a history of working in a mining area 25 years ago. Negative immunohistochemical stains for which of the following markers supports the diagnosis of mesothelioma over reactive mesothelial hyperplasia?

- A. BAP-1
- B. Calretinin
- C. D2-40
- D. GLUT-1
- E. p53



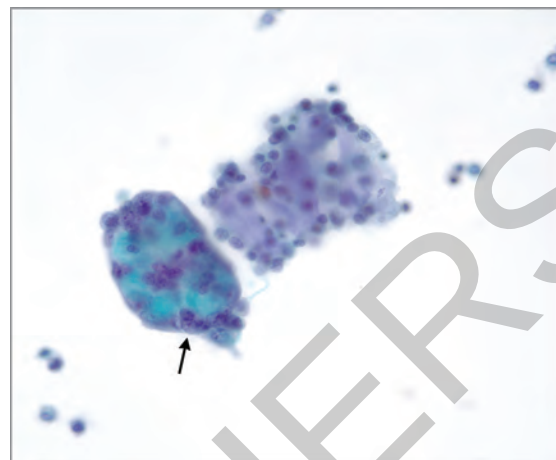
Q25. This image was taken from a pleural fluid specimen of a 57-year-old man who had a clinical history of chronic lymphocytic leukemia. Which of the following is the most appropriate test for this effusion specimen?

- A. Immunohistochemical stains on the cell block sections
- B. Flow cytometry analysis
- C. Cytogenetic study
- D. Gene rearrangement study
- E. Microbiology culture



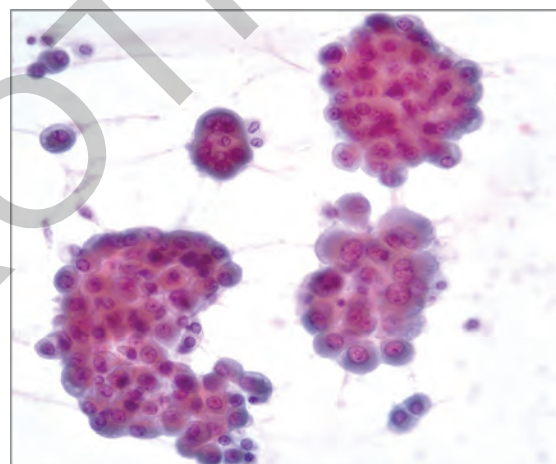
Q26. This structure (arrow) is commonly seen in peritoneal washing specimens. What is the significance of this cytologic finding?

- A. Diagnostic of endometriosis
- B. Diagnostic of endosalpingiosis
- C. Diagnostic of ovarian borderline serous tumors
- D. Indication of mesothelial hyperplasia
- E. None (of no clinical significance)



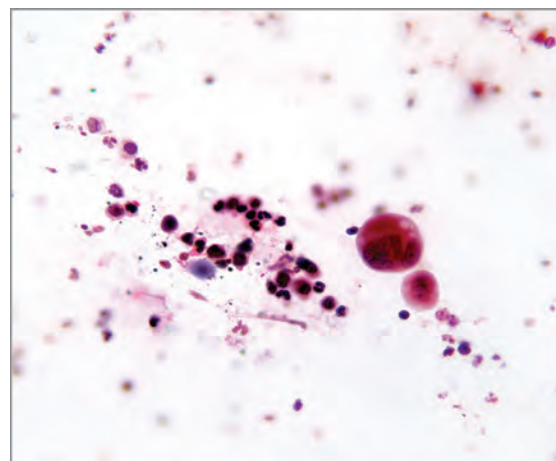
Q27. A 68-year-old man presents with chest pain and shortness of breath. Imaging study shows a large right-sided effusion and pleural thickening. The effusion smear is shown here. What is the most likely diagnosis?

- A. Granulomas
- B. Mesothelioma
- C. Metastatic adenocarcinoma
- D. Melanoma
- E. Lymphoma



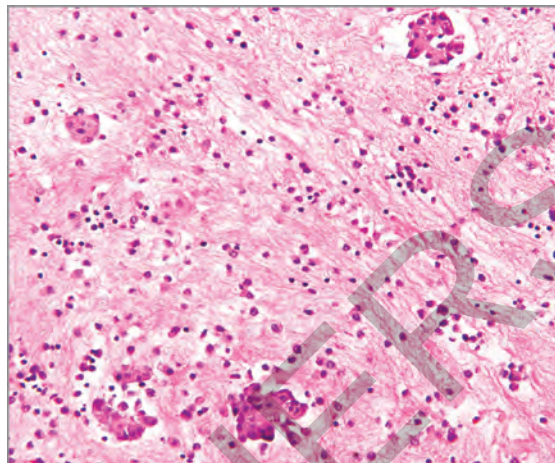
Q28. A 62-year-old woman developed left-sided pleural effusion and multiple lung nodules. This image depicts the smear from the pleural effusion. What is the correct diagnosis?

- A. Lupus pleuritis
- B. Rheumatoid pleuritis
- C. Pleural tuberculosis
- D. Metastatic carcinoma
- E. Lymphoma



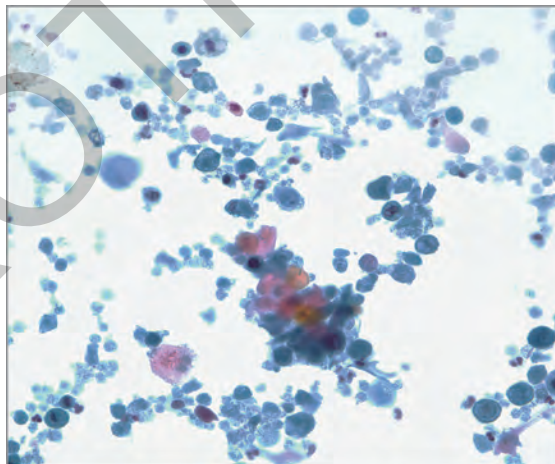
Q29. This image is taken from an H&E stained cell block section of a pleural fluid. Which of the features depicted in this image is more commonly associated with metastatic adenocarcinoma?

- A. Cohesive groups
- B. Flat sheet arrangement
- C. Clear space around cell groups (lacunae)
- D. Irregular contour of the cell groups
- E. Background lymphocytes



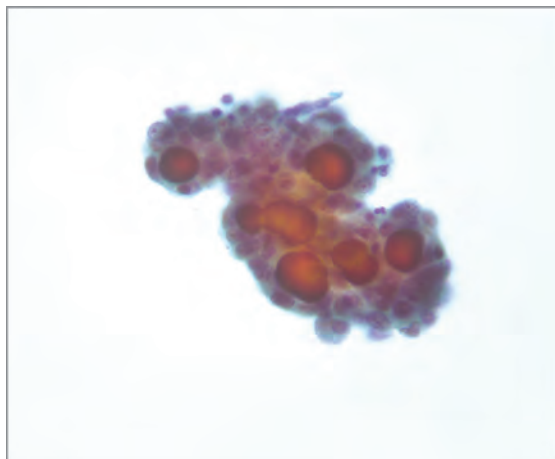
Q30. A 58-year-old man was admitted for pneumonia and right side pleural effusion. Inquiry of the clinical history revealed that he was a smoker and had a history of head and neck squamous cell carcinoma. The pleural effusion specimen was sent to cytology and a representative image is shown here. The cytologic features are highly suggestive of which of the following diagnosis?

- A. Empyema
- B. Rheumatoid pleuritis
- C. Tuberculous pleuritis
- D. Metastatic squamous cell carcinoma
- E. Mesothelioma



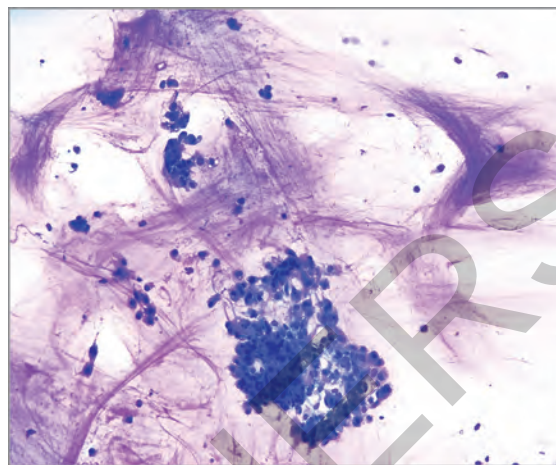
Q31. This cell group is seen in a pelvic washing specimen. The bilateral ovaries were involved by serous borderline tumors. What is the most likely diagnosis?

- A. Reactive mesothelial cells
- B. Endosalpingiosis
- C. Endometriosis
- D. Positive for neoplastic cells
- E. Positive for malignant cells



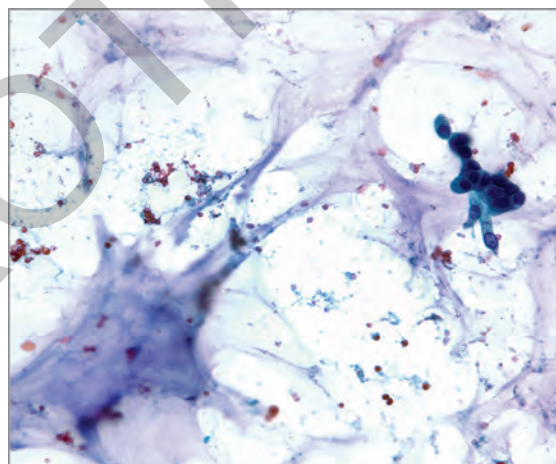
Q32. This peritoneal fluid specimen was collected from a 56-year-old woman. Her bilateral ovaries were also involved by the same process. Which of the following statements is correct?

- A. It is most likely a primary ovarian carcinoma
- B. It is most likely a primary peritoneal carcinoma
- C. It is most likely a primary appendiceal carcinoma
- D. It is most likely a primary rectal carcinoma
- E. It is most likely a primary breast carcinoma



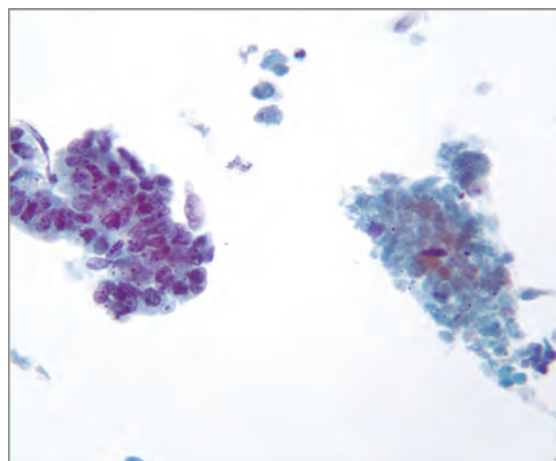
Q33. Which of the following immunohistochemical stains would support the diagnosis of appendiceal adenocarcinoma in this peritoneal fluid specimen?

- A. Calretinin+
- B. GATA-3 +
- C. PAX-8 +
- D. CDX2+
- E. Estrogen receptor (ER)+



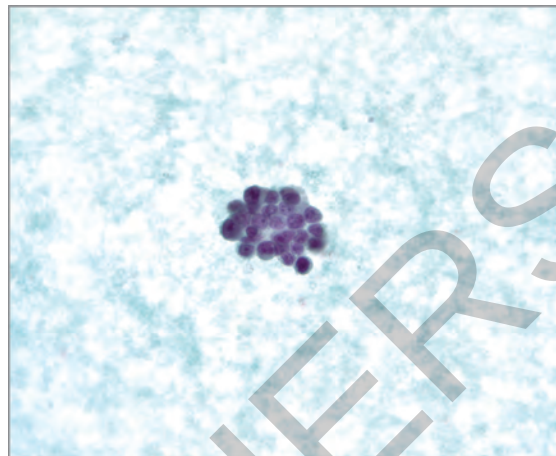
Q34. Based on morphology, what is the most likely diagnosis of this ascites smear from a 72-year-old man?

- A. Metastatic colon cancer
- B. Metastatic lung cancer
- C. Metastatic prostate cancer
- D. Metastatic renal cell carcinoma
- E. Metastatic germ cell tumor



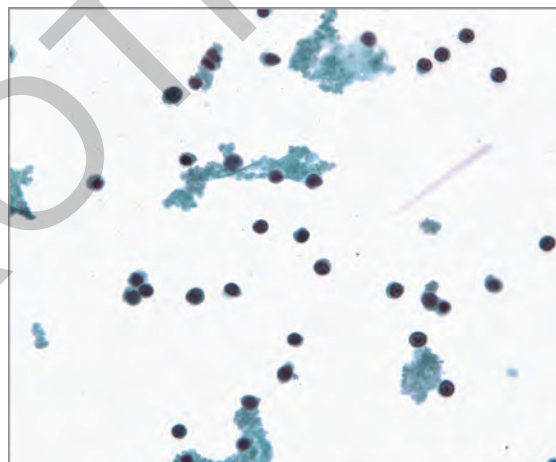
Q35. A 1-year-old boy was discovered to have a large retroperitoneal mass and ascites. A representative image of the abdominal fluid smear is shown here. Based on the clinical setting and the cell morphology, what is the most likely diagnosis?

- A. Metastatic small cell carcinoma
- B. Neuroblastoma
- C. Desmoplastic small round cell tumor
- D. Lymphoblastic lymphoma
- E. Mesothelioma



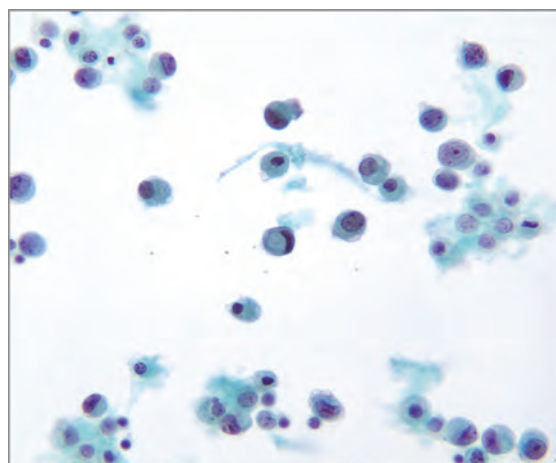
Q36. This pleural effusion is from a 26-year-old man. What is the most likely diagnosis?

- A. Reactive mesothelial cells
- B. Reactive lymphocytosis
- C. Mesothelioma
- D. Diffuse large B-cell lymphoma
- E. Metastatic carcinoma



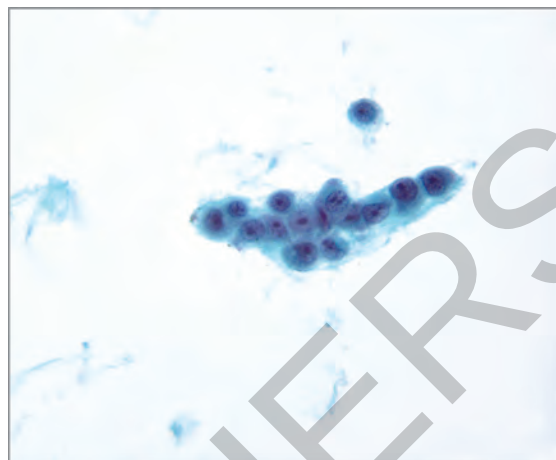
Q37. A 45-year-old man developed recurrent ascites. He did not have clinical history of liver disease or malignancy. Previous fluid cytology showed reactive mesothelial cells. This image shows a recent smear from the ascitic fluid. Which of the following special stains should be performed?

- A. Fungal stain
- B. Giemsa stain
- C. Oil-Red-O stain
- D. Mucin stain
- E. Fontana–Masson stain



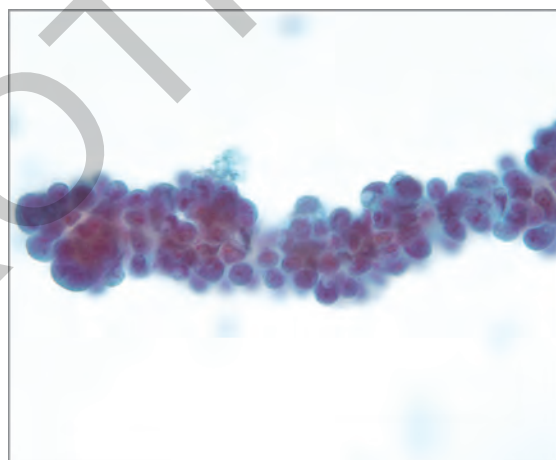
Q38. These cells are seen in a pleural effusion specimen. All of the following are included in the differential diagnoses based on morphology except:

- A. Metastatic adenocarcinoma of the lung
- B. Metastatic adenocarcinoma of stomach
- C. Metastatic renal cell carcinoma
- D. Metastatic melanoma
- E. Metastatic small cell carcinoma



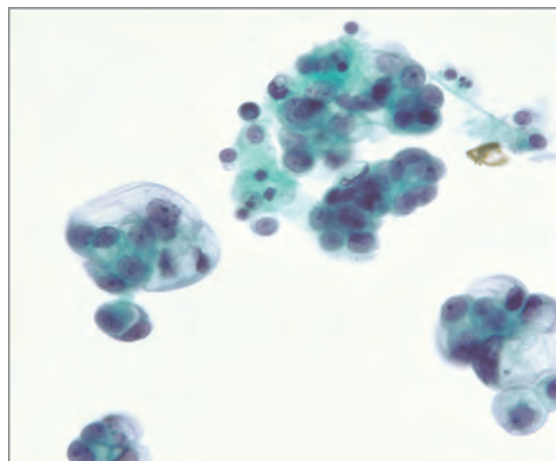
Q39. This pelvic washing specimen is collected from a woman undergoing hysterectomy for endometrial adenocarcinoma. Negative immunohistochemical stains for which of the following markers supports the diagnosis of metastatic endometrial adenocarcinoma over endometriosis?

- A. ARID1A
- B. CD10
- C. Ki-67
- D. PAX-8
- E. Vimentin



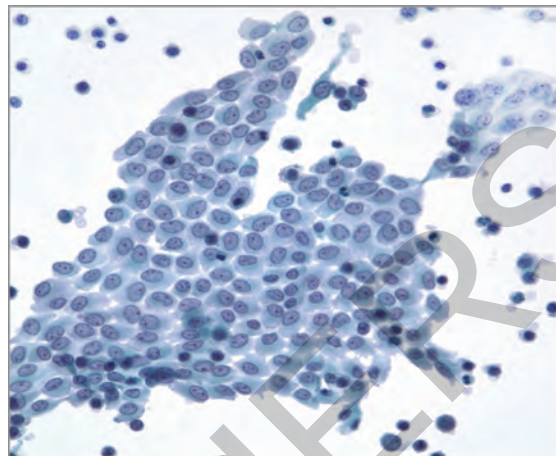
Q40. This peritoneal washing specimen is most likely collected from a patient with which of the following conditions?

- A. Ovarian serous borderline tumor
- B. Ovarian serous carcinoma
- C. Ovarian granulosa cell tumor
- D. Ovarian endometriosis
- E. Ovarian torsion



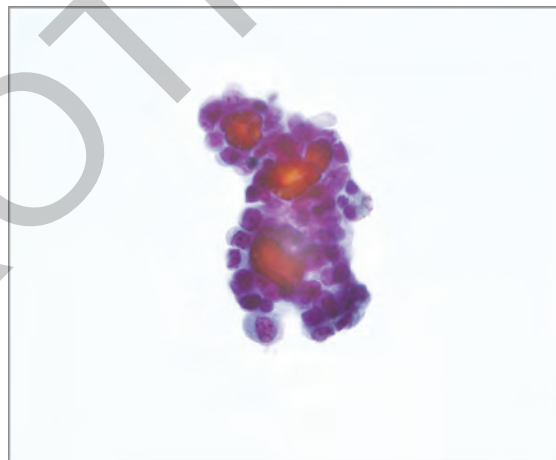
Q41. This group of cells most likely represents which of the following?

- A. Benign mesothelial cells in peritoneal washing
- B. Ovarian serous borderline tumor in peritoneal washing
- C. Metastatic pancreatic adenocarcinoma in ascites
- D. Metastatic hepatocellular carcinoma in ascites
- E. Malignant mesothelioma in ascites



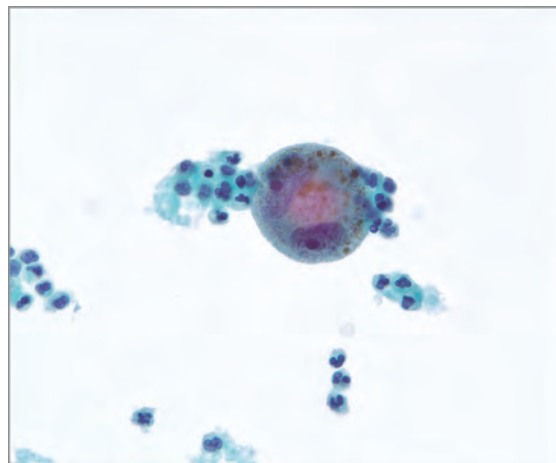
Q42. A 42-year-old man developed pleural effusion. Inquiry of the clinical history revealed previous thyroidectomy for "cancer" 7 years ago. This group of cells identified in the effusion smear is highly suggestive of which of the following diagnosis?

- A. Reactive mesothelial hyperplasia
- B. Mesothelioma
- C. Metastatic papillary thyroid carcinoma
- D. Metastatic lung adenocarcinoma
- E. Metastatic lung squamous cell carcinoma



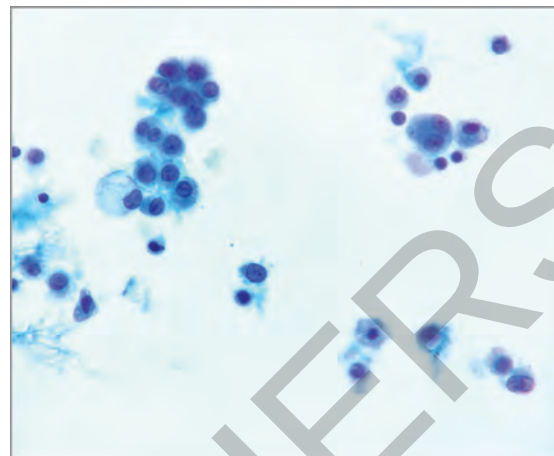
Q43. A 23-year-old patient with *CDKN2A* (cyclin-dependent kinase 2A) mutation developed right pleural effusion along with multiple metastatic lesions in the liver. The effusion specimen has a high protein level and high LDH level. The pleural effusion smear is shown here. What is the correct diagnosis?

- A. Mesothelioma
- B. Metastatic lung adenocarcinoma
- C. Metastatic gastric adenocarcinoma
- D. Metastatic melanoma
- E. Diffuse large B cell lymphoma



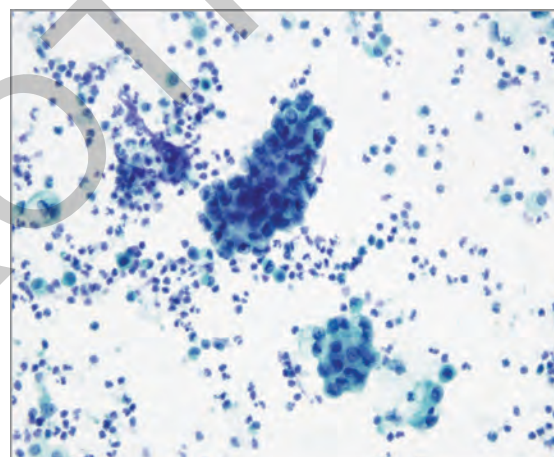
Q44. A 39-year-old woman developed fatigue, ascites and right-sided pleural effusion. Clinical examination revealed normal cardiac, liver and renal functions. The pleural fluid cytology is shown here. Further examination discovered a large ovarian mass. Based on the effusion cytology and clinical history, what is the most likely diagnosis of the ovarian mass?

- A. Benign serous cystadenoma
- B. Borderline serous tumor
- C. Fibroma
- D. Teratoma
- E. Granulosa cell tumor



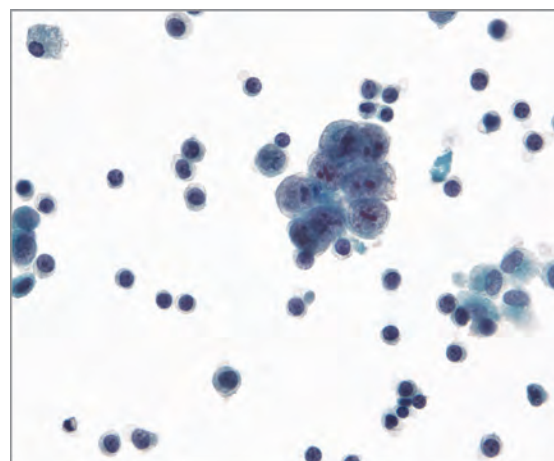
Q45. This image is taken from a pleural effusion specimen of a 56-year-old woman with a clinical history of lung adenocarcinoma. Immunohistochemical stain on the cell block sections demonstrated the cells being positive for TTF-1. Molecular test of which of the following genes may be requested by the oncologist on this cytology sample?

- A. *ALK*
- B. *c-KIT*
- C. *Rb*
- D. *RET*
- E. *TP53*



Q46. A 24-year-old woman presented to the emergency department for an acute abdominal pain. CT scan revealed a right adnexal mass. A right salpingo-oophorectomy was performed. Peritoneal washing was performed and a representative image is shown here. These cells were positive for SALL4 and CD117. What is the correct diagnosis of this peritoneal washing cytology?

- A. Endometriosis
- B. Metastatic dysgerminoma
- C. Metastatic serous carcinoma
- D. Metastatic embryonal carcinoma
- E. Reactive mesothelial cells



CYTOPATHOLOGY REVIEW

The book *Cytopathology Review* (3rd edition) is a multiple-choice question book covering comprehensively the most important aspects of modern cytopathology, including diagnostic criteria, reporting systems, ancillary testing modalities, molecular mechanisms of diseases, and clinical-pathological correlations. This review book features:

- Tremendous multiple-choice questions, more than half of them pertaining to Images
- Answers with detailed explanatory notes emphasizing the key learning points of each question

This review book provides an educational resource and serves as an invaluable aid for the following:

- Supplement to standard cytopathology textbooks
- Study guide for pathology residents preparing for in-service examinations and the Anatomic Pathology board examination conducted by the American Board of Pathology
- Review for cytopathology fellows preparing for the Cytopathology board examination conducted by the American Board of Pathology
- Review and update for practicing cytopathologists preparing for the Cytopathology board recertification

Target audience:

- Residents in pathology
- Cytopathology fellows
- Cytotechnology students
- Practicing cytopathologists

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All authors of this review book are board certified in Anatomic Pathology and Cytopathology.

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