Cytopathology Fellowship Rotation at the
University of Minnesota Medical Center
Goals and Objectives

Rotation Goal:
The institution has a smaller total volume of cases, but a greater relative emphasis on non-gynecologic samples. The nature of this center ensures that the fellow has ample opportunity to evaluate various samples from patients with transplants of bone marrow or solid organs, as well as those receiving chemotherapy for a variety of malignant conditions. Also well represented in this material are patients with malignant lymphoma and leukemia of various types.

Additionally, the Cytopathologists and the University of Minnesota Medical Center Department of Surgery have partnered with Hennepin County Medical Center in treating patients with treatable pancreatic cancers. As referenced above the University of Minnesota Medical Center has a large transplant population and the Cytopathology Fellows gain extensive experience working with the Bone Marrow Transplant Team.

General:
Contemporary cytopathology is viewed as a clinically oriented subspecialty that aims to rapidly diagnose significant patient problems with atraumatically collected material. The goal is improved patient care through highly skilled application of the methods available in our discipline. This includes educating our clinical colleagues to the possibilities and advantages of cytologic evaluations, as well as realizing the full application of newer diagnostic modalities to cytologic material. The laboratory's philosophy features an active, interventional stance for the modern cytopathologist through performing aspirations in the clinic, participating in radiographically directed aspirations, and acting as a consultant to the clinical staff.

Interactions between the cytopathology fellow and services devoted to necropsy, clinical pathology, and surgical pathology are most commonly based on follow-up of patients who have been previously studies by cytologic means. Staging of malignancies initially diagnosed in histologic biopsies is often addressed by fine needle aspiration. In the setting of certain types of disease, cytologic specimens are collected for cytogenetic, immunophenotypic, flow cytometric, or hormone receptor analysis. Communication with the laboratories responsible for these studies is an important component of complete evaluation of some cytology cases. Follow-up of cytology cases in surgical pathology is a daily activity, as a part of quality control, and in preparation of teaching sets. Both of these are important areas of activity for the fellow.

The procedure for work-up of cases varies with the type of case. Gynecologic cases are prepared and screened by staff cytotechnologists. The fellow works closely with the cytopathology staff in signing out these slides. In the second one-half of the training program, the fellow has primary sign-out privileges. Non-gynecologic, non-aspiration cases are addressed in a similar manner. Fine needle aspirations of palpable masses are performed by the fellow, following several months of supervised activity in this field. Preparation of smears, application of the

initial rapid stain, and communication of rapid diagnoses are all accomplished by the fellow. Radiographically guided aspirations of deep masses are attended by the fellow, who prepares the smears, applies a rapid stain and gives a preliminary interpretation of specimen adequacy. Based on the diagnostic possibilities suggested by the combined clinical radiographic and rapid cytologic findings, the fellow makes decisions about specimen allocation to the various media required for cell blocks, electron microscopy, immunocytochemistry, cytogenetics, flow cytometry, and microbiologic culture.

In all cases, the patient's previous pathology and cytology specimens are available for review. The current clinical history is considered as the case is evaluated. Frequent contact with the physicians on clinical services insures rapid and accurate correlation of all pertinent information. As the fellow prepares and evaluates cases in the manner just described, the cytopathology staff is available for consultation. This includes bedside assistance with difficult aspirations. Regularly scheduled conferences insure that all significant abnormal findings are ultimately seen by several individuals at all levels of the service. This insures both high-quality teaching, and constant review of diagnostic patient material.

During interactions with the clinical staff, the fellow is encouraged to take an active role, not only in obtaining detailed information about material currently being studied, but in educating other physicians about applications of cytology and its advantages in specific situations. This includes recognizing situations in which cytologic evaluations (particularly fine needle aspiration) are not appropriate. This exchange of information occurs informally as cases are discussed at the microscope, in written form through results reporting, and in multidisciplinary patient-care conferences.

As the fellow gains experience, the teaching responsibilities increase. This includes supervision of residents in case preparation and evaluation, as well as introducing residents to the technique of fine needle aspiration. In the second one-half of the year, there is ample opportunity to engage in formal teaching of cytotechnology students and pathology residents.

Goals and Objectives

Objectives

A number of specific objectives subtend the overall goal. These objectives are presented below, organized by the general competencies defined by the Accreditation Council for Graduate Medical Education (ACGME) and the cytopathology fellowship program.

Patient Care

The cytopathology fellow will demonstrate ability to:

- Communicate with patients and family members with compassion and courtesy.
- Gather appropriate and accurate clinical information in both pathology and cytopathology settings.
- Interpret diagnostic information and test results within the clinical context for effective patient management.
- Use clinical decision-making concepts and techniques and interpret results.
- Advise clinicians on the choice of clinically appropriate, cost-effective tests.

- Advise clinicians on appropriate follow up for unexpected test results.

Medical Knowledge

The cytopathology fellow will demonstrate:

- Knowledge of common clinical and diagnostic procedures and their medical application and correlation.
- Knowledge of specialized diagnostic procedures, including special staining techniques, electron microscopy, immunofluorescence and immunohistochemistry, and cytologic fine needle aspiration.
- Ability to collect and evaluate medical evidence relevant to cytopathology.
- Ability to use a variety of resources to investigate clinical questions.
- Development of a personal strategy to regularly maintain and update medical knowledge.

Practice-Based Learning and Improvement

The cytopathology fellow will demonstrate:

- Ability to counsel and educate in a clear and effective manner with patients and family members.
- Ability to function effectively as a member of the clinical care team with fellow clinicians, nursing and laboratory staff, and administrative personnel.
- Ability to use appropriate modes of communication (direct, telephone, email, written) in a timely manner.
- Ability to communicate clearly and effectively in written documents (including legible handwriting).
- Ability to prepare and deliver effective presentations.

Professionalism

The cytopathology fellow will demonstrate:

- Knowledge and understanding of ethical and confidential issues affecting patient care.
- Knowledge of issues concerning cultural diversity in the patient population.
- Respectful behavior towards all patients and medical personnel, including punctuality and courtesy.
- Maintain a professional demeanor in appearance and interactions with others, including acceptance of responsibility, responding effectively to criticism, and taking initiative.

Systems-Based Practice

The cytopathology fellow will demonstrate:

- Understanding of the role of the diagnostic clinician and the health care system, and the importance of reliable, cost-effective, and timely results in clinical decision-making.
- Ability to work with clinicians, administrators, and others to determine the role of diagnostic testing in specific situations to optimize patient outcomes.
- Understanding of the CLIA, CAP, JCAHO, and HIPAA/Data Security requirements for practice management.
- Understanding of the basic reimbursement mechanisms and regulatory requirements, including kickbacks and compliance with the Medicare/Medicaid “fraud and abuse” avoidance requirements.
- Understanding of effective managerial practices.

Overview of Gynecologic Cervical Cytology at the University of Minnesota Medical Center

Goals: Learn to accurately diagnose cervical cytology specimens and understand the clinical significance of cervical cytology findings.
Objectives: Upon completion of this rotation, fellows should be able to:

- Stain a slide using Papanicolaou stain
  a. Explain the cellular fixatives which can be used for the Pap statin
  b. Explain the value of the hematoxylin, OG and EA dyes
  c. Explain regressive and progressive staining methods
- Explain the CLIA '88 regulations as they apply to gynecologic cytology in laboratories.
- Know the Bethesda 2001 nomenclature system for gynecologic cytology and be able to describe similarities and differences to previous nomenclature systems (Bethesda I and II, the CIN system-CIN I, CIN II, CIN III, and Papanicolaou numerical classification).
- Define what constitutes an adequate Pap test according to the Bethesda 2001 system.
- Describe and recognize the normal cellular elements in the cervical Pap test
  a. Describe the significance of normal endometrial cells in the cervical Pap test, according to age
  b. Recognize "exodus"
  c. Describe the significance of navicular cells, decidual cells, trophoblastic cells, and Arias-Stella cells.
  d. Describe the significance of histiocytes
  e. Recognize spermatozoa; know how a Pap smear is handled for forensic purposes, and when sperm should be reported.
- Recognize and describe the diagnostic patterns in hormonal cytology
  a. Describe how a Pap test should be taken for hormonal evaluation
  b. Describe the commonly used indices (KPI and MI)
  c. Describe the expected patterns associated with
     1. Menstrual cycle
     2. Pre-puberty
     3. Pregnancy
     4. Postpartum
     5. Post menopause
     6. Describe when the estrogen proliferation test is useful and tell how it should be done.
- Recognize common infections which can be diagnosed by Pap test and describe in general terms the sensitivity, specificity and clinical significance of the specific diagnoses.
  a. Bacterial vaginosis
  b. Actinomyces
  c. Leptothrix
  d. Herpes simplex
  e. Chlamydia
  f. Candida
  g. Trichomonas
- Recognize benign cellular changes associated with the following:
  a. Acute inflammation

b. Repair
c. Hyperkeratosis
d. Folic acid deficiency
e. Intrauterine device
f. Follicular cervicitis
g. Radiation effect
h. Atrophic cervicitis
i. Tubal metaplasia of endocervical cells

- Recognize and describe the cytologic features diagnostic of HPV infection.
  a. Discuss the prevalence of HPV infection revealed by different assays (hybrid capture, ISH, PCR, Invader assay)
  b. Discuss the association of specific HPV genotypes with neoplasia
  c. Discuss the role of HPV testing as a triage method for equivocal results, as a primary screening method and as a QA tool.
- Recognize and describe preneoplastic changes of squamous cells in terms of nuclear size and contour, chromatin patterns, cytoplasm, cell size and cell number, and liquid-based preparation background.
  a. Atypical squamous cells of undetermined significance (ASC-US)
  b. Atypical squamous cells , can not exclude high grade SIL (ASC-H)
  c. Low grade squamous intraepithelial lesions(LSIL)
  d. LSIL, can not exclude high grade SIL (LSIL-H)
  e. High grade squamous intraepithelial lesions (HSIL)
  f. Microinvasive carcinoma
  g. Invasive carcinoma
- Describe and identify the cytologic features of adenocarcinoma in the cervical Pap test.
  a. Describe the features of adenocarcinoma in situ and how it can be distinguished from some of its mimics.
  b. Describe how to distinguish reactive endocervicals from adenocarcinoma
- Describe and identify the cytological features of endometrial and extrauterine adenocarcinomas in the Pap test.
    a. Distinguishing features of endocervical and endometrial adenocarcinoma
    b. Distinguishing features of extrauterine adenocarcinoma
- Discuss the effectiveness of the cervical Pap test in diagnosis of malignant and premalignant lesions.
    a. Significance of the atypical Pap test
    b. Interobserver reproducibility
    c. Screening accuracy of conventional and liquid-based Pap tests.
    d. Correlation with histopathology, and possible reasons for discrepancies.
    e. Relative rates of cervical carcinoma in screened and unscreened populations.
- Discuss the appropriate management of abnormal Pap test results and cervical biopsy results according to the ASCCP guidelines and the management of women over 30 with normal Pap test results with positivity of high-risk HPV, when HPV testing is used in primary screening in conjunction with the Pap test (ACOG guidelines).

Fine Needle Aspiration Cytology/Non-Gynecologic Cytology

Goals: Learn to perform fine needle aspiration of palpable masses and to diagnose the majority of commonly encountered lesions. Develop an appreciation for the value and limitations of fine needle aspiration.

Objectives: Fellows will be expected to study the following organ systems and achieve the following objectives:

- Lymph nodes
  a. Perform fine needle aspiration of palpable lymph nodes, appropriately triaging the specimens for ancillary studies.
  b. Diagnose
     1. metastatic carcinoma
     2. metastatic melanoma
     3. lymphoma
     4. granulomatous inflammation
     5. acute suppurative lymphadenitis
     6. benign reactive changes
     7. Mycobacterial infection
     8. Branchial cleft cyst
  a. Recognize when a specimen should be judged non-diagnostic
  b. Suggest appropriate clinical follow-up for the above diagnoses
- Breast
  a. Describe the sensitivity and specificity of diagnosing carcinoma by fine needle aspiration.
  b. Be familiar with technique of performance of fine needle aspiration of the breast
  c. Know when a specimen is non-diagnostic
  d. Diagnose the following
     1. carcinoma
     2. ductal atypia
     3. fibroadenoma
     4. benign ductal cells
     5. fat necrosis
     6. mastitis
  a. Suggest appropriate clinical follow-up for the above diagnoses
- Thyroid
  a. Safely perform a fine needle aspiration of the thyroid
  b. Know what constitutes a diagnostic specimen
  c. Diagnose the following
     1. anaplastic carcinoma
     2. Papillary carcinoma
     3. medullary carcinoma
     4. follicular neoplasm
     5. nodular goiter
     6. Hashimoto's thyroiditis
     7. Hürthle cell neoplasm
     8. normal thyroid tissue

  Suggest appropriate clinical follow-up for the above diagnoses
- Salivary gland
  a. Perform a fine needle aspiration of salivary gland

b. Know what constitutes an adequate specimen
c. Diagnose the following
    1. sialadenitis
    2. pleomorphic adenoma
    3. Warthin's tumor
    4. oncocytoma
    5. acinic cell carcinoma
    6. adenoid cystic carcinoma
    7. monomorphic adenoma
    8. mucoepidermoid carcinoma
    9. adenocarcinoma

Lung

- Assist in the performance of CT guided lung FDA
    1. recognize a diagnostic specimen
    2. suggest appropriate ancillary studies
- Diagnose the following:
    1. reactive lung and mesothelial cells
    2. granulomatous inflammation
    3. squamous cell carcinoma
    4. adenocarcinoma
    5. small cell carcinoma
    6. metastatic malignancy
    7. carcinoid tumor

- Liver

a. Assist in CT guided liver aspiration
b. Be familiar with findings in benign liver aspiration
c. Diagnose the following:
    1. granulomatous disease
    2. abscess
    3. hepatocellular carcinoma
    4. metastatic carcinoma
        a. adenocarcinoma (including characteristics of colonic adenocarcinoma
        b. squamous cell carcinoma
        c. small cell carcinoma
        d. carcinoid

1. <u>List of clinical procedures to be learned during the rotation:</u>

Emphasis is placed on evaluating patients and forming fine needle aspirations. This includes not only the actual puncture, but also preparation of material, coordination of ancillary studies, and discussions with the clinical fellows, residents and faculty.

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cytology cases. Follow-up of cytology cases with other physicians and residents as a consultant in pathology is a daily activity, as part of quality control, and in preparation of teaching sets. Both of these are important areas of activity for the fellow.

The cytopathology fellow uses data from many sources daily in making diagnostic and management decisions for the patients. These include molecular methods such as interpreting the results of HPV DNA testing on equivocal Pap tests, clonality analysis through immunoglobulin light chain and T-cell receptor rearrangement studies on fine needle aspiration biopsies of lymph nodes suspected of lymphoma, etc. Additionally, the fellow uses FISH (Urovysion) on urine specimens to confirm the presence of urothelial neoplasms in urine specimens with atypical cells, flow cytometry in fine needle aspirates of lymph nodes suspected of lymphoma. The fellow will also judiciously use immunoperoxidase studies and chromogenic in-situ hybridization studies to demonstrate the presence of malignancy, such as the presence of epithelial cells in effusions or to demonstrate the differentiation of a neoplastic process. All these ancillary tests are used by the fellow after careful examination of the cytomorphology and triage of the specimen to allow aliquots to be sent to various labs, including cytogenetics, flow and image cytometry, molecular diagnostics, etc.

Recommend Reading

1. DeMay, Richard M, The Art and Science of Cytopathology, ASCP Press, Chicago, 1996.
2. DeMay, RM, Practical Principles of Cytopathology, ASCP Press, Chicago, 1999.
3. Atkinson, Barbara (Ed.), Atlas of Diagnostic cytopathology, WB Saunders, Philadelphia, second edition, 2003.
4. Cibas, ES and Ducatman, BS, Cytology: Diagnostic Principles and Clinical Correlates, WB Saunders, Edinburough, second edition, 2003.
5. McKee, GT, Cytopathology, Mosby-Wolfe, London, 1997
6. Ramzy, I (Ed.),clinical Cytopathology and Aspiration Biopsy: fundamental Principles and Practice, second edition, Appleton and Lange, Norwalk, CT, 2000.
7. Bibbo, Marluce, Comprehensive Cytopathology, WB Saunders, 1991.
8. Koss, Diagnostic Cytopathology and It's Histopathologic Basis.