UMMC Department of Pathology

NEUROPATHOLOGY

The neuropathology rotation is designed for the second - fourth year pathology resident who is gaining experience in autopsy pathology. It includes experience in removing the brain and spinal cord during the initial postmortem examination, and the subsequent gross description after fixation. The resident will learn how to obtain the appropriate sections for microscopic analysis, to systematically evaluate these sections, and to construct a concise, comprehensible neuropathology report. Handling and interpretation of neurosurgical specimens and neuromuscular biopsies are key elements of the curriculum as well.

Objectives for Six General Competencies

Skill Level I

1. **Patient Care**
   The pathology resident will gain an understanding of proper specimen collection, processing, gathering of essential clinical data, and will be able to provide appropriate consultation to clinicians with suggestions for follow-up.

   Autopsy Neuropathology: He/she will be instructed in basic autopsy techniques necessary to study the central and peripheral nervous systems: 1) scalp incision, use of the vibrating saw to enter the cranial cavity, removal of an intact specimen, and appropriate fixation; 2) using the vibrating saw, how to systematically incise the vertebral laminae to remove the spinal cord by an anterior approach; 3) specialized dissections, e.g. how to remove the sympathetic chain, how to obtain the carotid arteries in the neck or skull in a patient with stroke; 4) how to obtain suitable portions of psoas, deltoid, or quadriceps muscle for frozen section analysis; 5) how to remove the sural nerve in a patient with neuropathy.

   The pathology resident will learn how to perform a gross brain examination by cutting a brain after an appropriate interval of fixation. He/she will learn to make observations about existing lesions, correlate them with anatomical landmarks, and then take the proper sections for light microscopy and electron microscopy if indicated. Microscopic analysis of these cases will facilitate a review of neuroanatomy, and the recognition of microscopic pathology. He/she will become familiar with the special stains used by neuropathologists to highlight axons (silver), myelin (luxol fast blue), and glial cells, particularly astrocytes (glial fibrillary acid protein). Similarly, the resident will be exposed to the analysis of neurodegenerative diseases, especially the more common dementing illnesses (e.g. Alzheimer's disease) and movement disorders (e.g. Parkinson's disease), and he/she will have experience in choosing the immunohistochemical antibodies that best emphasizes the pathologic features that characterize a particular disease.

   Skills: Demonstrate knowledge of basic anatomy of the brain and spinal cord; demonstrate knowledge of basic gross description of the normal brain; demonstrate knowledge of the routine sections to be taken for gross and microscopic examination of the brain and spinal cord. By the end of the rotation the resident should have a working knowledge of common vascular diseases affecting the central nervous system.

   Surgical Neuropathology: The resident on rotation will learn how to accurately describe specimens at the surgical pathology bench, and dictate a report that gives a clear pictorial representation, to the

reader, of the lesions that are present. He/she will become adept at subdividing the tissue into portions for electron microscopy, frozen and permanent sections, and for storage at -80 degrees Centigrade. He/she will learn to anticipate the microscopic appearance of lesions they encounter at the gross examination of the brain, and obtain the proper microscopic sections to best show the predicted findings.

Skills: Demonstrate diagnostic knowledge of the common brain tumors; demonstrate knowledge of the common special stains used in neuropathology; demonstrate knowledge of basic muscle pathology and common enzyme histochemical stains used in muscle biopsy interpretation; demonstrate understanding of the common neurodegenerative diseases.

2. **Medical Knowledge**

The core reading assignments for rotating residents will be the following :

1. Chapter 29. *Peripheral Nerve and Skeletal Muscle*. in Robbin's Pathologic Basis of disease Cottran, Kumar, Collins. 6th Edition, Saunders, 1999
2. Chapter 30. *The Central Nervous System*. in Robbin's Pathologic Basis of Disease. Cottran, Kumar, Collins. 6th Edition, Saunders, 1999.
3. Chapters on peripheral nerve, muscle, and central nervous system in Histology for Pathologists. S. Sternberg, Lippincott-Raven Press, 1997

The rotating residents will also be expected to complete all the neuropathology modules in the Neuropathology Self-Instructional Units CD, by Katherine L.Lovell and Mark W. Hodgins, Michigan State University, 1998.

Gross and Microscopic Neuropathology Sessions

Residents will be required to attend the twice-weekly brain cutting sessions under the supervision of Dr. Fratkin. These forums will encourage an interchange between resident and faculty, in which the resident can demonstrate his/her general fund of knowledge and ability to formulate clinico-pathologic correlations. Microscopic sessions revolve around neurosurgical, neuromuscular, and autopsy brain specimens. These interactions will allow additional sharpening of resident diagnostic and correlative skills.

Outcomes Assessment:

The resident will be evaluated by a 25-question examination given in the last week of the rotation. These questions will be taken from a bank of questions usually used for second-year medical students during their pathology course.

3. Communication Skills

Effective communication: The rotating pathology resident will design and deliver portions of monthly review conferences for neurology and neurosurgery residents. He/she will read topic background and construct tutorials, create handouts, and demonstrate clinico-pathologic correlations. During the neuropathology section of the second-year pathology course, rotating residents will participate in the small group, gross laboratory, and microscopic laboratory sessions. He/she will be expected to effectively communicate neuropathology concepts to medical students.

Rotating residents will demonstrate ability to communicate with laboratory technicians about processing of brain, spinal cord, and how a degree of special handling is necessary for these tissues. Rotating residents will also communicate with the neuropathology histotechnologist to acquire a working knowledge of muscle biopsy processing, including frozen section technique, histochemical preparations, and routine stains. Assessment: feedback from medical students and pathology staff.

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4. Professionalism

Residents will exhibit professionalism in dress and demeanor, punctuality in attendance of conferences, and the high degree of motivation expected of a post-graduate trainee in a professional field. He/she will use scrupulous, ethical judgment when performing duties. By discussing the latest findings in the literature, the resident contributes to the "cutting edge" skills of everyone in the group. He/she will always be aware of limitations, seek additional information, accept criticism, and gracefully accept suggestions for improvement.

5. Practice-Based Learning/Improvement

The resident will consistently seek opportunities for self-education, consulting with departmental experts when appropriate and using library/internet resources. He/she will know how to apply SNOMED codes and how to use these codes to retrieve cases from the file.

The resident will show a working knowledge of the basic principles of quality assurance as it relates to neuropathology, such as correlation of frozen sections, permanent sections, and previous histologic/cytologic material, quality control of histologic sections and special stains utilized in neuropathology, and regulatory/safety requirements established by JCAHO, CAP, (ex: proper protocol for Creutzfeldt-Jakob disease). Many of these issues are discussed at the monthly Departmental Performance Improvement Meeting.

6. System-Based Practice

The resident will be cognizant of the costs involved in managing a neuropathology service and should strive to maintain cost-effective practices, such as appropriate use of ancillary studies (ex: use algorithm when ordering immunoperoxidase), avoiding submitting unnecessary blocks at the surgical and autopsy cutting table, and correctly assigning charge codes on pathology reports. The resident should understand the basic legal aspects of medical malpractice as it relates to surgical and autopsy neuropathology.

He/she will demonstrate knowledge of the basic principles of informatics in neuro- pathology, and be able to effectively utilize the local computer network and understand how this system stores and relays data from one system to another.