

NEUROPATHOLOGY FELLOW MULTIDISCIPLINARY SERVICE ROTATION (FIRST YEAR)

DESCRIPTION OF ROTATION

The purpose of the Neuropathology Fellow Multidisciplinary Service Rotation (First Year) is to introduce the neuropathology fellow to the broad spectrum of diagnostic neuropathology including surgical neuropathology, autopsy neuropathology, neuromuscular neuropathology and ophthalmic neuropathology. The clinical exposure to these areas of neuropathology will occur, under direct supervision by a neuropathology attending, through the fellow's involvement in all case material for the month.

GOALS AND OBJECTIVES

PATIENT CARE

A. *Surgical Neuropathology*

Demonstrate understanding of and/or ability to:

1. Diagnosis and grade common adult CNS tumors (e.g., glioma, pituitary adenoma and meningioma) and pediatric neoplasms (e.g. pilocytic astrocytoma, medulloblastoma) on formalin-fixed, paraffin-embedded sections, using routine and special stains.
2. Develop a differential diagnosis for CNS lesions based on radiologic findings and intra-operative smear and frozen section analysis. Prepare tissue for intra-operative smear and frozen section analysis; distinguish between normal and abnormal histologic findings in these preparations.
3. Use routine and special/immunohistochemical stains to confirm or distinguish among possible sources of origin for a metastatic CNS neoplasm.
4. The proper use of molecular genetic analysis in primary and metastatic CNS neoplasms

B. *Autopsy Neuropathology*

Demonstrate understanding of and/or ability to:

1. Systematically examine fresh and fixed brains and spinal cords at autopsy. Distinguish between normal gross findings and common neuropathologic states, including atrophy, herniation, vascular disease, hemorrhage and developmental anomalies.
2. Use gross and microscopic examination skills for the diagnosis of common CNS pathology in medical autopsy cases, including cerebrovascular disease, Alzheimer disease, and Parkinson disease.

C. *Neuromuscular Pathology*

Demonstrate understanding of and/or ability to:

1. Prepare neuromuscular biopsy material, including proper freezing and fixation techniques
2. Enzyme histochemical principles and techniques for neuromuscular pathology.
3. Recognize common histopathological features in nerve and muscle biopsy specimens, including immune/inflammatory myopathies, dystrophic myopathy, and axonal neuropathy with active degeneration and regeneration.

D. *Ophthalmic Pathology*

Demonstrate understanding of and/or ability to:

1. Macroscopic examination and processing of ophthalmic pathology specimens including globes.
2. Recognize and diagnose common entities in ophthalmic neuropathology practice, including bullous keratopathy, pthisis bulbi, capillary hemangioma, meningioma.

E. *General*

Demonstrate understanding of and/or ability to:

1. Synthesize data and compose complete surgical and autopsy neuropathology reports.
2. Communicate surgical and autopsy results clearly to others.

MEDICAL KNOWLEDGE

A. *Surgical Neuropathology*

Demonstrate understanding of:

1. Manifestations of CNS neoplasia, including seizures, focal neurologic signs, and increased intracranial pressure.
2. Typical profiles (patient age, gender, CNS location) for common adult and pediatric CNS neoplasms.
3. Classic radiologic appearances of common CNS neoplasms, such as glioblastoma, and pilocytic astrocytoma

B. *Autopsy Neuropathology*

Demonstrate understanding of:

1. Gross and microscopic neuroanatomy, with emphasis on the nuclei (hippocampus, striatum, nucleus basalis, locus ceruleus) and pathways that are commonly involved in CNS disease.
2. Classification system for neurodegenerative disorders based on current knowledge of underlying pathophysiology, (e.g., tauopathy vs synucleinopathy vs triplet repeat disorders).
3. Risk factors and mechanisms for common neuropathologic features in autopsy specimens, including various types of ischemic injury (atherosclerotic/embolic, watershed, global), infection (bacterial, viral, fungal, protozoan, opportunistic), and neurodegeneration.

C. *Neuromuscular Pathology*

Demonstrate understanding of and/or ability to:

1. Understand normal functioning of neuromuscular transmission and the neuromuscular unit.
2. Understand the pathophysiology of neuromuscular disease at the level of the neuronal cell body, axon, synapse and myofiber.
3. The molecular bases for congenital dystrophies.

D. *Ophthalmic Pathology*

Demonstrate understanding of and/or ability to:

1. Recognize normal macro- and microscopic anatomy of the eye and its component structures.
2. Normal physiology of the eye and its components.
3. Basic pathophysiology of the eye and its components, including such disease states of glaucoma, cataract, retinal detachment, macular degeneration.

INTERPERSONAL AND COMMUNICATION SKILLS

In all the areas of neuropathology outline above, the fellow will demonstrate ability to:

1. Interact with office and laboratory personnel and others.
2. Participate in formal and informal medical education, including clinical conferences, teaching of junior residents etc.

PROFESSIONALISM

In all the areas of neuropathology outline above, the fellow will demonstrate ability to:

1. Provide helpful, timely case evaluations.
2. Establish effective and respectful team-oriented interactions with others.
3. Take leadership role in new case work-ups and daily case evaluations.

SYSTEMS-BASED PRACTICE

In all the areas of neuropathology outline above, the fellow will demonstrate understanding of:

1. Role of neuropathology in the delivery of healthcare.
2. Neurohistology laboratory management practices.
3. Mechanisms and role of quality assurance in the practice of neuropathology.

PRACTICE-BASED LEARNING

In all the areas of neuropathology outline above, the fellow will demonstrate ability to:

1. Use effective problem-solving skills in service neuropathology.
2. Access the medical literature for self-learning and to teach others.
3. Use case-based learning for insight into the pathogenesis/diagnosis of CNS diseases.

NEUROPATHOLOGY FELLOW MULTIDISCIPLINARY SERVICE ROTATION (SECOND YEAR)

DESCRIPTION OF ROTATION

The purpose of the Neuropathology Fellow Multidisciplinary Service Rotation (Second Year) is to provide additional exposure to the core areas of surgical neuropathology, autopsy neuropathology, neuromuscular pathology and ophthalmic neuropathology. The focus in the second year is to build on the foundation laid in the first year, and to expand the trainee's diagnostic repertoire to include more entities, including those that are relatively rare. This is achieved through a more focused participation (determined in consultation with the Program Director and program faculty), by the trainee, in the various clinical services. In addition, in consultation with the Program Director and normally in the second year of training, the fellow may have the opportunity to broaden his/her experience in surgical neuropathology and eye pathology through elective rotations at The Johns Hopkins Hospital, (Charles Eberhart M.D, Ph.D, Fausto Rodriguez, M.D.) Emory University (Daniel Brat, M.D., Ph.D., Hans Grossniklaus, M.D.), and St. Jude Children's Research Hospital (David Ellison, M.D., Ph.D.) The goals and objectives for these off-site experiences are identical to those below for "surgical pathology" and "ophthalmic pathology." It is anticipated that the high-volume, consultative practices of the pathologists at these institutions will facilitate the fellow's exposure to and ability to diagnose relatively uncommon diagnostic entities in surgical neuropathology and ophthalmic pathology.

In addition, the fellow's diagnostic acumen in the second year will be sharpened through increased participation in and responsibility for patient care (outlined below), through clinical conferences, and through supervision of residents and/or a junior fellow.

Finally, the fellow is expected, in the second year, to develop an active research project (see goals and objectives below). Depending on the interests and experience of the fellow, this will take the form of a substantive clinical/translational or basic science research project.

GOALS AND OBJECTIVES

PATIENT CARE

A. Surgical Neuropathology

Demonstrate understanding of and/or ability to:

1. Diagnose less common adult CNS tumors (e.g., lymphoma, hemangioblastoma, peripheral nerve sheath tumors) and pediatric neoplasms (e.g, atypical teratoid rhabdoid tumor, pilomyxoid astrocytoma), using routine and special stains.
2. Distinguish primary CNS tumors from metastatic lesions based on intra-operative smear and frozen section analysis. Distinguish between high- and low-grade lesions at the time of intra-operative consultation.
3. Perform intra-operative consultations with indirect (on-site) supervision from neuropathology attending.
4. Prepare photomicrographs for and present cases at the weekly interdisciplinary clinical case conference ("tumor board").
5. Prepare well written, comprehensive pathology reports.

B. Autopsy Neuropathology

Demonstrate understanding of and/or ability to:

1. Lead weekly brain-cutting conference with indirect (on-site) supervision of neuropathology attending.
2. Utilize gross and microscopic examination skills for the diagnosis of less common CNS pathology in medical autopsy cases, including rare forms of neurodegenerative disease (multiple system atrophy, corticobasal degeneration, progressive supranuclear palsy).
3. Review microscopic findings from autopsy case with resident prosector and/or rotating Neurology residents.
4. Indications for and procedures to implement in cases of suspected prion disease.
5. Prepare well written, comprehensive autopsy reports, integrating CNS findings with the clinical history and non-CNS findings.

C. *Neuromuscular Pathology*

Demonstrate understanding of and/or ability to:

1. Accurately diagnose less common conditions associated with examination of these specimens, including inclusion body myositis, myofibrillar myopathy, centronuclear myopathy, axonal neuropathy with segmental demyelination and remyelination.
2. Integrate clinical data in the diagnosis of neuromuscular disease.
3. Review cases with pathology and neurology residents on service before sign-out with the neuropathology attending.
4. Prepare well written, comprehensive pathology reports.

D. *Ophthalmic Pathology*

Demonstrate understanding of and/or ability to:

1. Recognize and diagnose relatively less common neoplastic and non-neoplastic ophthalmic pathology entities including keratoconus with hydrops, hemangiopericytoma, rhabdomyosarcoma, melanoma (CAP checklist completed), and retinoblastoma. For retinoblastoma, follow proper Children's Oncology Group (COG) protocol.
2. Review cases with pathology and/or neurology residents on service before sign-out with the neuropathology attending.
3. Select, photograph and present cases at the quarterly Ophthalmic Pathology Conference.

E. *General*

Demonstrate understanding of and/or ability to:

1. Synthesize data and compose comprehensive and accurate surgical and autopsy neuropathology reports.
2. Communicate surgical and autopsy results clearly to others

RESEARCH

Demonstrate understanding of and/or ability to:

1. Recognize limitations in current knowledge that may be addressed through research.
2. Recognize strengths and limitations of various experimental designs.
3. Implement the experimental approach that is best suited to address the experimental question.
4. Collect and analyze data using appropriate statistical methods

5. Prepare a manuscript for publication.

MEDICAL KNOWLEDGE

A. *Surgical Neuropathology*

Demonstrate understanding of:

1. Common tumor syndromes, genetic alterations, and the associated CNS manifestations, including NF1 and NF2, von Hippel Lindau, and tuberous sclerosis.
2. Diagnostic criteria for classification of CNS neoplasms using WHO classification system.
2. Common, molecular genetic alterations in sporadic CNS neoplasms, including glioma and meningioma.
3. Typical profiles (patient age, gender, CNS location, symptoms) for relatively rare CNS neoplasms such as DNT, ganglioglioma, craniopharyngioma, germ cell tumors.

B. *Autopsy Neuropathology*

Demonstrate understanding of and/or ability to:

1. Diagnostic criteria and grading for Alzheimer disease and Lewy body disease.
2. Differential diagnosis for neurodegenerative disease based on clinical presentation and radiologic findings.
3. Diagnose relatively rare neurodegenerative disorders such as multiple system atrophy, progressive supranuclear palsy, and corticobasal degeneration based on integration of clinical, radiologic, gross, and microscopic features, including immunohistochemistry.

C. *Neuromuscular Pathology*

Demonstrate understanding of:

1. The pathophysiology of mitochondrial myopathies and associated syndromes.
2. The pathophysiology and associated clinical finding associated with acute and chronic inflammatory demyelinating neuropathies.

D. *Ophthalmic Pathology*

Demonstrate understanding of and/or ability to:

1. Pathophysiology of the eye and its components
2. Clinical approaches to eye disease, and their histopathologic correlates.
3. Molecular pathophysiology of congenital/heritable eye disease.

INTERPERSONAL AND COMMUNICATION SKILLS

In all the areas of neuropathology outline above, the fellow will demonstrate ability to:

1. Interact with office and laboratory personnel and others.
2. Participate in formal and informal medical education, including clinical conferences, teaching of junior residents etc.

PROFESSIONALISM

In all the areas of neuropathology outline above, the fellow will demonstrate ability to:

1. Provide helpful, timely case evaluations.

2. Establish effective and respectful team-oriented interactions with others.
3. Take leadership role in new case work-ups and daily case evaluations.

SYSTEMS-BASED PRACTICE

In all the areas of neuropathology outline above, the fellow will demonstrate understanding of:

1. Role of neuropathology in the delivery of healthcare.
2. Neurohistology laboratory management practices.
3. Mechanisms and role of quality assurance in the practice of neuropathology.

PRACTICE-BASED LEARNING

In all the areas of neuropathology outline above, the fellow will demonstrate ability to:

1. Use effective problem solving skills in service neuropathology.
2. Access the medical literature for self-learning and to teach others.
3. Use case-based learning for insight into the pathogenesis/diagnosis of CNS diseases.

