

CORE CURRICULUM IN CLINICAL NEUROMUSCULAR PATHOLOGY

7/26/05

(Note: this document has not been adopted by the United Council for Neurologic Subspecialties and is currently under review: August 2005)

Program Content

The Clinical Neuromuscular Pathology program is based upon the pathological studies of muscle and nerve, and their clinico-pathological correlations. Muscle and nerve pathology is evaluated in the context of the clinical case history, physical findings, and laboratory assessment including electrophysiology, and all blood and urine tests, as well as any specific tests of other organ system functions. This material is collated and reviewed and serves to establish a plan of action for analyses of muscle and nerve biopsies. The differential diagnosis of the clinical problem is used to influence special stains used to assess the tissue. While a standard battery of stains follows a template for evaluation of all muscle and nerve biopsies, individual case analysis will dictate special stains that are required. These stains can include ones more clearly delineating a presumed autoimmune pathogenesis or a specific molecular-biochemical defect. In some instances recommendations for western blots or biochemical tissue analysis will be necessary.

Goals

The goal of the Clinical Neuromuscular Pathology training program is to train candidates to fully evaluate muscle and nerve pathology in the context of the unique clinical setting that each patient presents to the physician. The trainee should learn to stop at nothing short of exploring all means of *relevant* diagnosis. This does not mean performing tests without careful thought but rather to be inclusive to the extent that all avenues of *specific* diagnosis are explored on behalf of every patient. The trainee should not only be familiar with the appropriate histological methods for analysis but should be well-acquainted with the histological techniques through first hand exposure. This will require a laboratory rotation to become familiar with the methods. This is critical for the assessment of microscopic sections and stains in order to recognize artifacts of tissue handling (causes and cures). In addition, the training program should teach the principles and importance of research methods that can be applied to pathological material. For example, while it may be impractical to employ quantitative means of analysis (morphometrics) in the routine evaluation of all case material, trainees should learn the techniques used for this type of analysis. This will help prepare individuals for interpretation of the literature relevant to muscle and nerve pathology and expose individuals to research methodology. In addition, it will provide a basis for understanding when such methods might be important for the evaluation of cases submitted for diagnostic workup. With regard to research, the goal is not train individuals in “bench” research but rather to familiarize trainees with the methods used for outcomes research that can be applied to clinical material. Such methods include data collection, organization, and storage appropriate to address specific questions. Trainees should also learn appropriate statistical methods applicable to outcomes research.

Objectives

Upon completion of the program the trainee should be able to:

A. Muscle

1. Understand how muscle biopsies are performed and processed.
2. Understand the indications and limitations of muscle biopsy.
3. Choose or recommend the best sites for biopsy based on the available clinical and electrophysiological information.
4. Differentiate artifacts from true pathological findings and trouble-shoot problems in processing the specimens.
5. Know which enzymes histochemical and immunostaining are useful in evaluation of muscle specimens.
6. Distinguish all aspects of neurogenic atrophy, specific fiber type atrophies and their clinical significance.
7. Distinguish features of different inflammatory myopathies, and recommend appropriate immunocytochemical reactions leading to specific diagnoses.
8. Distinguish an inflammatory myopathy from muscular dystrophies choosing appropriate immunostaining and providing necessary guidance to other physicians for further molecular genetic and other studies.
9. Recognize pathological features of metabolic muscle diseases or congenital myopathies.
10. Report the findings of muscle pathology in a clear and comprehensive manner conveying the findings, interpretation of findings, and final diagnosis.

B. Nerve

1. Understand how nerve biopsies are performed and processed, choose the best site for biopsy and assess indications or contra-indications for biopsy.
2. Recognize the complication of nerve biopsy and guide the physician and patient for the best site of biopsy to ensure harvesting an adequate specimen.
3. Know which stain or immunostaining are best for the evaluation of nerve biopsy based on the available clinical and electrophysiological information.
4. Know how to evaluate semi-thin section and teased nerve fiber preparation.
5. Distinguish demyelinating from axonal neuropathies, identify inflammatory/infectious neuropathies, vasculitis, amyloid and hereditary neuropathies.
6. Provide guidance to physicians for further laboratory, electrophysiological and molecular genetic studies.
7. Report the findings of nerve pathology in a clear and comprehensive manner conveying the findings, interpretation of findings, and final diagnosis.

C. Research Methods

Understand the principles of outcomes research

Methods of Training

The trainee will observe, or perform the muscle or nerve biopsies, assist in histological preparations, staining procedures, and acquire microscopic images of pathological feature and/or artifacts of all biopsies for presentation to the faculty. Each case will be reviewed by the trainee with faculty supervision. The appropriate method of reporting findings will be taught including the description of findings, diagnosis and comments related to interpretation of findings. Each trainee will evaluate and write-up no less than 100 muscle and/or 60 nerve biopsies.

Trainees must review and submit a report of the clinical findings of each patient undergoing muscle or nerve biopsy. The report will include a synopsis of the clinical findings and relevant laboratory data.

Trainees should also be taught the principles of data storage and organization, and outcomes research methodology using appropriate statistical measures.

Methods of Program Evaluation

The trainee will be working closely with the neuromuscular faculty on a daily basis completing muscle and nerve biopsy reports. This will provide the opportunity to evaluate progress as demonstrated by completion of reports and in case discussions. All reports will be edited, finalized and filed for longitudinal evaluation of the trainee's progress.

At six month intervals the trainee will have a formal meeting with program director for feedback on progress. A written report will be generated with input from the entire neuromuscular faculty (each faculty member submitting a separate report and collated by the program director). At the six month meeting the trainee will also be provided the opportunity to discuss faculty performance and the trainee will be asked to submit a written report inclusive of the performance of each faculty member.

Methods of Feedback

Feedback will take place as described above. Following the six month meetings with the program director, a written report will summarize the performance of the trainee and include comments regarding expectations. The trainee will also provide a written evaluation that will include problems that have been encountered and comments regarding faculty training.