

Histopathology 2

Lecture 7

Neuropathology and muscle biopsy techniques

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Histopathology of Nerve Tissue (Neuropathology)

Neuropathology is a branch of pathology that focuses on diagnosing diseases that affect the central nervous system (brain and spinal cord) and the peripheral nervous system (nerves outside the brain and spinal cord). Nerve tissue examination is essential for diagnosing various neurological disorders.

1 Common Neurological Diseases:

- **Neurodegenerative Diseases:** Such as Alzheimer's disease, Parkinson's disease, and Amyotrophic Lateral Sclerosis (ALS). These diseases usually lead to the degeneration of neurons and loss of function.
- **Neurological Tumors:** Such as brain tumors, spinal cord tumors, and tumors in peripheral nerves.
- **Neurological Infections:** Such as encephalitis and myelitis caused by viruses or bacteria.
- **Genetic Neurological Disorders:** Such as Huntington's disease and other inherited neurological conditions.

2 Techniques for Examining Nerve Tissue:

- **Histopathological Examination:** This is the primary method for diagnosing neurological diseases. It involves taking tissue samples and performing staining to highlight cellular and tissue changes.
 - **Hematoxylin and Eosin Staining (H&E):** The most commonly used stain in laboratories to detect tissue changes, such as cellular swelling, inflammation, or necrosis.
 - **Immunohistochemistry:** This technique uses antibodies to detect specific proteins that may be present in neurons or tumors.
 - **Electron Microscopy:** This method provides a detailed view of nerve tissue at the cellular level.
- **Magnetic Resonance Imaging (MRI) and Computed Tomography (CT Scan):** These techniques are used to obtain detailed images of large neurological structures like the brain and spinal cord, but they cannot replace histopathological examination for identifying cellular changes.

3 Methods of Collecting Nerve Tissue Samples:

- **Brain Biopsy:** This is performed when there is suspicion of brain tumors or chronic diseases like multiple sclerosis.
- **Spinal Cord Biopsy:** A sample is taken from the spinal cord when neurological diseases affect this area.
- **Nerve Biopsy:** This is performed when there is suspicion of peripheral nerve diseases, and a sample of the nerve is taken for examination.

Muscle Biopsy Techniques

A muscle biopsy is a vital procedure where a sample of muscle tissue is taken for examination under a microscope. This examination is mainly used to diagnose diseases affecting the skeletal muscles and neuromuscular disorders.

1- Common Muscular Diseases:

- **Muscular Dystrophy:** Such as Duchenne muscular dystrophy, which leads to progressive muscle weakness due to genetic mutations.
- **Myositis:** Inflammation of the muscles, which may result from autoimmune diseases.
- **Neuromuscular Diseases:** Such as Amyotrophic Lateral Sclerosis (ALS), which causes the degeneration of motor neurons controlling muscles.
- **Genetic Muscle Diseases:** Such as Myofibrillar Myopathy and other conditions affecting muscle structure.

2- Techniques for Collecting Muscle Samples:

- **Muscle Biopsy:** This is the primary method for diagnosing muscular diseases. A small piece of muscle tissue is taken for analysis of the changes occurring due to the disease.
 - **Surface Biopsy:** A small sample is taken from the surface of the muscle using a surgical needle.
 - **Deep Biopsy:** A sample is taken from deeper layers of the muscle using more specialized instruments.
 - **Needle Biopsy:** A less invasive technique where a needle is used to remove a small sample from the muscle.

3- Laboratory Techniques for Examining Muscle Samples:

- **Histological Examination:** Various stains such as Hematoxylin and Eosin (H&E) are used to observe changes in muscle tissue.
 - **Hematoxylin and Eosin Staining (H&E):** This stain helps visualize the cellular structure and abnormalities in muscle tissue.
 - **Periodic Acid-Schiff (PAS) Staining:** This is used to detect glycogen accumulation in muscle tissue.
- **Immunohistochemistry:** This technique is used to detect specific proteins in muscles, which may be absent or abnormally present in some muscle diseases.
- **Molecular Testing:** Genetic testing is performed to identify mutations that may be responsible for muscle diseases.

4- Handling Muscle Samples:

- **Sample Storage and Fixation:** Muscle samples are stored in formalin solution to preserve tissue integrity, or they may be frozen for other types of examination, such as genetic analysis.