

Ultrastructural Examination of Congenital Myopathies

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Light microscopy has been established as the foundation of pathology, and will always be an essential tool for histological diagnosis. Difficulty in diagnosing specific myopathies, however, has led to the increasing utilization of electron microscopy. The emergence of this new tool has expanded the pathologist's view of neurologic disease by allowing the ultrastructural visualization of muscle.

Myopathies are usually congenital and are frequently associated with genetic mutations that result in dysfunction of muscle proteins. For example, excess deposition of the proteins actin, vimentin, dystrophin, and desmin result in myofibrillar myopathies, also termed desminopathies. [1] Onset may occur during the neonatal period or during the adult years and symptoms may consist of hypotonia, hyporeflexia, and generalized weakness with secondary dysmorphic features. Respiratory difficulty is a common presenting symptom and cardiopulmonary disease is a common cause of death from a congenital myopathy. Creatine kinase levels and nerve conduction studies are generally included in the work-up of a patient that presents with any of the above symptoms; however, for diagnosis of a suspected myopathy, a muscle biopsy is key. Light microscopy is used to identify morphological and histochemical characteristics and ultrastructural examination is especially needed because several pathological features of specific myopathies are based on electron microscopy.

Two cases of congenital myopathies were evaluated at The Mount Sinai Hospital, New York and diagnoses of Myofibrillar Myopathy and Myopathy with tubular aggregates were assigned based on their unique histochemical and ultrastructural characteristics. The first mentioned case initially showed an equivocal desmin stain and darkly stained myofiber aggregates with associated internalized nuclei on modified Gomori's trichrome stain with a predilection for type I fibers. These findings suggested a nemaline rod myopathy or a myofibrillar myopathy. Electron microscopy failed to reveal nemaline rods or bodies, and instead, revealed focal subsarcolemmal collections of myofibrils and granules, thus supporting a diagnosis of myofibrillar myopathy [2]. The second case showed subsarcolemmal aggregates on Gomori's trichrome and NADH stained sections, which suggested a mitochondrial myopathy or a myopathy with tubular aggregates. No subsarcolemmal aggregates were seen on SDH stained sections, suggesting that the aggregates were not mitochondria, however, electron microscopy revealed focal tubular aggregates, consistent with a diagnosis of myopathy with tubular aggregates [3-4].

Without the aid of electron microscopy, a nonspecific diagnosis or one based solely on clinical correlation would have been inevitable. While light microscopy continues to be a relevant diagnostic tool, electron microscopy affords the pathologist a necessary closer look at neuromuscular disease.

References

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