Muscle Biopsy is a useful and current diagnostic method in clinical practice
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The muscle biopsy is part of the arsenal of diagnostic choices that a clinician has available in evaluating neuromuscular disorders and conditions that affect the pediatric population. One important question is how much relevant information a clinician can obtain from the biopsy? This is a relevant question in view of the explosion in the number of diagnostic tests and procedures. The following is just a brief summary of selected information to consider when there is a request for a muscle biopsy.

The muscle biopsy is diagnostic a test and like any test it has specific indications and limitations. It requires critical insight into the appropriate indications. The biopsy requires a careful plan which includes a good deal of communication between the involved providers: the clinician and care team taking care of the patient, the surgeon performing the procedure and the pathologist who will take care of the specimen. This approach will optimize the chances of getting the answer to the specific clinical question or questions.

What type of unique information could be obtained from examining the muscle that is not readily available using other methods? The biopsy can show if the condition is a primary disease affecting the muscle (myopathy) or secondary process due to a neurogenic condition, or possibly a systemic condition that is affecting the muscle. The diagnostic yield of the muscle biopsy is high when there are structural (morphological) alterations of the muscle. In primary myopathies the muscle abnormalities are responsible for the clinical condition and they can be observed in the biopsy. Examples of these conditions include the large group of congenital myopathies, muscular dystrophies and inflammatory myopathies. The diagnostic yield of the muscle biopsy is low when the sample is not taken from indicated sites (regional involvement) or when the condition is not primarily of the muscle and only affects the muscle in a non specific manner. In these cases the biopsy may help to narrow the differential diagnosis but may not help in the etiologic diagnosis. If a metabolic or storage disease is suspected, a skin sample of the area of the biopsy can be examined by electron microscopy and a culture for fibroblasts can be requested so additional tests can be performed to arrive at the correct diagnosis.

A properly processed muscle biopsy can also be a powerful diagnostic resource if there is the clinical need to use the sample for biochemical and molecular tests. These tests, however, are more likely to yield a diagnosis when the clinical and morphological results of the biopsy point to a particular metabolic or a testable genetic condition.

There are a fast growing number of definable genetic mutations and diagnosable genetic conditions that can be suspected by using morphological evaluation including electron microscopy and immunohistochemical assessment of the muscle. There are a large numbers of commercially available antibodies that can detect deficient production or accumulation of proteins in the muscle and the results of the immunohistochemistry can guide the selection of genetic tests. This may be very helpful in suspected cases of rare conditions. There are rare primary conditions in which the etiology may not be found but at least they may be classified morphologically for clinical management and prognostic purposes. There are still cases with abnormalities that fall in the group of unclassified conditions. Some biopsies fall into the uncomfortable group of “absence of evidence” which does not mean “evidence of absence” and these cases require additional clinical assessment.
A practical Muscle Biopsy protocol is in use at Children’s Mercy Hospital and Clinics. There is a requisition form that is available in the Histology Laboratory (Extension 53827); this form can be mailed or send via FAX when planning a muscle biopsy. If you or your care team is planning to do a muscle biopsy please follow the recommendations and advice for the procedure; they will help to assure a proper processing of the biopsy and to increase the diagnostic yield of the sample. An adequate muscle biopsy is routinely processed for morphological, histochemical, biochemical, molecular and electron microscopy studies that will be performed accordingly to the needs of each particular case. We process the samples in coordination and consultation with reference laboratories that include our Molecular Genetics Laboratory and referral laboratories under Dr. Carol Saunders direction. External reference experts and laboratories include Dr. Kevin Bove, Cincinnati Children’s Hospital Department of Pathology that process about 345 muscle biopsies per year, Dr. DiMauro and colleagues at Columbia University Department of Neurology and other special reference laboratories, depending on the specific tests or areas of expertise including The University of Iowa and Mayo Clinic.

**Muscle Biopsy Advices:**

- The muscle to be biopsied should be preferably determined by the clinician evaluating the neuromuscular disorder.
- Muscle specimens may be obtained using biopsy clamps, if necessary, by sharp dissection, but preferably without clamps and using sutures at each end.
- Muscle clamping is NOT recommended because of troublesome artifacts from twisting, tearing or compressing, and a portion of the specimen is destroyed by clamps.
- Surgeons should take special precautions to avoid trauma, cauterization, twisting, squeezing, etc. during excision.
- Fascia need not be included unless of specific interest. The recommended biopsy site is the belly of the muscle, away from fascia or osseous insertion site.
- Local anesthetic should not be injected into muscle.
- Ideal size of each specimen is 1.0-2.0 cm in length x 0.5 cm in width, with the long measurement representing the orientation of muscle fibers.
- Larger specimens are perfectly acceptable and may be divided by the pathologist.

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