SCIENTIFIC ARTICLE

Diagnostic Biopsy of the Pronator Teres and a Motor Branch of the Median Nerve: Indications and Technique

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Purpose Biopsy of muscle tissue and motor nerve is helpful in the neurological evaluation of patients who present with upper limb and/or diffuse motor weakness. The procedure is indicated to supplement clinical, serological, and imaging diagnostic work-up of myopathic and neuropathic disorders. We describe a surgical technique and clinical series of biopsy of the pronator teres muscle and a motor branch of the median nerve.

Methods We performed a retrospective review of 20 patients who underwent biopsy of the pronator teres and a motor branch of the median nerve as part of a clinical, serological, and radiographic evaluation for weakness of the upper extremity. All of the biopsies were performed by a single surgeon. The surgical technique is described. Follow-up visits with both the surgeon and the neurologist were reviewed to evaluate preoperative and postoperative neurological function to identify any changes in nerve or muscle function and any postoperative complications.

Results Biopsied tissue was sufficient for pathological diagnosis in all 20 patients. Diagnoses included multifocal motor neuropathy in 14 patients, amyotrophic lateral sclerosis in 3 patients (2 sporadic; 1 familial), inclusion body myositis (1 patient), inflammatory myopathy (1 patient), and chronic inflammatory demyelinating polyneuropathy (1 patient). At a mean follow-up of 11 weeks (range, 5–31 wk), there were 6 minor surgical complications, all of which were superficial hematomas that resolved with use of a compressive wrap.

Conclusions Biopsy of the pronator teres and a motor branch of the median nerve was safe and effective. The technique is particularly useful when considering the diagnosis of multifocal motor neuropathy affecting the upper extremity. *(J Hand Surg 2012;37A:2570–2575.*

Type of study/level of evidence Diagnostic III.

Key words Muscle biopsy, nerve biopsy, neuropathy.

The diagnostic work-up to differentiate motor neuropathy, anterior horn cell disease, or myopathy may include motor nerve biopsy with or without muscle biopsy. Previously described techniques for nerve biopsy include sensory (sural nerve) biopsy[1–4] and motor (obturator and deep peroneal nerves) biopsy.[5–7] Because a biopsy should include all affected tissues,[8] motor nerve *and* muscle biopsy is

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indicated for the work-up of diseases such as multifocal motor neuropathy (MMN), which may present exclusively in the upper extremity.[9] Muscle and motor nerve biopsies are particularly helpful in differentiating MMN from entities such as motor neuron disease, myopathies, and myositis because MMN can be treated effectively with intravenous immunoglobulin.[10] The diagnosis of MMN is challenging, particularly in cases that present without a conduction block. MMN without conduction block is an established clinical entity without agreed-upon clinical or electrophysiological confirmatory markers,[11,12] which indicates the need for an alternative means to confirm the diagnosis. Because previous research has suggested that excessive sprouting in motor nerve biopsies would favor the presence of intravenous immunoglobulin–responsive motor neuropathy,[5] motor nerve biopsy may be helpful to confirm the diagnosis of MMN with or without conduction block. Whereas biopsy of the gracilis muscle, obturator nerve, and sural nerve may be helpful in evaluating patients with a disease process that predominantly affects the lower extremities or is mainly sensory in nature, a motor nerve and muscle biopsy for the upper extremities will help in guiding management of those with motor symptoms that primarily affect the upper extremities.

We describe our experience with a technique to obtain a motor nerve biopsy from a branch of the median nerve and a muscle biopsy from the pronator teres. A branch of the median nerve observed to enter the pronator teres muscle was chosen because such a branch, as opposed to a fascicle of the median nerve itself, was likely to be motor in nature and could be readily dissected without affecting other neural components that might compromise sensory and motor functions in the distribution of the median nerve. In addition, a fascicular biopsy disrupts the integrity of the nerve and distorts the pathology. The original technique was described at academic meetings (Chan et al, presented at the 132nd Meeting of the American Neurological Association, 2007; and Addona et al, presented at the New York Regional Society of Plastic Surgeons, 2007). We report the technique and our results in 20 patients.

METHODS

Following institutional review board approval, we retrospectively reviewed the outpatient charts, surgical records, and pathology reports of 20 consecutive patients undergoing a median nerve motor branch and pronator teres biopsy over a 3-year period (2009–2011). All patients presented for neurological evaluation of weakness. There were no specific preoperative diagnoses but, instead, a broad differential diagnosis for upper extremity weakness in all patients (hence, prompting the biopsy to aid in narrowing the differential diagnosis). The biopsy was performed as part of an extensive clinical, serological, and diagnostic imaging work-up of their condition. There were 11 men and 9 women with an average age of 59 years (range, 29–79 y). The surgeon examined and consented each of the patients prior to surgery. The procedures were performed in the operating room under infraclavicular regional nerve block (although general anesthesia or other forms of appropriate regional anesthesia may also be used). All patients were discharged on the day of surgery and were followed by the surgeon until the wound had fully healed and the pathological results were final. Care for their neuromuscular condition was initiated under the supervision of the patient's treating neurologist.

Routine preoperative and postoperative examinations, consisting of sensation to light touch in peripheral nerve distributions and forearm pronation strength as graded by the British Medical Research Council grading scale,[13] were recorded. Our routine postoperative evaluation included a specific query as to whether the patient has experienced any decrease in sensibility in his or her upper extremity. If the patient responded negatively, the only further examination for sensibility performed was response to light touch in the peripheral nerve distributions. If the patient responded positively, it was our routine to then employ additional methods of assessing sensibility, such as Semmes-Weinstein filaments or 2-point discrimination. Assessment of forearm pronation strength was performed 1 time by 1 examiner (S.W.W.) with the elbow in 90° flexion and the forearm initially positioned in neutral. The examiner then asked the patient to actively pronate the forearm without and against resistance provided by the examiner. Furthermore, any postoperative complications noted on the chart were recorded. The pathology reports were reviewed for the final pathological diagnosis and assessment of the adequacy of biopsied tissue.

Surgical technique

Under tourniquet control, an 8-cm oblique skin incision is made, beginning at the antecubital crease and extending distally on the anteromedial forearm. The brachial and antebrachial fascia are divided to expose the median nerve and brachial artery. The brachial artery, median nerve, and associated vena comitantes along the pronator teres muscle belly are identified and protected.