Dynamic Chiropractic

CHIROPRACTIC (GENERAL)

The Practical Neurological Examination, Part 4

ASSESSMENT OF MOTOR FUNCTION

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Testing motor function has several facets. Strength, lower motor function, upper motor function and tone are standard neurological components of motor testing. Some also bring manual muscle testing (reflexive test, applied kinesiology) into this realm, but it has a different purpose and performance, and will not be discussed in this writing.

In orthopedics, neurology and chiropractic, motor testing usually applies to testing the strength of individual muscles associated with specific nerve root levels and rating the strength using a scale of 0 to 5. The nerve root levels are primarily those that extend into the upper (C5-T1) and lower (L2-S2) extremities. The scale ranks muscle contraction from no contraction (0) to full strength against gravity (5). See Table 1 for the complete scale.[1]

Table 1: Muscle Strength Rating Scale

Rating	Degree of Function
0	No contraction / no movement
1	Evidence of contraction
2	Movement through partial or full ROM with gravity eliminated
3	Movement through partial or full ROM with resistance limited to gravity
4	Movement through full ROM against gravity with some resistance
5	Movement through full ROM against gravity and resistance / normal strength

The muscles typically tested for motor function in the extremities appear in Table 2.[2] In testing these muscles, the examiner applies a force that the patient resists using the muscle in question. There are rules to follow to assure accurate testing and results.[3]

The examiner must also keep in mind that in addition to proper testing techniques, the side of handedness also plays a role in strength assessment. The side of handedness is typically 10 percent stronger than the opposite extremity.

First, isolate the muscle to the greatest degree possible. The most common mistake here is making contact with the extremity beyond the most distal end of the muscle. This means the examiner has usually crossed a joint beyond the distal end of the muscle. The examiner must contact the most distal end of the muscle *without* crossing the next joint. Otherwise, the test involves more than the joint that the muscle in question moves and other muscles.

Table 2: Muscles Typically Tested to Assess Motor Function	
Nerve Root Level(s)	Muscle(s)
C5	Deltoid
C6	Wrist extensors
C7	Wrist flexors/finger extensors
C8	Finger flexors
T1	Finger adductors/abductors
L2-L4	Quadriceps
L4	Tibialis anterior (heel walking)
L5	Extensorhallucis longus
S1-S2	Gastrocnemius/soleus (toe walking)

Second, the examiner should stabilize the area above the joint moved by the muscle, when possible. Third, the examiner must hold the testing pressure for a steady 3-5 seconds. A pumping motion should be avoided. This could irritate the muscle and associated joint. Pumping also prevents the examiner from detecting the smooth, gradual weakness (giving way) felt when a true weakness is present.

The feel of a true weakness must be discerned from weakness due to pain or that of a patient attempting to fake weakness. Weakness that is true is usually a slow release, while weakness associated with pain is usually quick and can be accompanied by facial expressions of pain and guarding of the area. Attempts to fake a weakness are often identified by movement that is ratchet like or cogwheel in quality.

In grading a weak muscle, the true nature of the 0-5 grading scale must be understood. According to Clark, the 0-5 scale is nonlinear.[3] Thus, a rating of 4 does not equate with the muscle having 80 percent of its normal strength and a rating of 3 does not equate with 60 percent of normal strength. A rating of 4 actually reflects a loss of 50 percent of a muscle's strength.

The weakness described above is typically associated with lower motor neuron (peripheral nervous system) lesions. It is a flaccid weakness. This is opposed to a spastic weakness seen with upper motor neuron (central nervous system) lesions.

Weakness is the only common symptom among lower motor and upper motor neuron lesions. The remaining characteristics of lower and upper motor lesions deal with deep tendon, superficial and pathological reflexes. With lower motor dysfunction, deep tendon reflexes are decreased, pathological reflexes are absent and superficial reflexes are present. With upper motor dysfunction, deep tendon reflexes are increased, pathological reflexes are present and superficial reflexes are absent.

If motor testing reveals muscle weakness, the testing of deep tendon, pathological and superficial reflexes should always follow.

The flaccid and spastic weaknesses of muscle described for lower and upper motor neuron lesions relate to muscle tone. Tone is related to a muscle's ability to resist passive stretching.[4] The normal muscle will have a degree of stretch related to the individual's physical condition. With a lower

motor neuron lesion, the muscle will lose tone and the terms *hypotonic, flaccid* and later *atrophied* apply. With an upper motor neuron lesion, the muscle will gain tone and the terms *hypertonic, spastic* and *ridged* can apply.

A contradiction to the above rules is the presence of spasm. Spasm is a hypertonic state and can be present in conjunction with lower motor neuron lesions. It is most prevalent with joint injury. Muscle spasm serves as a protective mechanism stabilizing the joint.

Tone can be assessed during muscle strength testing and during palpation. Tone is particularly pertinent in the chiropractic documentation of subluxation as required by the Medicare PART system. The "T" in PART stands for tone. Since most of the components of PART are required for each Medicare visit, the assessment of tone will occur almost daily as opposed to other motor assessments that may only occur during initial and progress examinations.

For Medicare documentation, tone is generally noted for the immediate area of the subluxation in question, but it can be noted for an entire spinal region. There has to be a happy medium here. Noting spasm, etc., at a single spinal region (e.g., T5) does not make sense, as it would be almost, if not completely, impossible to isolate the individual muscles associated with a single segment. Similarly, saying a region is in complete spasm, etc., also fails to make sense in most cases.

Routine use of muscle strength testing is an important aspect of proper examination and diagnosis of neuromusculoskeletal conditions encountered in chiropractic practice. It helps differentiate lower and upper motor neuron lesions, and can help isolate individual nerve root involvement. Take a new look at this aspect of neurological examination and refine your skills.

Resources

1. Clark JW. *Clinical Neurology, From the Classroom to the Exam Room*. Wolters Kluwer/Lippincott Williams and Wilkins, Philadelphia, PA, 2007.
2. Hoppenfeld S. *Orthopedic Neurology*. Lippincott, Philadelphia, PA, 1977.
3. Miller KJ. *Orthopedic and Neurological Examination in a Flash*. Lippincott, Williams and Wilkins/Wolters Kluwer, Philadelphia, PA, 2008.
4. Ross RT. *How to Examine the Nervous System, 4th Edition*. Humana Press, Totowa, NJ, 2006.

This article is the fourth of six written to provide practical knowledge and examples of how to incorporate all six components of the neurological assessment into a standard examination in an efficient and productive manner. Part 1 of this series appeared in the Feb. 12, 2011 issue; part 2 appeared in the April 9 issue; and part 3 ran in the June 17 issue.

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