Neuromuscular Problems in Foot and Ankle: Evaluation and Workup

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KEYWORDS

• Neuromuscular foot • Charcot-Marie-Tooth • Clubfoot • Muscular dystrophy
• Cerebral palsy • Spina bifida • Myelomeningocele

KEY POINTS

- Neuromuscular disorders of the foot and ankle are important to recognize, understand, and accurately diagnose. It is essential to determine the functional goals of the patient during the workup and particularly treatment planning stages.
- Accurate diagnosis, and informed discussion of treatment options. Must be in the context of the patient's disease, cognition, comorbidities, functional attributes, and family environment.
- Regardless of cause, a thorough history and physical examination aid in an appropriate diagnostic workup and optimal orthopedic management of each patient.

INTRODUCTION

Neuromuscular disorders include a spectrum of conditions that affect the spinal cord, peripheral nerves, neuromuscular junctions, and muscles. Both congenital and acquired neurologic conditions can profoundly affect the shape and function of the foot, ankle, and lower extremities. To optimize the orthopedic management of these patients, it is vital to identify and accurately diagnose the underlying cause of foot and ankle deformity or disability. Accurate diagnosis is important in defining prognosis, likelihood of progression, selection of appropriate treatment modalities, and patient/family counseling.

The diagnosis is often made from clinical history, detailed family history, and physical examination. However, for the various disorders, several adjunctive tests can be vital to the diagnosis, including:

- Laboratory tests (eg, serum enzyme studies, creatine kinase, and aldolase)
- Genetic testing

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- Electromyography (EMG) and nerve conduction velocity studies
- Nerve and muscle biopsies

This article focuses on evaluation and workup for common congenital and acquired neuromuscular conditions that affect the foot and ankle. Some general principles of the diagnostic process are explored, followed by discussion of specific congenital and acquired disorders commonly encountered by orthopedic foot and ankle specialists.

GENERAL HISTORY AND PHYSICAL EXAMINATION

Neurologic abnormalities can manifest with an imbalance of available muscular function. It is important that all individuals with suspected neurologic conditions be carefully assessed in the context of their disease. History should include onset, timing, frequency, and severity of symptoms and the resulting functional limitations. Parents and caregivers can be important providers of information, depending on the patient's age and cognitive function. Evaluation of feet, ankles, and lower extremities is important for an adequate physical examination, but the examiner must be prepared to assess the entire neurologic and musculoskeletal system. A precise diagnosis can often be reached through careful history, a thorough physical examination, and by use of select specific laboratory and imaging procedures.

The examination technique of the foot and ankle can vary based on patient age. For example, in examination of an infant, inspection, palpation, and manipulation must be relied on, whereas in the older child and adults, these techniques can be supplemented with observations of ambulation and other activities.[1] The examiner should consider the foot and ankle as parts of the entire body and an important part of the locomotion system. They should not be considered static in nature, because they are subject to anatomic and functional variation during activities.

Strength testing to detect symmetric or asymmetric muscle weakness is an important part of the clinical evaluation. Strength can be assessed by observing activities such as walking and dressing and by testing individual muscle groups. Evaluation of muscle strength can help localize the distribution of weakness. Be aware of associated fixed deformities, because these may affect the examination.[2] Both agonist and antagonist muscles are graded for strength throughout range of motion and in all planes.

Deep tendon reflexes of the patella and Achilles should be tested. The quality of the reflex is assessed by the briskness of muscle contracture and should be graded as absent, hypoactive, normal, or hyperactive. Clonus is generally a description used for reflexes as well. For example, children with muscular dystrophy have normal reflexes until later in the course of the disease, after which they become weaker.[3,4] Also important in workup of neuromuscular disorders is sensory status. In neuropathies, there can be a glove or stocking distribution of loss, paresthesias, pins and needles sensation, and even dysesthesia.

ASSESSMENT OF GAIT

Observation of the patient's gait is a useful component of the physical examination, particularly of a child. The examiner should review at least 6 stride pairs in both the anteroposterior (AP) and lateral direction during each walk. The examiner should watch the patient's foot placement, and whether this is a heel-toe disposition with a triple rocker, flat-footed placement with inversion or eversion, toe-heel placemen, or persistent dynamic equinus. These entities represent degrees of increasing severity