

Gait In the Elderly

Joseph H. Friedman, MD

A number of impressive statistics on falls in the elderly are routinely cited in review articles.^{1,2} Interestingly, none of them are recent.^{1,2} My guess is that as the population ages, these numbers will worsen. In addition, abandonment of the "chemical straitjacket" routinely used for the demented twenty years ago which rendered poor walkers into non-walkers may have increased fall frequency.

For example, data from 1988, still cited in recent articles,^{1,2} state that one third of people over age 65 fall each year, and for half of them this is an ongoing problem.^{3,4} Ten percent of these falls results in significant morbidity (data from early 1990s).⁵ Presumably these numbers increase with age. Falls are the fifth most common cause of death in the elderly. Only 25% of patients who suffer hip fractures regain their former level of function. And falls frequently induce a fear of falling, which itself contributes to the problem.

Impairment in mobility affects 14% of those between 65 and 74 but half of those over 85.⁶ This impairment occurs for a number of reasons, including brain changes, both normal and pathological, as well as changes in muscles and the sensory organs (eyes, vestibular apparatus, peripheral nerves). Normal aging produces physical changes that overlap with the signs of Parkinson's disease, except for tremor.⁷

The clinical importance of gait cannot be overestimated. In a nursing home evaluation, every single patient seen by this author had a significant gait abnormality. Of course, in many cases, that was why they were not living at home.

It is my hypothesis that gait abnormalities are often not identified by doctors because it has not been part of their training. In the outpatient setting, doctors, for efficiency, tend to see patients in examining rooms, partially undressed, seated on the examining table. In the hospital, it is difficult to get patients out of bed or off their stretchers, and a lot more difficult to get them back on them, especially in the emergency department where the stretchers are quite high.

The basic problem is the lack of a language for describing and classifying gait problems.

Gait disorders may occur for a number of reasons, and most are non-neurological in origin. Joint pain, muscle weakness, deformities, blindness, vestibular dysfunction, psychological factors, poorly fitting shoes (especially in those with edema and bunions) and deconditioning all may play a role. Pain, shoes, feet and blindness should be asked about.

Weakness and numbness may be peripheral nervous system contributions to gait disorders or may result from central nervous disorders. Increased tone, ataxia, weakness and abnormal "motor programs" are central nervous system abnormalities.

COMPONENTS OF GAIT

1. Ability to stand

The patient should be asked to stand without using her arms. They may be kept folded across the chest or put into a praying position. If the patient cannot do this, she should try to stand pushing off from the armrests on her chair. A note should be made of how easily the patient was able to do this or whether the doctor needed to help.

2. Posture

Patients with an abnormal posture will generally have kyphosis, scoliosis or some degree of both. Rare patients will have a hyperlordotic posture from lower spinal muscle weakness or dystonia. Kyphosis is usually idiopathic, but may be due to compression fractures, Parkinson's disease, spondylitis. The curvature may occur anywhere from the lumbar spine up. In PD, for example, patients may have highly variable degrees of flexion in the thorax or the neck or both.

3. Base

The normal width of foot placement is considered the width of the shoulders. The base should be noted both when standing and when walking. Ataxic gaits, due to sensory problems, cerebellar or vestibular dysfunction will cause the base to increase or to vary. Spastic problems, due to corticospinal tract dysfunction, as seen in spastic forms of cerebral palsy, stroke or cervical myelopathies, cause a narrowing

of the base, with scissoring, the crossing of feet, being an extreme example, most often seen in people who were born with a form of cerebral palsy.

4. Stride and foot strike

The stride length depends on the speed of gait as well as the height of the subject. Excessively long strides are rare, and produce a "loping" quality, whereas short steps are common, especially in the elderly, seen in parkinsonian disorders as well as "fear of falling" in which people walk as if they are on ice. In asymmetric disorders, such as Parkinson's disease, one stride length may be shorter than the other, producing a limping gait.

In normal gait the heel strikes the ground first, but in Parkinsonian disorders there is a flat foot strike. In spastic disorders the ball of the foot hits first. These different foot strike patterns may be reflected in wear on the shoes.

5. Armswing

This is not important in the biophysics of walking but is extremely important in making diagnoses. The armswing is reduced in Parkinsonism, for example, generally more reduced on the worse side, possibly absent on one side and normal on the other. Armswing is absent after a stroke. In patients with ataxic syndromes the arms are often abducted, as if supplying extra balance. Tremor may be seen only during walking in Parkinson's disease, whereas tremor is not seen during walking in patients with essential tremor. In choreiform disorders, such as generalized tardive dyskinesia or Huntington's disease, the armswing is often excessive. It may also be excessive in some disorders in which there is a short stride, as if to compensate.

6. Turning

A normal turn requires a pivot. One foot is kept on the ground and rotation occurs on the ball of that foot. In Parkinsonism the patient turns "en bloc," in one piece, using two or more steps. Sometimes the patient turns in a large circle, as if making a U-turn. Turning frequently causes loss of balance, in all gait disorders.

7. Pull test

This test, like the Romberg, tests balance. The pull test is performed by informing the patient that you are going to pull him off balance and that he should try to keep from falling, taking as few steps as possible. It is important to pull hard enough to make the patient take a step or two. Taking more than three steps is considered abnormal, indicative of a balance problem.

INTERPRETATIONS

As in most aspects of the neurological examination, the cardinal feature is symmetry. When the stride length is different on the two sides, we usually see a limp or scuffing of one foot. Asymmetric armswing is obvious, once you look for it. When the gait looks abnormal, try to break it down into the component parts listed above to see if the abnormality can be localized. When the patient shifts weight suddenly, it is often an indication of joint pain, and this should be inquired about.

Examples:

1. **Foot drop:** the affected foot is lifted higher than normal and then the ball of the foot is dropped onto the ground or is thrown forward and slapped.

2. **Hip weakness** produces a waddling gait. To lift the swing leg and move it forward, weight is shifted to the supporting leg by tilting the pelvis up on the swing side. This is usually a symmetric problem so that the hip swivels up and down.

3. **Parkinsonism** is one of the most common gait in the elderly, and not always pathological.⁷ The posture is stooped, the stride length is reduced and there is a tendency for a flat foot strike. Armswing is reduced. Turning is without a pivot and balance is impaired on the pull test. As the gait deteriorates, the patient will often be flexed at the knees, which causes a major increase in weightbearing problem for the thigh muscles.

4. **Ataxic:** this may be from cerebellar dysfunction, vestibular impairment or sensory denervation. The stance may be normal or wide, but the gait is irregular and often lurching, with a tendency to veer to one side, or to either side, with increased problems on turning.

Armswing is normal, but sometimes reduced when the arms are abducted, acting like a balancing rod used for tight-rope walkers. Alcohol intoxication produces an ataxic gait.

5. **Post stroke:** armswing is lost on the affected side, and the arm is often flexed at the elbow, and wrist, while adducted at the shoulder. The affected leg is typically kept in extension, as if acting like a crutch. The leg is moved in a circular fashion as the knee is not bent. The ball of the foot usually hits the ground first.

6. **Spastic:** this is seen in children or adults with cerebral palsy, but also with other bilateral corticospinal dysfunction, typically after bilateral strokes, multiple sclerosis or cervical myelopathy, as occurs with cervical spondylosis. The posture is normal. The legs are stiff and do not bend normally at the knees. The base narrows. Because the legs are kept extended, the ball of the foot usually hits the ground first. Stride length is reduced. Armswing changes are determined by the level of the lesions so that in brain diseases, the armswing is reduced. When the spastic gait arises from a cervical process, it may or may not be reduced.

7. **Cautious gait.** This is the gait of someone fearful of falling, which, paradoxically, may increase the risk. The patient walks as if on ice, with slow, deliberate steps, placing each foot flatly and solidly on the ground before advancing.

8. **Astasia abasia.** This is an old term, meaning "can't sit, can't stand," used for conversion disorder, or psychogenic gait disorders. Although these are considered rare in the elderly, they do occur. Generally the gait is extremely bizarre, and, unlike other gait disorders where the body tries to minimize risk and effort, these generally maximize effort and produce convoluted postures, standing on one leg and other unusual stresses to the balance systems. Contrary to popular belief, these disorders are not generally associated with "belle indifference" or with the absence of falls or injuries.

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http://medlib.med.utah.edu/neurologiceexam/html/gait_abnormal.html contains information on gait including video examples of a doctor simulating and explaining common gait disorders as well as including examples. Other websites cited include information about gait, both for health professional and patient.

Joseph H. Friedman, MD, is executive editor of Medicine & Health/Rhode Island.

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CORRESPONDENCE

Joseph H. Friedman, MD
Neurohealth
227 Centreville Rd.
Warwick, RI 02886
e-mail: Joseph_Friedman@brown.edu

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