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Review

Falls and gait disorders in geriatric neurology

Hubertus Axer[a,*], Martina Axer[b], Heinrich Sauer[b], Otto W. Witte[a], Georg Hagemann[a]

[a] Department of Neurology, Friedrich-Schiller-University Jena, Erlanger Allee 101, D-07747 Jena, Germany
[b] Department of Psychiatry, Friedrich-Schiller-University Jena, Philosophenweg 3, D-07747 Jena, Germany

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ABSTRACT

Gait disturbances are frequent in older patients and lead to immobility, falls, and increased mortality. In gerontoneurologic patients a higher prevalence of risk factors for gait disturbances and falls has to be attributed due to neurodegenerative diseases, dementia, delirium, or psychotropic medication. The potential of neurological expertise to contribute to the evaluation and treatment of falls and gait disorders in geriatric patients is still not fully exploited. Sometimes a fall can be an index event to the diagnosis of the underlying disorder. This review, therefore, focuses on the relationship between falls, gait, and neurological diagnosis. It helps to find the correct diagnosis of the underlying disease as one major step in the management of gait disorders and fall prevention. From a pragmatic point of view falls can be classified according to loss or preservation of consciousness. Gait disturbances should be differentiated into gait disorders with and without cognitive impairment. Although gait impairments are influenced by multifactorial parameters, this differentiation may help to find a diagnosis and also to initiate an appropriate, disease-specific therapy. In addition, every fall patient has to be analyzed individually according to his individual risk factors, which all can potentially be influenced to improve mobility and to reduce falls.

Contents

* Corresponding author. Tel.: +49 3641 9323454; fax: +49 3641 9323402.
E-mail address: Hubertus.Axer@med.uni-jena.de (H. Axer).

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1. Introduction

Falls and gait disorders are relevant problems in the elderly. While at the age of 60 years still 85% have no gait disorders, the prevalence of gait abnormalities rises up to 82% at the age of 85 and older [1]. In the United States 30% of people over the age of 65 years fall each year and in the group of people older than 80 years this proportion is as high as 50% [2]. 25% of deaths due to falls occur in the 13% of people older than 65 years [3].

The danger of falls in elderly people is due to high susceptibility to injuries caused by prevailing diseases e.g. osteoporosis or reduced protective reflexes. Besides the direct risk of fall-related injuries (e.g. major fractures or head trauma) another important consequence of falls is reduced mobility and loss of self-confidence, which in turn leads, therefore, to a significant reduction of quality of life [4,5]. Recurrent falls often lead to admission of previously independent older people to long-term care institutions with severity of fall-related injuries being a predictor of admission [2,6]. Although not every fall is caused by a specific gait disorder, there are quite a few neurological conditions with abnormalities of gait and stance which predispose to falls. Therefore, these two conditions are obviously strongly associated and it is worthwile to discuss these two topics together, especially as a fall might be an index event, which draws the attention to abnormalities of gait, or to other underlying pathological and potentially treatable conditions.

Gait disorders are indicators of negative sequelae or even markers for reduced survival [7,8] caused not only by fall-related injuries but also by reduced cardiovascular fitness or death from the underlying disease. Besides, gait disturbances in older people are predictors for the development of dementia [9].

In geriatric neurological patients a higher prevalence of gait disturbance and falls must be considered because neurodegenerative diseases, dementia, delirium, or psychotropic medication are common in the elderly. As population ages, this will place an increasing burden on health care providers and society. This warrants a systematic review to discuss the assessment and timely differential diagnosis of gait disorders and falls of geriatric patients in order to prevent further falls and other deleterious consequences.

Most reviews dealing with falls in the elderly [10,11] focus on interventions which must be multifactorial. However, from a neurological point of view, the significance of gait disorders and falls caused by neurodegenerative diseases is steadily increasing as the population ages. A fall can be an index event to the diagnosis of a hitherto unknown underlying disease and hereby help to initiate a timely therapy. Therefore, this review focuses primarily on falls and gait disorders associated to the dysfunction of central nervous system in elderly patients.

2. Assessment of falls and gait

In the elderly population most often causes of falls [3,12] have been attributed to accidental or environmental related factors (31%), gait disorders and weakness (17%), dizziness (13%), drop attack (9%), confusion (5%), postural hypotension (3%), visual disorders (2%), or syncope (0.3%). However, many of the accidental falls may really be attributable to a combination of an "accident" and age or disease-related cofactors. Although not all major factors in fall causation are neurologic in origin, neurological impairments or diseases significantly increase the risk of falls. In addition, mobility limitations, cognitive impairment, history of falls, and use of assistive devices are indicators of increased risk for falls [13–27]. Therefore, a main target to prevent falls is to identify treatable or modifiable risk factors early.

However, risk factors for falls are often multifactorial in origin [10]. These can be classified as intrinsic (e.g. the underlying disease), extrinsic (e.g. polypharmacy) or environmental factors (e.g. lack of safety equipment in the bathroom, poor lighting, etc.). Some of these may be modifiable (e.g. medication, hypotension, muscle weakness, etc.) or not modifiable (e.g. blindness, hemiplegia, etc.) [10].

Table 1
Examination of gait.

	General inspection
General examination	Cardiovascular system Orthopedic evaluation of joints, bones, etc. Vision Cognition
Gait examination	Standing, posture Romberg-test (standing with closed eyes) Retropulsion test (postural instability) Rising up from a chair Initiation of gait (freezing of gait) Locomotion: length of step, height of step, base of gait (width of steps), number of steps, arm swinging, velocity of gait Climbing stairs Tandem gait
Quantifiable tests	'get up and go' test [29,30] 6 min walking distance [31] One leg balance test [32]
Standardised rating scales	Tinetti mobility index [33] Berg balance test [34]

The first step to assess the risk of falling is a careful history taking of the patient and/or his relatives. Special emphasis has to be put on known gait disorders, medication and especially history of previous falls [28]. Clinical examination is the second step to evaluate gait, balance, and risk of further falls (Table 1). A general medical examination especially evaluating cardio-vascular, visual, and cognitive impairments should be accompanied by a specific neurological examination of stance and gait. Moreover, quantifiable tests and standardized rating scales exist to quantitatively evaluate the risk for falling of the patients (Table 1). In the clinical setting, i.e. on ward rounds, the patients should regularly be instructed to walk whenever possible. Visits of patients lying in bed are not sufficient, especially as information obtained by confused patients as well as by relatives can be misleading. In addition, communication about gait and falls should regularly include relatives and/or nurses. A detailed clinical description of specific gait characteristics helps to identify the cause of gait disturbance from clinical examination. Table 2, therefore, gives an overview about major clinical types of gait disorders.

3. Falls with loss of consciousness

From a pragmatic point of view, the causes for falls can be divided into patients who fall with a loss of consciousness and patients who fall while consciousness is preserved e.g. because they have a disturbance of gait and balance, or because of external reasons. This discrimination, however, may be difficult to make in cognitively impaired elderly patients without an accurate history and/or witness. In case of a self-limiting loss of consciousness with rapid but complete recovery the broad differential diagnosis is usually syncope. Naturally speaking, syncope is a symptom and not a diagnosis as many different mechanisms may lead to the transient cerebral hypoperfusion resulting in loss of awareness and fall. A detailed description of the complete spectrum would be beyond the scope of this review and we will instead focus on the most important facts about syn-