Frail Patients with ST-Elevation Myocardial Infarction: Correlations between Physical and Cognitive Activity

Pasquale Mone1,2*, and Gaetano Santulli3

1University of the Study of Campania Luigi Vanvitelli, Italy
2Department of Medicine, University of Campania “Luigi Vanvitelli, Italy
3Department of Cardiology, Albert Einstein College of Medicine, USA

Abstract

The review aim to investigate physical and cognitive decline after St-Elevation Myocardial Infarction (STEMI), in frail older adults. In the general critical care setting, about one-third of older adults are frails and frailty is associated with increased morbidity, mortality, and resource use, such as length of critical care unit stay and readmission rate. Cognitive and physical decline are very common in older populations, and their prevalence increases with age; in fact, dementia is a progressive and typically irreversible deterioration of cognitive function typical of older adults.

Frailty may increase the future risk of mild cognitive impairment (MCI), and all-cause dementia. It is known the association between cardiovascular diseases with functional and cognitive decline.

Gait speed is a quick, inexpensive, reliable measure of functional capacity with well-documented predictive value for major health-related outcomes. Numerous studies have documented gait speed in older people. No studies are available on the correlations between 5-metres gait speed test and Mini Mental State Examination (MMSE), on frail STEMI patients. Here we reviewed the literature.

BACKGROUND

St-Elevation Myocardial Infarction (STEMI) is one of the most common cause of death worldwide [1]. The mortality in STEMI patients is influenced by many factors. In particular, aging is one of the most common, leading to worst clinical outcomes. In fact, medically and surgically treated older adults with STEMI may develop a frailty status, but many patients are already frails before STEMI [2]. Frailty is a clinical syndrome with an increased vulnerability to stressors. Stressors are acute or chronic illness (e.g., myocardial infarction) or iatrogenic (e.g., cardiac surgery) [2,3]. It is known that one-third of older adults are frails and frailty may lead to increased morbidity, mortality, complications and re-hospitalizations [2,4].

The adverse outcomes associated with frailty and STEMI have reported in the existing literature. It is known that elders with frailty have a higher prevalence of functional and cognitive decline on presentation, including slow gait speed and cognitive impairment. This is why we believe that every frail patient with STEMI should be evaluated after percutaneous coronary angiography (PCI), to prevent physical and cognitive impairment. The aim of this review, thus, is to show the importance of evaluating physical and cognitive status in older adults to prevent or delay a frailty status.

METHODS

Frailty Evaluation

Frailty is measured by many tools. Here we define the frailty phenotype:

- Slowness,
- Weakness,
- Low physical activity,
- Exhaustion
- Shrinking.

Slowness is evaluated with a gait speed test, weakness with a handgrip strength test and other domains by specific questionnaire [5]. The Fried scale encompasses slowness, weakness, low physical activity, exhaustion, and shrinking, with ≥ 3 of 5 criteria required for a diagnosis of frailty. This is the most frequently cited frailty scale and has been demonstrated to predict mortality and disability in large cohorts of elders with cardiovascular disease (CVD).
On the basis of some studies, cognition and mood should be considered as the sixth and seventh domains of frailty but this idea remains an area of discussion [5,6]. There is a large and increasing body of evidence indicating that the prognosis of older patients is strongly related to the presence of concomitant diseases and to the degree of physical, cognitive, biological, and social impairment [6-10]. A multidimensional assessment is known to be useful to evaluate prognosis in these subjects [8,10]. Disabilities are measured with activities of daily living (ADL), or instrumental ADL (IADL). They are usually identified with “frailty” in many conditions. However, disability is a consequence of adverse outcome associated with frailty (for example after a myocardial infarction) [5,8,10].

The Short Physical Performance Battery (SPPB), is a test that evaluates slowness, weakness and balance. This is measured by a series of 3 timed physical performance tests (gait speed, chair rises, and tandem balance), each is scored 0 to 4 and a total score ≤ 5 of 12 is required for a diagnosis of frailty. In contrast to these multi-item frailty scales, 5-metres gait speed test has been proposed as a single-item measure of physical frailty [11,12].

**Frailty Status in STEMI Patients**

Frail patients receive lower rates of invasive cardiac care during ACS hospitalization. In a 2018 study, the investigators utilized the CONCORDANCE registry database to report the prevalence of frailty in older adults presenting with ACS [13]. Increased frailty was independently associated with increased postdischarge all-cause mortality but not cardiac-specific mortality [2-4]. These findings inform identification of frailty during ACS hospitalization as a potential opportunity to address competing risks for mortality in this high-risk population. The SILVER-AMI Study evaluated the impact of frailty along side other risk factors in older adults hospitalized with acute myocardial infarction (AMI), for creating a more personalized assessment of risk and identify potential targets for interventions [14].

In a 2013 study, Yasushi Matsuzawa et al., evidenced that slow gait speed was strongly associated with future cardiovascular events in STEMI patients who underwent successful primary percutaneous coronary intervention (PPCI) [15]. These findings indicated that the clinical assessment of gait speed could identify the subsets of patients at a higher risk for cardiovascular events after STEMI [15]. Interestingly, in a 2010 and 2016 study, Afilalo J et al., showed how gait speed test may predict mortality in older adults, after cardiac surgery [16,17]. Therefore, it should be consequential to correlate gait speed test to STEMI evaluation for better tailoring therapy and setting follow-up.

**Treatment**

The leading therapeutic choice in frailty patients with STEMI is PCI but these patients may present atypical symptoms that should delay or miss STEMI diagnosis. In addition, older adults have more comorbidities (as already explained in the text) and they receive reperfusion therapy less than younger patients [18,19]. In fact, they have particular risk of bleeding and other complications such as bleeding risk and renal failure. Observational studies have shown frequent excess dosing of antithrombotic therapies in elderly with frailty [20,21]. These observational studies, principally focused their attention on NSTEMI but they decribe in STEMI too. Nevertheless, there is no upper age to practice reperfusion, particularly with PCI.

**Gait Speed Test**

Gait speed is a quick, inexpensive, reliable measure of functional capacity with well-documented predictive value for major health-related outcomes. Numerous studies have documented gait speed in older people [22-24]. In a 2014 JACC paper, Afilalo J. et al. analyzed that 5-metres gait speed as a single-item measure of frailty [5]. The gait speed test has shown an excellent inter-rater reliability (intraclass coefficient 0.88 to 0.96) and test-retest reliability (intraclass coefficient 0.86 to 0.91). It is responsive to change, with significant improvements in gait speed (estimated at 0.05 to 0.2 m/s) [5,23,24], predicting positive outcomes on a population level but not necessarily an individual patient level.

The walking distance may change between 3 and 10 [25]. The 5-metres distance has been chosen by many studies and allows patients to get a good walking speed without bringing to cardiopulmonary symptoms, because of its shorter duration [5]. Finally, slow gait speed, has been associated with all-cause mortality, hospital re-admission, adverse outcomes, disability and cardiovascular disease [5,15,26-29].

The most effective treatment to improve the outcomes of frailty with slow gait speed and cardiovascular disease is not clear. Exercise is the most studied intervention and cardiac rehabilitation (CR), combines exercise and lifestyle interventions, and it is a guideline-recommended therapy after acute myocardial infarction (AMI) [26-28] (Figure 1).

**Cognitive Decline in Frailty**

Cognitive decline is very common in older populations, and its prevalence increases with age, in fact, dementia is a progressive and typically irreversible deterioration of cognitive function that is most often seen in older adults [29-33]. Alzheimer disease (AD), and cerebrovascular diseases are the 2 leading causes of cognitive impairment, accounting for ≈80% of cases and often having a mixture of both pathologies [33]. Frailty may increase the future risk of mild cognitive impairment (MCI) and all-cause dementia [34-36]. Furthermore, frailty is related to pathological findings of Alzheimer’s disease (AD), and vascular dementia, supporting the notion of a possible common biological pathway between frailty and cognitive disorders. In particular, physical frailty was associated with increased risk of developing vascular dementia [35-39].

Therefore, it should be important understanding the relationship between frailty and geriatric cognitive disorders could contribute to new interventions for the prevention and management of both conditions [35]. Cognitive tests are the gold standard for cognitive evaluation of frailty patients.

**Cognitive Decline in ACS**

Cognitive impairment during hospitalization is associated with poor clinical outcomes including lack of functional recovery, rehospitalization, institutionalization and mortality [40-44]. It is known the association between cardiovascular disease
and impaired cognition [45-47]. A 2017 study, evidenced an high incidence of cognitive decline during the high-risk transitional period from hospital to home, in ACS patients [48-51]. Furthermore, components of frailty appeared to be related to pathological findings of AD and vascular dementia, supporting the notion of a possible common biological pathway between frailty and cognitive disorders. In particular, physical frailty was associated with increased risk of developing vascular dementia, as already explained in the text. So, cognitive tests are the gold standard for cognitive evaluation of frailty patients.

The Mini-Mental State Examination (MMSE), is a simple test that evaluates global cognitive functions. It is known to be easy and not expensive with its 30 items. For these reasons, it might be useful to test frail patients with STEMI.

**Potential Relationships between Gait Speed Test and Cognitive Decline in frail STEMI**

The assessment of cognition, during hospitalization in ACS patients, is important for detecting patients who could benefit from tailored transitional care, including early follow-up appointments with healthcare providers, increased surveillance, and booster post-discharge instructions [48]. The association between gait and cognition is complex [52, 53]. In cross-sectional studies, slow speed is associated with poor cognitive function [54], mild cognitive impairment [55], and dementia [56]. Furthermore, longitudinal data suggest faster subsequent cognitive decline in those with slow gait speed [57, 58]. In community-dwelling elderly people, gait abnormalities are associated with the risk of mild cognitive impairment [59,60], and dementia [61,62].

However, the relationships between decline in gait speed test and cognitive decline remain unclear, particularly in STEMI subjects. In the clinical practice, it is not used to test physical and cognitive status, in this kind of patients, before hospital discharge. The 5-metres gait speed test and MMSE are simple and economic. Furthermore, no studies are available on the correlations between 5-metres gait speed test and MMSE, in a frail population with previous STEMI.

**CONCLUSIONS**

On the basis of existing literature, we may speculate that STEMI patients with frailty should be evaluated with 5 metres gait speed test before hospital discharge, for a better evaluation of physical status and cognitive functions. The 5-metres gait speed test might be useful, in addition to cognitive evaluation with MMSE, to evaluate the risk of cognitive decline in a frail population with STEMI. Furthermore, they are simple and economic. The results of the test might indicate how to set the pharmacological strategy, CR and the time of follow-up, for improving quality of life of these patients and reducing the risk of physical and cognitive decline.

In the clinical practice, there is no test for physical and cognitive evaluation, in these kind of patients, before hospital discharge; future studies are necessary to confirm our hypothesis.

**REFERENCES**

2. Flint K. Which Came First, the Frailty or the Heart Disease? Exploring the Vicious Cycle. JACC. 2015; 65: 10.


40. Solfrizzi V, Scafato E, Seripa D, Lozupone M, Imbimbo BP, D’Amato A.


