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University of Novi Sad, Faculty of Medicine Novi Sad¹
University Clinical Center of Vojvodina, Novi Sad
Clinic of Anesthesia and Intensive Care²
University of Niš, Faculty of Medicine, Niš³

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FRAILTY IN VASCULAR SURGERY

SLABOST U VASKULARNOJ HIRURGIJI

Danijela MILENKOVIĆ^{1,2}, Teodora TUBIĆ^{1,2}, Sanja VICKOVIĆ^{1,2}, Gordana JOVANOVIĆ^{1,2},
Nataša NESTOROV² and Lazar STOŠIĆ³

Summary

Introduction. Frailty manifests as diminished physical capacity and heightened susceptibility to stressors, significantly increasing the risk of adverse health outcomes, functional decline, and mortality. **Measurement of frailty.** Despite its clinical significance, there is currently no universally accepted tool for routine frailty assessment in clinical practice. Frailty has emerged as an independent predictor of postoperative outcomes across various surgical disciplines, including general surgery, colorectal surgery, oncology, cardiac surgery, and urology. The modified frailty index is commonly utilized in research to quantify frailty and assess its impact on surgical outcomes. **Frailty in vascular surgery.** Approximately 39% of patients undergoing vascular surgery are estimated to be frail. Frail individuals identified face nearly triple the risk of complications such as postoperative myocardial infarction, stroke, renal failure, and graft/prosthesis/flap failure. Studies consistently report higher postoperative mortality rates among patients with higher modified frailty index scores. Assessing frailty remains a complex task for anesthesiologist and surgeons during preoperative evaluations. **Conclusion.** Early identification of frailty in vascular surgery patients is crucial given their advanced age and numerous concurrent health conditions. Optimizing preoperative management tailored to frail patients can potentially reduce complications and mortality rates.

Key words: Frailty; Vascular Surgical Procedures; Risk Factors; Risk Assessment; Mortality; Postoperative Complications; Anesthesiology

ORCID NUMBER
Danijela Milenković 0009-0000-4325-5730
Teodora Tubić 0000-0001-8094-4607

Introduction

The precise definition of frailty is continuously evolving, yet it is commonly understood as a condition marked by reduced physiological capacity and in-

Sažetak

Uvod. Slabost je stanje koje se karakteriše smanjenom fiziološkom rezervom i povećanom osetljivošću na stresore, što dovodi do povećanog rizika od loših zdravstvenih ishoda, invaliditeta i smrti. **Merenje slabosti.** Još uvek ne postoje standardizovane mere za procenu i kvantifikaciju slabosti, koje bi se svakodnevno koristile u kliničkoj praksi. Slabost se pokazala kao nezavisni faktor rizika za predviđanje neželjenih postoperativnih ishoda kod pacijenata koji su podvrgnuti velikim hirurškim zahvatima, uključujući opšte, kolorektalne, onkološke, kardijalne i urološke procedure. Većina studija koje analiziraju uticaj slabosti na postoperativne ishode koriste modifikovani indeks slabosti. **Slabost u vaskularnoj hirurgiji.** Procenjeno je da je oko 39% pacijenata koji su podvrgnuti vaskularnoj hirurgiji slabo. Slabi pacijenti imaju oko tri puta veći rizik od komplikacija, kao što su postoperativni infarkt miokarda, moždani udar, progresivna bubrežna insuficijencija i otkazivanje grafta, proteze ili flapa. Rezultati studija ukazuju na veći postoperativni mortalitet posle različitih vaskularnih intervencija, kod kojih je veća vrednost modifikovanog indeksa slabosti. Tokom preoperativne pripreme, procena slabosti predstavlja težak zadatak za anesteziologa i hirurga. **Zaključak.** Identifikacija slabog pacijenta preoperativno u vaskularnoj hirurgiji je izuzetno važna, zbog godina starosti i brojnih komorbiditeta ove grupe pacijenata. Na taj način se može optimizovati preoperativno stanje pacijenta i napraviti bolji plan lečenja, sa ciljem smanjenja broja komplikacija, kao i mortaliteta.

Ključne reči: slabost; vaskularne hirurške procedure; faktori rizika; procena rizika; mortalitet; postoperativne komplikacije; anesteziologija

Gordana Jovanović 0000-0003-4899-4748
Sanja Vicković 0000-0002-2153-3135
Lazar Stošić 0009-0001-5829-7121

creased susceptibility to stressors, leading to a heightened risk of negative health outcomes, disability, and mortality [1]. Frailty is characterized by a reduction in physiological reserves, resulting in increased vulnerability, distinct from the normal aging process [2]. Frail

Abbreviations

mFI – modified frailty index

individuals typically exhibit deficits in nutrition, endurance, mobility, physical strength, stability, and cognitive function [3]. This systematic review aims to explore the concept of frailty and the utilization of frailty indices in patients undergoing vascular surgery.

Measurement of frailty

The concept of frailty was first introduced by Vapuel in 1979 [4]. Initially applied to the geriatric population, it has since been incorporated into clinical practice across various domains. Despite its widespread recognition, there is currently no universally accepted tool for routine frailty assessment in clinical settings. Two primary models have been proposed to quantify frailty. The first is the physical phenotype model introduced by Fried et al., which is based on five criteria: unintentional weight loss, feelings of exhaustion, diminished grip strength, reduced gait speed, and low levels of physical activity [2, 5]. An individual is diagnosed as frail if they meet at least three of these criteria; meeting one or two criteria indicates a pre-frail state, which predisposes the individual to progression towards frailty [6]. The second model is the deficit accumulation approach, which views frailty as the cumulative burden of various symptoms, diseases, conditions, and disabilities [7]. The “acquired deficit” model quantitatively assesses frailty based on a 70-item list of patient deficits, with frailty represented by the sum of the deficits [8].

Rockwood et al. proposed the frailty index, a model suggesting that frailty is a multidimensional risk condition marked by the aggregation of diverse health-related deficits. The severity of frailty depends on the quantity rather than the specific nature of these deficits. This model includes various health domains, such as cognitive impairment, functional impairments, psychosocial vulnerabilities, geriatric syndromes, and medical comorbidities [3].

In 2011, Obei et al. introduced the modified frailty index (mFI) [9]. The mFI was derived from the Canadian Study of Health and Aging Frailty Index by matching its 70 variables to 11 comorbidity and deficit variables from the American College of Surgeons’ National Surgery Quality and Improvement Project [10]. The mFI consists of 11 variables, with each criterion assigned one point. The index is calculated by summing the points and dividing by the total number of variables, which is 11. Most studies examining the influence of frailty on post-surgical outcomes utilize the mFI due to its reliance on easily identifiable patient characteristics, which can be gathered through straightforward history taking and physical examination [3].

Frailty in various surgeries

As the general population ages, there is an increasing need for surgery among older adults, particularly

due to the prevalence of certain diseases. Surgical procedures and the administration of anesthesia impose significant physiological and psychological stressors on the body [11]. Increasing evidence suggests that frailty holds substantial prognostic value for various surgical procedures. Recent findings indicate that frailty independently serves as a risk factor for forecasting postoperative outcomes among patients undergoing major surgical, including general, colorectal, oncologic, cardiac, and urologic procedures [12].

Frailty frequently correlates with an extended postoperative recovery period, leading to unplanned intensive care unit admissions, prolonged hospital stays, and discharge to skilled care facilities. It is also significantly associated with a higher likelihood of complications following surgery. Frail surgical patients experience more adverse events, ranging from wound infections to mortality. The increased incidence of wound complications in frail patients may be due to their limited physiological reserves, predisposing them to surgical wound issues such as infections [3]. These complications contribute to higher health care costs. Therefore, identifying frailty before surgery is crucial for planning perioperative care [8].

Frailty in vascular surgery

Given that vascular surgery patients primarily comprise older adults with numerous physical disabilities and chronic diseases, considering frailty is particularly significant [13]. The prevalence of vascular disease is closely associated with increased age: 2% among individuals aged 40 to 50 years, 3.5% in those 51–60 years old, 7.1% in 61–70 years old, 13.0% in 71–80 years old, 22.3% in 81–90 years old, and 32.5% in 91–100 years old [14]. With continuous advancements in surgical techniques and minimally invasive technology, the demand for vascular surgical interventions among the elderly is expected to rise [15]. Consequently, the growing prevalence of frailty among elderly patients undergoing vascular and endovascular surgery necessitates the integration of frailty assessments both before and after surgery to improve patient outcomes [16].

Approximately 39% of vascular surgery patients are estimated to be frail [17]. Frail patients have an approximately threefold increased risk of complication, including postoperative myocardial infarction, stroke, progressive renal failure, and graft/prosthesis/flap failure. Ischemic cerebrovascular disease, with its high mortality rate, is the leading cause of disability among neurological diseases, and stroke ranks as the third leading cause of death in developed countries, following heart disease and cancer [18]. Patients scoring between 0.54 and 0.63 on the mFI face a notably increased risk of mortality and complications [19].

Studies consistently suggest higher postoperative mortality rates for patients with higher mFI scores undergoing various vascular procedures. Significant associations have been established between frailty and increased mortality at 30 days, 90 days, 1 year, and 5

years, with the strongest evidence for 30-day mortality [16]. Notably, frailty has emerged as an independent predictor of postoperative morbidity and mortality, with a greater effect size than age alone. Although older age is a major risk factor for poor surgical outcomes, frailty can also develop in younger age groups and might be overlooked if assessments are restricted only to geriatric patients. Using an mFI >0.2 cut-off to define frailty, 20% of those under 65 years and 24% of those aged 65 years or older were classified as frail [12].

Discussion

The majority of preoperative risk assessment for patients with aortic aneurysms and other vascular conditions primarily focus on cardiac risk, often neglecting to consider physiological reserve. A decline in physiologic reserve may be associated with a reduced ability to recover from the stresses of significant surgical procedures [12]. Assessing frailty preoperatively is a challenging task for anesthesiologists and surgeons [8]. Thorough preoperative patient assessment is correlated with decreased hospitalization duration and a reduced risk of postoperative complications. Despite the established role of patient frailty as a predictive risk factor of poor outcomes, the absence of an efficient gold standard to objectively quantify frailty limits its utility as a preoperative risk assessment tool [20]. The mFI was created to facilitate a broader application of assessing patient frailty [21]. Furthermore, Karam et al. found the mFI was the best predictor of mortality compared to other pre-existing comorbidities among vascular surgery patients [22].

Anesthesia and surgical stress contribute to various postoperative complications, such as atelectasis, pneumonia, myocardial injury, acute kidney injury, and postoperative delirium [23], with a significantly elevated risk observed in patients with frailty [8].

Since several elements of the mFI are variable risk factors that can be influenced preoperatively, a multidisciplinary approach involving experts from different specialties is essential to address and correct these factors. Clinicians can optimize outcomes for frail patients through preoperative conditioning, nutrition, and pharmacological therapy [16].

Frailty assessment can aid clinicians and patients in making informed decisions. Medical treatments often need to be tailored to elderly patients due to age-related physiological decline and presence of comorbidities, which can alter the risk-to-benefit analysis. Researchers indicate that frailty assessments can assist physicians in making more accurate predictions and conducting risk-to-benefit analyses. Additionally, these assessments help patients understanding their greater risk of mortality if they are frail, allowing them to make more informed decisions about their treatment [24].

Moreover, frailty is an independent risk factor for increased healthcare costs due to the heightened level of care required for frail patients, which includes greater caregiver involvement, management of postoperative complications, and often prolonged hospital stay [8].

Conclusion

Frailty plays a crucial role in predicting and guiding the management of vascular and endovascular surgery patients throughout the pre-, peri-, and postoperative periods. Identifying frail patients preoperatively is essential due to the advanced age and numerous comorbidities often present in this group. Early identification allows for optimization of the patients' preoperative condition and the development of a more effective treatment plan, ultimately aiming to reduce complications and mortality rates.

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