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Presence and development of sarcopenia in the context of selected chronic diseases - a systematic review

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Abstract

Introduction

Sarcopenia, the loss of muscle mass, is common in chronic diseases and contributes to adverse outcomes like frailty, falls, and increased mortality. Recent studies show it also affects pediatric patients, impairing growth and development. Sarcopenia and nutritional status both linked to chronic conditions like cancer, surgery, and gastroenterology, share pathophysiological mechanisms but require different treatments.

Aim of the study

The aim of this study is to provide a clear understanding of the definitions of sarcopenia and nutritional status, as well as their role in chronic diseases. The authors focused mainly on finding the explore the shared and unique mechanisms that underlie these conditions discuss potential diagnostic approaches review the current therapeutic strategies available for managing these two syndromes.

Materials and methods

The methodology of the literature search involved using the keywords: „Sarcopenia'', „muscle mass loss", „chronic disease", „nutritional status" and „clinical outcomes". The search terms were entered into the PubMed database. References include systematic reviews, but also clinical trials, as well as case reports.

Conclusion

Sarcopenia is a critical factor across various patient groups, contributing to poor health outcomes, including higher morbidity, complications, and mortality. Early identification and intervention through exercise, nutrition, and medical management can significantly mitigate these effects, improving quality of life and recovery outcomes. Comprehensive management strategies are essential, particularly for older adults, individuals with chronic conditions, and surgical patients.

Keywords:

Sarcopenia, muscle mass loss, chronic disease, nutritional status, clinicial outcomes, healthcare.

Introduction

Sarcopenia, or muscle mass loss, is a common phenomenon of malnutrition in patients with chronic diseases. Reduced intake of nutrients, lack of physical activity, and high levels of inflammatory cytokines lead to a catabolic state with muscle mass degradation, resulting in significant muscle loss. Substantial evidence highlights the association between sarcopenia and various adverse chronic diseases in adults, as well as its connection to falls and fractures, limited physical activity, frailty, and increased mortality[1].

In recent years, an increasing number of publications have reported on the impact of sarcopenia in pediatric patients. These reports indicate that it negatively affects clinical outcomes, such as increased hospitalization and a higher incidence of chronic diseases. Furthermore, sarcopenia in children may negatively impact growth, neurological development, and the development of fine motor skills, as well as impair quality of life[2].

Sarcopenia and cachexia can complicate many different chronic diseases, including cancer, heart failure (HF), chronic kidney disease (CKD), thyroid disease, chronic obstructive pulmonary disease (COPD), and chronic liver failure. When wasting disorders occur, they can worsen the clinical condition of patients, decrease their quality of life, lead to prolonged or recurrent hospitalizations, and potentially worsen the patient's prognosis. Sarcopenia and cachexia share some common pathophysiological pathways, such as abnormalities in protein metabolism and increased inflammation. However, they should be considered separately, as the therapeutic approach for each condition is different. Therefore, the aim of this review is: 1) to clarify the definitions of sarcopenia and cachexia and their clinical involvement in chronic diseases; 2) to explain the common and distinct mechanisms underlying them; 3) to present diagnostic possibilities; 4) to review current therapeutic strategies for these two disease syndromes.

Epidemiology

The prevalence of sarcopenia in the elderly population ranges from 10% to 16% worldwide, but is higher in patient groups, especially among those with various medical conditions.[4] In patients with diabetes, the percentage is 18%, while in those with inoperable esophageal cancer it can reach 66%. Sarcopenia is associated with a number of negative health consequences, such as worsened overall health, lower survival rates, higher risk of postoperative complications, longer hospitalisation, as well as a higher risk of falls, fractures, metabolic disorders, cognitive impairment and higher mortality in general populations. In healthcare settings, its prevalence reaches up to 29% and ranges from 11% to 50% in people aged 80+ years [5].

Pathogenesis of sarcopenia

Primary sarcopenia results from various factors that affect muscle development. Myofibers, or muscle cells, are derived from satellite cells, which are stem cells for skeletal muscles[6].

Although skeletal muscles can regenerate after damage, aging disrupts the balance between anabolic and catabolic processes, leading to a decrease in the number and size of type II muscle fibers. These fibers are replaced by fat, and satellite cells lose their ability to repair damage. As aging progresses, the regulatory factors controlling satellite cell activity, such as TGF-β and myogenin, also change, affecting regenerative processes. Additionally, in the muscles of individuals with sarcopenia, there is dysfunction of neuromuscular junctions, a decrease in motor unit numbers, inflammation, insulin resistance, mitochondrial disorders, and oxidative stress. Denervation of muscle fibers results in the loss of type II fibers, which are replaced by type I fibers and fat [5].

Impact of physical training

Elderly individuals diagnosed with sarcopenia engaged in a structured program consisting of aerobic, strength, and balance exercises three times per week for two years, complemented by nutritional advice. After two years, they demonstrated preservation of VL muscle architecture, maintaining pennation angle and fascicle length despite a slight reduction in cross-sectional area. Serum C-terminal agrin concentrations remained stable, and overall SPPB performance improved, indicating enhanced physical function. No significant changes in neurofilament light chain concentrations were observed. A long-term, mixed-exercise program can effectively preserve neuromuscular health, maintain muscle structure, and enhance physical performance in sarcopenic older adults. The stability of CAF concentrations indicates potential preservation of neuromuscular junction integrity, highlighting the importance of structured exercise interventions in mitigating age-related neuromuscular decline[18].

Sarcopenia in knee osteoarthritis

The article explores the connection between sarcopenia and knee osteoarthritis (KOA) in older adults in China, highlighting significant results:

Sarcopenia notably raises the risk of developing symptomatic KOA, with low muscle mass being a critical factor. After a three-year follow-up, individuals with sarcopenia were

more likely to develop new KOA than those without it. The study highlights that sarcopenia, particularly reduced muscle mass, has a negative impact on KOA outcomes, which should be considered in clinical practice. A prognostic model for KOA was developed that incorporated factors such as sarcopenia, age, BMI, health status, and physical activity, demonstrating high accuracy. The findings emphasize the need to address sarcopenia in older adults to enhance KOA outcomes. Early intervention strategies focusing on improving muscle mass and strength could potentially help improve outcomes in this population of patients[1].

Sarcopenia in inflammatory bowel disease in pediatrics

Children with IBS are more prone to sarcopenia due to factors like poor nutrition, chronic inflammation, and corticosteroid use. In this population sarcopenia often leads to growth failure, delayed recovery from illness, and poor overall quality of life. By identifying sarcopenia early in pediatric IBS population it is possible to take steps to prevent or mitigate its effects. Nutritional support, exercise programs, and medications to address inflammation could help preserve muscle mass and improve physical function in these children. Addressing sarcopenia could reduce hospitalizations, improve growth and development, and enhance the overall quality of life for children with IBD[2].

Sarcopenia in surgery

Sarcopenia before MIPD (Minimally invasive pancreaticoduodenectomy) has an impact on postoperative outcomes. It is associated with higher postoperative morbidity and major complications. Nutritional status assessment, especially sarcopenia, should be part of the routine preoperative procedures to provide early and appropriate nutritional support for MIPD patients [7].

Importance of muscle recovery in enhancing bone health after knee surgery: after total knee arthroplasty muscle mass increased consistently following surgery, whereas bone mineral density of the lumbar spine and proximal femur did not change significantly for the first 12 months, but increased sharply after 12 months, slowing down after 18 months. A positive correlation between muscle mass increase and bone mineral density suggests that the muscle mass gain post-TKA may contribute to the improvement in bone density[8].

Frailty, sarcopenia and myosteatosis contribute significantly to adverse outcomes in patients admitted for emergency general surgery. Frailty, being an independent risk factor, is associated with poorer outcomes, including higher 30-day and 1-year mortality. Assessment of frailty and body composition (such as sarcopenia and myosteatosis) can be used to predict outcome in patients undergoing emergency surgery[9]. Preoperative nutritional status of patients undergoing cardiac surgery was assessed using the Comprehensive Nutrition

Screening Index (CNSI) to evaluate its effectiveness in predicting mortality among these patients. CNSI includes factors such as weight loss, dietary intake, and body mass index. Patients were categorized based on their CNSI scores. Patients identified as malnourished according to the CNSI had a significantly higher mortality rate following cardiac surgery compared to well-nourished patients. The CNSI demonstrated good predictive ability for postoperative mortality, suggesting its utility in preoperative risk stratification. Preoperative nutritional assessment using the CNSI is valuable in identifying patients at increased risk of mortality after cardiac surgery. Implementing nutritional interventions for at-risk patients may improve surgical outcomes. Routine nutritional screening in the preoperative evaluation of cardiac surgery patients is important to enhance risk assessment and guide perioperative care strategies[10]. Patients undergoing pancreatic resection were assessed for sarcopenia and muscle strength to investigate the impact of these factors on postoperative complications within 30 days post-surgery. Sarcopenia was evaluated using CT imaging to measure muscle mass and muscle strength was assessed through handgrip strength measurements. Higher levels of muscle strength were associated with a lower risk of postoperative complications. Sarcopenia did not show a significant independent association with complication risk after adjusting for muscle strength. Muscle strength is a critical factor influencing postoperative outcomes in pancreatic surgery. Enhancing muscle strength preoperatively may reduce complication rates. Sarcopenia alone may not be a sufficient predictor of postoperative risk when muscle strength is considered. Focusing on muscle strength in perioperative care is important to improve recovery and reduce risks associated with pancreatic surgery[13]. The clinical factors and postoperative complications associated with sarcopenia by assessing the grip strength and skeletal muscle mass in patients undergoing hepatectomy for hepatocellular carcinoma (HCC). The group of patients with sarcopenia was significantly associated with older age, low body mass index, comorbid heart or chronic pulmonary disease, cerebrovascular accident history, and overall and major postoperative complications compared to the non-sarcopenia group. Among major postoperative complications [Clavien-Dindo classification (CDC) ≥III], the incidence of bile leakage and intra-abdominal abscess were higher in the sarcopenia group than in the non-sarcopenia group. Sarcopenia, defined by grip strength and skeletal muscle mass, is a predictor of overall and major complications after hepatectomy for HCC[17].

Impact of regular physical activity on muscle quality and metabolic functions in patients after roux-en-y gastric bypass. Patients who had undergone bariatric surgery were divided into two groups: the intervention group, who participated in a regular exercise

training program (resistance plus aerobic exercise) and control group, who received standard postoperative care without additional exercise intervention. The intervention group showed significant improvements in muscle quality and favorable changes in metabolic parameters compared to the control group, which suggests that regular physical exercise after bariatric surgery can support muscle remodeling, counteracts the post-surgical loss of muscle mass and function and enhance metabolic functions. Incorporating an exercise training program into postoperative care following bariatric surgery may offer additional benefits for muscle health and metabolism[19]. Patients with spinal metastases who underwent surgery were categorized based on their nutritional status, assessed using body mass index (BMI) and other laboratory parameters. Malnourished patients exhibited a higher risk of postoperative complications, including infections and wound healing issues, and experienced longer hospital stays[20]. Additionally, malnutrition was associated with an increased rate of hospital readmission within 30 days post-surgery. Malnutrition serves as a significant risk factor for adverse outcomes following spinal surgery in patients with metastatic tumors. Preoperative assessment and optimization of nutritional status may enhance treatment outcomes in this patient population[26]. Preoperative CT scans of patients with symptomatic carotid artery disease scheduled for carotid endarterectomy were utilized to assess neck muscle mass and quality. Additionally, inflammatory markers, such as C-reactive protein (CRP) levels, were measured. Patients with lower neck muscle mass and poorer muscle quality exhibited higher levels of inflammatory markers and reduced postoperative survival rates, which suggests a correlation between neck muscle deterioration, increased inflammation, and poorer prognosis in patients undergoing carotid endarterectomy. Assessing neck muscle mass and quality via CT scans can provide valuable prognostic information for patients with symptomatic carotid artery disease undergoing carotid endarterectomy[27].

Sarcopenia in gastroenterology

Patients with Crohn's disease often exhibit signs of sarcopenia, which correlates with more severe disease activity and poorer responses to biologic therapies. Sarcopenia could be a marker for disease severity and treatment effectiveness. Sarcopenia was associated with higher disease activity index (CDAI) scores and lower levels of nutritional indices (including albumin, hemoglobin) and body weight.

The skeletal muscle index (SMI) was inversely correlated with CDAI, suggesting that lower muscle mass may indicate greater disease severity.

SMI also correlated with albumin and hemoglobin levels, indicating a link between sarcopenia and patients' overall nutritional status[10]. The aim of the study was to examine the

relationship between sarcopenia and arterial stiffness and hypertension in elderly Koreans without underweight or obesity. The results showed that as the severity of sarcopenia increased, both arterial stiffness and blood pressure increased. Those with moderate to severe sarcopenia were significantly more likely to develop high arterial stiffness and hypertension. The study confirmed that sarcopenia, independent of obesity, is a risk factor for arterial stiffness and hypertension in older adults. Reduced muscle mass, the presence of intramuscular fat, insulin resistance and chronic inflammation may contribute to this association. In addition, sarcopenia can lead to impaired muscle function, which increases the risk of arterial problems[11]. Patients with inflammatory bowel disease (Crohn's disease and ulcerative colitis) were assessed for nutritional status, body composition, muscle strength and quality of life in order to study the impact of malnutrition and sarcopenia on quality of life of these patients. Nutritional status was evaluated using Nutritional Risk Screening 2002 and Global Leadership Initiative on Malnutrition (GLIM) criteria, body composition was measured via bioelectrical impedance analysis (BIA), muscle strength was assessed through handgrip strength (HGS) and quality of life was assessed using the Inflammatory Bowel Disease Questionnaire. IBD patients were compared with 122 sex-, age-, and BMI-matched healthy controls. IBD patients exhibited significant deterioration in body composition and physical function compared to healthy controls, characterized by: muscle depletion (lower appendicular skeletal muscle mass index (ASMI)) and fat accumulation (higher visceral fat area). Prevalence rates among IBD patients: malnutrition 60.1%, sarcopenia 25.2%. Co-occurrence of malnutrition and sarcopenia was associated with reduced quality of life. Handgrip strength correlated strongly with various BIA-derived body composition parameters. Malnutrition and sarcopenia are prevalent in IBD patients and often co-occur, negatively impacting quality of life. IBD-related body composition changes include muscle depletion and fat accumulation. Handgrip strength is a promising tool for evaluating nutritional status and sarcopenia in IBD patients. Routine nutritional assessment and interventions may improve health outcomes and quality of life in individuals with inflammatory bowel disease[12].

Sarcopenia in diabetes

Muscle strength and function is important in managing foot health in diabetic individuals. Sarcopenia may worsen foot-ankle function and slow recovery from diabetic foot ulcer. Addressing sarcopenia could play a key role in improving outcomes for diabetic foot ulcer patients and comprehensive treatment strategies should include both diabetes management and muscle health[14].

Muscle Capillarization

Sarcopenic individuals had 20% lower capillary-to-fiber ratios and reduced exercise capacity compared to non-sarcopenic participants. Low muscle capillarization contributes to sarcopenia and functional decline by limiting the transport of nutrients and oxygen to muscles. Strategies to improve or preserve muscle capillarization could help slow sarcopenia and associated declines in physical function in older adults[15].

Sarcopenia in oncology

Preoperative assessments of patients with NSCLC who underwent lung resection surgery included imaging studies to identify sarcopenia (loss of skeletal muscle mass and strength) and evaluations of immunonutritional status through markers such as lymphocyte count and albumin levels. Patients exhibiting preoperative sarcopenia and immunonutritional impairments had a higher incidence of postoperative complications, such as infections and respiratory failure, and required longer hospital stays compared to those without these preoperative conditions. Preoperative evaluation of muscle mass and nutritional status is crucial in identifying NSCLC patients at increased risk for adverse postoperative outcomes. Implementing strategies to improve muscle mass and nutritional health prior to surgery may help reduce complication rates and enhance recovery in this patient population[16]. Patients with colorectal cancer were assessed for psoas muscle mass index (through imaging studies) in order to investigate the prognostic significance of sarcopenic obesity. Patients identified with sarcopenic obesity exhibited significantly poorer overall and disease-free survival rates compared to those without this condition. Sarcopenia combined with visceral obesity (sarcopenic obesity) as preoperative condition, significantly shortens cancer-related relapse-free survival in patients with colorectal cancer who underwent radical resection. Sarcopenic obesity, as determined by the psoas muscle mass index, serves as a negative prognostic factor in colorectal cancer. Assessing both muscle mass and fat composition is crucial for risk stratification and management of CRC patients. Sarcopenia combined with visceral obesity (sarcopenic obesity) as preoperative condition, significantly shortens cancer-related relapse-free survival in patients with colorectal cancer who underwent radical resection. Body Mass Index (BMI) influences cancer risk across a broad range of cancer types- both underweight and obesity are linked to an increased risk of various cancers, with the risk varying depending on cancer type. Higher BMI is associated with a greater risk for cancers such as esophageal, colorectal, and kidney cancer, while lower BMI increases the risk for cancers like liver and pancreatic cancer. Each 5 kg/m² increase in BMI was linked to: a 62% higher risk of uterine

cancer, a 31% higher risk of gallbladder cancer, a 25% higher risk of kidney cancer, a 10% higher risk of colon cancer, a 5% higher risk of postmenopausal breast cancer. Inverse associations were observed for premenopausal breast and prostate cancers. Maintaining a healthy weight is important for cancer prevention[24]. Patients with nonmetastatic colorectal cancer were assessed for systemic inflammation (pre-diagnostic) and sarcopenia (at diagnosis) in order to examine associations between these conditions and survival outcomes. Systemic inflammation was measured using the neutrophil-to-lymphocyte ratio (NLR) from blood samples taken within 24 months before diagnosis. An NLR of 3 or greater indicated elevated inflammation. Sarcopenia was assessed through imaging studies to evaluate skeletal muscle mass at the time of diagnosis. A higher pre-diagnostic NLR was associated with an increased likelihood of sarcopenia at diagnosis. Patients presenting both sarcopenia and an NLR of 3 or greater had approximately double the risk of overall and CRC-specific mortality compared to those with neither condition. Both systemic inflammation and sarcopenia independently predict poorer survival outcomes in nonmetastatic CRC patients. The combination of elevated NLR and sarcopenia identifies patients at a significantly higher risk of mortality. Given that NLR and muscle mass assessments are commonly performed and potentially modifiable, they hold substantial clinical value for prognostication and may guide interventions aimed at improving patient outcomes. Managing these conditions, through interventions like anti-inflammatory treatments and muscle-strengthening exercises, could potentially improve survival and quality of life for patients with CRC. (25) Patients with colorectal cancer were assessed for psoas muscle mass index (through imaging studies) in order to investigate the prognostic significance of sarcopenic obesity. Patients identified with sarcopenic obesity exhibited significantly poorer overall and disease-free survival rates compared to those without this condition. Sarcopenia combined with visceral obesity (sarcopenic obesity) as preoperative condition, significantly shortens cancer-related relapse-free survival in patients with colorectal cancer who underwent radical resection. Sarcopenic obesity, as determined by the psoas muscle mass index, serves as a negative prognostic factor in colorectal cancer. Assessing both muscle mass and fat composition is crucial for risk stratification and management of CRC patients. Sarcopenia combined with visceral obesity (sarcopenic obesity) as preoperative condition, significantly shortens cancer-related relapse-free survival in patients with colorectal cancer who underwent radical resection[22].

Sarcopenia in cardiology

Influence of muscle health (indicated by sarcopenia index) on both procedural and post-procedural outcomes in patients undergoing PCI for coronary artery disease. Sarcopenia

Index (SI), used as a proxy to identify sarcopenia in patients, was calculated using biomarkers like serum creatinine and cystatin C levels, which are indicators of muscle mass and function. Patients with higher SI (indicative of lower muscle mass) were more likely to experience intraprocedural events such as coronary slow flow and no-reflow, which refer to complications during PCI where blood flow to the heart is disrupted. Additionally, these patients were more susceptible to experiencing malignant ventricular arrhythmias during or after the PCI procedure. Patients with a higher SI (sarcopenic patients) had a higher post-discharge mortality rate, indicating that low muscle mass negatively affects recovery and survival following PCI. Muscle health (as indicated by the sarcopenia index) should be considered in clinical assessments for patients undergoing PCI. Identifying patients with low muscle mass could help predict who is at greater risk for both intraoperative complications and adverse post-discharge outcomes. Preoperative interventions aimed at improving muscle mass, such as exercise or nutritional support, seem be important in reducing complications and improving survival after PCI. Sarcopenia, as measured by the sarcopenia index, is an important factor to consider in predicting patient outcomes after PCI. Addressing sarcopenia could improve patient care, reduce complications during PCI, and ultimately lower post-discharge mortality rates.

The relationship between admission nutritional status and clinical outcomes

Nutritional status of older patients admitted to the hospital was evaluated, using standard criteria to identify malnutrition, in order to investigate its impact on hospital readmission and mortality rates among older patients within two time frames: early (within 7 days) and late (between 8 and 180 days) post-discharge. Malnourished patients exhibited a higher likelihood of hospital readmission and mortality in both early and late post-discharge periods compared to well-nourished patients. The association was particularly pronounced in the late post-discharge period (8-180 days)[21]. Malnutrition in older hospitalized patients is a significant predictor of increased risk for both readmission and death following discharge. Early identification and management of malnutrition during hospital stays are crucial to improve post-discharge outcomes in this population. Nutritional assessments and interventions are integral components of healthcare for older adults to enhance recovery and reduce adverse post-discharge events[23].

Nutritional status in selected diseases

The study demonstrates that the Nutritional Risk Index (NRI) is a useful predictor of mortality for hospitalized patients with advanced heart failure (HF). It was found that the NRI, calculated at discharge, improved the ability to predict 6-month mortality when added to the

existing ESCAPE mortality model. Specifically, the NRI helped identify high-risk patients who might benefit from closer follow-up or interventions. Notably, the NRI was most effective in patients with higher predicted mortality, showing a significant difference in 6-month survival rates between those with NRI values below and above 100. These findings underscore the importance of nutritional assessment in managing advanced HF and improving patient outcomes[28]. The study investigates the potential of the Nutritional Risk Index (NRI) as a predictor for 6-month all-cause mortality in hospitalized patients with advanced heart failure. The results suggest that the NRI can be a useful tool for identifying patients at higher risk for mortality due to malnutrition, a common issue in these patients. The NRI combines measures such as serum albumin levels and weight relative to ideal body weight. In the study, 30 out of 160 patients died within 6 months post-discharge. The NRI's moderate predictive power, when combined with other clinical data, could enhance risk assessment in heart failure patients[29]. The study evaluated the effectiveness of several nutritional screening tools for identifying malnutrition in patients with Inflammatory Bowel Disease (IBD) who are undergoing surgery. The new tool, NS-IBD, was developed and compared to others such as NRS-2002, MUST, MST, MIRT, and SaskIBD-NR. The GLIM criteria were used as the standard for assessing malnutrition. 40% of IBD patients were malnourished according to GLIM. Among the tools tested, NS-IBD demonstrated the highest sensitivity in detecting malnutrition. Currently used nutritional screening tools have relatively low sensitivity when compared to the GLIM criteria. The newly developed NS-IBD tool showed the highest sensitivity, suggesting it is more effective for identifying malnourished patients and ensuring timely nutritional interventions before surgery. This highlights the need for more accurate screening tools in clinical practice to improve patient outcomes in IBD surgery[30]. The article discusses the SPRINTT (Sarcopenia and Physical Frailty in Older People: Multi-component Treatment Strategies) project, focusing on the feasibility of a nutrition intervention for community-dwelling older adults in Europe. It aims to address issues like sarcopenia and frailty by integrating nutrition as a critical component in preventing or mitigating these conditions. The study explored the effectiveness of specific dietary interventions, evaluating both the challenges and successes encountered in real-world settings. Older adults often experience difficulties in managing nutrition due to limited accessibility and knowledge. Proper nutrition can significantly impact muscle health, frailty, and overall physical function in aging populations. The intervention showed positive results, though maintaining long-term participation and adherence posed challenges. Collaboration with healthcare professionals and community involvement is crucial for the program's

success. Nutrition interventions are effective but must be tailored to the individual needs of older adults. Long-term engagement strategies are necessary to ensure continued success. Future initiatives should focus on enhancing accessibility and education to ensure broader participation and impact[31]. Based on the study of nutritional status as a prognostic factor in hip fracture outcomes, the key observations and conclusions can be summarized as follows:

- Nutritional status was a significant independent predictor of both clinical outcomes and long-term mortality following a hip fracture.
- Poor nutritional status at baseline was linked to worse outcomes, including increased complications, longer hospital stays, and higher readmission rates.
- Malnourished individuals showed incomplete recovery in physical function, with deterioration even in the months following surgery.

Early identification and improvement of nutritional status in elderly individuals can significantly enhance recovery after hip fractures and reduce long-term health risks, including mortality. Healthcare strategies for elderly patients should prioritize nutrition management even before a hip fracture occurs to improve outcomes and quality of life[32].

Discussion

Sarcopenia, characterized by the progressive loss of muscle mass and function, poses significant challenges across different patient populations. This condition is closely linked to poorer health outcomes, including increased morbidity, complications, and mortality, particularly in older adults and individuals with chronic conditions. In elderly individuals with sarcopenia, structured exercise programs consisting of aerobic, strength, and balance exercises, along with nutritional guidance, have proven effective in preserving muscle structure and improving physical function. After two years of such interventions, despite a slight reduction in muscle cross-sectional area, muscle architecture, including pennation angle and fascicle length, remained stable. These findings suggest that long-term, mixed-exercise programs can help mitigate the effects of sarcopenia, preserving neuromuscular health and improving overall physical performance. The stability of serum C-terminal agrin concentrations also indicates that neuromuscular junction integrity may be maintained, reinforcing the importance of exercise in preserving muscle health. Additionally, sarcopenia has been identified as a significant risk factor for the development and progression of knee osteoarthritis (KOA), particularly in older adults. Sarcopenia not only increases the likelihood of developing symptomatic KOA but also worsens its outcomes. Prognostic models incorporating factors such as muscle mass, age, BMI, and physical activity have shown high accuracy in predicting KOA progression, emphasizing the need for early intervention.

Strengthening muscle mass and function can enhance outcomes in individuals with KOA, underscoring the importance of addressing sarcopenia in clinical practice. In pediatric populations, especially those with inflammatory bowel disease (IBD), sarcopenia is a growing concern due to factors like poor nutrition, chronic inflammation, and corticosteroid use. These factors contribute to muscle loss, resulting in growth failure, delayed recovery, and reduced quality of life. Early identification of sarcopenia in children with IBD, coupled with nutritional support, exercise programs, and medications to manage inflammation, is essential for improving physical function and overall well-being. Addressing sarcopenia in this group can reduce hospitalizations and improve growth outcomes. Sarcopenia is also a critical factor in surgical settings, where it is associated with poor postoperative outcomes, such as increased morbidity, complications, and mortality. This is particularly evident in major surgeries, such as Minimally Invasive Pancreaticoduodenectomy (MIPD) and total knee arthroplasty (TKA), where sarcopenia can significantly hinder recovery. Preoperative screenings focusing on muscle mass and strength, along with early nutritional interventions, can improve surgical outcomes. Furthermore, in patients with chronic conditions like diabetes and cancer, sarcopenia exacerbates health issues and impairs recovery, making it crucial to address muscle preservation through targeted interventions. Nutritional assessments and screenings, such as the Nutritional Risk Index (NRI) and Sarcopenia Index (SI), play a vital role in identifying individuals at risk of sarcopenia and its complications. Early interventions focused on nutrition and exercise can help mitigate the impact of sarcopenia, but long-term adherence to these interventions remains a challenge. In older adults and those with chronic conditions, sarcopenia remains a major contributor to poor health outcomes, including higher readmission rates and mortality, further emphasizing the need for comprehensive management strategies.

Disclosure

Author’s contribution

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