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Review Article

Rehabilitation for elderly patients with cancer

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Abstract

If physical functions are impaired in patients with cancer owing to the progression of the disease and the treatment processes, their activities of daily living (ADLs) decline; thus, the quality of life is impacted. Elderly patients with cancer constitute a group with diverse basic physical, mental and social skill levels owing to aging. Given that there are potential risks of frailty and sarcopenia, their physical functions and ADL are prone to decline. Furthermore, there are many cases in which patients live alone, isolated from the society or face social problems. Therefore, in the treatment of elderly patients with cancer, geriatric assessment is used to comprehensively assess comorbidity, physical functions and psychophysiological/social/environmental situations and a system that provides supportive care is required. As part of this process, cancer rehabilitation plays an important role in prevention of complications, functional recovery and maintenance and improvement of physical functions and ADL until the time of palliative care. To provide rehabilitation, utmost attention must be paid to issues unique to elderly people, such as frailty, sarcopenia, dementia, delirium, pain management, depression and undernutrition/dysphagia.

Key words: exercise, activities of daily living (ADL), physical activity, physical function

Introduction

In Japan, the proportion of elderly people (65 years or older) among patients newly diagnosed with cancer has exceeded 70% (1). In recent years, minimally invasive cancer treatment and effective supportive care schemes have been developed, and opportunities for elderly patients to receive active treatment are increasing. Age-adjusted cancer mortality rates are decreasing. Nevertheless, the rehospitalization rates of elderly patients with cancer and their mortality rates remain high (1). This high rate could be attributed to the fact that elderly patients with cancer constitute a group with diverse basic physical, mental and social skill levels owing to aging. Also, symptoms and findings are atypical and exhibit notable individual differences. Therefore, in the treatment of elderly patients with cancer, a system is necessary to provide supportive care concurrently with cancer treatment. As part of this system, rehabilitation plays an important role.

Definition and role of cancer rehabilitation

For patients, anxiety on cancer and its progression itself is significant. Moreover, anxiety on impairment of physical functions owing to the direct impact of cancer and its treatment is also significant (2). Cancer-related functional impairments are shown in Table 1.1 and Table 1.2. Functional impairments are classified into those caused by cancer itself and cancer treatment (3). For patients with cancer, various physical functional impairments develop owing to the progression of cancer and/or its treatment, and these impairments restrict their activities of daily living (ADL), such as transfer, walking and self-care, and inevitably reduce the quality of life (QOL). Cancer rehabilitation helps prevent secondary disabilities and maintain/improve functions and ADL.

Silver et al. (4) defined cancer rehabilitation as 'medical care that should be integrated throughout the oncology care continuum and delivered by trained rehabilitation professionals who have it within their scope of practice to diagnose and treat patients' physical, psychological, and cognitive impairments in an effort to maintain or restore function, reduce symptom burden, maximize independence, and improve quality of life in this medically complex population'. Cancer rehabilitation is provided under the guidance of a clinical oncologist and a rehabilitation physician by a team consisting of a physical therapist, occupational therapist, speech therapist, nurse and medical social worker as core members, together with various other professionals to deal with problems specific to patients with cancer (3).

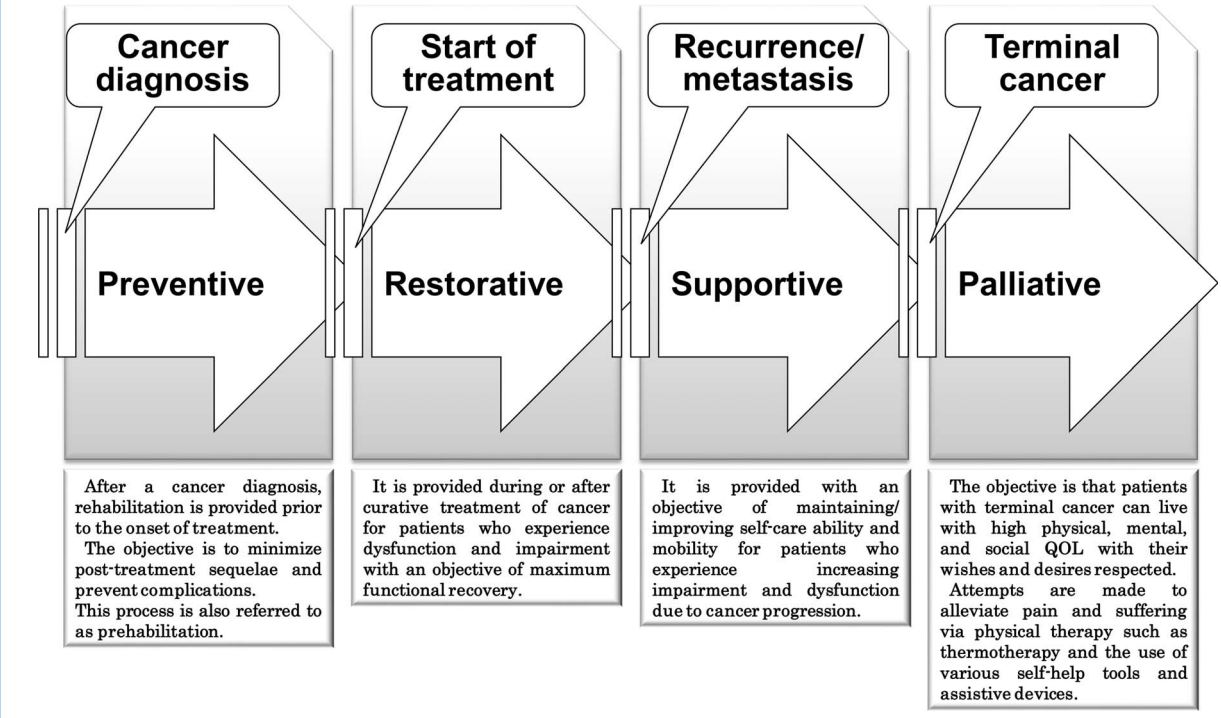

Figure 1. Objective of cancer rehabilitation for each stage.

Cancer rehabilitation plays a role in all disease stages, from prevention and functional recovery to maintenance of patients with cancer' functions in the time that they have left and the period of mostly palliative care (Figure 1) (5).

Major issues impacting rehabilitation treatment of elderly patients with cancer

Frailty and sarcopenia

In elderly people, aging causes physiological changes, thus reducing the functions of all organs and tissues compared with those in younger people. Changes attributed to aging are not pathological, but as the physiological functional reserve declines, even minor loads from treatments can render the maintenance of homeostasis difficult (6). As neuromuscular function declines, coordination (such as agility, balance and flexibility), muscular strength and fast responses also decline. Given that bone metabolism also declines, bone mass and lean body mass decline too. Furthermore, with age, there may also be musculoskeletal system dysfunctions, such as osteoarthritis in the spine, the hip joint and the knee joint. Osteoporosis, muscle weakness in limbs and limited range of motion (ROM) in joints (contracture) are also seen, which have an impact on the walking ability and ADL, thus increasing the risk of fall and fracture and making people prone to situations that require care or even result in death (7).

In the field of geriatrics, 'frailty' is gaining attention as a factor that impacts healthy life expectancy and nursing care needs of elderly people. While frailty is a vulnerable state of mind and body that could lead to health issues, it is also a state caused by decreased reserve against stress. The components of frailty include body composition, physical functions, physical activities, fatigue, psychophysiological state and social issues (8). Frailty has negative effects on the treatment of elderly patients with cancer (9). It has been reported that frailty that exists prior to cancer treatment is associated with poor completion rates of chemotherapy and radiation therapy, increased treatment-related toxicity, increased post-operative complications and high mortality rate. In a survey of elderly residents aged ≥65 years in a Japanese community, the proportion of those who met the extensively used definition of frailty introduced by Fried et al. (10) was 11.3%, and in those aged ≥80 years, it was 34.9% (11). Given that the prevalence of frailty is high in elderly people without nursing care needs, it is important to confirm prior to the treatment whether elderly patients with cancer are in a state of frailty and choose appropriate treatments.

Sarcopenia is a syndrome characterized by a decrease in skeletal muscle mass/strength with aging and impaired physical functions caused by such decrease (12,13). When there is no clear reason other than age, it is classified as primary sarcopenia. When there are other pathological conditions (e.g. physical activities, disease and nutrition), it is classified as secondary sarcopenia. Cancer is a disease that typically causes secondary sarcopenia.

It is common for elderly patients with cancer to already have frailty and sarcopenia when they develop cancer. In these instances, ADL and instrumental ADL (IADL) easily decrease because of cancer and comorbidities, and the patients take time to recover. Adverse events from cancer treatment and decrease in tolerance have an impact on survival; thus, simple screening and comprehensive assessment (discussed later) are combined from the instance of cancer diagnosis, whereby the presence and severity of frailty and sarcopenia are evaluated from the onset of treatment to the time of the decision on treatment strategy. If diagnosed with frailty, physical and mental functions are assessed in detail in conjunction with ADL and IADL.

Table 1-1. Cancer-related functional impairments caused by cancer itself

Direct impact of cancer
1) Brain tumor (primary/metastasis): higher brain dysfunction, difficulty in swallowing, hemiplegia, etc.
2) Spinal cord and spinal tumor (primary/metastasis): spinal cord compression symptoms (quadriplegia, paraplegia and bladder and rectal dysfunction)
3) Metastatic bone tumor: impending fracture and pathological fracture (long bones, pelvis, etc.)
4) Direct infiltration by tumor: neuropathy (brachial plexus paralysis, lumbosacral plexus paralysis and radiculopathy)
5) Cancer cachexia
6) Cancer-related cognitive impairment (CRCI)
Indirect impact of cancer (remote effect)
1) Cancer-related peripheral neuropathy (motor/sensory multiple peripheral neuropathy): motor/sensory nerve paralysis, and numbness
2) Paraneoplastic syndrome: impaired muscle strength owing to cerebellar ataxia and myositis

Accordingly, a system should be prepared to provide rehabilitation that suits the condition of each patient before the treatment begins.

Dementia

It has been reported that 27% of elderly patients hospitalized in oncology departments experience memory impairments (15). As such, many elderly people experience some form of cognitive impairment. Cognitive impairment has an impact on the goals of the overall and rehabilitation treatments; thus, appropriate assessments and approaches are necessary. Screening tests for overall general mental and intellectual functions include Mini-Mental State Examination (MMSE) (14), Mini-Cog (15) and Montreal Cognitive Assessment (MoCA) (16).

Delirium

Elderly patients are prone to delirium. It has been reported that 14–55% of hospitalized patients with cancer and 38% of elderly patients with cancer experience delirium (17). Delirium is a major inhibitory factor in rehabilitation treatment. Thus, appropriate assessment and approaches are necessary. To assess delirium, the Confusion Assessment Method is used (18). To minimize possible confusion, glasses and hearing aids are actively used to prevent any loss in the sensory input via vision and hearing. Moreover, patients spend their time in rooms with windows that allow sunlight to regain the sense of time and diurnal rhythms. Clocks and calendars are installed (reality orientation), and patients adhere to routine activities, such as rehabilitation treatment and meeting with family.

Pain management

Pain is a symptom about which many patients with cancer complain, and it constitutes a major inhibitory factor in rehabilitation treatment; thus, this symptom needs to be actively addressed in elderly patients with cancer. If patients have advanced dementia, behavioral signs such as expressions, protective posture, rigidity of the body, refusal to eat and confusion can help in understanding the characteristics of pain experienced by them (19).

Depression

Elderly people have high prevalence of depression. It has been reported that 13.5% of the elderly have clinically apparent depression (20). Depression can impact the motivation to effectively participate in rehabilitation treatment; thus, its detection and treatment are important. To screen for depression, questions such as 'Do you often feel sad or down?' are posed or the GDS (Geriatric Depression Scale) is used (21).

Undernutrition/dysphagia

Causes of undernutrition include cancer as the primary disease, loss of appetite, dementia, dysphagia, poor fit of dentures, impaired ability to taste, depression and pain. The state of undernutrition not only has an adverse impact on surgery and recovery after it but also has an impact on the overall treatment. Mini Nutritional Assessment is used to screen for undernutrition (22).

Treatable conditions, such as poor fit of dentures and pain from oral mucositis, should be actively treated. In terms of loss of appetite and setting of the appropriate caloric intake, the nutritional support team provides help. As for functional and organic dysphagia, diagnosis and treatment can be provided by rehabilitation physicians and rehabilitation experts. Swallowing videofluoroscopic examination of swallowing (VF) and video endoscopic examination of swallowing (VE) are performed, and as a treatment, indirect/direct swallowing training or compensations (posture during a meal, form of a meal, pace of a meal and the amount of a meal) are utilized.

Social factors

The course of disease in the elderly is strongly influenced not only by medical factors but also by social factors. According to a survey conducted by Cabinet Office, Government of Japan, as of 2016, 58.2% of households consisted of a single person or a couple with one of the members aged 65 or older, indicating that the number of elderly families is increasing and that isolation is progressing (23). With an increase in patients with this kind of life background, it is expected to become increasingly difficult to maintain self-care independence and exercise function.

Assessment methods used in rehabilitation treatment of elderly patients with cancer

Assessment of general condition

The performance status scale of the ECOG (Eastern Cooperative Oncology Group, USA) (24) is extensively used to assess the general condition during cancer treatment, such as chemotherapy, which is not limited to elderly patients but is applicable to all patients with cancer. However, if mobility is restricted owing to dysfunctions, such as pathological fracture or motor paralysis, even if the general condition is good, the grade would be low. As such, it does not necessarily present the patient's general condition.

Table 1-2. Cancer-related functional impairments caused by cancer treatment

Immobility/inactivity associated with treatment
1) Surgery, chemotherapy, radiation therapy and hematopoietic stem-cell transplantation: muscle weakness in limbs, muscle atrophy and declined physical fitness

Post-operative sequelae and complications
1) Bone and soft tissue tumors: Gait disturbance following limb-salvage surgery (tumor prosthesis) and prosthetic hands and feet following a limb amputation
2) Breast cancer: contracture of the shoulder joint and adhesive capsulitis following mastectomy/breast-saving surgery
3) Breast cancer/gynecologic cancer/urologic tumor: secondary lymphedema in the upper/lower limbs after lymph node dissection in the axilla and pelvis
4) Head and neck cancer: dysphagia, dysarthria and voice disorders (aphonia) after glossectomy, pharyngectomy or laryngectomy
5) Head and neck cancer: accessory nerve palsy (trapezius palsy) and adhesive capsulitis following cervical lymph node dissection
6) Lung cancer and gastrointestinal cancers such as esophageal cancer: respiratory complications and dysphagia after an operation in the chest or abdomen

Adverse events of chemotherapy
1) Peripheral neuropathy (motor/sensory multiple peripheral neuropathy): motor–sensory nerve paralysis, numbness, muscle pain, joint pain, edema of limbs and Cancer-related fatigue (CRF)

Adverse events of radiation therapy
1) Brain necrosis, spinal cord disorders, peripheral neuropathy, subcutaneous induration, lymphedema, trismus and dysphagia

Table 2. Quantitative assessment of physical functions

Muscle strength
Grip strength (29)
Isometric knee extension strength (knee flexion of 90°) (30)
30-s chair-stand *test* (CS-30) (31)
Sit-to-stand test (five times) (32)
Balance
One-leg standing duration (33)
functional reach test (FR) (34,35)
Berg balance scale (BBS) (36,37)
four square step test (FSST) (38)
Exercise tolerance
6-min walk test (39,40)
Shuttle Walking test (SWT) (41)
Mobility and walking
Timed up & go test (TUG) (42)
Maximum walking speed (10 m) (43)

Geriatric Assessment (GA) is a tool used to comprehensively determine the general condition of elderly patients with cancer (25). GA uses (i) ADL, (ii) IADL, (iii) cognitive functions, (iv) emotion, mood, degree of happiness, (v) communication and (vi) social environment as the basic components. G8 (Geriatric 8) (26) and the Vulnerable Elders Survey-13 (VES-13) (27) have been developed as screening tools as screening tools, which are used to screen those vulnerable patients for whom full assessment will be necessary.

Physical functional assessments

For the quantitative assessment of frailty, the definition of Fried et al. (10) is extensively used. In this method, the characteristics of frailty—shrinking, exhaustion, low activity, slowness and weakness—are individually assessed based on weight loss, fatigue, decline in physical activities and decline in walking speed tests. In Japan, the use of the Japanese version of the Cardiovascular Health Study criteria (revised J-CHS criteria) with assessment criteria adjusted to Japanese people has been recommended (28). With the revised J-CHS criteria, five items—weight loss, muscle strength (grip strength), fatigue, walking speed and physical activities—are assessed.

Regarding sarcopenia, the diagnostic criteria of the European Working Group on Sarcopenia in Older People (EWGSOP) (12) are extensively used. After sarcopenia screening with a questionnaire, its state is assessed based on muscle strength, muscle mass and quality, and physical functional tests. Asian countries, including Japan, also use sarcopenia diagnostic criteria adjusted for Asian people, as proposed by the Asian Working Group for Sarcopenia (13).

In rehabilitation treatment (which is applicable to all ages and not only elderly patients), it is essential to assess the muscle strength of limbs and core using Manual muscle testing, ROM, basic movements, such as turning over, getting up, maintaining a sitting position and standing up from a chair or a floor, and walking. Muscular strength, balance, exercise tolerance and mobility/walking are then quantitatively assessed as needed (Table 2) (29–43).

ADL and IADL

ADL is a series of basic physical movements repeated every day by everyone to live independently. More specifically, ADL refers to movements necessary for daily life, such as washing the face, brushing the teeth, changing cloths, using the toilet and bathing. Quantitative and qualitative assessments of these movements are used as a reference for the goals of rehabilitation treatment and progress toward them during treatment. Functional Independence Measure that can be used regardless of the type of disease (44), Barthel index (45) and Katz index (46) are used as quantitative assessment scales of ADL.

IADL is a concept similar to ADL. IADL refers to the set of daily activities that are not quite essential but related to the surrounding environment and social activities. Specifically, it consists of household chores, such as cooking, cleaning and laundry, parenting, shopping, use of public transportation, management of medications and management of finances and is a measure of independent life skills while living at home. While ADL refers to basic physical movements for independent living, IADL refers to applied movements and activities that require social independence. Important IADL evaluation items differ depending on age, sex, living environment,

etc. Thus, there is no development or distribution of internationally unified assessment methods. Lawton's IADL scale (47) and Frenchay Activities Index (48) are used relatively extensively.

Cancer rehabilitation treatment

How to provide rehabilitation treatment

The most notable characteristic of rehabilitation medicine is that it does not examine patients at an organ level and instead assesses at individual and social levels, wherein the multidisciplinary team members provide treatment once the issues are summarized. To apply rehabilitation medicine for various residual impairments after the illness has been cured, especially motor impairments, the existing medical model by International Classification of Diseases is inadequate. Thus, the issues were classified into three levels—dysfunction, limited mobility and limited participation—based on International Classification of Functioning, Disability and Health and its predecessor International Classification of Impairments, Disabilities and Handicaps (49) to summarize the issues and prepare a rehabilitation program.

For the rehabilitation of patients with cancer, consideration must be given to worsening dysfunction, secondary impairment and prognosis along with the progression of the primary disease. Regardless of hospitalization or outpatient status, treatment is often provided concurrently with the rehabilitation treatment, wherein the side effects of treatment may interrupt the rehabilitation treatment or the initial program may be changed owing to the stage of the disease. Thus, close communication between the attending physician, ward and outpatient staff and the rehabilitation staff is necessary via conferences and cancer boards. In rehabilitation treatment, subjective symptoms, general conditions, cancer stages and the course of cancer treatment for patients must be understood to manage the risks (50,51).

Perioperative period

The objective of perioperative rehabilitation treatment is to prevent post-operative complications and minimize sequelae with pre-operative or early post-operative rehabilitation treatments so that the post-operative recovery would be smooth. In recent years, as surgical techniques and post-operative management techniques improved, the indications of active surgical treatments for elderly patients with cancer have increased. However, elderly patients with cancer have a high likelihood of experiencing 'frailty' before an operation in conjunction with comorbidities, such as impaired physical functions, exercise tolerance and respiratory function because of aging, chronic obstructive pulmonary disease, heart failure and diabetes. Thus, risk management during the peri-operative period is important. It has been reported that pre-operative 'frailty' in elderly patients with gastroenterological cancer is related to the incidence of post-operative complications and post-operative survival (46).

It has been reported that thoracotomy and laparotomy used to treat lung cancer and gastroenterological cancer are associated with 5–30% incidence of post-operative pulmonary complications (PPCs), such as atelectasis and pneumonia (52,53). It has been suggested that 45.5–55% of in-hospital deaths after thoracotomy and laparotomy are caused by PPCs. PPCs have major impacts on post-operative outcomes, such as prolonged post-operative hospitalization (54). Therefore, it is important to provide rehabilitation from an early post-operative stage to prevent PPCs, promote early discharge, enable early return to the society and improve the QOL.

In recent years, many studies have reported that with 'prehabilitation', i.e. rehabilitation provided prior to cancer surgery (55), the physical and mental functions can be improved and the complications associated with treatment can be prevented. Furthermore, survival rate is improved, physical and mental functions are maintained and improved, hospitalization is shortened, rehospitalization rate decreases and medical costs are reduced (56,57). In a randomized controlled trial (RCT) in elderly patients with non-small cell lung cancer, aerobic exercise plans under supervision and respiratory rehabilitation were implemented for 1 week prior to lobectomy. It was shown that the intervention group had a shorter average total (P = 0.023) and post-operative length of stay (P = 0.001) than the control group; the incidence of PPCs (P = 0.019) was significantly lower (58).

In the surgical treatment of elderly patients with cancer, implementation of pre-operative 'frailty' assessment and initiation of assessment-based active rehabilitation prior to or shortly after the surgery improves physical and mental functions and ADL of elderly patients with cancer and may contribute to the improvement of the treatment results and prognosis.

During and after radiation therapy and chemotherapy

During radiation therapy and chemotherapy, patients often experience pain, numbness, cancer-related fatigue (CRF), nausea, diarrhea, loss of appetite due to oral mucositis, deterioration in nutritional state and sleep disturbance due to cancer itself or treatment side effects. When patients are isolated in a clean room owing to bone marrow suppression, they often lose motivation owing to mental stress. As a result, patients tend to remain in bed even during the day and thus stay inactive, which in turn leads to reduced muscle strength in the entire body, muscle atrophy and declined physical strength and endurance, i.e. they enter a 'vicious cycle of inactivity'. Therefore, active response is necessary to maintain and improve physical activities during and after treatment. By embarking on exercise therapy (aerobic exercise and strength training) routinely with a goal of improving physical strength during and after radiation therapy and chemotherapy, not only improvements in cardiopulmonary and musculoskeletal functions but also improvements in CRF, psychological states and QOL are achieved (59–63).

In elderly patients with cancer receiving chemotherapy and radiation therapy, 'frailty' is reportedly associated with a decreased completion rate of chemotherapy and radiation therapy and increased treatment-related toxicity. Caillet et al. (64) assessed 'frailty' using GA in elderly patients with cancer in whom treatment plans had already been designed and found that in 20.8% of the patients, the treatment plan had to be changed. In addition, It has been reported that the decline in IADL: the need for assistance in taking medications, decline in walking ability prior to treatment and restricted social activities are predictive factors for treatment-related toxicity in elderly patients (65 years or older) with cancer who receive chemotherapy (65). Therefore, for elderly patients with cancer, the treatment strategy must be carefully designed while considering the merits and risks, such as the treatment results and adverse events, general condition and prognosis. The guidelines of the American Society of Clinical Oncology recommend that for elderly patients (65 years or older) with cancer receiving chemotherapy, GA should be used to assess physical functions, comorbidities, history of falls, depression, cognitive functions and nutritional state prior to a treatment and

that G8 and VES-13 should be used as a means of predicting prognosis (66).

Therefore, in the rehabilitation of elderly patients with cancer who receive chemotherapy and radiation therapy, 'frailty' needs to be assessed prior to treatment and rehabilitation should be provided based on the assessment. Compared with the younger population, there are not many studies on the effects of exercise therapy (a combination of aerobic exercise and strength training) in elderly patients with cancer. One reason is likely to be the fact that elderly patients with cancer often have diverse background factors and comorbidities, thus making standardization difficult. In previous reports on RCTs in which exercise therapy intervention was implemented for elderly patients with cancer who were undergoing chemotherapy, there was evidence for improvements related to anxiety and depression, memory, physical functions, amount of daily activity and subjective sense of health despite the fact that this therapy did not have a notable impact on survival (67–69).

Cachexia

In a cancer-bearing condition, cancer cachexia becomes an issue. Cachexia is defined as 'a multifactorial syndrome defined by an ongoing loss of skeletal muscle mass that cannot be fully reversed by conventional nutritional support and leads to progressive functional impairment' (70). Cachexia is not a simple nutritional abnormality but a pathological condition caused by metabolic, immunological and neurochemical abnormalities. Regarding skeletal muscles, tumor-produced factors—proteolysis-inducing factor, tumor necrosis factor and angiotensin II—work on the ubiquitin-proteasome system to induce decomposition of muscle proteins. As a result, skeletal muscle atrophies, muscle strength decreases and endurance diminishes. Aggravation of cachexia due to cancer progression cannot be avoided. However, nutritional therapy and exercise therapy should be provided from the early stage, patients should be encouraged to get out of bed while paying attention to fatigability and exercise loads should be adjusted according to the patient's condition to maintain physical functions (70,71).

Bone metastasis

Bone metastasis is not uncommon in the spine, pelvis, femur and proximal humerus. Moreover, if lesions are not discovered early, it could cause pathological fractures of long bones in limbs, paraplegia, quadriplegia and bladder/rectal dysfunction owing to spinal compression, which dramatically reduces the QOL for the remainder of the patient's life. The objective of rehabilitation treatment is to notice bone metastasis manifesting as impending fractures in an early stage and provide training for basic movements, walking and ADL to minimize pain and avoid pathological fractures (72,73). If skeletal related events occur, compensatory approaches are necessary to accommodate paralysis due to spinal compression, pathological fracture and the state of treatment, such as providing appropriate prosthetics and instruction on how to rise and assist so that ADL and QOL can be maintained at the highest level possible. Routinely held bone metastasis conferences (cancer boards) are useful to determine the treatment strategy and direction of rehabilitation treatment for patients with bone metastasis.

Terminal stage

The objective of rehabilitation treatment at the terminal stage in which the focus is on palliative care is summarized as the understanding of the hopes and demands of patients and their families, regardless of the remaining life expectancy and the promotion of acquisition of ADL with limited physical burden and the highest QOL possible.

If the life expectancy is estimated to be a few months, potential skills are often not utilized, wherein the ADL of the patients is below their skill levels. During this time, recovery of function is difficult; however, with rehabilitation treatment, patients learn ways to move, identify ways to use prosthetics and learn to cover pain and decline in muscle strength. In this manner, patients can utilize the remaining skills to maintain and improve ADL (74). Conversely, if prognosis spans weeks or days, alleviation of symptoms and mental/psychological aspects become the focus of support. More specifically, QOL is maintained by alleviating symptoms such as pain, breathing difficulties and fatigue and by providing tasks on wheelchairs and bed so that the patients can rest easily (75,76).

Conclusions

There are potential frailty- and sarcopenia-induced risks in elderly patients with cancer as their physical functions and ADL are prone to decrease. Furthermore, many elderly patients are socially isolated because they either live alone or have social issues as they only live with their elderly spouses. Thus, in the case of cancer treatment of elderly patients, not only the state of the primary cancer but also the comprehensive assessment of comorbidities, physical functions and psychophysiological/social/environmental state should be done using GA. A system in which supportive care is provided in parallel to cancer treatment is necessary. As part of this system, cancer rehabilitation plays an important role in prevention of complications, functional recovery, maintenance of functions and palliative care for patients with cancer who have limited life expectancy with a goal of improving their QOL.

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