

Undernutrition in elderly patients with cancer: Target for diagnosis and intervention

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Abstract

In recent years, geriatricians and oncologists have worked together to evaluate elderly patients with cancer before and during treatment, to estimate the balance between the efficacy and safety of chemotherapy and to upgrade treatment in this population according to their comorbidity and physiological status. The clinical and biological factors of this population need to be assessed in multidisciplinary comprehensive geriatric assessment (CGA) in order to optimize treatment without inducing major adverse effects. We reviewed the nutritional aspects of this evaluation that highlight the impact of undernutrition on poor survival. In this paper we briefly describe tumoral cachexia (molecular and physiological), the impact of undernutrition on cancer prognosis (predictive factors), therapeutic effects of cancer on nutritional status, nutritional indicators (biological, anthropometric) and undernutrition in the elderly (specific needs of this population). The potential for nutritional intervention in geriatric oncology with regard to CGA is explored.

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1. Introduction

The number of elderly patients older than 70 years in France and in the industrialized world is steadily increasing. In 2002, the average life expectancy at 75 years was 12 years for both males and females. At that time in Aquitaine, France, 273,741 individuals were over 75 years and represented 9.2% of the population. The incidence of cancer at this age was 72,000 new cases per year in France in 2000. Older subjects (>70 years) represent more than 40% of patients with cancer [1]. Diagnosis and treatment of older patients is one of the priorities of the cancer campaign set up by the French government. Despite the difficulties of physicians to evaluate the ratio between risk and benefits, the fears of patients and their families, studies focusing on elderly patients have been conducted in recent years [2,3]. The few oncologic therapeutic studies conducted in this older population have shown excellent results with tolerable toxicities [4–6] despite the presence of comorbidity (cardio-vascular diseases, diabetes, hypertension, etc.).

Undernutrition is frequent after 70 years of age due to inadequate dietary intake and particularly protein intake [7]. It is now considered as one of the criteria of frailty in older patients due to the major association of undernutrition with altered cognition, mobility, mood, physiological status and quality of life in environmental, social and familial contexts [8]. Nutritional prognostic factors during medical treatments are poorly understood. No simple specific undernutrition marker is available in daily practice. Furthermore, independently of tumor specificity, central anorexia was noted to differing degrees associated with hypothalamic dysfunction interfering via an inflammatory process with serotonergic systems or neuropeptides that control dietary intake. Interactions between inflammatory mediators, nutritional status, tumor course, chemotherapy-related events and survival are likely.

We aimed to describe the influence of undernutrition in elderly patients with cancer on cancer course and prognosis and to explore any positive effects of nutritional interventions in geriatrics.

2. Tumoral cachexia

Cancer is generally associated with undernutrition, particularly in advanced stages. Cancer cachexia is characterized by a slow weight loss consequence of abnormal metabolic activity and anorexia, altered immune function, modified prognosis, and decreased efficacy of chemotherapy regimens (Table 1) [9,10].

The cancer process involves extensive tissue remodeling including modulation of numerous cellular activities and tissue functions [11]. Cytokine expression (IL-1 β , IL-2, IL-6, TNF α , IFN γ , IGF-1) and C-reactive protein (CRP) synthesis by cell-mediated immunity cells (macrophages) and by cancer cells have been reported [12–15]. Aging is related

Table 1

Main phenomena implicated in development of cancer cachexia

Weight loss/cachexia	Mechanisms
Anorexia	Proinflammatory cytokines
Anatomic incapacity	Loss of swallowing ability, digestive hindrance,
Metabolism changes (hypercatabolism)	Neoglucogenesis inducing fat mass and lean mass atrophy, insulin resistance, increasing free fatty acid level
Hypercatabolism cancer dependent	Neoglucogenesis inducing fat mass and lean mass atrophy
Treatment of cancer	Nausea, vomiting, mucositis, diarrhea, constipation
Hypoxia	Decrease in O ₂ pressure, increase in HIF-1 α expression (stimulating GLUT-1 expression (glucose transporter)), increase in GLUT-1 expression suggestive of glucose accumulation in cells

to important changes in lymphocyte subsets and innate and non-specific immune response. Moreover, protein-energy malnutrition and micronutrient deficiencies are common in the elderly and undernutrition is a major factor leading to immunodeficiency [16–19].

Undernutrition in patients with cancer, termed tumoral cachexia, concern about 50% of subjects during the course of the pathology [20,12]. Potential causes in the elderly include hypercatabolic activity [21,22], the impact of cancer and cancer treatment on dietary intake and the digestive apparatus [23], depression, comorbidity, swallowing disorders, radiotherapy, xerostomia, functional and anatomic hindrance, presbyphagia decompensation due to asthenia, pulmonary infections and hypoxia. The highest prevalence was observed in patients with aerodigestive tract cancers [24]. Cancers thus play a role in pathologies that can induce cachexia such as anorexia, asthenia and progressive decrease in body mass index due to chronic inflammation [25,26]. Furthermore, the origins of undernutrition in elderly cancer patients are numerous [20] and involve the cancer *per se* and the conditions of the patient in different proportions.

2.1. Anorexia

This symptom is present in as many as 50% of patients during cancer and is only partly due to hypercatabolism [27]. Proinflammatory cytokines play their part as follows: IL-1 could inhibit Y neuropeptide that stimulates hunger hypothalamic neurons. TNF alpha may stimulate the genetic expression of mitochondrial decoupling proteins (UCP 1-2-3) and muscular thaw (induction of degradation of muscular proteins). Interferon gamma and IL-6 production promote cachexia. Inflammatory cytokines produced by the host in response to the tumor are thought to play a role in cancer-associated malnutrition [27]. TNF alpha, IL-6 and leptin act on the central nervous system and alter the release and function of several key neurotransmitters, thereby altering both

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