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Applied nutritional investigation

Influence of a nutritional intervention on dietary intake and quality of life in cancer patients: A randomized controlled trial

Alexandra Uster M.Sc. [a], Ursula Ruefenacht R.D. [a], Maya Ruehlin R.D. [a], Miklos Pless M.D. [a], Marco Siano M.D. [b], Mark Haefner M.D. [c], Reinhard Imoberdorf M.D. [a], Peter E. Ballmer M.D. [a,*]

[a] Kantonsspital Winterthur, Department of Medicine, Winterthur, Switzerland
[b] IOSI, Oncology Institute of Southern Switzerland, Ospedale San Giovanni, Bellinzona, Switzerland
[c] Oncological Practice, 8180 Bülach, Switzerland

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ABSTRACT

Objective: Weight loss is common in patients with malignant tumors and it can adversely affect quality of life and survival. The aim of the present study was to investigate the effects of a nutritional intervention in cancer patients in an outpatient setting.
Methods: Cancer outpatients (N = 58) who were classified as undernourished or at high risk for undernutrition by the Nutritional Risk Screening 2002 tool were randomized into two groups. One group (n = 30) received standardized individual nutritional therapy, including counseling by a dietitian, food fortification, and oral nutritional supplements if required. The second group (n = 28) received standard care. The nutritional intervention lasted 3 mo. Dietary intake (3-d dietary record), nutritional status (body weight), physical functioning (performance status, hand-grip strength) and quality of life (European Organization for Research and Treatment of Cancer Quality of Life Questionnaire version 3.0) were assessed at baseline and after 6 wk and 3 mo. An additional follow-up assessment was carried out 3 mo post-intervention.
Results: Nutritional intervention led to a significantly higher average energy and protein intake in the nutritional therapy group (+379 kcal; 95% confidence interval [CI], 117–642; $P = 0.007$, respectively; +10.4 g; 95% CI, 2.3–18.5; $P = 0.016$). However, the increased dietary intake was not associated with improvements in nutritional status, physical functioning, or quality of life.
Conclusions: Individual nutritional counseling significantly and positively influenced energy and protein intake, but did not improve nutritional or physical outcome or quality of life. These results indicate that nutritional therapy alone is of limited efficacy in cancer patients whose nutritional status has already deteriorated.

Introduction

Involuntary weight loss is common in patients presenting with malignant tumors. Depending on the type of tumor, the literature suggests that 31% to 87% of individuals with cancer show substantial loss of body weight before malignant disease is diagnosed [1,2]. Both the disease itself and the various treatments provided to patients, such as chemotherapy and radiotherapy, may cause loss of appetite, problems with swallowing, and gastrointestinal (GI) disturbances. This may aggravate the loss of body weight, in particular of lean body mass, leading to undernutrition [3]. Individuals with cancer who experience undernutrition suffer from ongoing loss of skeletal muscle mass, referred to as cancer cachexia [4]. Cancer cachexia is associated with both reduced tolerance and reduced response to anticancer therapy, resulting in diminished benefits of anticancer treatment. Consequently, cancer cachexia leads to higher rates of hospital admission, more in-hospital complications, and longer hospital lengths of stay (LOS) [1,5]. Furthermore, it substantially impairs quality of life (QoL) of these patients [6]. Because reduced protein and energy intake is an important contributory factor in the onset of cancer cachexia [4], nutritional support is crucial for its prevention and treatment.

In a former study, we investigated the effect of nutritional intervention (dietary counseling versus oral nutritional supplements) on QoL and food intake in hospitalized undernourished

PEB was the principal investigator. All authors contributed to the design of the study, the writing of the study protocol, the analysis of the data, and writing of the manuscript. UR was in charge of the study and collected the data. All authors read and approved the final manuscript.

* Corresponding author. Tel.: +41 (0)52 266 23 02; fax: +41 (0)52 266 47 06.
E-mail address: peter.ballmer@ksw.ch (P. E. Ballmer).

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patients and found significant improvements in energy and protein intake as well as QoL [7]. We concluded that this effect on QoL was due to intensive and personalized counseling by a specialist dietitian. The subgroup of patients in that study who had cancer seemed to derive particular benefit from the individualized nature of the nutritional counseling, especially in respect to QoL. Based on those findings, we anticipated a similar benefit in undernourished patients with cancer in an ambulatory setting, where most care for this population takes place. Preliminary studies have supported this assumption, showing a potentially beneficial effect of early individual nutritional counseling on QoL in cancer outpatients [8–13]. However, these studies concentrated on patients with specific tumor types, in particular GI and head and neck cancers. In contrast, we aimed to investigate the common situation of patients attending a cancer center with various types of malignant tumors, to assess the real efficacy of nutritional interventions on dietary intake and QoL in undernourished ambulatory patients with cancer using the Nutritional Risk Screening 2002 (NRS-2002) tool by Kondrup et al [14].

Materials and methods

The protocol of this randomized controlled trial (RCT) was approved by the local ethics committee in November 2006. All patients included into the study gave written informed consent.

Patients

Patients with malignant tumors who were referred to the cancer center at the Kantonsspital Winterthur, were assessed by means of the NRS-2002. NRS-2002 is a simple nutritional screening tool with a maximum score of 7 points. It was developed based on the analysis of 128 RCTs. Analysis showed that nutritional status and severity of disease are necessary to identify patients who are likely to benefit from nutritional support. Furthermore, age $\geq$ 70 y was significantly associated with a beneficial effect of the nutritional intervention. Therefore, NRS-2002 consists of both a disease severity score and a nutritional score. Patients $>$ 70 y are given an additional point. By definition, patients with a score $\geq$ 3 are judged as severely undernourished or "at high risk" for undernutrition [14].

Patients with an NRS-2002 score $\geq$ 3, unintended loss of body weight of $\geq$ 5% of usual weight over the past 2 mo, or $\geq$ 10% over the past 6 mo, and food intake less than the usual quantity were eligible for inclusion. Exclusion criteria were estimated survival $<$ 6 mo (as judged by the treating physician); on enteral tube feeding or parenteral nutrition; ongoing nutritional counseling or interventions (e.g., intake of oral nutritional supplements); adjuvant chemotherapy; impaired cognition and inability to give consent.

Nutritional therapy group

A professional dietitian individually counseled patients in the nutritional therapy group at three time points (baseline, 6 wk, and 3 mo). To ensure reproducibility and consistency of individualized nutritional intervention, all patients in the nutritional therapy group were advised by the same dietitian following a predetermined standardized procedure. In a first step, the dietitian assessed history of usual and actual food intake, change in body weight, and problems with food intake using a defined form. Relevant aspects of the medical history (diagnosis; medical therapy; blood parameters; drugs; and symptoms such as nausea, dysphagia, and emesis), actual protein and energy intake, quantity of fluid intake, and change of body weight over time were taken into account. Patients had to complete a questionnaire about relevant factors influencing eating patterns (appetite, chewing ability, capacity to swallow, dysgeusia, allergies, psychological factors, and symptoms). Intake needed to fulfill energy requirements were calculated according to the Ireton-Jones formula. Protein requirements were set at 1 g/kg body weight daily.

Thereafter, an individual nutritional plan was devised with a variety of dietary interventions such as enrichment of foods (e.g., maltodextrine), vegetable oil, protein powder, energy, and/or protein-rich snacks and beverages, as well as energy- and protein-dense oral nutritional supplements. Dietary interventions were standardized. If consumption of oral nutritional supplements (Resource® 2.0 fibre, Nestlé Nutrition, Vevey, Switzerland) seemed feasible and sensible, patients were asked to consume at least one cup (2 dL = 400 kcal, 18 g protein) daily.

Six wk and 3 mo after the initiation of nutritional therapy, the dietitian evaluated implementation of dietary measures using the same assessment form. The most important criteria determining whether advice needed amending were whether energy requirements were being met and the dietary measures were proving practicable and being implemented by the patient. The overriding goal of nutritional intervention was to enable patients to meet calculated energy and protein requirements. Dietary advice was adjusted to individual eating patterns and preferences and also took into consideration other relevant factors such as digestive and absorptive capacity. The nutritional therapy group received an appropriate treatment tailored to the patient's requirements and the course of the disease.

Usual care group

The patients in the usual care group received the cancer center's standard medical therapy, following good clinical practice, without specific nutritional intervention or fixed prescription of oral nutritional supplements. If patients had questions concerning nutrition, they were advised by the cancer center's attending physician or the nurses but not by professional dietitians.

Study measurements

Co-primary end points of the study were QoL as well as energy and protein intake. Secondary study end points included body weight, nutritional status, and physical status. The total study period was 6 mo. Measurements were made at baseline, after 6 wk and at 3 and 6 mo (follow-up). These measurements included height, weight, QoL, hand-grip strength, and performance status. Dietary intake and compliance with nutritional therapy were assessed using 3-d food diaries. Additionally, tumor response according to the Response Evaluation Criteria in Solid Tumor (RECIST) [15], number of drugs, and serum albumin concentration were included as explanatory variables.

Dietary intake

Patients were asked after each study visit to keep a 3-d food diary and to record the amount of all ingested foods, beverages, and oral nutritional supplements. The diary was explained with the help of a detailed manual, which was distributed to patients. For each food category, the manual described how to record the amount consumed and was illustrated by examples. Main nutrients of the dietary record were analyzed and the ingested amounts were calculated with the software PRODI 5.2 expert (Nutri-Science GmbH, Freiburg, Switzerland). The extent to which energy requirements were being met was calculated according to the Ireton-Jones formula [16]. Protein requirements were set at 1 g/kg body weight daily.

Quality of life

QoL was assessed by a visual analog scale (VAS) as described previously [7] and the European Organization for Research and Treatment of Cancer Quality of Life Questionnaire version 3.0 (EORTC QLQ-C30). The VAS evaluated factors such as appetite, nausea, and vomiting in order to quantify QoL and quality of food intake. A high VAS score indicated good quality of food intake. The EORTC QLQ-C30 is a 30-item cancer-specific questionnaire including six function scales (physical, emotional, cognitive, social, role, and global health QoL), three symptom scales (fatigue, pain, nausea/vomiting) and six single items assessing symptoms and the financial effects of the disease. Results of the EORTC QLQ-C30 were transformed to obtain scores within the range of 0 to 100 and overall scores were calculated according to EORTC guidelines [17]. VAS and EORTC QLQ-C30 were assessed at each study visit.

Hand-grip strength

Hand-grip strength is an indicator of overall muscle strength and was measured with a hydraulic dynamometer (Jamar, Smith and Nephew, Memphis, TN, USA). Hand-grip strength of the right and left hands were measured at each study visit. Each hand was measured three times and the means were recorded. Results are given as "strong hand" (in most cases the right hand) and "weak hand" (usually the left hand).

Performance status

The performance status was assessed according to the Eastern Cooperative Oncology Group (ECOG) scale.

Statistical analyses

Statistical analyses were performed based on the intention-to-treat principle, including data from all patients who consented to participate in the study. Statistical models were fitted using the R statistical program Version 2.11.1 and