Oral Oncology 71 (2017) 67–74

Contents lists available at ScienceDirect

Oral Oncology

journal homepage: www.elsevier.com/locate/oraloncology

Nutritional changes in patients with locally advanced head and neck cancer during treatment

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ARTICLE INFO

Article history:
Received 2 May 2017
Received in revised form 1 June 2017
Accepted 4 June 2017

Keywords:
Clinical
Oncology treatment
Head and neck cancer
Nutrition
Dietary counseling
Fat free mass

ABSTRACT

Objective: The purpose of the study is to evaluate changes in body composition and nutritional status that occur throughout the oncological treatment in head and neck cancer patients.
Methods: A prospective cohort observational study in patients diagnosed with head and neck squamous cell carcinoma (HNSCC) that underwent treatment with induction chemotherapy (iCT) followed by chemoradiotherapy or bioradiotherapy were invited to participate. All patients had dietetic counseling from the diagnosis and a close monitoring throughout the treatment implementing nutritional support as needed.
Results: From June 2011 until October 2012, 20 patients were included. Nutritional and anthropometric parameters were collected at diagnosis, post iCT, after radiotherapy, 1 and 3 months post radiotherapy. According to Patient Generated Subjective Global Assessment, 30% of patients were malnourished at diagnosis. After iCT there was an increase in weight, body mass index (BMI) and fat free mass (FFM) with almost complete improvement in dysphagia and odynophagia. Nevertheless a significant nutritional deterioration ($p = 0.0022$) occurred at the end of radiotherapy with 95% of patients becoming severe or moderate malnourished. Nutritional parameters such as weight, BMI and hand grip strength also decrease significantly during treatment.
Conclusions: Despite an intensive nutritional support from the diagnosis throughout the oncological treatment in advanced HNSCC cancer patients, nutritional status deteriorates during radiotherapy. Our findings suggest that iCT may help improve nutritional status by ameliorating the symptoms that limit the oral intake. This improvement in the nutritional status could contribute to minimize further deterioration. Further investigations are needed involving novel approaches to avoid nutritional deterioration.

Introduction

Head and neck squamous cell carcinoma (HNSCC) includes a wide range of malignant tumors that originate in the different structures of this region of the body. Its presentation causes aesthetic alterations and disturbance of functions as phonation, swallowing, hearing and breathing [1]. The surgical option compromises all these basic functions, therefore an alternative for the treatment of these tumors in advanced stages is a conserva-

Abbreviations: BIA, Bioimpedance; BMI, Body mass index; BMR, Basal metabolic rate; CRP, C-reactive protein; CT, Computerized tomography; CTCAE, Common Terminology Criteria for Adverse Events; ESPEN, European Society for Enteral and Parenteral Nutrition; FFM, Fat free mass; G, Grade; HB, Harris-Benedict equation; HGS, Hand grip strength; HNSCC, Head and neck squamous cell carcinoma; HT, Height; ICO, Catalan Institute of Oncology; iCT, Induction chemotherapy; MS, Mifflin-St Jeor equation; PG-SGA, Patient Generated Subjective Global Assessment; RT, Radiotherapy; WT, weight.

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http://dx.doi.org/10.1016/j.oraloncology.2017.06.003
1368-8375/

tive treatment [2]. These are based on the association of radiotherapy (RT) with concomitant chemotherapy [3], or bioradiotherapy [4,5] and, in some cases previous induction chemotherapy (iCT) [6]. HNSCC patients are specially at high risk of malnutrition due to tumor site and treatment [7]. In recent years antineoplasic treatments have contributed to improve locoregional control and survival [8,9], however, acute toxicity caused by these treatments may exacerbate nutritional deterioration by compromising dietary intake by odynodysphagia (mucositis related), anorexia or xerostomia [10].

The prevalence of malnutrition in HNSCC patients at diagnosis ranges from 42 to 77% and worsen throughout the treatment [11,12]. Nutritional support is an essential part of the multidisciplinary care from the diagnosis through the oncological treatment [13]. An early detection of malnutrition helps to implement an individualized nutritional intervention to improve oncological outcomes [14,15] and minimize acute toxicities, treatment interruptions and enhance survival [16]. The teamwork and support among the different professionals responsible for cancer patients' care allows us to adjust the nutritional intervention to the clinical situation and to treat early toxicities and the evolution of the disease [17].

Weight loss in cancer patients is one of the independent negative factors in prognosis and development of complications [18]. In recent years, several studies have demonstrated the importance, not only on the weight but the changes in body composition throughout cancer treatment [19,20]. Muscle loss determines the limiting dose of some antineoplasic drugs due to the high volume of distribution in adipose tissue (patients with more adipose tissue have a slower drug elimination) [21–23]. Many patients with HNSCC have a body mass index (BMI) above normal values contributing in many cases to masking a decreased muscle mass [12].

Furthermore, primary sarcopenia includes not only loss of muscle mass but age-related functionality [24]. Life expectancy and obesity increased in developed countries, have contribute to determine the body composition of patients with cancer. Far from the idea of an emaciated oncological patient, only 10% of all cancer patients are underweight (BMI$\leq$18.5 kg/m^2) at the diagnosis [18].

The objective of our study is to evaluate in a prospective cohort the changes in body composition and nutritional status that occur throughout the oncological treatment in HNSCC patients.

Methods

Study population

This is a prospective cohort observational study conducted in a single center, the Catalan Institute of Oncology (ICO)/Hospital Universitari de Bellvitge from June 2011 until October 2012. Patients (age$\geq$ 18 years) diagnosed with locally advanced HNSCC that underwent oncoespecific and radical treatment with iCT followed by chemoradiotherapy or RT plus cetuximab were invited to participate in the study. Eligibility criteria included pathologically confirmed squamous cell carcinoma of the oral cavity, oropharynx, hypopharynx, larynx and nasopharynx with no history of recurrent disease. Patients were excluded if they were unable to understand and speak Spanish, had a definitive diagnosis of dementia or lacked capacity to understand the purpose of the study.

The iCT scheme was based on taxanes and cisplatinum (TPF-like) [25]. Cisplatinum 100 mg/m^2 every 21 days or cetuximab 250 mg/m^2 weekly (loading dose of 400 mg/m^2) was used in patients with concomitant RT. Patients were referred to concomitance chemoradiotherapy or RT plus cetuximab according to the head and neck multidisciplinary committee decision; previous toxicity to iCT or patients inclusion on a clinical trial protocol [26].

The study protocol was approved by the Hospital Universitari de Bellvitge Ethics Committee for Clinical Research (PR231/11). All patients provided written informed consent.

Procedures

An oncology dietitian collected data at diagnosis (baseline), after finishing iCT/prior to begin RT (visit 1), after finishing RT (visit 2), 1 month after RT (visit 3) and 3 months after the end of treatment (visit 4). Data included were nutritional and anthropometric parameters, serum albumin (mg/dl), tumour location, tumour staging (TNM 7th edition), oncological treatment, toxicity according to the CTCAE scale version 4.0 (Common Terminology Criteria for Adverse Events) [27] and follow-up data.

Height (ht) and weight (wt) were measured using standard protocols [28]. BMI was calculated as [(wt in kg)/(ht in m)^2]. Percent wt loss was calculated as {[usual body wt-actual body wt]/ usual body wt}$*$100.

Dietary intake was estimated by a 24-h recall conducted by the oncology dietitian each time. Dietary intake data were analyzed using the Dietsource® software version 3.0 to estimate the calories and protein intake.

Energy requirements were estimated using Harris–Benedict (HB) equation [29,30] and Mifflin-St Jeor (MS) equation [31] using the adjusted body weight for patients with BMI$\geq$ 25 kg/m^2. 1.5 per physical activity was added as all patients had no incapacity and 1.2 per active oncology disease. Daily protein requirements were estimated at 1.5 g/kg actual body wt [29].

Muscle functionality was evaluated by handgrip strength (HGS) in the dominant hand, using Jamar dynamometer (Hydraulic Hand Dynamometer, SI Instruments PtyLtd, Adelaide, Australia). Three successive measurements were taken and the maximal measurement was used for the analysis [32].

Nutritional status was evaluated by the Patient Generated Subjective Global Assessment (PG-SGA) validated in cancer patients [33,34]. The first section of the assessment that includes actual weight, height, food intake, symptoms, activity and functionality was completed by the participant, with the help of the dietitian when needed [33]. The oncology dietitian performed the remainder form (diagnoses, metabolic demand and physical exam). Individuals were categorized as being well nourished (A), moderately malnourished or risk of malnutrition (B) or severely malnourished (C). Dietetic counseling was given to all patients from the diagnosis. Oncology dietitian adapted their diet to improve their nutritional intake, especially emphasizing on the protein intake and the fractionation of intakes along the day. Only when nutritional requirements were not met with dietetic intervention, nutritional supplementation was prescribed according to the individual needs.

Body composition was assessed by bioimpedance (BIA). Data were recorded at each visit using TANITA bioelectrical impedance analysis device (TANITA BC-418MA segmental; Biológica tecnología médica, SL, Barcelona, Spain). Measurements were made at 10 min after the participant assumed a supine position using standard protocols for BIA [35].The BIA variables collected were fat free mass (FFM) and basal metabolic rate (BMR).

Statistical analysis

A descriptive analysis of each of the variables was made using descriptive statistics. Changes of the anthropometric parameters, food intake, serum albumin and nutritional support in each visit were evaluated, calculating the average of these parameters at each visit and a 95% confidence interval was estimated.