Nutritional support in head and neck cancer: how and why?

Paula Ravasco

To devise a meaningful nutritional therapy in cancer, a greater understanding of nutritional dimensions as well as of expectations of patients and disease impact is essential. We have shown that nutritional deterioration in patients with gastrointestinal and head and neck cancer was multifactorial and mainly determined by tumour burden and location. In a larger cohort, stage and location were yet again the major determinants of patients' quality of life (QoL), despite the fact that nutritional deterioration combined with intake deficits was functionally more relevant than the cancer stage. On the basis of this framework, the potential role of integrated oral nutritional support on outcomes was investigated. In a pilot study using individualized nutritional counselling on a heterogeneous patient population, the achieved improvement in nutritional intake was proportional to a better QoL. The role of early nutritional support was further analysed in a prospective randomized controlled trial in patients with head and neck cancer stratified by stage, undergoing radiotherapy. Predefined outcomes were as follows: nutritional status and intake, as well as morbidity and QoL, at the end and 3 months after radiotherapy. Nutritional interventions only given during radiotherapy consisted of three randomization arms: (i) individualized nutritional counselling; (ii) *ad-libitum* diet plus high-protein supplements; and (iii) *ad-libitum* diet. Nutritional interventions 1 and 2 positively influenced outcomes during radiotherapy; however, 3 months after its completion, individualized nutritional counselling was the single method capable of sustaining a significant impact on patients' outcomes. The early provision of the appropriate mixture of foods and textures using regular foods may modulate outcomes in patients with cancer. *Anti-Cancer Drugs* 22:639–646 © 2011 Wolters Kluwer Health | Lippincott Williams & Wilkins.

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Introduction

Cancer-related weight loss is known to worsen the well being [1,2], tolerance to antineoplastic therapies [3] and prognosis of patients [4,5]. Specifically, weight loss seems to reduce immunological competence [6] and resistance to infection [7,8]; it enhances susceptibility to post-operative complications [5,9,10] and increases disability and the overall cost of care [11].

Although a few studies were undertaken in the early 20th century [12–14], malnutrition remained a bewildering syndrome even in relatively recent publications. Indeed, estimates of the prevalence of malnutrition in patients with cancer range from 8 to 84% [15], apparently associated with the cancer site; for example, 80% in patients with gastrointestinal cancer [16,17] and 50–70% in patients with head and neck cancer [18]. Despite the fact that nutritional deterioration has been associated with the functional impairment of patients [19], neither potential interactions between cancer location and stage, treatments, nutrition, morbidity and quality of life (QoL) nor the impact of individualized nutritional counselling on the nutritional, clinical and QoL outcomes of patients has ever been thoroughly explored [20,21]. In fact, there is remarkably little information about the effect of oral nutrition on functional outcome measures and QoL [15]. Innovative and consistent evidence to support integrated nutritional counselling as a major topic in oncology will be shown in this overview, which results from the accumulation of data from prospective studies in patients with cancer conducted by our group [22–26].

Cancer and the nutrition spectrum

Nutritional deterioration, intake deficits and tumour burden

To tackle nutritional deterioration, gathering objective data on nutritional status and its evolution throughout the disease course is an absolute necessity. There are indeed studies reporting cancer-related weight loss as the most frequent presenting symptom [27] or being potentially associated with advanced disease [28]. Nevertheless, previous data have been inconsistent regarding nutritional status assessment and cancer/treatment-related variables, even when addressing similar cancer locations [29,30]. Thus, we performed a thorough investigation of their possible interactions [22] to present solid fundamentals to further elaborate on the appropriateness of nutritional therapy, as anticipated by Ottery [31].

Long-standing energy and substrate deficits have not been previously investigated, nor have they been adjusted by the cancer stage of patients. In 205 patients with

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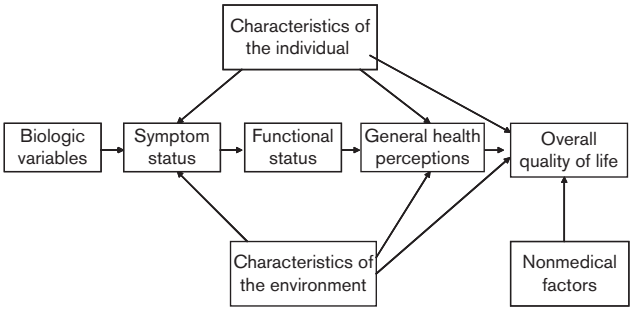
gastrointestinal and head and neck cancer, we have shown that nutritional deterioration is a multifactorial end result determined by cancer and diet-related factors [22]. The most significant association with worse nutritional status was by far an advanced cancer stage; nevertheless, cancer location, duration of the disease, protein and energy intake and previous surgery or chemotherapy was also significantly associated [22]. This provided novel clinical evidence of the complex interactions between cancer-related and/or treatment-related variables and diet changes, all of which exerted a combined effect on nutritional wasting in patients [22]. Our results were consistent with previously described, although partial, associations between wasting, marked nutritional-intake deficits and advanced disease [4,5,8,9,11,32,33]. A subsequent study conducted in a larger patient sample with the same cancer sites showed that patients with stage III/IV cancer had markedly lower intakes than those with stage I/II cancer [24]. Advanced stage was on the whole the common denominator of wasting in patients, and patients with stage III/IV head–neck cancer reported the most severe weight loss. Our results thus corroborated previous observations that cancer stage and location are major factors for nutritional deterioration [34–37], and further emphasized the role of nutritional intake deficits, which may occur early on and will become more severe with disease progression [22,24].

Tumour burden and quality of life

The World Health Organisation in 1948 defined 'health as being not only the absence of disease and infirmity but also the presence of physical, mental and social well being' [38]. Thereafter, QoL issues became increasingly important in research [39] and have been acknowledged as valid instruments in the growing field of outcome research to evaluate efficacy, cost effectiveness and net benefit of new therapeutic strategies [40,41]. QoL assessment, and more specifically 'health-related QoL', is able to measure changes in physical, functional, psychological, social domains of health, as well as in human and financial costs, seen as distinct areas modulated by a person's experiences, beliefs, expectations and perceptions [42,43]. It must be acknowledged that each individual has different health and performance expectations; hence, QoL is highly individualized. Moreover, we should bear in mind that when measuring QoL in any patient, particularly in patients with cancer, individuals may be at different time points of their illness and expectations are likely to change over time [44,45]. Figure 1 shows domains known to contribute to the patients' QoL [46]. A meaningful QoL evaluation in cancer must include the impact of the disease, together with therapeutic interventions, expectations and personal satisfactions; hence, the European Organisation for Research and Treatment of Cancer Quality of Life Questionnaire-C-30 is recommended as the most effective tool [23,47].

Fig. 1



Domains that contribute to the quality of life (QoL) of patients [46].

Nutrition: a key determinant of the quality of life of patients with cancer

Multifactorial cancer-related malnutrition [22] is also swayed by the symptoms experienced, for example, anorexia, taste changes, odynophagia, dysphagia, nausea, vomiting and diarrhoea, often subsequent to antineoplastic therapies, and may further compromise nutrition and functional ability [48–51]. Thus, the interaction between the reported symptoms and/or disease/treatment-related factors, as well as nutritional status and intake, adds up to a complex combination potentially capable of dictating the QoL of patients [23,52–54]. Yet, despite the suggested association between worse overall well-being/morbidity and nutritional deterioration [55,56], the interaction between nutrition and QoL did remain underestimated [57]. Fatigue, anorexia and emotional stress are common in patients with cancer and may aggravate and/or may be worsened by poor nutritional intake and/or QoL [52,58]. Although nutritional care has been proposed to be integrated in the overall management of patients with cancer [22,31,59], to date, there is scant evidence supporting a close interaction between nutrition and QoL. Various disease and diet-related factors do have implications in the QoL of patients as we have shown [24].

The weight of nutrition in the quality of life of patients

This study, comprising 271 patients with cancer of the head–neck, oesophagus, stomach and colon/rectum, provided objective evidence that cancer, diet deficits, nutritional depletion and therapeutic interventions were determinants of the QoL of patients, although with distinct relative weights [24]. Nutritional deficits and/or wasting were inherent to the cancer site and stage; however, reduced energy/protein intake and weight loss were independent QoL determinants. Our results concur with the landmark study by Keys *et al.* [60], which showed that semistarvation impairs systemic physiological, functional and psychological abilities.

Moving further, it is of major clinical relevance to generate evidence on whether individualized nutritional counselling, education and monitoring integrated in the

overall management do effectively maintain or even improve nutritional intake and status, along with significant improvements in the overall QoL and outcomes of patients; these issues will be focused upon in the next sections.

Nutrition intervention improves the outcome and quality of life of patients

Cancer location and its progression are central to nutritional decline [22]. Notwithstanding, nutritional deterioration and intake deficits were shown to be the second most relevant factor to nutritional decline, after disease severity (Table 1) [22,24]. Our studies were conducted in outpatients referred for radiotherapy, and radiation injury is known to aggravate symptoms with nutritional consequences [61,62]. Thus, such patients were suitable to test whether nutritional therapy would influence outcomes. Therefore, a pilot prospective intervention study was conducted in a heterogeneous patient population [23], and, given the promising results, was followed by two prospective randomized controlled trials, one in colorectal cancer [25] and the other in outpatients with head and neck cancer [26].

Pilot intervention study

In a heterogeneous population of patients with cancer submitted to radiotherapy (RT), the effect of nutritional intervention in the form of individualized nutritional counselling based on regular foods, nutritional parameters and QoL was evaluated [23]. Individualized nutritional counselling based on regular foods was always designed and prescribed in the form of dietary guidelines in writing, which were given and explained in detail to the patients. The dietary plan (daily meal plan in quantity, type of foods and daily meal distribution) was therefore based on the location of the patient's cancer, concomitant treatments, surgery, symptoms, nutritional status and weight changes, individual dietary habits and preferences, present intake, food intolerances, taste abnormalities, functional capacity and nutritional requirements [63]. Patients submitted to RT, particularly of the head and neck or the gastrointestinal tract, are at higher risk of malnutrition, aggravated by RT toxicity that may further compromise nutritional and functional status [64]. This study showed that, in patients prone to developing nutritional problems and to reporting the worst QoL during RT, individualized nutritional counselling did improve nutritional intake, which was identified as central to a better QoL (Table 2) [23]. In addition, two QoL instruments were tested; the non-specific EuroQol [65] could be used routinely because it is less time-consuming, whereas the more comprehensive cancer-specific European Organisation for Research and Treatment of Cancer Quality of Life Questionnaire-C-30 instrument [47] covers more items and scales, identifies more domains and specific complaints and, although time consuming, provides the accuracy required for research. Both instruments were able to assess the QoL of patients and both exposed the relevance of nutrition care [23]. Subsequently, nutritional intervention was further evaluated in a prospective randomized controlled trial in outpatients with head and neck cancer (submitted to RT) to assess the potential role of adjuvant oral nutritional support on the outcomes of patients. Patients stratified by cancer stage were randomized to receive: (i) individualized dietary counselling based on regular foods (as described above) [63]; (ii) an *ad-libitum* diet plus high-protein supplements; and (iii) an *ad-libitum* diet [26].

Randomized controlled trial of nutritional therapy in head and neck cancer

Nutritional deterioration and intake deficits

Weight loss during RT is an early indicator of potential nutritional decline further on disease progression [61]. The majority of patients with head–neck cancer who submitted to a 6–7 week course with $\pm$ 70 Gy of RT reported weight loss in the absence of nutritional support [66]. In our trial, in which patients were submitted to neoadjuvant RT, the nutritional intervention occurred only during RT, whereas the study period comprised a follow-up (3 months after RT completion without any

Table 1 Inter-relationships and estimates of effect size (relative weights) of nutritional parameters and cancer/treatment-related variables on quality of life: results from general linear model analysis

	Global function scores		Global symptom scores[b]		Global single-item scores[b]	
Variable	Estimates of effect size (%)[a]	*P*	Estimates of effect size (%)[a]	*P*	Estimates of effect size (%)[a]	*P*
Cancer stage	1	0.18	22	0.001	30	0.0001
Cancer location	30	0.0001	41	0.0001	20	0.001
Energy intake	10	0.01	3	0.35	4	0.07
Protein intake	10	0.01	4	0.25	5	0.07
Weight loss	30	0.0001	1	0.82	3	0.10
Duration of the disease	3	0.14	7	0.06	3	0.30
Chemotherapy	10	0.001	4	0.22	1	0.25
Surgery	6	0.01	1	0.86	4	0.09

Columns denote dependent variables and rows denote independent variables.
Each of the scales and single items were linearly transformed and grouped to obtain global scores before inclusion in the analytical model.
Estimates of effect size and percent of the overall variance for the dependent variables are determined by the independent variables.
QoL scores are given by the European Organisation for Research and Treatment of Cancer Quality of Life Questionnaire-C-30.
[a]The sum of percentages may not be equal to 100% due to the corrected error size.
[b]Owing to the potential association between symptoms and diagnoses, associations were adjusted for cancer location.

Table 2 Self-reported quality of life problems at the onset and at the end of radiotherapy

	n=6 Oesophagus		*n*=5 Stomach		*n*=46 Colorectal		*n*=23 Head and neck		*n*=45 LR	
Items	Onset	End	Onset	End	Onset	End	Onset	End	Onset	End
Function scales										
Global QoL	52	69	56	70	68	75	50	73	73	80
Physical function	42	65	40	55	69	74	50	80	74	70
Role function	53	68	42	62	62	78	55	75	80	80
Emotional function	58	63	36	45	65	65	74	74	82	82
Social function	68	74	35	58	69	69	66	86	83	83
Cognitive function	54	65	41	55	38	58	53	72	80	80
Symptoms, scales										
Fatigue	59	64	29	19	26	26	67	52	30	30
Pain	22	58	29	52	25	49	13	60	17	17
Nausea and vomiting	25	45	24	72	48	58	43	18	4	4
Symptoms, single items										
Dyspnoea	56	58	2	2	5	5	38	38	2	2
Sleep disturbance	45	45	35	35	39	39	53	53	21	21
Appetite	41	79	19	55	68	68	73	19	6	6
Constipation	2	2	1	1	15	4	8	8	12	12
Diarrhoea	2	2	0	0	59	78	9	9	6	6
Finance	4	4	1	1	8	8	38	38	5	5

Data are expressed as median value of QoL dimension scores.
Higher scores on function scales indicate better functioning, higher scores on symptom scales/single items denote increased symptomatology or worse financial impairment.
QoL scores are given by the European Organisation for Research and Treatment of Cancer Quality of Life Questionnaire-C-30.
LR, low risk (breast, prostate, uterus, brain); QoL, quality of life.

Table 3 Changes in nutritional status during RT and at 3 months categorized according to PG-SGA

	G1				G2				G3					
	Decline		Maintained/improved		Decline		Maintained/improved		Decline		Maintained/improved			
Methods	End RT	3 months	End RT	3 months	End RT	3 months	End RT	3 months	End RT	3 months	End RT	3 months	P^1	P^2
PG-SGA	5	3	20	22	19	24	6	1	24	25	1	0	<0.002	<0.001

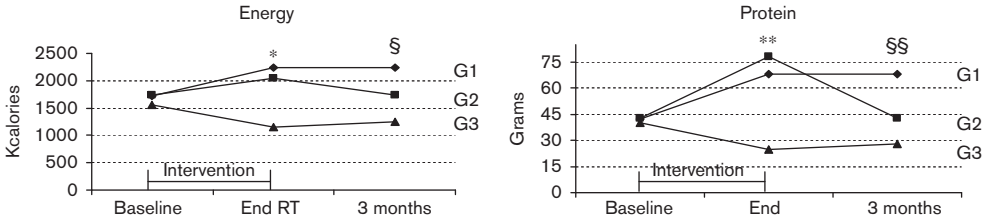
Data are expressed as number of patients.
G1, individualized dietary counselling based on regular foods.
G2, *ad-libitum* intake and supplements.
G3, *ad-libitum* intake.
P^1 expresses the significance of statistical differences between intervention groups, regarding nutritional decline both at the end RT and at 3 months.
P^2 expresses the significance of statistical differences between intervention groups, regarding maintenance/improvement of nutritional status at the end RT and at 3 months.
NS, not significant; PG-SGA, patient-generated subjective global assessment; RT, radiotherapy.

nutrition intervention). At the end of RT, nutritional deterioration was only observed in 20% of the patients receiving individualized dietary counselling based on regular foods (G1), amounting to 76% in those who received supplements (G2) and to more than 96% in the *ad-libitum* patients (controls; G3; Table 3) [26]. These findings concur that disease-related malnutrition is frequently caused by reduced dietary intake, which may be overcome by the provision of an appropriate nutritional therapy, which generally reflects an improvement in the protein–energy status [15]. Indeed, although at baseline the three study groups showed comparable nutritional status and energy and protein intakes, nutritional intake patterns became quite different according to the type of nutritional intervention. At the end of RT, G1 showed the highest average energy intake, sustained throughout the 3-month follow-up. The smaller increase in G2 was lost during follow-up when energy intake decreased to/or below baseline; in G3, energy intake never increased but instead decreased to/or below baseline. During nutritional intervention, both dietary manipulation and supplements were effective in restoring protein intake; the increase was just maintained at 3 months in G1, whereas in the other two groups the protein intake followed a pattern similar to that observed for energy (Fig. 2) [26]. Thus, individualized dietary counselling during RT, taking into consideration each patient's clinical condition and symptoms, was the most effective nutritional intervention, assuring a sustained and adequate diet, which was able to overcome the predictable deterioration [25].

Symptom-induced morbidity

The susceptibility to acute radiation damage on neoplastic and healthy tissues, for example, head and neck, depends on the tumour histology, total RT dose, fractionation, volume and anatomical location of the

Fig. 2



Energy and protein intake patterns during intervention and follow-up for the three study groups; G1, dietary counselling based on regular foods; G2, supplements; and G3, *ad-libitum* intake. Energy: *G1 > G2 > G3 ($P=0.005$) and §G1 > G2 > G3 ($P=0.001$); protein: **G2 > G1 > G3 ($P=0.006$) and §§G1 > G2 > G3 ($P=0.001$).

Table 4 Radiotherapy-induced morbidity categorized according to severity grade [67,72]

	G1				G2				G3						
	Grade 1		Grade 2		Grade 1		Grade 2		Grade 1		Grade 2				
Symptoms	End RT	3 months	End RT	3 months	End RT	3 months	End RT	3 months	End RT	3 months	End RT	3 months	P^1	P^2	P^3
Anorexia	10	1	2	0	9	4	5	3	9	5	7	3	<0.05	<0.12	<0.001
Nausea/vomiting	4	0	1	0	3	2	2	1	3	2	2	1	<0.001	<0.10	<0.05
Xerostomia	12	2	3	0	10	6	6	3	10	5	7	3	<0.04	<0.05	<0.0003
Dysgueusia	10	1	7	2	10	6	11	5	11	5	12	6	<0.04	<0.008	<0.0004
Odynophagia/ dysphagia	14	2	8	1	12	3	10	3	12	6	12	6	<0.0001	<0.05	<0.0002

Data are expressed as number of patients.
G1, individualized dietary counselling based on regular foods.
G2, *ad-libitum* intake and supplements.
G3, *ad-libitum* intake; grades 3 and 4 were never observed.
P^1 expresses the significance of statistical differences between intervention groups, regarding the reduction of grade 1 symptom' incidence between the end RT and 3 months.
P^2 expresses the significance of statistical differences between intervention groups, regarding the reduction of grade 2 symptom' incidence between the end RT and 3 months.
P^3 expresses the significance of statistical differences between intervention groups, regarding the reduction of grades 1 + 2 symptom' incidence between the end RT and 3 months.
RT, radiotherapy.

irradiated area, as well as on injury repair mechanisms and concurrent chemotherapy [61]. Indeed, patients with head and neck cancer already have nutritional handicaps ensuing from the tumour location [23]. Further nutritional intake decreases resulting from the direct effects of RT on oral, pharyngeal and laryngeal neoplastic and healthy tissues accentuate physical discomfort and symptoms [67], such as xerostomia, dysgeusia, odynophagia, dysphagia, anorexia and nausea/vomiting [8,68,69].

Two randomized controlled trials of enteral nutrition in patients with gastrointestinal or head and neck cancer showed a possible weight gain or reduced weight loss and reduced mortality, although functional status or global health scores remained unaltered [70,71]. The routine approach, however, is to maintain an *ad-libitum* oral diet, as comparative studies with dietary manipulation or oral nutritional supplementation and evaluating functional, clinical and QoL outcomes are lacking [15]. Our study is the first to show that the nutritional content of the patient's diet based on regular foods with appropriate manipulation, and not just protein and calorie supplementation, is the key to improving nutritional intake as well as some local symptomatic morbidity derived from mucosal damage, both during and after RT. Furthermore, RT-induced toxicity was more severe and incident in patients with an *ad-libitum* intake and to a lesser extent in the supplemented group, whereas in those patients who received dietary counselling/education the symptom incidence and/or severity were inferior along with a faster improvement (Table 4) [26]. Indeed, dietary modifications may as well modify the ecology of the oral cavity by means of stimulating salivary secretion, thereby decreasing the oral intolerance to foods [55].

Quality of life

In clinical trials, QoL assessment of three major dimensions, namely, function, symptom and single-item scores, thus measuring experiences of the impact of disease/therapy in patients, should be the gold standard as an independent end point [73,74]. In this clinical trial, dietary counselling (G1) significantly improved all QoL function scores, in association with an adequate dietary intake and nutritional status, both at the end and 3 months after RT. In patients in G2 who received oral supplements, function scores improved during the intervention period, to a lesser extent than in G1, although still proportional to the increase in diet intake; however, most function scores deteriorated once the supplementation was discontinued.

Table 5 Median quality of life dimensions' scores

	G1			G2			G3		
Items	Onset	End	3 months	Onset	End	3 months	Onset	End	3 months
Function scales									
Global QoL	48	75[a]	82[b,c]	46	70[a]	62[b]	47	30[a]	30[b]
Physical function	49	74[a]	79[b]	48	69[a]	60[b]	45	21[a]	22[b]
Role function	50	78[a]	80[b]	52	68[a]	58[b]	48	20[a]	19[b]
Emotional function	55	79[a]	83[b]	50	66[a]	62[b]	51	28[a]	28[b]
Social function	52	82[a]	85[b]	51	66[a]	61[b]	49	19[a]	20[b]
Cognitive function	38	58[a]	60[b]	35	51[a]	54[b]	37	20[a]	20[b]
Symptoms, scales									
Fatigue	30	55[a]	26[c]	31	75[a]	78[b]	29	78[a]	79[b]
Pain	25	63[a]	15[b,c]	22	74[a]	45[b,c]	23	78[a]	73[b]
Nausea and vomiting	15	50[a]	10[b,c]	14	71[a]	60[b,c]	12	72[a]	73[b,c]
Symptoms, single items									
Dyspnoea	15	39[a]	8[b,c]	14	40[a]	38[b]	18	38[a]	38[b]
Sleep disturbance	30	55[a]	29[b,c]	28	55[a]	75[b,c]	32	60[a]	78[b,c]
Appetite	45	68[a]	48[b,c]	40	59[a]	72[b,c]	42	65[a]	75[b,c]
Constipation	12	10	10	11	9	8	9	8	8
Diarrhoea	7	7	7	6	6	6	7	7	7
Finance	38	38	38	37	37	37	40	40	40

G1: individualized dietary counselling based on regular foods.
G2: *ad-libitum* intake and supplements.
G3: *ad-libitum* intake; higher scores on function scales indicate better functioning.
Higher scores on symptom scales/single items denote increased symptomatology or worse financial impairment.
__Highlights overall significant improvement.
_ _ Highlights overall significant deterioration.
QoL, quality of life.
[a]Significant differences between baseline end of RT.
[b]Significant differences between baseline and at 3 months.
[c]Significant differences between end of RT and at 3 months.

Throughout the whole study period patients in G3 receiving only the *ad-libitum* diet experienced a significant deterioration in function scores and fatigue in direct relation to the worsening of their nutritional intake and nutritional status [26]. Therefore, our results emphasize that 'the impairment in structure, function and well being that form malnutrition is nutritionally responsive' [15]. Furthermore, the benefits of nutritional intervention on QoL were extended to improved physiological function and the overall clinical outcome. In fact, QoL symptom scores deteriorated in all groups during RT, although they were more pronounced in the *ad-libitum* group; most were also worse in G2 than in G1. At the 3-month follow-up, G3 symptom scores remained as poor as those reported at the end of RT, and worse than at the onset; worse scores were again associated with inadequate nutritional intake. Conversely, in patients in G1, all the above-mentioned QoL scores were then improved and significantly better than at baseline, whereas in G2 only pain showed an improvement (Table 5) [26]. The results that were achieved in patients who experienced a variety of persistent and severe swallowing disturbances confirm the sensible practice of providing the appropriate mixture of foods and textures using regular foods, which may modulate outcomes [15].

Conclusion

Nutritional deterioration in cancer is a highly complex end result of multiple interactions, which are most likely individual to each patient and the tumour [22,62,75,76]. Cancer location and stage are the major determinants of nutrition and its impact on the patients' QoL; nutritional aspects are equally important for QoL functional scores, in which the impact of nutritional deterioration combined with deficiencies in nutritional intake may be from a clinical perspective as relevant as the stage of the disease [24].

The final question was 'Does nutrition influence outcomes?' Therefore, a prospective randomized controlled intervention trial was conducted in 75 patients with head and neck cancer submitted to RT to address the potential role of adjuvant oral nutritional support on the outcomes of patients [26,77]. Nutritional counselling was indeed central to the improvement of a diversity of outcomes: nutritional intake, nutritional status, QoL and lessened morbidity, even in the medium term after nutritional intervention. Adding oral nutritional supplements to the diet was not as effective as dietary counselling [26,77].

In what concerns enteral nutrition [tube feeding (TF)], indications include patients with cancer who are unable to swallow and thus may starve. Furthermore, TF may allow completion of RT without interruption, and perioperative TF may reduce complications of major abdominal cancer surgery. TF should be started if undernutrition already exists or if it is anticipated that the patient will be unable to eat for more than 7 days. TF should also be started if an inadequate food intake (< 60% of estimated energy expenditure) is anticipated for more than 10 days (grade C evidence) [77].

The body of evidence conveyed in this review shows that nutrition is significant in cancer wasting and QoL, both of which are responsive to early individualized dietary counselling based on regular foods. Patients with cancer do benefit from multiprofessional patient management to include a proper early assessment of nutritional status and nutritional requirements, dietary counselling/education, as well as monitoring and timely management of symptoms. Early intensive nutritional intervention and sensible partnerships with patients are the key factors for success.

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