Assessment of nutritional status at the time of diagnosis in patients treated for head and neck cancer

C.-A. Righini*, N. Timi, P. Junet, A. Bertolo, E. Reyt, I. Atallah

Pôle TCCR, clinique universitaire d’ORL, CHU de Grenoble, 1, avenue des Maquis-du-Grésivaudan, 38043 Grenoble cedex 09, France

Summary

**Objective:** To evaluate the nutritional status at the time of diagnosis of patients treated for head and neck cancer.

**Material and methods:** Single-centre prospective study. Nutritional assessment comprised: clinical interview, physical examination, and a laboratory work-up. Clinical interview assessed: reference weight, diet, calorie intake, causes of weight loss, use of dietary supplements. A subjective global assessment of nutritional status (Detsky index) was established on the basis of clinical interview. The patient’s height and weight were determined and serum albumin was assayed. Weight loss, body mass index, and Buzby index were then calculated. Two groups of malnourished patients were distinguished: moderately malnourished (group 1), severely malnourished (group 2). Variables were compared between the two groups by Chi² test.

**Results:** One hundred and sixty-nine patients were included in the study: 145 had a history of smoking and alcohol abuse, 82 (48.5%) were malnourished and 47 of them were classified in group 1. All patients of group 1 had a normal or pureed diet. 21 (69%) patients of group 2 had a pureed or liquid diet. The mean daily calorie intake was 31 kcal/kg/24 h for group 1 and 20 kcal/kg/24 h for group 2. The main causes of weight loss were pain and dysphagia. Dietary supplements were not used by any of the patients in group 1 and by four (13%) patients in group 2. The concordance between the Detsky index and objective nutritional status was 92% for the overall population. Malnutrition was significantly more frequent among males ($P=0.01$), alcohol users ($P=0.02$), elderly subjects ($P=0.01$), patients with pharyngeal tumour ($P=0.03$), and patients with advanced tumour stage ($P=0.01$).

**Conclusion:** The prevalence of malnutrition among patients with head and neck cancer is high. Assessment of nutritional status and appropriate management must be part of the initial work-up of these patients.

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Introduction

The relationship between cancer and malnutrition has been established for a long time. Malnutrition can occur at all stages of the disease. The overall prevalence of...
malnutrition, regardless of cancer type, is about 40% and has remained constant for the last 30 years. The percentage of malnourished patients is particularly high among patients with gastrointestinal or head and neck cancers [1]. The aetiology of malnutrition is multifactorial and its mechanisms are complex [2–4] (Fig. 1). Prevention and early management by appropriate nutritional support limit the extent of malnutrition and correction of malnutrition decreases the number of outpatient visits and hospital admissions, facilitates therapeutic management and limits treatment-related complications [5]. The corollary of a low treatment-related complication rate is increased treatment efficacy and therefore a direct impact on the patient’s quality of life and survival. Treatments themselves are also responsible for malnutrition [6]. The prevalence of malnutrition in a given population is therefore directly dependent on the time of evaluation.

Independently of treatment, weight loss greater than 15% in a cancer patient is constantly associated with a poorer prognosis. Malnutrition alone is the cause of death in 5 to 25% of patients [7]. Weight loss can be either progressive or sudden and the approach to nutritional management must be adapted accordingly [8].

While multidisciplinary consensus conferences, diagnosis disclosure consultations and personalized treatment programmes are becoming increasingly widespread, assessment of malnutrition in oncology units is often neglected, inappropriate, or performed too late. However, many patients with head and neck cancer, most of whom have a history of smoking and alcohol abuse, are derived from lower socioeconomic categories, which does not facilitate their management.

The objective of this study was to assess the nutritional status based on clinical and laboratory data at the time of diagnosis in patients receiving curative treatment for head and neck cancer and therefore to study the prevalence of malnutrition in this population.

**Material and methods**

This single-centre prospective study was conducted between March 2010 and December 2011. The nutritional assessment was performed at the time of the patient’s admission to the ward and consisted of clinical interview, physical examination and a laboratory work-up. All elements concerning nutrition were reported on a “nutrition form” (Supplementary data, Appendix 1). Clinical interview determined the reference weight 6 months before the diagnosis, the type of diet (normal, pureed, liquid), the calorie intake (kcal) per 24 hours (nomograms provided by dieticians), the use of analgesics, the use of one or more dietary supplements, identification of the causes of weight loss (pain, dysphagia, loss of appetite, altered taste) and the patient’s physical capacities (not altered, moderately altered, severely altered). When the patient reported pain, pain severity was assessed by visual analogue scale (VAS) scored from 1 to 10. The presence or absence of a nasogastric tube (NGT) was recorded and whether or not the patient had received temporary enteral and/or parenteral feeding before admission and for how long. The Detsky index or subjective global assessment (SGA) was established on the basis of this clinical interview, assessing the degree of malnutrition with respect to the degree of weight loss, the severity of gastrointestinal and clinical signs malnutrition and functional and muscle changes. According to this classification, patients were classified as not malnourished (A), moderately malnourished (B) and severely malnourished (C). The classification based on this index therefore corresponded to the examiner’s subjective assessment with no calculations or precise indications [9].

The patient’s height and weight were then determined. The presence of peripheral oedema and/or ascites was recorded. The laboratory work-up comprised the assay of four proteins (Supplementary data, Appendix 1), including albumin (Alb), and C-Reactive Protein (CRP). Weight loss

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**Figure 1** Multifactorial aetiology of malnutrition in cancer patients. According to Nitenberg and Raynard [3].
(WL) was also calculated in absolute values or as a percentage using the following formula: weight loss (%) = (reference weight-current weight) \times 100/reference weight. The body mass index (BMI) was calculated according to the formula: height/weight^2. Malnutrition was defined by:

- BMI \leq 18.5 \text{ kg/m}^2 \text{ between the ages of 18 and 75 years;} \\
- BMI \leq 21 \text{ kg/m}^2 \text{ after the age of 75 years;} \\
the patient was considered to be overweight when the BMI was between 25 and 30.

The Nutritional Risk Index (NRI) or Buzby index [10] was calculated according to the formula: 1.519 \times \text{Albumin [g/l]} + 0.417 \times \text{(current weight/usual weight)} \times 100. Subjects with an NRI less than 83.5 were considered to be severely malnourished and those with an NRI between 83.5 and 97.5 were considered to be moderately malnourished.

Two groups of malnourished patients were distinguished:

- moderately malnourished patients (group 1: WL <10% / BMI \geq 18.5 (21 for patients over the age of 75) / 83.5 \leq \text{NRI} \leq 97.5 / 30 \leq \text{Alb} \leq 35);
- severely malnourished patients (group 2: WL \geq 10% / BMI < 18.5 (21 for patients over the age of 75) / NRI < 83.5 / Alb < 30).

This evaluation was used to distinguish three situations: overweight patients; patients with stable weight, not malnourished; moderately or severely malnourished patients.

Two other parameters were also taken into account: tobacco and/or alcohol consumption; lifestyle. These data were derived from information provided by the physician who referred the patient to hospital and medical observations in hospital. Tobacco consumption was expressed in pack-years (PY) and alcohol consumption was expressed in units of alcohol (UA). The quantity of alcohol consumed by a patient was calculated in grams (g) according to the formula: strength of alcohol (g) \times \text{volume in litres} \times 0.8. In the literature [11], the risk of developing a head and neck cancer becomes significant for an alcohol intake more or equal to 40 g/24 h, i.e. four UA (1 unit = 10 g). Two groups of drinkers were distinguished: moderate drinkers (consumption < 4 UA) and heavy drinkers (\geq 4 UA). Two lifestyle parameters were taken into account: domestic situation (in a couple relationship / Yes-No); employment status (employed / unemployed / Yes-No). Categorical variables were compared by Chi^2 test.

## Results

One hundred sixty-nine patients (139 men) with a mean age of 59 years (44–86) were included in the study. Fifteen patients (9%) were 75 years or older, including 10 women.

Tobacco and alcohol consumption was indicated in the medical charts for all patients. One hundred forty-five patients (86%) reported a history of smoking and 125 were active smokers at the time of inclusion. The mean tobacco consumption was 30 PY (15–70). One hundred thirty five patients (80%) drank alcohol each day, with a mean daily consumption of seven UA. One hundred twenty patients (71%) were heavy drinkers according to the previously defined criteria.

The domestic situation was recorded in the medical charts for 101 patients (60%). Sixty patients were in a couple relationships. Thirty (73%) of the patients who lived alone were men. The employment status was reported for 68 (40%) patients: 35 were employed, 22 were unemployed and 11 had retired. The occupation was specified for only 30 (44%) patients. The majority of patients (66%) worked or had worked in factories or in the building industry.

Fifteen patients (9%) had been treated for a first head and neck cancer by surgery and/or radiotherapy, an average of 30 months before inclusion. Treated sites were: tonsil (n=9); piriform sinus (n=4); mobile tongue (n=2), corresponding to stage I-II tumours in every case. All of these patients had stopped smoking and drinking.

No patient had an NGT at the time of nutritional assessment and no patient had received temporary enteral or parenteral feeding prior to admission. No patients presented clinical and/or laboratory signs of hepatocellular insufficiency and five (3%) patients of group 2 presented peripheral oedema.

Tumour sites were: oropharynx (n=60); oral cavity (n=40); larynx (n=39); hypopharynx (n=30) with 64 (38%) stage I-II tumours and 105 (62%) stage III-IV tumours.

The Detsky index established on the basis of clinical interview was used to classify patients as follows: group A (n=99); group B (n=40); group C (n=30). A total of 99 (58.5%) patients were considered to be not malnourished and 70 (41.5%) were considered to be moderately or severely malnourished.

According to the criteria defined for objective assessment of malnutrition, two (1.2%) patients were overweight, 85 (50.3%) were not malnourished and 82 (48.5%) were malnourished: 52 patients in group 1 (31%) and 30 patients in group 2 (17.8%). A concordance was observed between the Detsky index and the objective nutritional status in 92% of cases for the overall population. For malnourished patients, this concordance was 85% for group 1 and 100% for group 2.

Sixty-four (73.5%) non-malnourished patients were smokers with a mean consumption of 19 PY. Fifty-two (60%) were drinkers (mean alcohol consumption = 2 UA). Forty patients lived in a couple relationships, 25 were employed and nine had retired.

The prevalence of malnutrition according to tumour site is shown in Table 1. The distribution of tumour sites as a function of the two subgroups of malnourished patients is shown in Table 2. The percentage of stage I-II and III-IV tumours was 65% and 35% in group 1, and 40% and 60% in group 2, respectively.

Five of the malnourished patients of group 1 were women (three of whom were over the age of 75). Thirty-nine (75%) patients were smokers with a mean consumption of 25 PY. Forty-three (86%) drank alcohol (mean consumption = 4 UA / 35 \geq 4 UA). Fifteen patients lived in a couple relationships, 10 were employed and two had retired. All patients reported a normal or pureed diet. The mean calorie intake was 31 kcal/kg/24h. None of the patients used dietary supplements. Ten per cent of patients reported odynophagia (VAS \leq 5) and/or dysphagia and 5% reported loss of appetite.
and/or altered taste. Three (6%) patients took a step I analgesic.

All patients of group 2 were males. Twenty-two (73%) were smokers with a mean consumption of 35 PY. Thirty-two (100%) drank alcohol (mean consumption = 10 UA / 32 ≥ 4 UA). Five patients lived in a couple relationships, five were employed and none had retired. Twenty-two (69%) reported a pureed or liquid diet. The mean calorie intake was 20 kcal/kg/24 h. Four (13%) patients used dietary supplements. Eighty five per cent of patients reported odynophagia and/or dysphagia (5 ≤ VAS ≤ 10), and 15% reported loss of appetite and/or altered taste. Thirteen (41%) patients took a step II analgesic.

Table 3 summarizes the various factors with or without an impact on malnutrition. Lifestyle was not taken into account due to the large number of missing data, which could bias the results.

Discussion

No study has been conducted in France to evaluate the prevalence of malnutrition among patients with head and neck cancer at the time of initial management. The NutriCancer study, initiated in 2005, was designed to study the prevalence of malnutrition in hospitalised cancer patients on given day, regardless of cancer site, but without specifying the exact stage of management of the disease [1]. This study was conducted in 24 cities in France and 154 hospitals (general hospitals, teaching hospitals or private institutions); 2068 patients were eligible, but 165 were excluded due to incomplete medical records. A total of 1903 patients were included in the study, including 382 patients with head and neck cancer, i.e. 19% of the overall study population [12]. Forty-nine percent of patients were malnourished, mostly corresponding to patients with a tumour of the oral cavity or oropharynx. The present study cannot be compared to the NutriCancer study for an essential reason: the exact stage of management of the patients was not specified in the NutriCancer study, which means that some patients were evaluated at the time of initial management, while others had already received treatment which, as indicated above, can be responsible for malnutrition. Secondly, cancers of the nasopharynx were included in the NutriCancer study, but these head and neck cancers constitute a distinct entity, as they are often diagnosed at an advanced stage and require specific treatments, essentially based on chemotherapy and radiotherapy, which introduces an additional bias when comparing the results of the two studies.

This study clearly demonstrates that the nutritional status of head and neck cancer patients is altered in one half of cases due to multiple causes. Malnutrition was significantly more frequent among men, elderly subjects, patients with a history of alcohol abuse, patients with a pharyngeal tumour and advanced tumour stage. In 2004, Martin Villares et al. demonstrated that the risk of malnutrition increased with the quantity of alcohol consumed [13]. These authors also demonstrated that alcohol intake must be rapidly decreased or even stopped, at the stage of initial management of patients with head and neck cancer. Alcohol withdrawal can therefore promote correction of malnutrition [14].

On the basis of clinical interview and simple objective measures such as weight and height, the physician, assisted by a dietician, can rapidly assess the patient’s nutritional status, the course of malnutrition and its main causes. These data can be recorded on a “nutrition form”, as proposed in this study, or can be simply recorded in the patient’s medical charts. However, a review of medical charts in our institution, prior to introduction of this nutrition form, revealed that these basic data were absent in more than two-thirds of cases.

The Detsky index provides a subjective assessment of malnutrition, but allows noninvasive classification of patients with satisfactory reproducibility (90%) into three categories: A, B and C [9]. This index is particularly reliable for severely malnourished patients, as the correspondence between this index and objectively demonstrated severe malnutrition in this group of patients was 100% versus only 85% for moderately malnourished patients, due to the difficulty of distinguishing between moderately malnourished patients and well nourished or slightly malnourished patients. This index is nevertheless useful in clinical practice, as the concordance between subjective assessment of malnutrition and the objective assessment was 92% in our study population, in line with the results published in the literature.

In terms of objective criteria, weight loss less or equal to 5% has no impact on patient survival, while weight loss greater or equal to 10% is considered to be a prognostic marker in oncology, which is why this cut-off was used in the present study [15].

### Table 1 Prevalence of malnourished patients according to tumour site.

<table>
<thead>
<tr>
<th></th>
<th>Oral cavity</th>
<th>Oropharynx</th>
<th>Hypopharynx</th>
<th>Larynx</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sample size</td>
<td>40</td>
<td>60</td>
<td>30</td>
<td>39</td>
<td>169</td>
</tr>
<tr>
<td>Prevalence of malnutrition (%)</td>
<td>13 (33)</td>
<td>35 (59)</td>
<td>25 (82)</td>
<td>9 (23)</td>
<td>82 (48.5)</td>
</tr>
</tbody>
</table>

### Table 2 Distribution of tumour sites in the two groups of malnourished patients.

<table>
<thead>
<tr>
<th>Group (%)</th>
<th>Oral cavity</th>
<th>Oropharynx</th>
<th>Hypopharynx</th>
<th>Larynx</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group 1 (%)</td>
<td>12 (30)</td>
<td>20 (37)</td>
<td>11 (37)</td>
<td>9 (23)</td>
<td>52 (31)</td>
</tr>
<tr>
<td>Group 2 (%)</td>
<td>1 (2.5)</td>
<td>15 (21)</td>
<td>14 (47)</td>
<td>0 (0)</td>
<td>30 (17.5)</td>
</tr>
</tbody>
</table>
Various authors have reported different cut-off values for severe hypoalbuminaemia with a prognostic impact, ranging between 30 and 35 g/L [16]. We adopted a value of 30 g/L, the cut-off used by the majority of authors. The presence of an inflammatory syndrome makes it difficult to interpret the nutritional significance of absolute values for serum albumin, hence the value of CRP assay. Patients must be examined for the presence of clinical and laboratory signs of hepatocellular insufficiency, which can often be responsible for hypoalbuminaemia.

The two main causes of malnutrition in this study were pain and/or dysphagia, in patients with either moderate or severe malnutrition, with a higher percentage of these two symptoms among patients with severe malnutrition. This can probably be largely explained by the large number of tumours situated in the oropharynx and hypopharynx. This high rate of pain and/or dysphagia appears to be specific to head and neck cancers and cancers of the upper gastrointestinal tract (oesophagus), as previously highlighted by the NutriCancer study. The leading cause of malnutrition in the context of other cancers is anorexia, associated with very frequent disorders of taste and stimulation of the proopiomelanocortin system, which inhibits food intake [17]. In 2007, a study conducted on a single day in 1,023 patients showed that more than 50% of patients reported that they ate less, and a similar percentage reported a modification of taste since onset of their disease [18]. Alterations of taste may have been underestimated in the present study due to the high prevalence of pain and/or dysphagia in the population of malnourished patients. Alterations of taste

| Variables | Non-malnourished patients n = 87 (%) | Malnourished patients n = 82 (%) | P  
---|---|---|---
| Gender | | |  
| Male | 62 (71) | 77 (94) | 0.01  
| Female | 25 (29) | 5 (6) |  
| Age | | |  
| Mean age of the population | | |  
| < 59 years | 42 (48) | 32 (39) |  
| > 59 years | 45 (52) | 50 (61) | ns  
| Elderly subjects (n = 15) | | |  
| ≥ 75 years | 5 (6) | 10 (12) | 0.01  
| < 75 years | 0 | 0 |  
| Smoking (n = 145) | | |  
| Yes | 64 (73.5) | 61 (74) | ns  
| No | 8 (9) | 12 (14) |  
| Alcohol (n = 135) | | |  
| Yes | 52 (60) | 68 (82) | 0.02  
| No | 7 (8) | 8 (10) |  
| Tumour sites | | |  
| Oropharynx + hypopharynx | 30 (34.5) | 60 (76) | 0.03  
| Oral cavity + larynx | 57 (65.5) | 22 (27) |  
| Tumour stage | | |  
| I-II | 57 (65) | 33 (40) | 0.01  
| III-IV | 30 (35) | 49 (60) |  

n: number.

* Groups 1 and 2 combined: limit of significance: P = 0.05.
The patient must also be made aware of the importance of nutrition in the treatment of cancer, and all of the medical team must provide specific education on these aspects right from the start of management. Finally, pain must be treated rapidly and effectively and referral to a pain specialist may be useful and necessary.

Once the diagnosis of malnutrition has been established, the nutritional intake, particularly oral feeding, must be adapted to the constraints related to the head and neck cancer and secondary treatment-related malnutrition must be prevented to avoid interruption of these treatments. The modalities of nutritional support must take into account the tumour site, nutritional consequences related to treatments, absorption capacities and the estimated duration of nutritional support. Enteral nutrition should be preferred and must be monitored by the dietician together with the physician, in collaboration with the patient. No formal consensus has been reached concerning the optimal protein and energy intake nutritional objectives in cancer patients, but the data of the literature indicate that daily calorie intake required to improve the patient’s lean weight and increase hepatic protein production, i.e. anabolism, is situated between 30 and 45 kcal/kg, i.e. an average of 1600 to 2400 kcal/24 h. Similarly, the protein intake usually recommended is about 0.2 to 0.35 g of nitrogen/kg/24 h, i.e. an average of 12 to 18 g of nitrogen per day. These values apply to both enteral and parenteral nutrition [20] and must be adapted to the patient’s physical activity.

Conclusion

Decreased food intake and its corollary, malnutrition, must be very rapidly taken into account in the management of patients with head and neck cancer. The Detsky index, although subjective, constitutes a good marker of malnutrition. The risk of malnutrition is higher in patients with a history of alcohol abuse, in men, in patients with advanced tumours of the pharynx and in the elderly. Corrective measures must be instituted very rapidly, based on a multidisciplinary approach with close collaboration between physicians, diетicians and the patient, as the nutritional management of patients with this type of cancer is often poorly adapted, as demonstrated in the present study. Long-term follow-up is essential to improve tolerance of cancer treatments, as these treatments are responsible for deterioration of malnutrition, which can compromise the patient’s quality of life and survival.

Disclosure of interest

The authors declare that they have no conflicts of interest concerning this article.

Acknowledgement

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Appendix A. Supplementary data

Supplementary data associated with this article can be found, in the online version, at http://dx.doi.org/10.1016/j.anorl.2012.10.001.

References


