ESMO Open
Cancer Horizons

Prognostic Nutritional Index: an easy nutritional screening for patients with head and neck cancer?

Paolo Bossi

To cite: Bossi P. Prognostic Nutritional Index: an easy nutritional screening for patients with head and neck cancer? *ESMO Open* 2018;**3**:e000449. doi:10.1136/esmoopen-2018-000449

Received 28 September 2018
Accepted 29 September 2018

Published online
24 October 2018

Head and Neck Medical Oncology, Fondazione IRCCS Istituto Nazionale dei Tumori di Milano, Milan, Italy

Correspondence to
Dr Paolo Bossi; paolo.bossi@istitutotumori.mi.it

Weight loss in patients with head and neck cancer (HNC) may have different causes, mainly driven by reduced caloric intake and inflammatory status. The first may be caused by disease-associated pain and difficulty in swallowing due to tumour burden obstructing the upper aerodigestive ways; the latter by an aberrant metabolic and inflammatory state due to the release of mediators produced by the tumour and the host. Therefore, nutritional and metabolic issues should both be assessed with the attention to caloric intake and inflammatory cytokines release.

Malnutrition, sarcopenia and cachexia, defined according to the issues of weight loss, reduced body mass index, muscle mass loss, decrease of muscle strength, metabolic abnormalities and increase in inflammatory markers or with a combination of these factors, have been shown to be predictors of worse outcomes in patients with HNC.[1–3]

In their work, Bruixola and colleagues retrospectively evaluated two cohorts of patients with squamous cell HNC, who were treated in a homogeneous way, and confirmed an independent prognostic role for the Prognostic Nutritional Index (PNI).[4] Moreover, they found that PNI, defined with the combined parameters of albumin and lymphocytes, reflected a trait of the patient, who was not apparently correlated with primary tumor site, HPV status and smoking or alcohol addiction. In this regard, easy and pragmatic markers could be useful for screening and further identification of patients who could need a tailored diagnostic approach and therapeutic intervention.

Acknowledging the limits of the work, mainly consisting of a low number of patients evaluated for HPV status and in the intensive and not up-to-date treatment (induction chemotherapy followed by 3D radiation therapy with concurrent systemic therapy), this paper adds to the current evidence in HNC research of prognostic factors. Other haematological markers have been studied for their prognostic role in patients with HNC before treatment. Pretreatment neutrophil:lymphocyte ratio (NLR), total lymphocytes number, albuminaemia, haemoglobin level and C-reactive protein values are some examples of circulating markers linked with outcomes.[5–7] In this context, PNI is an easy and reproducible tool, with minor variability, and it could be considered as a surrogate marker both of nutritional status and systemic inflammation, so intercepting both components and killing two birds with one stone. Moreover, it could help in refining our ability to define prognosis in chemoradiation-treated patients, where the clinical research is going to find a direction between de-escalation and escalation trials.

Many questions remain unanswered, and many studies are stimulated by the results of this study. First, is PNI related to treatment toxicities and to the inability to receive adequate dose intensity? Furthermore, is PNI an expression of a reduced tolerance to the treatments themselves which, however, could maintain their efficacy, if performed with a correct dose intensity or is it a marker of a reduced immunological response by the host which compromises the response to the treatments?

The answer to this question would orientate different therapeutic strategies. Obviously, it cannot be considered a black or white situation, but the different impact of these two factors could direct the therapeutic choices. Embracing the first option, we should prehabilitate the patient's ability to tolerate the correct treatment intensity. If we choose the second option, we should work on different therapeutic strategies which are aimed at increasing the host immune response and reverting the resistance to the treatment, through the increase of immunological response.

The first option could be reinforced by early interventions aimed to restore better nutritional status, as with enteral nutrition, so to increase treatment tolerability. In this regard, previous studies have dealt with the impact of nutritional factors in predicting a higher risk of treatment toxicities. Kono *et al* demonstrated that patients with a low PNI at baseline had a significant higher risk of adverse events during radiation treatment.[8] Therefore, supporting nutritional status of the patients before treatment start could reduce the risk of toxicities, increasing the compliance with the full treatment and finally providing better outcome.

The second option could be exploited, for instance, with the use of immunonutritional supplements. Immunonutrition refers to the administration of specific products with pharmaceutical-like effect, with the aim of reducing inflammation and improving the immunological host response.[9] In this regard, data suggest the ability of immunonutrition to improve the outcome of surgically treated gastrointestinal patients. How these products could reinforce the immune response of patients with HNC to combined treatments and how they could positively interact with new immunotherapeutic combinations deserve specific trials.

It is important to stress the importance of nutritional assessment before, during and at the end of the treatment for patients with HNC, with easy screening tools, which could promptly identify patients who need an intensive approach. Often, the implementation in clinical practice of such tools is lacking, therefore not alllowing an effective treatment able to correct nutritional issues with individualised counselling.[10] Therefore, PNI could represent one of the parameters to be considered in the nutritional screening, and further research should correlate the circulating nutritional and inflammatory biomarkers with functional and radiological parameters, to best define the patients at higher risk and to implement tailored interventions.

Future applications of PNI in HNC should identify its role in the context of other therapeutic approaches. The prognostic ability of PNI in primarily surgically treated patients should be better explored, to identify whether this parameter is treatment-dependent, or whether it is applicable to different therapeutic strategies. Similarly, one should consider PNI as a predictor of response to immunotherapy in HNC. Recently, low pretreatment PNI has been associated to early termination of nivolumab in patients with non-small cell lung cancer[11]; moreover, in a heterogeneous population of patients treated with immunotherapy, the Gustave Roussy Immune Score, based on albumin, LDH and NLR, showed to be prognostic for survival.[12] Therefore, the advantages of PNI as an easy and reproducible biomarker reflecting both the underlying immune status and the host inflammatory response should be better exploited also in the immunotherapeutic arena.

Contributors PB is the sole author.

Funding The authors have not declared a specific grant for this research from any funding agency in the public, commercial or not-for-profit sectors.

Competing interests None declared.

Patient consent Not required.

Provenance and peer review Commissioned; internally peer reviewed.

REFERENCES

1. Orell-Kotikangas H, Österlund P, Mäkitie O, *et al*. Cachexia at diagnosis is associated with poor survival in head and neck cancer patients. *Acta Otolaryngol* 2017;137:778–85.
2. Grossberg AJ, Chamchod S, Fuller CD, *et al*. Association of body composition with survival and locoregional control of radiotherapy-treated head and neck squamous cell carcinoma. *JAMA Oncol* 2016;2:782–9.
3. van Bokhorst-de van der Schuer, van Leeuwen PA, Kuik DJ, *et al*. The impact of nutritional status on the prognoses of patients with advanced head and neck cancer. *Cancer* 1999;86:519–27.
4. Bruixola G, Caballero J, Papaccio F, *et al*. Prognostic nutritional index as an independent prognostic factor in locoregionally advanced squamous cell head and neck cancer. *ESMO Open* 2017;28.
5. Yu Y, Wang H, Yan A, *et al*. Pretreatment neutrophil to lymphocyte ratio in determining the prognosis of head and neck cancer: a meta-analysis. *BMC Cancer* 2018;18:383.
6. Park MJ, Roh JL, Kim SB, *et al*. Prognostic value of circulating biomarker score in advanced-stage head and neck squamous cell carcinoma. *Eur J Cancer* 2018;92:69–76.
7. Moon H, Roh JL, Lee SW, *et al*. Prognostic value of nutritional and hematologic markers in head and neck squamous cell carcinoma treated by chemoradiotherapy. *Radiother Oncol* 2016;118:330–4.
8. Kono T, Sakamoto K, Shinden S, *et al*. Pre-therapeutic nutritional assessment for predicting severe adverse events in patients with head and neck cancer treated by radiotherapy. *Clin Nutr* 2017;36:1681–5.
9. Vasson MP, Talvas J, Perche O, *et al*. Immunonutrition improves functional capacities in head and neck and esophageal cancer patients undergoing radiochemotherapy: a randomized clinical trial. *Clin Nutr* 2014;33:204–10.
10. Langius JA, Zandbergen MC, Eerenstein SE, *et al*. Effect of nutritional interventions on nutritional status, quality of life and mortality in patients with head and neck cancer receiving (chemo)radiotherapy: a systematic review. *Clin Nutr* 2013;32:671–8.
11. Nakao M, Muramatsu H, Kagawa Y, *et al*. Immunological status may predict response to nivolumab in non-small cell lung cancer without driver mutations. *Anticancer Res* 2017;37:3781–6.
12. Bigot F, Castanon E, Baldini C, *et al*. Prospective validation of a prognostic score for patients in immunotherapy phase I trials: The Gustave Roussy Immune Score (GRIm-Score). *Eur J Cancer* 2017;84:212–8.