THE EVALUATION OF PREOPERATIVE NUTRITIONAL STATUS IN PATIENTS UNDERGOING THORACIC SURGERY

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THE EVALUATION OF PREOPERATIVE NUTRITIONAL STATUS IN PATIENTS UNDERGOING THORACIC SURGERY. **Aim.** The aim of this study was to assess the preoperative nutritional status of patients undergoing thoracic surgery using different nutritional tools. **Material and methods.** We conducted a prospective study on a sample of 43 thoracic patients, including 23 with neoplasms and 20 with non-neoplastic pathology who underwent thoracic surgery procedures between July-September 2011, in the Thoracic Surgery Clinic in Iaşi. Weight and height were measured and body mass index (BMI) was calculated. WHO classification for BMI categories was used. Preoperative serum level of transthyretin (TTR) and demographic data (gender, age) were also assessed. All patients were examined by the Subjective Global Assessment (SGA) and the Nutritional Risk Screening 2002 (NRS 2002). **Results.** After performing SGA, 67.9 % of the patients were well-nourished, 21.4 % were moderately or suspected of being malnourished and 10.7 % were severely malnourished. The level of TTR was significantly lower in the moderately or severely malnourished group, compared to those considered well-nourished. According to NRS-2002, 42.9 % of the patients were considered at nutritional risk. The level of TTR of these patients was lower than the level of TTR of the patients without nutritional risk, but without statistical significance. **Conclusions.** Subjective Global Assessment (SGA) and the Nutritional Risk Screening 2002 (NRS 2002) are useful in identifying patients with nutritional risk, so that appropriate nutritional management could be initialised even before surgery. **Keywords:** PREOPERATIVE STATUS, NUTRITIONAL STATUS, THORACIC SURGERY, TRANSTHYRETIN

The prevalence of malnutrition in surgical services varies between 20-50% (1). Preoperative malnutrition is common in surgical patients and has been associated with adverse clinical outcomes (2). This suggests that identifying patients at risk and recommending perioperative nutritional support can improve nutritional status of patients undergoing surgery. Hospital malnutrition has serious adverse effects on the treatment and outcome of illness and is associated with higher infection and complication rates, increased muscle loss, impaired wound healing, longer length of hospital stay and increased morbidity and mortality (2, 3). Costs are increased in

malnourished patients whether or not a complication occurs, but they augment significantly if one happens (4). All of these factors contribute to increasing length of hospitalization, number of re-admissions in the hospital and a marked increase in patient care costs (5).

Protein-energy malnutrition is associated with a worse prognosis and increased mortality. Although several screening systems have been developed, it is still poorly recognized, and there is no consensus on which test is more reliable and feasible in clinical practice. Transthyretin (TTR) is a potential useful marker because its serum concentrations are closely related to early changes in nutritional status (6). Nutritional status is largely not systematically assessed and therefore the patient's nutritional plan is not yet included in the usually medical plan. There is a lack of data on the perioperative nutritional risk and on the prevalence of perioperative malnutrition in thoracic surgery units. The aim of this study was to assess the nutritional status of patients undergoing thoracic surgery using different nutritional tools.

MATERIAL AND METHODS

The study took place in Thoracic Surgery Department in Clinical Pneumology Hospital, Iaşi, Romania. In this prospective study, we enrolled all consecutive patients who underwent thoracic surgery between July-September 2011. The Ethics Committee of the Clinical Hospital of Pneumology Iaşi approved the study (no. 13953/2011), which was conducted in accordance with the Helsinki Declaration and all patients signed informed consent form before being enrolled. The demographic data (gender, age) of patients were assessed. We evaluated weight, height and thus calculated body mass index (BMI). All anthropometric measurements were performed by the same investigator. The weight was recorded *a jeun*, to the nearest 0.1 kg, using calibrated medical portable scales with 4 sensors (model 27236; Liamed, Brasov, Romanian). Height was measured using a stadiometer to the nearest 0.1 m (Practical Metrology, Lancing, UK). The BMI was calculated by the current weight (kg) over height $(H)^2$ (m^2) ratio and classified according to World Health Organization. Subjects were grouped in well-nourished (BMI $\geq$ 18.50 kg/m^2) and malnourished (BMI $<$ 18.50 kg/m^2) patients. Preoperative serum level of TTR was analysed by ELISA. All patients were examined by the Subjective Global Assessment (SGA) and the Nutritional Risk Screening 2002 (NRS 2002). SGA was carried out based on patient's history regarding weight loss, dietary intake, gastrointestinal symptoms, functional capacity, and physical signs of malnutrition (loss of subcutaneous fat or muscle mass, oedema, ascites), according to the method described by Detsky et al. (7). Patients were classified as well-nourished (A), moderately or suspected of being malnourished (B) or severely malnourished (C). The Nutritional Risk Score (NRS-2002) is the recommended screening tool (for nutritional risk) by the European Society of Parenteral and Enteral Nutrition/European Society of Clinical Nutrition and Metabolism (ESPEN) and was performed according to the recommendations set by Kondrup et al. (8). Nutritional risk was evaluated through impaired nutritional status and disease severity. Evaluated nutritional parameters were: BMI, recent weight loss, and food intake during the week before admission. The worst indicator was taken into account. Patients were scored in each of the two components: undernutrition and disease severity. A score between 0 and 3 was given for each of the two components according to the recommendations for each

parameter. When the age of the patient was>70 years, a value of one was added to the total score. Patients with a total score of three or more were considered at nutritional risk. The results of the study were expressed as mean ± standard deviation (x±SD). Unpaired t-tests were used to compare data in different groups of patients. Statistical significance was set at $p \leq 0.05$ for all tests.

RESULTS

Forty three patients who underwent thoracic surgery were included in this study (tab. I). Subjects had a median age of 54.51 ± 16.70 years and 79 % (n=33) were male. The average BMI in the study group was 24.14 ± 5.44 kg/m^2, the women having an average BMI of 25.25 ± 5.32 kg/m^2, and the men with an average BMI of 23.72 ± 5.35 kg/m^2 ($p>0.05$).

Analysing BMI, we noticed that 13.8 % of the subjects had a BMI < 18.5 %, the others being: 44.8 % of normal weight, 24.1 % overweight and 17.2 % obese. The average TTR level in the study group was 20.8 ± 8.9 mg/dl, and there was no statistically significant difference between the TTR of patients with BMI < 18.5 kg/m^2 (TTR = 19.2 ± 8 mg/dl) and those with BMI ≥ 18.5 kg/m^2 (TTR = 21.1 ± 9.2 mg/dl).

TABLE I

Distribution of series of 43 thoracic patients according to pathology

Pathology		**N**	**%**
Neoplastic	NSCLC	17	39,53
	SCLC	1	2,32
	Esophageal squamous cell carcinoma	1	2,32
	Breast Cancer with malignant pleural effusion	1	2,32
	Basal cell cancer of central face with malignant pleural effusion	1	2,32
	Cancer with no clear origin and malignant pleural effusion	2	4,65
Non-neoplastic	Spontaneous pneumothorax	4	9,30
	Pleural empyema	4	9,30
	Sarcoidosis	2	4,65
	Pulmonary tuberculoma	2	4,65
	Tuberculous thoracic parietal abcess	1	2,32
	Pulmonary abcess	1	2,32
	Posttraumatic pneumothorax	1	2,32
	Posttraumatic hemopneumothorax	1	2,32
	Spontaneous chest wall hematoma	1	2,32
	Miastenia gravis with thymus hyperplasia	1	2,32
	Pulmonary hamatochondroma	1	2,32
	Costal osteoid osteoma	1	2,32

NSCLC - non-small cell lung cancer; SCLC - small cell lung cancer

After performing SGA, we concluded that 67.9 % of the patients were well-nourished (score A), 21.4 % were moderately or suspected of being malnourished (score B) and 10.7 % were severely malnourished (score C). When taking into account only patients with a BMI ≥ 18.5 kg/m^2, we still found that 25 % were in the categories with risk, that is: 20.8 % were moderately or suspected of being malnourished (score B) and 4.2 % were severely malnourished (score C). The level of TTR was significant-

ly lower in the group with scores B or C according to SGA, compared to those considered well-nourished (TTR = 15.5 ± 7 mg/dl vs. TTR = 23.1 ± 8.9 mg/dl, p=0.05).

The Nutritional Risk Score (NRS-2002) showed that 42.9 % of the patients included in our study were considered at nutritional risk. Moreover, out the patients with a BMI ≥ 18.5 kg/m^2, 37.5 % were at nutritional risk, based on the NRS-2002. The level of TTR of the patients considered at nutritional risk was lower than the level of TTR of the patients without nutritional risk, but statistical significance was not obtained (TTR = 17.9 ± 6.9 mg/dl vs. TTR = 23 ± 9.8 mg/dl, p>0.05).

DISCUSSION

Protein-energy malnutrition represents acute or chronic protein loss leading to a state of nutritional deficiency that causes a decrease in defense mechanisms against infection, delay healing and alteration of certain important functions (respiratory, cardiac, endocrine). It is associated with a lower response of the organism during a certain condition and may be reversed in an anabolic state by medical intervention. It is common in hospitalized patients, being associated with increased mortality (9).

Disease-related malnutrition varies in different studies and has been reported in 10% to 55% of people in hospital and the community (2). The prevalence of malnutrition in people with cancer, chronic diseases and after major surgery has been reported to be around 10% (2). A large percentage of our study population had or was at risk of malnutrition.

There is no "gold standard" for determining nutritional status. A modification of protein and energy intake leads to changes in the same direction of circulating concentrations of TTR (10). Like albumin, TTR is considered a negative acute phase reactant, as it may decrease in an inflammatory context (11).

Currently TTR is the most commonly used visceral protein to assess nutritional status (12). TTR is a useful marker in monitoring malnourished patients because its serum concentrations are influenced by changes of early nutritional status and respond to nutritional support (13). TTR level measurement is a sensitive and cost-effective method for assessing the severity of disease in critically or chronically ill patients (14).

TTR is a more reliable nutritional marker than albumin due to short half-life (48 hours), a relatively low spread in the body and the rapid synthesis which is influenced by protein intake (15). TTR concentration decreases significantly in just three days after inadequate nutritional intake and increases by 1 mg/day when the nutritional requirements are satisfied (16). Hypoalbuminemia is an independent strong risk factor, depending on the concentration, for morbidity, mortality, acute renal failure and other negative clinical results (17), but due to the widespread in the body, the half-life of 20 days, and sensitivity to the patient's hydration status, albumin is a less sensitive parameter in assessing protein-energy malnutrition. A study on 1760 patients demonstrated that serum albumin and BMI alone underestimated the prevalence of malnutrition at hospital admission (18).

TTR concentration decreases in the presence of inflammation (negative acute phase reactant). Rapid changes in C-reactive protein may lead to overestimation of malnutrition. While these limitations must be taken into account, the study conducted by Devoto et al. (6) concluded that serum TTR can still be reliable in cases associating inflammatory processes.

SGA is a nutritional score created over two decades ago to assess nutritional status

and risk of infectious complications in patients undergoing surgery. This score takes into account changes in body composition and physiological functions. In one study, patients considered in the category of preoperative severe malnutrition showed higher postoperative infectious and non-infectious morbidity (19). In our study, 32 % of subjects had moderate or severe malnutrition, according to SGA.

In Western Europe, 25-30% of patients who are undergoing surgery are considered at increased nutritional risk preoperatively (20). For nutritional screening in hospitalized patients, the European Society for Clinical Nutrition and Metabolism recommends the use of Nutritional Risk Screening score (NRS 2002). In a general population of hospitalized patients, this score is easy to implement, reliable and reproducible for identifying patients at nutritional risk (8). Compared with other screening tools, this system is unique in that it has been developed from the idea that the indication for nutritional support depends on the severity of malnutrition and increased nutritional needs that may result from underlying disease. Therefore, severe malnutrition or severe disease, alone or together, constitutes an indication for the need for nutritional support (8, 21). NRS 2002 is also used increasingly for preoperative classification and risk assessment (22), although it has been designed to predict therapeutic effects, not complications (8).

A study conducted by Kawai et al. aimed at identifying biomarkers that might be useful in predicting postoperative early recurrence of lung cancer. They evaluated the perioperative nutritional status of the patients by measuring the serum level of TTR and analyzed the correlation between this factor and early recurrence, in a sample of forty-four patients with NSCLC. The conclusion of the authors was that low serum TTR level in the perioperative period was associated with a poorer prognosis in NSCLC patients and could serve as a marker for identifying patients at high risk, even at an early clinical stage. (23).

Devoto et al. studied the prevalence of protein-energy malnutrition and TTR serum concentrations in 108 hospitalized patients. The Detailed Nutritional Assessment (DNA) was used as the reference method to determine protein-energy malnutrition. TTR performance was compared with that of 2 other methods, the Subjective Global Assessment (SGA) and the Prognostic Inflammatory and Nutritional Index score (PINI). According to the DNA reference method, 41% of patients were classified with mild malnutrition and 19% with severe malnutrition. TTR showed the best concordance with the standard DNA method (concordance index, 76.8%) and a good sensitivity/specificity profile (83.1%/76.7%) compared with SGA and PINI. They concluded that TTR could represent a feasible and reliable tool in the evaluation of malnutrition, especially in settings where it is difficult to obtain a more detailed and comprehensive nutritional assessment such as the DNA (6).

CONCLUSIONS

Our data support the assessment of nutritional status of in-patients undergoing thoracic surgery. The nutritional state per se is predictive for postoperative outcome and must be seriously assessed in every thoracic patient undergoing surgery. BMI is not a reliable tool on its own in assessing nutritional status of patients undergoing thoracic surgery. Subjective Global Assessment (SGA) and the Nutritional Risk Screening 2002 (NRS 2002) are useful in identifying patients with nutritional risk, so that appropriate nutritional management could be initialized even before surgery.

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