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Original Article

Nutritional follow-up in patients with ischemic stroke: With a screening test or with blood parameters?

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Abstract

Aim: The aim of this study was to evaluate the nutritional status of stroke patients and to investigate the value of screening tests and blood parameters in nutritional status follow-up.

Material and Methods: This study was conducted on 42 patients who were hospitalized with ischemic stroke. Mini nutritional assessment (MNA) test was performed at admission to all patients. Personalized oral nutritional support was initiated in patients with malnutrition risk (MNA score < 24) or malnutrition (MNA score < 17). During the first visit, albumin, prealbumin, C - reactive protein (CRP), total cholesterol and hemogram tests were examined. After four weeks follow-up, MNA test and blood tests were repeated in all patients included in the study. Data at baseline and at the end of four weeks were compared.

Results: The mean MNA score was 22.44±3.13 at first visit. 15 patients (35.7%) were found to be at risk of malnutrition and 7 (16.6%) were malnourished at admission. Serum albumin and prealbumin levels were significantly lower in patients with abnormal nutritional status ($p<0.001$). There were no significant differences in other blood parameters. Patients who were provided oral nutritional support had significantly higher MNA scores and mid-arm circumference value at the end of four weeks. No significant differences were found between baseline and fourth week blood parameters ($p>0.05$).

Conclusion: The nutritional status of stroke patients should be evaluated at regular intervals after the admission and optimal nutrition plan should be made. MNA scoring is a safe method for both diagnosis and monitoring of malnutrition.

Keywords: Ischemic stroke; malnutrition; mini nutritional assessment; blood parameters.

INTRODUCTION

Disease related malnutrition is an important health problem. Malnutrition in hospitalized patients is associated with many negative consequences such as longer hospitalization, increased morbidity and mortality, and increased costs (1,2). Assessment of nutritional status and nutritional planning during admission are important in terms of clinical outcomes (3). The rate of malnutrition in stroke patients at admission to hospital is 3.8-32% and this ratio increases to 7.5-35% at the end of the second week of hospitalization (4,5). The American Stroke Association and Heart Association guidelines for the early management of patients with acute ischemic stroke recommend that all stroke patients should be evaluated for their baseline nutritional status and any malnutrition should be corrected or improved as soon as possible (6). There are different methods used to classify malnutrition ranging from clinical signs and symptoms to anthropometric measures and biochemical tests. The aim of the nutritional screening tests to be used is to predict the effects of nutritional status on prognosis and to provide an idea about whether nutritional support will benefit (7). There are studies that biochemical parameters can also be used to monitor the nutritional status of stroke patients (8,9). Although many markers have been used for nutritional purposes, none have been found to be entirely satisfactory (10).

The aim of this study was to evaluate the nutritional status of stroke patients and to investigate the value of screening tests and blood parameters in nutritional status follow-up.

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MATERIAL and METHODS

This study was conducted on 42 patients prospectively who were hospitalized with ischemic stroke in Burdur State Hospital neurology clinic. The study was approved by Pamukkale University Medical School Non-Interventional Clinical Trials Ethics Committee and has been conducted in accordance with the principles of Helsinki Declaration. All participants were informed about the purpose and procedures and their written informed consent was obtained to participate in this study.

Patients with a known history of malnutrition, diabetes, gastrointestinal disease, liver and/or kidney disease, rheumatic disease or malignancy were excluded. Only patients who could be fed orally were included in the study. Mini nutritional assessment (MNA) test was performed at admission to all patients. MNA has been developed as a screening and evaluation test in geriatric patients (11). It includes anthropometric measurements and is one of the most frequently used tests. Mid-Upper Arm Circumference (MAC) is the circumference of the left upper arm, measured at the mid-point between the tip of the shoulder and the tip of the elbow. MAC is a part of MNA and used for the assessment of nutritional status. Besides malnutrition screening, malnutrition severity can be evaluated by MNA test.

Nutritional support protocol is part of routine clinical care in our clinic for the patients with abnormal nutrition status. Personalized oral nutritional support was initiated in patients with malnutrition risk (MNA score < 24) or malnutrition (MNA score < 17). These patients were assessed by the dietitian and nutrition nurse. Oral nutritional supplements were recommended according to patients' basic daily calorie and protein intake and their daily needs. Energy requirements were calculated using 25-30 kcal/kg body weight or the Harris Benedict equation. During the first visit, albumin, prealbumin, C - reactive protein (CRP), total cholesterol and hemogram tests were examined. After four weeks, MNA test and blood tests were repeated in all patients included in the study. Patients with malnutrition and under the risk of malnutrition were grouped as abnormal nutritional status. Data at baseline and at the end of four weeks were compared.

Statistical analysis of the study was performed with SPSS 21.0. The Kolmogorov Smirnov test was applied to determine the normality of the distribution of data. Independent samples T test was used in the comparison of normal versus abnormal nutritional status groups. Paired samples T test was used to compare the scores at the baseline and at the end of four weeks. $p<0.05$ was considered statistically significant.

RESULTS

The mean age of the patients was 67.1±16.9 years. The mean MNA score was 22.44±3.13 at first visit. 15 patients (35.7%) were found to be at risk of malnutrition and 7 (16.6%) were malnourished at admission. Serum albumin and prealbumin levels were significantly lower in patients with abnormal nutritional status ($p<0.001$). There were no significant differences in other blood parameters. Baseline clinical and laboratory features according to nutritional status are shown in table 1. Patients who were provided oral nutritional support had significantly higher MNA scores and MAC value at the end of 4 weeks. No significant differences were found between baseline and fourth week blood parameters ($p>0.05$) (Table 2).

Table 1. Baseline clinical and laboratory features according to nutritional status

Variable	Abnormal Nutritional Status (n:22)	Normal Nutritional Status (n:20)	p-value
Age (year, mean±SD)	66.85±14.3	67.40±15.3	0.972
Gender (female, n,%)	12 (54.5)	10 (50)	0.319
MNA (mean±SD)	20.09±4.87	25.02±4.03	<0.001
Albumin (mean±SD, g/dl)	2.9±1.1	3.8±1.9	<0.001
Prealbumin (mean±SD, mg/dl)	14.7±4.3	34.9±5.8	<0.001
CRP (mean±SD, mg/dl)	2.9±1.1	2.6±0.9	0.630
Hemoglobin (mean±SD, g/dl)	11.3±6.2	12.1±6.1	0.123
Cholesterol (mean±SD, mg/dl)	190.1±15.2	212.8±14.9	0.097

MNA: Mini Nutritional Assessment, CRP: C-Reaktive Protein, SD: Standard Deviation

Table 2. Comparison of the MNA scores, anthropometric measurements and blood parameters in baseline and four-week control of the patients with abnormal nutritional status (n:22)

Variable	Baseline (mean ± SD)	Four-week control (mean ± SD)	p-value
MNA	20.09±4.87	24.35±6.78	**<0.001**
Mid-arm circumference (cm)	24.7±3.6	27.1±3.9	**0.047**
Albumin (g/dl)	2.9±1.1	3.2±1.8	0.071
Prealbumin (mg/dl)	14.7±4.3	19.3±5.3	0.084
CRP (mg/dl)	2.9±1.1	2.7±0.9	0.117
Hemoglobin (g/dl)	11.3±6.2	12.1±6.8	0.876
Cholesterol (mg/dl)	190.1±15.2	192.8±13.7	0.914

MNA: Mini Nutritional Assessment, CRP: C-Reaktive Protein, SD: Standard Deviation

DISCUSSION

According to the data we obtained in our study, 22 patients (52.3%) who were hospitalized with the diagnosis of ischemic stroke, were found to have abnormal nutritional status. In these patients, albumin and prealbumin levels were lower than patients with normal nutritional status. Although there was an improvement in MNA scores in patients provided oral nutritional support at the end of four weeks, no significant change was observed in blood parameters.

Serum biomarkers have been used to evaluate the adequacy of nutrient intake or nutritional status during hospital admissions (12). Serum biomarkers, measured as part of routine blood tests, are objective and relatively convenient to use. Albumin is the most studied blood parameter for the diagnosis of malnutrition. Albumin is a plasma protein primarily synthesized in the liver. Decrease of albumin level is associated with malnutrition and chronic inflammatory diseases (13). Hypoalbuminemia, usually defined as serum albumin concentration <3.5 g/dl, is traditionally considered a standard indication of malnutrition (14). Prealbumin levels, such as albumin, can also be used as a marker of malnutrition (15). However their predictive value in assessing nutritional status of stroke patients is not well studied. In our study, serum albumin and prealbumin levels were significantly lower in patients with ischemic stroke who were found malnourished and at risk of malnutrition. Serum markers may vary due to many non-nutritional reasons in acute pathologies. Because albumin and prealbumin are negative acute phase reactants, their levels can be found low in acute stress (16). The half-life of albumin and prealbumin is approximately 21 days and 2 days, respectively. Therefore, prealbumin is relatively more sensitive to changes in nutritional status compared to albumin, and provides a better reflection of the most recent dietary intake rather than the general condition of nutrition (17). In most patients, an increase in prealbumin can be expected within 2-4 days after nutritional support is provided (18). In our study, serum albumin and prealbumin levels were examined in the first 24 hours and at the end of 4 weeks. Hence, the baseline values that we obtained reflect the previous nutritional status. In our study, serum albumin and prealbumin levels did not show significant improvement in patients who have better nutritional assessment scores. In another study assessing nutritional status of critically ill patients by using serum prealbumin levels, it was shown that there is no relationship between prealbumin and clinical outcomes (19). Although albumin and prealbumin levels may be used in the diagnosis of malnutrition, it is thought that they are not appropriate for monitoring nutritional status and should be used carefully in the follow-up of malnutrition.

Inflammation due to disease or aging is an important etiological factor in the development of malnutrition (20). Thus, CRP, an indicator of the inflammatory process, was also used for malnutrition monitoring. However, many studies have shown that CRP is not a good indicator for nutritional status (21-23). Similarly in our study, CRP was not found to be significant in the follow-up of nutritional status. CRP can be found to be high in the early period in case of an acute disease as an acute phase reactant. In acute stroke patients, CRP may be elevated due to acute stress. In our study, in follow up, CRP was found to be vary independently of nutritional status. In this sense, it was thought that CRP can not be used in nutritional status assessment and follow-up.

Data on nutritional status assessment with other blood parameters are limited. In some studies, it was stated that hemoglobin and cholesterol levels could be used in the diagnosis of malnutrition. In a study, hemoglobin and triglyceride values were significantly improved in stroke patients with early enteral nutrition (24). It is important

that these parameters are not affected by acute stress, but there is not enough evidence to explain their relationship with nutritional status. In a study, malnourished geriatric patients were shown to have lower cholesterol levels (25). In our study, there was no significant difference in cholesterol levels in malnourished patients. Considering the role of atherothrombosis in the pathophysiology of ischemic stroke, it is not appropriate to use cholesterol values in the diagnosis and follow-up of malnutrition in stroke patients.

The efficacy of nutritional status monitoring with MNA has been demonstrated in various neurological diseases (11, 26, 27). In our study, 22 (52.3%) patients had malnutrition or risk of malnutrition. This ratio is higher than the data obtained in previous studies. The population assessed in our study generally consisted of low-income patients with lower education levels and residing in rural areas could account for the higher malnutrition rates. Patients who are not fed adequately and develop malnutrition during the hospitalization period have worse prognosis (28). MNA, which is a valid and reliable scoring, is important because it also includes anthropometric measurements in addition to general nutritional assessment. MAC measurement is an easy and good way to assess lean muscle mass and nutritional status (29). In our study, significantly higher malnutrition screening scores were obtained in patients after oral nutrition support. In addition, significantly higher MAC values were found in these patients. This is another indicator of improvement in nutritional status in patients. However, no significant change in blood parameters was observed after nutritional support in these patients. Therefore, MNA scoring is a safe method for both diagnosis and monitoring of malnutrition.

Our study has some limitations. First, because our study was conducted only in orally fed ischemic stroke patients, generalization is not possible for all stroke patients and for patients who cannot be fed orally. Second, in our study, control was studied at the end of the four-week period, nevertheless longer follow-up periods may be required for blood parameters. In addition, it is not possible to make comment about other blood parameters which could not be performed because technical reasons.

CONCLUSION

The nutritional status of stroke patients should be evaluated at regular intervals after the admission and optimal nutrition plan should be made (30). Previously, studies combining screening tests and blood markers have been carried out to determine the risk of malnutrition (25, 31). To our knowledge, this is the first study to evaluate screening tests and blood biomarkers in nutritional status follow-up in stroke patients. Further studies are needed about the importance of blood parameters in nutritional status follow up in other patient groups.

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