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Original / *Valoración nutricional*

Nutritional status and its impact on time and relocation in postoperative complications of abdominal patients undergoing surgery

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Abstract

Introduction: The nutritional state is the independent factor that most influences the post-operational results in elective surgeries.

Objective: to evaluate the influence of the nutritional state on the hospitalization period and on the post-operative complications of patients submitted to abdominal surgery.

Methods: prospective study with 99 surgical patients over 18 years of age, submitted to abdominal surgeries in the period from April to October of 2013, in the *Instituto de Medicina Integral Professor Fernando Figueira* (IMIP). All patients were submitted to anthropometric nutritional evaluations through the body mass Index (BMI), arm circumference (AC) and triceps skinfold thickness (TEST). The biochemical evaluation was carried out from the leukogram and serum albumin results. The identification of candidate patients to nutritional therapy (NT) was carried out through the nutritional risk (NR) evaluation by using the BMI, loss of weight and hypoalbuminemia. The information about post-operational complications, hospitalization period and clinical diagnosis was collected from the medical records. Program SPSS version 13.0 and significance level of 5% were used for the statistical analysis.

Results: The malnutrition diagnosed by the AC showed significant positive association with the presence of post-operative complications (p=0.02) and with hospitalization period (p=0.02). The presence of NR was greater when evaluated by hypoalbuminemia (28.9%), however, only 4% of the sample carried out the NT in the pre-operational period. The hospitalization period was greater for patients with malignant neoplasia (p<0.01).

Conclusion: The malnutrition diagnosis of patients submitted to abdominal surgeries is associated to greater risk of post-operational complications and longer hospitalization permanence.

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ESTADO NUTRICIONAL Y SU IMPACTO EN EL TIEMPO DE LA REUBICACIÓN Y EN LAS COMPLICACIONES POSTOPERATORIAS EN PACIENTES SOMETIDOS A CIRUGÍA ABDOMINAL

Resumen

Introducción: El estado nutricional es el factor independiente que más influye en los resultados post-operacionales en las cirugías electivas.

Objetivo: evaluar la influencia del estado nutricional en el periodo de hospitalización y en las complicaciones post-operatorias de los pacientes sometidos a cirugía abdominal.

Métodos: Estudio prospectivo de 99 pacientes quirúrgicos mayores de 18 años de edad, sometidos a cirugía abdominal en el período de abril a octubre de 2013, en el Instituto de Medicina Integral Professor Fernando Figueira (IMIP). Todos los pacientes fueron sometidos a evaluaciones nutricionales antropométricos a través del índice de masa corporal (IMC), la circunferencia del brazo (CB) y el espesor del pliegue cutáneo tricipital (PCT). La evaluación bioquímica se llevó a cabo a partir de los resultados leucograma y albúmina sérica. La identificación de los pacientes candidatos a la terapia nutricional (TN) se llevó a cabo a través de la evaluación del riesgo nutricional (RN) utilizando el IMC, la pérdida de peso y la hipoalbuminemia. La información sobre las complicaciones postoperatorias, tiempo de hospitalización y diagnóstico clínico se recogió de los registros médicos. Programa SPSS versión 13.0 y nivel de significancia de 5 % se utilizaron para el análisis estadístico.

Resultados: La malnutrición diagnosticada por el CB mostraron asociación positiva significativa con la presencia de complicaciones postoperatorias (p = 0,02) y con el período de hospitalización (p = 0,02). La presencia de RN fue mayor cuando se evaluó por la hipoalbuminemia (28,9 %), sin embargo, sólo el 4 % de la muestra llevó a cabo el TN en el período pre-operacional. El período de hospitalización fue mayor para los pacientes con neoplasia maligna (p < 0,01).

Conclusión: El diagnóstico desnutrición de los pacientes sometidos a cirugía abdominal se asocia a un mayor riesgo de complicaciones post-operativas y más tiempo de permanencia de hospitalización.

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Palabras clave: *Estado Nutricional. Evaluación nutricional. Cirugía. Complicaciones.*

Introduction

The nutritional state is most likely one of the independent factors which most influences the post-operational results of elective surgeries. In patients who are malnourished or in risk of malnutrition, the organic response to surgical trauma has greater repercussions and negatively influences the results[1].

Various methods for nutritional evaluation (NE) have been proposed, using clinical, biochemical and anthropometric evaluation tests, as well as corporal composition exams. In general, the anthropometric methods are practical, simple, non-invasive and without additional costs and, when associated to other objective parameters (laboratorial, for example), they improve precision and the accuracy of the diagnosis of the nutritional disorder[2].

It is important to establish nutritional monitoring routines[3] to identify early the individuals who are at risk of malnutrition or malnourished, so that they can initiate pre-operative nutritional therapy (NT)[4]. A meta-analysis involving 17 random studies and 2,305 patients demonstrated that pre-operative supplementation for five to seven days reduced morbidity, including anastomotic fistula, and the post-operative hospitalization period[5].

Therefore, it is believed that malnutrition could lead the patient to harmful effects[6], and it is also suggested that obesity can represent a risk factor for surgical patients, in virtue of the greater difficulty for surgical resection which would be predictive of a complicated post-operative course[7].

Objective

To evaluate the influence of the state of nutrition on hospitalization permanence and on the post-operative complications of patients submitted to abdominal surgeries.

Material and methods

Subjects and clinical characterization

This is a prospective study carried out on 99 patients over 18 years of age, submitted to elective abdominal surgery, from April to October of 2013, in IMIP, Recife/PE – Brazil. The study excluded patients whose nutritional evaluation could not be carried out in the pre-operative period or who presented factors which masked and/or negatively influenced the anthropometric values (edema, gestation, neurological diseases, treatment with radio and/or neoadjuvant chemotherapy).

The data collection was carried out through a direct approach form (to the patient and/or companion) and active search of medical prescription, nutritional prescription and the patient's record, to collect demographic, anthropometric and clinical data.

The analyzed post-operative complications presented in up to 30 days after the surgical procedure, were: infection of the surgical site, anastomotic dehiscence, abdominal abscess and/or respiratory complications. The post-operative hospitalization period (in days) was calculated by the difference between the date of the surgery and the date of hospital discharge.

Anthropometric evaluation

The anthropometric measurements collected were: weight, stature, body mass índex (BMI). triceps skinfold thickness (TEST) and arm circumference (AC). The procedures described by Lohman et al[8] were used to standardize measurements, performed in duplicate, using the arithmetic average of the values. To preserve the consistency of the data, the study omitted the measurements that presented differences greater than 100g for weight and 0.5 cm for height. The anthropometric evaluation was carried out at the moment of hospital admission or within 72hs of hospitalization, exclusively in the pre-operative period.

The current weight was measured using a vertical digital scale (Welmy®, model W300) with attached stadiometer, having capacity for 300 kg and precision of 50g, and located on a flat location. The normal weight corresponds to the value in Kg, referred to by the patient, before loss of weight (intentional or not) and that was maintained for a long period of time. The percentage of weight loss was obtained by the equation [(normal weight – current weight)/normal weight x 100], quantified in relation to the time and classified according to Blackburn & Bistrian[9].

For the height, the patient was placed at an orthogonal position, erect and with their backs to the equipment, and the mobile part of the stadiometer was positioned against the head with sufficient pressure to compress the hair.

The BMI was calculated through the ratio of weight to height squared and its classification followed the criteria of the World Health Organization[10] for adult individuals, or Lipschitz[11] for the elderly. For statistical purposes, the patients were regrouped in three groups: the malnourished, the eutrophic and those with excess weight. The candidates to surgery for obesity who possessed BMI ≥ 30.0 kg/m² were classified according to the American Association of Bariatric Surgery[12].

The TEST was measured by adipometer, brand Lange Skinfold Calipe, and the AC using inextensible metric tape of the same brand. The TEST was not collected from patients with BMI ≥ 30.0 kg/m² because of the technical difficulties involved in obtaining it. The result obtained from both corporal composition parameters (TEST and AC) was compared to the reference values suggested by Frisancho[13] and its adequation was determined through the equation [(obtained

value x 100) / percentile value 50] and classified according to Blackburn & Bistrian[9].

Biochemical evaluation

For the evaluation of immunological competence the total lymphocyte count (TLC) was used, calculated from the leucogram through the formula [(% lymphocytes x leukocytes)/100] and classified according to Blackburn & Thornton[14]. The biochemical dosages were solicited as pre-operative routine and followed the standard procedures of the hospital, where a skilled professional collected nearly 5 ml of blood by venipunction from each patient in Vacuntainer tubes, after fasting for 12 to 14 hours. The bottles were placed in Styrofoam boxes with ice packs, sealed and transported for sample processing. The material was analyzed in a clinical analysis laboratory using the Automation method.

Nutritional Risk

Patients considered as having nutritional risk (NR) and, therefore, candidates for NT were those who presented severe weight loss, BMI < $18.5 Kg/m^2$ or serum albumin < 3mg/dL (without evidence of hepatic or renal dysfunction)[1]. The NT was classified in relation to the route of administration (oral, enteral, parenteral or mixed) and the duration period (days). When the patient used the nutritional support exclusively (enteral or parenteral), the intention was to reach 100% of his/her necessities, with the objective of offering a normocaloric and hyperproteic diet. However, if the NT was used as supplement, only 30% of the patient's nutritional needs were offered.

Statistical analyses

The data was analyzed by *software* SPSS version 13.0 for Windows and Excel 2007. All tests were applied with 95% confidence (CI95%). The quantitative variables were tested with respect to distribution normality using the Kolmogorov-Smirnov test. To verify the existence of association the chi-square test and Fisher's Exact test were used for the categorical variables. For comparison between two groups the Mann-Whitney test was used and for comparison among more than two groups the Kruskal Walls test was used, both for non-normal variables. The coefficient of Spearman (non-normal variable) was used for the correlation tests.

The results are presented in table form with respective absolute and relative frequencies. The numerical variables are represented through measurements of central tendency and of dispersion. The significance level 5% ($p<0.05$) was used to reject the null hypothesis.

Ethical aspects

This research project was evaluated and approved by the Ethical Committee of Research on Human Beings of IMIP, under N° 3402/13, according to resolution N° 196/96 of the National Health Council. The patients who accepted to participate in the study were previously informed of the objectives of the study and of the methods to be adopted, and signed a term of free and informed consent

Results

The study evaluated 99 patients from April to October of 2013, average age of 46.4 ±16.7 years, the majority being adults (73.7%) and female (70.7%). The most frequent diagnoses were: non-neoplastic diseases of biliary tracts followed by malignant neoplasias, morbid obesity and abdominal hernias, as can be seen in table I. From the evaluated group, 41.4% presented some sort of associated comorbidity, the most common being systemic arterial hypertension (SAH) with 36.4%, followed by mellitus diabetes with 13.1%.

With respect to the presence of post-operative complications, 15.2% of the sample presented some sort of disorder. The rate of reoperations was of 5.1% and the mortality rate was 1%. The average post-operative hospitalization period was of 4.63 ± 4.34 days.

The classification of the nutritional state according to the anthropometric methods is described in table II. The prevalence of malnutrition was less when evaluated by the BMI. On the other hand, according to the BMI, 2/3 of the sample presented excess weight.

The patients submitted to bariatric surgery were classified as super obese and super-super obese, according to the BMI classification, accepted by the American Society of Bariatric Surgery[12], revealing a frequency in relation to the total sample, of 3% and 1%, respectively.

Table I
Percentage distribution according to clinical diagnosis of patients undergoing elective abdominal surgery from April to October, 2013, IMIP/PE, Brazil

Diagnoses	N	%
Morbid obesity	17	17,2
Malignant neoplasias	24	24,3
Non-neoplastic diseases of gastrointestinal tract	4	4,0
Non-neoplastic diseases of biliary tract	38	38,4
Abdominal hernias	13	13,1
Other	3	3,0
Total	99	100

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Variables (n)	Malnutrition (%)	Eutrophic (%)	Overweight/ Obesity (%)
BMI (n = 99)	6,1	27,3	66,6
AC (n = 99)	15,8	48,4	35,8
TEST (n = 67)	15,9	15,9	68,2
TLC (n = 58)	82,7	17,3	–

BMI, body mass Index; AC, arm circumference; TEST, triceps skinfold thickness; TLC, total lymphocyte count.

According to the AC, approximately 50% of the sample was classified as eutrophic. With respect to the TEST, this was the anthropometric parameter that revealed the highest prevalence of weight excess. The TLC revealed that more than 80% of the studied population presented some degree of depletion, 27.6% of which had severe depletion.

The NR was 21.2% of the sample, being 28.9% when evaluated by the serum albumin levels, 15.8% by weight loss percentage and null when evaluated by the BMI. However, only 4% received some sort of NT in the pre-operational period. With respect to the route of administration used, 2% used enteral nutrition (nasoenteric tube) and 2% parenteral nutritional (central access). The average time to reach 100% of the nutritional needs was 2.5 ±0.7 days and the average duration time of the nutritional therapy for both routes of administration was 6.8 ±0.5 days.

There was significant positive association between the malnourishment diagnosed by the AC and post-operative complications (p=0.02), as shown in table III. Table IV shows positive association between length of hospital stay and diagnosis of neoplastic disease (p< 0.001); between length of hospital stay and severe weight loss in the pre-operative period (p< 0,001), and between length of hospital stay and malnourishment diagnosed by AC (p=0.022).

Discussion

Nutrition is a fundamental aspect to consider in the proper care of surgical patients. Early nutritional diagnosis and NT in the pre and post-operative periods can determine substantial differences in the conduct and prognosis, reducing the organic response to stress and interfering significantly on the improvement of the patient[15,16]. In this sense, choosing the most adequate method to determine the nutritional state of patients that are candidates for surgery is of utmost importance to establish a better nutritional conduct and allow for adequate clinical improvement in the post-operative period[17].

In the present study, the average age was similar to that presented by Correia, Fonseca and Machado Cruz[18], with a majority of women, which suggests that they are more prone to look for health care than men[19].

From the patients evaluated in the study, the most common diagnosis was that of non-neoplastic diseases of biliary tracts, characterized mostly by the cholelithiasis. It is known that this disease is frequent in general surgery wards as was suggested by Rezende et al[2], in their study with patients hospitalized in surgery wards from two public hospitals in the state of Bahia. The explanation for this high frequency could be related to the fact that gallstones constitute the gastrointestinal disease that most needs hospitalization in the world[20]. Following this disease, malignant neoplasia diseases present lower frequencies than those found in the study of Bragagnolo et al[21], with patients hospitalized in general surgical wards, where more than half of the sample presented neoplasia. A lower frequency can be expected in this study, since patients who carried out radio

Variables	Complications Yes n (%)	No n (%)	p- value
BMI			
Malnutrition	1 (6,7)	5 (6,0)	0,394 *
Eutrophic	6 (40,0)	21 (25,0)	
Weight excess	8 (53,3)	58 (69,0)	
AC			
Malnutrition	6 (40,0)	9 (11,3)	0,020 **
Eutrophic	5 (33,3)	41 (51,2)	
Weight excess	4 (26,7)	30 (37,5)	
TEST			
Malnutrition	3 (30,0)	7 (13,2)	0,563 *
Eutrophic	1 (10,0)	9 (17,0)	
Weight excess	6 (60,0)	37 (69,8)	
Severe weight loss			
Yes	5 (33,3)	10 (12,5)	0,057 *
No	10 (66,7)	70 (87,5)	

BMI, body mass Index; AC, arm circumference; TEST, triceps skinfold thickness.
* Fisher's exact test ** Chi-square test

Table IV
Length of hospital stay second age group, presence of malignancy and nutritional status of patients undergoing elective abdominal surgery in the period from April to October, 2013, IMIP/PE, Brazil

Variables	Length of hospital stay Median (Q1; Q3)	p- value
Age group		
Adult	2,00 (2,00; 6,00)	0,155 *
Elderly	5,00 (2,00; 7,50)	
Malignant neoplasias		
Yes	7,00 (5,00; 11,00)	< 0,001 *
No	2,00 (2,00; 3,25)	
Severe weight loss		
Yes	5,50 (5,00; 8,00)	< 0,001 *
No	2,00 (2,00; 5,00)	
BMI		
Malnutrition	5,50 (5,00; 7,50)	0,155 **
Eutrophic	4,00 (2,00; 6,25)	
Weight excess	2,00 (2,00; 5,75)	
AC		
Malnutrition	5,00(4,00; 8,00)	0,022 **
Eutrophic	3,00 (2,00; 7,00)	
Weight excess	2,00 (2,00; 2,50)	
TEST		
Malnutrition	4,00 (2,00; 6,50)	0,910 **
Eutrophic	3,00 (2,00; 5,75)	
Weight excess	3,00 (2,00; 6,00)	

BMI, body mass Index; AC, arm circumference; TEST, triceps skinfold thickness
* Mann-Whitney ** Kruskal-Wallis

and/or chemotherapy in the pre-operative period were excluded, and also considering that the standard treatment for some types of tumors includes neoadjuvancy.

The presence of comorbidities found was higher than in the study of Melo et al[22], where 34% of patients evaluated presented some chronic disease. In both studies the SAH was the most prevalent comorbidity. The presence of associated diseases must be investigated since they play an important role in the determination of infection[23] and higher incidence of post-operative complications[24].

The weight excess found in the studied population when evaluated by the BMI, reflects the great number of hospitalized patients submitted to surgery for obesity treatment, especially because the hospital where the study was applied is a reference center for bariatric surgery. Moreover, it is important to highlight once more the exclusion of patients who carried out pre-operative radio/chemotherapy. It is known that these anti-neoplastic treatments can lead to anorexia and consequently to weight loss, which would negatively influence their nutritional state. However, excess weight can also be found in patients with neoplasias. In a recent study that investigated patients who were going to have surgery to treat colon cancer, the frequency of excess weight evaluated by the BMI was similar to that found in this study, 62% of patients being classified as overweight or obese[7].

With respect to weight excess, another point that needs reminder is the frequency of patients classified as having extreme obesity. The number of super obese individuals multiplied five fold in the last 15 years[25] and the frequency presented in the sample suggests that this quick increase is of concern, even in developing countries.

When investigating signs of malnutrition, Sommacal et al[26] studying patients with periampullary neoplasia in the pre-operative period, also found a higher percentage of malnourished patients when evaluated by the TEST. In patients with megaesophagus, malnutrition percentages similar to those found in this study were found by the AC, TEST and BMI.[27] It is important to highlight that no method is free of error and that a combination among them helps to diminish the probability of errors caused by the isolated use of any one of them.

The TLC measures in a practical manner the momentary immunological reserves, indicating the conditions of the organism's cellular defense mechanism at that moment[26]. In this study, the percentage of patients that presented some sort of degree of depletion was high (80%), corroborating the results found in the study of Sommacal et al[26] (62%), but contrasting with the study of Leandro-Merhi, Aquino and Chagas[3], where no depletion was observed in the majority of patients studied. No association tests were carried out with this variable due to the limited number of patients that had this information in their record. However, this study suggests that the TLC is not a good prognostic marker for operative morbimortality[28].

The NR diagnosis is the first step in the identification of patients who benefited from pre-operative NT. The results found show how the frequency of NR can be different depending on the method used, corroborating with another study[3], where frequencies of 8.1% were found by the BMI, of 32.6% using the TLC and 45.2% by weight loss. The NR was higher when evaluated by hypoalbuminemia, suggesting that albumin must be considered a prognostic method and a reliable indicator of morbimortality[29].

Independently of the method used to evaluate the risk, the study shows that only a small portion of these patients carried out pre-operative-NT. This can be explained by the fact that many patients are admitted days before or even on the day of surgery. When there is early hospitalization, all patients identified with risk

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carry out or are advised to carry out some kind of NT. However, in this study only the patients who carried out NT in a hospital environment were considered, because even with orientation, there is no guarantee that the patient will carry out the therapy in their residence.

The average duration of enteral NT was in accordance with the recommendations proposed by the *Projeto Diretrizes* (7-14 days)[1]. And the necessary time to reach the nutritional needs (in up to 72 hours) was carried out according to the recommendation of the American *Guideline* about NT[30].

With respect to the association between the post-operative complications and the nutritional state, the AC can be used in a promissory manner for the diagnosis of malnourishment. Because it is a simple measurement, easy to collect and non-invasive, its routine use is recommended to evaluate surgical patients. Also, it is suggested that the loss of lean mass is correlated with the values of AC, since in studies with colorectal cancer patients in the pre-operative period[31], those who presented an accelerated weight loss diminished their AC. The same authors observed that after the surgery, the AC values became smaller[31].

Patients with malignant neoplasias or those with severe weight loss in the pre-operative period, generally present risk of malnourishment or are malnourished[32,33], which may explain why this group of patients presents longer hospitalization permanence. Malnutrition, when evaluated by AC, in a Brazilian study carried out in a university hospital, was responsible for the increase in hospitalization period in up to 2.8 times[34].

Conclusion

The malnutrition diagnosed by the anthropometric methods in patients submitted to abdominal surgery is associated with higher risks of post-operative complications and longer hospitalization permanence. Therefore, early identification of NR and the institution of NT must be essential strategies for the care of the surgical patient to obtain better prognoses in the post-operative period.

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