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INCREASED PRESSURE SORE RISK HAS A WORSE DIAGNOSIS IN HOSPITALIZED STROKE PATIENTS

Maior risco de lesão por pressão tem pior prognóstico na hospitalização de pacientes com Acidente Vascular Cerebral

Mayor riesgo de lesión por presión tiene peor pronóstico en la hospitalización de pacientes con Accidente Vascular Cerebral

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ABSTRACT

Objective: to associate pressure sore risk with the severity of hospitalized stroke patients. **Method:** transverse study with 64 hospitalized stroke patients. Sociodemographic data were obtained from the medical information form; anthropometrics, pressure sore risk (via Braden Scale) and plasma vitamin C were assessed. **Results:** sample predominantly elderly with ischemic stroke; 48.4% presented a high risk of pressure sore development. Patients with higher pressure sore risk had increased mortality (p<0.001) and greater leukocytosis (p=0.028) and lymphopenia (p<0.001) than those with lower pressure sore risk. Nonetheless, vitamin C levels did not differ with regard to the pressure sore risk. There were no significant differences in nutritional status as regards pressure sore risk. **Conclusion:** patients with high risk for developing pressure sore present leukocytosis, lymphopenia and increased mortality risk.

DESCRIPTORS: Human; Biomarkers; Mortality; Nervous system diseases.

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RESUMO

Objetivo: associar o risco de lesão por pressão com a gravidade de pacientes hospitalizados com Acidente Vascular Cerebral. **Método:** estudo transversal, 64 pacientes hospitalizados com Acidente Vascular Cerebral. Foram coletados dados sociodemográficos em prontuário, sendo realizada avaliação antropométrica, risco de lesão por pressão pela Escala de Braden e vitamina C sérica. **Resultados:** amostra predominantemente de idosos com Acidente Vascular Cerebral isquêmico,48,4% apresentaram alto risco de desenvolver lesão por pressão. Pacientes com maior risco de lesão por pressão tiveram maior mortalidade (p < 0,001), leucocitose (p = 0,028) e linfopenia (p <0,001) quando comparados com pacientes com menor risco. No entanto, os níveis de vitamina C sérica não diferiram estatisticamente entre o risco de lesão. Sobre o estado nutricional não houve diferenças significativas entre o risco de lesão por pressão. **Conclusão:** conclui-se que pacientes com alto risco de desenvolver lesão por pressão apresentam leucocitose, linfopenia e maior risco de mortalidade.

DESCRITORES: Humanos; Marcadores bioquímicos; Mortalidade; Doenças do sistema nervoso.

RESUMEN

Objetivo: asociar el riesgo de lesión por presión con la gravedad de pacientes hospitalizados con Accidente Vascular Cerebral. **Método:** estudio transversal, con 64 pacientes hospitalizados con Accidente Vascular Cerebral. Fueron recolectados datos sociodemográficos y realizada evaluación antropométrica, riesgo de lesión por presión por la Escala de Braden y vitamina C sérica. **Resultados:** muestra predominantemente de los ancianos con Accidente Vascular Cerebral isquémico,48,4% presentaron alto riesgo de desenvolver lesión por presión. Pacientes con mayor riesgo de lesión por presión tuvieron mayor mortalidad (p < 0,001), leucocitosis (p=0,028) y linfopenia (p < 0,001) cuando comparados con pacientes con menor riesgo. Sin embargo, los niveles de vitamina C sérica no defirieron estadísticamente entre el riesgo de lesión. Sobre el estado nutricional no hubo diferencias significativas entre el riesgo de lesión por presión. **Conclusión:** pacientes con alto riesgo de desenvolver lesión por presión presentaron leucocitosis, linfopenia y mayor riesgo de mortalidad.

DESCRITORES: Humanos; Marcadores bioquímicos; Mortalidad; Enfermedades del sistema nervioso.

INTRODUCTION

Stroke is defined as the interruption of blood flow to the brain, with consequent obstruction or rupture of cerebral blood vessels. Stroke is a disease that affects more men, and is considered one of the leading causes of death, disability, and hospitalization worldwide.[1]

There are two types of stroke, ischemic stroke (ischemic stroke), which occurs when an artery is blocked, making it impossible for oxygen to pass through to the brain cells, and may be caused by a thrombus or an embolus; it is the most prevalent type, accounting for 85% of all cases. The hemorrhagic stroke (HCV), on the other hand, happens when a cerebral vessel ruptures, resulting in blood leakage into the brain, causing an aneurysm or trauma. ChChronic stroke accounts for 15% of all stroke cases, and can cause death more frequently than ischemic stroke.[1]

Individuals who suffer stroke and survive may have sequelae of vision loss, speech loss, paralysis, and confusion. They are also at increased risk of having another episode.[2]

The risk factors for increasing the probability of a stroke are Systemic Arterial Hypertension (SAH); Type 2 Diabetes Mellitus (DM 2); hypercholesterolemia; overweight or obesity; smoking; excessive use of alcohol; advanced age; sedentary lifestyle; use of illicit drugs; family history; male gender; and heart disease. Hypertension and smoking are the most significant modifiable risks, since for every 10 people who die of stroke, 4 could have been saved if their blood pressure was controlled. Two-fifths of people who died of stroke under the age of 65 were related to tobacco use.[3] In many countries the incidence of stroke is declining as a result of controlling hypertension and reducing smoking levels.[1,2]

Individuals with neurological diseases may have physical and mental disabilities, and most are bedridden, thus unable to relieve pressure on bony prominences and are often affected by PUs. PU is defined as a localized change in the skin, membranes, mucous membranes, or underlying tissues caused by prolonged pressure on the skin. Factors contributing to its onset are hypertension, DM, unconsciousness, nutritional deficiencies, loss of motor function, high or low body mass index (BMI), and others.[3,4]

PML can affect people of any age and in any health condition, but it is more common among the elderly and the sick with several comorbidities. It is associated with up to 3 times longer hospital stay, as well as more complications and higher risk of death.[5]

The risk of developing PML can be evaluated using scales such as the Braden scale. Diagnosis through this scale uses six sub-scales to evaluate the patient: sensory perception, skin wetness, physical activity, mobility, nutritional status, and friction/scratching, and indicates whether the individual has high, medium, or low risk of developing CLP.[6]

Considering that the clinical and pathological conditions of stroke patients can lead to the onset of SPL, studying the associations with anthropometric and biochemical parameters can

help in the care and control of these patients, as well as decrease hospitalization time and the development of SPL. Thus, the present study aims to associate the risk of PU with the severity of stroke patients.

METHOD

The following work is a cross-sectional, prospective study. The research was conducted in a public hospital in the central region of Rio Grande do Sul, Brazil, during the period from August 2018 to August 2019. The sample was by convenience, composed of adults and elderly hospitalized post-stroke, of both genders. The diagnosis of stroke, was confirmed by the physician through CT or MRI scan and collected from the patients' medical records. Patients diagnosed with stroke who fed orally and/or with enteral nutrition were included in the study. The exclusion criteria were as follows: patients with parenteral nutrition, sepsis, anasarca.

This study was approved by the Research Ethics Committee and is registered under number 1.579.090, CAAE 51109315. 4.0000.5306, according to Resolution n. 466/12 of the National Health Council, referring to research with human beings. Written informed consent was obtained from all participants.

Data collection such as age, gender, income, education, reason for hospitalization, associated diseases, biochemical tests, were collected from the patients' electronic medical records. It was performed within 72 hours after admission, by trained staff. Patients' weight was checked on an analog scale, Sul Fitness, with a capacity of 150 kilograms (kg), and height was measured with a movable stadiometer. When it was not possible to weigh the patients on the scales or measure them with a stadiometer, weight[7] and recumbent height were estimated.[8]

The circumferences, knee height found in the formulas were measured using a tape measure, and the triceps (TSD) and sub-scapular (SSC) skinfolds were measured using a Cescorf scientific adipometer. Measurements of the adductor pollicis muscle (APM), arm circumference (AC), and calf circumference (PC) were also taken. The PC is considered a marker of muscle reserve. Values lower than 31 centimeters indicate muscle depletion in the elderly.[9] Body mass index (BMI) was obtained from the current weight in kilograms (Kg) divided by the height squared in meters (Kg/m²). Nutritional status in adults was classified according to World Health Organization (WHO) criteria,[10] and BMI in the elderly was classified according to Lipschitz.[11]

Data to assess the risk of developing PML were collected from the Braden Scale record by the hospital nursing staff. The validated Brazilian version of the Braden Scale was used in this study.[12]

The Braden score was classified according to the degree of severity, i.e., hospitalized patients with a score ≥ 15 points were considered at low risk for developing the lesion, while scores ≤ 12 pointed to high risk. The classifications were categorized as

follows: score ≥ 15 low risk; score between 13 and 14 moderate risk; score ≤ 12 high risk.[6]

To perform the serum vitamin C analysis, blood samples were acquired from the leftover collection tubes intended for the patients' blood tests during hospitalization and then stored at – 80°C. The samples were precipitated with 5% TCA (1:1), homogenized with the aid of a vortex and centrifuged at 3000 RPM at 10°C for 10 minutes. The serum vitamin C analysis was performed High Efficiency Liquid Chromatography (HPLC) being used a C18 chromatography column (15mm x 4.6mm, 5μm), pre-column – Phenomenex C18 (4 x 3mm, 5μm).

The biochemical parameters used were evaluated and interpreted according to the reference values of the hospital laboratory. The total lymphocyte count (TLC) was calculated in order to verify the degree of depletion of the hospitalized individual. For this we used the values of lymphocytes and leukocytes in the following equation: CTL = % lymphocytes x leukocytes/100 and interpreted as: mild depletion: 1,200 to 2,000/mm³; moderate depletion: 800 to 1,199/mm³; severe depletion: < 800/mm³.[13]

The data obtained were tabulated and stored in a table in Microsoft Excel program. For the characterization of the sample, a descriptive analysis of the participants' data was performed; the categorical variables were presented as percentages and the quantitative variables as means and standard deviations.

The normality of the variables was verified using the Shapiro-Wilk test. In the analysis of the quantitative variables the t-test for independent data or the Mann-Whitney test were used when comparing 2 groups, and the Anova or Kruskal-Wallis test when comparing 3 groups, depending on the normality result. Differences were considered significant when the results showed p-value < 0.05. IBM SPSS Version 25 software was used as a computational tool for the statistical analysis of the data.

RESULTS

Sixty-four hospitalized stroke patients were included in the study. The mean age was 64 ± 13.12 years, and most of them were male and elderly. Most of the sample was smokers or former smokers, but most were non-drinkers (Table 1).

Regarding the type of stroke, most of the sample (72%) had ischemic type stroke, without Diabetes Mellitus. Most patients had a high risk of developing PML and regarding nutritional status, most patients were eutrophic, followed by overweight according to BMI (Table 2).

Regarding the risk of LPP (Table 3), individuals classified at higher risk had a worse prognosis, with higher mortality compared to patients at lower risk of developing LPP (U = 90; p < 0.001). In addition, it was observed that patients with AVCh stroke had a higher risk of developing LPP compared to patients with AVCi stroke, but these data were not statistically different (U = 285.5; p = 0.055).

Table 1 – Sociodemographic characteristics in patients hospitalized with stroke, Santa Maria, RS, Brazil, 2019

Sociodemographic Data	Patients n=64 n (%)
Gender	
Male	37 (57,8)
Female	27 (42,2)
Age	
Adults	21 (32,8)
Elderly	43 (67,2)
Smoking	
Smokers	19 (29,7)
Former smokers	16 (25)
Non-smokers	29 (45,3)
Alcoholism	
Drinkers	17 (26,6)
Former alcoholics	9 (14)
Non-drinkers	38 (59,4)

Table 2 – Presence of comorbidities and nutritional status in patients hospitalized with stroke, Santa Maria, RS, Brazil, 2019

Comorbidities and nutritional status	Patients n=64 n (%)
Type of AVC	
Ischemic stroke	46 (72)
Hemorrhagic stroke	18 (28)
Diabetes Mellitus (DM)	
With DM	26 (40,6)
Without DM	38 (59,4)
Risk of developing PML	
Low risk	21 (32,85)
Moderate risk	12 (18,75)
High risk	31 (48,4)
BMI – Body Mass Index	
Low weight	14 (21,87)
Eutrophy	27 (42,2)
Overweight	23 (35,94)

PML: Pressure Injury

According to the WBC, patients at high risk of developing PML had leukocytosis (p = 0.028). Similarly, patients at high risk of PML also had lymphopenia (p < 0.001). Regarding erythrogram and thrombocytometry, it was found that patients had neither anemia, according to the WHO, (2011)[14], nor changes in the number of platelets, however, individuals at higher risk of developing PML had lower hemoglobin values, according to Table 4.

Regarding the nutritional status, no statistical differences were observed in the second parameters evaluated, but regarding the adequacy of the adductor pollicis muscle (APMT), patients at high risk of PML were classified with mild depletion,[15] and with lower serum albumin values, and all patients were hypoalbuminemic. According to total lymphocyte count, patients had mild depletion in all PML risk classifications, but without significant differences (p = 0.078), according to Table 4.

No significant differences were observed regarding the mean values of glycemias and serum vitamin C with the risk of PML (p > 0.05).

Table 3 – Variables in stroke patients and their risk of pressure injury, according to Braden Scale scores, Santa Maria, RS, Brazil, 2019

Variables	Patients (n=64) Braden Scale Scores	p-value
Prognosis		
Hospital Discharge	14[2]	
Death	8,33[2]	p = 0,001[1]
Type of AVC		
Ischemic stroke	13,5[2]	
Hemorrhagic stroke	11,3[2]	p = 0,055[1]

[1]Mann-Whitney test; [2]Median results.

Table 4 – Variables in patients with stroke and their risk of developing pressure injury (PPI), according to the Braden Scale classifications, Santa Maria, RS, Brazil, 2019

Bookmark	Pressure Injury			P
	Low Risk	Moderate Risk	High Risk	
Leukocytes (µL)	8295 ± 3559,3[a]	8999,9 ± 5886,6	11401,3 ± 3725,9[a]	0,028
Lymphocytes (%)	23,11 ± 7,68[b]	17,46 ± 9,34	12,51 ± 7,12 [b]	0,001
Red blood cells (µL)	4,28 ± 0,77	3,82 ± 0,73	3,88 ± 0,85	0,156
Hemoglobin (g/dL)	12,72 ± 2,56	11,77 ± 2,61	11,41 ± 2,31	0,162
Hematocrit (%)	38,34 ± 6,97	35,90 ± 7,73	34,64 ± 6,64	0,167
VCM (fL)	89,65 ± 5,36	93,70 ± 6,33	87,94 ± 11,74	0,210
HCM (pg)	29,68 ± 2,32	30,72 ± 1,95	31,57 ± 12,21	0,739
CHCM (g/dL)	33,08 ± 1,28	32,79 ± 0,69	32,85 ± 1,46	0,776
RDW (%)	14,30 ± 2,16	14,52 ± 1,38	15,59 ± 2,88	0,142
Platelets (mm³)	225,36 ± 78,13	184,50 ± 67,34	233,52 ± 82,49	0,236
Albumin (mg/dL)	3,21 ± 0,45	2,63 ± 1,13	2,38 ± 0,78	0,316
CTL (mm³)	1802,47 ± 867,81	1218,12 ± 507,16	1379,49 ± 811,26	0,078
Weight (Kg)	75,17 ± 16,80	62,73 ± 12,37	70,27 ± 16,35	0,114
IMC (Kg/m²)	27,40 ± 5,98	23,43 ± 4,15	24,61 ± 5,27	0,087
AMBc (cm²)	46,07 ± 14,47	42,81 ± 12,51	44,83 ± 15,44	0,833
CP (cm)	36,21 ± 4,76	34,45 ± 4,77	32,42 ± 4,62	0,364
MAP (mm)	12,86 ± 2,91	13,09 ± 5,15	11,18 ± 4,02	0,227
Vit. C sérica (µmol/L)	247,35 ± 187,12	370,30 ± 223,13	328,46 ± 177,95	0,157
Glicemia (mg/dL)	142,40 ± 42,30	137,28 ± 41,84	151,11 ± 49,14	0,889

[a] – p = 0,028 [b] – p<0,001. VCM: Mean Corpuscular Volume; HCM: Mean Corpuscular Hemoglobin; CHCM: Mean Corpuscular Hemoglobin Concentration; RDW: Red Cell Distribution Width; CTL: Total Lymphocyte Count; IMC: Body Mass Index; AMBc: Corrected Arm Muscle Area; CP: Calf Circumference; MAP: Thumb Adductor Muscle.

DISCUSSION

Just as data from the Ministry of Health[2] indicate that men are more affected by stroke, the study population is also mostly male. Risk factors for stroke, such as smoking, may also be associated with a higher risk of developing LPP.[16]

Some studies have shown that low serum or plasma vitamin C values are associated with increased incidence of and mortality from stroke.[17,18] Vitamin C plays several roles in the human body, among them the stimulation of collagen synthesis for consequent wound healing,[19] and may be a protective factor and also a treatment for patients who present LPP. In the present study, serum vitamin C levels did not influence the risk of developing SCI.

Stroke causes motor disorders in 90.5% of the individuals; these disorders include hemiplegia, that is, weakness on one side of the body, and the most severe is permanent paralysis, which makes the affected person unable to move freely.[20] Being bedridden without being able to change position, without the help of other people. In view of this a study has stated that about 50% of patients diagnosed with stroke develop PML.[21] In the present study, almost 50% of the sample has a high risk of developing PML.

In addition, patients with stroke have a higher risk of infection, not only in the lesions, but also of developing other types of infections, such as pneumonia and urinary tract infections.[4] In the present study, patients at higher risk of developing LPP had leukocytosis and lymphopenia, and may have a higher mortality rate, a similar result was found in the work of Lee et al., (2016).[4]

As observed in the study the values of lymphocytes and leukocytes were outside the reference of normality in patients at high risk of developing LPP. Lymphocytes are essential for the inflammatory and proliferative phases of tissue repair, provide cellular immunity and antibody production, act as mediators in the wound environment through the secretion of lymphokines and direct stem cells, so when below reference values, they may indicate a relationship with delayed wound healing.[22,23]

Elevated leukocytes reflect chronic inflammatory, immunological, and hematological conditions.[24] In a study of hospitalized patients with PML, 77.6% presented leukocytosis.[23] A prospective study of patients admitted to a hospital in Minas Gerais observed a statistically significant association between increased total leukocyte values and PML development (p = 0.007), which may mean a poor PML prognosis, data similar to this study.[25]

Lymphocytes and WBCs are also used to calculate the total lymphocyte count (TLC), which measures the momentary immune reserves, indicating the conditions of the body's cellular defense mechanism that suffers interference from nutritional status, and is used as a nutritional parameter for measuring immune competence.[26] In the present study, the total lymphocyte count was performed, which showed mild depletion, in all PML risk classifications.

The data presented in this study show that 42.2% of patients are eutrophic, followed by overweight (35.5%) according to BMI. In a study of hospitalized elderly patients, a higher risk for PML was found in patients with above average BMI and obese patients, thus overweight can also lead to PML.[27]

In patients at high risk of developing PML, MAP is lower than in the other risk classifications. In stroke patients, this measure is associated with muscle mass indicators, indicating risk for malnutrition and prognosis for hospital complications.[28] According to the BMI, the studied patients are eutrophic or overweight, but present hypoalbuminemia and mild depletion according to CTL and MAP.

The hemoglobin of patients at high risk of developing PML, are lower than the other risk classifications, but without presenting anemia. According to data from our research group, at hospital admission of stroke patients, low albumin and hemoglobin concentrations were found, which was associated with a higher risk of PML.[29] Similarly studies have found an increased risk of PML in patients with anemia and hypoalbuminemia.[30]

CONCLUDING REMARKS

Associations between PU risk and the parameters evaluated could be observed. Among them, patients with high risk presented higher mortality, leukocytosis and leukopenia. Regardless of the risk of PU, patients presented hypoalbuminemia and mild depletion according to CTL. According to the MAP the patients with high risk of LPP presented nutritional risk. Serum vitamin C and blood glucose levels did not differ statistically in relation to PU risk in these patients.

Periodic nutritional monitoring and assessment is important in order to assist in early interventions, avoiding more severe conditions in stroke patients. Finally, further studies should be conducted on the subject to investigate these possible associations.

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