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EDITORA

RISK OF INJURY FROM SURGICAL POSITIONING IN PATIENTS UNDERGOING NEUROSURGERY

RISCO DE LESÃO POR POSICIONAMENTO CIRÚRGICO EM PACIENTES SUBMETIDOS À NEUROCIRURGIA

RIESGO DE LESIÓN POR POSICIONAMIENTO QUIRÚRGICO EN PACIENTES SOMETIDOS A NEUROCIRUGÍA

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ABSTRACT

Introduction: Neuropathologies impact the central and peripheral nervous system. Surgeries to correct these diseases are at high risk for the development of neurological and systemic complications. The perioperative nurse is responsible for planning and implementing nursing interventions to ensure the prevention of possible complications.

Objective: To assess the risk of developing injury resulting from surgical positioning in patients undergoing neurological surgery.

Materials and Methods: This is an observational, descriptive study with a quantitative approach, developed from February to July 2023, in the surgical center of a university hospital in Northeastern Brazil. The sample consisted of 22 patients. Data collection occurred by applying a sociodemographic questionnaire, followed by the Risk Assessment Scale for the Development of Injuries Resulting from Surgical Positioning. The present study was approved by the research ethics committee.

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Results: In the sample, the prevalence was women, white skin color, and high school completion. Regarding comorbidities, overweight and obesity stand out with greater occurrence, followed by Diabetes Mellitus and Systemic Arterial Hypertension. Of these patients, it was observed that 14 participants presented a reduced risk for the development of surgical positioning injury, with a minimum score of 13 and a maximum of 26 points.

Conclusion: By applying the scale it is possible to identify the risk factors during the intraoperative period and implies the provision of subsidies for the assistance of the surgical team. In addition to creating a specific therapeutic plan for each patient, by implementing actions to prevent complications associated with surgical positioning.

Keywords: Patient Positioning. Neurosurgery. Perioperative Nursing. Risk Factors. Risk Assessment.

RESUMO

Introdução: As neuropatologias impactam o sistema nervoso central e periférico. As cirurgias para correção dessas doenças, são de alto risco para o desenvolvimento de complicações neurológicas e sistêmicas. O enfermeiro perioperatório é responsável pelo planejamento e implementação de intervenções de enfermagem para garantir a prevenção de possíveis complicações.

Objetivo: Avaliar o risco de desenvolvimento de lesão decorrente do posicionamento cirúrgico em pacientes submetidos a cirurgia neurológica.

Materiais e Métodos: Trata-se de um estudo observacional, descritivo com abordagem quantitativa, desenvolvido de fevereiro a julho de 2023, no centro cirúrgico de um hospital universitário do Nordeste do Brasil. A amostra foi constituída por 22 pacientes. A coleta de dados ocorreu ao aplicar um questionário sociodemográfico, seguido pela Escala de Avaliação de Risco para o Desenvolvimento de Lesões em Decorrência do Posicionamento Cirúrgico. O presente estudo obteve aprovação pelo comitê de ética em pesquisa.

Resultados: Na amostra, a prevalência foi de mulheres, de coloração branca e ensino médio completo. Com relação às comorbidades, o sobrepeso e a obesidade destacam-se com maior ocorrência, seguido pelo Diabetes Mellitus e Hipertensão Arterial Sistêmica. Destes pacientes, observou-se que 14 participantes apresentaram risco reduzido para o desenvolvimento de lesão por posicionamento cirúrgico, com mínima de escore 13 e máxima de 26 pontos.

Conclusão: Ao aplicar a escala permite-se identificar os fatores de risco durante o intraoperatório e implica no fornecimento de subsídios para a assistência da equipe cirúrgica. Além de criar um plano terapêutico específico para cada paciente, ao implementar ações para prevenir complicações associadas ao posicionamento cirúrgico.

Palavras-chave: Posicionamento do Paciente. Neurocirurgia. Enfermagem Perioperatória. Fatores de Risco. Medição de Risco.

RESUMEN

Introducción: Las neuropatologías impactan el sistema nervioso central y periférico. Las cirugías para corregir estas enfermedades conllevan un alto riesgo de desarrollar complicaciones neurológicas y sistémicas. La enfermera perioperatoria es responsable de planificar e implementar las intervenciones de enfermería para garantizar la prevención de posibles complicaciones.

Objetivo: Evaluar el riesgo de desarrollar lesiones resultantes del posicionamiento quirúrgico en pacientes sometidos a cirugía neurológica. Materiales y

Métodos: Se trata de un estudio observacional, descriptivo con abordaje cuantitativo, desarrollado de febrero a julio de 2023, en el centro quirúrgico de un hospital universitario del Nordeste de Brasil. La muestra estuvo constituida por 22 pacientes. La recolección de datos se produjo mediante la aplicación de un cuestionario sociodemográfico, seguido de la Escala de Evaluación de Riesgo para el Desarrollo de Lesiones Derivadas del Posicionamiento Quirúrgico.

Resultados: En la muestra prevalecieron mujeres, color de piel blanca y escolaridad secundaria completa. En cuanto a las comorbilidades, el sobrepeso y la obesidad destacan como las más comunes, seguidas de la Diabetes Mellitus y la Hipertensión Arterial Sistémica. De estos pacientes, se observó que 14 participantes presentaron un riesgo reducido de desarrollar lesión por posicionamiento quirúrgico, con una puntuación mínima de 13 y una máxima de 26 puntos.

Conclusión: La aplicación de la escala permite identificar factores de riesgo durante el intraoperatorio e implica brindar apoyo a la asistencia del equipo quirúrgico. Además de crear un plan terapéutico específico para cada paciente, implementar acciones para prevenir complicaciones asociadas al posicionamiento quirúrgico.

Palabras clave: Posicionamiento del Paciente. Neurocirugía. Enfermería Perioperatoria. Factores de Riesgo. Medición de Riesgos.

1 INTRODUCTION

Neurological pathologies negatively impact the central and peripheral nervous system, consequently, they can affect the brain, spinal cord, peripheral nerves, and the neuromuscular junction. They come from genetic aspects, hereditary or acquired through the influence of the environment, such as smoking and systemic diseases (Lopes, 2023).

Regarding therapeutics, neuroscience has made great scientific advances in recent decades, with drug and non-drug treatments, neurological surgeries with invasive and minimally invasive techniques (Cavalheiro, 2022). Despite technological advances, patients are not inhibited from the risks generated by surgical procedures.

Neurosurgeries are at high risk for the development of neurological and systemic complications, especially in individuals who have comorbidities. The most common complications are: nausea, vomiting, decreased level of consciousness, hypotension, respiratory distress, seizures, and surgical site infections (Lopes, 2023)

In addition to the inherent risks of each surgery, studies indicate that surgical positioning can also become a triggering factor for complications, including vessel compression, ischemia, compartment syndrome, respiratory distress, musculoskeletal pain, skin and peripheral nerve lesions, and joint dislocation (Bentsen *et al.*, 2024; Lopes *et al.*, 2016).

Thus, the patient's positioning aims to promote the exposure of the surgical site, balanced with complications due to the time the patient remains in the same position. In addition, it consists of a procedure of extreme importance and responsibility of the entire perioperative team (Bjøro *et al.*, 2022; Speth, 2023).

Therefore, the multidisciplinary team must be involved in the process of identifying risks of complications, maintaining safety, protecting from injuries and the occurrence of possible adverse events during the procedure (Bentsen *et al.*, 2024; Maya, 2022; SOBECC, 2021; Tura *et al.*, 2023). The perioperative nurse is responsible for planning and implementing nursing interventions to ensure the prevention of possible complications caused by positioning (Maya, 2022; SOBECC, 2021). Thus, to assist the professional in decision-making, tools were created to support clinical practice (Brooker; Vikan; Thyli, 2020).

For this, it is necessary to have knowledge of the anatomical and physiological changes inherent to the positioning in the patient's body, as well as the equipment and devices available to serve as a care strategy and assist in the prevention of complications (Lopes *et al.*, 2016; Speth, 2023).

Thus, several scales have been developed with the objective of assessing the risk of injury in the perioperative period, such as the *Munro scale*, *Scott Trigger* scale, and the Risk

Assessment Scale for the Development of Injury Resulting from Surgical Positioning (ELPO) (Speth, 2023; SOBECC, 2021).

ELPO stands out for presenting a greater scope for the identification of risk factors for injuries resulting from the physiological modification of the organism specific to surgical positioning (Brooker; Vikan; Thyli, 2020; SOBECC, 2021). In addition, it consists of a validated tool that can be used quickly and easily, with the objective of detecting patients who are at high risk of developing lesions and thus signaling to the team the need to implement interventions to prevent these lesions (Lopes *et al.*, 2016)element.

This study is justified in order to improve perioperative nursing care, aimed at increasing the safety of surgical patients and thus reducing the risk of injuries resulting from positioning, considering the profile of neurological patients treated at the hospital unit.

In addition to collaborating with the hospital team by offering subsidies through the results of this research to collaborate and contribute to the improvement of care for surgical patients. In view of the above, this research aims to evaluate the risk of lesion development resulting from surgical positioning in patients undergoing neurological surgery.

2 METHODOLOGY

This is an observational, descriptive study with a quantitative approach, developed from February to July 2023, in the morning and afternoon shifts, at a university hospital in the Northeast region of Brazil, a reference in medium and high complexity procedures.

Among the inclusion criteria, patients aged 18 years or older, undergoing elective neurological surgery and in a position to be interviewed are mentioned. Patients undergoing emergency surgery and in isolation were excluded.

For data collection, a form developed by the researchers was used, with sociodemographic (gender, age, origin) and clinical data (Body Mass Index, comorbidities, physical limitations, pain and PPL in the preoperative period) of the patient in the admission room and in the Post-anesthetic Recovery Room (PACU). In addition, ELPO was applied after the patient was positioned on the operating table.

The scale has 7 items, which include the type of surgical position, surgery time, type of anesthesia, support surface, position of the limbs, comorbidities and age of the patient. Each item has a score ranging from 1 to 5 points and the total score of the scale ranges from 7 to 35 points (Lopes, 2014; Lopes *et al.*, 2016).

It is observed that the higher the score, the greater the risk of the patient developing lesions. Thus, patients with a score of 7 to 19 points are considered low risk and in the case

of a classification of 20 to 35 points, they are considered high risk and deserve special attention (Lopes, 2014; Lopes *et al.*, 2016).

The study data were entered and processed in an Excel spreadsheet, calculating the mean and the minimum and maximum values. To be stored in the form of a database and then analyzed. The sample was characterized by processing these data in a descriptive analysis.

The project was approved by the Research Ethics Committee (CEP) of the Federal University of Rio Grande do Norte (UFRN), under CAAE 30098220.2.0000.5537, in compliance with Resolution No. 466/2012 of the National Health Council.

Regarding the limitations of the study, the small sample of the study stands out, due to the cancellation of surgeries during the period of collection due to lack of supplies to perform the procedures. In addition, the lack of studies available in the literature on the subject is mentioned.

3 RESULTS

During the study period, the sample consisted of 22 patients who underwent elective neurological surgery at the hospital. Among them, the majority of females (68.2%), prevailed adults under 60 years of age (72.6%), with a mean age of 47.5 years, a maximum of 69 and a minimum of 22 years, of brown ethnicity (54.5%), coming from the metropolitan region and the interior of the state (77.2%) and complete high school (31.8%), as shown in table 1.

Regarding the body composition of the patients, the mean weight was 73.5 kg and the mean height was 1.64 meters. When analyzing the Body Mass Index (BMI), it was found that most patients had an index outside the recommended values of normality, with a prevalence of overweight. It is important to mention that two patients did not know how to inform their weight and height, obtaining values from only 20 participants (Table 1).

Table 1

Sociodemographic characterization of the research participants in the preoperative period of neurological surgery

Variables	Frequency n (%)
Gender	
Female	15 (68,2)
Male	06 (31,8)
Colour	

White	09 (40,9)
Brown	12 (54,5)
Negress	01 (4,5)
Schooling	
Illiterate	02 (9,1)
Literate	01 (4,5)
Incomplete elementary school	05 (22,7)
Elementary school	02 (9,1)
Incomplete high school	03 (13,6)
Middle school	07 (31,8)
Incomplete higher education	01 (4,5)
Higher education	01 (4,5)
BMI	
Normal	06 (30)
Overweight	09 (45)
Obesity - grade II	05 (22,7)

Source: Author himself, 2025.

It was evidenced that 14 (63.6%) patients had comorbidities, especially obesity 05 (22.7%), followed by Systemic Arterial Hypertension (SAH) and Diabetes Mellitus (DM), both with 04 (44.4%). It is worth noting that 05 (35.7%) patients had more than one comorbidity simultaneously, as shown in Table 2.

Table 2

Clinical characterization of the research participants in the preoperative period of neurological surgery

Clinical variables	Frequency n (%)
Comorbidities	
Systemic Arterial Hypertension	04 (28,5)
Diabetes Mellitus	04 (28,5)
Dyslipidemia	03 (21,4)
Cardiopathy	01 (7,1)
Physical disability	02 (14,2)
Pressure Injury	02 (14,2)

Vascular disease	01 (7,1)
Neuropathy	01 (7,1)
No comorbidities	08 (36,3)
Preoperative pain	
Yes	08 (36,4)
No	14 (63,6)
Preoperative pressure injury	
Yes	02 (9,1)
No	20 (90,9)
Physical limitation	
With limitations	04 (18,2)
No limitations	18 (81,8)

Source: Author himself, 2025.

Preoperative pain was identified in 08 (36.4%) sample participants, with a predominance of headache in 04 (50%), followed by low back pain and eye pain, with 03 (37.5%) and 01 (12.5%), respectively. Regarding the presence of PPL, only 02 (9.1%) patients had it, both in the occipital, sacral and lateral regions of the external thigh. It was observed that 02 (9.0%) patients had physical limitations in the left lower limb and 02 (9.0%) in the lower limbs and upper limbs (Table 2).

Regarding the profile of elective neurological surgeries, the following surgeries had the highest frequency: carpal tunnel 04 (18.2%), percutaneous rhizotomy 03 (13.6%), peritoneal ventricular shunt 03 (13.6%) and cervical/lumbar/lumbosacral discectomy 03 (13.6%).

Table 3 shows the distribution of the items present in the ELPO among the patients in the intraoperative period of neurological surgery. Of the research participants, 08 (36.3%) patients obtained a high score for the development of lesions due to surgical positioning. The mean score was 18.4 points, with a minimum of 13 and a maximum of 26 points.

Table 3

Distribution of patients undergoing elective neurological surgeries according to the items of the ELPO Scale

ELPO variables	Frequency n (%)
Type of surgical position	
Lithotomy	02 (9,0)
Prone	05 (22,7)
Lateral	01 (4,5)
Supine	14 (63,6)
Surgery time (hours)	
From 4 to 6	05 (22,7)
From 2 to 4	06 (27,2)
From 1 to 2	04 (18,1)
Up to 1	07 (31,8)
Type of anesthesia	
General	15 (68,1)
Sedation	07 (31,8)
Support surface	
Foam Surgical Table Mattress (conventional) + cushions made of cotton fields	22 (100)
Members' position	
Knee > 90° elevation and opening of the lower limbs > 90° or Upper limb opening > 90°	05 (22,7)
Knee Elevation >90°/ or Opening of the lower limbs >90°	01 (4,5)
Upper limb opening < 90°	04 (18,1)
Anatomical position	12 (54,5)
Comorbidities	
Pressure injury or neuropathy previously diagnosed or thrombosis deep venous	03 (13,63)
Obesity or malnutrition	06 (27,2)
Diabetes mellitus	02 (9,0)
Vascular disease	01 (4,5)

Patient's age (years)	
Between 60 and 69	06 (27,2)
Between 40 and 59	08 (36,3)
Between 18 and 39	08 (36,3)

Source: Author himself, 2025.

In view of the results obtained with the application of the ELPO, it was identified that 14 (63.63%) patients undergoing elective neurosurgery had a reduced risk for the development of lesions due to surgical positioning, with a mean of 18.45 points, with a maximum score of 13 and a minimum score of 26 points.

4 DISCUSSION

By analyzing the results obtained in the present study, the sample was characterized according to the sociodemographic, clinical and surgical data of the participants, and the classification of patients according to the ELPO was identified.

There are many factors associated with the risk for the development of injuries related to surgical positioning, including: surgery time, surgical positioning, support surfaces, limb position, type of anesthesia, comorbidities, lifestyle, nutritional status, weight, and age, which are present in the ELPO assessment (Cebeci; Şenol, 2021; Balcı *et al.*, 2023).

In this regard, patients at extreme ages are quite vulnerable to lesions, especially the elderly, who have physiological changes in the skin structure resulting from senescence, such as decreased circulation, nutrition, and elasticity, hindering the cell and scar replacement process (Khalid *et al.,* 2022; Munoz *et al.*, 2022). Studies show that patients over 65 years of age are more vulnerable to positioning lesions, and have lower tolerance to prolonged positioning (SOBECC, 2021; Wu *et al.*, 2021).

In addition, the elderly population has a higher number of associated comorbidities, such as vascular and osteoarticular problems, which increases the risk of injury (SOBECC, 2021). This pattern was observed in the present study and, in agreement with a cross-sectional study conducted with 138 elderly patients undergoing elective surgery, the risk of injury due to positioning was high (57.2%) (Nova *et al.*, 2025).

The presence of vascular and respiratory diseases and neuropathies cause fragility of the physiological system. In addition, the more severe the comorbidities, the greater the risk for the development of these adverse events (Lopes, 2014; Hail; Paula; Carvalho, 2014).

High BMI, specifically above 30 kg/m2, may also be associated with risk factors for the development of these lesions, due to compression of blood vessels and nerve structures

resulting from excess adipose mass, generating a decrease in tissue perfusion and the appearance of lesions (Peng; Xiao; He, 2024; Qazi; Khattak; Barki, 2022; Wu *et al.*, 2021).

The presence of vascular diseases predisposes to the occurrence of PPL, a study shows that 34 of the patients who developed lesions had SAH and the risk increased when it was associated with another comorbidity (Saraiva; Paula; Carvalho, 2014). DM, which is responsible for causing peripheral vasoconstriction, decreases the diameter of blood vessels and increases the risk of stroke and heart disease (Lopes *et al.*, 2016; Maya, 2022).

In view of the adverse events caused by surgical positioning, pain is evidenced, a factor indicative of complications and which can cause delay in the patient's recovery (Balcı *et al.*, 2023; Bentsen *et al.*, 2024). Considered as the "fifth vital sign", pain is a sensory and emotional experience, associated with a tissue or potential injury (Raja *et al.*, 2020).

It should be taken into account that for each additional point in the ELPO score in which the patient is classified, the chance of presenting pain increases by 28%. Thus, the scale has the validity of a predictive criterion when considering pain related to the surgical positioning of the patient (Lopes *et al.*, 2016).

Therefore, special attention should be paid to preoperative pain management, based on nursing interventions that reduce pain exposure time, optimizing patient comfort and improving care in the perioperative period (Lopes *et al.*, 2016).

In addition, PPL was identified in the preoperative period of the sample of the present study. It should be noted that Pressure Injury is considered the most common complication in prolonged surgical procedures and that the patient remains in the same position throughout the surgical time (SOBECC, 2021). Therefore, the importance of skin inspection in the preoperative period and the use of protection resources, such as Support Surfaces (SS), is emphasized, so that the rate of these complications decreases (Levy *et al.*, 2018; SOBECC, 2021).

From this perspective, SS or Support Surfaces (SA) are of great relevance for surgical procedures and aim to reduce, relieve and/or redistribute pressure and certain areas of the patient's body, and thus prevent the development of injuries resulting from surgical positioning (Bentsen *et al.*, 2024; Betts; Scott; Makic, 2022; Bjøro *et al.*, 2022; SOBECC, 2021).

They are the primary choice to help protect the skin against shear and friction, pressure redistribution and among other functions, being chosen based on the specificity of each patient and the type of surgery (Nascimento; Rodrigues, 2020). Among the recommended positioners, viscoelastic, prophylactic adhesive dressings, specific positioners, and foams (Betts; Scott; Makic, 2022; Eberhardt *et al.*, 2020).

During the preoperative period, attention should be paid to the physical limitations of the patients, since at the time of surgical positioning, the multidisciplinary team should have resources and identify a position favorable to the patient's tolerance (Nascimento; Rodrigues, 2020).

Regarding other ELPO findings, the most frequent type of surgical positioning, especially in neurosurgery, is the supine position, however the type of position varies according to the procedure to be performed, considering the most appropriate for the team and the patient (SOBECC, 2021; Wu *et al.*, 2021).

The prone position occupies the second place as the most frequent position, and in spine surgeries and neurosurgeries in the posterior fossa it is the one that prevails. This type of position is initially risky when the patient is anesthetized and placed in the prone position, due to the compensation mechanisms being compromised due to hemodynamic changes (SOBECC, 2021).

Among the possible complications caused, the following are mentioned: inadequate pressure on the face, jaw pain in the postoperative period, corneal injury due to dryness or pressure, and even loss of vision. As well as eye, cervical, brachial plexus, radial and ulnar nerve injuries, increased chest and abdominal pressure, impaired ventilation, and other adverse events (SOBECC, 2021).

From this perspective, the most prevalent limb position in the study was knee elevation > 90° and lower limb opening > 90° or upper limb opening > 90°, the scale item with the highest score (5 points) due to anatomical changes in limb position. It is worth noting that the greater the modifications, the greater the risk of physiological impairment (Lopes, 2014; Speth, 2023).

In addition, the surgical time associated with fixed positioning can cause bone pressure points and thus trigger skin lesions. As well as, tissue hypoxia, ischemia and tissue necrosis (Li *et al.*, 2023; Qazi; Khattak; Barki, 2022). Studies have shown that the longer the surgical time, the greater the risk of injury due to positioning, and the increase in perioperative injuries is related to surgical procedures lasting more than 2 hours (Peng; Xiao; He, 2024; SOBECC, 2021).

Anesthesia is responsible for influencing the degree of depression of the nervous system, consequently depressing the pain receptors and relaxing the muscles. In this way, the body counteracts the defense mechanisms, unprotecting the body against pressure, stretch, muscle effort and/or joint damage (Bentsen *et al.*, 2024; Laughlin *et al.*, 2020; SOBECC, 2021).

However, this action often causes hypotension due to systemic vascular resistance, heart rate, and myocardial contractility, situations that can be potentiated in patients with vascular disease (Lopes, 2014).

In view of the scores obtained by the ELPO, studies have shown that the development of lesions in the postoperative period was more evident in patients who presented a high risk for the development of lesions due to surgical positioning (Lopes *et al.*, 2016). In addition, they are more likely to develop pain and PPL in the postoperative period (Lopes *et al.*, 2016).

5 CONCLUSION

Through the application of the ELPO, it was possible to evaluate the high risk for the development of lesions due to surgical positioning in 08 patients undergoing neurological surgery. In addition, the risk factors that influenced the increase in the score were identified.

In addition, identifying the risk factors for the appearance of these lesions implies the provision of subsidies for the care of the surgical team, especially the nursing team. So that actions can be implemented to prevent complications associated with surgical positioning and, consequently, increase patient safety.

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