

FACTORS ASSOCIATED WITH SKIN LESIONS RESULTING DURING THE INTRAOPERATIVE PERIOD

Fatores associados a lesões de pele decorrentes do período intraoperatório

Factores asociados a lesiones de piel resultantes del período intraoperatorio

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ABSTRACT: Objective: To evaluate the occurrence of skin lesions in the intraoperative period due to surgical procedures performed at a large university hospital. **Method:** A cross-sectional, descriptive study with a quantitative approach, performed at a university hospital in Recife, Pernambuco, Brazil. The sample consisted of 154 patients undergoing elective surgeries between January and April 2018. They were evaluated in the pre and postoperative periods, through the application of the Risk Assessment Scale for the Development of Injuries due to Surgical Positioning (ELPO), during the intraoperative period. Data were collected at the preoperative visit and on the first postoperative day. **Results:** Of the 154 patients evaluated, seven presented 11 skin lesions, such as stage I, stage II and abrasion lesions, predominantly in the gluteus and thorax. The variables length of the surgical procedure, type of anesthesia and comorbidities were the main factors associated with the occurrence of lesions. **Conclusion:** Among patients who presented skin lesions due to surgical positioning, most were classified by the ELPO as high risk, which suggests that this is a suitable scale for assessing the risk of skin lesions in surgical patients.

Keywords: Perioperative nursing. Skin. Pressure ulcer. Operative surgical procedures.

RESUMO: Objetivo: Avaliar a ocorrência de lesões de pele no período intraoperatório decorrentes de procedimentos cirúrgicos realizados em um hospital universitário de grande porte. **Método:** Estudo transversal, descritivo, com abordagem quantitativa, realizado em um hospital universitário do Recife, Pernambuco, Brasil. A amostra foi constituída de 154 pacientes submetidos a cirurgias eletivas entre os meses de janeiro e abril de 2018, avaliados nos períodos pré e pós-operatório, por meio da aplicação da Escala de Avaliação de Risco para o Desenvolvimento de Lesões Decorrentes do Posicionamento Cirúrgico (ELPO), no intraoperatório. A coleta de dados ocorreu na visita pré-operatória e no primeiro dia de pós-operatório. **Resultados:** Dos 154 pacientes avaliados, sete apresentaram 11 lesões de pele, como lesões por pressão estágio I, estágio II e abrasão, predominantemente no glúteo e no tórax. As variáveis tempo do procedimento cirúrgico, tipo de anestesia e comorbidades foram os principais fatores de associados à ocorrência das lesões. **Conclusão:** Entre os pacientes que apresentaram lesões de pele devido ao posicionamento cirúrgico, a maioria foi classificada pela ELPO como alto risco, o que leva a crer que se trata de uma escala adequada para avaliação de risco de lesões de pele em pacientes cirúrgicos.

Palavras-chave: Enfermagem perioperatória. Pele. Lesão por pressão. Procedimentos cirúrgicos operatórios.

RESUMEN: Objetivo: Evaluar la ocurrencia de lesiones de piel en el período intraoperatorio resultantes de procedimientos quirúrgicos realizados en un hospital universitario de gran porte. **Método:** Estudio transversal, descriptivo, con abordaje cuantitativo, realizado en un hospital universitario de Recife, Pernambuco, Brasil. La muestra fue constituída de 154 pacientes sometidos a cirurgías electivas entre los meses de enero y abril de 2018, valuados en los períodos pre y postoperatorio, por medio de la aplicación de la Escala de Evaluación de Riesgo para el Desarrollo de Lesiones Debidas al Posicionamiento Quirúrgico (ELPO), en el intraoperatorio. La recolección de datos ocurrió en la visita preoperatoria y en el primer día de postoperatorio. **Resultados:** De los 154 pacientes evaluados, siete presentaron 11 lesiones de piel, como lesiones por presión estadio I, II y abrasión, predominantemente en el glúteo y en el tórax. Las variables tiempo del procedimiento quirúrgico, tipo de anestesia y comorbidades fueron los principales factores de asociados a la ocurrencia de las lesiones. **Conclusión:** Entre los pacientes que representaron lesiones de piel debido al posicionamiento quirúrgico, la mayoría fue clasificada por ELPO como alto riesgo, lo que lleva a creer que se trata de una escala adecuada para la evaluación del riesgo de lesiones de piel en pacientes quirúrgicos.

Palabras clave: Enfermería perioperatoria. Piel. Úlcera por presión. Procedimientos quirúrgicos operativos.

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INTRODUCTION

The surgical environment is considered to be a place of risk for iatrogenic diseases, due to the characteristics of care provided, the diversity of surgical procedures and diagnoses, as well as the intense circulation of health professionals, making it one of the units of the hospital where adverse events (AE) are most frequent, and are preventable in up to 43% of cases^{1,2}.

AEs are injuries or lesions originating from care that results in temporary or permanent disability or dysfunction, and even in death among patients³.

Among the AE that happen in the perioperative period, complications that occur due to surgical positioning include: musculoskeletal pain, joint displacement, peripheral nerve damage, skin lesions (SL), cardiovascular and pulmonary involvement, and compartment syndrome⁴. Intraoperative SL can range from an erythema, which compromises skin integrity, to extensive lesions such as burns caused by an electric scalpel and accessories, or even friction or shear lesions, as a result of surgical exposure without proper prevention care in positioning. Regardless of the position of the patient, bony prominences and high-pressure areas should be protected⁵.

Recent studies have highlighted several risk factors associated with SL in surgical patients, and such factors are divided into two groups: intrinsic, such as age, body weight, nutritional status and chronic diseases like diabetes mellitus, vasculopathies, neuropathies, hypertension and anemia; and extrinsic, for example, type and length of surgery, anesthesia, surgical position and positioning. The intensity of these factors and the duration of the anesthetic-surgical procedure show a greater or lesser risk of developing SL, which can be observed after the procedure is completed and can be strengthened rapidly. The most common sites for the development of SL through surgical positioning are: the sacral region, the calcaneus, the mandibular region and the trochanters^{5,6}.

In order to adequately and safely position the surgical patient on the operating table, it is imperative that the nurse at the surgical center (SC) be aware of the anatomical and physiological changes resulting from the surgical positioning on the body, as well as the equipment and devices available to assist in the execution of the procedure. In this way, he or she will reduce the rate of SL in patients undergoing anesthetic-surgical procedures^{7,8}.

Thus, it is essential that all members of the surgical team understand the risk factors related to the occurrence of SL in the perioperative period and that they effectively apply SL prevention protocols in the SC, thus responding to the real needs of the surgical patient during perioperative care⁹⁻¹¹.

Faced with the multifactorial etiology of surgical lesions, all patients who undergo some surgical intervention should be systematically evaluated during the perioperative period in order to identify risks and to prepare an individualized care plan that guarantees quality perioperative care^{4,6}.

OBJECTIVE

To evaluate the occurrence of SL in the intraoperative period due to surgical procedures performed at a large university hospital.

METHOD

This is a cross-sectional, descriptive study with a quantitative approach, developed in the SC unit and in the surgical wards of a large university hospital in the Northeast of Brazil. The SC is composed of ten operating rooms, and the surgical procedures occur according to the distribution map, which shows the rooms for each specialty. Between 350 and 400 elective surgeries per month are performed, which includes 14 surgical specialties and highly complex surgeries such as cardiac, thoracic, neurological, oncological and transplantation surgeries.

The population consisted of patients undergoing surgery during the collection period, including those who were older than 18 years old and who were not being included in emergency surgeries or reoperations. The exclusion criteria were patients with a cognitive deficit, a hospital discharge less than 24 hours after the end of surgery, and a referral to the intensive care unit after their anesthesia-surgical procedure.

The sample was obtained for convenience. To estimate the sample size, a calculation was used to estimate means, considering the quantitative variable risk score as the main outcome, as measured by the Risk Assessment Scale for the Development of Injuries due to Surgical Positioning (ELPO), the principal outcome of the study. A standard deviation (SD) of 3.84 was considered; extracted from the ELPO scale-study

study⁷, a maximum error was estimated at 0.5 points and a significance level for the statistical tests was 5%. Thus, for the monthly average of 370 surgeries/month in the previous year and the collection period of three months, the calculated sample was 189 patients. In total, 227 patients were approached, of which 154 fulfilled the inclusion criteria. There was a loss of 73 patients, of whom 43 were discharged before 24 hours, 12 had surgeries that were canceled/suspended, 7 patients were unable to perform verbal communication due to orotracheal intubation, 6 had some type of cognitive limitation or were using sedatives, and 5 did not agree to participate in the study.

The data collection was performed in two moments. In the immediate preoperative period, the patients were identified at the preoperative visit, invited to participate in the study and informed about the study protocol. After the patient agreed to participate in the research, an Informed Consent Form was given to them with all of the information and specifics about the study. The sociodemographic and clinical data and an assessment of the hospitalized patient's skin conditions were collected in the surgical infirmary of the patient's origin, using a specific instrument to record the observations.

On the first postoperative day, the second evaluations were performed in a new visit to the patient in the surgical infirmary of origin, from 24 to 48 hours after the anesthetic-surgical procedure. This was done by inspecting the skin's condition in order to verify if the development of SL had occurred, and thus filling out the collection instrument. The surgical data (procedure performed, surgical positioning, surgical time, type of anesthesia, classification by the American Society of Anesthesiologists - ASA, location of the scalpel plate, complications, use of blood products, skin preparation, use of adhesive tapes on the skin and trichotomy) were obtained from the patient's chart, the intraoperative record (completed by the anesthesiologist), the description of the surgical procedure (filled out by the surgeon) and the perioperative nursing record (completed by the nursing team). The postoperative data were not collected in the post-anesthetic recovery room due to the patients' difficulties with communication and mobilization.

The ELPO was used to evaluate the risk score and to evaluate the factors associated with the lesion. The ELPO was created and validated in Brazil in 2013, in order to evaluate the risk for the development of tegumentary lesions (pressure lesions), neurological lesions (nerve lesions) and pain unrelated to surgical incision⁷.

The scale contains seven items: type of surgical positioning, length of surgery, type of anesthesia, support surface, limb position, comorbidities and age of the patient. A score of 20 was the cut-off point to differentiate the patients classified by the ELPO, that is, a patient with a score of up to 19 points was classified with a lower risk for the development of lesions resulting from the surgical positioning, and a patient with a score of 20 or more was classified with a greater risk. This classification established which patients were at greater risk and, consequently, which perioperative team should be more cautious during the execution of the positioning, in order to prevent complications associated with the surgical procedure⁷.

In order to evaluate the SL identified in the postoperative period, the National Pressure Ulcer Advisory Panel (NPUAP) was adopted and culturally adapted for Brazil for SL, but other injuries were included, such as abrasion¹².

The data were tabulated in Microsoft Excel and analyzed using the free software, Statistical Package for the Social Sciences (SPSS). Descriptive statistics (absolute and relative frequencies, averages, and DP) were used. Student's *t* test was used for data analysis in order to compare independent sample means. Data regarding ELPO variables, according to the presence or absence of SL in the intraoperative period, were analyzed by Student's *t* test.

The research was elaborated based on the ethical precepts of Resolution 466/2012 of the National Health Council, which was initiated after approval by the Research Ethics Committee of the hospital, under report No. 2,045,355.

RESULTS

Of the patients who participated in the study (n=154), the majority (n=102/66.2%) were of the feminine sex; had an average of age of 51.8±15.4 years, 37% (n=57) were elderly; 21.4% (n=33) were retired. Of the 154 patients, 23.3% (n=36) were from the capital city, 37% (n=57) lived in the metropolitan region, 33.7% (n=52) lived in the countryside and 5.8% (n=9) were from another northeastern state. Most had already previously undergone a surgery (n=108/70.1%).

Of the patients evaluated, 53.9% (n = 83) had systemic arterial hypertension as a comorbidity, followed by diabetes mellitus (n = 26 / 16.8%), alcoholism (n = 28/18.2%) and smoking n = (27/17.5%). With regard to body mass index (BMI), the mean was 26.7 kg/m², and ranged from 16.7 to

51 kg/ m², and 21.1% (n = 31) of the patients presented patterns of obesity.

In relation to physical limitations, 14 (9%) patients needed ambulatory help, 8 (5.1%) reported having some type of movement limitation due to being overweight, 8 (5.1%) patients were bedridden and 1 (0.6%) had paraplegia.

The evaluation of skin conditions in the preoperative period revealed that 147 (95.5%) patients had no cutaneous lesions in this period, however, 7 (4.5%) were admitted to the SC with some type of SL, including: a diabetic foot/vascular lesion on the foot/leg (37.5%), abrasions (12.5%), a psoriasis dermatological disease (12.5%), a keloid (25%) and a soft tissue infection(12.5%).

The most frequent surgical specialty was general surgery (n = 47/30.5%), followed by gynecology (n=44/28.5%) and urology (n=34/22%). The most performed surgeries were exploratory laparotomy and enlarged total hysterectomy, both with 19 patients (12.3%) each, followed by videolaparoscopic cholecystectomy (n=11/7.14%).

It was verified, according to the ELPO, that 72 (46.7%) anesthetic-surgical procedures performed lasted between 2 to 4 hours, and 7 (4.6%) procedures lasted more than 6 hours (Table 1).

It was observed that 39.7% (n = 61) of the procedures used regional anesthesia and 68.2% (n=105) adopted the surgical position of dorsal decubitus; and in all procedures (n = 154/100%) the standard operating table (MOP) with foam mattress and cotton-field cushions were used as support surfaces for patients (Table 1). Regarding the position of the limbs (upper and lower), it was found that in 110 (71.4%) evaluated procedures, the opening of the upper limbs was less than 90° (Table 1).

From the surgical procedures, it was observed that 88.3% (n=136) used electrocautery (an electric scalpel), and the plate was placed mainly in the calf (n=65/42.2%), in the vastus lateralis of the thigh (n=51/33.1%) and in the posterior thorax (n=15/9.7%).

With regard to intraoperative complications, only 8 (5.1%) cases were identified: hypotension, hypertension, severe bleeding, hypoxemia, hypoglycemia, hyperglycemia and oliguria.

In more than half of the patients (n=92/59.7%) no trichotomy was performed; 43 (27.9%) reported having performed the trichotomy more than 2 hours before the anesthetic-surgical procedure and 19 (12.4%) performed the trichotomy within 2 hours of the surgery.

The results of the ELPO score in the intraoperative period showed a mean score of 18.33 ± 3.02 , a median of

19 points, a minimum score of 11 and a maximum score of 27 points. The majority of patients evaluated (n=103/66.9%) had a low risk of developing SL in the intraoperative period, according to ELPO (≤ 20 points). Only 7 (4.5%) patients had SL at the end of the anesthetic-surgical procedure, and 4(57.1%) presented more than one lesion, thus totaling 11 recorded lesions. Table 2 presents the recorded cases of intraoperative SL.

The main specialty to have SL was orthopedic surgery (n=4/57.1%). The most adopted position for SL patients was dorsal decubitus (n=3/42.8%), followed by the left lateral

Table 1. Distribution of patients undergoing elective surgeries (n = 154), according to variables present in the Risk Assessment Scale for the Development of Injuries due to Surgical Positioning.

Variables	n	%
Length of surgery (hours)		
Up to 2	59	38.3
Between 2 and 4	72	46.7
Between 4 and 6	16	10.4
Above 4	7	4.6
Type of Anesthesia		
Local	1	0.6
Sedation	1	0.6
Regional	61	39.7
General	60	39.0
General + regional	31	20.1
Type of surgical position		
Supine	105	68.2
Lateral	13	8.4
Trendelenburg	0	0.0
Prone	3	2.0
Lithotomic	33	21.4
Type of support		
Foam mattress + cushions with cotton pads	154	100.0
Surgical positioning of the limbs		
Anatomical position	1	0.65
Opening of the upper limbs <90°	110	71.4
Elevation of the knees <90° and opening of the lower limbs <90° or neck without chin-sternal alignment	40	26.0
Elevation of the knees >90° or opening of the lower limbs >90°	3	2.0

decubitus position and the ventral decubitus position, both with 2 (28.6%) patients each. The most prevalent type of anesthetic procedure was general anesthesia and the combined form (general + regional), each had 3 patients (42.8%), and only 1 (14.3%) patient underwent regional anesthesia. With regard to the ASA classification, 4 (57.1%) were classified as ASA II, 2 (28.6%) ASA III and 1 (14.3%) ASA I. Table 3 lists the characterizations of SL and their frequencies, found in this study sample.

On the first postoperative day, of the 7 patients presenting SL, 5 (71.4%) had pain that was not related to the surgical procedure, but rather, due to SL caused during the intraoperative period. The pain intensity at the lesion site was evaluated according to the patient's report score and ranged from 1 to 8, with a higher frequency of score 1,

reported by 2 patients, followed by scores of 3 to 8, reported by 1 patient.

Regarding the ELPO score, it ranged from 17 to 26 points, showing a mean score of 21.71 ± 2.69 in the patients presenting SL in the intraoperative period. It should be noted that the majority of patients assessed who presented SL ($n = 6/85.71\%$) were classified by the ELPO as high risk (Table 3).

Patients who presented SL in the intraoperative period had a mean of 21.7 ± 2.7 on the ELPO scale. On the other hand, patients who did not present SL had an average of 18.21 ± 3.0 .

Table 4 shows that patients with lesions presented worse results (higher scores) in the domains of length of surgery, type of anesthesia, and comorbidities, and the difference was not significant for age, position of the limbs, and type

Table 2. Characterization of patients with skin lesions resulting from the intraoperative period.

Case	Sex	Age	BMI	Comorbidities	Physical limitations
1	Female	57	44	DM/SAH/CA/obesity	None
2	Male	37	17.9	CA/malnutrition	None
3	Female	67	24.5	SAH	Walking with help
4	Female	60	20.8	No comorbidities	None
5	Male	43	22.2	No comorbidities	Bedridden
6	Male	52	25.4	No comorbidities	None
7	Male	50	31	DM/SAH/VD/obesity	None

BMI: Body mass Index; DM: diabetes mellitus; SAH: Systemic arterial hypertension; CA: cancer; VD: Vascular disease.

Table 3. Clinical characterization, type and location of the lesions, scoring and classification of the Risk Assessment Scale for the Development of Injuries due to Surgical Positioning that presented skin lesions in the intra-operative period ($n = 7$).

Case	Surgery Performed	Scalpel Plate Site	Type of Position	Length (in hours)	Type of anesthesia	ASA	Type of skin lesion	Skin lesion site	Pain*	ELPO
1	Colectomy	Thigh	Dorsal	4	Combined	II	Supra Pubic region/ Perichannel	Abrasion/PL II	04	21
2	Cholecystectomy	Calf	Dorsal	9	Combined	II	Gluteus L/RLL	PL II/abrasion	05	22
3	Knee arthroplasty	Back	Dorsal	3	Spinal	II	Sacrum Coccigea	PL I	01	18
4	Nephrectomy	Thigh	Lateral	4.3	Combined	II	Gluteus D	PL I	01	21
5	Hip arthrodesis	Gluteus	Lateral	8	General	II I	Dorsal/thorax	Abrasion/ Abrasion	03	21
6	Lumbar decompression	Thigh	Ventral	5.5	General	I	Zygomatic Region	PL I	07	22
7	Review of Cervical Arthrodesis	Thigh	Ventral	8	General	II I	Bilateral thorax	PL I/PLII	08	27

ASA: Clinical condition and anesthetic risk of the patient according to the American Society of Anesthesiology Classification; *Pain scale at the site of the skin lesion; ELPO: Risk Assessment Scale for the Development of Injuries due to Surgical Positioning; Combined Anesthesia: General + regional; L: Left; RLL: Right lower limb; PL: Pressure lesion.

of surgical position. The surgical surface was the same in both groups, since in the hospital there is only one type of mattress for the operating tables and there are no gel pads, or viscoelastic pads. Sheets with cushions for positioning were used.

DISCUSSION

Nursing care that is dedicated to patients during the intraoperative period will reflect in the postoperative period, since many SL begin in the operating room and intensify in the postoperative phase. Surgical patients are the first candidates for tissue ischemia due to decreased capillary flow, prolonged immobility and pressure in the surgical procedure, giving the patient greater pressure intolerance. Therefore, it is essential to maintain the cutaneous integrity of each patient, requiring the nurse to become familiar with the proper technical and scientific knowledge⁹⁻¹³.

Studies describe that there is an association between the development of LP due to surgical positioning and the various risk factors related to the occurrence of these lesions, especially the intrinsic factors such as age, body weight, nutritional status, chronic diseases (diabetes mellitus, neuropathies, arterial hypertension and anemia), and extrinsic factors such as type and length of surgery, type of anesthesia, surgical positions adopted and resources and measures used for protection⁶⁻¹⁴.

The prevalence of women (66.2%) undergoing elective surgeries remained equivalent, when compared to other studies⁷⁻¹⁵. As for age group, most patients were adults (63%).

Elderly people have a higher risk of perioperative complications, and an even greater risk of developing SL in the intraoperative period, when compared to adults, because they have lower skin thickness, decreased muscle mass and subcutaneous fat on their bone prominences, leaving them more susceptible to pressure and, consequently, to the occurrence of tissue damage¹⁴⁻¹⁶.

In addition to age, the presence of comorbidities such as diabetes mellitus, vasculopathies, neuropathies and arterial hypertension is a risk factor for the occurrence of perioperative lesions because of positioning, since such pathologies compromise tissue perfusion^{6-8,14-17}. Hypertension and diabetes, both entities found in a significant proportion of the sample, are the comorbidities responsible for increasing the risk of SL⁸⁻¹⁸.

Regarding nutritional status, being underweight and overweight, which is indicated by BMI, are also risk factors associated with the appearance of lesions¹⁷. Patients who are overweight and obese present little vascularity of the fatty tissue, leading to more time-consuming surgical procedures, a greater likelihood of trauma on the operated tissue, and difficulty performing adequate hemostasis. On the other hand, being underweight results in a marked exposure of bone prominences, leaving patients more susceptible to the occurrence of SL due to surgical positioning⁴⁻¹⁴.

The devices used to decrease the pressure interfaces during the anesthetic-surgical procedure can be classified as static and dynamic. Static devices include foam and gel mattresses, dry viscoelastic gel and polymer mattress covers, air or fluid mattresses, and foam and gel pads. The dynamic devices include micropulsing air mattresses¹⁹. The service

Table 4. Data referring to the variables of the Risk Assessment Scale for the Development of Injuries due to Surgical Positioning, according to the presence or absence of skin lesions during the intraoperative period.

ELPO	No skin lesion (n=147) average±SD	Skin lesion (n=7) average±SD	p*
ELPO Variable			
Type of surgical position	2.02±1.66	1.63±1.41	0.465
Length of surgery	2.69±0.86	4.75±1.17	0.001
Type of anesthesia	3.73±0.78	4.63±0.52	0.002
Support surface	4±0.00	4±0.00	**
Position of limbs	2.29±0.51	2.25±0.46	0.52
Comorbidities	2.25±1.35	3.37±1.06	0.02
Age	2.25±1.31	2.12±0.83	0.649
ELPO Score	18.21±3.05	21.75±2.69	0.06

ELPO: Risk Assessment Scale for the Development of Injuries due to Surgical Positioning; SD: standard deviation; *Student's t test; **they all used the same surface.

does not yet have these features, taking only the traditional mattress and improvising cushions with cotton fabric pads.

An important finding that deserves to be highlighted is related to the lack of lesions (burns) from electric scalpel plates (electrocautery) in the patients evaluated. It is known that the risk for burns is mainly associated with an improper placement of the electrocautery plate and inadequate electrical installation⁹. However, only disposable adhesive plates are used and the scalpels have a safety system, which prevents their use if the plate has not been connected or if it is out of use¹⁹.

The length of surgery evidenced in this research, lasting more than 2 hours, is also cited as one of the risk factors for injury, since long periods of immobilization and exposure to pressure cause anoxia, tissue necrosis, and consequently SL⁶⁻⁹.

Prolonged immobility of the patient on the surgical table decreases the volume of pulmonary capillary blood flow, thereby limiting lung expansion because of the position pressure on the ribs and the ability of the diaphragm to force abdominal contents down.¹⁷

Another intraoperative risk factor is the type of anesthesia, which influences the degree of depression of the nervous system, in which peripheral vasodilation occurs, resulting in hypotension and decreased venous return, pain receptor depression. This causes the defense mechanisms of the patient to offer less protection against pressure, leaving them susceptible to perioperative lesions due to positioning¹⁷⁻²⁰.

The supine position was the most common surgical position (68.2%), which corroborates Lopes' study, in which, of the 115 surgical procedures, 83 (72.2%) were performed in the supine or prone position¹⁶. In another study, performed with surgical patients in a hospital in Triângulo Mineiro, Minas Gerais, the supine position was adopted in 50% of patients⁹.

In another national study, in 251 (90.3%) anesthetic-surgical procedures, the foam surgical table mattress (conventional) and improvising cushions with cotton pads were used. Another study showed that the surgical foam mattress and the cushions made from cotton pads were used in 69 (60%) surgeries¹⁶.

Support surfaces are specialized devices, overlays, mattresses or integrated systems fabricated for pressure redistribution, shear control or frictional forces on the fabric, maintenance of the microclimate or other therapeutic functions and shall be chosen according to the particular needs of the patient and type of surgery. They aim to avoid friction, preventing SL, compression or neuromuscular stretching, contact with metal from the table, which can cause burns (due to the use of an electric scalpel) and other injuries^{21,22}.

However, these areas of support are little used in surgical patients, since the political, economic and social issues faced by health in the country do not allow for many public services to have these types of technological resources, interfering directly in the prevention of injuries⁹⁻²⁰.

The surgeries were performed in the same type of standard operating table, with the same improvised cushions with cotton pads. The electric scalpel apparatuses (electrocautery) were always of the same make and model, with the same type of disposable plate. Therefore, there were no differences between the material used in the surgeries. There were also no differences in the preparation of the skin, as all of the surgeries followed the same institutional protocol.

Other studies presented a disagreement, since the incidence of SL was quite high, as pointed out in studies carried out in the state of São Paulo, which showed incidences of perioperative lesions because of positioning of 20.6 and 20.9%, respectively^{6,18}. In the state of Minas Gerais, research identified incidence rates in which 21.7 and 74% of the patients presented SL at the end of the surgical procedure^{7,9}. As noted, the incidence of perioperative lesions resulting from positioning remains high because of the absence of preventive measures to avoid such lesions. The lack of compliance or verification of norms and/or clinical guidelines protocols was the main contributing factor.³⁻²⁰

In a study of patients submitted to robotic urologic surgeries, the authors report an incidence of zero, detected in the immediate postoperative period. This incidence rate is justified by the effectiveness of the institutional protocol for the prevention of SL in SC¹¹. This result demonstrates that training with a simulation of the interdisciplinary and multi-professional team, as well as the implementation of prevention strategies and protocols, are essential to guarantee the effectiveness of patient safety in the surgical environment.

When analyzing the pain score in patients who presented SL after the anesthetic-surgical procedure, all reported having pain that was not related to the surgical incision, but to the SL site occasioned in the intraoperative period. Patients with a higher ELPO score are more likely to present postoperative pain due to surgical positioning¹⁶.

The studies on perioperative lesions in the surgical patient indicate that stage I lesions are the most frequent, and this data is corroborated by the present research, in which 34% of the lesions were classified in LP stage I^{6-8,13-18}. In addition, research indicates that most of these lesions evolve to resolution, indicating post-operative care as being decisive for the improvement of the lesion¹³⁻¹⁸.

In spite of other studies that found that the sacral and calcaneal regions were the most affected in the intraoperative period of the investigated patients, in our sample the main sites were the thorax and the gluteal region^{6-9,15}.

When we analyzed the means of the ELPO scores in the patients who did not present SL versus those who presented them, there was a difference of almost 4 points between the groups, close to the study of Lopes, which presented a difference of almost 5 points between the means of the ELPO in the two statistically significant ($p < 0.001$) groups¹⁶. Although this difference was not significant ($p = 0.06$), it was found that patients with lesions had higher ELPO scores and, in addition, 85.7% of patients with lesions presented an ELPO score greater than 20 points, corroborating the inference that elevated ELPO scores are associated with a higher incidence of perioperative SL.

Regarding ELPO scores and the occurrence of lesions, Lopes et al. identified the association of ELPO scores with the development of perioperative lesions because of positioning, showing that each additional point in which the subject is classified in the scale increases the probability of developing SL by 44%⁷. In the present study, 66.9% of the patients obtained an ELPO classification at a low risk of developing perioperative lesions, corroborating the study by Lopes et al., in which the majority of the patients (53.2%) obtained an ELPO score of 19 points, or were classified as low risk for developing SL due to surgical positioning⁷. In another population, 56.5% of the patients had a higher risk of developing perioperative lesions, according to the ELPO¹⁵. When we analyzed the only seven patients who presented SL in the intraoperative period, in relation to the classification of risk of the ELPO, six of them obtained a high risk for the development of this type of lesion.

Using the Student's *t* test for comparison between the means of the ELPO variable scores, significance was found in the domains of length of surgery, type of anesthesia and comorbidities. This refers to the issues directly related to the risk factors for the occurrence of both intrinsic and extrinsic perioperative lesions, demonstrated in this study.

Thus, the identification of risk and the occurrence of injuries, together with the associated factors, can generate evidence for the development of strategies and for the implementation of effective actions that help and guide the multidisciplinary team in the detection of patients at a higher risk for the development of lesions, favoring the prevention of complications in clinical practice or in solving these complications in a timely manner.

The nursing team should be attentive at the time of the surgical positioning, check to see if there are folds in the sheets, if all of the protective resources have been placed properly, and if the positioning accessories available at the institution are being utilized¹⁸.

Because of limitations of this study, the evaluation of neuromuscular lesions was not considered, because it is not part of the objective of the study. However, this type of lesion is also considered to be a perioperative lesion, and it is an important variable to be evaluated in future studies. Further research on the subject is suggested, in which sampling is more representative.

CONCLUSION

In view of the results obtained, it was possible to conclude that, in the intraoperative period, of the 154 patients in the study, 7 (4.5%) presented some type of SL, classified in stage I, stage II and abrasions. Of these, 6 patients had an ELPO score of greater than 20 points. Regarding the risk of developing SL in the intraoperative period, 66.9% of the patients had an ELPO score that was classified as low-risk.

In this study, it was demonstrated that the following variables were the main risk factors for the appearance of LP in the intraoperative period in patients undergoing elective surgery in the studied hospital, as identified through the ELPO scale: length of the surgical procedure, type of anesthesia and comorbidities.

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