

Injuries Resulting from Positioning for Surgery: Incidence and Risk Factors



Lesões Decorrentes do Posicionamento para Cirurgia: Incidência e Fatores de Risco

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ABSTRACT

Introduction: The appropriate surgical positioning is an essential step that is often underestimated, but must be considered, because can lead to serious but preventable injury. The objective of this study is to evaluate the incidence of injury due to surgical positioning, as well as try to identify their risk factors.

Materials and Methods: Prospective study held for one year and included patients from different surgical specialties proposed for elective surgery. Patients were evaluated prior to surgery and exclusion criteria were: age < 18 years, American Society of Anesthesiologists - ASA score > III neuropathy or neuromuscular disease documented. Were considered injuries resulting from the positioning: erythema not reversible under digital pressure and/or persistent > 30 minutes, severe pain on pressure points and not related to the surgical site (Visual Analogue Scale - VAS \geq 7) and peripheral nerve injury. We evaluated the following variables: sex, age, Body Mass Index, ASA classification, anesthetic technique, type of positioning, duration of surgery and its relationship with postoperative injury.

Results: Of the 172 patients included in the study, perioperative lesions were identified in 12.2%, but five of these patients had more than one lesion (pain on pressure point + neuropathy). About 9.9% complained of severe pain (Visual Analogue Scale - VAS \geq 7) on pressure points, 4.7% presented peripheral neuropathy and 0.6% had erythema that did not yield to the digital pressure. In the group that developed lesions, no significant difference with regard to age, sex, anesthetic technique, duration of surgery and positioning was found. Concerning to ASA classification, it was found that ASA II and III patients had a higher incidence of lesion (90.5%) compared with patients ASA I (9.5%), $p < 0.05$. The Body Mass Index > 30 Kg / m² showed also statistically significant association with the development of postoperative injury, $p < 0.001$. In separate analysis of neuropathic injury was found that Body Mass Index > 30 Kg / m² was associated with the occurrence of neuropathy, $p < 0.05$. Concerning the remaining variables and their relation with postoperative neuropathy, it wasn't found a statistically significant relationship.

Conclusion: The scientific evidence for prevention of injuries in the perioperative period, including the neuropathy is limited. The post-operative evaluation of patients is essential because it allows early recognition of lesions and its documentation and guidance.

Keywords: Intraoperative Complications; Posture; Surgical Procedures, Operative; Wounds and Injuries/etiology.

RESUMO

Introdução: O posicionamento cirúrgico adequado é um passo essencial que é muitas vezes subestimado, no entanto há que considerar que pode levar a lesões graves, mas evitáveis. O objetivo deste estudo é avaliar a incidência de lesão decorrente do posicionamento cirúrgico, bem como tentar identificar os seus fatores de risco.

Material e Métodos: Estudo prospetivo que decorreu durante um ano e incluiu doentes de diferentes especialidades cirúrgicas propostos para cirurgia eletiva. Os doentes foram avaliados previamente à intervenção cirúrgica, sendo considerados critérios de exclusão: idade menos de 18 anos, classificação da American Society of Anesthesiologists ASA > III, neuropatia ou doenças neuromusculares documentadas. Consideraram-se lesões decorrentes do posicionamento: eritema não reversível sob digitopressão e/ou persistente > 30 minutos; dor severa em pontos de pressão e não relacionada com o local cirúrgico (Escala analógica visual - VAS \geq 7) e lesão de nervo periférico. Avaliaram-se as variáveis: sexo, idade, Índice Massa Corporal, classificação ASA, técnica anestésica, tipo de posicionamento, duração da cirurgia e a sua relação com o aparecimento de lesão pós-operatória.

Resultados: Dos 172 doentes incluídos no estudo, foram identificadas lesões perioperatórias em 12,2%, sendo que cinco destes doentes apresentaram mais do que uma lesão (dor em ponto de pressão + neuropatia). Destes, 9,9% queixou-se de dor severa (Escala analógica visual - VAS \geq 7) em pontos de pressão, 4,7% apresentou neuropatia periférica e 0,6% apresentou eritema que não cedia à digitopressão. No grupo que desenvolveu lesão, não houve diferença significativa no que diz respeito à idade, sexo, técnica anestésica, duração da cirurgia e posicionamento. No que diz respeito à classificação ASA, verificou-se que os doentes ASA II e III apresentaram uma maior incidência de lesão (90,5%) quando comparados com os doentes ASA I (9,5%), $p < 0,05$. O Índice Massa Corporal > 30 Kg / m² mostrou também estar associado ao desenvolvimento de lesão perioperatória, $p < 0,001$. Na análise isolada de lesão neuropática constatou-se que o Índice de Massa Corporal > 30 Kg / m² estava relacionado com a ocorrência de neuropatia, $p < 0,05$. No que se refere às restantes variáveis e sua relação com neuropatia pós-operatória, não se verificou uma relação estatisticamente significativa.

Conclusão: A evidência científica para a prevenção das lesões no peri operatório, nomeadamente das neuropatias, é limitada. A avaliação pós-operatória dos doentes é também essencial pois permite o reconhecimento precoce das lesões e a sua documentação e orientação.

Palavras-chave: Posicionamento Cirúrgico; Complicações Intra-Operatórias.

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INTRODUCTION

Surgical positioning is an art, a science and also a key factor for a safe and efficient surgical procedure.

The aim of surgical positioning is to provide the best surgical exposure, always considering that associated risks should be reduced.^{1,2} All positionings present risks, and these increase in the anaesthetised patient, who cannot complain of his discomfort.¹

The safety and wellbeing of a patient is delivered to the surgical team, from the moment the patient enters the operating theatre.² Adequate positioning is an essential step which is frequently underestimated; however, it must be considered that if performed incorrectly it may lead to serious but preventable injuries.²

Injuries related with an incorrect positioning include physiological changes (respiratory and cardiovascular), pressure ulcers, alopecia, peripheral nerve injuries and blindness.³ Injury mechanisms that apparently contribute to these injuries include pressure mechanisms, friction and shearing forces.³⁻⁵

Pressure ulcers may be related to an inadequate protection during surgery, as all positions are associated with unphysiological pressures on body surface. These pressures may lead to a reduction in tissue perfusion, which results in ischaemia and subsequent ulcer development. Despite infrequent macroscopic evidence of intraoperative development of ulcers, precipitating events frequently start intraoperatively.^{1,2}

According to the American Society of Anesthesiologists (ASA) - "Closed Claims Project Database", peripheral nerve injuries in the perioperative period are the second most frequent complaint (16%).⁶⁻⁸

In what concerns ocular injuries, their frequency during anaesthesia and surgery is very low (< 0.1%), although the

spectrum may vary from a mild discomfort to permanent vision loss.¹

Several studies have been conducted to try to evaluate neuropathy incidence and risk factors in perioperative period, but other types of perioperative injury are less well studied.⁹⁻¹⁴ Moderate to severe post-operative pain due to bad positioning and inadequate protection of pressure points is sometimes associated to significant discomfort and increased financial costs in the postoperative period. The aim of this study is to evaluate the incidence and risk factors of surgical positioning-related injuries.

MATERIAL AND METHODS

A prospective study held during one year included patients of different surgery specialties proposed for elective surgery.

The following positionings were evaluated: dorsal, ventral or lateral decubitus and lithotomy dorsal position. Exclusion criteria for study entry included: individuals younger than 18 years, physical status classification ASA > III, documented neuropathy or neuromuscular diseases. Fig.1

All patients were previously evaluated in the Anaesthesia Consultation or in a Pre-Anaesthesia Visit and gave written consent for study entry.

Injuries associated to positioning were considered: non-reversible erythema in an area under pressure persisting for more than 30 minutes; severe pain in pressure points not related with the surgical area (pain was evaluated using a Visual Analogical Scale, considering severe pain = VAS ≥ 7) and peripheral nerve injury (sensitive and/or motor) evaluated through a physical neurological examination. All patients were observed in the immediate postoperative period and 24 hours later, for detection of any complication.

ASA	Description
I.	Normal health
II.	Systemic mild disease
III.	Systemic serious disease, non disabling
IV.	Systemic serious disease, disabling, seriously life threatening
V.	Dying patient, with minimal life expectancy, independently from surgery
VI.	Organ donor (cadaver donor)

Figure 1 - Physical status classification according to the American Society of Anesthesiologists (ASA)



Figure 2 - Visual Analogical Scale (VAS)

Previous and postoperative evaluation of each patient was performed by the same researcher. In cases of identified injuries, patients were re-evaluated and treated appropriately.

The following variables were evaluated: gender, age, Body Mass Index (BMI), physical status classification as per ASA classification, anaesthetic technique, positioning requirement and surgery duration.

For the analysis, all cases were divided according to the presence or absence of an injury. Associations between studied variables and postoperative injury development, including neuropathy were analysed. The SPSS® program, version 17, was used for statistical analysis. The χ^2 test or

exact Fisher test were used when appropriate to test the association between variables, considering a significance level of 0.05.

RESULTS

This study included 172 patients, of which 59.9% were females and 40.1% were males. Perioperative injuries were identified in 21 patients (12.2%), five of which presented more than one injury (adding up to 26 injuries in total). From those patients that presented an injury, 9.9% described severe pain (VAS ≥ 7) in pressure points, 0.6% presented an erythema that did not yield to digital pressure and 4.7% presented a peripheral neuropathy (3.5% with a sensitive

Table 1: Injuries found in postoperative period.

Injury	Number of injuries
Severe pain in pressure points (VAS ≥ 7)	17 (9.9%)
Non reversible erythema to digital pressure with a duration higher than 30 min	1 (0.6)
Peripheral nerve injury:	8 (4.7%)
- Sensitive neuropathy	6 (3.5%)
- Motor neuropathy	2 (1.2%)

Table 2: Association between patient related variables and post-operative injury.

Patient related variables	Injury	Injury absence	p value
Age			
18 - 44	4 (19%)	61 (40.4%)	0,06
45 - 64	11 (52.4%)	43 (28.5%)	
≥ 65	6 (28.6%)	47 (31.1%)	
Gender			
Male	6 (28.6%)	63 (41.7%)	0.2
Female	15 (71.4%)	88 (58.3%)	
BMI			
< 30	6 (28.6%)	122 (80.8%)	< 0.001
≥ 30	15 (71.4%)	29 (19.2%)	
ASA classification			
ASA I	2 (9.5%)	45 (29.8%)	0.02
ASA II/III	19 (90.5%)	106 (70.2%)	

Table 3: Association between anaesthesia/surgery related variables and postoperative injury appearance or absence.

Anaesthesia / surgery related variables	Injury	Injury absence	p value
Anaesthetic technique			
General anaesthesia	18 (85.7%)	108 (71.5%)	0.13
Regional anaesthesia	3 (14.3%)	43 (28.5%)	
Surgery duration			
< 2 h	5 (23.8%)	65 (43%)	0.09
≥ 2 h	16 (76.2%)	86 (57%)	
Positioning			
Dorsal decubitus	10 (47.6%)	45 (29.8%)	0.15
Ventral decubitus	1 (4.8%)	27 (17.9%)	
Lateral decubitus	3 (14.3%)	40 (26.5%)	
Lithotomy	7 (33.3%)	39 (25.8%)	

neuropathy and 1.2% a motor neuropathy) - Table 1.

In the group that developed an injury, there was no significant difference concerning age, gender, anaesthetic technique, surgery duration and positioning when compared to the non-injured patients. In what concerns ASA classification, we observed that ASA II and III patients presented a higher incidence of injury (90.5%) when compared with ASA I patients (9.5%), $p < 0.05$. A BMI > 30 Kg / m² also shown to be associated to postoperative injury development, $p < 0.001$. (Table 2 and 3).

In a single analysis of neuropathic injury a BMI > 30 Kg/m² was related to neuropathy occurrence, $p < 0.05$. In what concerns the remaining variables and their relation with postoperative neuropathy, no statistically significant relationship was observed (Table 4 and 5).

DISCUSSION

Our study did not observe a higher frequency of pressure injuries in the elderly, contrary to expectations derived from previous studies where elderly patients present a higher risk of perioperative pressure injury development, due to lower skin thickness, muscle bulk and subcutaneous fat

over bony prominences^{13,14},

Patients with a high Body Mass Index (BMI > 30 Kg / m²) present a perioperative injury risk, as the fat mass increase may compress blood vessels and nervous structures in dependent areas, reducing tissue perfusion and originating injuries.^{13,14} This study revealed an association between a BMI > 30 Kg / m² and injury occurrence.

The association between ASA classification and injury occurrence may have been due to the fact that ASA II and III category include diabetic and hypertensive patients, disorders which are known from previous studies to increase perioperative neuropathy risks.^{7,8,10} Surgical positioning longer than two hours has been related to perioperative injury in several studies. Nevertheless, this association has not been found in the present study.

This study presents some limitations in what concerns the timing of patient evaluation after surgery. Previous studies demonstrated that neuropathy appearance may be delayed for one week after surgery.¹³⁻¹⁵ Considering that patient evaluation was performed 24 to 48h post-operatively, the frequency of a nerve injury may have been under-evaluated. The aetiology of peripheral neuropathy is

Table 4: Association between patient-related variables and postoperative neuropathy.

Patient-related variables	Neuropathy presence	Neuropathy absence	p value
Age			
< 65	5 (62.5%)	114 (69.5%)	0.67
≥ 65	3 (37.5%)	50 (30.5%)	
Gender			
Male	3 (37.5%)	66 (40.2%)	0.5
Female	5 (62.5%)	98 (59.8%)	
BMI			
< 30	3 (37.5)	125 (76.2%)	0.27
≥ 30	5 (62.5%)	39 (23.8%)	
ASA classification			
ASA I	1 (12.5%)	46 (28%)	0.30
ASA II/III	7 (87.5%)	118 (72%)	

Table 5: Association between anaesthesia/surgery related variables and postoperative neuropathy.

Anaesthesia/surgery related variables	Neuropathy presence	Neuropathy absence	p value
Anaesthetic technique			
General anaesthesia	6 (75%)	120 (73.2%)	0.90
Regional anaesthesia	2 (25%)	44 (26.8%)	
Surgery duration			
< 2 h	2 (25%)	68 (41.5%)	0.47
≥ 2 h	6 (75%)	96 (58.5%)	
Positioning			
Dorsal decubitus	2 (25%)	53 (32.3%)	0.48
Ventral decubitus	1 (12.5%)	27 (16.5%)	
Lateral decubitus	1 (12.5%)	42 (25.6%)	
Lithotomy	4 (50%)	42 (25.6%)	

generally multifactorial and this perception renders efforts to eliminate its occurrence more difficult.¹⁰ However, a significant proportion of these injuries is clearly associated to intraoperative positioning.⁶

CONCLUSION

Scientific evidence for perioperative injury, namely neuropathy, is scarce. Therefore, ASA recommends a preoperative evaluation of patients, in order to identify if the necessary surgery position will be tolerated by the patient and to alert the physician for patient individualised specific requirements in each positioning. Postoperative evaluation of patients is also crucial, as it allows early identification of any injuries, as well as their documentation

and management.

In the future, this study will be followed with a higher number of patients, in order to allow a better understanding of injury risks during surgical positioning and identify adequate preventative methods.

CONFLICT OF INTERESTS

The authors declare that there is no conflict of interests concerning the present manuscript.

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