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The exploration of factors related to postoperative pressure injuries in neurosurgical patients

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INTRODUCTION

Neurosurgical patients undergoing prolonged surgery may require postoperative bed rest and the use of sedative medications to prevent rapid increases in blood pressure, intracranial pressure, and other drastic changes. As a result, patients need to maintain immobility for a period after surgery to avoid postoperative restlessness, as these factors may increase the risk of developing pressure injuries during the postoperative bed rest period. (pressure injury; PI). Among them, intraoperatively acquired pressure injuries (IAPIs) directly associated with surgery have been proven to be related to prolonged surgical duration. (Grap et al., 2019). Pressure injuries caused by surgery are one of the contributing factors to the occurrence of hospital-acquired pressure injuries. The occurrence of IAPIs may become apparent immediately after surgery or within 2-4 hours to 3 days postoperatively. These injuries commonly manifest as stage I and stage II pressure injuries. (Grap et al., 2019; Sengul et al., 2022; Tang et al., 2021). In addition to prolonged surgical duration, factors such as age, gender, severity of illness, history of cardiovascular diseases, diabetes, and other systemic conditions can also increase the risk of intraoperatively acquired pressure injuries (IAPIs).

Furthermore, anesthesia drugs, by rendering patients unable to sense numbness or pain and alter their positions, contribute to the inability to release localized pressure, serving as another significant risk factor. The low-temperature environment in the operating room can lead to a decreased metabolic rate, serving as an intermittent risk factor for pressure injuries.

Keywords

pressure injury, intraoperatively acquired pressure injuries, intensive care, neurosurgical

AIM

The purpose of this study is to investigate the associated risk factors for intra-hospital pressure injuries occurring within 24 hours following neurosurgical procedures.

METHOD

A retrospective case study was conducted to collect and analyze cases of pressure injuries occurring within 24 hours post-surgery in the neurosurgical intensive care unit of a medical center in central Taiwan from January 1, 2023, to December 31, 2023. This ICU consisted of 20 beds dedicated to neurosurgical patients.

The inclusion criteria encompassed adult patients who underwent neurosurgical procedures and developed pressure injuries within 24 hours post-surgery. The collected variables included demographic data, gender, age, consciousness status, smoking status, hypertension, diabetes, APACHE II score, Braden score, length of hospital stay, surgical duration, site and grade of pressure injury, among others. Descriptive statistical analysis will be employed to examine the distribution of basic attributes within the sample. Subsequently, independent t-tests, chi-square tests, logistic regression, and other methods will be utilized for inferential analysis to assess factors associated with postoperative pressure injuries.

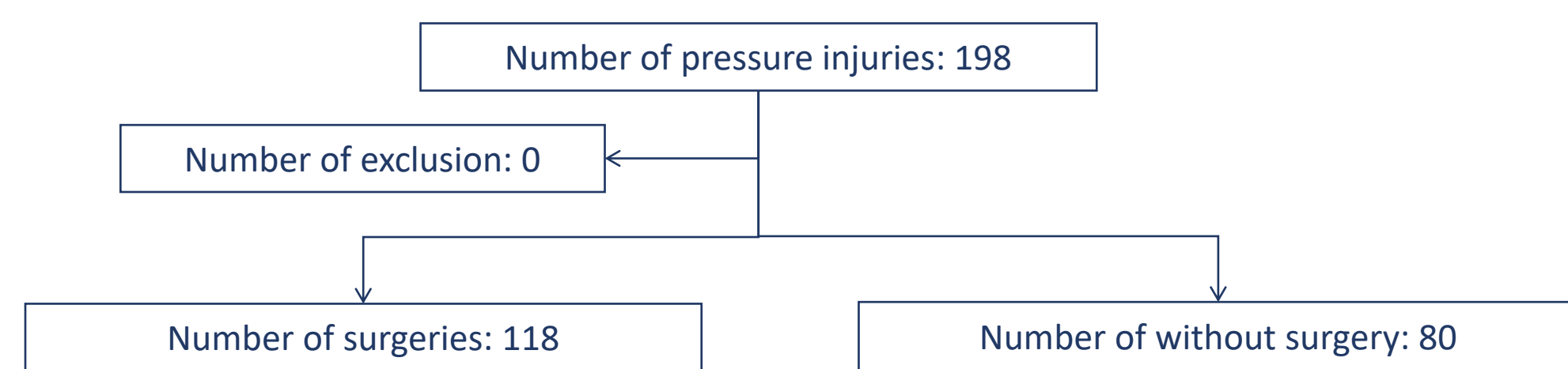


Figure 1. screening of the patients

DISCUSSION

There is a significant difference in smoking habits ($p=.025$) and APACHE II score ($p=.001$), indicating an association between smoking habits, disease severity, and the occurrence of pressure injuries post-surgery. Despite the lack of literature supporting an increase in post-operative pressure injuries due to smoking, the significant differences observed in both variables warrant attention to these related issues.

The most common site for pressure injuries was the sacrococcygeal region, observed in 58 cases (49.2%). Engels et al. (2016) demonstrated that the most frequent site was also the coccyx, consistent with our study. The majority of pressure injury occurrences were classified as Stage 1 (112 cases, 56.6%). Significant correlations were found between the two groups in terms of pressure injury staging ($p=.000$), DTI ($p=.000$), and MDRPI ($p=.000$). These findings align with the study by Tang et al. (2021).

The longer the surgical duration, the higher the risk of developing pressure injuries ($p = .000$), indicating that surgical duration is a significant contributing factor. Tang et al. (2021) noted in their study that prolonged surgeries and underlying issues increase the risk of IAPIs. Therefore, identifying preventive measures for pressure injuries is crucial. Proactive risk assessment should identify potential factors contributing to pressure injury occurrence, focusing on common sites and stages of pressure injuries. Nursing interventions tailored to these factors should be implemented, considering any contributing factors as risks.

RESULTS

For providing the comprehensive breakdown of pressure injury cases during the period from January 1, 2023, to December 31, 2023. The inclusion of 198 cases allows for a thorough analysis. It's noteworthy that 118 cases (59.5%) occurred in patients who underwent neurosurgical procedures, while 80 cases (40.4%) occurred in those who did not undergo surgery.

The statistical analysis revealing no significant differences between the two groups in variables such as sex, GCS (Glasgow Coma Scale), Braden scale, diabetes mellitus, and hypertension is important information.

The significant differences observed in smoking habits ($p=.025$) and APACHE II score ($p=.001$) indicate that smoking habits and the severity of illness, as reflected in the APACHE II score, are associated with the occurrence of pressure injuries postoperatively (Table 1).

The distribution of pressure injury cases among the 118 patients who underwent neurosurgical procedures reveals that the most common site is the Sacrococcygeal region with 58 cases (49.2%). Other notable locations include the Lower limb with 22 cases (18.6%), Head and neck region with 19 cases (17.8%), Trunk with 7 cases (5.9%), Upper limb with 5 cases (4.2%), and Hip joint with 5 cases (4.2%) (Table 2).

The predominance of Stage 1 injuries (56.6%) · It's noteworthy that while stage 1 injuries are predominant, there are a few cases of stage 2 (4.2%) and even fewer cases of MDRPI (0.8%). The absence of cases in the more severe stages (stage 3, stage 4, and DTI) is a positive aspect, indicating a lower incidence of deeper tissue damage. The statistical results indicate significant correlations between the two groups in terms of pressure injury grading ($p=.000$), DTI ($p=.000$), and MDRPI ($p=.000$) (Table 3).

These findings suggest that there are notable associations between the groups concerning the severity and specific types of pressure injuries.

Table 2. Analysis of characteristics of pressure injury cases in patients after surgery (n=118)

Location	Stage1	Stage2	Stage3	Stage4	DTI	MDRPI	Total
Sacrococcygeal region	55	3	0	0	0	0	58 (49.2%)
Upper limb	5	0	0	0	0	0	5 (4.2%)
Lower limb	22	0	0	0	0	0	22 (18.6%)
Head and spine	19	1	0	0	0	1	21 (17.8%)
Hip joint	5	0	0	0	0	0	5 (4.2%)
Trunk	6	1	0	0	0	0	7 (5.9%)
Total	112 (94.9%)	5 (4.2%)	0 (0%)	0 (0%)	0 (0%)	1 (0.8%)	118 (100%)

DTI: Deep tissue injury; MDRPI: Medical device related pressure injury

It seems there is a correlation between intraoperatively acquired pressure injuries (IAPIs) and restrictions on postoperative lying positions or prolonged maintenance of the same lying position. This highlights the potential impact of surgical positioning and postoperative immobility on the occurrence of pressure injuries. The data suggests a notable difference in the occurrence of pressure injuries based on surgical duration. With 111 cases (56.1%) associated with surgeries lasting over 240 minutes, and only 7 cases (3.5%) with surgeries lasting less than 240 minutes, it indicates a significant increase in the incidence of pressure injuries for procedures exceeding 240 minutes. This observation underscores the potential impact of prolonged surgical duration on the development of pressure injuries.

The statistical significance ($p=.000$) in Table 4 reinforces the observation that as surgical duration increases, the risk of developing pressure injuries also rises. This underscores the importance of surgical duration as a significant contributing factor to the occurrence of pressure injuries.

Table 3. Analysis of the correlation between pressure injuries after surgery and non-surgery (n=198)

Variables	Without surgical (n=80)	With Surgical (n=118)	p value
PI stage			.000**
Stage 1	61 (30. 8%)	112 (56.6%)	.000**
Stage 2	16 (8.1%)	5 (2.5%)	.142
Stage 3	0 (0%)	0 (0%)	
Stage 4	0 (0%)	0 (0%)	
DTI	1 (0.5%)	0 (0%)	.000**
MDRPI	2 (1%)	1 (0.5%)	.000**

* $p < 0.05$; ** $p < 0.01$

Table 4. The correlation analysis between surgical time and occurrence of stress injuries. (n=198)

Variables	Surgical time	p value
Surgical time		.000**
Non-surgical	80 (40.4%)	.993
≤240mins	7 (3.5%)	
>240mins	111 (56.1%)	

* $p < 0.05$; ** $p < 0.01$

CONCLUSIONS

This study preliminarily explores the related factors of pressure injury within 24 hours after neurosurgery. The discovery that prolonged surgical duration is a significant risk.

Although the current number of cases is relatively low, a trend is emerging. Future efforts will continue to collect more cases for statistical analysis, aiming for a more comprehensive assessment of the association between IAPIs and postoperative occurrences of pressure injuries.

Engels et al. (2016) suggest that for high-risk patients undergoing surgeries lasting over 4 hours, it is advisable to use protective pads (such as foam pads) preemptively. Additionally, it is recommended to intensify postoperative turning every 24 hours, utilize high-risk warning signs as reminders, and ensure adequate nutrition to prevent the occurrence of pressure injuries, thereby enhancing the quality of care.

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