Pressure Ulcer Formation Frequency and Evaluation of Effective Factors in Patients Followed in the Second Level Intensive Care Unit

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ABSTRACT

Introduction: Pressure ulcer (PU) is necrosis and tissue damage caused by pressure applied in various parts of the body, especially in areas where there are bone protrusions. With this study, it was aimed to evaluate the frequency and risk factors of PUs seen in the intensive care unit (ICU).

Material and methods: Patients who were kept in the ICU for more than 72 hours were included in this retrospective study. Patients were followed up daily, and whether or not PU development and data that could be a risk factor in PU development were evaluated.

Results: A total of 125 patients were included in the study. While twenty-two patients had PU in ICU acceptance, 7 patients developed new PU during follow-up. PU was most frequently observed in the sacral region (56%). Advanced age, having albumin≤2.5 g / dL, sedation status and fecal incontinence were found as risk factors for PU development. The average ICU length of stay of patients who developed PU was longer ($p < 0.05$).

Conclusion: Advanced age, sedation status, fecal incontinence and having albumin≤2.5 g / dL are factors leading to the development of PU. PU development can increase ICU length of stay. In order to prevent PU development, measures should be developed for effective factors and sedation should be applied to patients only when it is imperative.

Keywords: Bed Sores, Hypoproteinemia, Intensive Care Unit, Malnourishment, Pressure Ulcer

INTRODUCTION

Pressure ulcer (PU) is necrosis and tissue damage caused by pressure applied in various parts of the body, especially in areas where there are bone protrusions.[1]

Especially in intensive care units (ICU), PU, which is seen in those who stay for a long time, not only affects the quality of life of the individual but also causes severe costs. It increases the length of hospital stay of patients and adversely affects the prognosis of the disease, leading to septicemia and causing deaths.[2]

When the patients are accepted to the service, PU evaluation is one of the evaluations within the patient safety. Proper risk assessment improves patient care quality.[3] Various scales are used for this evaluation. Braden, Norton, Waterflow are the most used PU scales.[3] The most commonly used scale in the world and Turkey, "Braden Risk Assessment Scale (BRDS)" is.[4,5]

There are many risk factors for PU formation. The most important risk factors listed by the authors in the literature are the local effect of pressure, malnutrition, advanced age, hypotension, reduced mobilization, decreased consciousness functions, septicemia, fecal and urinary contamination of the skin, moisture, friction, mechanical ventilation.[6]

In the ICUs, it is important to assess the risk assessment and risk factors to be performed in each patient according to pressure sore scales. With this study, it was aimed to evaluate the frequency and risk factors of PUs seen in the ICU.

MATERIAL AND METHODS

This research, which was planned retrospectively, was carried out in the second level ICU of a private hospital in Istanbul Province. The files of all patients who were kept in the ICU for more than 72 hours between 01.01.2018 and 01.06.2019 were included in the research coverage. The data used in this study were analyzed in accordance with the principles of XXX Health Sciences Research Ethics Committee. (Date: 01.07.2019 No: 2019/7). Those with PU at the time of their admission to the ICU were not included in the study. Since it was a retrospective study, written consent was not obtained from the patients. The data of the patients were obtained from the nurse and doctor follow-up records. Demographic and clinical features of patients; Presence of PU in ICU acceptance, APACHE II score, service before ICU acceptance, BRDS were recorded. According to the BRDS score, 12 points and below were evaluated as high risk, 13-14 points as medium risk and 15-18 points as low risk.[7] The patients included in the study were divided into two groups as those with and without PU during ICU follow-up. During the ICU hospitalization, patients were followed up daily, and whether or not PU developed, location and grade, and data that could be a risk factor in PU development (Acute Physiology and Chronic Health Inquiry II values, BRDS scores, whether it received mechanical ventilation support, albumin level, use of steroid, sedation use Glasgow coma score (GCS), ICU length of stay, use of inotropy, presence of fecal incontinence, nutritional form, presence of anemia, presence of diabetes) were evaluated.

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In our unit, inactive patients are routinely changed position every two hours, protective creams are used to protect the integrity of the skin, gel pads are placed in the areas where the patients have bone protrusions, and the patients are deposited in antibacterial beds.

STATISTICAL ANALYSIS

Statistical analysis of the data was done using IBM SPSS (USA) software for Windows 23.0 and statistical significance was accepted as $p<0.05$. Patient descriptive statistics were given as frequency and percentages for categorical data and mean and standard deviation for continuous data. Continuous variables were compared using the t-test. Multivariate analysis was performed to identify associated factors via linear regression.

RESULTS

The files of 125 patients who were hospitalized in ICU for more than 72 hours between January 2018 and June 2019 were examined. Twenty-two patients were excluded from the study because they had PU during their hospitalization (Figure 1). 58.3% of 103 patients included in the study were male and 41.7% were female. The mean APACHE II scores were 21.93 ± 6.75, and the mean age was 72.12 ± 13.66 years.

According to BRDS, PU developed in 57.14% of high-risk patients, 28.57% of medium-risk patients and 14.29% of low-risk patients in the study. Although the rate of PU development was higher in the high-risk group, this was not statistically significant ($p> 0.05$). APACHE II value was 21.71 ± 6.02 in patients treated with ICU but developed PU, while it was 21.95 ± 6.83 in patients who did not develop. GCS values of patients who developed PU were on average 11, while the group without PU developed 10.82. There was no significant difference between groups in terms of APACHE II and GCS values ($p> 0.05$).

In 7 (6.79%) of 103 patients, new PU developed during ICU follow-ups.

	ICU PU n=7	ICU no-PU n=96	P
Age, mean (min-max)	82 (73-91)	71 (37-90)	0,045
Gender			0,128
Male gender n (%)	6 (85,7)	54 (56,3)	
Female gender n (%)	1 (14,3)	42 (43,7)	
APACHE II (Mean ± SD)	21,71±6,02	21,95±6,83	0,930
Braden score			0,828
0-12 (high-risk) n (%)	4(57,14%)	46(47,92%)	
13-14 (medium-risk) n (%)	2(28,57%)	27(28,13%)	
15-18 (low-risk) n (%)	1(14,29%)	23(23,96%)	
Mechanical ventilation support n (%)	6 (85,7%)	81(84,4%)	0,703
Albumin ≤2.5 g / dL n (%)	5(71,43%)	31(32,29%)	0,049
Sedation n (%)	3(42,86%)	6(6,25%)	0,014
Steroid use n (%)	2(28,57%)	63(65,63%)	0,062
ICU length of stay Mean (SD)	29,91 (7,11)	14,52 (17,55)	0,024
Inotropic support n (%)	2(28,57%)	26(27,08%)	0,615
Fecal incontinence n (%)	7(100,00%)	17(17,71%)	0,000
Feeding patterns			0,339
Enteral n (%)	6(85,71%)	63(65,63%)	
Oral n (%)	0(0,00%)	23(23,96%)	
Parenteral n (%)	1(14,29%)	10(10,42%)	
Hgb <9 g / dl n (%)	5(71,43%)	42(43,75%)	0,153
Diabetes n (%)	1(14,29%)	11(11,46%)	0,591
Outcome			0,358
Exitus n (%)	5(71,43%)	42(43,75%)	
Shipment n (%)	0(0,00%)	2(2,08%)	
Discharged n (%)	2(28,57%)	52(54,17%)	
GCS Mean (SD)	11(4,28)	10,82(3,52)	0,900

Definition of abbreviations: ICU = intensive care unit; PU = pressure ulcer. GCS=Glaskow coma score. *P values refer to comparisons between no-PU and PU groups.

Table-1: Patient characteristics and risk factors for pressure ulcer

	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
Albumin ≤2,5 g/dL	0,163	0,047	0,311	3,471	0,001
Sedation	0,32	0,08	0,359	3,997	0,000

Table-2: Linear regression analysis of ICU patients

Figure 2 shows which body regions of 29 patients' PUs, including 22 patients with PUs during hospitalization and seven patients who developed during ICU follow-ups, developed. It was seen that PU developed most frequently in the sacrum (56%). Other regions were in the form of trochanter, heel, scapula and patella, respectively.

The demographic data and distribution of risk factors of patients with and without PU during follow-up of the ICU were as given in Table 1.

Patients who developed PU as a result of the comparison showed that the patient age and length of ICU stay were higher; sedation application status, having albumin≤2.5 g / dL and fecal incontinence status were found to be more common ($p < 0.05$).

The mean ICU hospitalization day of patients who developed PU was 29.91 (7.11) days, while the patients who did not develop were 14.52 (17.55) days. It was seen that PU developed on average in 10.14 (min: 4 max: 29) days.

In our study, 85.7% of the patients who developed PU were male, while 56.3% of the patients who did not develop were male. Although the rate of male patients is higher in the group where pressure sores develop, this difference was not statistically significant ($p > 0.05$).

There was no significant difference between the two groups in terms of mechanical ventilation support, steroid use, inotropic support, nutritional form, presence of anemia, presence of diabetes and mortality rates ($p > 0.05$).

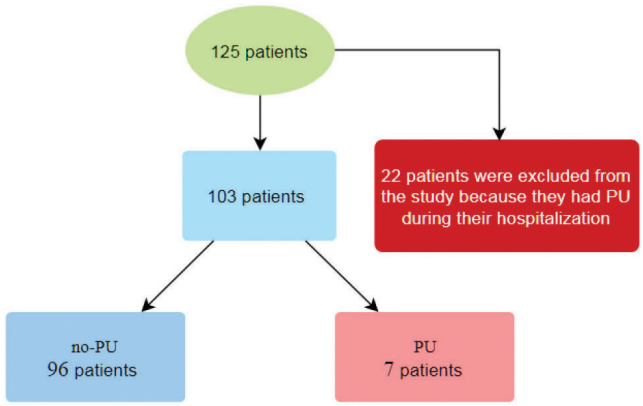

Figure-1: Flow chart

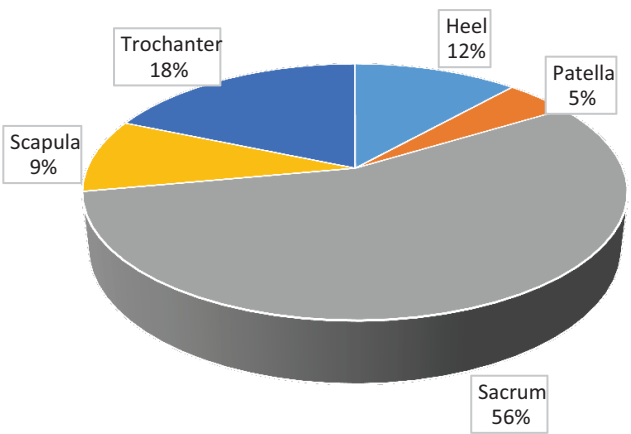

Figure-2: Pressure ulcer localization and stages during hospitalization

Age, albumin≤2.5 g / dL, sedation and fecal incontinence status parameters were reevaluated in the logistic regression model; albumin≤2.5 g / dL and sedation status were associated with the development of new PU (Table 2).

DISCUSSION

The incidence of PU is reported between 5.8% and 22.1% in ICU.[8] In our study, 6.79% (7/103) of patients developed PU during ICU follow-up. PU can develop in any area where there are bone protrusions in the body such as sacrum, iliac crest, heel, trochanter, wrist, scapula, ischial tuberosity and spinal protrusions.[9] The area where PU develops most often is the sacrum.[10] It was observed that PU was the most in the sacrum (56%) in the patients hospitalized in our unit.

In our study, the majority of patients who developed PU (57.14%) were in the high-risk group, according to BRDS. Although the rate of PU development was higher in the high-risk group, the difference was not statistically significant compared to patients without PU ($p > 0.05$). The reason for this was evaluated as the majority of the patient group (48.54%) who were followed up at ICU were high-risk group patients. In the studies, PU development was observed more in patients in the high-risk category compared to BRDS.[11] Although BRDS is a valuable scale in PU development, it has been suggested to be used with different scales in ICU patients.[12] In a study on 206 third-level YBU patients, it was shown that BRDS was insufficient in determining risk and risk factors that played a role in PU development were not adequately represented in BRDS.[5]

In the literature, very different results have been reported on the relationship between APACHE II and the development of GCS and PU. A study with 135 people reported that patients who developed PU had higher APACHE II scores than patients without.[13] In another study in which 206 ICU patients were evaluated, there was no relationship between APACHE II values and PU development.[5] In another study conducted with 236 people, it was stated that there was no relationship between PU development and APACHE II scores, while it was found that PU development was observed more frequently in patients with low GCS.[14] In a study conducted in Neurology ICU, no relation was found between PU and GCS.[15] We think that these different results are due to the fact that PU development is affected by many factors. In our study, no relation was found between APACHE II and GCS scores and PU development.

Many risk factors in PU formation are exchangeable factors. Age and gender are factors that cannot be changed. Studies have shown that the risk rate of PU is higher in patients over 65 years of age and the risk of development increases with age.[16] It is determined that advanced age has an important place in PU etiology.[17] In our study, the mean age of patients who developed PU was higher than those without PU ($p < 0.05$).

In our study, although the rate of male patients was higher in the group developing PU (85.7%), this

difference was not statistically significant. This result is consistent with the results of similar studies, where no significant relationship was found between gender and PU formation.[18]

Hypoalbuminemia is a very common picture in ICU. Hypoalbuminemia complicates wound healing by causing interstitial edema.[19] It is stated in the literature that the rate of PU is high in patients with low albumin levels, and this rate decreases in those with high albumin levels.[20] In our study, in parallel with the literature review, the number of patients with Albumin ≤2.5 g / dL was higher in the group with PU compared to the group without PU ($p < 0.05$).

The only cause of hypoalbuminemia is not lack of intake. The body may be exposed to protein breakdown because the energy needs are higher than expected due to various reasons, such as increased catabolism and infection in ICU patients.[21] Albumin provides both tissue integrity and plays a role in its preservation. Low albumin levels affect wound healing by causing interstitial edema.[21] In our study, the detection of hypoalbuminemia in 71.43% of patients who developed PU and is statistically significant compared to the other group supports this hypothesis.

Conditions that disrupt body integrity such as fecal-urinary incontinence, diarrhea, discharge from the wound and sweating, which are frequently seen in patients with ICU, increase the risk of developing PU.[22] In our study, all patients who developed new PU had fecal incontinence. Fecal incontinence was observed in 17.71% of patients in the group without PU. The difference between the two groups was statistically significant ($p < 0.05$).

Some applications performed for the purpose of treatment in ICU also pose a risk for PU formation. Mechanical ventilation support, sedation application, steroid use, inotropic support are the main risk factors. These applications cause a decrease in peripheral tissue perfusion and capillary blood flow of patients.[5] In our study, it is seen that such practices are applied to the majority of patients who develop PU. It was determined that 85.7% of the patients who developed PU provided mechanical ventilation support, 42.86% received sedation, 28.57% received inotropic support, and 28.57% used steroids.

Studies on patients followed in the ICU reported a relationship between PU and mortality.[23] In a study conducted on 206 patients who were followed up at the third level ICU, it was stated that PU development did not affect the mortality rate.[5] In our study, although the mortality rate was higher for patients developing PU, this difference was not statistically significant ($p > 0.05$).

While there are studies reporting different results in the relationship of PU with mortality in the literature, it has been shown by many studies that patients with PU have longer length of ICU stay.[5] In our study, ICU length of stay of patients who developed PU was significantly higher ($p < 0.05$).

The most important limitations of our study are the low number of cases and the applications to prevent PU development have not been questioned.

CONCLUSION

Advanced age, sedation status, fecal incontinence and having albumin≤2.5 g / dL are factors leading to the development of PU. Sedation status and having albumin≤2.5 g / dL are the factors most related to the development of PU among these factors. PU development is associated with increased ICU length of stay. To prevent the development of PU, precautions should be developed for all effective factors, especially protein malnutrition, and sedation should be applied to patients only when necessary.

We believe that our study can be a resource for the development of preventive measures against the factors that it shows to be effective in PU development.

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