



Pressure injury on the face of patients undergoing noninvasive ventilation, hospitalized in the intensive care unit

Viveiros, Abel¹; Nóbrega, Júlio²; Santos, Luísa³; Peña-Otero, David⁴; Costa, Ana⁵; Ribeiro, Leonardo⁶; Alves, Ana⁷

Introduction: Noninvasive ventilation (NIV) implies some complications, being the lesion by pressure on the face the most frequent lesion associated to this practice in intensive care. **Objectives:** To determine the incidence of injuries caused by pressure on the face occurred in patients hospitalized in intensive care unit (ICU) of a hospital in the Autonomous Region of Madeira (ARM), submitted to NIV. **Methodology:** Retrospective study carried out between January and December 2017. **Inclusion criteria:** patients with age 18 years, hospitalized in the intensive care unit (ICU), exceeding 24 hours, with the introduction of NIV for an equal time and/or exceeding 2 hours and showing healthy skin on the face at the time of the admission. **The data of 103 patients in our sample were collected from the database of patients with NIV in the ICU. Conclusion:** The use of masks for single use, pressure relief and the application of sweet almond oil seems to have contributed to the reduction of lesion incidence on the skin which were caused by pressure (LSP) in patients submitted to NIV in the ICU.

INTRODUCTION

In the last 20 years the use of NIV has increased in clinical practice, as well as the availability of technological resources for its implementation, which means that it is currently considered the first-line treatment of respiratory failure¹. The NIV is a relatively new method that uses a mask for the administration of positive pressure ventilation^{14,15}. One of the main complications of NIV, the LSP, expresses a quality of care and the patient's safety indicator. The maintenance of the skin's integrity from the face of the critically-ill patients who is submitted to NIV is a challenge in the daily practice of a professional in a ICU.

Theoretical Framework

Changes in respiratory system are the main causes of diseases recorded on a global scale, resulting in a high morbidity and mortality. According to the National Observatory of Respiratory Diseases, the respiratory diseases constitute the third leading cause of death in Portugal, presenting however, in recent years a downward trend, which may reflect an improvement in patient care. The NIV has been determinant in the treatment of respiratory failure, since these proceedings are such relevant in a patient's quality of life. It is a therapeutic option in increasing use, with the acknowledged importance, not only in the treatment of acute respiratory failure, but also in the treatment of chronic respiratory insufficiency.² This technique requires a great willingness and dedication on the part of the professional healthcare and it has come to assume an ever greater importance in scientific studies and in the clinical practice, thus constituting a safe and efficient therapeutic option, without resorting to invasive methods of the airway. In Portugal studies concerning the incidence and prevalence of LSP are limited, however, at the global level there are often studies that allow sustaining the assertion that the LSP is an international problem, with great relevance in providing quality care. This issue is of particular importance to be included in the nine strategic objectives outlined by the Ministry of Health and the National Plan for Patient Safety 2015-2020, as a response to

¹RN, MSc, Head of Department Critical Care Hospital Dr. Nélio Mendonça, Madeira, Portugal; e-mail: abelviveiros@gmail.com; ²MD, Chief of Department Critical Care Hospital Dr. Nélio Mendonça, Madeira, Portugal; e-mail: jjpnobrega@gmail.com; ³RN, MSc, PhD, Professor & Coordinator of the CLE, College of Nursing S. José de Cluny, Madeira, Portugal; e-mail: mlsantos@esesjcluny.pt; ⁴RN, MSc, MRes, PhD of Nursing Practice; Cantabria Health Department. Gregorio Marañón Healthcare Research Institute-Nursing Department (IISGM), e-mail: david.penha.otero@gmail.es; ⁵RN, MSc, Department Critical Care Hospital Dr. Nélio Mendonça, Madeira, Portugal; e-mail: anaraquel_costa@hotmail.com; ⁶RN, Department Critical Care Hospital Dr. Nélio Mendonça, Madeira, Portugal; Dr. Nélio Mendonça, e-mail: leojmr@gmail.com; ⁷RN, MSc, Department Critical Care Hospital Dr. Nélio Mendonça, Madeira, Portugal; e-mail: anaialves@gmail.com

European guidelines regarding security in health systems. The plan predicts that by 2020, 95% of the institutions providing health care will implement practices to assess, prevent and treat injuries caused by pressure (LSP) and "reduce by 50% the number of LSP acquired in the institutions of the National Health Service from Portugal".³ In pursuit of this objective and based on the records of the UCI where this study was conducted in 2017, 575 patients were admitted, of whom 103 (17.9%) were subject to NIV, so it is important to assess their effects in critically-ill patients.

Research Question

What is the incidence of injuries caused by pressure on the face of patients who were admitted to an ICU and submitted to NIV?

METHODOLOGY

We have carried out a retrospective study in an ICU at the hospital of the Autonomous Region of Madeira (Portugal), in the period from January to December 2017. It was defined the following criteria of inclusion in order to obtain the sample: patients around 18 years, admitted to the ICU and submitted to NIV, which at the time of admission showed intact skin on the face. We have included all participants who were admitted during the period of the study and who fulfilled the criteria set out previously, obtaining a sample of 103 participants. The data for the socio-demographic characterization of patients: age, sex, diagnosis at admission, the time of NIV in hours were obtained on database from patients who were submitted to NIV in the service in digital format. The direct observation of the skin's characteristics was performed daily during the provision of hygiene care to the face by the nurse responsible for the patient, which allowed us to identify the onset of lesion. The registration of LSP was performed on the occasion of their identification. For the interpretation of the results we have used descriptive statistics.

RESULTS

Our study sample comprised 103 patients, of whom 60 (58.3%) were male and 43 (41.7%) of them female. The average age stood at 67 years old, with a standard deviation of around 13.7 being the minimum age of 31 and a maximum of 90 years. The appearance of LSP (3.9%) occurred in 4 male patients aged less than 65 years (Table 1). There was a predominance of grade II lesions (3 LSP in the nasal region) soon followed by 1 frontal lesion grade I.

Table 1 Presence of LSP according to gender and age

		Presence of UPP				TOTAL	
		No		Yes			
		n	%	n	%	n	%
Age	<65	40	38,8	4	3,9	44	42,7
	65	59	57,3	0	0,0	59	57,3
Gender	male	56	54,4	4	3,9	60	58,3
	female	43	41,7	0	0,0	43	41,7

The duration of participants treatment with NIV in this study are variable, being that 78 (75.7%) had between 2 to 48 h of contact with the interface, without having developed LSP. The largest percentage of LSP occurred in patients with more than 97 h of contact with the NIV interface; however, 4.9% of patients, despite undergoing more than 120 h of NIV, remained with their skin intact. The total percentage of LSP in patients submitted to NIV was 3.9%. There were times of 256 hours maximum and average of 41 hours of contact with facial device (Table 2).

Table 2 Presence of LSP according to the total number of NIV in hours

	Presence of UPP				TOTAL	
	No		Yes			
	n	%	n	%	n	%
> 2 - 24 h	48	46,6	0	0,0	48	46,6
25 - 48 h	30	29,1	0	0,0	30	29,1
49 - 72 h	8	7,8	1	1,0	9	8,7
73 - 96 h	3	2,9	1	1,0	4	3,9
97 - 120 h	5	4,9	2	1,9	7	6,8
> 120 h	5	4,9	0	0,0	5	4,9

The diagnoses on admission that most requested the imposition of the technique of NIV were respiratory failure with 36.9%, and the PCR/cardiovascular disease with 21.4% of patients. The presence of LSP occurred in equal proportion in patients with respiratory failure and

PCR/cardiovascular diseases with 1.9%, respectively. We, therefore, highlight the fact that 43 patients (41.7%) submitted to NIV have not developed LSP (Table 3).

Table 3 Presence of LSP in accordance with the diagnosis of admission

	Presence of UPP					
	No		Yes		TOTAL	
	n	%	n	%	n	%
Respiratory failure	36	35,0	2	1,9	38	36,9
Cardiopulmonary arrest and heart disease	20	19,4	2	1,9	22	21,4
Other	43	41,8	0	0,0	43	41,7

DISCUSSION

The LSP are a public health problem and constitute a relevant indicator of the quality of nursing care provided. The Spanish Society of Intensive Care Medicine and Coronary Units (SEMICYUC) elected a monitoring plan for the indicator of the facial LSP related to the use of the interface during the NIV, as an indicator of priority and it recommends that the incidence rate to be less than 7%.⁴

In 2017 were admitted to the ICU 575 patients of whom 103 were submitted to NIV. In our sample we have found a predominance of the male gender (58.3%), with an incidence of LSP on the face in patients submitted to NIV in the context of intensive care of 3.9%, which represents a much lower rate than standard of SEMICYUC. All patients submitted to NIV during the study had as preventive measures the application of sweet almond oil under pressure zones and the frequent relief of the mask (every two to four hours depending on the risk analysis). The institution plans for preventive care aims to improve the quality indicators of the services, through the standardization of care based on scientific grounds and practice based on evidence. The appeal to scientific methodology in providing nursing care through a standardized language has allowed us to identify the focus, elaborate diagnoses, plan interventions and assess the results. The average age of the patients of the sample was 68 years, however, the appearance of LSP occurred in male patients aged less than 65 years, which contradicts the results of the studies of other authors, namely, Silva *et al.*⁵ for whom the changes resulting from the use of sedative therapy, analgesic and curarizant (very common in these units), makes patients less reactive to excessive pressure and more susceptible to injury,⁶ who argue that with age the skin loses elasticity, thickness and resistance, making it more vulnerable when subjected to pressure or aggression, thus increasing the risk of emergence of LSP. Patients who developed LSP (3.9%) were submitted to NIV during long hours (average of 104 hours, approximately four days), all with high risk of developing LSP (Braden scale of 8 on admission and 20 at the time of discharge). In a prospective cohort study, performed by Borchardt,⁷ with the aim of identify the incidence and describe the factors associated to the LSP in critically-ill patients, 77 patients were studied, and it was found an incidence of 22%, length of hospital stayed longer than 10 days and had high risk on the Braden scale (59%). The study by Otero *et al.*⁸ reported that 48.7% of patients with NIV in the ICU generate LSP facial (N = 152; NORTON average = 10.7; Hours average = 14.5), on the nasal bridge being the most frequently anatomical structure affected, but the application of essential oils to prevent injuries is also beneficial.

All patients used disposable oronasal masks, which may have contributed to the low incidence of LSP, the length of time of its use and the cleaning/sterilization procedures contribute to the degradation of the material, increasing air leaks and consequently the need for greater pressure to adjust the mask.⁹ Another critical point is the assessment and classification of facial LSP since Grade I may not be considered in some studies as LSP.¹⁰ A significant part of the sample (36.9%) submitted to NIV, presented respiratory insufficiency/pneumonia at admission, and these diagnoses have motivated the use of NIV, with the emergence of two LSP (2%). However, the patients with the diagnosis of cardiopulmonary arrest/cardiovascular diseases developed LSP on the face (1.9%). In the study of the Yamaguti *et al.*,¹¹ which aimed to identify potential risk factors for the development of LSP in 375 in adults with IRA and were submitted to NIV for a period exceeding two hours, were found that 54 individuals (14.4%) developed LSP, because they have been subjected to a greater duration of use of the interface. Also in the study by Martins *et al.*,¹² the diagnosis at admission that motivated greater recourse to NIV was wrath (60.0 %) having developed LSP from face 6 (20.0%) of the participant. Also, in the study by Silva *et al.*,⁵ about the adaptation to different interfaces of NIV in critical patients, 71.3% of patients requiring NIV was by IRA, since the same imposes a severe deterioration of the gas exchange.

As Schallon & Crachiolo refers,¹³ it is a recent problem derived from an increasing therapy, therefore, with our relevant information results we hope to contribute to improve the care.

CONCLUSION

The ulcer caused by pressure on the face is one of the most frequent complications associated to the practice of NIV in critically-ill patients. Male patients under 65 years were those that presented a higher number of LSP (3.9%), still a lower value to the quality indicator recommended by the SEMICYUC, whose standard is < 7%. The appearance of LSP is directly related to the increase of continuous hours of NIV. The use of masks for single use, pressure relief and the application of sweet almond oil seems to have contributed to the reduction of incidence of LSP in patients submitted to NIV in the ICU. The respiratory insufficiency/pneumonia and cardio-respiratory arrest/cardiovascular diseases were the most prevalent diagnoses that have motivated the use of NIV.

REFERENCES

1. Cruz M, Zamora V. Ventilação mecânica não invasiva. *Revista HUPE* 2013;12(3), 92-101
2. Ferreira S, Nogueira C, Conde S, Taveira N. Ventilação Não Invasiva. *Revista Portuguesa de Pneumologia* 2009; XV(4), pp. 655-667
3. Diário da República n.º 28/2015, 1º Suplemento, Série II de 2015-02-10 - Ministério da Saúde no Plano Nacional para a Segurança dos Doentes 2015-2020 (DGS, 2015)
4. Sociedad Española de Medicina Intensiva, Crítica y Unidades Coronarias (SEMICYUC) - Indicadores de Calidad Del Enfermo Crítico - Actualización 2017. Madrid: SEMICYUC; 2017
5. Silva D, Barbosa M, Araújo D, Oliveira L, Melo A. Úlcera por pressão: Avaliação de fatores de risco em pacientes internados em um hospital universitário. *Revista Eletrônica de Enfermagem* 2011;13(1), 118-123
6. Maruccia M, Ruggieri M, Onesti M. Facial skin breakdown in patients with non-invasive ventilation devices: Report of two cases and indications for treatment and prevention. *International Wound Journal* 2015;12, 451-455
7. Borghardt AT, Prado TN, Bicudo SD, Castro DS, Brinquente ME. Pressure ulcers in critically ill patients: Incidence and associated factors. *Revista Brasileira de Enfermagem* 2016;69(3), 460-467
8. Otero DP, Dominguez DV, Fernandez LH, Magarino AS, Gonzalez VJ, Klepzing JV, Montesinos JV. Preventing facial pressure ulcers in patients under non-invasive mechanical ventilation: A randomised control trial. *Journal of Wound Care* 2017;26(3), 128-136
9. Passarini J, Zambon L, Morcillo A, Kosour C, Saad A. Utilização da ventilação não invasiva em edema agudo do pulmão e exacerbação da doença pulmonar obstrutiva crônica na emergência: Preditores de insucesso. *Revista Brasileira de Terapia Intensiva* 2012; 24(3), 278-283.
10. Pancorbo Hidalgo PL, García Fernández FP, Soldevilla Agreda J, Martínez Cuervo F. Valoración del riesgo de desarrollar úlceras por presión: Uso clínico en España y metaanálisis de la efectividad de las escalas. *Gerokomos* 2008; 19(2), 84-98.
11. Yamaguti W, Moderno E, Yamashita S, Gomes T, Maida A, Kondo C, Salles I, Brito C. Treatment-related risk factors for development of skin breakdown in subjects with acute respiratory failure undergoing noninvasive ventilation or CPAP. *Respiratory Care* 2014;59(10), 1530-1536
12. Martins MD da S, Ribas PSC, Sousa JRA, Da Silva NAP, Preto LSR, Correia TIG. Úlceras de pressão na face em doentes submetidos a ventilação não invasiva hospitalizados em cuidados intermédios. *Referência Revista de Enfermagem* 2016;4(10), 103-111
13. Schallon M, Crachiolo L. Pressure ulcers caused by masks during noninvasive ventilation. *Am J Crit Care* 2016;25(1), 7
14. Süheyla Abitao lu, Ceren Köksal, Güldem Turan, Arzu Yıldırım Ar, Fatma Nur Akgün, Dilek Erdoğan Ar. Comparison of the clinical performances of i-gel and baska mask. *Medical Science*, 2019, 23(95), 100-107
15. Hasti Ansari Ashlaghi, Azita Pourshirvani, Mitra Zandi, Maliheh Nasiri. The effect of familiar voices on levels of agitation in patients admitted to intensive care units. *Medical Science*, 2018, 22(91), 328-334

undergoing noninvasive ventilation, hospitalized in the intensive care unit. *Medical Science*, 2019, 23(96), 155-158

Publication License



This work is licensed under a Creative Commons Attribution 4.0 International License.

General Note



Article is recommended to print as color digital version in recycled paper. *Save trees, save nature*

Article Keywords

Intensive Care Unit; Non invasive ventilation; Lesion on the skin caused by pressure on the Face

Article History

Received: 24 November 2018

Accepted: 10 January 2019

Published: March-April 2019

Citation

Viveiros Abel, Nóbrega Júlio, Santos Luísa, Peña-Otero David, Costa Ana, Ribeiro Leonardo, Alves Ana. Pressure injury on the face of patients