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Nasal septal injury in hospitalized newborns: exploratory descriptive study

Lesão de septo nasal em recém-nascidos hospitalizados: estudo descritivo exploratório

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ABSTRACT

Objective: To identify and describe the profile of newborns who presented nasal septal injury using Noninvasive Ventilation and the treatment used. **Method:** Descriptive, exploratory research, with retrospective data collection in medical records of newborns hospitalized between January/2020 and December/2021, through a structured instrument, with simple descriptive frequency analysis. **Results:** Nasal septal injury was identified in 19.0% of newborns, with gestational age between 30-35 weeks and birth weight <1,500 grams. The most frequent stage of injury was I, treated with Askina spray + prong rotation, followed by Hydrocolloid + Dersani Hydrogel, between 1-7 days (36.4%). **Conclusion:** The nursing team encounters difficulties in the approach to newborns submitted to noninvasive ventilation with prong, making it relevant to invest in their qualification and in care protocols for skin care and for the performance of safe and humanized care.
Keywords: Wounds and Injuries; Nasal Septum; Neonatal Nursing.

RESUMO

Objetivo: Identificar e descrever o perfil de recém-nascidos que apresentaram lesão de septo nasal em uso de Ventilação Não Invasiva e o tratamento utilizado. **Método:** Pesquisa descritiva, exploratória, com coleta retrospectiva de dados em prontuários de recém-nascidos hospitalizados entre janeiro/2020 a dezembro/2021, por meio de um instrumento estruturado, com análise de frequência descritiva simples. **Resultados:** A lesão de septo nasal foi identificada em 19,0% dos recém-nascidos, com idade gestacional entre 30-35 semanas e peso ao nascer <1.500 gramas. O Estágio da lesão mais frequente foi I, tratado com Askina spray + rodízio de prongas, seguida de Hidrocoloide + Dersani Hidrogel, entre 1-7 dias (36,4%). **Conclusão:** A equipe de enfermagem depara-se com dificuldades na abordagem ao recém-nascido submetido a ventilação não invasiva com pronga, tornando-se relevante investir em sua qualificação e em protocolos assistenciais de cuidados com a pele para o desempenho de uma assistência segura e humanizada.
Descritores: Ferimentos e Lesões; Septo Nasal; Enfermagem Neonatal.

INTRODUCTION

The incidence of premature births is high worldwide, especially in developing countries. In Brazil, the incidence of prematurity is 11.5%, twice as high when compared to European countries[1].

Many premature newborns require hospitalization in the Neonatal Intensive Care Unit (NICU)in order to survive due to the immaturity of their organs and systems. The predominant problem for the hospitalization of premature infants refers to respiratory complications, which require ventilatory support for the recovery of their health[1].

Devices and technological means are necessary for ventilatory assistance, but currently there are several invasive and non-invasive support modalities. Non-invasive ventilatory support was created to reduce the need for Invasive Mechanical Ventilation (IMV) and to expose newborns to the minimum pos-

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sible harm resulting from invasive interventions, such as infection [2-3].

The use of Noninvasive Ventilation (NIV) in NICU can reduce morbidity and mortality among critically ill infants[4-6]. The use of NIV, regardless of continuous or intermittent positive pressure in the airways, is extremely important, as it offers adequate ventilatory support for the development of preterm infants, until they reach lung maturity and remain on spontaneous ventilation. It is indicated for cases of apnea of prematurity, hyaline membrane diseases, bronchopulmonary dysplasia, among others[7].

However, its use is not exempt from adverse events, which require professional training for the proper management of the devices necessary for NIV. The use of nasal prongs, a necessary device for NIV, when in contact with the newborn's skin exerting a local pressure, predisposes the nasal septum to injuries, causing pain and discomfort[6,8-9].

NIV-related skin injuries are frequent in NICU, and gestational age, birth weight and prolonged use of these devices are factors that predispose the injuries[10-11]. The types of skin injuries are varied, in general it begins with local hyperemia, bleeding and in more severe stages, necrosis and tissue loss occurs at the site of the injury. The complications resulting from these injuries can lead to delays in the evolution of the clinical picture and a longer hospitalization period, causing higher costs to the health system[12]. The use of hydrocolloid dressings is usually recommended to prevent and treat the injuries in the initial stage, it is composed of a cellulose, pectin and gelatin membrane, which is adhered to the nasal septum of the newborn that is under NIV, with the objective of protecting the skin[9,12].

When an injury is already present and the newborn does not have clinical conditions or gestational age that allow the suspension of ventilatory support, it is recommended to use a hydrocolloid dressing, associated with topical products that can help in the healing process of the injury. It is worth emphasizing the importance of inspecting skin that may be in contact with the ventilatory device, in addition to alternating the form of ventilation between nasal prongs and nasal mask to prevent the progression of the injury[7,13].

The daily inspection of the newborn's skin, present in the nursing care practices, can enable the preservation and protection of the skin of the newborn receiving ventilatory support. For this, nurses should seek knowledge and evidence-based practices that help in the systematization of care, contributing to the safety and quality of care[13].

The management of pressure injuries in newborns on NIV does not require high financial investment, but daily care actions, which include the identification of newborns who are more vulnerable to injuries and more effective treatment[8,12]. Pressure injury prevention and management is an indicator of the quality of nursing care[14]. Given the above, the present study aims to identify and describe the profile of newborns who presented nasal septal injury using non-invasive ventilation and the treatment used.

METHOD

Descriptive, exploratory research, with retrospective data collection from electronic medical records in an archives department of a hospital institution in the municipality of Cascavel, Paraná, southern Brazil. The medical records included in the research refer to hospitalizations over a period of two years, between January 2020 and December 2021.

The hospital institution elected for the research refers to a teaching hospital, which provides assistance to the Unified Health System, and private health care sector, and is a reference center for the care of high-risk newborns.

The inclusion criteria for commencing the study population were: medical records of newborns hospitalized in the NICU; the need to use NIV; who presented nasal septal injury, regardless of the stage of the injury. The exclusion criteria included newborns who needed to use NIV and who evolved directly to the supply of oxygen by inward mask, babies who did not use any ventilatory support and/or who remained hospitalized in a period longer than proposed for the research.

Data collection was performed during 2021 and in January 2022 by two nurses and a physiotherapist with experience in complex neonatal care, using a structured research script, elaborated by two researchers with expertise in neonatology.

The instrument used was composed of the following variables: birth weight, gestational age, gender, diagnosis of hospitalization, need and time of use of IMV and NIV, use of phototherapy, stage of nasal septal injury (Stage I, II, III and IV), type and time of treatment and time of hospitalization.

The stages of nasal septal injury were based on the following clinical manifestations: Grade

I - hyperemia in the septum region; Grade II - superficial ulceration; Grade III - necrosis; Grade IV - loss of nasal septum tissue[11-12,15].

Two pilot tests were carried out to adapt the instrument and to train the data collection team, which could be included in this research.

The collected data were double-entered into a Microsoft Office Excel 2019 spreadsheet. After checking for inconsistencies, the data were tabulated and subjected to simple descriptive frequency analysis.

The study was evaluated and approved by the Research Ethics Committee of *Centro Universitário Assis* Gurgacz (FAG), under Protocol nº 4,532,938. All ethical and legal principles were preserved in the research, in accordance with Resolution 466/2012 of the National Health Council (CNS).

RESULTS

During the study period, 308 newborns were admitted to the NICU studied. Of these, 116 required noninvasive ventilatory support and 22 (19.0%) developed nasal septal injury. Table 1 shows the characteristics of newborns who presented nasal septal injury. During the study period, 308 newborns were admitted to the NICU under study. 116 of these required non-invasive ventilatory support and 22 (19.0%) developed a nasal septal injury. Table 1 shows the characteristics of newborns who presented nasal septum injuries.

Table 1 - Characterization of newborns who developed nasal septal injury hospitalized in the Neonatal Intensive Care Unit. Cascavel, PR, Brazil, 2020-2021 (n=22)

Variables	n	%
Sex		
Female	13	59.1
Male	09	40.9
Gestational age		
≤ 29 weeks	09	40.9
30 to 35 weeks	13	59.1
Birth weight		
< 1500 grams	14	63.6
≥ 1500 grams	08	36.4
Admission diagnosis		
Prematurity + Respiratory Complications	12	54.5
Prematurity	10	45.5

Source: Prepared by the authors, 2022.

The minimum birth weight of the newborns included in the study was 700 grams and the maximum weight was 1,920 grams, while the minimum gestational age was 26 weeks and six days and maximum of 33 weeks and one day.

Regarding the days hospitalized, the mean rate was 47.33 days. During hospitalization in the NICU, the newborns, mostly due to prematurity and respiratory complications, required ventilatory support to improve their clinical conditions. On this occasion, NIV was used in the 22 newborns, however, 15 (68.2%) newborns also initially needed IMV for more than seven days (40.9%), as shown in Table 2. Regarding length of NIV, it is observed that 31.8% of the babies used the device for up to seven days and 36.4% used the device between eight and 20 days.

Table 2 - Type of ventilatory support and frequency used during hospitalization of newborns in the Neonatal Intensive Care Unit. Cascavel, PR, Brazil, 2020-2021 (n=22)

Variables	n	%
Invasive Mechanical Ventilation		
Yes	15	68.2
Did not use	07	31.8
Invasive Mechanical Ventilation Time		
1 to 7 days	06	27.3
Over 7 days	09	40.9
Did not use	07	31.8
Non-Invasive Ventilation Time		
1 to 7 days	07	31.8
8 to 20 days	08	36.4
21 to 30 days	03	13.6
Over 30 days	04	18.2

Source: Prepared by the authors, 2022.

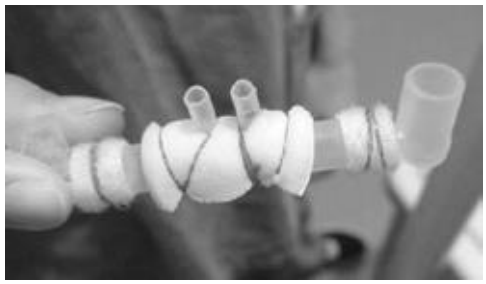
With respect to the main object for describing the cases in this research, Table 3 presents the variables on the stage of the injury, treatment used and duration of treatment. It is observed that most newborns (45.5%) remained in Stage I, whose main treatment involved the application of Dersani gel and Askina spray film (40.9%), followed by the placement of a hydrocolloid dressing and the application of Dersani Hydrogel (13.8%), for up to one week (36.4%). Overall, 31.8% of babies used hydrocolloid dressings.

Table 3 - Data on nasal septal injury and treatment in newborns hospitalized in the Neonatal Intensive Care Unit. Cascavel, PR, Brazil, 2020-2021 (n=22)

Variables	n	%
Stage of Nasal Injury		
Stage I	10	45.5
Stage II	07	31.8
Stage III	04	18.2
Stage IV	01	4.5
Treatment Used		
Askina + prong caster	09	40.9
Hydrocolloid + Dersani Hydrogel	03	13.8
Dersani Hidrogel + Askina + prong rotation	02	9.1
Dersani Hydrogel + prong rotation	02	9.1
Hydrocolloid	02	9.1
Suspension of noninvasive ventilation	01	4.5
Hydrocolloid + Suspension of noninvasive ventilation	01	4.5
Transparent Film	01	4.5
Hydrocolloid + Dersani Hydrogel + Transparent Film	01	4.5
Treatment time		
1 to 7 days	08	36.4
8 to 20 days	07	31.8
Over 20 days	06	27.3
Immediate	01	4.5

Source: Prepared by the authors, 2022.

It is important to highlight that the treatment for prong rotation includes the temporary replacement of the short nasal silicone cannula for a different style of nasal prong. In addition, adjustments are made to the prong with foam and hydrocolloid dressing, as shown in Figure 1.



Source: Prepared by the authors, 2022.
Figure 1 - Neonatal nasal prong (A) With protective foam. (B) With protective foam and hydrocolloid dressing applied to the skin of the newborn. Cascavel, PR, Brazil, 2020-2021

Regarding the stage of the injury, in Table 4, it was observed that milder stages of the injury were identified among newborns with the longest time of NIV use and gestational age, however, newborns with the lowest birth weight presented a higher degree of septal injury. Regarding the use of phototherapy while remaining on NIV, all newborns needed treatment for at least two days. Newborns with Stage II injuries required longer treatment time (22.8%) and those with Stage III required longer hospitalization time (18.2%). With regard to the clinical outcome of these newborns monitored, most evolved to a favorable outcome, with discharge from the NICU for 21 (95.5%) patients and one (4.5%) evolved to death.

DISCUSSION

The results showed that nasal septal injury is still an event among newborns undergoing NIV use in the NICU. It was observed that Stage II and III injuries were identified among babies with lower birth weight and resulted in longer treatment and hospitalization time.

NIV has therapeutic advantages for the recovery of newborns with respiratory problems, however, the use of prongs without preventive care can result in injuries and may cause deformities, nasal asymmetry and airway obstruction[6,8-9]. Nasal trauma among premature babies due to the use of prongs can vary between 20 and 60%

Table 4 – Newborns with septum injury, distributed according to injury stages, NIV time, gestational age, birth weight, phototherapy use, treatment time. Cascavel, PR, Brazil, 2020-2021 (n=22)

	Stage I		Stage II		Stage III		Stage IV	
	n	%	n%	n	%	n	%	
Noninvasive Ventilation								
Up to 7 days	04	18.2	01	4.5	02	9.1	00	0
More than 7 days	06	27.3	06	27.3	02	9.1	01	4.5
Gestational age								
< 29 weeks	01	4.5	02	9.1	02	9.1	01	4.5
≥ 29 weeks	09	40.9	05	22.8	02	9.1	00	0
Birth weight								
< 1500 grams	02	9.1	06	27.3	04	18.2	01	4.5
> 1500 grams	08	36.4	01	4.5	0	0	00	0
Phototherapy								
Yes	10	45.5	07	31.8	04	18.2	01	4.5
No	0	0	0	0	0	0	00	0
Treatment time								
Up to 7 days	06	27.3	02	9.1	01	4.5	00	0
More than 7 days	04	18.2	05	22.8	03	13.6	01	4.5
Hospitalization time								
Up to 30 days	08	36.4	02	9.1	0	0	00	0
30 to 60 days	01	4.5	03	13.7	0	0	00	0
Over 60 days	01	4.5	02	9.1	04	18.2	01	4.5

Source: Prepared by the authors, 2022.

worldwide and in Brazil it can reach percentages from 70 to 100%[10,16]. Nasal breathing prevails in the neonatal period and keeping the mucosa intact minimizes the risk of infections, breathing difficulties and the appearance of deformities[17].

With regard to the birth data of preterm infants, there was a higher occurrence of NIV use in female newborns, gestational age between 30 and 35 weeks and weighing less than 1,500 grams. It is relevant to pay attention to the anatomy and physiology of the immature skin of premature infants with low birth weight hospitalized in the NICU, which presents a greater risk for injuries due to the constant need for procedures and invasive devices, essential for their survival[18]. In the Brazilian study, reporting a high rate of nasal septal injury, the most affected newborns had a gestational age of approximately 31 weeks, weight of 1,500 grams and NIV use time of 96 hours[16].

The prevalent diagnosis of babies affected by septal injury involved prematurity with respiratory complications, which led to the need to start NIV, which was used by the majority for up to seven days. Newborns on NIV, using nasal prongs, need specialized care in view of the damage and iatrogenic effects that this device can generate due to the pressure exerted on the nasal septum. Prematurity is a determining factor of integumentary immaturity and can lead to the development of more severe injuries in the nasal mucosa[9].

The vulnerability of the skin of preterm infants is due to the absence of protection by the vernix and the stratum corneum in the epidermis. A Brazilian study showed that the use of protective dressings such as Hydrocolloid in places with bony prominences and with constant friction with devices, such as the nasal prong, is among the most used measures to prevent skin injuries in premature babies[18-19].

Respiratory complications are the main clinical conditions that affects premature newborns. The immaturity of the premature infant's respiratory system is caused by failure in the production of pulmonary surfactant, therefore, the lower the gestational age at birth, the greater the immaturity of the organs and systems, increasing the risk of the baby developing this complication[20].

The average weight of the babies included in the study was less than 1,500 grams (700 – 1920 grams) and the hospitalization period was considered high, that is, approaching 50 days. Scientific literature indicates risk factors for nasal injuries associated with NIV the low gestational age as low birth weight, longer use of prongs and longer stay in the NICU[11].

Regarding the nasal septum injuries monitored during this study, it was found that the majority remained in Stage I, whose treatment required rotation between the nasal prongs, use of Askina, in the form of a protective film spray, followed by the placement of Hydrocolloid and application of Dersani + Hidrogel, with up to seven days of treatment for skin recovery. Hydrocolloid benefits are known to prevent and minimize the severity of nasal injuries. However, its use in infected or colonized sites with the presence of devitalized tissue is contraindicated[21].

A study showed that hydrocolloid may be the best choice to prevent injury to the base of the nasal septum in newborns who need NIV[22]. While another study that aimed to test the application of hydrocolloid in a double layer, that is, in the nostrils and in the high-flow nasal catheter - prong, observed that the cases that presented favorable results may have been due to the vigilant care of the teams of neonatal unit nursing, an extremely relevant factor for the protection and care of the skin of premature newborns[18-19]. In that investigation, the hydrocolloid patch used in only seven babies was placed when the injury was already present, differing from the studies in which its use was recommended as protection against the appearance of septal injuries[7,9,12-13].

There is evidence in the literature of other forms of treatment for septal injuries. A case study used Kinesio® Taping to protect against friction caused by direct contact and for long periods of time from the prong to the nasal septum. Good results were found with Kinesio® Taping by reducing nasal injury after three days of use, as the device adapted properly to the shape of the nose[17].

It is also important to highlight measures to alleviate discomfort and pain due to the use of NIV and the occurrence of injuries. In the scientific literature, there are studies that discuss the need to increase the actions of health professionals, through the administration of analgesia[12] at opportune moments, as well as non-pharmacological measures, which include choosing the appropriate size of the prong, better positioning of the prongs and the NIV circuit, periodic massage with circular movements on the nasal septum and the use of music therapy to keep the baby calmer in the neonatal unit[12,23].

With regard to the injury severity variables, it was found that babies with the lowest birth weight developed injuries more severely, which consequently increased the time of treatment and hospitalization of the premature newborn.

It is known that the longer the time of NIV use, the higher the incidence of Stage II, III and IV injuries. This is a worrying factor, considering the damage that occur in these stages may involve necrosis and total loss of the nasal septum[24].

Based on these considerations, it is important for nurses to identify the risks for the appearance of these injuries at an early stage and build and use scales for risk prediction, bearing in mind the quality of care, which includes the reduction of injuries resulting from septal injury, hospitalization time, mortality and treatment costs[24].

The scientific literature shows the effectiveness of using scales to qualify newborn care, which are useful for classifying the risk of loss of skin integrity in newborns, with regard to the presence of dryness, erythema and rupture/skin injury[25-26]. For this, it is necessary to have scientific evidence in hand to support and assist in choosing the best products, techniques, materials and procedures.

The absence of protocols for skin care in premature newborns and the lack of standardization of materials can lead to difficult situations for care practice, making further studies necessary to group knowledge supported by scientific bases with the aim of supporting the nurse in the construction of protocols and in the organization of clinical practice[18].

This research was limited by the fact that the collection was performed only in medical records, and consequently, the lack of photographic representation of the stages of injuries may limit the discussion about evolution and treatment, making it impossible to deepen the subject.

CONCLUSION

Nasal septal injury was identified among premature newborns submitted to NIV. Babies with gestational age between 30 and 35 weeks and birth weight less than 1,500 grams were the most affected by the injury. Regarding treatment, the use of Askina, Hydrocolloid and prong rotation were the most used, regardless of the stage of the injury, and more severe cases were treated with Dersani and Hidrogel.

It was identified that most newborns maintained Stage I injury, but infants with birth weight of less than 1,500 grams presented injuries in more severe stages and longer period of treatment and hospitalization.

The research was relevant because it presented that the nursing team is faced with difficulties in the care of newborns using NIV with nasal prongs

and with the possible injuries resulting from its use. Thus, it is necessary to invest in the qualification of professionals and in care protocols for the care of the newborn's skin, envisioning a safe and humanized care, especially in more vulnerable segments such as premature ones due to their integumentary and respiratory immaturity.

CONFLICT OF INTERESTS

The authors have declared that there is no conflict of interests.

REFERENCES

1. Vanin LK, Zatti H, Soncini T, Nunes RD, Soqueira LBS. Maternal and fetal risk factors associated with late preterm infants. Rev Paul Pediatr. 2020;38: e2018136. https://doi.org/10.1590/1984-0462/2020/38/2018136

2. Shi Y, Luca D. Continuous positive airway pressure (CPAP) vs noninvasive positive pressure ventilation (NIPPV) vs noninvasive high frequency oscillation ventilation (NHFOV) as post-extubation support in preterm neonates: protocol for an assessor-blinded, multicenter, randomized controlled trial. BMC Pediatr. 2019 Jul 26;19(1):256. https://doi.org/10.1186/s12887-019-1625-1

3. Behnke J, Lemyre B, Czernik C, Zimmer K, Ehrhardt H, Waitz M. Non-invasive ventilation in neonatology. Dtsch Arztebl Int. 2019;116:177-83. https://doi.org.10.3238/arztebl.2019.0177

4. Black JM, Cuddigan JE, Walko MA, Didier LA, Lander MJ, Kelpe MR. Medical device related pressure ulcers in hospitalized patients. Int Wound J. 2019;5(7):358-65. https://doi.org/10.1111/j.1742-481X.2010.00699.x

5. Permall DL, Pasha AB, Chen XQ. Current insights in non-invasive ventilation for the treatment of neonatal respiratory disease. Ital J Pediatr. 2019;45(1):105. https://doi.org/10.1186/s13052-019-0707-x

6. Bishopp A, Oakes A, Antoine-Pitterson P, Chakraborty B, Comer D, Mukherjee R. The preventative effect of hydrocolloid dressings on nasal bridge pressure ulceration in acute non-invasive ventilation. Ulster Med J [Internet]. 2019 [cited 2022 Feb 15];88(1):17-20. Available from: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6342034/

7. Tamez RN. Enfermagem na UTI neonatal: assistência ao recém-nascido de alto risco. 6. ed. Rio de Janeiro (RJ): Guanabara Koogan; 2017.

8. Imbulana DI, Manley BJ, Dawson JA, Davis PG, Owen LS. Nasal injury in preterm infants receiving non-invasive respiratory support: a systematic review. Arch Dis Child Fetal Neonatal Ed. 2018;01(103):29-35. https://doi.org/10.1136/archdischild-2017-313418

9. Guedes BLS, Ferreira MMB, Mascarenhas MLVC, Ferreira ALC, Costa LC, Lúcio IML. Pressão positiva contínua nas vias aéreas em neonatos: cuidados prestados pela equipe de enfermagem. Esc Anna Nery. 2019;23(02):e20180122. https://doi.org/10.1590/2177-9465-EAN-2018-0122

10. Bashir T, Murki S, Kiran S, Reddy VK, Oleti TP. Nasal mask in comparison with 'nasal prongs' or 'rotation of nasal mask with nasal prongs' reduce the incidence of nasal injury in preterm neonates supported on nasal continuous positive airway pressure (nCPAP): a randomized controlled trial. PLoS One. 2019;14(01):e0211476. https://doi.org/10.1371/journal.pone.0211476

11. Khan J, Sundaram V, Murki S, Bhatti A, Saini SS, Kumar P. Nasal injury and comfort with jet versus bubble continuous positive airway pressure delivery systems in preterm infants with respiratory distress. Eur J Pediatr. 2017;176(12):1629-35. https://doi.org/10.1007/s00431-017-3016-7

12. Ribeiro DFC, Barros FS, Fernandes BL, Nakato AM, Nohama P. Nasal prongs: risks, injuries incidence and preventive approaches associated with their use in newborns. J Multidiscip Healthc. 2020;13:527-37. https://doi.org/10.2147/JMDH.S252017

13. Santos SV, Ramos FRS, Costa R, Batalha LMC. Evidence on prevention of skin lesions in newborns: integrative review. Braz J Enterostomal Ther. 2019;17:1-20. https://doi/org/10.30886/estima.v17.787_IN

14. Teo CSM, Claire CA, Lopez V, Shorey S. Pressure injury prevention and management practices among nurses: a realist case study. Int Wound J. 2019;01(16):153-63. https://doi.org/10.1111/iwj.13006

15. Azevedo TMD, Morais LL, Batista IBC. Prevalência de lesão de septo nasal em recém-nascidos prematuros por uso de pressão positiva contínua nas vias aéreas (CPAP) em uma unidade de terapia intensiva neonatal. ASSOBRAFIR Ciênc. 2022;13:e44541. http://dx.doi.org/10.47066/2177-9333.AC.2022.0049

16. Ribeiro DFC, Barros FS, Fernandes BL, Nakato AM, Nohama P. Incidence and severity of nasal injuries in preterm infants associated to non-invasive ventilation using short binasal prong. Glob Pediatr Health. 2021;8:2333794X211010459. https://doi.org/10.1177/2333794X211010459

17. Souza BHS, Sousa H, Oliveira HNS, Torres HVB, Pereira SA. Kinesio Taping® as an innovative therapeutic tool to prevent nasal septal lesions in newborns: a case study. Fisioter Mov. 2020;33. https://doi.org/10.1590/1980-5918.033.AO40

18. Aredes NDA, Santos RCA, Fonseca LMM. Skin care of premature newborns: integrative review Rev Eletr Enf. 2017;19:a59. http://doi.org/10.5216/ree.v19.43331

19. Rolim KMC, Farias CPX, Marques LC, Magalhaes FJ, Gurgel EPP, Caetano JA. Atuação da enfermeira na prevenção de lesão de pele do recém-nascido. Rev Enferm UERJ [Internet]. 2017 [cited 2022 Feb 05];17(4):544-9. Available from: https://www.facenf.uerj.br/v17n4/v17n4a16.pdf

20. Pontes S, Caxias CC, Silva ANN, Silva SMP, Lima AMF. Repercussões da ventilação não invasiva em recém-nascidos prematuros com síndrome do desconforto respiratório agudo: revisão integrativa. Rev Ciênc Plural. 2021;7(2):211-26. https://doi.org/10.21680/2446-7286.2021v7n2ID22612

21. Gan JE, Chin CY. Formulation and characterization of alginate hydrocolloid film dressing loaded with gallic acid for potential chronic wound healing. F1000Res. 2021;10:451. https://doi.org/10.12688/f1000research.52528.1

22. Ribeiro DFC, Barros FS, Fernandes BL, Nakato AM, Nahoma P. Hydrocolloid versus silicone gel for the prevention of nasal injury in newborns submitted to noninvasive ventilation: a randomized clinical trial. Heliyon. 2020;06(07):1-7. https://doi.org/10.1016/j.heliyon.2020.e04366

23. Barcellos AA, Mathiolli C, Lago MTG, Matos GM, Zani AV. Effects of music therapy on the physiological responses of preterm newborns on non-invasive ventilation: a quasi-experimental study. Online Braz J Nurs. 2021;20:e20216487. https://doi.org/10.17665/1676-4285.20216487

24. Milligan PS, Goldstein MR. Implementation of an evidence-based non-invasive respiratory support (NIRS) bundle in the NICU to decrease nasal injury complications. J Neonatal Nurs. 2017;23(2):89-98. https://doi.org/10.1016/j.jnn.2016.05.003

25. Martina COA, Curado MAS. Escala de observação do risco de lesão da pele em neonatos: validação estatística com recém-nascidos. Rev Enferm Ref. 2017;IV(13):43-52. https://doi.org/10.12707/RIV16082

26. Schaefer TIM, Neves ET, Jantsch LB, Magnago TSB de S. Avaliação das condições da pele do recém-nascido em terapia intensiva neonatal. Rev Enferm Atual. 2019;84(22):33-44. https://doi.org/10.31011/reaid-2018-v.84-n.22-art.265

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