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Araştırma Makalesi/ Research Article

Prevention of Skin Damage Caused by Medical Adhesive Removal in Premature Infants

Prematüre Bebeklerde Tıbbi Yapıştırıcının Çıkartılmasının Neden Olduğu Deri Hasarlarının Önlenmesi

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ABSTRACT

Objective: The aim of this study is to assess the effectiveness of the use of silicone tape and the use of a protective hydrocolloid dressing under silk tape in preventing skin damage due to medical adhesive removal in premature infants.

Method: A randomized controlled trial was conducted with 75 premature infants between 32 and 36 weeks gestational age to examine the effects of the following medical adhesives used for fixing equipment on skin damage: protective hydrocolloid dressing+silk tape, silicone tape, and silk tape+silicone-based solvent spray. After medical adhesives were applied to the skin of the newborn for orogastric tube fixation, the skin condition was monitored for 24 hours. The skin condition was assessed with the Neonatal Skin Condition Scale before and after adhering to the medical adhesives. The statistical tool SPSS 22 was used to examine the study's data.

Results: Neonatal skin condition scores were highest in the silk tape + silicone-based solvent spray group, while the lowest score was found in the silicone tape group. A statistically significant, moderate correlation, with a negative direction, was found between birth weight and post-application skin condition scores ($r= -.432$, $p<0.05$) in the hydrocolloid dressing + silk tape group.

Conclusion: The results of this study indicate that hydrocolloid dressings and silicone tape did not cause skin damage. Silk tape+silicone-based solvent spray increased skin condition scores.

Keywords: Epidermis, hydrocolloid, premature infant, adhesives

ÖZ

Amaç: Bu çalışmanın amacı prematüre bebeklerde ekipman sabitlemek için koruyucu hidrokolloid örtü üzerine ipek bant kullanımının ve silikon bant kullanımının tıbbi yapıştırıcı çıkarmaya bağlı cilt hasarını önlemede etkinliğini değerlendirmektir.

Yöntem: Randomize kontrollü bu çalışmada 32-36. gestasyon haftasında 75 prematüre bebek çalışmanın örneklemini oluşturmuştur. Ekipman sabitlemek için kullanılan tıbbi yapıştırıcıların cilt hasarı üzerindeki etkisi karşılaştırılmıştır. Çalışmada karşılaştırılması yapılan tıbbi yapıştırıcılar koruyucu hidrokolloid örtü+ipek bant, silikon bant, ipek bant + silikon bazlı çözücü spreydir. Tıbbi yapıştırıcılar yenidoğanın cildine orogastrik sonda sabitlemede uygulandıktan sonra cilt durumu 24 saat izlenmiştir. Tıbbi yapıştırıcıları cilde yapıştırma öncesi ve sonrası cilt durumu Yenidoğan Cilt Durum Değerlendirmesi ölçeği ile değerlendirilmiştir. Çalışmanın verileri SPSS 22 istatistik programı ile analiz edilmiştir.

Bulgular: Yenidoğan cilt durum skorları en yüksek ipek bant + silikon bazlı çözücü sprey grubunda saptanırken, en düşük silikon bant grubunda saptanmıştır. Hidrokolloid örtü + ipek bant grubunda doğum ağırlığı ile uygulama sonu cilt durum skorları arasında istatistiksel olarak anlamlı, negatif yönde, orta düzeyde ilişki saptanmıştır ($r= -.432$, $p<0.05$).

Sonuç: Bu çalışmanın sonuçları koruyucu hidrokolloid örtü ve silikon bandın cilt hasarına neden olmadığını göstermektedir. İpek bant + silikon bazlı solvent sprey, cilt durum skalası puanlarını arttırmıştır.

Anahtar Kelimeler: Epidermis, hidrokolloid, prematüre bebek, yapıştırıcılar

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Introduction

A newborn infant's skin has four main functions: preventing transepidermal water loss (TEWL), protecting against microorganisms, ensuring thermoregulation, and acting as a physical barrier (Bellini and Beaulieu, 2017). However, the layers of the skin and the adequacy of its functions in the newborn are related to the maturity of the infant. While a full-term infant has a well-developed skin structure, the skin of premature infants is insufficient in terms of structure and functionality as the epidermis and stratum corneum are thin (Bellini and Beaulieu, 2017; Tüzün et al., 2005). In this case, the skin cannot perform its barrier function and causes the entry of microorganisms, heat loss, easy physical damage to the skin, and TEWL (Boswell et al., 2016; Lund et al., 1997).

In neonatal intensive care units, it is significant to fix medical devices securely for the monitoring and continuity of vital functions, and various medical adhesives such as plastic tape, elastic fabric acrylate tape, and paper tape are typically used for this (Grove et al., 2014; Lund et al., 1997; Wang et al., 2019). These medical adhesives are used to securely attach devices such as endotracheal tubes, nasogastric tubes (NG), orogastric tubes (OG), pulse oximetry probes, temperature probes, umbilical catheters, peripheral vascular accesses, chest tubes, ostomy bags, urine collection bags, monitor connectors, breathing devices and electrocardiogram (ECG) monitor electrodes (Arslan and Ateş, 2022; Boswell et al., 2016; Dollison and Beckstrand, 1995; Lund et al., 1997; Lund et al.; 1986; Lund et al., 2001; O'Neil and Schumacher, 2014; Wang et al., 2019).

Medical adhesives used to fix equipment such as NG, OG, probes, and intubation tubes used for follow-up and treatment of premature infants in neonatal intensive care units cause peeling of the stratum corneum layer of the epidermis while being removed from the skin. This is the most common cause of skin damage in premature newborns (Grove et al., 2014; Lund et al., 2001; O'Neil and Schumacher, 2014; Wang et al., 2019).

In premature infants, connective tissue fibers are short and spaced-out at the dermal-epidermal junction. Therefore, the dermis and epidermis can easily become separated. In premature infants, the connection between the adhesive surface of medical adhesives used for fixing equipment may be stronger than the weak connection between dermis and epidermis. Thus, removal of these adhesive can cause peeling of the epidermis resulting in skin damage which can leave the infant vulnerable (Daloğlu, 2000; MacDonald et al., 2005; Paige et al., 2010; Tüzün et al., 2005).

Skin damage such as redness, stripping, peeling, tearing, erythema, and bleeding can occur after medical adhesives are removed (Lund et al., 1997; Wang et al., 2019). The resulting damage seriously affects mortality and morbidityand recovery causing the already weak barrier to weaken further (Bellini and Beaulieu, 2017; Boswell et al., 2016; Lund et al., 1997; Tüzün et al., 2005; Wang et al., 2019). In a study on newborn infants and children conducted by Wang et al., (2019), it was found that skin damage caused by medical adhesive is common in intensive care units and seriously affects the recovery of patients.

As yet, no adhesive proven to be effective and which does not cause skin damage has been found as all adhesives can cause skin deterioration (Boswell et al., 2016). Being aware of the risks associated with the application and removal of medical adhesives in newborns allows healthcare services to better address the problem, develop better protocols, and potentially select softer medical adhesives for newborns (de Oliveira Marcatto et al., 2021). Studies for adhesives and protective barrier dressings recommended for minimizing skin damage due to epidermal stripping are limited and more are needed.

Medical adhesives used on premature infants can cause tearing of the skin of the premature infant while being removed, thus weakening the skin structure and leaving it vulnerable to microorganisms, heat loss, physical damage to the skin, and TEWL (Bellini and Beaulieu, 2017; Boswell et al., 2016; Lund et al., 1997; Tüzün et al., 2005). These conditions may require longer hospitalization periods forthe premature infant and cause unnecessary antibiotic use, exposure to more drugs through the use of topical products due to skin damage, toxic effects generated by the products used due to weak skin, delayed healing, and increased mortality and morbidity. When these situations are examined in general, unnecessary medical use causes an increase in expenses due to longer hospital stays and the family's reunion with their baby would be delayed, which could lead to greater emotional burdens as well as financial problems forthe family. From an ethical perspective, a prolonged hospital stay may prevent other infants who need neonatal intensive care from taking advantage of intensive care facilities. Determining the appropriate medical adhesive application and removal method can

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contribute to the reduction of mortality and morbidity percentages and allow for shorter discharge times, reductions in unnecessary medicine use and expenses, protection of the family's integrity, and the use of neonatal intensive care facilities for more infants in need (Daloğlu, 2000; Daloğlu and Görak, 2008; Darmstadt et al., 2005; Habiballah, 2017; Hoath and Maibach, 2003; Hoath and Narendan, 2001; Lund et al., 1999; Rutter, 2003; Tüzün et al., 2005; Sardesai et al., 2011; Wang et al., 2019).

Silk tapes are acrylates used to fix equipment in neonatal intensive care units (Lund,2014; Kuller 2016). Protective hydrocolloid dressings are absorbent, wafer-like adhesive dressings consisting of a base made of materials such as carboxymethylcellulose, gelatin, and pectin. It is used under the adhesive tape, integrated with the tape (Lund, 2014; Dumville vd 2015; Kuller 2016). Silicone tapes are soft tapes that adhere quickly to the skin due to low surface tension and can re-adhere when removed from the surface (Morris vd 2009; Grove vd 2014; Lund 2014; Johnson 2016; Kuller 2016). Silicone-based solvent spray aids in easy and painless removal of medical adhesive tapes. It evaporates immediately after application and leaves no residue. It is non-toxic, not absorbed by the skin, does not cause sensitivity, and does not dry (Stephen-Haynes, 2008; Lund 2014).

The purpose of this study is to evaluate the effectiveness of the use of silicone tape and the use of a protective hydrocolloid dressing under silk tape in preventing skin damage due to medical adhesive removal in premature infants.

Method

This randomized controlled trial was conducted in a tertiary neonatal intensive care unit in Turkey between December 2019 and December 2020. The study was conducted in the tertiary neonatal intensive care unit. This unit consists of 30 incubators and 10 ventilators. Treatment and follow-up of 0 – 28 days old infant patients are carried out. 27 nurses work in the unit. Infant patients are accepted by pediatricians. There is no neonatal intensive care specialist.

The sample size for the study was calculated using the findings of a reference study (Arslan, 2022). The influence quantity obtained in this reference study was quite strong (d=1.44). As a result of the power analysis performed with the assumption that there would be 3 groups in the study and that a lower level of effect size could be achieved (f = 0.5), it was determined that 80% power could be obtained at the 95% confidence level when a total of 66 premature infants, 22 for each group, were included in the study, with a confidence level of 95%. Considering the losses, a total of 75 premature babies, 25 in each group, were included.

Inclusion Criteria:

- Premature infants at 32-36 weeks of gestation
- Premature infants using an orogastric tube
- Premature infants who have not been applied to the skin before
- Premature infants receiving nasal CPAP or not receiving oxygen

Exclusion Criteria:

- Having a condition that prevents the use of an orogastric tube
- Presence of skin disease that would interfere with assessment of skin condition
- Intubated premature infants
- Premature infants receiving phototherapy
- Premature infants receiving free oxygen in an incubator or receiving oxygen with a hood

Hypotheses

H1: There is a difference between neonatal skin condition scores compared to silk tape and silicone-based solvent spray in preventing skin damage due to tape peeling of the protective hydrocolloid dressing under the silk tape used in the detection of OGS in premature infants.

H2: There is a difference in neonatal skin condition scores compared to silk tape and silicone-based solvent spray in preventing skin damage due to tape peeling of the silicone tape used in the detection of OGS in premature infants.

Data Collection

The Premature Infants Introductory Information Form and the Neonatal Skin Condition Assessment Scale were used to collect the study data.

The Premature Infants Introductory Information Form

This form consists of four questions, including the week of gestation, birth weight, postnatal age, and length of hospitalization within the scope of the study.

Neonatal Skin Condition Assessment Scale

Lund and Osborne (2004) developed this tool to evaluate the skin condition of full-term, premature or postmature, healthy or sick newborn infants. Validity and reliability tests were performed in Turkey by Çalışır et al., in 2016. The Cronbach's alpha coefficient of the scale was determined to be

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between 0.10 and 0.18. (Çalışır et al., 2016). In our study, it was found to be 0.18. The scale consists of three items; dryness, erythema and deterioration of skin integrity / stripping. Each item is assessed using a 3-point Likert-like scale. The lowest possible score is 3 and the highest score is 9, with a high total score indicating that the skin condition of the newborn is poor (Lund and Osborne, 2004). Permission to use the scale in data collection was obtained from the responsible author via e-mail.

Data Collection Process

In order to determine the experimental and control groups, a number sequence was created in three groups using the simple randomization method (Random, 2019). Premature infants who had the appropriate conditions for the study and whose parents agreed to participate in the study were numbered according to their order of arrival. The infant was then assigned to the corresponding group their number had been designated to in the randomization. Which group the infant was assigned to also determined the adhesion and removal methods for the OG tube. The study was conducted using two experimental and one control group. The follow-up period was determined to be 24 hours for all groups based on the reference studies in the literature (Arslan, 2022; Grove et al., 2014; Lund et al., 1997). The OG tube was adhered to the area between the upper lip and the nose of each infant. Before adhesion, the Premature Infants Introductory Form was completed. The medical adhesive to be used was measured according to the length of the premature infant's upper lip, and in a thickness that would not dressing the upper lip and nostrils, and the size was adjusted. The skin condition of each infant between the upper lip and the nose was evaluated and recorded through the use of the Neonatal Skin Condition Assessment scale before the medical adhesive application. Afterward, the OG tube was fixed to the skin of the premature infant with the appropriate size medical adhesive.

In Group A, the first experimental group, a transparent and extra-thin protective hydrocolloid dressing was adhered to the skin and an OG tube was fixed with silk tape on the hydrocolloid dressing.

The fixation method and region were closely monitored for 24 hours. After 24 hours, the fixation (without using any removal product) was slowly removed parallel to the skin surface.

In Group B, the second experimental group, only silicone tape was used for OG tube fixation and the fixation method and region were closely monitored for 24 hours. After 24 hours, the fixation (without using any removal product) was slowly removed parallel to the skin surface.

Group C was determined as the control group. In this group, the OG tube was fixed with silk tape directly on the skin surface, a method routinely used in the clinic and the fixation method and area were closely monitored for 24 hours. Again, after 24 hours, the fixation was removed slowly parallel to the skin surface, after softening the tape by applying a silicone-based solvent spray on the silk tape. This was performed using a 100% silicone-based solvent spray, which is the medical adhesive removal method routinely used in the clinic.

In all three groups, after the tape removal, the application area was scored again using the Neonatal Skin Condition Assessment Scale for the post-application skin condition and the data were recorded. Evaluation of the skin condition was made by one of the researchers. The researcher is a nurse in the neonatal intensive care unit. Statistical analysis of the obtained data was performed, and the results were evaluated (Figure 1).

Statistical Analysis

The data were analyzed using Statistical Package for Social Science (SPSS) Version 22. The conformity of variables with normal distribution was examined by the Kolmogorov-Smirnov test. One-way analysis of Variance, The Kruskal Wallis-H Test, The Wilcoxon Paired-Sample Test, and Spearman Correlation Analysis were used for data analysis. The significance level was accepted as $p<0.05$.

Ethical Considerations

Legal permission was obtained from the hospital where the research was conducted, after obtaining ethics permission from the Pamukkale University Non-Interventional Clinical Research Ethics Committee to conduct the study (Approval number: 2019/14 Date: 06/08/2019). Parents of premature infants to be included in the study were informed about the research. Written consent was obtained from parents who agreed for their premature infants to participate in the study.

Results

The research results were analyzed in three parts: descriptive features of premature infants, comparison of skin condition scores post-application according to routine application and two different applications in terms of some variables, and comparison of pre-and post-application skin condition scores according to two different methods against the routine application.

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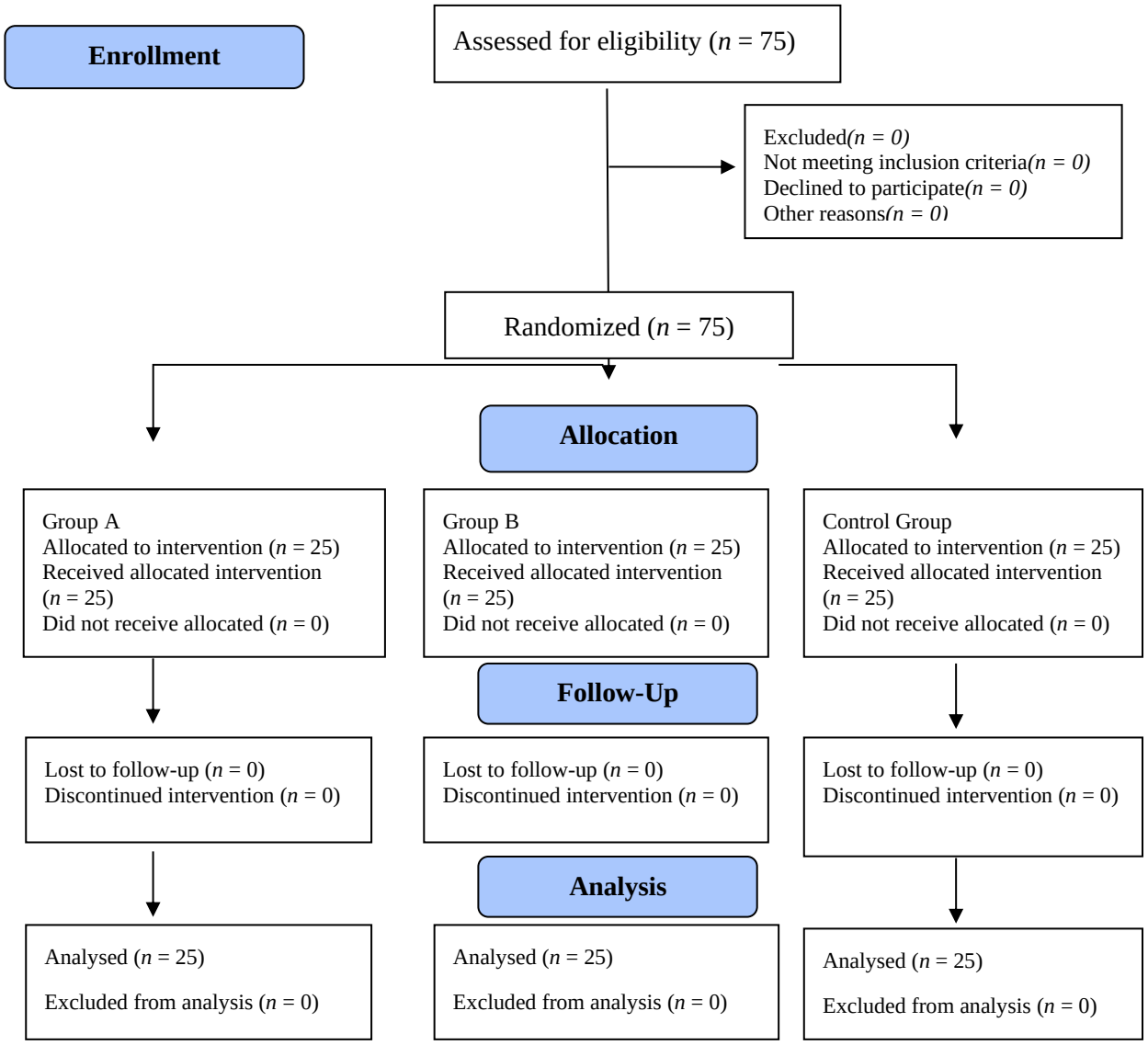

Figure 1. CONSORT flow diagram

Descriptive features of premature infants

The distribution of the descriptive features of premature infants is shown in Table 1. There were no statistically significant differences between the three groups in terms of gestational age and birth weight (p>0.05).

Comparison of post-application skin condition scores in terms of some variables

Post-application skin condition scores of premature infants were compared with gestational age and birth weight according to routine application and two different applications. There were no statistically significant relationships between gestational age and skin scores in the three groups (p>0.05). No statistically significant relationship was found between birth weight and skin condition scores in Groups B and C (p>0.05). In group A, a statistically significant moderate negative correlation was found between birth weight and post-treatment skin condition scores (r=-.432, p<0.05) (Table 2).

Comparison of pre-and post-application skin condition scores

The skin condition scores of the premature infants within the scope of the study before and after the adhesive applications were compared within the group and between the groups according to two different methods of routine application.

When the pre-application skin condition scores were examined, no statistically significant differences were found between the three groups (p> 0.05) (Table 3).

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Table 1. The distribution of descriptive features of premature infants

Variables	Hydrocolloid Dressing + Silk Tape (A) (*n* = 25)		Silicone Tape (B) (*n* = 25)		Silk Tape + Silicone Solvent Spray (C) (n = 25)		*F/KWH*	*p*
	$\bar{x}$ ±*SS*	Min/Max	$\bar{x}$ ±*SS*	Min/Max	$\bar{x}$ ±*SS*	Min/Max		
Gestational Age (week)	34.24 ± 1.3	32 - 36	34.4 ± 1.38	32 - 36	34.12±1.51	32 - 36	*KWH*=0.450	.799
Birth Weight (g)	2301.4 ±625.5	1425 - 3640	2204.8±496.04	1320-3110	2233.2±387.6	1645-3030	*F* =0.235	.791

F = One-Way Variance Analysis, KWH = Kruskal Wallis - H Test, SS = Standard Deviation, $\bar{x}$=Mean

Table 2. Comparison of post-application skin condition scores with gestational age and birth weight

Variables		Hydrocolloid Dressing + Silk Tape (A) (*n* = 25)	Silicone Tape (B) (*n* = 25)	Silk Tape + Silicone Solvent Spray (C) (*n* = 25)
		Post-Application Skin Score	Post-Application Skin Score	Post-Application Skin Score
Gestational Age (week)	*r*	-.361	.048	-.345
	p	.076	.819	.091
Birth Weight (g)	*r*	-.432	-.292	-.383
	p	.031*	.157	.059

** p< 0.05 statistically significant relation, r: Spearman correlation coefficient*

Table 3. Comparison of pre- and post-application skin condition scores of premature infants

	Hydrocolloid Dressing + Silk Tape (A) (*n* = 25)		Silicone Tape (B) (*n* = 25)		Silk Tape + Silicone Solvent Spray (C) (*n* = 25)		*KWH*	Intergroup *p*
	$\bar{x}$ ±*SS*	Min-Max	$\bar{x}$ ±*SS*	Min-Max	$\bar{x}$ ±*SS*	Min-Max		
Pre-Application skin Condition Score	3 ± 0	3 - 3	3 ± 0	3 - 3	3 ± 0	3 - 3	0	1
Post-Application Skin Condition Score	3.2± 0.5	3 - 5	3.12 ± 0.44	3 - 5	6.12 ± 1.24	4 - 8	59.603	.0001*
z	-1.89		-1.342		-4.451			
Intragroup *p*	.059		.18		.0001*			

** p<0.05 Statistically Significant Relation, SS = Standard Deviation, $\bar{x}$= Mean, KWH = Kruskal Wallis-H Test, z= Wilcoxon Two Sample Paired Test*

When the mean of the post-application skin condition scores were examined, the mean was 3.2 ± 0.5 for Group A, 3.12 ± 0.44 for Group B, and 6.12 ±1.24 for Group C. Significant differences were determined between the post-application skin condition scores of the three groups (p<0.05, KWH=59.603) (Table 3).

As a result of further analysis performed to determine from which group the differences originate, a significant relationship was found between the post-application skin condition scores of Group C and those of Group B, as well as the post-application skin condition scores of Group C and those of Group A (p<0.05).

A significant difference was also found between the skin condition scores pre and post-application in Group C when the relationship between the skin condition scores within the group was examined (p<0.05, z=- 4.451).

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Discussion

Comparison of post-application skin condition scores in terms of some variables

The results of this research indicated no significant correlation between the skin condition scores of the premature infants in Groups A, B, and C (control) and their gestational ages ($p>0.05$). Lund et al., (1986) compared the use of plastic tape and a pectin-based barrier dressing under a cloth adhesive tape in newborns aged between 25 to 40 gestational weeks and found no correlation between skin condition and gestational age. This research supports the results of the present study. Boswell et al., (2016) compared the use of transparent dressing and a hydrocolloid dressing under a transparent dressing. They found that subjects in the 24–28 week gestational age group had significantly higher skin condition scores than those in the 29–34 week-old group. According to the results of Arslan and Ateş's (2022) study to evaluate the effectiveness of the protective transparent dressing, it was determined that as the gestational age of the baby decreased, the rate of skin damage increased in both groups with and without a protective dressing. Harpin and Rutter, (1983) examined the effects of skin damage caused by the removal of adhesive tape on the barrier function of the skin and determined that the trauma caused by the adhesive tape was much higher in extremely premature infants than in others with higher gestational ages. Lund et al.'s (2001) study with 2820 newborn babies concluded that the initial skin condition scores were worse in premature infants than in other newborns. The above studies differ from the results of the present research. A severely premature infant born in the 26th week of pregnancy does not have a stratum corneum layer, while one born in the 28th week has a stratum corneum layer with 5-6 layers of cells. In a full-term infant, there are 15 layers of cells (Tüzün et al., 2005). As the present study consisted of subjects at a higher gestational age than these studies, resulting in a more developed stratum corneum layer, the relationship between skin condition scores and gestational age could not fully be determined.

The results of the present study indicate a significant, moderate, negative correlation between skin condition scores and birth weights of premature infants in the hydrocolloid dressing+silk tape group ($r =-.432$, $p<0.05$). As birth weight decreased, skin condition scores increased. Lund et al., (1986) compared the use of various medical adhesives in newborns with birth weights of 700 g to 4220 g and found no correlation between skin condition and birth weight. The present research differs from the results of the study. Habiballah, (2017) examined skin injuries due to adhesive tape in neonatal intensive care units and determined that low birth weight was among the causes of greater skin damage. The present research shows similarity with the results of the study. Birth weight is also among the main risk factors for skin damage in the newborn baby (Habiballah, 2017; Sardesai et al., 2011). The fact that there was a moderate negative relationship between birth weight and skin damage in the hydrocolloid dressing + silk tape group supports this result in the present study.

Comparison of pre-and post-application skin condition scores

In this study, no statistically significant difference was found between the pre-application skin condition scores of premature infants in Groups A, B, and C ($p>0.05$). When the post-application skin condition scores were examined, it was observed that there was a statistically significant difference between the 3 groups ($p<0.05$). A significant correlation was found between the post-application skin condition scores of Group C and those of Group B as well as between the post-application skin condition scores of Group C and those of Group A ($p<0.05$). The skin condition scores of the silk tape+silicone solvent group, which was used as the control group, were higher than both the A and B groups.

It is understood through the results of the present research that the hydrocolloid dressing used as a protective barrier does not harm the skin and that silk tape prevents damage to the skin. Unlike these results, Lund et al., (1997) compared plastic tape, pectin barriers, and hydrophilic gel adhesive and concluded that plastic tape and pectin barrier impair skin barrier function in newborns. However, in parallel with the present research, Lund et al.'s study (1986) used a pectin-based barrier dressing and as a result of removing the barrier-supported adhesives, a low incidence of skin stripping was observed on the skin, thus determining that the barrier is an effective adhesive and securely fastens the necessary medical devices. Dollison and Beckstrand, (1995) affixed a NG tube on the same baby with adhesive tape on a pectin-based barrier on one side of the face and directly on the other side with adhesive tape. Of the infants in the study, 94% on whom adhesive tape was applied over the barrier showed no signs of skin damage for 21 days, whereas 80% of the same infants showed severe skin

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damage within 5 days on the side where the tape was applied directly to the skin. In addition, Boswell et al., (2016) compared the effectiveness of a transparent film dressing and a hydrocolloid dressing under a transparent film dressingand determined no significant difference the two adhesive methods. However, the hydrocolloid dressing was more effective under the transparent film dressing according to comments made by the nurses. It was concluded that use of only the transparent film dressing caused conspicuous skin redness on the face and nose of the newborn. In a systematic review of 19 studies by Behr et al., (2020), it was determined that barrier dressings are the main intervention for the prevention of medical adhesive skin damage, and hydrocolloids are among the most-utilized barrier dressings. O'Neil and Schumacher, (2014) examined the effects of a thin hydrocolloid (pectin) product used to prevent adhesive-induced skin damage that can be put between the adhesive surface of the silver reflective patch covering aheat probe, which causes epidermal peeling, and the newborn skin, and removed it after 8 days of monitoring. No epidermal stripping was observed under the probe, and the use of a pectin barrier to affix the temperature probe and prevent skin damage caused by medical adhesive proved to be a suitable method. Waziry et al., (2018) compared the method routinely used in bonding methods used in umbilical catheter fixation, with a protective hydrocolloid dressing under the tape and a transparent film dressing. As a result of the study, it was determined that protective hydrocolloid dressing and transparent film dressing did not cause skin damage in parallel with our study. The results obtained in the above studies show similarities with the results of the present study.

This present research determined that silicone tape did not cause skin damage and resulted inthe best post-application skin condition scores. However, there were issues in the adhesion of the silicone tape to the skin and the OG tube to which it was applied. Thus, external intervention was required to ensure the tape remained on the skin for 24 hours. Due to its weak adhesive strength, use of silicon tape caused partial separation of the tape from the skin due to the weight of the probe on the silicone tape in the area where the OG tube was attached to the skin. In addition, it was observed that the silicone tape did not adhere effectively to the OG tube itself, and after some time, the tape began detach from the OG tube. Grove et al., (2014) evaluated the softness of both silicone tape and paper tape on the intrascapular area in healthy infants and children. In their study, silicone tape was found to be softer than paper tape for children's skin; however, they concluded that more clinical research is needed in the neonatal intensive care unit. In Johnson's (2016) study to review the evidence on best skin care practices for severely premature babies and to define result-oriented approaches, it was determined that gentle adhesives such as silicone tapes and hydrogel-supported electrodes can help reduce medical adhesive-related skin injuries. Morris et al., (2009) rated dressings made with soft silicone adhesive technology, which is the new technology, between "good" and "very good" in terms of minimizing trauma and pain, ease of use, ease of removal, and patient comfort. Similar to the studies above, the skin evaluation scores of infants who used silicone tapes were the lowest in the present study.

When the relationship between pre- and post-application skin condition scores within the groups of the present study was examined, a significant difference was found between the pre- and post-application skin scores in the silk tape + silicone solvent spray group ($p<0.05$, $z= - 4.451$). The post-application skin condition score in the control group was higher than the pre-application skin condition score. Wang et al., (2019) determined that medical adhesive-related skin injuries were generally caused by the cloth tape used and Lund et al., (2001) found that adhesives werethe main cause of skin integrity deterioration. Suggestions were made to minimize the use of adhesives, to avoid adhesive tape remover solvents during removal, and to use gel electrodes. When the research is examined, it is evident that cloth tapes cause skin damage. According to the present study's results, it can be said that the risk of skin damage is higher when silk tape is removed using a silicone solvent spray, similar to the studies above.

Conclusion and Recommendations

In evaluating the effectiveness of the use of silk tape on a protective hydrocolloid dressing and the use of silicone tape to affix medical devices in preventing skin damage in premature infants, examination of the results of this study indicate that in the hydrocolloid dressing+silk tape group, the mean score of the post-application skin condition scores increased as the birth weight of the premature babies decreased. When the pre-application skin condition scores were examined, no statistically significant difference was found between the three

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groups, while a significant difference was determined between the post-application skin condition scores of the three groups. When the control group was compared with group A and group B, the post-application skin condition scores were found to be higher. A significant difference between pre and post-application skin condition scores in the control group was determined. The skin condition scores post-application were higher than pre-application. No significant relationship between pre- and post-application skin condition scores was determined in the hydrocolloid dressing+silk tape group and no significant relationship between pre- and post-application skin condition scores in the silicone tape group was determined.

Group B has the best post-application skin condition score and the lowest incidence of skin damage. However, it was observed that the adhesion strength of this tape was weak. For this reason, the use of silicone tape in non-life-threatening devices can be evaluated. The protective hydrocolloid dressing was found to be effective in preventing skin damage and can be recommended for routine clinic use. However, since the protective hydrocolloid dressing was found to moderately increase skin condition scores as birth weight decreased, it should be used with caution in very low birth weight infants. It was also observed that the skin condition scores were highest in the control group used; therefore, it would be appropriate to use alternative adhesive and removal methods.

Limitation of the Study

Since a neonatology specialist wasn't available at the time of the study, only infants 32 weeks and older were admitted to hospitalization. Therefore, extremely premature infants were not included in the study.

Strengths of the Study

Silk tape, which is frequently used for equipment fixation in neonatal intensive care units in Türkiye, and silicone-based solvent spray method, which is used for tape removal, are routinely used. Silicone tape and protective hydrocolloid dressing are methods known as bonding methods that cause little damage to the skin. Our study is the first to compare silicone tape and protective hydrocolloid dressing with the routinely used method.

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Ethics Committee Approval: Legal permission was obtained from the hospital where the research was conducted, after obtaining ethics permission from the Pamukkale University Non-Interventional Clinical Research Ethics Committee to conduct the study (Approval number: 2019/14 Date: 06/08/2019).
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Conflict of interest: The authors declare that there is no conflict of interest.
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What did the study add to the literature?

- The silicone tape has the lowest incidence of skin damage.
- Because the adhesion strength of silicone tape was weak, the use of it in non-life-threatening devices can be evaluated.
- The protective hydrocolloid dressing was effective in preventing skin damage.
- The protective hydrocolloid dressing should be used with caution in very low birth weight infants.

References

Arslan C, Ateş NA. (2022). Prematüre bebeklerde cilt hasarını azaltmada şeffaf cilt örtüsü kullanmanın etkisi. Sağlık Bilimleri Üniversitesi Hemşirelik Dergisi, 4(1), 21-26.

Behr JH, Wardell D, Rozmus CL, Casarez RL. (2020). Prevention strategies for neonatal skin injury in the NICU. Neonatal Network, 39(6), 321-329.

Bellini S, Beaulieu MJ. (2017). Neonatal advanced practice nursing: a case-based learning approach. Retrieved from:01.06.2019.

Bellini, S., Beaulieu, MJ. (2017) Neonatal Advanced Practice Nursing: A Case-Based Learning Approach. p. 213. Retrieved from: 01.06.2019.

Boswell N, Waker CL, Dowling D. (2016). Comparing 2 adhesive methods on skin integrity in the high – risk neonate. Advances in Neonatal Care, 16(6), 449-454.

Çalışır H, Sarıkaya Karabudak S, Güler F, Aydın N, Kaynak Türkmen M. (2016). Validity and reliability of the Turkish version of neonatal skin condition score. Cumhuriyet Hemşirelik Dergisi, 5(1), 9-15.

Daloğlu T, Görak G. (2008) Temel Neonataloji ve Hemşirelik İlkeleri. Vol. 2, İstanbul, Nobel Tıp Kitabevleri, p.183-189.

Daloğlu T. (2000). Neonataloji. İstanbul, Nobel Tıp Kitabevleri, p.145-156.

Ordu University J Nurs Stud
2024, 7(1), 1-10
DOI:10.38108/ouhcd.1178060

Darmstadt GL, Saha SK, Ahmed ANU, Chowdhury MA, Law PA, Ahmed S, et al. (2005). Effect of topical treatment with skin barrier-enhancing emollients on nosocomial infections in preterm infants in Bangladesh: a randomized controlled trial. The Lancet, 365(9464), 1039-1045.

de Oliveira Marcatto J, Santos AS, Oliveira AJF, Costa ACL, Regne GRS, da Trindade RE, et al. (2021). Medical adhesive-related skin injuries in the neonatology department of a teaching hospital. Nursing in Critical Care, 27(4), 583-588.

Dollison EJ, Beckstrand J. (1995). Adhesive tape vs pectin-based barrier use in preterm infants. Neonatal Network: NN, 14(4), 35-39.

Dumville JC, Keogh SJ, Liu Z, Stubbs N, Walker RM, Fortnam M. (2015). Alginate dressings for treating pressure ulcers. Cochrane Database of Systematic Reviews, 21(5), CD011277.

Grove GL, Zerweck CR, Ekholm BP, Smith GE, Koski NI. (2014). Randomized comparison of a silicone tape and a paper tape for gentleness in healthy children. Journal of Wound Ostomy and Continence Nursing, 41(1), 40-48.

Habiballah L. (2017). Prevalence of neonate adhesive skin injuries in a Jordanian intensive care unit. Nursing Children and Young People, 29(10), 42-46.

Harpin VA, Rutter N. (1983). Barrier properties of the newborn infant's skin. The Journal of Pediatrics, 102(3), 419-425.

Hoath SB, Maibach HI. (2003). Neonatal skin: structure and function. Hoath SB, Maibach HI, editors. CRC Press. Retrieved from: 21.05.2019.

Hoath SB, Narendran V. (2001). Development of the epidermal barrier. NeoReviews, 2(12), e269-e281.

Johnson DE. (2016). Extremely preterm infant skin care: a transformation of practice aimed to prevent harm. Advances in Neonatal Care, 16, S26-S32.

Kuller JM. (2016). Neonatal skin care: evidence-based clinical practice guideline.

Lund C, Kuller J, Lane A, Lott JW, Raines DA. (1999). Neonatal skin care: the scientific basis for practice. Journal of Obstetric, Gynecologic and Neonatal Nursing, 28(3), 241-254.

Lund C, Kuller JM, Tobin C, Lefrak L, Franck LS. (1986). Evaluation of a pectin-based barrier under tape to protect neonatal skin. Journal of Obstetric, Gynecologic, and Neonatal Nursing, 15(1), 39-44.

Lund C. (2014). Medical adhesives in the NICU. Newborn and Infant Nursing Reviews, 14(4), 160-165.

Lund CH, Nonato LB, Kuller JM, Franck LS, Cullander C, Durand DK. (1997). Disruption of barrier function in neonatal skin associated with adhesive removal. The Journal of Pediatrics, 131(3), 367-372.

Lund CH, Osborne JW, Kuller J, Lane AT, Lott JW, Raines DA. (2001). Neonatal skin care: Clinical outcomes of the AWHONN/NANN evidence-based clinical practice guideline. Journal of Obstetric, Gynecologic and Neonatal Nursing, 30(1), 41-51.

Lund CH, Osborne JW. (2004). Validity and reliability of the neonatal skin condition score. Journal of Obstetric, Gynecologic and Neonatal Nursing, 33(3), 320-327.

MacDonald MG, Mullett MD, Seshia MMK. (2005). Arvey's Neonatology Pathophysiology and Management of the Newborn. USA, Lippincott Williams and Wilkins, p. 365-367.

Morris C, Emsley P, Marland E, Meuleneire F, White R. (2009). Use of wound dressings with soft silicone adhesive technology. Nursing Children and Young People, 21(3), 38-43.

O'Neil A, Schumacher B. (2014). Application of a pectin barrier for medical adhesive skin injury (epidermal stripping) in a premature infant. Journal of Wound Ostomy and Continence Nursing, 41(3), 219-221.

Paige DG, Gennery AR, Cant AJ. (2010). The Neonate. Book's Textbook of Dermatology. 8th ed. Wiley-Blackwell, p:1012-1023.

Rutter N. (2003). Applied physiology: the newborn skin. Current Paediatrics, 13(3), 226-230.

Random. Retrieved from: 16.07.2019. https://www.random.org/integers/

Sardesai SR, Kornacka MK, Walas W, Ramanathan R. (2011). Iatrogenic skin injury in the neonatal intensive care unit. The Journal of Maternal-Fetal and Neonatal Medicine, 24(2), 197-203.

Stephen-Haynes J. (2008). Skin integrity and silicone: Appeel®'no-sting' medical adhesive remover. British Journal of Nursing, 17(12), 792-795.

Tüzün Y, Kotoğyan A, Serdaroğlu S, Çokuğraş H, Tüzün B, Mat MC. (2005). Pediyatrik Dermatoloji. İstanbul, Nobel Tıp Kitabevleri, p.20-40.

Wang D, Xu H, Chen S, Lou X, Tan J, Xu Y. (2019). Medical adhesive-related skin injuries and associated risk factors in a pediatric intensive care unit. Advances in Skin and Wound Care, 32(4), 176-182.

Waziry OG, Rashwan ZI. (2018). Effect of umbilical catheter fixation using Tegaderm® versus hydrocolloid dressing and safe removal on abdominal skin condition among preterm neonates. IOSR J Nurs Health Science, 7, 44-55.