

The Effectiveness of Skin Barrier on Medical Adhesive Related Skin Injury in Neonates at Perinatology Dr. Cipto Mangunkusumo Hospital Jakarta

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Abstract: Skin damage is one of the serious problems in neonates. One of causing of medical adhesive that is MARSİ. Skin damage on neonates will cause discomfort and affect the process of babies care. Based on AWHONN recomended that skin barrier aplication to reduce MARSİ The aim of this study are to identify the effectiveness of transparant dressing with skin barrier and transparant dressing without skin barrier to prevent MARSİ in neonates attached infusion at Perinatology Dr. Cipto Mangunkusumo Hospital Jakarta. The design of this study was pre experimental with non equivalent without control group. The sampling methode used is total sampling. Total sample in this research are 80 neonates getting infussion (40 neonates with gestational age ≤ 34 weeks, and 40 neonates with gestational age ≥ 34 weeks) who were divided into 4 groups. The data collected using NSCS (neonatal skin condition scale) questionnaire with score 3-9. The analysis used is Wilcoxon. The result of this research found that use of transparant dressing with skin barrier in neonates with gestational age ≤ 34 weeks and neonates with gestational age ≥ 34 weeks is effective for reducing MARSİ incident ($p < 0,05$). Transparant dressing with skin barrier recomended use to prevent of MARSİ.

1 INTRODUCTION

Skin damage is one of the serious problems in neonates. One of causing the using of medical adhesive that is MARSİ (Medical adhesive related skin injury). MARSİ has been defined as an occurrence in which erythema and or other manifestation of cutaneous abnormal (including but not limited to vesicle, bulla, erosion, or tear) persists 30 minutes or more after removal of the adhesive (McNichol, Lund, Rosen, & Gray, 2013)

In 2017, The Townsville Hospital and health service in the neonatal unit, found that prevalence of skin damage in neonates was 9.25%-43%. This result shows that prevalence of MARSİ is high.

There are some factors that causing of skin damage on neonates such as using of medical adhesive, gestation age and birth weight. In 2013, a study found that causing of skin damage were 22,4% of the using of vascular catheter, 14% of non-invasive continous positive airway pressure delivery

device, and 17,8% of oxygen saturation and temperature. Based on the data that causing of skin damage are using of medical devices.

Another factor causing of skin damage is premature birth. Because of this condition will cause distrupction of the skin structure particularly stratum corneum. Consequently, will increase transepidermal water loss (TEWL) in neonates which will cause termoregulation disturb, dehydration and electrolite imbalance (Kuller et al., 2006; Lambe, 2001; Lund, 2014; Nonato & Lund, 2001; M. O. Visscher, 2009).

The conditions require appropriately management to prevent MARSİ. One of them management of MARSİ is recomended by Association of Women's Health Obstetric and Neonatal Nurses (AWHONN) and National Association of Neonatal Nurse (NANN) is skin care in neonates (Kuller et al., 2006).

The guideline skin care in neonates involve assessment of newborn skin, umbilical cord care, circumsision care, diaper rash, using medical

adhesive, TEWL, skin damage, intravena infiltration, and skin nutrition (Kenner & Lott, 2007). Skin damage on neonates will cause discomfort and affect the process of babies care. To increase comfort of babies is needed role of a nurse according to theory of comfort by Kolcaba (Alligood, 2014).

Based on Consensus AWHONN (Association of Women Health, Obstetric and Neonatal Nurses) in 2007 recommended that medical adhesive choice and skin barrier application are as alternative to reduce MARS (McNichol et al., 2013). Skin barrier is a product to protect skin which will provide a protective layer between epidermis and adhesive. Skin barrier available in liquid wipes, applicators, or spray formulated from various substances such as acrylic, polymer organic and anorganic, and silicon.

The aim of this study are to identify the effectiveness of transparent dressing with skin barrier and transparent dressing without skin barrier to prevent MARS in neonates attached infusion at Perinatology Dr. Cipto Mangunkusumo Hospital Jakarta.

2 METHODS

This study was pre experimental with non equivalent without control group (non randomized without control group pretest-posttest). The studies using research assistant. The result of interreliability test was $p < 0,05$. Participants were 80 neonates divided into 4 groups. Group 1 were 20 neonates with gestational age ≤ 34 weeks applied by transparent dressing with skin barrier. Group 2 were 20 neonates with gestational age ≤ 34 weeks applied by transparent dressin without skin barrier. Group 3 were 20 neonates with gestational age ≥ 34 weeks applied by transparent dressing with skin barrier. Group 4 were 20 neonates with gestational age ≥ 34 weeks applied by transparent dressing without skin barrier

Firstly, group 1 and 3 were evaluated using NSCS (Neonatal Skin Condition Scale) observation sheet before applied with medical adhesive, was applied 3M Cavilon No Sting Barrier Film 3344E, 1 ml Product USA and then leave around 30 seconds. Then, cover skin with using a transparent dressing (3M Tegaderm film 6cm x 7cm). Change of the medical adhesive was done after 3 days or when skin area looked dirty.

At the same time, for group 3 and 4 transparent dressing is used. The skin was evaluated for conditions using the NSCS observation sheet.

The data collected using Observation sheet with NSCS (neonatal skin condition scale) with score 3-9. The NSCS instrument is recommendation from AWHONN. The data was analyzed using SPSS 2.0. Since the data not normally distributed, Wilcoxon was used for statistical analysis.

Ethical clearance for this study was granted from ethics committe Cipto Mangunkusumo Hospital.

3 RESULTS

Table 1: Characteristics of Respondents in each group based on gender (n=80).

Characteristics	Group				p value
	I (n=20) f (%)	II (n=20) f (%)	III (n=20) f (%)	IV (n=20) f (%)	
1.Male	9 (45)	11 (55)	8 (40)	11 (55)	0.701
2.Female	11 (55)	9 (45)	11 (55.5)	8 (40)	
3.Ambiguos	0 (0)	0 (0)	1 (5)	1 (5)	

Table 1 show that the majority of respondent were female in group 1 and 3 (55% and 55.5%, respectively) and male in group 2 and 4 (55% in both group). The test of homogeneity result shows value of 0.701 which means that the characteristics of respondent homogeneous.

Table 2: Characteristics of Respondents in each group based on NSCS before intervention (n=80).

Characteristics	Group				p value
	I (n=20)	II (n=20)	III (n=20)	IV (n=20)	
NSCS score	3.70 (0.73)	3.70 (0.57)	3.75 (0.85)	3.85 (0.75)	0.441

Table 2 shows that the test of homogeneity NSCS score from each group with p value =0.441. This shows characteristics of respondent in each group based on NSCS score before intervention is homogeneous.

Table 3: MARS score in neonates with gestational age ≤ 34 weeks (n=80).

	f (Score)				Percentage(Score)			
	3	4	5	6	3	4	5	6
1.Transparent dressing + skin barrier								
a. Before	9	8	3	0	45	40	15	0
b. After	12	7	1	0	60	35	5	0
2.Without skin barrier								
a. Before	7	12	1	0	35	60	5	0
b. After	4	9	7	0	20	45	35	0

Table 3 show that MARSI score before and after intervention transparent dressing with skin barrier no increase MARSI incident. The majority of MARSI score was 3 (45%) before intervention and after intervention was 3 (60%).

The data show that there was a change in MARSI score before and after intervention transparent dressing without skin barrier. Before intervention, MARSI score 5 only 1 respondent (5.0%), but after intervention transparent dressing MARSI score 5 becomes 7 neonates (35.0%).

Table 4: MARSI score in neonates with gestational age \geq 34 weeks.

	Frequent (Score)				% (Score)			
	3	4	5	6	3	4	5	6
1. Transparent dressing with skin barrier								
a. Before	9	8	2	1	45	40	10	5
b. After	11	8	0	1	55	40	0	5
2. Transparent dressing without skin barrier								
a. Before	6	12	1	1	30	60	5	5
b. After	4	9	6	1	20	45	30	5

Table 4 show that MARSI score before and after given intervention transparent dressing with skin barrier not increase MARSI incident. The majority MARSI score is 3 (45%) before intervention and after intervention is 3 (55%).

The data also shows that MARSI score before and after intervention transparent dressing there is a change. Before intervention MARSI score 5 only 1 respondent (5%), but after intervention MARSI score 5 to be 6 respondent (30%).

Table 5: Difference in average of MARSI score before and after intervention in neonates with gestational age \leq 34 weeks.

	Mean	SD	Mean rank	Pv	n
1. Transparent dressing with skin barrier					
a. Before	3.7				
b. After	3.45	0.733		0.02	20
c. (Δ)	-0.25	0.605	3.00	5	
2. Without skin barrier					
a. Before	3.7	0.571		0.01	20
b. After	4.15	0.745	0.00	4	
c. (Δ)	0.45		4.00		

Table 5 shows that in the intervention group given transparent dressing with skin barrier there was no increase in the MARSI score with the

difference before and after the intervention was - 0.25. The statistical test results obtained $p = 0.025$ with 95% CI. It can be concluded that there is a difference between the MARSI score before and after skin barrier intervention.

The table also shows that in the group with transparent dressing without skin barrier intervention there was also an increase in the MARSI score. The difference between before and after the intervention is 0.45. This is shows that after transparent dressing there is an increase in skin irritation in infants. The statistical test results obtained a value of $p = 0.014$ so it can be concluded that there is a difference between the MARSI score before and after given transparent dressing.

Table 6: Difference in average of MARSI score before and after intervention in neonates with gestational age \geq 34 weeks.

	Mean	SD	Mean rank	Pv	n
1. Transparent dressing with skin barrier					
a. Before	3.75	0.851			
b. After	3.55	0.759	2.50	0.04	20
c. (Δ)	-0.2			6	
2. Transparent dressing without skin barrier					
a. Before	3.85	0.745	4.00	0.03	20
b. After	4.20	0.835	4.57	5	
c. (Δ)	0.35				

Based on table 6, shows that in group III given transparent dressing intervention with skin barrier there was no increase in MARSI score. The difference between before and after the intervention is -0.2. The results of the statistical test obtained $p = 0.046$, it can be concluded that there is a difference between the MARSI score before and after the transparent dressing intervention with the skin barrier.

The table above also explains that in group IV given transparent dressing dressing without skin barrier there was an increase in MARSI scores. The difference between before and after the intervention is 0.35. This shows that after the transparent installation of the dressing without the skin barrier there is a deterioration of the skin condition in the baby. The statistical test results obtained $p = 0.035$, so it can be concluded that there is a significant difference between the MARSI score before and after being given a transparent dressing intervention without the skin barrier.

4 DISCUSSION

1. Gender

The majority gender of neonates in each group is male. In theory, it was not found that gender affected damage to skin integrity. The research conducted by Alfiyanti (2012) stated that there was no significant relationship between gender with the incidence of compressive wounds in children treated in PICU. The study showed that gender factors did not affect the occurrence of damage to skin integrity (Alfiyanti, Nurhaeni, & Eryando, 2012).

2. Gestational Age

In this research, each respondent was divided into groups based on gestational age ≤ 34 weeks and ≥ 34 weeks. In premature babies, skin barriers have not developed properly so that babies has damageskin integrity (M. Visscher & Narendran, 2014). The structure of skin integrity, especially the stratum corneum, is associated with gestational age because skin barriers develop 24 to 34 weeks after birth, so that premature infants have a thin epidermal layer and less stratum corneum (M. O. Visscher, 2009).

3. The effectiveness of transparant dressing with skin barrier and transparant dressing without skin barrier in neonates given infussion on MARSII

a. Transparant dressing with skin barrier application

The average MARSII score before and after given skin barrier decreases. So it can be concluded that the use of an effective skin barrier to prevent skin damage due to the use of medical adhesive or other adhesive devices. The use of a skin barrier application will provide a protective layer between the epidermis and medical adhesive. This study the barrier skin used was in the form of Cavillon no sting barrier 3M product film. After the application, the barrier liquid will evaporate and leave a protective layer that is transparant and breathable for up to 72 hours.

In the gestational age of ≥ 34 weeks, the use of skin barriers also causes a decrease in the incidence of MARSII with a difference in value (Δ) The statistical test results obtained $p = 0.046$ so that it can be concluded that there are differences in the average use of skin barriers before and after intervention in infussion infants with a gestational age of ≥ 34 weeks. In groups with a gestational age of ≥ 34 weeks there was a greater difference in value than gestational age ≤ 34 weeks. This is due to gestational age of ≥ 34 weeks so that anatomically the epidermis and stratum corneum have begun to

function so that the skin will be bluish pink and smooth or white (Kenner & Lott, 2007).

The use of skin barriers has been recommended to skin care for neonates who are treated (Telofski, Morello, Mack Correa, & Stamatas, 2012). That was because the structure of the baby's skin is different from that of an adult. Research conducted by Kuller et al., (2006) states that the use of medical adhesive in infants is a major factor cause of skin damage in infants treated at the NICU. Invasive procedure also causes the baby to have iatrogenic injury. These injuries can cause damage to the integrity of the skin including burns and lesions due to the use of disinfectants, erythema and hollows on the skin due to the use of monitoring probe devices (Kenner & Lott, 2007).

The difference value before and after being given a skin barrier application thus indicating that the skin barrier is more effective in preventing MARSII incident or other skin damage. The use of skin barriers in this study does not cause improvement in the baby's skin, but prevents further damage to the baby's skin due to medical adhesive. In addition to the use of adhesives, skin damage in premature babies is also caused by many things, one of which is gestational age of ≤ 34 weeks. The gestational age is associated with not yet developing the skin layer perfectly, especially the stratum corneum is still small.

This research is in line with research conducted by Brondon et al., (2010) which states that the use of skin protection such as the no sting barrier film will reduce TEWL and maintain skin integrity in infants. This study was conducted in 69 infants with a gestational age ≤ 33 weeks for 18 months. Every baby gets treatment for 2 weeks (Brandon, Coe, Hudson-Barr, Oliver, & Landerman, 2010).

b. Transparant dressing without skin barrier application

The average MARSII score before and after the intervention was given using transparant dressing, there was an increase in the MARSII score. The statistical test results so that it can be concluded that there are differences in the average before and after the intervention using transparant dressings without skin barriers to the incidence of MARSII in infants with gestational age of ≤ 34 weeks given infussion.

The high difference value indicates that the skin changes towards negative, where there is an increase in skin irritation in the baby after being given transparant dressing without the skin barrier. It can be seen in Table 2 that after the use of transparant

dressing, the score of MARSIS becomes 7 respondents; where before the intervention the MARSIS score is only 1 respondent.

One of the recommended use of transparant dressings is 3M Tegaderm. This Tegaderm film consists of elastic film with adhesive that is free of latex and hypoallergenic and is breathable which allows the exchange of oxygen and water vapor well so that the skin will remain moist. In addition to this, conditions are transparant, making it easier to observe skin conditions due to invasive actions that occur.

The use of transparant dressings is often used both in adults and children. Research conducted by Inoue & Matsuda (2015) in 25 patients showed that the use of transparant film dressings in press wounds was more cost effective compared to hydrocolloid dressings (Inoue & Matsuda, 2016). In premature babies, recommends using transparant dressings to maintain skin integrity in infants (Lund, 2014). This is different from this study, where the use of transparant dressing increases the incidence of MARSIS in premature infants. The increase is due to the structure of the baby's skin that is still not fully developed, so the use of transparant dressing will lift the epidermis layer of the baby's skin and TEWL increases so that the baby's skin will be more damaged. Another possibility is that the increase in MARSIS scores on the use of transparant dressing applications without skin barriers can also be caused due to the wrong technique of releasing transparent dressings, it is not using stretch methods so that the risk increases MARSIS.

In the infants with gestational age of ≥ 34 weeks there was also an increase in the MARSIS score before and after the use of transparant dressing without skin barrier with a difference. But the difference in value is smaller when compared to the infant with gestational age of ≤ 34 weeks. This is due to the development of the skin structure in the baby. The statistical test results so it can be concluded that there was a significant difference in the use of transparant dressings without skin barriers before and after intervention in infants with gestational age of ≥ 34 weeks given infussion. The difference that occurs in neonatal skin is an increase in the MARSIS score, so the use of transparant dressing without a skin barrier will worsen the condition of the baby's skin.

The limitations of this study are the removal of the medical adhesive in each babies is not the same because several conditions, like dirty, contains blood and babies move the room.

5 CONCLUSIONS

In this study, it was shown that the use of transparant dressings with skin barriers was effective in prevent of MARSIS.

It is recommended that the use of transparant dressings with skin barrier to prevent of MARSIS as a guidelines in infant skin care, especially in infants with gestational age of ≤ 34 weeks.

The limitations of this study are the removal of the medical adhesive in each babies is not the same because of several conditions, like dirty, contains blood and babies move the room.

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