

Original Article

Efficacy of modified isolation in incontinence associated dermatitis

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Abstract: Objective: To analyze the value of modified isolation in preventing the occurrence of incontinence associated dermatitis (IAD) in patients with incontinence, and to provide high value skin care intervention for the patients. Methods: Clinical data of 204 patients were collected for retrospective analysis. The patients were divided into a conventional group (conventional skin care protocol, n=102) and a modified group (modified isolation care protocol, n=102) according to the different treatment regimens. The differences in the incidence of IAD, time to IAD, required weekly care, cost of nursing supplies, perineal skin status and nursing satisfaction were compared between the two groups. Results: Compared with the conventional group, the modified group had a greatly lower incidence of IAD (42.16% vs. 2.94%), longer time to IAD occurrence (5.75±1.25 vs. 12.50±1.50), less required weekly care (43.05±8.41 vs. 13.54±2.57), lower cost of nursing supplies (330.16±98.44 vs. 115.53±32.58), and a better correlation between perineal skin status and nursing satisfaction (all $P<0.05$). Conclusion: Modified isolation can greatly reduce the incidence of IAD in incontinent patients, improve their status of the perineal skin, increase patient satisfaction with care, and reduce the cost of required nursing supplies. So, modified isolation may serve as the preferred care protocol for incontinent patients.

Keywords: Incontinence associated dermatitis, moist dressings, skin protective film, nursing satisfaction

Introduction

Incontinence associated dermatitis (IAD) is an irritant inflammation that complicates with incontinence and is a skin injury resulting from the action of related substances in the urine or feces [1, 2]. The site of IAD is related to urine or fecal contact and is commonly found in the perineum, perianal, sacral region, buttocks, groin as well as medial thighs. The clinical manifestations of IAD are erythema, edema, maceration, exfoliation, papules, etc., and in severe cases, gangrene or serous spills occur [3]. Patients with IAD can develop skin breakdown, erosions and even infection if they are not treated promptly and can develop pressure injuries [4]. Recent data have shown that the worldwide prevalence of IAD is 5%-50%, and the incidence can be as high as 42% [5]. IAD prolongs the patient's hospital stay, increases hospitalization costs, and puts extra work-

load on the healthcare workers. At the same time, IAD can lead to severe reductions in patients' self-care ability, mobility, as well as sleep quality. It has been demonstrated that IAD is a high-risk factor for stress injury, and in patients with incontinence, the presence of IAD significantly increases the risk of developing stage II stress injury [6].

Modern medicine holds that for skin problems, prevention is always better than treatment. Therefore, compared with the treatment of IAD, the prevention research of IAD is currently the focus of clinicians and numerous scholars. The predisposing factor for IAD is prolonged exposure of the skin to an unclean and moist environment. Therefore, prophylaxis for IAD can start with avoiding skin to excessive moisture contact. When patients experience incontinence, caregivers should remove the source of dampness as soon as possible. Previous stud-

ies have considered that the most important prevention for IAD was structured skin care, such as gentle cleansing, moisturizing and application of skin protective agents [7-9]. Skin protective film is one of the most commonly used agents for incontinent patients. The film consists of a small amount of fatty acids with anisole, which is able to form a lipid protective film on the skin surface [10]. Isolation is achieved by attaching a skin protector to the skin, forming a layer of protection that can, to a certain extent, sequester external harmful bacteria from the skin. This isolation fails to completely isolate the maceration of skin by loose stool or secretions, and the patient's distress is not completely relieved. Therefore, there is still a need to find means to more effectively isolate urine and fecal irritations from the skin.

Since the theory of wound wet healing was put forward, various new kinds of wet dressings have continuously emerged and are widely used in the clinic, becoming the main stream of medical dressings. The most commonly used gel in the new wet dressings is hydroxymethyl cellulose sodium, which can be firmly pasted to the wound edge skin. On one hand, hydrophilic particles in novel wet dressings can form gel like semisolid materials that attach to the bottom of the wound, providing and maintaining a wet environment that is conducive to wound healing [11, 12]. On the other hand, new wet dressings can form a closed environment isolating the erosive effect of external hazardous substances on the skin [13]. At present, a variety of novel wet dressings have been widely used in the treatment of various chronic wounds and have achieved significant efficacy, but their application in preventing IAD is rare. This study investigated the use of modified isolation methods for the prevention of IAD through modification of a routine isolation care protocol for incontinence creation in combination with a novel moist dressing on the basis of a skin protective film. We hope that this study can provide a high-value skin care intervention protocol for incontinent patients.

Materials and methods

General information

Data of 204 Patients with incontinence (including fecal incontinence, urinary incontinence or double incontinence) admitted to Fengdu People's Hospital from March 2018 to May

2021 were retrospectively analyzed. The patients were divided into a conventional group (n=102) and a modified group (n=102) according to the different treatment regimens. In the conventional group, 63 patients suffered from fecal incontinence, 17 patients from urinary incontinence and 22 patients from double defecation, with 62 males and 40 females, and a mean age of (65.75±7.25) years. In the modified group, there were 62 patients who had fecal incontinence, 18 patients had urinary incontinence, and 22 patients had double incontinence, with 54 males and 48 females, and a mean age of (67.55±8.51) years. This study was approved by the Ethics Committee of Fengdu People's Hospital.

Inclusion criteria: (1) Patients met the diagnostic criteria of fecal, urinary or double incontinence [14, 15]; (2) Patients had clinical treatment data and efficacy evaluation data required for this study.

Exclusion criteria: (1) Patients had significant erythema, edema, breakage or pre-existing infected wounds on the skin of the perineum, sacrococcygeal region or buttocks before intervention; (2) Patients had a Braden Scale score of less than 16 points [16]; (3) Patients had previous skin disease, mental disease, immune disease, severe malnutrition, severe heart liver and kidney dysfunction or systemic infection conditions; (4) Patients were critically ill or hemodynamically unstable.

Intervention protocols

Conventional group: To avoid IAD triggered by prolonged periods of loose stools or impregnation of secretory fluids on the skin, the conditions of incontinent patients were closely observed by the nurses. Discharges of flatus were promptly managed and well documented. The cleaning for patients was gently conducted using a warm soft towel to avoid damaging patient skin from repeatedly applying force. Dry soft towels were used to pat dry the skin after spraying a skin protector (manufacturer: Minnesota Mining and Manufacturing; model number: 3346). In addition, caregiver's kept the patient sheets clean and neat. If the patient had redness or erythema of the skin over the perineum, sacrococcygeal region, buttocks, around the wound or around the stoma, prompt therapeutic interventions were required.

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Modified group: (1) The skin was thoroughly cleaned with normal saline or benzalkonium chloride liquid cotton balls, and square yarn or dry paper towels were used for drying. (2) The skin protector was sprayed three times at sites susceptible to stool dipping. (3) Ultrathin hydrocolloids (manufacturer: Kangle Medical Supplies Company; model number: 3533) were tailored to desired sizes based on shape and pasted at sites susceptible to stool dipping. (4) A 3M transparent dressing was covered over the ultrathin hydrocolloid 1-2 cm beyond its edges. (5) The dressing was routinely changed once in 3-5 d and replaced promptly when curling, excoriation of the ultrathin hydrocolloid or transparent dressing occurred. Specific operating procedures were as follows, evaluating surrounding skin conditions → preparing for use and environment → washing hands and wearing gloves → cleaning the skin → spraying skin protective film on sites susceptible to loose stool three times → trimming ultrathin hydrocolloids → taping ultrathin hydrocolloids and transparent dressings → explaining precautions → washing hands and recording.

Outcome measures

Primary indicator: Patients were assessed for the occurrence of IAD according to the international consensus on IAD. Assessment criteria [17]: signs of erythema, papules, blisters, edema or erosions of the skin, elevated skin temperature, secondary infections, local itching discomfort due to incontinence (fecal, urinary or double incontinence) in the perineum, sacrococcygeal region, buttocks, etc. IAD grading scale [18]: grade 0 (no IAD): skin intact without redness; grade 1 (mild IAD): skin intact but with redness, erythema and edema; grade 2 (moderate to severe IAD): skin redness and breakdown with edema, blisters, erosions and infection.

Secondary indicators: (1) Time to first occurrence of dermatitis, frequency of required cares per week, and cost of nursing supplies were recorded. (2) The skin status of patients in both groups was recorded 1 day before the intervention, as well as 3, 7 and 14 days after the intervention. The patients' skin status was evaluated with perineal skin score [19] (perineal assessment tool, PAT). PAT included 4 items on irritant, duration of irritation, perineal skin status and influencing factors, and each item was

evaluated using a 3-level scoring method, in which 1 point indicated the best status, 3 points indicated the worst status. The total score ranged from 4 to 12 points, with a higher score indicating a worse skin status. (3) After 14 days of intervention, the patients' satisfaction with nursing work was evaluated by self-developed nursing satisfaction questionnaire. The full score of the questionnaire is 100 points. The nursing satisfaction was divided into 4 grades: very satisfied (>90 points), relatively satisfied (70-90 points), basically satisfied (60-69 points) and dissatisfied (<60 points).

Statistical analysis

SPSS 25.0 statistical software was used to analyze the data in this study. Count data were expressed as n (%). The comparisons between groups were performed using χ^2 test, and the rank sum test was used for comparison when data had internal hierarchical characteristics. The measurement data that conformed to normal distribution were expressed in the form of ($\bar{x} \pm s$). A t-test was used for comparison between two groups, and repeated measures analysis of variance was used for comparison between two groups at multiple time points. All differences were considered significant at a one-sided $P < 0.05$.

Results

Comparison of baseline data between two groups

The baseline data of the two groups were analyzed differentially. There was no statistical difference in sex, age, incontinence type and other diseases between the two groups ($P > 0.05$), as shown in **Table 1**.

Occurrence of IAD in patients under different intervention regimens

The incidence of IAD is the primary metric for assessing the value of the segregation methods. When comparing the occurrence of IAD in between the two groups, it was found that the incidence of IAD in the conventional group was as high as 42.16%, while the incidence of IAD in the modified group was only 2.94%. As shown in **Table 2**, a statistical difference was found in the incidence of IAD between the two groups

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Table 1. Baseline data of patients [n (%), $\bar{x} \pm s$]

Item	Conventional Group (n=102)	Modified Group (n=102)	t/ χ^2	P
Sex			0.080	0.777
Male	59 (57.84)	57 (55.88)		
female	43 (42.16)	45 (44.12)		
Age (years)	65.75 \pm 7.25	67.55 \pm 8.51	1.667	0.097
Incontinence types			0.037	0.982
fecal	63 (61.76)	62 (60.78)		
urinary	17 (16.67)	18 (17.65)		
double	22 (21.57)	22 (21.57)		
Other disease			0.724	0.868
pancreatitis	19 (18.63)	21 (20.59)		
cancer	23 (22.55)	20 (19.61)		
infectious	37 (36.27)	41 (40.20)		
others	23 (22.55)	20 (19.61)		

Table 2. Occurrence of IAD [n (%)]

Group	n	Grade 0	Grade 1	Grade 2	Overall incidence
Conventional Group	102	59 (57.84)	37 (36.27)	6 (5.88)	43 (42.16)
Modified Group	102	99 (97.06)	2 (1.96)	1 (0.98)	3 (2.94)
χ^2					44.909
P					<0.001

Note: IAD: Incontinence Associated Dermatitis.

Table 3. Care effectiveness and cost ($\bar{x} \pm s$)

Group	n	Time to first occurrence of dermatitis (d)	Average number of required cares per week (n)	Cost of nursing supplies per person
Conventional Group	102	5.75 \pm 1.25	43.05 \pm 8.41	330.16 \pm 98.44
Modified Group	102	12.50 \pm 1.50	13.54 \pm 2.57	115.53 \pm 32.58
T		34.910	33.890	20.900
P		<0.001	<0.001	<0.001

($P < 0.05$). This suggests that the modified isolation methods greatly reduce the incidence of IAD in incontinent patients.

Comparison of care effectiveness and cost

As shown in **Table 3** and **Figure 1**, patients in the modified group had a later time to first presentation of dermatitis, fewer times of required care per week, and lower cost of care per capita than patients in the conventional group (all $P < 0.05$). These findings suggest that modified isolation methods can not only improve patient care but also reduce the cost of the nursing paraphernalia.

Skin status of patients at different time points

As shown in **Table 4** and **Figure 2**, it was found that the skin status of both groups improved with the extension of the intervention time ($F_{\text{time}} = 31.850$, $P_{\text{time}} < 0.001$), but the improvement in the modified group was significantly more than that in the conventional group ($F_{\text{group}} = 75.280$, $P_{\text{group}} < 0.001$), and there was a great interaction effect ($F_{\text{interaction}} = 5.389$, $P_{\text{interaction}} = 0.001$).

Patient satisfaction with care

A higher proportion of patients felt very satisfied with their care and a lower proportion felt dissatisfied with their care in the modified group than those in the conventional group. After the rank sum test, a significant difference was found between the two groups in patient satisfaction ($Z = -2.164$, $P = 0.030$), as shown in **Table 5**.

Discussion

Skin is a very important protective barrier of the human body. It protects the body from harmful substances such as pathogenic bacteria. Many factors can disrupt the integrity of the skin barrier, causing discomfort such as pain and itching, and increasing the risk of secondary infection. A common factor is incontinence. The urine and feces in the excretion are able to penetrate the skin, where the stratum corneum cells absorb water to become inflated and even break down, leading to a breakdown of the skin barrier integrity [20, 21]. Urea contained in urine is converted to alkaline substance ammonia by microbial colonies residing on the surface of human skin, which in turn destroys the weak acidic environment of the skin [22]. After

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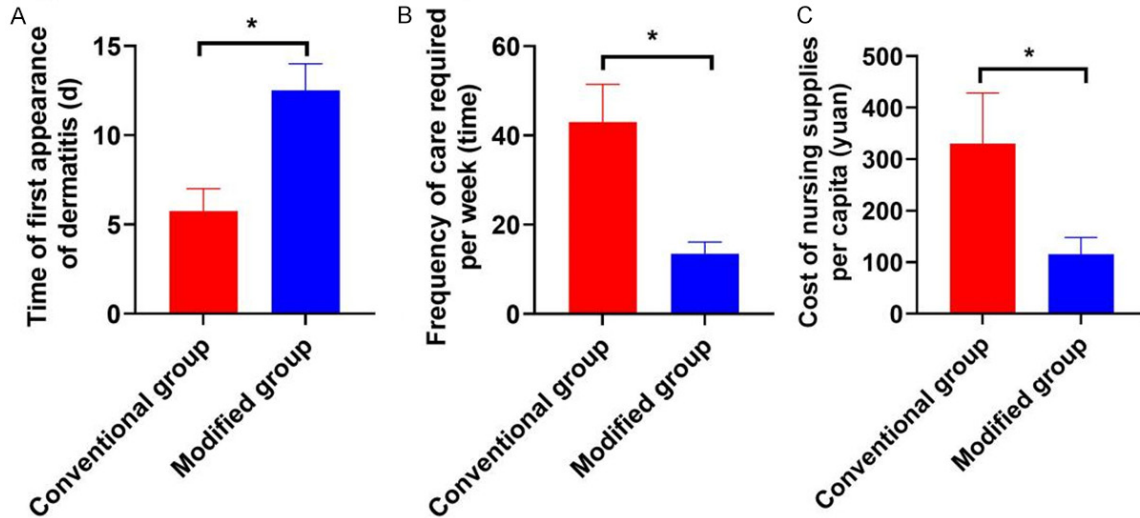


Figure 1. Effect and cost of care of different care options. A. Time to first occurrence of dermatitis; B. Amount of required care per week; C. Cost of nursing supplies per capita. Note: * represents $P < 0.05$.

Table 4. Comparison of skin status between the two groups at different times ($\bar{x} \pm s$)

Group	n	Before the intervention		After the intervention	
		1 d	3 d	7 d	14 d
Conventional Group	102	9.16±1.37	8.94±1.12	8.41±1.09	7.92±1.15
Modified Group	102	9.23±1.41	8.39±1.27	7.85±1.13	7.06±1.02
F_{time}			31.850		
P_{time}			<0.001		
F_{group}			75.280		
P_{group}			<0.001		
$F_{interaction}$			5.389		
$P_{interaction}$			0.001		

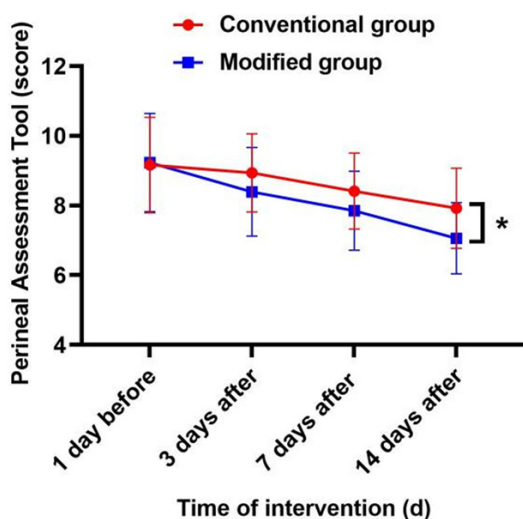


Figure 2. Skin status scores of the perineal region of patients under different intervention modes. Note: * represents $P < 0.05$.

the weak acidic environment on the skin surface is destroyed, the microbial colonies that inhabit the skin surface continue to grow, and this form a vicious cycle, which greatly increases the chance of skin infection. Meanwhile, urea is also converted to the basic substance ammonia by lipid soluble enzymes and proteolytic enzymes contained in feces, which also increases the risk of developing skin infections [23]. Therefore, isolating the skin of incontinent patients from excreta in care is the key to preventing the occurrence of IAD.

This study, by looking at the value of different care protocols in patients with incontinent, found that patients with combined wet dressings had a significantly lower incidence of IAD compared to those with skin protective films. Skin protective membranes are common nursing materials for the prevention of IAD. The skin

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Table 5. Patient satisfaction with nursing work [n (%)]

Group	n	Very satisfied	Relatively satisfied	Basically satisfied	Dissatisfied
Conventional Group	102	50 (49.02)	26 (25.49)	15 (14.71)	11 (10.78)
Modified Group	102	65 (63.73)	20 (19.61)	11 (10.78)	6 (5.88)
Z				-2.164	
P				0.030	

protective film is able to reduce the acid-base degree of the skin surface, improve the hydration status of glial cells, and thus maintain a good microenvironment on skin surface by isolating the irritants from the skin to some extent. The inadequacy of skin protective membrane is the difficulty in resisting the harmful substances in excreta as well as the erosion of bacteria from the outside world. This study modified the traditional isolation methods and investigated the efficacy of applying a 3M transparent dressing cover (surgical incision patch membrane available for large areas of skin) after spraying susceptible sites with a skin protector and attaching an ultrathin hydrocolloid to the outer layer. 3M transparent dressings are required to exceed the ultrathin hydrocolloid edges by 1-2 cm to create a clean environment with adequate isolation, ultimately preventing the occurrence of IAD.

Hydrocolloid dressings are processed from elastic, polymeric hydrogels blended with synthetic rubbers and adhesives, and are initially applied in the care of acute wounds. Research in recent years has found its positive effect in preventing dermatitis. For example, Kamann et al. [24] stated that hydrocolloid dressings reduced the incidence of allergic dermatitis. Cai et al. [25] effectively prevented pressure ulcers in patients with noninvasive mechanical ventilation. In addition, da Silva Augusto et al. indicated that the application of hydrocolloid dressings was able to reduce the risk of pressure ulcers in critically ill patients in hospitals [26]. As can be seen, hydrocolloid dressings have an effect on preventing dermatitis and pressure ulcers. The hydrocolloid dressing is soft and can completely fit with the skin because it has a strong adhesion and will not fall off when the patient turns over, which can reduce the frequency of dressing replacement. The results of this study also confirm that the average amount of required nursing care per week in the modified group was significantly less than that of the conventional group. In addition, as the times of nursing care de-

creased, not only the pain caused by changing dressings was reduced, but also the cost incurred by consumables such as gloves, sanitary paper, towels required for nursing care was reduced. In addition to the objective advantages described above, this study found that the modified segregation method improved patient satisfaction, which has positive implications for creating a harmonious doctor-patient relationship.

Limitations and perspectives

This study concludes that modified isolation can reduce the incidence of IAD in incontinent patients and it has a high value in guiding clinical care work. However, because this study is retrospective and did not use a study design when data accumulated, there were limited measures that could be used for analysis, such as failure to collect the satisfaction of nurses with the modified isolation. It is expected that prospective studies will be conducted in the future to comprehensively examine the value of modified isolation in improving the outcomes of care for incontinent patients.

Conclusions

In order to reduce the incidence of IAD in incontinent patients, this study modified the traditional isolation care protocol and applied it in the care for incontinent patients. The results of the study showed that the modified isolation care program was able to significantly reduce the incidence of IAD, care burden and skin status, as well as improve patient satisfaction when comparing with conventional care. Therefore, this study considered that the modified isolation method has a high value in the care of incontinent patients and can be used as the preferred care option for incontinent patients.

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Disclosure of conflict of interest

None.

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