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Evaluation of effectiveness of hydrocolloid dressing vs ceramide containing dressing against pressure ulcers

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Abstract. – OBJECTIVE: Pressure Ulcers (PUs) often is an indication of quality of nursing care as it remains as severe manifestation of the integrity of impaired skin. Our study designed to evaluate the effectiveness of hydrocolloid dressings and ceramide dressings in healing of PU.

PATIENTS AND METHODS: The study was done at Chinese hospital between Feb 2014-November 2014. 72 study group patients and 25 control group patients were included in the study. The study group patients were divided into Group A with 24 patients received only ordinary hydrocolloid dressings, Group B with 24 patients who ceramide containing hydrocolloid dressings and Group C with 24 patients received both hydrocolloid and ceramide dressings. Dressings were applied for 4 weeks. The dressings were changed every 10 days and skin conditions such as pH of the skin, hydration are measured by capacitive method.

RESULTS: Among 72 study population 48 (66.7%) were male and 24 (33.3%) were females. Group A with 18 (75%) males and 6 (25%) females, group B with 20 (83.3%) males and 4 (16.7%) females, and group C with 10 (41.7%) males and 14 (58.3%) females. 25 Control group patients with 8 (32%) males and 16 (68%) females. Erythema seen in 4/24 (16.67%) group A patients, group B and C patients had 1/24 (4.17%) erythema. In control group patients 6/25(24%) developed erythema.

CONCLUSIONS: In our study, we evaluated the effectiveness of the hydrocolloid dressings and ceramide containing dressings in which ceramide containing dressings showed effective prevention and water holding capacity. Our study highlights that ceramide containing dressings found to be more effective in reducing erythema and improving the healing of PU.

Key Words:
Dressings, Pressure, Ulcers, Infection, Effectiveness.

Introduction

Pressure Ulcers (PUs) often are an indication of quality of nursing care and thes remain as severe manifestation of the integrity of impaired skin[1]. Pressure ulcers are more commonly observed in older patients among many countries worldwide. The incidence rate of PU among long term care facilitates are 27.7% and in acute care settings was 14.3%-15.6%[2,3]. In acute care hospitals and health care settings PU observed to occur most frequently with 93% of PU case in stage 1-2[3,4].

The most common sites of PU occurrence are sacral and coccygeal area which develops PU due to friction and shear forces[5]. Prevention of pressure ulcers is more expensive in medical and surgical interventions[6-8]. Pressure ulcers dates back to many centuries and is still remains a persistent problem to be dealt in many health care settings and hospitals[9].

Many approaches have been attempted to avoid pressure ulcers one such attempt is to evaluate two different types of dressings. Pressure ulcers are categorized into different stages based on the level of tissue damage. Grade 1 considered to be least severe and grade 4 the complete tissue damage[10,11]. PU are seen mostly in people who don't have the ability to reposition to relieve pressure especially in old age, with spinal cord injury and immobilized hospitalized patients are prone to PU's[12,13].

Nowadays prevention of PU's has widely developed with vast range of interventions including skin care, repositioning, selection of dressings which protects and promotes healing of PU.

Our study designed to evaluate the effectiveness of hydrocolloid dressings and ceramide dressings in healing of PU by reducing shear forces and increasing the water retention capacity of the skin.

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Patients and Methods

Study Design

The study was done at Chinese hospital between Feb 2014-November 2014. The study was approved by institutional ethical committee. A total of 72 patients were included in the study. 25 patients with other injuries served as control group population. The sample size were calculated with two tailed method assuming a precision of 20% and α=5%. The inclusion criteria was geriatric patients > 60 years and mostly grade 2-4, inability to reposition themselves were included. Exclusion criteria were patients not willing to involve in the study, those discharged middle of the study were excluded from participation in the study.

All the patients, demographic details such as age, sex, etc were obtained from the hospital records. The other risk factors for PU are hypertension, diabetic, shock, incontinence etc. In our study, we used hydrocolloid dressing and ceramide containing dressing both dressings had hydrocolloid as common factor with lamellae in the middle made of polyurethane film with nylon strands at the outer layer. The dressings are round in shape with 0.40 mm in thickness. The presence of hydrocolloid layers enhances the water absorption and hydrates skin area thereby inflammation can be reduced. Nylon reduces friction when skins in that particular area are moved during any movement by the patients.

Dressings Applied

The dressings were applied on left or right trochanter area at the place were older patients have chance of development of PU. The 72 patients included in the study were divided into 3 groups: Group A with 24 patients who received only ordinary hydrocolloid dressings, Group B with 24 patients who received ceramide containing hydrocolloid dressings, Group C with 24 patients who received both ordinary hydrocolloid and ceramide dressings. All the baseline assessments for the erythema and PU are measured. Dressings were applied for 4 weeks and, then, onwards patients were under direct observation to check for occurrence of erythema and PU. The dressings were changed every 10 days with skin conditions are examined such as pH of the skin, hydration are measured by capacitive method (Corneometer, Cologne, Germany) (Skin pH meter-Germany). All the readings were recorded. Nurses involved in the study were educated on applying procedure of dressings to trochanter area. The patients were scheduled to reposition every 4 hours and supine position.

All the patients in the study group were shifted to mattress that redistributes pressure evenly and patient's position was changed to supine position 30 minutes before measurement to reduce erythema due to pressure. 25 control group population who had chance to develop PU due to spinal cord injury were given only ordinary hydrocolloid dressings they were also monitored similarly to study group population. The dressings were applied for 4 weeks and skin hydration capacity, pH, erythema were also recorded.

Statistical Analysis

The pH, erythema and hydration capacity of skin were compared between the study population and control group population using *t*-test and χ^2 test and statistical significance of the two dressings $p < 0.05$ were analyzed using SPSS Inc statistical software version 20.0 (SPSS Inc., Chicago, IL, USA).

Results

In our work among 72 study group population 48 (66.7%) were male and 24 (33.3%) were female patients. No statistical difference was found when the gender was compared. All the 72 patients divided in 3 groups consist of 24 patients in each group. Group A consist of 18 (75%) males and 6 (25%) females, group B has 20 (83.3%) males and 4 (16.7%) female patients and group C consist of 10 (41.7%) males and 14 (58.3%) females. In control group patients out of 25 patients 8 (32%) were males and 16 (68%) were females. When age wise comparison was done statistically significant difference of p = 0.003 was obtained (Table I) (Figure 1).

Among the three groups of study population Group C had patients with PU in grade III and IV. Group B patients had PU in grade II and Group A patients had PU in grade I PU lesions. Control group patients had only grade III PU at the time of inclusion in the study. The level of pressures and capacity of retaining water in the skin at greater trochanter area was recorded for both the study and control group patients. When the pressure level was compared statistically, we found a statistical significance with p value 0.001 (Table II) (Figure 2 a-b) (Figure 3 a-b) (Figure 4 a-b).

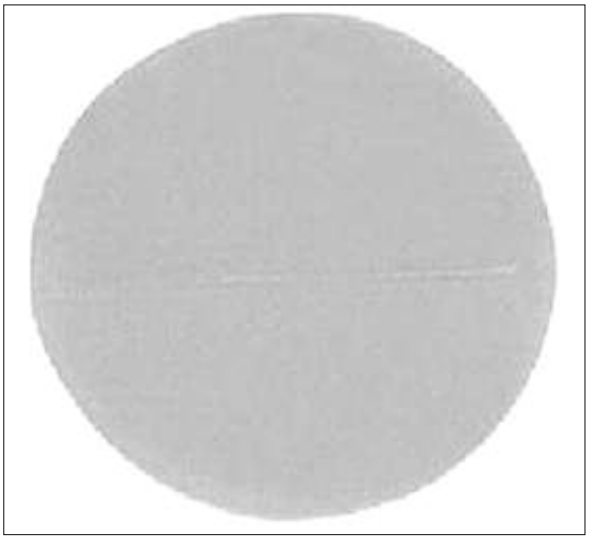

Figure 1. Ordinary Hydrocolloid dressing used in our study.

All the group patients' were checked for the presence of erythema on the beginning of the study and every 10 days when the dressings was changed. Erythema was seen in group A patients in 4/24 (16.67%), group B &C patients had 1/24 (4.17%) showed the presence of erythema. In control group patients 6/25 (24%) showed the presence of erythema which was not significant statistically when the dressings were taken for statistical analysis. Other parameters such as pH, water retention capacity were also recorded for both the study and control group population (Table III).

Table I. Various parameters of study group & control group patients.

Parameters	Study group (N=72)	Control group (N=25)
Age (yrs)	60± 10.2	58 ± 8.1
Male	48	8
Female	24	16
Immobilized patients	52	18
Diabetes	47	11
Hypertension	38	9
CVD	12	2
Respiratory disease	22	4

Side effects

From our study, none of the patients developed pruritis, infection or other adverse effects throughout the study in both study and control group patients.

Discussion

In our study, we evaluated the effectiveness of the hydrocolloid dressings and ceramide containing dressings in which ceramide containing dressings showed effective prevention and water holding capacity. Our study, showed production of erythema in 16.67% of the patients in group A. 4.17% of patients developed erythema in group B and C in study group patients, whereas control patients who received only ordinary hydrocolloid

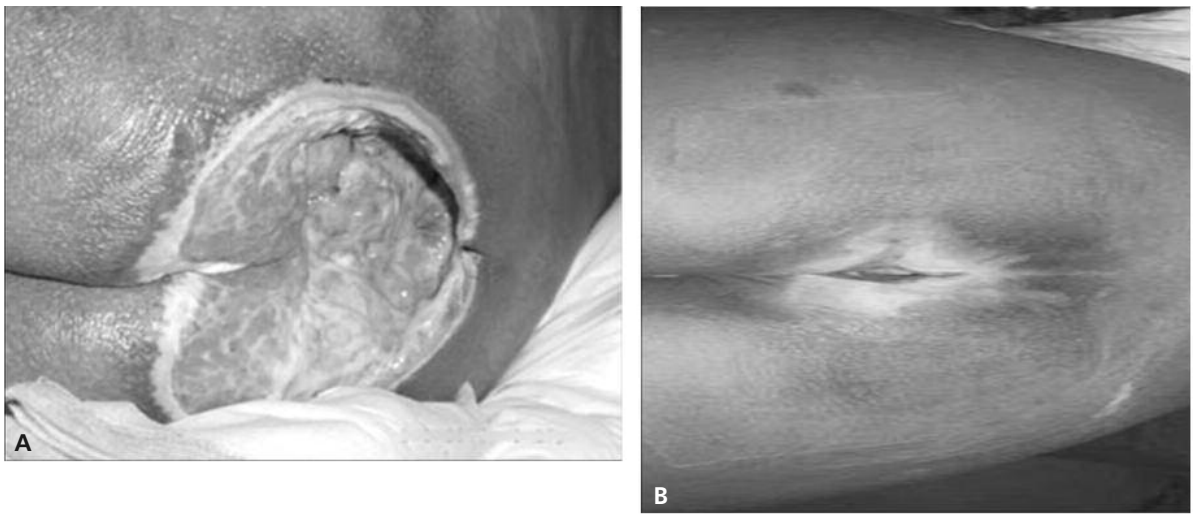

Figure 2. Patients in group with grade IV PU C. *A,* Before dressings-beginning of the study. *B,* After application of Hydrocolloid dressings and ceramide containing dressings the ulcers has been healed-at the end of the study.

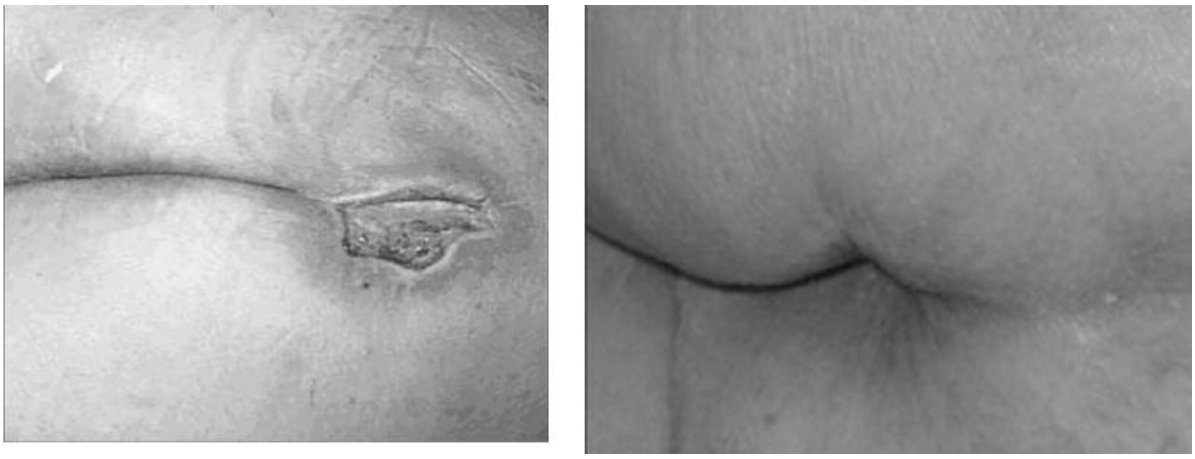

Figure 3. Patients in group B in grade II ulcers. *A,* At the time of enrolment for the study. *B,* After application of ceramide containing dressings the PU was completely healed at the end of the study.

Table II. Baseline measurements between study group and control group.

	Study group				
Parameters	Group A (N=24)	Group B (N=24)	Group C (N=24)	Control group (N=25)	*p* value
Pressure (mmHg)	22.4	24.9	29.4	21.8	0.001
Water retention capacity	32.4	32.2	32.1	32.1	0.001

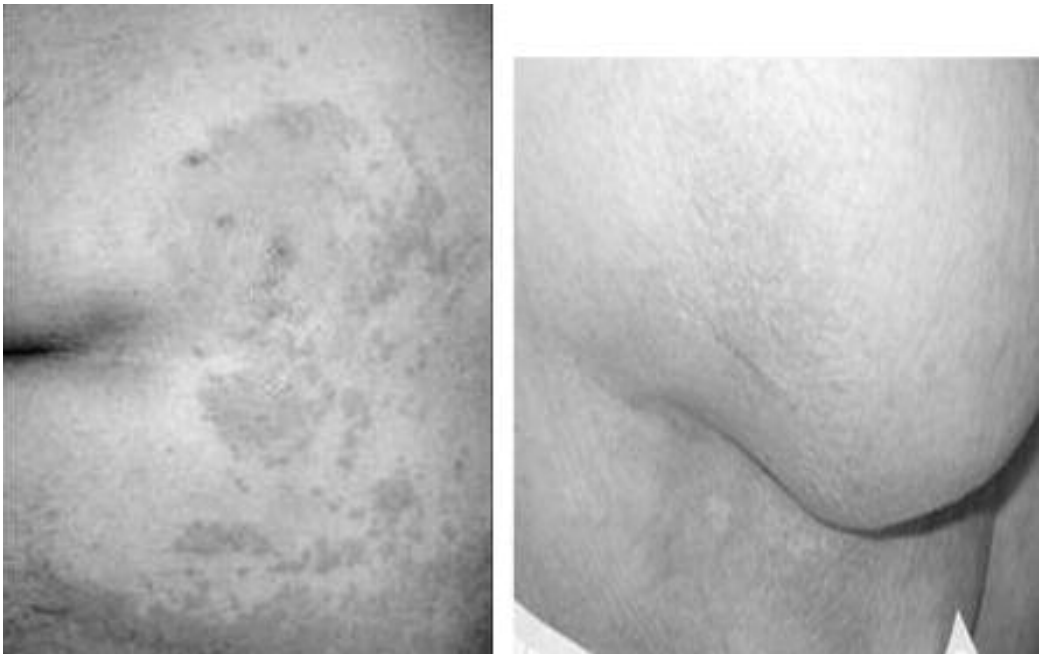

Figure 4. Patients in group A in grade I ulcers. *A*, At the time of enrolment for the study *B*, After application of Ordinary Hydrocolloid dressings at the end of the study.

Table III. VCharacteristics of various parameters before and at the end of the treatment with two dressings in study and control group population.

Parameters	Study group						Control group	
	Baseline			End of the study				
	A	B	C	A	B	C	Before	After
P H	5.8 ± 0.4	5.7 ± 0.23	5.4 ± 0.5	4.6 ± 0.3	4.2 ± 0.2	4.1 ± 0.4	5.9 ±0.4	4.8 ± 0.3
Skin water retention capacity (%)	32.4	30.6	28.9	33.4	35.8	36.1	33.1	34.2
Erythema	0	0	0	4 (16.67%)	1(4.17%)	1(4.17%)	2 (8%)	6(24%)

dressings developed erythema in 24% of patients which is high compared to other studies who had reported only 4.11% of patients developed erythema[14]. This less percentage compared to our study may be due to repositioning of the patients every 2 hours basis to supine position whereas in our study patients were repositioned only every 4 hours basis which may be one among the reason for development of erythema[14,15].

Patient's in group C were given both hydrocolloid and ceramide containing dressings along with support of pressure redistributing mattress of about 15cm thickness which may be one of the reason for reduced erythema development in group C compared to group A and control group patients. Whereas group B patients who received only ceramide containing dressings with of pressure redistributing mattress support also has less erythema production compared to patients who received only ordinary hydrocolloid dressings, which correlates with the other studies[14,16].

Secondly, the increase in retention of water capacity among group C and B patients with ceramide containing dressings after 2 weeks of therapy were high compared to group A and control group patients with ordinary hydrocolloid dressings. This finding was similar to other previous studies with ceramide containing dressings have proved to have increased the water retention capacity of the skin thereby preventing dryness which in turn leads to tissue destruction[14].

In our study, the baseline water retention capacity of all the 3 groups A, B, C were found to be 32.4%, 30.6%, 28.9%. At the end of the study the water retention capacity of the 3 groups have increased significantly to 33.4%, 35.8%, 36.1%. Whereas, control group patients had 33.1% at the baseline and 34.2% at the end of the study which correlates with previous study[16].

Ceramide containing dressings seems to be widely attempted method for pressure ulcers because of use of ceramide friction of the skin are reduced comparatively, and also balances skin pH, protects from infection by acting as cushion thereby promotes healing of PU[14]. More research are needed for the comparison of hydrocolloid and ceramide containing dressings with regard to skin hydration. Ceramide has been known to have moisturizing property due to the presence of lipid contents which penetrates into the stratum corneum so when ceramide containing dressings are applied it is readily absorbed by the skin thus helping in protecting the skin from dryness thereby promoting healing[17,18].

When our study is compared with other studies, who had reported 11% of patients had developed dermatitis due to side effect by hydrocolloid dressings[19]. However, our study has reported only very less side effects of the dressings and our study highlights that in our study no severe complications occurred in any of the patient's population both in ordinary hydrocolloid dressings and in ceramide containing dressings.

Conclusions

Our study results highlights that ceramide containing dressings found to be more effective in reducing erythema and improving the healing of PU compared to ordinary hydrocolloid dressings, which can be used for old age patients and immobilized patients. Still more and more research studies are required to prove the efficiency of these dressings in preventing PU for all age group patients to prove its clinical application and recent technologies are required to make it cost effective.

Conflict of Interest

The Authors declare that they have no conflict of interests.

Acknowledgements

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