Original Article

The Effect of Henna (*Lawsonia Inermis*) on Preventing the Development of Pressure Ulcer Grade One in Intensive Care Unit Patients

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Abstract

Background: Detecting pressure ulcer is an important nursing diagnostic and care requirement in patients hospitalized in Intensive Care Unit (ICU). The purpose of this study is to examine the effect of Lawsonia plant on pressure ulcer grade one in ICU patients. **Methods:** In this clinical trial, 72 patients eligible for hospitalization in hospitals of Isfahan University of Medical Sciences were divided randomly into two control and intervention groups. The standard program of skin care was implemented on both groups; in addition, a mixture of Lawsonia (henna) and distilled water was applied topically in the intervention group. The classification form of the International Pressure Ulcer Advisory Panel was used to identify grade one ulcers. Data were collected on the 1st day through demographic information questionnaire and Braden pressure ulcer risk assessment scale. An infrared thermometer was used to record local temperature of the ulcers on a daily basis. Assessments were made based on Pressure Ulcer Scale for Healing (PUSH), and the pressure ulcer area was examined per square centimeter on the 1st, 4th, and 7th days. The data were analyzed using SPSS 16. **Results:** The average change in the ulcer area per square centimeter in the control group increased by 29.9 ± 37.93 whereas it decreased by 3.54 ± 33.91 in the intervention group. The mean PUSH score decreased in the intervention group (5.36 ± 3.12) while it increased in the control group (1.91 ± 1.53). The average changes of PUSH score before and after the intervention showed a significant difference in both groups. **Conclusions:** With regard to the effect of henna on the reduction of ulcer area and the average PUSH score in ICU patients, the application of henna is recommended for healing grade one pressure ulcers.

Keywords: *Intensive Care Unit, Iran, Lawsonia plant, nursing, pressure ulcer*

Introduction

Pressure ulcer is the third costly disorder after cancer and cardiovascular disease.[1] Estimates in 2013 indicate that each year about 1.6 million Intensive Care Unit (ICU) patients develop pressure ulcers. It increases the period of hospitalization and delays patient recovery. Furthermore, members of health-care team spend much time and energy to manage physical, emotional, and economic challenges in the treatment of pressure ulcers.[2] According to the classification of the National Pressure Ulcer AdvisoryPanel (NPUAP), there are four stages of pressure ulcer. Grade one bedsore is the most superficial type of skin injury. Diagnosis and treatment of the ulcer in this stage is very important and helpful because without early diagnosis and prompt treatment it progresses rapidly.[1] Early diagnosis and preventing the progress of the ulcer is a nursing care priority and a key indicator of care quality.[3]

Complementary medicine is suitable in terms of cost, efficiency, and effectiveness and involves fewer side effects.[4] It is less invasive, more accessible, and is not addictive.[5] One of the herbal products with many applications and special position in popular culture of Iran is henna (*Lawsonia inermis*). Different studies have shown the therapeutic effect of its leaves in the prevention and treatment of diabetic foot ulcer,[6] treatment of diaper dermatitis in infants,[7] prevention of bedsore,[8] treatment of hand-foot syndrome caused by drug side effects,[9] and treatment of acute and chronic gastric ulcer in rats.[10] Numerous pharmacological effects have also been reported for henna including antibacterial, antifungal, antiviral, antimicrobial, antiparasitic,[11,12] analgesic, anti-inflammatory, and antipyretic.[9,11,13]

Due to the high cost of medicines and ulcer dressings and lack of ample scientific studies on the effect of henna on the

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treatment of grade one pressure ulcers, this study aimed to investigate the effect of henna on pressure ulcer grade one in ICU patients hospitalized in the hospitals of Isfahan University of Medical Sciences.

Methods

This clinical trial was conducted on two groups in 2017 in ICUs of Isfahan teaching hospitals. The project was registered under registration No. IRCT201605167391N4. After approval, permission of the Ethics Committee was obtained. Due to the fact that an infection with this type of henna has not yet been reported, and that henna is only applied on the surface of the affected skin and does not penetrate the deeper layers, physicians allowed the conduction of the research. Afterward, written consent was obtained from the conscious patients or the family of patients with reduced consciousness. Seventy-six patients hospitalized in ICUs of hospitals affiliated with Isfahan University of Medical Sciences were selected and divided into two control and intervention groups of 38 people based on a table of random numbers. In the sampling method, Z_1 is a confidence coefficient of 95%, Z_2 is a test power factor of 80%, S is an estimation of standard deviation (SD) of pressure ulcer area in either groups, and d, the minimum difference in average area of pressure ulcers between the two groups, is considered 0.8 s.

Inclusion criteria

No history of disease and skin irritation, any food and medicine allergies, nonaddiction to drugs. The information was obtained from patients themselves or their caregivers or files. Exclusion criteria: unwillingness of patients or their families to participate in the study.

Grade one pressure ulcers of the patients were identified using the classification form of the International Pressure Ulcer Advisory Panel. Braden scale was used by the researcher to assess pressure ulcer risk at the beginning of the study; patient demographic information questionnaire was also filled at the start. Braden score 15–18 indicates low risk, 13–14 indicates medium risk, 10–12 indicates high risk, and ≤9 indicates very high risk. Pressure ulcer caring methods such as repositioning was performed by nurses for all patients at least every 2 h.

Henna leaves and stems were collected around Yazd and after being approved by a botanist in the Agricultural Research Center of Shahrekord, the gathered plants were dried for a week at normal temperature in the shade. Decoction operation was carried out by soaking. A herbarium sample was prepared; the sample is available under no. 234 in the Herbarium Unit of Medicinal Plants Research Center of Shahrekord University of Medical Sciences. In the intervention group, to test the allergic reaction to henna, a mixture of 1 g henna and 10 ml distilled water was applied on the inner part of the forearm to see an allergic reaction in 10 min; the mixture was applied on the ulcer for 30 min if no reaction occurred. Then, the area was washed with lukewarm water and dried. An expert trained nurse who did not know about the classification of patients into intervention and control groups scored ulcer area with a ruler and using Pressure Ulcer Scale for Healing (PUSH) tool on the 1st, 4th, and 7th days. PUSH tool has three variables: ulcer surface area (length × width), the amount of exudate and tissue type, each scored separately. A score of 0 shows that the ulcer is healed while the highest score of 17 indicates that it is progressing. A Microlife infrared thermometer made in Switzerland was used to record local temperature of the ulcers on the 1st, 4th, and 7th days. These days were selected following the study of Keshavarz *et al*. and Ahmadian *et al*.[7,8] Two pictures were taken in the 1st and 7th days from both intervention and control groups. Data were analyzed by SPSS 16 (SPSS Inc., Chicago, IL), using Chi-square, paired *t*, independent *t*, repeated measures ANOVA, and Pearson correlation tests.

Results

In this study, 52.8% and 55.6% of the control and intervention groups were male, respectively. Married people had the highest percentage, 75% in the control group and 69.4% in the intervention group. The majority of patients in both control (66.7%) and intervention (72.7%) groups had a history of using henna. In the control and intervention groups, 72.2% and 80.6% of the subjects had no history of smoking, respectively. The most common location of pressure ulcers in the control (66.7%) and intervention (58.3%) groups was the sacral region and buttocks. Data analysis showed no significant difference between intervention and control groups in terms of demographic characteristics and other variables such as age, body mass index, level of consciousness, baseline hemoglobin, albumin, duration of hospitalization, systolic blood pressure, diastolic blood pressure, and Braden score ($P > 0.05$) [Table 1].

The mean and SD of pressure ulcer area per square centimeter on the 1st day had no significant difference in the intervention and control groups as measured by independent *t*-test ($P > 0.05$). However, the average pressure ulcer surface area on the 4th and 7th days in the intervention group was significantly lower than that in the control group ($P < 0.05$).

Results showed that the mean and SD of the pressure ulcer on the first to the 7th day in the control group increased by 54.3 ± 91.33 indicating progression of the ulcer in the control group while it decreased by 9.29 ± 93.37 in the intervention group. This suggests a significant difference between the two groups ($P < 0.05$). In addition, repeated measures ANOVA indicated no significant difference in the average area of a pressure ulcer on the 1st, 4th and 7th days in the control group ($P > 0.05$), but the difference was significant in the intervention group ($P < 0.05$). LSD test showed that the average area of pressure ulcer in the

intervention group on the 4th day was significantly less than that on the 1st day [Table 2].

Independent *t*-test results showed no statistically significant difference in the average score of pressure ulcer (PUSH tool) between the two groups on the 1st day. This means that the risk of pressure ulcer at baseline were equal in the two groups ($P > 0.05$). Although average PUSH score on the 4th and 7th days in the intervention group was significantly lower than that in the control group ($P > 0.05$), repeated measures ANOVA showed no significant difference in this score in the control group on the 1st, 4th, and 7th days ($P > 0.05$), but the difference was significant in the intervention group ($P < 0.05$) [Table 3].

The mean and SD of local temperature of the ulcer and forehead on the 1st, 4th, and 7th days in the intervention and control groups had no significant difference as measured by independent *t*-test and repeated measures ANOVA ($P > 0.05$) [Table 4].

Pearson correlation coefficient showed a significant relationship between body temperature (forehead) and local temperature of the ulcer in both intervention and control groups on the 1st, 4th, and 7th days ($P < 0.05$) [Table 5].

Table 1: Characteristics of patients in control and intervention groups

Personal information	Group (SD±average)		*P**
	Control group	Intervention group	
Age (year)	16.32±57.53	19.20±65.39	0.066
BMI (kg/m^2)	4.81±26.85	5.72±26.16	0.58
Level of consciousness (GCS)	4.37±8.53	4.46±9.44	0.382
Hemoglobin (g/dL)	1.55±12.58	2.16±11.71	0.052
Albumin (g/dL)	0.596±4.07	1.28±4.04	0.897
Hospitalization period (day)	13.92±17	17.24±11.75	0.16
Systolic blood pressure (mmHg)	18.01±122.75	20.53±120.89	0.58
Diastolic blood pressure (mmHg)	7.51±75.75	8.13±74.36	0.42
Braden tool (6-23)	5.50±13.58	4.68±13.53	0.963

*P value resulted from independent *t*-test .BMI=Body mass index, GCS=Glasgow Coma Scale, SD=Standard deviation

Table 2: The average area of pressure ulcer on the 1st, 4th, and 7th days between the two groups

Average area of pressure ulcers	Group (SD±average)		*P**
	Control group	Intervention group	
Pressure ulcer area changes	33.91±3.54	37.93±−29.9	0.000
1st day	43.95±43.22	41.72±34.40	0.390
4th day	46.92±44.75	13.30±9.80	0.000
7th day	48.34±46.76	8.94±4.51	0.000
*P***	0.589	<0.001	

*P value resulted from independent *t*-test, **P value resulted from repeated measures ANOVA. SD=Standard deviation

Discussion

In this study, 76 patients who met inclusion criteria for the study were divided into control and intervention groups of 38 people. During the study, 4 patients (2 women and 2 men) were excluded because two died and two were discharged from the hospital. The study continued on 72 patients in two control and intervention groups of 36 patients. As old age, loss of consciousness, albumin and hemoglobin, and decrease or increase in blood pressure are risk factors for the occurrence of pressure ulcers,[14] these characteristics were compared and the results are presented in Table 1. The results showed that the intervention and control groups were homogeneous and independent *t*-test showed no significant difference between the two groups in terms of the above variables.

Results showed that the average area of pressure ulcer on the 7th day increased as compared to the 1st day in the control group, but it showed no significant difference between the first 3 days as well as the fourth and 7th days. In the intervention group, the average area of pressure ulcer on the 7th day decreased significantly as compared

Table 3: The average score of pressure ulcer (by Pressure Ulcer Scale for Healing tool) on the 1st, 4th, and 7th days between the two groups

Average PUSH score	Group (SD±average)		*P**
	Control group	Intervention group	
Average PUSH score changes	2.35±0.75	3.12±−5.36	0.000
1st day	1.42±9.08	1.25±8.75	0.295
4th day	1.73±9.50	2.73±6.14	0.000
7th day	2.86±9.83	3.54±3.39	0.000
*P***	0.108	<0.001	

*P value resulted from independent *t*-test, **P value resulted from repeated measures ANOVA. PUSH=Pressure Ulcer Scale for Healing, SD=Standard deviation

Table 4: Local temperature of the ulcer and forehead in both groups before and after the intervention

Temperature	Group (SD±average)		Independent *t*-test (*P*)*
	Control group	Intervention group	
Forehead temperature			
1st day	0.68±37.18	0.85±37.17	0.988
4th day	0.39±37.07	0.51±37.15	0.489
7th day	0.50±37.04	0.66±37.17	0.328
*P***	0.91	0.410	
Local temperature of the ulcer			
1st day	0.86±37.41	0.83±37.34	0.720
4th day	0.52±37.31	0.43±37.12	0.940
7th day	0.72±37.37	0.56±37.12	0.108
*P***	0.515	0.172	

*P value resulted from independent *t*-test, **P value resulted from repeated measures ANOVA. SD=Standard deviation

Table 5: The relationship between body temperature and local temperature of the ulcer on the 1st, 4th, and 7th days

Day	Group			
	Intervention group		Control group	
	r	*P**	*r*	*P**
1st day	0.814	<0.001	0.921	<0.001
4th day	0.890	<0.001	0.951	<0.001
7th day	0.960	<0.001	0.957	<0.001

**P* value resulted from Pearson correlation coefficient

with the 1st day; it also had a significant difference on the 1st, 4th, and 7th days. In[7] the effectiveness of henna and hydrocortisone 1% ointment on recovery of diaper dermatitis was examined. The results suggested that henna was more effective than hydrocortisone.[7] In addition, the results of a study on the effect of henna in the prevention of pressure ulcers in ICUs indicated that henna can prevent the occurrence of pressure ulcers by reducing local temperature and inflammation of the sacral region.[8] Another research evaluated the effect of henna leaf extract on cutaneous ulcer in Wistar rats. The results showed that the average duration of complete healing in the intervention group was significantly less than that in the control group.[15] The findings of the above three studies are consistent with those of this study.

The average PUSH score on the 7th day increased as compared to the 1st day in the control group, but it showed no significant difference between the first 3 days as well as the 4th and 7th days. Average PUSH score on the 7th day in the intervention group decreased as compared to the 1st day, it also had a significant difference between the first 3 days as well as the 4th and 7th days, indicating recovery of the ulcer. Since the average PUSH score and the average area of pressure ulcers at the end of the study in the intervention group were more than those in the control group, it can be said that the intervention had prevented the progression of the ulcer. As noted earlier, henna has anti-inflammatory properties mentioned in several studies.[9] Researchers have found out that henna has good therapeutic effects on hand-foot syndrome (ulceration and exfoliation, painful redness, edema, and blistering).[9]

The 2016 study also showed that, as a product of traditional medicine, henna was an effective treatment for diaper dermatitis.[7]

The average temperature of the forehead, as representative of body temperature, and the average local temperature of the ulcer on the 1st day had no significant difference in the intervention and control groups. Accordingly, the two groups could be compared together. A 2003 study revealed that the average body temperature was 37.2°C in bedsore patients and 37°C in normal people which shows no significant difference.[14] Others have also concluded that body temperature in bedsore patients was high.[14] This study also showed that the average temperature of the forehead and local temperature of the ulcer on the 1st, 4th, and 7th days had no significant difference in the control and intervention groups.

Based on the results, there was a direct relationship between local temperature of the ulcer and forehead temperature in the intervention and control groups. The results of a study in 2016 indicated a direct relationship between sacral area and forehead temperature[8] which is consistent with the results of this study.

Conclusions

According to the results of this research, it seems that henna is effective on grade one pressure ulcer recovery in hospitalized patients. Given its anti-inflammatory properties, henna prevents pressure ulcer progress to higher stages and reduces the complications thus reducing the workload of nurses. Henna is an affordable, inexpensive substance that does not require the frequent use and can be used to maintain skin integrity which can reduce the cost of subsequent therapies.

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Conflicts of interest

There are no conflicts of interest.

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