Original Article

Effect of Olive Oil in Preventing the Development of Pressure Ulcer Grade One in Intensive Care Unit Patients

Abstract

Background: Detecting pressure ulcer is an important nursing diagnostic care required for the patients hospitalized in ICU. The purpose of this study is to examine the effect of olive oil in preventing the development of 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 groups; control and intervention (receiving olive oil). The standard program of skincare was implemented on both the groups; in addition, olive oil was applied topically in the intervention group. The data was collected on the first day through demographic information and Braden pressure ulcer risk assessment scale. An infrared thermometer was used to record the local temperature of the ulcers daily. Assessments were made based on pressure ulcer scale for healing (PUSH) tool and the pressure ulcer area was examined per square cm on the first, fourth, and seventh day. The data collected was analyzed by Fisher's exact test, independent sample *t*-test and repeated measure analysis using SPSS (version 22). **Results:** On the fourth and seventh day, the PUSH score was lower in the olive oil group (7.50 ± 2.823 and 5.44 ± 3.806) than in the control group (9.50 ± 1.732 and 8.83 ± 2.864) (*P*-value <0.001). Also, a significant improvement of ulcer was observed in the olive oil group (mean difference = 3.56; *P* value <0.001) but no change was observed in the control group (mean difference = 0.75; *P* value = 0.052). **Conclusions:** Based on the effect of olive oil in the reduction of ulcer area and the average PUSH score obtained in ICU patients, the application of olive oil is recommended for healing grade one pressure ulcers.

Keywords: *Intensive care units, Iran, olive oil, pressure ulcer*

Sepideh Miraj, Seyedmehdi Pourafzali[1], Zohre Vakili Ahmadabadi[2], Zahra Rafiei[3]

Department of Obstetrics and Gynecology, Infertility Fellowship, Qom University of Medical Sciences, Qom, Iran, [1]Department of Emergency Medicine, School of Medicine, Shahrekord University of Medical Sciences, Shahrekord, Iran, [2]Department of Emergency Medicine, School of Medicine, Isfahan University of Medical Sciences, Isfahan, Iran, [3]Department of Critical Care Nursing, School of Nursing and Midwifery, Isfahan University of Medical Sciences, Isfahan, Iran

Introduction

Pressure ulcers, being one of the most important problems for intensive care unit (ICU) patients, are considered as valuable indicators of the quality of treatment services. Bedsore grade one is the most superficial type of skin injury. During this stage, the skin turns red and does not regain its natural color even with the removal of pressure but its integrity remains undamaged and there is no rupture. Proper diagnosis and treatment of ulcers at this stage is very important because if controlled, it can heal within 7 days. Consequently, if it is not quickly diagnosed and treated, the ulcer will develop rapidly and can cause serious damage to the skin.[1]

Moreover, it is very expensive to treat these ulcers, hence about $2,200,000,000 is spent annually on the treatment of pressure ulcers in the United States. In Iran, a study by Sari *et al*. found that 24 of the 90 patients (26.7%) in the ICU had pressure ulcers. Clinically, treatment of these ulcers is time consuming hence, for patients with pressure ulcer grade two, on an average, the duration of hospitalization increases by 8 days.[2,3]

A majority of adolescents develop pressure ulcers within 2 weeks of hospitalization. The onset of pressure ulcer begins 2 hours after motionlessness condition, leading to many health problems for the patient, one of the most important being progress of the ulcer to deeper layers of muscles and skeleton, followed by bacterial infections that are very difficult to treat.[3] Many factors contribute to the development of bedsores, most notably, severe and prolonged periods of pressure reduce or stop the blood supply, leads to tissue ischemia, and ultimately cell death. Moreover, factors such as fragility, friction, and moisture affect the ability of the tissues to withstand pressure. Also,

How to cite this article: Miraj S, Pourafzali S, Ahmadabadi ZV, Rafiei Z. Effect of olive oil in preventing the development of pressure ulcer grade one in intensive care unit patients. Int J Prev Med 2020;11:23.

Address for correspondence:
Mrs. Zahra Rafiei, Department of Critical Care Nursing, School of Nursing and Midwifery, Isfahan University of Medical Sciences, Isfahan, Iran. E-mail: zahrarafiee2014@gmail.com

Access this article online

Website: www.ijpvmjournal.net/www.ijpm.ir

DOI: 10.4103/ijpvm.IJPVM_545_18

Quick Response Code:

factors such as the ability to underlie structures of the skin such as blood vessels and collagen are affected.[4]

Nevertheless, many studies have been conducted by researchers, especially nurses, to treat ulcers using herbal medicine. A study by Malekhosseini *et al*. (2013) showed that aloe vera gel was a good substitute for silver sulfadiazine 1% cream for healing burn ulcers grade two.[5] According to previous studies, the use of an ointment containing honey, sesame oil, and camphor can help to accelerate the recovery of pressure ulcers in diabetic patients.[6-8]

Olive is another medicinal plant that has attracted the attention of many researchers due to its numerous medicinal properties. In traditional medicine, this herb is used as an antihypertensive, analgesic, antiatherosclerotic, laxative, potentiating, and antipyretic drug.[9] The antimicrobial and antifungal properties of olive leaf extracts have also been reported.[10] Olive oil is a major source of fat in the Mediterranean diet, which is associated with a reduced incidence of cancer and heart disease.[11] Olive oil is also used as a protective agent for sunburn,[12] psoriasis,[13] and skin infections.[14]

Bedsore prevention is a very important aspect in treating critically ill patients. Since access to olive oil is quite easy and cost effective, apart from reducing the pain of patients, and as sufficient studies have yet not been carried out to analyze the effect of olive oil on ulcers; the present study was conducted to evaluate the effect of olive oil in preventing the development of pressure ulcer grade one in ICU patients.

Methods

This was a randomized single-blind trial study. The study population included all hospitalized patients in ICU of teaching hospitals of Isfahan University of Medical Sciences including Al-Zahra, Kashani, Amin, Noor, and Ali Asghar admitted in 2016. About 72 patients, older than 18 years of age, with the first stage of bedsore in sacral, shoulder, heel, or other areas and without a history of skin disease or allergy to food and drug or addiction were selected and the consent form was filled by the patients to participate in the study. The patient or his/her family who were not willing to continue with the study or did not follow up successfully, were excluded from the study (no cases found).

After obtaining the code of ethics from the Ethics Committee of Isfahan University of Medical Sciences (IR.MUI.REC.1396.1.198) and obtaining the written consent from the patient or their companion, the patients were divided into two groups of 36 each by using the random allocation software. The basic demographic and clinical characteristics of the patients including age, sex, level of consciousness, smoking, hemoglobin, hematocrit, albumin, systolic and diastolic blood pressure, ulcer position (upper, lower trunk), medical history such as respiratory, heart, psychological, cancer problems and so on and risk of pressure ulcer were recorded. Braden tool was used to assess the risk of pressure ulcer. This tool includes six items of sensory perception, namely, moisture, activity, mobility, nutrition, friction, and shear. The total score on this scale ranges from 6 (highest risk) to 23 (lowest risk).[15] Previous studies have also validated this scale.[16,17]

In the present research, for olive oil production, olive fruits were procured from Isfahan province and oil was extracted by using a specialized oiling machine. In addition, after authentication by the botanist of the Agricultural Jihad Research Center of Isfahan Province, a herbarium specimen (HUI 22134) was prepared at the Herbarium Department of the Medicinal Plants Research Center of Isfahan University of Medical Sciences.

In both groups, the bed, mattress, and sheet conditions were designed according to standard of bedsore prevention, and nutrition and excretion conditions of patients were matched in both groups. In addition, pressure ulcer care methods such as changing the position at least every 2 hours was duly performed by the nurses.

In the intervention group, in addition to these care arrangements, 15 ml olive oil was rubbed gently on the wounded area once a day for 30 min without massage and the area was washed with tepid water and the skin dried. During the first, fourth, and seventh day of intervention, the ulcer healing status was assessed using the pressure ulcer scale for healing (PUSH) tool. This tool consists of three criteria; wound surface (length × width), exudate rate, and the tissue type, which are combined to determine the ulcer healing status. A score of zero indicates that the ulcer is healed and a score of 17 indicates the progress of ulcer. This tool has been designed by the International Society for Pressure Sores Consultation and its reliability has been reported to be 97–100% in several previous studies.[18,19] In addition, skin temperature and ulcer area were measured in the first, fourth and seventh day, using a micro life NC100 infrared thermometer manufactured in Switzerland. In both study groups, two photographs were taken on the first and seventh day, so that the ulcer healing process could be accessed for all individuals and documented.

Furthermore, the nurse performing the intervention had complete knowledge of both the control and intervention groups but the trained nurse, who was referred to assess the ulcer healing status as well as the statistician, did not have any knowledge of both the groups types and therefore, conditions for a single-blinded study was established.

Finally, the data collected data was entered in SPSS software (Ver. 22). Quantitative and qualitative data was presented as mean ± SD and as *n* (%), respectively. At the inferential statistics level, parametric tests such as independent *t*-test, the repeated measures ANOVA (by adjusting the confounding variables including

gender, age, body temperature, wound temperature), and the Fisher's exact test were used according to results of Kolmogorov-Smirnov test of normality of the data. A significance level of less than 0.05 was considered in all analysis.

Results

This study included 17 men (47.2%) and 19 women (52.8%) in the control group (mean age = 57.53 ± 16.32 years) and 19 men (52.8%) and 17 women (47.2%) in the olive oil group (mean age = 57.67 ± 17.25 years) (*P*-value >0.05). Both groups were similar in other baseline and clinical characteristics [Table 1].

There was no significant difference in means of body and ulcer temperatures in both the groups on first, fourth and seventh day of treatment (*P*-value >0.05) [Table 2].

On contrary, mean of ulcers' area in both groups showed no significant difference on the first day (*P*-value = 0.093) but on fourth and seventh day, the mean in the olive oil group (16.70 ± 16.01 and 11.72 ± 16.62) was less than those in the control group (44.75 ± 46.92 and 46.76 ± 48.34) (*P*-value < 0.001). Moreover, the areas of ulcers showed a significant reduction in the olive oil group for seven days but no changes were observed in the control group (*P*-value = 0.719) [Table 3].

The evaluation of mean scores of pressure ulcer (using PUSH tool) on first, fourth and seventh day showed no significant difference on first day (*P*-value = 0.533) but mean scores of pressure ulcer were considerably lower in the olive oil group (7.50 ± 2.823 and 5.44 ± 3.806) than those in control group (9.50 ± 1.732 and 8.83 ± 2.864) (*P*-value < 0.001). Later during those 7 days, significant improvement of ulcer was observed in the olive oil group (mean difference = 3.56; *P* value <0.001) but no change was found in the control group (mean difference = 0.75; *P* value = 0.052) [Table 4].

Table 1: Comparing baseline and clinical characteristics of patients between two groups

Characteristics	Control (*n*=36)	Olive oil (*n*=36)	*P*
Sex			
Male	17 (47.2%)	19 (52.8%)	0.814
Female	19 (52.8%)	17 (47.2%)	
Age; year	57.53±16.32	57.67±17.25	0.972
BMI; kg/m^2	26.85±4.82	25.19±4.82	0.149
Smoking	10 (27.8%)	7 (19.4%)	0.498
Level of consciousness (GCS)	8.53±4.38	10.28±4.56	0.101
Hemoglobin; g/dl	12.59±1.55	12.84±1.53	0.484
Hematocrit; g/dl	38.28±4.73	36.73±3.85	0.130
Albumin; g/dl	4.07±0.59	4.26±1.05	0.362
Systolic blood pressure; mmHg	124.36±17.46	120.61±17.84	0.371
Systolic blood pressure; mmHg	74.25±7.65	72.03±8.35	0.129
Past Medical History*	13 (36.1%)	22 (61.1%)	0.136
Location of wound			
Upper limb	27 (75%)	22 (61.1%)	0.249
Lower limb	9 (25%)	14 (38.9%)	
Braden tool (6-23)	13.58±5.50	15.11±4.74	0.211

Data shows mean±SD or *n* (%). *The history of diseases such as problems in respiratory, cardiovascular systems, mental disease, cancer and so on

Table 2: Comparing means of body and ulcer temperatures between two groups

Temperature	Control (*n*=36)	Olive oil (*n*=36)	*P*[1]
Body temperature			
First Day	37.18±0.86	37.30±0.59	0.515
Fourth day	37.15±0.51	37.07±0.46	0.501
Seventh day	37.18±0.66	37.34±0.87	0.386
P[2]	0.948	0.039	
Ulcer temperature			
First Day	37.41±0.86	37.39±0.61	0.875
Fourth day	37.31±0.52	37.19±0.49	0.291
Seventh day	37.38±0.72	37.45±0.96	0.701
P[2]	0.681	0.100	

Data shown mean±SD, 1: Significant level of independent sample *t* test, 2: Significant level of repeat measure ANOVA

Table 3: Comparing the mean score of Area of pressure ulcers between two groups

Area of pressure ulcers	Control (*n*=36)	Olive oil (*n*=36)	*P*[1]
First Day	43.22±43.95	28.75±25.71	0.093
Fourth day	44.75±46.92	16.70±16.01	0.001
Seventh day	46.76±48.34	11.72±16.62	<0.001
P[2]	0.719	<0.001	

Data shows mean±SD, 1: Significant level of independent sample *t*-test, 2: Significant level of repeat measure ANOVA

Discussion

The results of the present study showed that the mean of the ulcer area and mean score of the pressure ulcer did not differ significantly between the two groups by using the PUSH tool on the first day but on the fourth and seventh day after the intervention, the ulcer healing status in the group receiving olive oil was significantly better than the control group, both in terms of wound area and PUSH criteria.

Similar studies by Alto Costa *et al*. (2016)[20] showed that olive oil consumption decreased the level of hydroperoxide lipids and thereby healed the pressure ulcers. Lupiáñez-Pérez *et al*. (2013)[21] also confirmed that using olive oil as a cheap product can be effective in preventing pressure ulcers in patients. In addition, Peimard *et al*. (2016) studied the effect of topical olive oil in prevention of bedsores thereby demonstrating that use of topical olive oil was effective in the prevention of bedsores.[22]

In this regard, it can be said that olive oil is probably effective to accelerate wound healing due to its essential

Table 4: Comparing the mean score of pressure ulcer using the PUSH tool control and intervention groups on different days

Pressure ulcer score measured by the PUSH tool	Control (*n*=36)	Olive oil (*n*=36)	*P*[1]
First Day	9.08±1.422	9.00±1.242	0.533
Fourth day	9.50±1.732	7.50±2.823	<0.001
Seventh day	8.83±2.864	5.44±3.806	<0.001
P[2]	0.052	<0.001	

Data shows mean±SD, 1: Significant level of independent sample *t*-test, 2: Significant level of repeat measure ANOVA

fatty acids and stimulation of epidermal cell proliferation. Phenolic compounds in olive oil have antimicrobial, anti-inflammatory, and antioxidant properties.[23] Due to its antioxidant, antimicrobial, and anti-inflammatory properties, olive oil probably increases the tissue coverage thereby accelerating the ulcer healing. Rosa *et al*. (2014) showed that consumption of olive oil caused an increase in tissue recovery in the stressed rats.[24] Another study showed that topical application of olive oil significantly increased the regeneration of the burned tissue in rats in comparison with sulfadiazine.[25] The above reports were in accordance to results of the present study.

Moreover, in the present study, the mean of local temperature of the ulcer on the first, fourth, and seventh day was not significant between the two groups. Also, there was no significant difference between the mean temperatures of the local area of the ulcer by passing seven days.

In this regard, the European Pressure Ulcer Advisory Panel (2009) stated that the skin should be examined in terms of temperature, edema, or stiffness, especially in dark-skinned people, to detect pressure ulcer. Factors such as temperature, edema, and stiffness cause pressure ulcers, although it is not always possible to see the signs of such ulcers or redness in dark-skinned people.[26] Hence, it can be said that the increase in the local temperature of the ulcer indicates the development of a pressure ulcer.

One of the study showed that the mean body temperature was 37.2°C in bedsore patients and 37°C in those not developing bedsore; this shows no significant correlation.[27] Braden and Bergstrom (1992) concluded in their study that the body temperature was also high in patients with a pressure ulcer.[28] As the results showed, the average local temperature of the ulcer in both groups on day 1 and 7 was higher than the mean of the forehead temperature, indicating the risk of pressure ulcer development at the site.[29]

Thus, according to the above effect of olive oil on the improvement of pressure ulcer grade one and considering the results of this study, clinically it can be stated that olive oil has been able to reduce the area of ulcer and prevent its progress to higher stages.

In conclusion, the strong point of the present study was controlling the confounding factors such as age, gender, body temperature, ulcer temperature, and ulcer location during assessing the ulcer area, healing condition, and pressure ulcer score. Therefore, the present study shows the effective role of topical use of olive oil on healing these ulcers. Further to improve and complete the present study, we can evaluate different doses of olive oil on healing and improvement of ulcer and also compare the effect of this oil on different stages of bedsores.

Conclusions

According to the results of this study, the mean area of pressure ulcer in the olive oil group was less than that in the control group after 7 days and the mean score of the PUSH tool decreased in the olive oil group, indicating a favorable recovery process of the ulcer, a positive effect on the reduction of ulcer area, and ultimately prevention of the progression of the ulcer to higher stages. It is further recommended to conduct this study on other populations including patients with underlying diseases. Moreover, it is suggested to use olive oil in the treatment of this type of ulcers in view of its easy availability and low cost.

Financial support and sponsorship

Nil.

Conflicts of interest

There are no conflicts of interest.

Received: 17 Dec 18 **Accepted:** 25 Sep 19
Published: 17 Feb 20

References

1. Potter PA, Perry AG, Stockert P, Hall A. Fundamentals of Nursing-E-Book. Elsevier Health Sciences; 2016.
2. Dealey C, Posnett J, Walker A. The cost of pressure ulcers in the United Kingdom. J Wound Care 2012;21:261-6.
3. Akbari Sari A, Doshmanghir L, Neghahban Z, Ghiasipour M, Beheshtizavareh Z. Rate of pressure ulcers in intensive units and general wards of Iranian hospitals and methods for their detection. Iranian J Public Health 2014;43:787-92.
4. Gorecki C, Closs SJ, Nixon J, Briggs M. Patient-reported pressure ulcer pain: A mixed-methods systematic review. J Pain Symptom Manag 2011;42:443-59.
5. Malekhosseini A, Ghaffarzadegan R, Alizadeh SA, Ghaffarzadegan RR, Haji Agaei R, Ahmadlou M. Effect of aloe vera gel, compared to 1% silver sulfadiazine cream on second-degree burn wound healing. CMJA 2013;3:418-28.
6. Mohammadi Tofigh A, Hayatollah G, Ayazi K, Hosseinian MA, Nemati Honar B, Safdari F. Treatment of pressure ulcer in diabetic patients using honey, sesame and campher ointment. Res Med 2014;38:131-8.
7. Salsali M, Shaban M, Naderi P. Effect of hydrocolloid coating on prevention of bedsore in patients undergoing coronary artery bypass surgery. J Hayat 2004;22:39-49.
8. Norouzi MAli, Mehrabani M, Hosseini M, Karimlou M. A comparative study on the effect of honey dressing and

hydrocolloid dressing on the recovery pressure ulcer in ICU patients. Q J Health Promot Manag 2012;3:37-45.
9. Miraj S, Kiani S. A Review study of chemical constituents and side-effects of black henna for children. Der Pharmacia Lettre 2016;8:277-81.
10. Lee OH, Lee BY. Antioxidant and antimicrobial activities of individual and combined phenolics in Olea europaea leaf extract. Bioresour Technol 2010;101:3751-4.
11. Visioli F, Poli A, Gall C. Antioxidant and other biological activities of phenols from olives and olive oil. Med Res Rev 2002;22:65-75.
12. Mogarehi M, Sanaiey Z. Pressure sore incidence and risk factors in patients admitted in medical, surgical and orthopedic wards in affiliated hospitals of Shiraz university of medical sciences. Iran J Nurs 2003;16:8-13.
13. Al-Waili NS. Clinical and mycological benefits of topical application of honey, olive oil and beeswax in diaper dermatitis. Clin Microbiol Infect 2005;11:160-3.
14. Taavoni S, Soltanipour F, Haghani H, Ansarian H, Kheirkhah M. Effects of olive oil on striae gravidarum in the second trimester of pregnancy. Complement Ther Clin Pract 2011;17:167-9.
15. Kottner J, Dassen T. Pressure ulcer risk assessment in critical care: Interrater reliability and validity studies of the Braden and Waterlow scales and subjective ratings in two intensive care units. Int J Nurs Stud 201047:671-7.
16. Serpa L, Santos V, Peres G, Cavicchioli M, Hermida M. Validity of the Braden and water low subscales in predicting pressure ulcer risk in hospitalized patients. Appl Nurs Res 2011;24:e23-8.
17. Amirifar S, Reza Masouleh S, Pourshikhian M, Monfared A, Kazemnejad Leili E. Predictive value of Braden Scale in pressure ulcer occurrence in hospitalized patients. J Holistic Nurs Midwifery 2013;23:8-15.
18. Stotts NA, Rodeheaver GT, Thomas DR, Frantz RA, Bartolucci AA, Sussman C, *et al*. An instrument to measure healing in pressure ulcers: Development and validation of the pressure ulcer scale for healing (PUSH). J Gerontol Ser A Biol Sci Med Sci 2001;56:M795-9.
19. Gardner SE, Hillis SL, Frantz RA. A prospective study of the PUSH tool in diabetic foot ulcers. J Wound Ostomy Continence Nurs 2011;38:385-93.
20. Alto Costa AM, Donnato-Trancoso A, Romana-Souza B. Olive oil administration improves cutaneous wound healing of pressure ulcers in mice. FASEB J 2016;30:1036-5.
21. Lupiáñez-Pérez I, Morilla-Herrera JC, Ginel-Mendoza L, Martín-Santos FJ, Navarro-Moya FJ, Sepúlveda-Guerra RP, *et al*. Effectiveness of olive oil for the prevention of pressure ulcers caused in immobilized patients within the scope of primary health care: Study protocol for a randomized controlled trial. Trials 2013;14:348.
22. Paymard A, Salehian T, Behnammoghadam M, Abbas Ali madadi Z, Shahnavazi A, Allahyari E, *et al*. The effect of local olive oil on prevention of pressure ulcers in patients hospitalized in the intensive care unit of Shahid Beheshti Hospital, Yasuj: A double-blind randomized clinical trial. J Anesthesiol Pain 2017;6:54-61.
23. Ghanbari R, Anwar F, Alkharfy KM, Gilani AH, Saari N. Valuable nutrients and functional bioactives in different parts of olive (Olea europaea L.)-A review. Int J Mol Sci 2012;13:3291-340.
24. Rosa AD, Bandeira LG, Monte-Alto-Costa A, Romana-Souza B. Supplementation with olive oil, but not fish oil, improves cutaneous wound healing in stressed mice. Wound Repair Regen 2014;22:537-47.
25. Edraki M, Akbarzadeh A, Hosseinzadeh M, Tanideh N, Salehi A, Koohi-Hosseinabadi O. Healing effect of sea buckthorn, olive oil, and their mixture on full-thickness burn wounds. Adv Skin Wound Care 2014;27:317-23.
26. Graves N, Birrell F, Whitby M. Effect of pressure ulcers on length of hospital stay. Infect Control Hosp Epidemiol 2005;26:293-7.
27. Diegelmann RF, Evans MC. Wound healing: An overview of acute, fibrotic and delayed healing. Front Biosci 2004;9:283-9.
28. Bergstrom N, Braden B. A prospective study of pressure sore risk among institutionalized elderly. J Am Geriatr Soc 1992;40:747-58.
29. Jiang Q, Li X, Qu X, Liu Y, Zhang L, Su C, *et al*. The incidence, risk factors and characteristics of pressure ulcers in hospitalized patients in China. Int J Clin Exp Pathol 2014;7:2587-94.