

Pressure ulcer healing by daily topical sucralfate and silver sulfadiazine: A case report study

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Abstract

Pressure ulcers are localized damage to the skin and/or underlying tissue that usually occurs over a bony prominence as a result of pressure. The patient was a 60-year-old male who was admitted to the intensive care unit for 1 month due to decreased consciousness in February 2019. He had a Grade 4 pressure ulcer in the sacrum area measuring 15 cm × 15 cm with 4 cm deep and exudate secretion and discoloration of the ulcer to yellow (ancestral tissue) and necrotic tissue around the ulcer. The ulcer was first bandaged with the daily silver sulfate ointment, but no healing process was achieved. After the patient was conscious and transferred to the inpatient ward, the necrotic tissue was debrided and washed with normal saline every day. Then, the ulcer was coated with 2 g of sucralfate tablets (4 tablets of 500 mg) dissolved in 5 cc of distilled water and mixed with 15 g of silver sulfadiazine ointment and was finally bandaged with sterile gauze. The Pressure Ulcer Scale for Healing instrument was used to evaluate the ulcer healing process. After 40 days, the patient's ulcer changed to a Grade 2 pressure ulcer measuring about 5 cm × 5 cm with pink color (granular tissue enclosed by epithelial tissue) on the skin.

Keywords: Heal, Pressure ulcer, Silver sulfadiazine, Sucralfate

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INTRODUCTION

Pressure ulcer is the third costly disorder after cancer and cardiovascular diseases,^[1] which affects more than 1.3 million adults all over the world every year.^[2] The prevalence of pressure ulcer in developed countries ranges from 3% to 30% and its incidence ranges from 1% to 50%.^[1]

Pressure ulcers are localized damage to the skin and/or underlying tissue that usually occur over a bony prominence as a result of pressure or pressure in combination with shear or friction.^[3]

The formation and development of pressure ulcers are complex and multifactorial. Loss of sensory perception, impaired level of consciousness, and decreased mobility

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are the most important causes of pressure ulcer formation because the patients do not feel uncomfortable and thus do not take any action to relieve pressure.^[4] Both external and internal factors work simultaneously and form these ulcers. The external factors, pressure, friction, shear, and humidity, as well as the internal factors including fever, malnutrition, anemia, and endothelial dysfunction accelerate the process of these lesions.^[5]

Moreover, the patients admitted to the intensive care unit (ICU) are limited and immobile due to taking sedatives or continuous and long-term mechanical ventilation in the bed, leading to increased risk of skin damage in these patients.^[6] The skin of patients admitted to the ICU is vulnerable during the first 1 or 2 days of hospitalization, and the onset of damage to the skin of these patients occurs in this period,^[7] and it can be said that pressure ulcer is an important complication for the patients admitted to the ICU.^[8]

Pressure ulcers are still considered as a major problem in many countries, which lead to significant human and financial costs that are associated with long-term treatment for these patients.^[9,10] Pressure ulcers and delays in the healing process not only reduce the patients' quality of life but also can worsen the patients' general conditions and have adverse effects on treatment outcomes.^[11] Regarding the serious problems caused by pressure ulcer, it is of great importance to prevent the formation of pressure ulcer in the first place and then to prevent the prolongation of the ulcer healing process.^[12,13] However, managing these ulcers is difficult since there has been no specific standard treatment and diet to treat pressure ulcers,^[14] and it seems that different available treatments and experiences to treat pressure ulcers need to be examined.

Silver sulfadiazine (SSD) is a very applicable silver formulation, especially in the treatment of Grade 2 burns.^[15] The usefulness of silver in the treatment of ulcers has been considered since 69 Before Christ.^[16] Silver ion (Ag^+) binds to DNA, RNA, and different proteins and causes cell death through a variety of mechanisms.^[17] This mechanism turns the silver ion to have a wide range of antimicrobials and to be considered toxic to bacteria, fungi, yeasts, and viruses.^[18] There is little research reporting silver ion resistance.^[19-21] Definitive and selective use of silver in ulcer care helps accelerate healing; it is especially useful as a supplement for surgical debridement in treating infected and smelly ulcers.^[22]

Sucralfate comprises aluminum hydroxide and sulfated sucrose. Sucralfate has been used as a protective factor in

the treatment of gastrointestinal ulcers for more than three decades, which makes a uniform protective barrier on the mucosa after consumption.^[23-29] Sucralfate has antimicrobial and antioxidant effects.^[30,31] Studies showed that the topical use of sucralfate is useful in recovering ulcers in different conditions including skin redness caused by radiography,^[32] oral mucositis,^[33] chronic venous ulcers,^[34] Grades 2 and 3 burns,^[35] diaper dermatitis,^[36,37] anal fistulotomy ulcers,^[38] and hemorrhoidectomy.^[39-41] Sucralfate seems to improve ulcers by various mechanisms. It also increases epidermal growth factor and the concentration of the basic fibroblast growth factor (bFGF) in the ulcer. Sucralfate binds to bFGF and stabilizes it in a similar way as heparin. The stabilized bFGF stimulates the formation of small blood vessels and activates cell division and fibroblast and epidermal cells.^[43-45] It also stimulates prostaglandin E2 (PGE2) and subsequently increases blood flow and epidermal growth factor, which can lead to angiogenesis.^[46]

The aim of this study is to report a case of pressure ulcer healing with topical daily use of sucralfate and silver sulfadiazine.

CASE REPORT

The patient was a 60-year-old male with a history of heroin use and hepatitis C, who was admitted to the ICU in February 2018 for 1 month, intubated and breathing under a ventilator, due to overdose with heroin and the subsequent loss of consciousness. During the hospitalization in the ICU, a Grade 4 pressure ulcer measuring 15 cm × 15 cm with 4 cm deep and exudate secretion and discoloration to yellow (ancestral tissue) with necrotic tissue around the ulcer was formed in the patient's sacrum area [Figure 1]. The ulcer was dressed daily with silver sulfate ointment and sterile gauze during the stay in the ICU, but there was no recovery.

In the ICU, routine nursing care was performed including the use of a wavy mattress, position change, and wound dressing.

After increasing the patient's level of consciousness and transferring to the hospital ward, the necrotic tissue of the ulcer was debrided and washed daily with normal saline and coated with 2 g of sucralfate tablets (4 tablets of 500 mg) dissolved in 5 cc of distilled water and mixed with 15 g of silver sulfate ointment (Emad Pharmaceutical Company) and was finally bandaged with sterile gauze and band-aids. Moreover, a daily supplement of one multivitamin tablet and one weekly Vitamin D3 5000 were given to the patient with the start of this dressing due to the patient's cachexia and malnutrition [Figure 2]. Wound debridement and

dressing were performed by a trained nurse in the inpatient ward. Written consent was obtained from the patient's family before initiating the procedure.

The Pressure Ulcer Scale for Healing was used to assess the ulcer healing. The ulcer, after 40 days, changed to Grade 2 measuring 5 cm × 5 cm and with pink color (granular tissue enclosed with epithelial tissue) on the skin [Figure 3]. The patient was discharged with a daily dressing replacement prescription.

The Braden score for discharge to assess the risk of pressure ulcers was 9 on the 1st day and 15 on the 40th day. All patient risk factors were evaluated and controlled.

To calculate the size of the ulcer, the largest diameter and largest width were measured by a centimeter ruler and then multiplied to obtain the total area. The amount of exudate was estimated after removing the dressing and before using any topical material. The type of tissue in the ulcer was determined according to the National Pressure Ulcer Advisory Panel.^[3]

DISCUSSION

This was a case report of pressure ulcer healing with sucralfate and silver sulfadiazine. Pressure ulcer is formed due to immobility and decreased level of consciousness in the ICU. In 67%–78% of patients with pressure ulcer, the ulcer is formed in the sacral area.^[9,40] In this case, the pressure ulcer was formed in the patient's sacrum area.

A variety of methods such as using disinfectants, biological factors, adjuvant therapies (vacuum therapy, electric current, ultrasound, electromagnetic therapy, low-level laser, ultraviolet, or monochromatic phototherapy),^[47-49] and therapeutic factors such as collagenase, phenytoin, and fibrinolysin, desoxyribonuclease, and sildenafil^[50-53] were used to prevent and improve pressure ulcers. However, the results were not satisfactory, and the effective options must be examined.^[40] Contrary to the popular belief on keeping the ulcers dry, the ulcers are faster healed in a humid environment rather than being dried in the air. There are many mechanisms involved in this regard including facilitating cell migration, stimulating fibroblasts to secrete collagen, forming a proper substrate to transfer enzymes and hormones such as growth hormone, stimulating macrophages, and facilitating autolytic debridement.^[50]

Sucralfate has been used as a protective factor in the treatment of gastrointestinal ulcers.^[54] It is antimicrobial and antioxidant^[30,31] and causes PGE2 secretion and

subsequently blood flow and mucus formation and increases the production of epidermal growth factor, which can lead to angiogenesis.^[46] In addition, it is used in 7%–20% concentration to heal different ulcers such as skin reactions with erythematous,^[32] oral mucositis,^[33] chronic venous ulcers,^[34] Grades 2 and 3 burns,^[35] diaper dermatitis,^[36,37] anal fistulotomy ulcers,^[38,39] and hemorrhoidectomy ulcers,^[40-42] all indicating a good effect of topical sucralfate on healing ulcers and protecting the skin. Wynn *et al.* found the use of sucralfate useful and effective in any type of injury.^[55] Ala *et al.* in a study entitled as “Effectiveness of Topical Sucralfate in the Management of Pressure Ulcer in Hospitalized Patients,” used this medication in treating hospitalized patients' pressure ulcers. In this study, ulcer healing in the sucralfate group was more than the control group, but there was no statistically significant.^[56]

In the present study, silver sulfadiazine was used besides sucralfate, the antimicrobial effect of which on the ulcers is obvious. The adjuvant use of silver sulfadiazine in pressure ulcers as a microbial load reducer has been used in other studies.^[22] However, it must be mentioned that the use of this medication in noninfectious ulcers can cause skin dermatitis, antibiotic resistance, and delayed recovery; thus, the noninfectious first and second degree pressure ulcers should not be dressed with silver sulfadiazine ointment.^[57] It was used, in the present study, in Grade 4 and infectious pressure ulcer.

Limitations of this study include the use of multivitamin tablets and Vitamin D3 5000 tablets in addition to sucralfate, which are not ineffective in the healing process.

CONCLUSION

Examining this case, it was revealed that using sucralfate as daily 2 g with silver sulfadiazine on the ulcer can have positive therapeutic effects and cause pressure healing process. It should be noted that proper nutrition and vitamins and minerals play a key role in healing ulcers and are considered as other important factors in the prevention and treatment of pressure ulcers. This issue can be considered in treating ulcers.

Conflicts of interest

There are no conflicts of interest.

Authors' contributions

Yasaman Pourandish: Data Curation, Writing - Original Draft Fatemeh Mehrabi: Conceptualization, Methodology, Writing, Reviewing, and Editing, Supervision. Nima Abbasi veldani: Data Curation. Reza Mansouri Tabar:

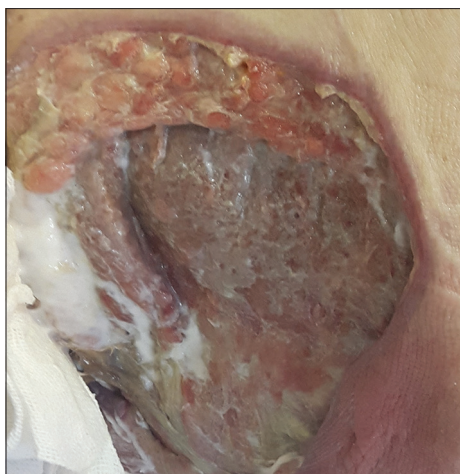


Figure 1: Clinical appearance of the pressure ulcer before using sucralfate



Figure 2: Clinical appearance of the pressure ulcer on the 30th of using sucralfate



Figure 3: Clinical appearance of the pressure ulcer on the 40th of using sucralfate

Data Curation. All authors read and approved the final manuscript for submission.

Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent forms. In the form the patient(s) has/have given his/her/their consent for his/her/their images and other clinical information to be reported in the journal. The patients understand that their names and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

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