Original Research Article

Comparing the Efficacy of Topical Sucralfate versus Silver Sulfadiazine in management of Burns

Tejashwini B[1], MD Shakeel[2], Vaibhav P Nagurkar[1]

1. Junior resident . Department of General Surgery Navodaya Medical College Raichur
2. Professor. Department of General Surgery. Navodaya Medical College Raichur

Received: 19-06-2026 /Accepted: 22-06-2026/ Published: 26/06/2026
Corresponding author: Dr Tejashwini B
Conflict of interest: Nil

ABSTRACT

Background:

Second-degree superficial burns constitute a substantial proportion of burn injuries and require effective topical therapy to promote wound healing, prevent infection, reduce pain, and improve functional and cosmetic outcomes. Although silver sulfadiazine (SSD) has traditionally been considered the standard topical agent, concerns regarding delayed epithelialization have prompted evaluation of alternative agents such as topical sucralfate.

Materials and Methods:

This prospective comparative clinical study was conducted in the Department of General Surgery over a period of 18 months. Sixty patients with second-degree superficial burns involving ≤40% total body surface area were enrolled and randomly allocated into two equal groups: Group A received topical sucralfate and Group B received 1% silver sulfadiazine. Patients were assessed for time to granulation tissue formation, time to complete wound healing, wound infection, pain score, duration of hospital stay, and scar quality. Statistical analysis was performed using the independent t-test and Chi-square test, with a p-value of <0.05 considered statistically significant.

Results:

The mean age of the study population was 43.8 ± 11.2 years, with females accounting for 56.7% of cases. Granulation tissue appeared significantly earlier in the sucralfate group compared with the SSD group (5.07 ± 0.78 vs. 8.17 ± 0.75 days; $p<0.001$). Complete wound healing occurred faster with sucralfate (12.20 ± 0.81 vs. 15.00 ± 0.91 days; $p<0.001$). Patients treated with sucralfate had significantly lower pain scores (2.63 ± 0.49 vs. 4.43 ± 0.50; $p<0.001$) and shorter hospital stay (8.03 ± 0.89 vs. 11.03 ± 0.81 days; $p<0.001$). Although wound infection rates were lower in the sucralfate group (16.7% vs. 26.7%), the difference was not statistically significant ($p=0.531$). Scar quality was significantly superior in the sucralfate group, with all patients demonstrating excellent or good outcomes ($p<0.001$).

Conclusion:

Topical sucralfate was found to be superior to silver sulfadiazine in the management of second-degree superficial burns. It significantly accelerated wound healing, reduced pain, shortened hospitalization, and improved scar quality while providing comparable infection control. Topical sucralfate may therefore be considered an effective and safe alternative to conventional silver sulfadiazine in superficial partial-thickness burns.

Keywords: Second-degree superficial burns; Sucralfate; Silver sulfadiazine; Wound healing; Granulation tissue; Pain score; Scar quality; Hospital stay.

Introduction

Burn injuries remain one of the most devastating forms of trauma worldwide and continue to pose a significant public health challenge. They are associated with considerable morbidity, prolonged hospitalization, functional disability, psychological distress, and mortality, particularly in low- and middle-income countries where access to specialized burn care is often limited [1]. Globally, millions of individuals sustain burn injuries each year, and a substantial proportion present with partial-thickness burns that require prolonged wound care and rehabilitation [2]. The resulting socioeconomic burden highlights the need for effective, affordable, and readily available treatment options.

Burn wound healing is a complex and dynamic process involving overlapping phases of inflammation, proliferation, angiogenesis, extracellular matrix remodeling, and re-epithelialization. Successful healing depends on

maintaining tissue viability and an optimal wound environment. Disruption of these processes may lead to delayed healing, infection, hypertrophic scarring, and long-term functional impairment. Therefore, appropriate topical therapy remains a cornerstone of conservative burn management.

Second-degree superficial burns, also known as superficial partial-thickness burns, constitute a large proportion of hospitalized burn injuries [2]. These injuries involve the epidermis and superficial dermis while preserving dermal appendages that facilitate spontaneous epithelial regeneration. However, inadequate wound management can compromise this regenerative capacity, resulting in delayed epithelialization, increased pain, infection, and prolonged hospital stay [2].Loss of the skin barrier following thermal injury predisposes wounds to microbial colonization, making infection a major contributor to burn-related morbidity and mortality [3]. Consequently, topical antimicrobial agents play a pivotal role in treatment. For decades, silver sulfadiazine has been regarded as the standard topical agent for partial-thickness burns because of its broad-spectrum antimicrobial activity against gram-positive and gram-negative bacteria and certain fungi. Its action is mediated through the release of silver ions that disrupt bacterial cell membranes and metabolic processes, while sulfadiazine inhibits microbial folate synthesis.Despite its widespread use, silver sulfadiazine has several limitations. Repeated application has been associated with delayed epithelialization, pseudo-eschar formation, and difficulty in assessing wound progression. Adverse effects such as hypersensitivity reactions, transient leukopenia, electrolyte disturbances, and systemic absorption in extensive burns have prompted the search for alternative agents that can enhance healing without compromising antimicrobial protection.

Sucralfate, an aluminium salt of sucrose octasulfate traditionally used in peptic ulcer disease, has emerged as a potential topical wound-healing agent [4]. When applied topically, sucralfate forms a protective barrier over injured tissue and binds growth factors, including epidermal growth factor and basic fibroblast growth factor. This promotes epithelial proliferation, angiogenesis, fibroblast migration, collagen synthesis, and granulation tissue formation. In addition, sucralfate exhibits mild antibacterial and anti-inflammatory properties that may improve patient comfort and wound healing outcomes [3].Clinical studies have reported faster epithelialization, enhanced granulation tissue formation, and reduced pain with sucralfate-based dressings compared with conventional therapies in partial-thickness burns [1]. Although silver sulfadiazine remains widely used, emerging evidence suggests that sucralfate may offer superior healing with fewer adverse effects [2]. However, methodological heterogeneity and limited sample sizes in existing studies preclude definitive conclusions. Therefore, the present study was undertaken to compare the efficacy of topical sucralfate and silver sulfadiazine in patients with second-degree superficial burns with respect to wound healing, granulation tissue formation, infection rates, and duration of hospital stay [5].

MATERIALS AND METHODS

The present study was conducted as a prospective, comparative, hospital-based clinical study to evaluate and compare the efficacy of topical sucralfate and silver sulfadiazine in the management of second-degree superficial burns.The study was carried out in the Department of General Surgery at a tertiary care teaching hospital.

Study Population

All patients presenting with second-degree superficial burns to the outpatient and inpatient services of the Department of General Surgery during the study period were screened for eligibility and considered for inclusion in the study.

Sample Size and Sampling Technique

A total of 60 patients fulfilling the eligibility criteria were enrolled in the study. The sample size was calculated using the formula:

$$n = 4pq/e^2$$

where:

p = prevalence = 85% (0.85)

q = 1 − p = 15% (0.15)

e = allowable error = 9.2% (0.092)

Accordingly,

$n = 4 \times 0.85 \times 0.15/(0.092)^2$

The calculated sample size was approximately 60 patients. Patients were allocated into two treatment groups using simple random sampling.

Group A (Sucralfate Group): 30 patients

Group B (Silver Sulfadiazine Group): 30 patients

Inclusion Criteria

Patients meeting the following criteria were included in the study:

Patients aged between 1 and 60 years.

- Patients diagnosed with second-degree superficial burns.
- Total body surface area (TBSA) involvement of ≤40%.
- Patients presenting within 24 hours of sustaining the burn injury.

- Patients willing to provide written informed consent.

Exclusion Criteria

- Patients fulfilling any of the following criteria were excluded from the study:
- Full-thickness burns.
- Chemical burns.
- Patients with diabetes mellitus, immunosuppression, or severe comorbid illnesses.
- Pregnant and lactating women.
- Patients with a known allergy to the study medications.

Intervention Protocol

Group A: Sucralfate Group

Following cleansing of the burn wound with normal saline, topical sucralfate paste was applied uniformly over the affected area once daily. The wound was subsequently covered with a sterile dressing.

Group B: Silver Sulfadiazine Group

After cleansing the wound with normal saline, 1% silver sulfadiazine cream was applied uniformly over the burn wound once daily, followed by sterile dressing.

Concomitant Treatment

- All patients received standard burn care in accordance with institutional protocols, including:
- Intravenous fluid therapy as indicated.
- Analgesics for pain control.
- Tetanus prophylaxis.
- Systemic antibiotics when clinically indicated.

Outcome Measures

Primary Outcome

The primary outcome measure was:

Time to complete wound healing, defined as the duration required for complete epithelialization of the burn wound, expressed in days.

Secondary Outcomes

The secondary outcome measures included:

- Time to appearance of healthy granulation tissue.
- Incidence of wound infection.
- Duration of hospital stay.
- Scar quality assessed during follow-up.

Assessment and Follow-Up

The burn wounds were assessed daily throughout hospitalization. Clinical signs suggestive of wound infection were documented systematically. Healing progress was recorded using a standardized proforma, and patients were followed until complete epithelialization of the wound was achieved. Scar quality was evaluated during the follow-up period.

Statistical Analysis

The collected data were entered into Microsoft Excel and analyzed using Statistical Package for the Social Sciences (SPSS) software version 27.0. Continuous variables were expressed as mean ± standard deviation, whereas categorical variables were presented as frequencies and percentages. Comparisons between the two groups for continuous variables were performed using the independent Student's t-test. Categorical variables were analyzed using the Chi-square test or Fisher's exact test wherever appropriate. A p-value of less than 0.05 was considered statistically significant.

Ethical Considerations

Approval for the study was obtained from the Institutional Ethics Committee prior to commencement of the study. Written informed consent was obtained from all participants or their legally authorized representatives before enrollment. Confidentiality and anonymity of patient information were maintained throughout the study in accordance with ethical principles governing biomedical research.

Results:

A total of 60 patients diagnosed with second-degree superficial burns were included in the present comparative clinical study. Patients were randomly allocated into two equal groups comprising 30 patients each: Group A (Topical Sucralfate) and Group B (Silver Sulfadiazine). All patients completed treatment and follow-up. Statistical analysis was performed using the independent t-test for continuous variables and the Chi-square test for categorical variables. A p-value of <0.05 was considered statistically significant.

The baseline demographic and clinical characteristics of the study population are summarized in Table 1 and illustrated in Figure 1. The majority of patients belonged to the 50–60 years age group (31.7%), followed by the 40–49 years age group (25.0%). Females constituted 56.7% of the study population, while males accounted for 43.3%. Regarding burn severity, 26.7% of patients had 16–20% TBSA involvement, which represented the largest subgroup. Flame burns were the most common etiology (36.7%), followed by electrical burns (33.3%) and scald injuries (30.0%). These findings indicate that the study population had a balanced distribution of demographic and burn-related characteristics (Table 1; Figure 1).

The comparison of wound healing outcomes between the two treatment groups is presented in Table 2 and depicted in Figure 2. Patients treated with topical sucralfate demonstrated significantly earlier granulation tissue formation (5.07 ± 0.78 days) compared with those receiving silver sulfadiazine (8.17 ± 0.75 days) ($t = 16.02$, $p < 0.001$). Similarly, the mean time to complete wound healing was significantly shorter in the sucralfate group (12.20 ± 0.81 days) than in the silver sulfadiazine group (15.00 ± 0.91 days) ($t = 13.15$, $p < 0.001$). The duration of hospital stay was also significantly reduced among patients treated with sucralfate (8.03 ± 0.89 days versus 11.03 ± 0.81 days; $t = 13.65$, $p < 0.001$) (Table 2; Figure 2).

The comparison of wound infection rates and pain scores between the two groups is shown in Table 3. Wound infection was observed in 16.7% of patients in the sucralfate group and 26.7% of patients in the silver sulfadiazine group. Although the infection rate was lower among patients receiving sucralfate, the difference was not statistically significant ($\chi^2 = 0.39$, $p = 0.531$). In contrast, pain scores assessed on Day 3 were significantly lower in the sucralfate group (2.63 ± 0.49) compared with the silver sulfadiazine group (4.43 ± 0.50), demonstrating a significant advantage of sucralfate in reducing dressing-related discomfort ($t = 14.06$, $p < 0.001$) (Table 3).Scar quality outcomes are presented in Table 4. In the sucralfate group, 50.0% of patients achieved excellent scar outcomes and the remaining 50.0% demonstrated good scar quality. In contrast, none of the patients in the silver sulfadiazine group had excellent scar outcomes; 43.3% had good scars, 20.0% had fair scars, and 36.7% had poor scar quality. The difference between the groups was highly statistically significant ($\chi^2 = 27.40$, $p < 0.001$), indicating superior cosmetic and functional scar outcomes with topical sucralfate (Table 4).

Table 1. Baseline Characteristics of the Study Population (n = 60).

Parameter	Category	Number (%)
Age Group (years)	18–29	12 (20.0)
	30–39	14 (23.3)
	40–49	15 (25.0)
	50–60	19 (31.7)
Sex	Male	26 (43.3)
	Female	34 (56.7)
TBSA (%)	≤10	14 (23.3)
	11–15	15 (25.0)
	16–20	16 (26.7)
	21–25	15 (25.0)
Cause of Burn	Flame	22 (36.7)
	Electrical	20 (33.3)
	Scald	18 (30.0)

Table 2. Comparison of Wound Healing Outcomes Between Study Groups

Outcome	Sucralfate Group (n=30)	SSD Group (n=30)	Statistical Value	p-value
Days to Granulation Tissue Formation	5.07 ± 0.78	8.17 ± 0.75	t = 16.02	<0.001
Days to Complete Wound Healing	12.20 ± 0.81	15.00 ± 0.91	t = 13.15	<0.001
Duration of Hospital Stay (days)	8.03 ± 0.89	11.03 ± 0.81	t = 13.65	<0.001

Table 3. Comparison of Wound Infection and Pain Scores Between Study Groups

Parameter	Sucralfate Group (n=30)	SSD Group (n=30)	Statistical Value	p-value
Wound Infection			$\chi^2 = 0.39$	0.531
Present	5 (16.7%)	8 (26.7%)		
Absent	25 (83.3%)	22 (73.3%)		
Pain Score (Day 3)	2.63 ± 0.49	4.43 ± 0.50	t = 14.06	<0.001

Table 4. Comparison of Scar Quality Between Study Groups

Scar Grade	Sucralfate Group (n=30)	SSD Group (n=30)
Excellent	15 (50.0%)	0 (0.0%)
Good	15 (50.0%)	13 (43.3%)
Fair	0 (0.0%)	6 (20.0%)
Poor	0 (0.0%)	11 (36.7%)
Statistical Test	$\chi^2 = 27.40$	$p < 0.001$

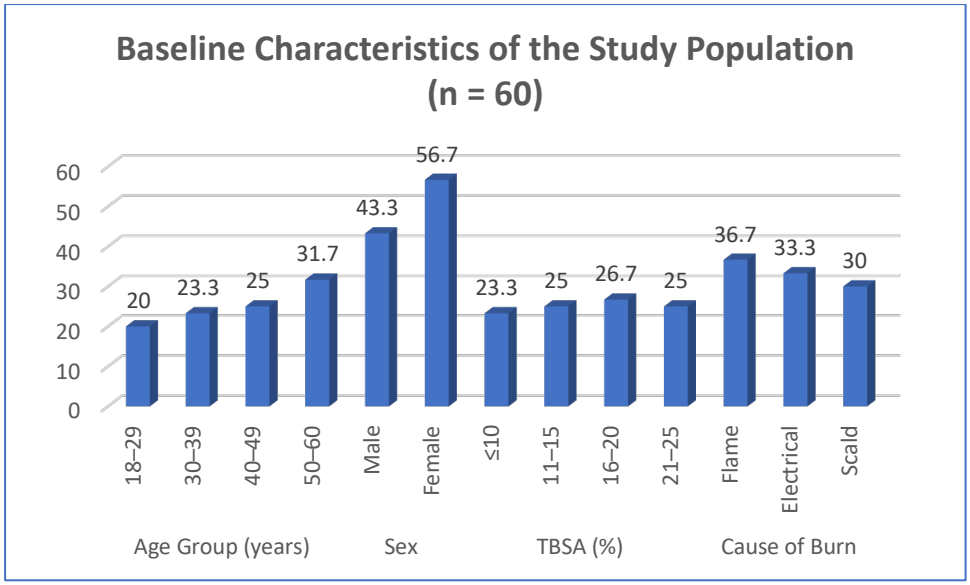

Figure 1 Baseline Characteristics of the Study Population (n = 60)

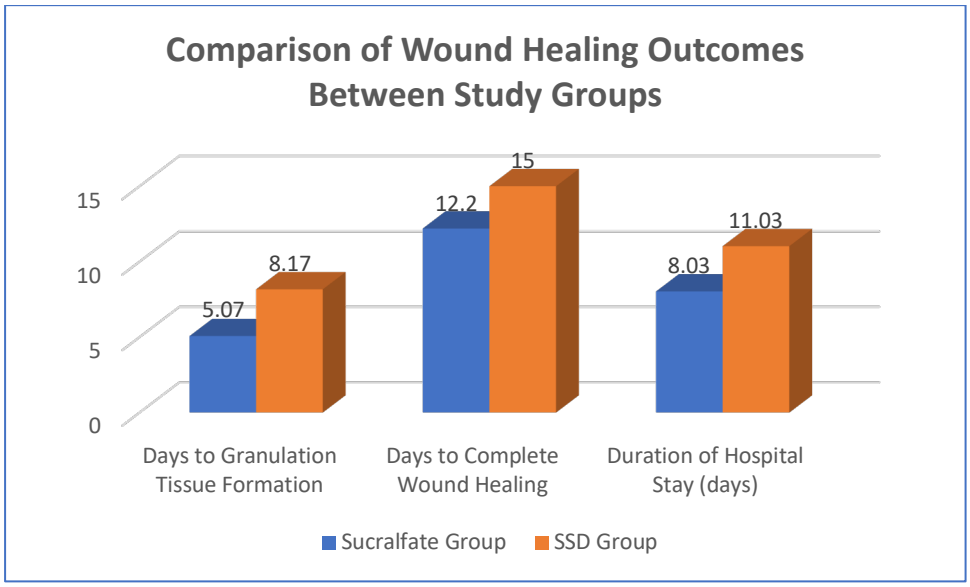

Figure 2 Comparison of Wound Healing Outcomes Between Study Groups

Discussion:

The present prospective comparative clinical study evaluated the efficacy of topical sucralfate and silver sulfadiazine (SSD) in the management of second-degree superficial burns in 60 patients equally divided into two groups. The findings demonstrated that topical sucralfate resulted in faster wound healing, reduced pain, shorter hospital stay, and superior scar quality compared with SSD.The mean age of the study population was 43.8 ± 11.2 years, with most patients belonging to the 50–60 years age group, and females constituted 56.7% of cases. Similar demographic patterns were reported by Godhi et al. [1], who observed female predominance among burn patients due to increased domestic exposure. Koshariya et al. [2] also noted that adults represented the majority of patients with partial-thickness burns. The mean total body surface area (TBSA) involvement in our study was 15.9 ± 4.6%, predominantly involving 16–20% TBSA. Flame burns were the commonest etiology, consistent with

the observations of Osmokrovic et al. [6].A major finding of the present study was significantly earlier granulation tissue formation with sucralfate (5.07 ± 0.78 days) compared with SSD (8.17 ± 0.75 days; p<0.001). Similar results were reported by Godhi et al. [1] and Koshariya et al. [2]. The beneficial effect of sucralfate may be explained by its ability to bind epidermal and fibroblast growth factors, thereby enhancing angiogenesis and collagen synthesis, as described by Accorroni et al. [4]. Conversely, Pletts et al. [7] suggested that SSD may delay healing because of its cytotoxic effects on keratinocytes and fibroblasts.Complete wound healing occurred significantly earlier in the sucralfate group (12.20 ± 0.81 days) than in the SSD group (15.00 ± 0.91 days; p<0.001). These findings corroborate those of Godhi et al. [1], Koshariya et al. [2], and the comparative study of 7% sucralfate versus 1% SSD [3], all of which demonstrated accelerated epithelialization with sucralfate.Although wound infection rates were lower with sucralfate (16.7%) than SSD (26.7%), the difference was not statistically significant (p=0.531). Similar trends were observed by Godhi et al. [1] and Koshariya et al. [2], indicating that sucralfate provides infection control comparable to SSD while preserving tissue regeneration.Pain scores on Day 3 were significantly lower in the sucralfate group (2.63 ± 0.49 vs. 4.43 ± 0.50; p<0.001). Godhi et al. [1] and Koshariya et al. [2] similarly reported improved patient comfort with sucralfate, while Holbert et al. [8] emphasized the importance of minimizing dressing-related trauma to improve patient satisfaction.Patients treated with sucralfate had significantly shorter hospital stays (8.03 ± 0.89 vs. 11.03 ± 0.81 days; p<0.001), a finding also reported by Godhi et al. [1]. Stoica et al. [9] highlighted that early epithelialization reduces complications and the need for prolonged hospitalization.Scar outcomes were markedly better with sucralfate, with all patients achieving excellent or good scars compared with 56.7% of SSD-treated patients developing fair or poor scars (p<0.001). Improved collagen remodeling with sucralfate has been documented by Bernardes et al. [10] and Naomi et al. [11], whereas Pletts et al. [7] associated delayed healing with poorer scar formation.Overall, the present study supports the findings of Godhi et al. [1], Koshariya et al. [2], Accorroni et al. [4], and other investigators, demonstrating that topical sucralfate offers significant clinical advantages over SSD and may represent a superior option for the conservative management of superficial second-degree burns.

Conclusion

The present study demonstrated that topical sucralfate is superior to silver sulfadiazine in the management of second-degree superficial burns. Sucralfate significantly accelerated granulation tissue formation and complete wound healing, reduced pain scores, shortened the duration of hospital stay, and resulted in better scar quality. Although the reduction in wound infection rates did not reach statistical significance, sucralfate provided infection control comparable to silver sulfadiazine. Therefore, topical sucralfate may be considered an effective, safe, and cost-effective alternative to conventional silver sulfadiazine for the conservative treatment of superficial partial-thickness burns.

Limitations of the study

The present study was limited by its relatively small sample size and single-center design, which may restrict the generalizability of the findings. Long-term follow-up for assessment of scar maturation and functional outcomes was not performed. In addition, microbiological culture assessment was not carried out uniformly in all patients, and histopathological evaluation of wound healing was not undertaken. Larger multicentric randomized studies with extended follow-up are required to validate these findings.

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