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A COMPARATIVE STUDY OF TWO DRESSING MATERIALS (PARAFFIN GAUZE VS. POVIDONE-IODINE FOAM) FOR DONOR SITES IN SPLIT-THICKNESS SKIN GRAFTS: EVALUATION OF

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ABSTRACT

Objective: To compare the effectiveness of paraffin gauze and povidone-iodine foam dressings for donor-site management following split-thickness skin grafting in terms of reepithelialization and pain.

Methods: This randomized controlled trial was conducted at the Department of Plastic Surgery, Shaheed Mohtarma Benazir Bhutto Institute of Trauma, Karachi. A total of 82 patients aged 18–75 years undergoing split-thickness skin grafting were randomized into paraffin gauze (n=41) and povidone-iodine foam (n=41) groups. Donor sites were assessed for complete reepithelialization, time to wound healing, pain using the Visual Analog Scale (VAS), and wound-related complications over a 14-day follow-up period. Data were analyzed using SPSS version 22, and a p-value ≤ 0.05 was considered statistically significant.

Results: The mean age of participants was 42.8 ± 13.4 years, and 64.6% were male. The mean time to complete reepithelialization was significantly shorter in the povidone-iodine foam group than in the paraffin gauze group (11.93 ± 2.48 vs. 14.68 ± 3.11 days; $p<0.001$). Complete reepithelialization by day 14 was achieved in 90.2% and 70.7% of patients, respectively ($p=0.025$). Pain scores were significantly lower in the povidone-iodine foam group throughout follow-up ($p<0.001$). No donor-site infections were observed. Mild inflammatory signs occurred in 14.6% of patients receiving povidone-iodine foam and 22.0% receiving paraffin gauze ($p=0.384$).

Conclusion: Povidone-iodine foam dressing provided faster healing, higher rates of complete reepithelialization, and lower pain scores than paraffin gauze, making it a more effective option for donor-site management following split-thickness skin grafting.

KEYWORDS: Split-thickness skin graft, donor site dressing, paraffin gauze, povidone-iodine foam, reepithelialization, pain.

INTRODUCTION

A Split-Thickness Skin Graft (STSG) is one of the commonly performed reconstructive procedures in the management of various skin and soft tissue defects due to trauma, burns, chronic ulcers, infections, and surgical excision of tumors (1). This technique extracts the epidermis and partial dermis from the donor site and transfers them to the recipient wound. Even though graft take and recipient-site healing typically garner the most attention, the donor site itself is a secondary wound that demands a similar level of care. Delayed healing, pain, infection, excessive exudation, and scarring at the donor site may have a negative impact on patient recovery and increase hospital stay and treatment expenses (2).

Trauma and burn injuries continue to pose an important global public health problem. As stated by the World Health Organization (WHO), injuries represent around 4.4 million deaths per year, or almost 8% of the overall mortality in the world. In relation to burn injuries, these are directly responsible for around 180,000 deaths each year, with more than 90% of these occurring in low- and middle-income countries. Additionally, a number of other burn and trauma injuries that do not result in fatalities need reconstructive procedures such as skin grafts, creating a high healthcare burden globally (3, 4).

It is estimated that Pakistan has a huge burden of trauma and burn injuries. Road traffic accidents account for approximately 25–30% of patients with trauma nationally, and burns account for a significant number of emergency admissions in plastic surgery and burn care units. Tertiary care hospitals in Pakistan have shown that over 60% of burn patients are young male adults, with a considerable number of these patients needing skin grafting procedures for wound closure. As rates of reconstructive surgery per annum increase, optimally managing the wound at the donor site is an important clinical goal (5).

An optimal dressing for use on a donor site seems to need to aid reepithelialization as quickly as possible while causing minimal pain, risk of infection, and/or exudate with relative ease of availability and cost. Various dressing products have been studied for the management of donor sites, including paraffin gauze, hydrocolloids, alginates, polyurethane foams, and antimicrobial dressings. Although too old and does not mean being outdated, paraffin gauze stays one of the most regularly used classic dressings for its affordable fee and moisture availability. In comparison, povidone-iodine foam dressing creates a moist environment for wound healing with broad-spectrum antimicrobial properties (6). CS Pak and colleagues reported full epithelialization by day 14 in 83.9% of sites treated with povidone-iodine foam compared with 55.9% of those treated with petrolatum gauze (7). These findings are promising, but evidence comparing paraffin gauze and povidone-iodine foam is still relatively scant, especially in South Asian populations. In addition, Pakistani data is especially limited. Hence, this randomized controlled trial aimed at comparing the rates of reepithelialization and pain in patients undergoing split-thickness skin grafting with paraffin gauze and povidone-iodine foam dressings to obtain local evidence for the optimal management of donor-site dressing to improve postoperative outcomes.

MATERIALS AND METHODS

2.1 | Study design and participants

After obtaining approval from the Institutional Review Board **(IRB Ref: IRB-000195/SMBBIT/ Approval/2025) 26 Sep 2025**, this prospective, randomized controlled trial was performed in the Department of **Plastic Surgery, Shaheed Mohtarma Benazir Bhutto Institute of Trauma (SMBBIT), Karachi**. The study was also registered at Clinical Trials. Gov. (Identifier: **NCT07257991**). This was a Three month study, started after approval of the research synopsis CPSP from **20th December 2025** to **29th March 2026**. Preoperative Evaluation: Patients who were scheduled to undergo split-thickness skin grafting were assessed for eligibility during the preoperative evaluation. The main inclusion criteria were being 18 to 75 years old, both sexes, and planned harvest of split-thickness skin grafts with a donor-site area of 25 to 200 cm^2. Patients with any disease that is known to impair wound healing (i.e., diabetes mellitus, collagen vascular disorders, chronic skin diseases, or malignancy), a history of steroid or immunosuppressive therapy, hypersensitivity to the dressing material used in the study, or pregnancy or lactation were excluded. All participants provided written informed consent before enrollment.

The sample size was determined using the World Health Organization (WHO) sample size calculator, at a 5% level of significance, 80% power, and assuming an effectiveness of 70.5% for paraffin mesh gauze dressing and 83.87% for povidone-iodine foam dressing (7). This sample size required a total sample size of 82 patients (41 per treatment group).

2.2 | Treatment allocation and schedule

Eligible subjects were assigned randomly in a 1:1 ratio, either to paraffin mesh gauze dressing (PG group), or to povidone-iodine foam dressing (PI group). Fixed randomized block for treatment groups. Due to the nature of the interventions, the treatment allocation was not blinded for the operating team.

Split thickness skin grafts were harvested using a dermatome, and the thickness was ensured by the calibration scale on the tool. Donor-site characteristics (size, depth, anatomical location) were recorded immediately after graft harvesting.

(Group PG) Donor sites were covered with paraffin mesh gauze and secured with standard secondary dressings. Dressing changes were conducted as clinically needed until healing or completion of follow-up.

In Group PI, an initial application of a layer of paraffin mesh gauze was placed directly over the donor site, followed by polyurethane foam soaked in 3% povidone-iodine solution and a second securing dressing. The paraffin mesh interface was applied to prevent adherence of the polyurethane foam to the wound surface and to assist with atraumatic dressing removal during follow-up visits. Dressing changes were performed clinically as necessary until complete healing or the end of follow-up.

Participants were run through 14 days of monitoring after donor-site harvest. Dressing changes were done clinically if required or until full epithelialization occurred.

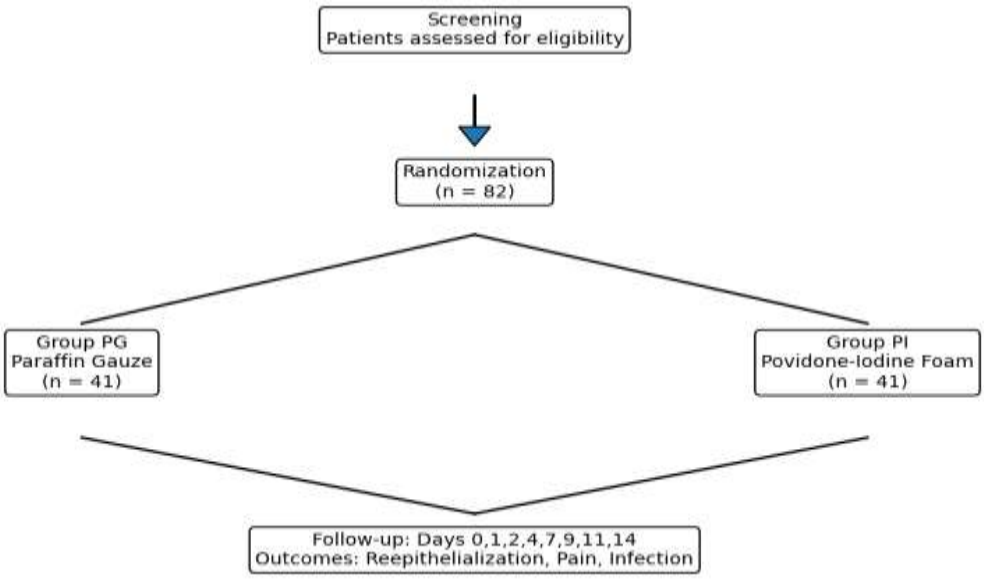


Figure 1. Study design and follow-up schedule.

Patients undergoing split-thickness skin grafting were screened for eligibility and randomized in a 1:1 ratio to paraffin gauze dressing (Group PG) or povidone-iodine foam dressing (Group PI). Participants were followed for 14 days after donor-site harvest. Outcomes assessed included complete reepithelialization, time to wound healing, pain scores, and wound-related complications.

2.3 | Study assessments and endpoints

Demographic and clinical variables collected at study enrollment included age, gender, body mass index (BMI), graft size, graft thickness, and location of graft harvest. BMI was calculated as kg/m² (weight/height²).

Complete reepithelialization of the donor site at postoperative day 14 was the main efficacy endpoint. The primary endpoint was complete reepithelialization, defined as full epithelial coverage of the donor-site wound without any residual raw area and assessed through direct clinical examination by a blinded consultant plastic surgeon to treatment allocation.

Other NHS outcome measures included secondary efficacy endpoints such as pain at the donor site and time to complete wound healing. Pain was scored with a 10-point Visual Analog Scale (VAS), a zero on which indicated no pain, and the number 10 was the worst pain imaginable. During the follow-up, we also monitored the donor sites for wound infection, excessive exudation, bleeding, and other complications in wound healing.

Method: All the data were documented on a pre-formed proforma. To maintain confidentiality of patient information, study codes were assigned, and personal identifiers were removed from study-related documents.

2.4 | Statistical analyses

SPSS version 22 was used for data analysis. Quantitative variables such as age, BMI, donor-site size, donor-site depth, time to reepithelialization, and pain scores were summarized as mean ± standard deviation or median with interquartile range, according to the distribution of the data evaluation with the Shapiro–Wilk test. Sociodemographic and clinical variables, if applicable, were expressed as frequencies and percentages; categorical variables that are considered as risk factors, including gender, donor-site location, treatment group, wound infection, and complete reepithelialization status.

Treatment groups had comparable baseline demographic characteristics and study outcomes. For continuous variables, an independent-samples t-test or Mann–Whitney U test was used for comparison, and for categorical variables, a chi-square test or Fisher's exact test was employed for comparison, as appropriate. Subgroup analyses according to age, gender, BMI, donor-site size, donor-site depth, and donor-site location were conducted to assess possible effect modifiers. Statistical significance was defined by a two-sided p-value ≤ 0.05.

3 | RESULTS

3.1 | Patient disposition and baseline characteristics

A total of 92 patients were screened for study eligibility between **20th December 2025** to **29th March 2026**. Ten patients were excluded, including six who did not meet the inclusion criteria and four who declined participation. The remaining 82 eligible patients were randomized to either the paraffin gauze group (n = 41) or the povidone-iodine foam group (n = 41). All randomized patients received the allocated intervention and completed the 14-day follow-up

period. Therefore, all 82 participants were included in the final efficacy and safety analyses. The mean age of the study population was 42.8 ± 13.4 years, and 53 (64.6%) participants were male. The thigh was the most common donor-site location in both groups. Baseline demographic and donor-site characteristics were comparable between the treatment groups, with no statistically significant differences observed (Table 1).

Table 1. Demographic variables and baseline characteristics

Variable	Paraffin Gauze (*N*=41)	Povidone-Iodine Foam (*N*=41)	P-value
Age (years), mean ± SD	43.9 ± 13.1	41.7 ± 13.8	0.471
Male gender, n (%)	27 (65.9)	26 (63.4)	0.816
BMI (kg/m²), mean ± SD	25.8 ± 3.7	25.1 ± 3.5	0.389
Donor site size (cm²), mean ± SD	118.4 ± 42.7	115.9 ± 39.8	0.782
Donor site depth (inch), mean ± SD	0.012 ± 0.002	0.011 ± 0.002	0.265
Donor site location – Thigh, n (%)	36 (87.8)	35 (85.4)	0.748
Donor site location – Buttock, n (%)	5 (12.2)	6 (14.6)	0.748

3.2 | Reepithelialization and wound healing

Time to complete reepithelialization was significantly shorter in the povidone-iodine foam group compared with the paraffin gauze group (11.93 ± 2.48 days vs. 14.68 ± 3.11 days; P < 0.001) (Figure 3A). At postoperative day 14, complete reepithelialization was achieved in 37 of 41 patients (90.2%) in the povidone-iodine foam group compared with 29 of 41 patients (70.7%) in the paraffin gauze group (P = 0.025) (Figure 3B).

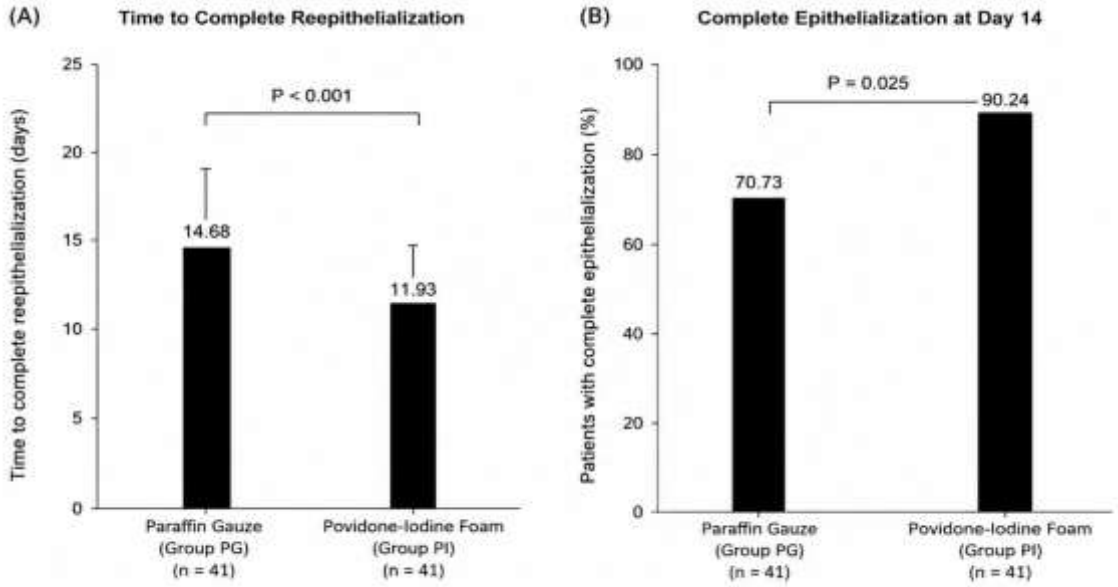


Figure 3A. Mean time to complete reepithelialization in the paraffin gauze and povidone-iodine foam groups. **Figure 3B.** Proportion of patients achieving complete reepithelialization by postoperative day 14 in the paraffin gauze and povidone-iodine foam groups.

No donor-site infections were observed in either treatment group during the study period. Minor inflammatory signs, predominantly pain and tenderness, were observed in 9 (22.0%) patients in the paraffin gauze group and 6 (14.6%) patients in the povidone-iodine foam group; however, the difference was not statistically significant (P = 0.384). Figure 2.

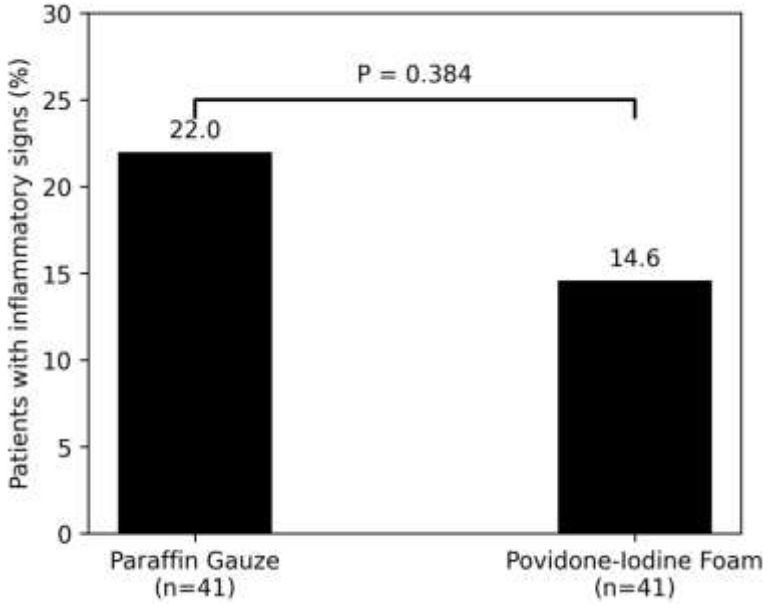
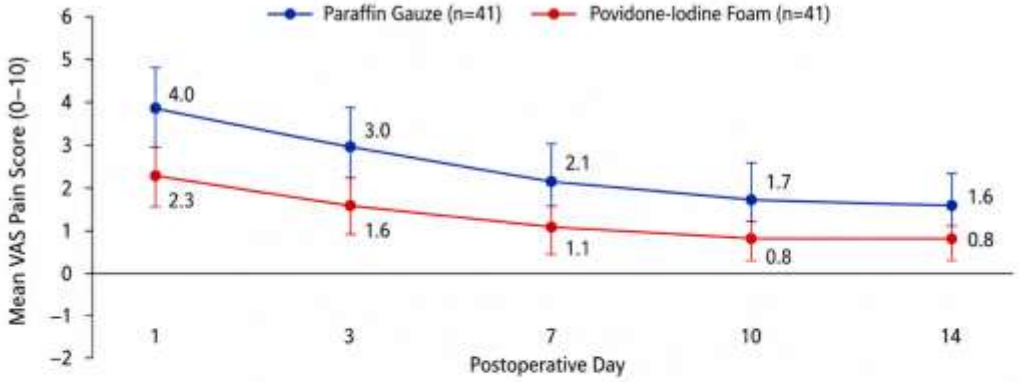


Figure 2. Frequency of inflammatory signs at donor sites in the paraffin gauze and povidone-iodine foam groups.

3.3 | Pain assessment

Mean pain scores progressively decreased in both groups throughout the follow-up period. However, patients treated with povidone-iodine foam reported consistently lower pain scores than those treated with paraffin gauze. On postoperative day 1, the mean VAS pain score was 6.3 ± 1.2 in the paraffin gauze group and 5.8 ± 1.1 in the povidone-iodine foam group (P = 0.048). By day 7, mean pain scores had decreased to 3.4 ± 1.1 and 2.5 ± 0.9, respectively (P < 0.001). On day 14, residual pain was significantly lower in the povidone-iodine foam group compared with the paraffin gauze group (0.8 ± 0.6 vs. 1.6 ± 0.8; P < 0.001). Figure 3.



Postoperative Day		1	3	7	10	14
Paraffin Gauze (n=41)	Mean ± SD	4.0 ± 1.2	3.0 ± 1.1	2.1 ± 1.0	1.7 ± 0.9	1.6 ± 0.8
	N	41	41	41	41	41
Povidone-Iodine Foam (n=41)	Mean ± SD	2.3 ± 1.1	1.6 ± 0.9	1.1 ± 0.6	0.8 ± 0.6	0.8 ± 0.6
	N	41	41	41	41	41

Values are mean ± standard deviation (SD). VAS, visual analogue scale (0–10 points, 0 = no pain and 10 = worst pain imaginable).

Figure 3. Mean VAS pain scores during follow-up in the paraffin gauze and povidone-iodine foam groups.

3.4 | Safety outcomes

Both dressing materials demonstrated favorable safety profiles. No serious adverse events, donor-site infections, or treatment-related complications requiring discontinuation of therapy were observed. Mild donor-site bleeding during dressing removal occurred in three patients (7.3%) in the paraffin gauze group and one patient (2.4%) in the povidone-

iodine foam group. Mild adherence of the dressing to the wound bed was observed more frequently in the paraffin gauze group (17.1%) than in the povidone-iodine foam group (4.9%). No participant withdrew from the study because of adverse events.

TABLE 2. Safety outcomes and donor-site complications

Safety Outcome	Paraffin Gauze (*N* = 41)	Povidone-Iodine Foam (*N* = 41)	P-value
Any adverse event, n (%)	10 (24.4)	5 (12.2)	0.154
Mild adverse events, n (%)	10 (24.4)	5 (12.2)	0.154
Moderate adverse events, n (%)	0 (0.0)	0 (0.0)	—
Severe adverse events, n (%)	0 (0.0)	0 (0.0)	—
Serious adverse events, n (%)	0 (0.0)	0 (0.0)	—
Adverse events resulting in withdrawal, n (%)	0 (0.0)	0 (0.0)	—
Donor-site infection, n (%)	0 (0.0)	0 (0.0)	—
Donor-site bleeding during dressing removal, n (%)	3 (7.3)	1 (2.4)	0.306
Dressing adherence to wound bed, n (%)	7 (17.1)	2 (4.9)	0.082
Treatment-related complications, n (%)	0 (0.0)	0 (0.0)	—

4 | DISCUSSION

This randomized controlled trial was conducted to assess the efficacy of paraffin gauze and povidone-iodine foam dressing methods for donor-site management after split-thickness skin grafting, focusing on reepithelialization and pain. We showed that patients with povidone-iodine foam dressing had significantly faster donor-site healing, earlier complete reepithelialization by postoperative day 14, and lower pain scores during the follow-up period compared with those treated with paraffin gauze. These results indicate povidone-iodine foam dressing as a feasible management for donor-site wound in patients following split-thickness skin graft.

The main result of this trial was total reepithelialization. Mean time to reepithelialization was significantly shorter in the povidone-iodine foam group compared with the paraffin gauze group (11.93 ± 2.48 days vs. 14.68 ± 3.11 days, $P < 0.001$). In a similar vein, significantly more patients in the povidone–iodine foam group exhibited complete reepithelialization at postoperative day 14 (90.2% vs. 70.7%, $P = 0.025$). These results correlate with the multicenter randomized trial in international studies, which found that in comparison with petrolatum gauze and hydrocellular foam dressings, there was a significant reduction of epithelialization time shown with the use of povidone-iodine foam dressing (8, 9). At day 14, the same authors noted that complete epithelialization was seen in 83.87% of the patients treated with povidone-iodine foam compared with 55.88% with petrolatum gauze. The results from the two studies may be similar due to the characteristics of povidone-iodine foam dressings sustaining a moist wound healing environment, in addition to having the ability to freely administer broad-spectrum antimicrobial activity. In particular, moist wound healing enhances keratinocyte migration, angiogenesis, and extracellular matrix synthesis to facilitate epithelial reconstruction (10).

Whilst there is little direct local literature comparing povidone-iodine foam against paraffin gauze dressings, several overseas studies comparing modern foam dressings against foreseen gauze-based dressings have shown improved healing outcomes. CY Ho et al. (11), Karlsson M et al. (12), and Demirtas et al. (13) compared moisture interaction dressings with standard donor-site dressings and showed that moisture interaction dressings were associated with higher rates of epithelialization and shorter healing times. The small differences in healing times reported from study to study could potentially be attributed to variations in donor-site size, graft thickness, patient population, follow-up schedules, and wound assessment methods. In addition, we applied a paraffin mesh interface under the polyurethane foam dressing, enabling painless and quick removal without adhering to the wound bed, which might have caused additional cellular damage during the healing process.

Another clinical outcome from skin graft harvest is pain alleviation. In the current study, patients treated with povidone-iodine foam dressing continuously reported lower VAS pain scores during follow-up, with statistically significant differences in VAS pain scores between the treatment groups noted as early as the early postoperative period. At day 14, the mean pain score in the povidone-iodine foam group was about 50% lower than that with paraffin gauze. These data are consistent with prior investigations showing reduced pain with foam-based dressings (14-16). Although reduced pain scores may occur from the use of foam dressings, this could be due to fewer mechanical factors like maintenance of a moist wound environment, prevention of wound desiccation resulting in exposed nerve endings, and potential trauma with the dressing change itself. Meanwhile, traditional gauze dressings may stick to the healing wound surface and cause discomfort and pain when removed (17, 18).

Throughout the study period, no donor-site infections occurred for either treatment group. This is an encouraging finding that is like the observations of Pak CS and colleagues, in whom no donor-site infections occurred among patients treated with povidone-iodine foam dressing (7). The low infection rate described in the presented study may be related to proper surgical technique, standardized postoperative wound care, and the relative health of our study population. Additionally, the antimicrobial properties of povidone-iodine, which likely added an additional protection against colonization, did not kill epithelial cells and compromise epithelialization (19).

Signs of inflammation, particularly pain and tenderness, were infrequently seen in the foam group as compared to the paraffin gauze group, but this difference was not statistically significant. Paraffin gauze was associated with more minor donor-site bleeding during dressing removal and more dressing adhering to the wound bed. These results are clinically relevant because atraumatic dressing removal enhances patient comfort and may minimize the risk of disrupting nascent epithelium. Paraffin mesh interface employed in the povidone-iodine foam group probably reduced the adherence of the polyurethane foam to the wound surface, and thus supported painless and comfortable dressing changes (20). Both dressing material types demonstrated an overall acceptable safety profile. Serious adverse events, treatment-related complications, and withdrawals because of adverse events were not reported. The results show that wounds adhered less to the wound bed and bled less when dressings were removed after use of povidone-iodine foam compared with conventional paraffin-impregnated gauze dressings, which may offer a practical benefit.

The current study presents several limitations. The study was limited by having been performed at a single tertiary care center and had a small sample size, making it less generalizable. Moreover, long-term cosmetic results, quality of scarring, patient satisfaction, and cost-effectiveness were not analyzed. These findings need to be confirmed in multicenter studies with larger patient populations and longer follow-up to assess long-term donor-site outcomes.

5 | CONCLUSION

Compared to paraffin gauze dressing, povidone-iodine foam dressing was associated with significantly improved donor-site healing, with faster reepithelialization, higher rates of complete healing by day 14, and lower pain scores. Both dressings were safe and well tolerated; however, povidone-iodine foam dressing led to significantly better overall clinical outcomes and may be preferred for the management of donor sites following split-thickness skin grafting.

Conflict of Interest: The authors declare no conflict of interest.

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