

Debridement and Infrequent Dry Dressing for Second Degree (Partial Thickness) Burn Wounds

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ABSTRACT

Background: Burns are among the most devastating of all injuries. Burn wounds are grouped into superficial (first degree), partial thickness (second degree), and full thickness (third degree) burn wounds. Whereas the burn wound treatment algorithm for superficial degree (first) and third degree (full thickness) burns is clearly defined, the management of mixed partial thickness burn wounds represents a debate between centers. This study aims to evaluate the debridement and infrequent dry dressing as a simple method for dressing for second degree burn wounds.

Methods: This interventional prospective study was conducted in a university hospital setting. We did the first dressing on admission. The second dressing was done after 24 hours. Vesicles (for superficial wounds) and any unhealthy tissue (for deep wounds) were debrided. Subsequent dressings were applied every four days.

Results: The results showed a rapid wound healing with a little number of dressing settings. This improves the general and psychological condition of the patient and gives a great chance for decreasing morbidity and mortality in cases of major burns and the patient's skin quickly becomes available as a donor site for skin graft.

Conclusion: Debridement and infrequent dry dressing is a simple, cost-effective method for dressing for second degree burn wounds. Healing with complete epithelization has been occurred in a short period.

Trial registration this article has been retrospectively registered by Mansoura University Hospital's Research Ethics Committee number R/16.05.02 in 11/06/2016.

Level of evidence level: IV, therapeutic study.

Key Words: Debridement – Dry – Dressing – Second degree – burns.

INTRODUCTION

Burns are among the most devastating of all injuries, with outcomes spanning the spectrum from physical impairments and disabilities to emotional and mental consequences [1].

The severity of a burn depends on surface area of the body affected and burn depth. Burns are classified based on how deep the tissue is burned.

They grouped into superficial (first degree), partial (second degree), and full (third degree) thickness burns. The epidermal layer of the skin is affected only in superficial thickness burn while partial thickness burn involves the epidermal layer as well as a varying thickness of the dermis. Thus, partial thickness burn can be further divided into superficial partial and deep partial thickness burns. Regarding a deep partial thickness burn, there is deep damage in the dermis involving sweat glands and hair follicles. Spontaneous healing occurs in superficial thickness and superficial partial thickness burn wounds if they do not become infected [2].

Partial thickness burn wounds are common injuries either due to flame or scald injuries. They are characterized by vesicles or bullae formation filled with clear fluid. These vesicles may still intact or become ruptured with evacuation of their contents.

In this study, we investigated a new method for dressing for second degree burn wounds. As such, it sought to develop a simple, easy and affordable method that could be beneficial for a large number of patients with second degree burn wounds, especially in developing countries that have limited available resources. None of the previous studies in the literature have proposed this method of dressing.

MATERIAL AND METHODS

Inclusion criteria:

The patients that were included in this study suffered from partial thickness burn wounds less than 25% of TBSA Figs. (1-3). Delayed cases were also included.

The study was approved by the Research Ethics Committee at our University Hospital. Informed consent was obtained from all the patients.

Exclusion criteria:

The following patients were excluded as study subjects:

- 1- Patients refuse.
- 2- Patients with partial thickness burn wounds more than 25% of TBSA.

Dressing:

First dressing (on admission) was done after good wash with normal saline and applied in layers as following: Sterile non-adherent layer (paraffin gauze), gauze moistened with betadine solution, dry gauze, cotton and crep bandage. Bulky layer of cotton was better used to allow absorption of wound exudates and prevent soaking. Adhesive tape was applied in thin strips to allow good aeration of the wound.

Dressing should be soaked with saline before removal.

The second dressing was done after 24 hours (second day after injury). Vesicles (for superficial wounds) and any unhealthy tissue (for deep wounds) were debrided. Debridement was better done with an instrument and avoid rubbing with a piece of gauze. Good wash with normal saline has been done and dressing was applied.

Subsequent dressings were applied every four days.

Cases with delayed presentation had undergone debridement then dressed with the same method.

The data were collected, computed, coded and analysed statistically using SPSS 16.0 software on Windows 7 to measure the mean time of healing and the mean number of dressing changes.

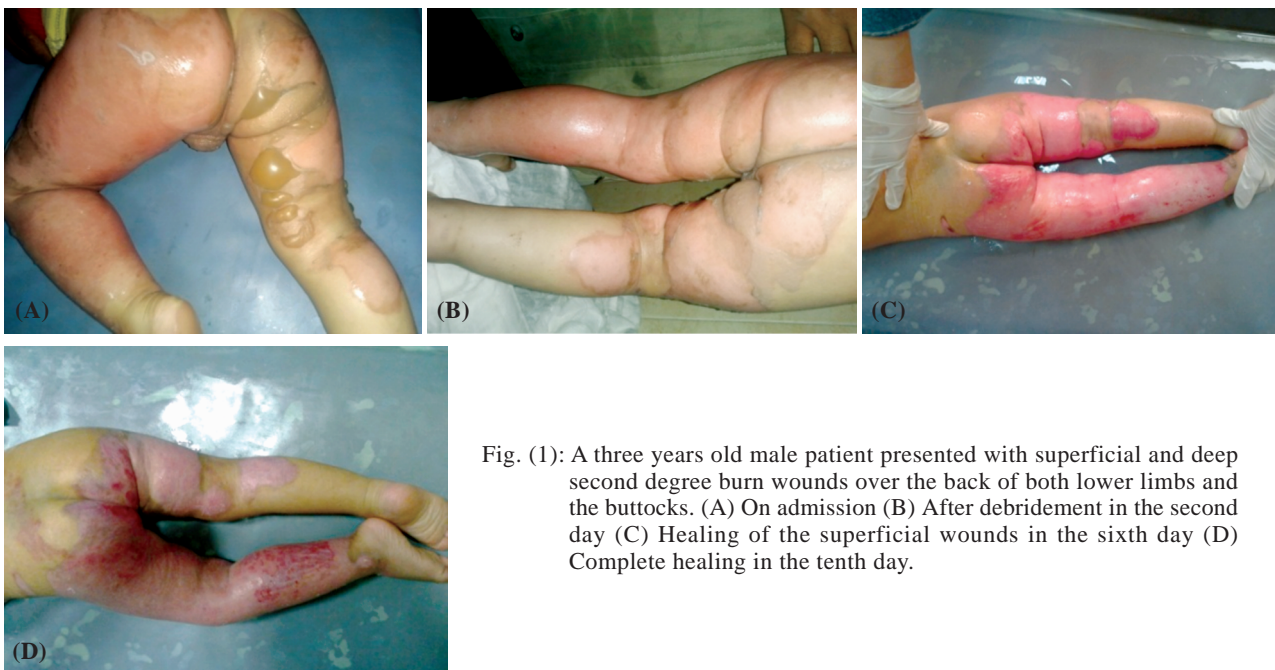


Fig. (1): A three years old male patient presented with superficial and deep second degree burn wounds over the back of both lower limbs and the buttocks. (A) On admission (B) After debridement in the second day (C) Healing of the superficial wounds in the sixth day (D) Complete healing in the tenth day.



Fig. (2): A three years old male patient with two days delayed presentation with deep second degree burn over the left thigh and leg. (A) On admission (two days after injury) (B) After debridement on admission (C) Complete healing in the eleventh day.

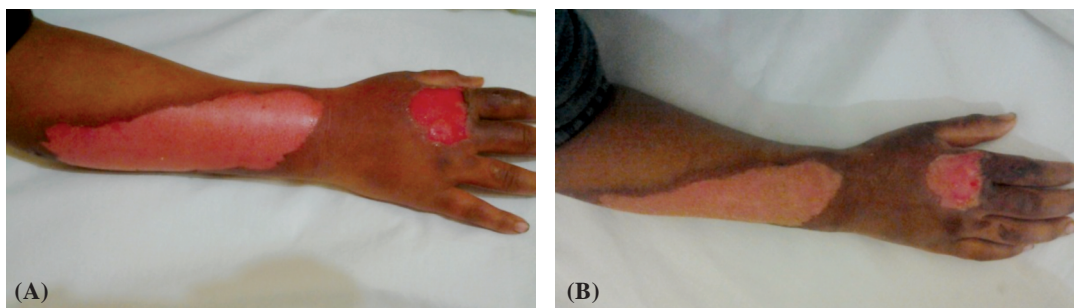


Fig. (3): A fifteen years old patient with a second degree burn over the right forearm and hand (A) After debridement in the second day (B) Complete healing in the sixth day.

RESULTS

48 cases needed more dressings, 32 cases needed more dressings beyond the tenth day and 16 cases in which the dressing became soaked; all were deep wounds. The extra-dressing was between the second and the third dressing (before the sixth day) and the burn wounds didn't show a complete healing. None of the patients needed skin graft operation.

Table (1): Demographic data of the patients.

	Number of cases	Percentage
Sex:		
Females	110	55%
Males	90	45%
Age:		
Below ten years	40	20%
10:30 years	90	45%
Above 30 years	70	35%
TBSA:		
Below 10%	50	25%
10%:25%	150	75%
Distribution:		
Upper limb	83	41.5%
Trunk	69	34.5%
Lower limb	48	24%
Degree:		
Superficial	40	20%
Deep	75	37.5%
Both	85	42.5%
Time to complete healing:		
Sixth day	40	20%
Tenth day	128	64%
14 th day	32	16%
The mean time of healing is 9.84±2.4 (ranging from 6 to 14)		
Number of dressing changes:		
2 dressings	40	20%
3 dressings	112	56%
More than 3 dressings	48	24%
The mean number of dressing changes is 3.04±0.66 (ranging from 2 to 4)		

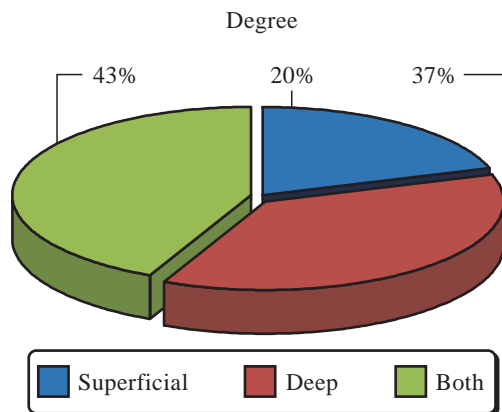


Fig. (4): Type of burn wounds of the patients.

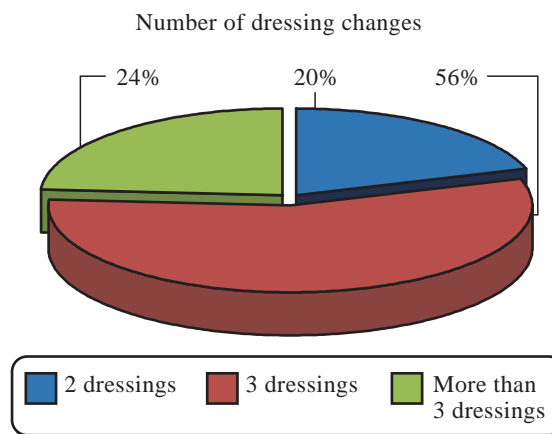


Fig. (5): The number of dressing changes.

DISCUSSION

The management for first degree (superficial) and third degree (full thickness) burn wounds is clearly defined; the algorithm for mixed partial thickness burn wounds presents a dilemma [3].

Partial thickness burn wounds are considered superficial if presented with vesicles or bullae filled with fluid and deep if these vesicles rupture with exposure of their beds or presented from the start with sloughed epidermis. Deep wounds are

usually associated with thin rim of necrotic tissue that is clearly noticeable in the second dressing [4].

Various wound management methods have been described and several antiseptic are used topically for burn wounds and each claims to be effective for preventing infection and accelerating wound healing [5,6].

Silver Sulfadiazine (SSD) cream in particular is commonly used to manage burn wounds [7]. However, it has disadvantage because it had a tendency to adhere to wound surface, so requires more dressing changes that act as a trauma to new epithelized wound surface and results in delayed wound healing [8]. Also, delay healing had been contributed to SSD cream itself due to toxic effect on skin cells [9].

Hydrocolloid dressings (example: DuoDerm) contain a diversity of ingredients including gelatin, pectin and sodium carboxymethylcellulose in an adhesive polymer matrix. These components form a gel when their inner layer comes into contact with exudate which in turn assists autolytic debridement of the wound [10,11].

A comparison was done by Wyatt et al., [11] between sterile gauze plus SSD and hydrocolloid dressings after initial burn wound cleaning. Hydrocolloid dressing significantly reduced mean healing time when compared with SSD. Hydrocolloid dressing (10.23 days \pm 3.19) versus SSD (15.59 days \pm 8.32) ($p < 0.01$). There were significantly fewer dressing changes with the hydro-colloid dressing compared with SSD (mean number of dressing changes: 3.55 with hydrocolloid dressing versus 22.2 with SSD).

Polyurethane films (example: OpSite) are clear, adhesive-coated sheets that are applied to the wound directly. They are permeable to water vapor, oxygen and carbon dioxide but not to liquid water or bacteria. Depending on the amount of wound exudate, the dressings can be left in place for several days. Film dressings are suitable for lightly exuding wounds [11].

Neal et al., [12] compared polyurethane film with chlorhexidine impregnate paraffin gauze dressing. He found polyurethane film significantly reduced healing time compared with chlorhexidine impregnated paraffin gauze (mean healing time: 10.0 days (SD 5.00) with polyurethane film, 14.1 days (SD 7.00) with chlorhexidine impregnated paraffin gauze; $p = 0.02$).

Hydrogel dressings (example: IntraSite) are high water content gels containing insoluble polymers. Their ingredients include modified hemicellulose, carboxymethylcellulose, agar, glycerol and pectin. They have ability to absorb fluid. So this dressing is used for heavy exudate. Their fluid donating properties may also support wound debridement and assist in preserving a moist wound environment [13].

Guilbaud [14] found healing times to be faster in the group of the hydrogel dressing (mean healing times: 11.92 days (SD 5.91) with hydrogel dressing versus 13.55 days (SD 6.70) with usual care; $p < 0.02$).

Silicon coated nylon dressings (example: Mepitel) acts as a direct wound contact layer and their mesh structure allows drainage of exudate from the burned surface. It consists of a flexible polyamide coated with soft silicone. They act as a non-adherent dressing layer, so they reduce damage during frequent dressing changes [15].

In a study done by Bugmann et al., it reports that mean time for epithelialization was significantly shorter with silicon coated nylon dressings (mean healing time: 7.58 days (\pm 3.12) with silicone coated nylon versus 11.26 days (\pm 6.02) with silver sulfadiazine; $p < 0.01$). Also, there were significantly fewer dressing changes with silicone coated nylon net dressing than with SSD (3.64 with silicone coated nylon net dressing versus 5.13 with SSD; WMD -1.49 95% CI -2.64 to -0.34 ; $p < 0.01$) [16].

Biosynthetic skin substitute dressings (example: Biobrane and TransCyte) are commercial products available for wound cover (which is useful for clean superficial partial thickness burns or split skin graft donor site alternatively they can provide temporary cover of excised deeper burns [17].

Barret et al., [18] noted mean healing times to be 9.7 days (\pm 0.7) with Biobrane compared with 16.1 days (\pm 0.6) with SSD ($p < 0.001$).

Kumar et al., [19] randomised 33 people with 58 wound sites to three different burn dressings (Transcyte, Biobrane and SSD). The mean healing time was 7.5 days for Transcyte; 9.5 days for Biobrane; and 11.2 days for SSD. The number of dressing changes: 1.5 with Transcyte and 2.4 with Biobrane compared with 9.2 with Silvazene cream ($p < 0.0001$). Nine patients required auto-grafting.

Antimicrobial dressings (example: Aquacel Ag) claim to manage the bio burden of the wound: they

are thought to reduce the risk of invasive infection by minimizing the bacterial colonization of wounds [13].

Li et al., [20] found mean healing time was significantly shorter in those treated with silver dressings compared with SSD (mean healing time: 12.42 days (SD 5.40) with silver dressing compared with 15.79 days (SD 5.60 with SSD).

Alginate dressings are absorbent derived from seaweed. It maintains a moist wound surface, whilst decrease wound secretions and diminishing bacterial contamination. They are used for wounds with moderate to heavily exudates. Alginates can be soaked away with saline irrigation, which diminishes interference with the healing process and may reduce pain experienced by patients [13].

The comparative study was done between calcium alginate versus SSD. There were no significant difference between calcium alginate and SSD regarding healing time (mean healing time: 12.1 days with calcium alginate versus 11.7 days with SSD). [21].

Recombinant bovine Basic Fibroblast Growth Factor (rbFGF) also provides an effective measure for local second-degree burn wound management with decreased healing time and improved wound healing quality.

Fu et al., [22] reported the mean healing time with rbFGF in superficial and deep second degree burn wounds was 9.9 (SD 2.5) days and 17.0 (4.6) days, respectively.

Amniotic membrane is another simple and cost-effective method of dressing with good results but carries risk of infection [23].

Animal study has been conducted to evaluate the effect of early debridement of second degree burn wound on healing process. It has been found that burn wounds that were early debrided (after 24 hours) enhanced the rate of healing as compared to delayed debrided (after 96 hours) and non-debrided burn wounds [24]. However, another study on swine demonstrated that early debridement of second-degree burn wounds resulted in more infections and slower re-epithelialisation rates in swine [25].

In our study, we performed debridement of the vesicles (removal of the epidermal layer) and their fluid contents (in superficial wounds) and the thin rim of necrotic tissue (in deep wounds). Debride-

ment was done after 24 hours at least as fluid collection inside the vesicles and wound exudates are noticed to be at their maximum level.

Infrequent dressing helps to avoid the new epithelial shed off and to minimize the painful maneuvers to the patient.

Dry dressing (without using any cream or ointment preparations) helps to decrease the chance to become soaked.

This method of dressing has many advantages, helps decreasing the cost so the antimicrobials and other topical preparations can be saved for dressing the areas that are difficult to be managed with closed dressing like the face and perineum, decreasing the chance of the dressing to be soaked, decreasing painful maneuvers to the patient during dressing so, improving the general and psychological condition of the patient and allowing early mobilization and daily activities.

Further, rapid healing of the second degree burn wounds gives a great chance for decreasing morbidity and mortality in cases of major burns and the patient's skin quickly becomes available for harvesting and grafting.

Results of this study are obtained as a result of the combined effect of debridement, infrequent and dry dressing. Further studies are needed to study the effect of each on the healing of partial thickness burn wounds.

Two years follow-up, healed wounds are satisfactory as regard color, itching and no keloid formation but further studies are needed to assess long-term results.

Conclusions:

Debridement and infrequent dry dressing can be considered a simple, cost-effective and reliable method of dressing for all cases presented with partial thickness burn wounds. Satisfactory results have been obtained and healing with complete epithelization has been occurred in a short period.

Funding: None.

Ethical standards: The study has been approved by Mansoura university hospital's Research Ethics Committee.

Conflict of interest: No conflict of interest.

Patient consent informed consent was obtained from all the patients (or legal parent or guardian for children) before their inclusion in this study. Also, informed consent was obtained to publish.

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