MANAGEMENT OF THE ACUTE PARTIAL-THICKNESS BURNED HAND; MOIST EXPOSED BURN OINTMENT OR SILVER SULPHADIAZINE CREAM BOTH COMBINED WITH A POLYETHYLENE BAG

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SUMMARY. Hand burns predominantly affect young adults, and therefore have serious social and financial implications. In the present work, 106 patients with less than 25% body surface area burns and acute partial-thickness burned hands were managed using polyethylene bags and 1% local silver sulphadiazine (SSD) cream or moist exposed burn ointment (MEBO). Females made up 61.3% of the cases and flame burn was the majority cause (54.7%). There were no significant differences between the two groups regarding either the analgesic effect after local ointment application or hand movement inside the polyethylene bag. Local agent crustation over the wound was very evident in the hands managed by local 1% SSD cream (69.81%). On follow-up, the burned hands healed faster using local MEBO (10.48 versus 14.53 days), with fewer post-burn hand deformities and better active hand movements; however, the total cost until complete hand burn wound healing was higher with MEBO than with 1% SSD, although the final results were superior, with early return to work, when MEBO was used. We concluded that the use of MEBO as a topical agent and of polyethylene bags for the dressing of the acute partial-thickness burned hand accelerated healing; daily wound evaluation was easy as there was no crustation over it of the agent. It was more expensive than 1% SSD cream but presented fewer post-burn complications and more rapid healing, with shorter hospital stay.

Introduction

Hand burns predominantly affect young adult males, and therefore have serious social and financial implications. Although the hand represents less than 5% of the total body surface area, the morbidity associated with thermal hand injury is considerable in terms of function and aesthetic appearance. The major determinant of long-term outcome in hand burns is scar formation, which depends on the depth of the thermal injury, the healing response, and the treatment.[1,2] An understanding of the underlying mechanism which, if uncorrected, could culminate in a negative outcome is the key to formulation of a successful treatment plan.[3,4]

Many techniques are available for the local treatment of partial-thickness burns. Examples include paraffin gauze, used either singly or in combination with topical silver-based antibacterial creams,[5] and alternative remedies with herbs, aloe vera, or honey.[6,7] Moist exposed burn ointment (MEBO) - an oil-based ointment containing sesame oil, beta-sitosterol, berberine, and other small quantities of plant ingredients developed at the China National Science and Technology Centre in Beijing, China, in 1989 - has been proposed as the ideal burn wound treatment.[8,9] The manufacturers of MEBO claim that it accelerates healing, inhibits bacterial growth, has analgesic effects, and prevents burn wound scarring.[10] MEBO's exact mechanism of action has not been fully elucidated, but it is thought that this oil-based ointment provides a moist environment for epithelial regeneration to occur, with the added anti-inflammatory effects of beta-sitosterol and the antibacterial effects of berberine.[8]

The present work is a prospective comparative randomized clinical study of 1% silver sulphadiazine (SSD) cream and MEBO, both combined with a polyethylene bag for the management of the acute partial-thickness burned hand in patients with less than 25% body surface area (BSA) burn admitted to Tanta Burns Unit, Egypt, in order to evaluate the impact of this regimen on the outcome of such patients.

Patients and methods

The study was carried out on 106 patients who had acute partial-thickness burned hand with total burns in less than 25% BSA. The cases were selected out of 442 burn patients treated in Tanta Burns Unit in the last three years - patients with more than 25% BSA or with hands spared from burns were excluded from the study. The patients were randomly allocated to one of two groups:

Fig. 1 - Bilateral burned hands (right hand treated with MEBO, left hand with 1% SSD).

Fig. 2 - Acute partial-thickness burned hand kept freely mobile in sterile polyethylene bag.

Group one: hand managed by daily application of SSD 1% cream

Group two: MEBO applied as a local agent twice daily

In patients with bilateral burned hands, each hand was managed separately either in group 1 or in group 2 (*Fig. 1*). In both groups, the hand was kept moving freely in a sterile polyethylene bag (*Fig. 2*).

The topical agent was changed twice daily, while the bag was changed several times depending on the amount of transudated fluids collecting inside it.

On application of topical SSD 1% cream or MEBO to cover the burned hand, each patient was asked to rate:

Table I - Subjective dressing assessment

Dressing assessment score	Group 1 (1% SSD)		Group 2 (MEBO)		*p*
	Number = 53	Percentage	Number	Percentage = 53	
Pain score					
0	18	33.96	19	35.85	
1	22	41.51	25	47.17	$p > 0.05$
2	13	24.53	9	16.98	
3	0	0.00	0	0.00	
Hand movement score					
0	0	0.00	0	0.00	
1	0	0.00	0	0.00	
2	22	41.51	20	37.74	
3	31	58.49	33	62.26	
Patient comfort score					
0	0	0.00	0	0.00	
1	0	0.00	0	0.00	$p > 0.05$
2	40	75.47	38	71.69	
3	13	24.53	15	28.30	

$p > 0.05$ non-significant (Mann-Whitney test)

- the pain felt during dressing change (score from 0 to 3, depending on the analgesic used to alleviate the pain)
- the ability to move the hand within the bag after dressing (score from 0 to 3, ranging from slight finger flexion to catching a pen)
- feeling and comfort regarding odour and hand appearance inside the bag (score from 0 to 3, ranging from uncomfortable and refusing dressing to very comfortable during dressing changes)

The hand's functional status was tested by the patient holding a large object, such as a soda can, or a small item (pen or toothbrush).

The cost of each daily dressing per hand was calculated and the total cost evaluated. Our regimen consisted of follow-up every week during the first month and then every month for six months. The results of burned hand management were recorded with regard to hand function, change of appearance of the healed burn wound in the form of hypo- or hyperpigmentation, hypertrophic scars or keloids, contractures, or deformities.

Results

Females were more affected (61.3%), and the age group most commonly affected was that aged 30-40 yr. Flame burn was the causative agent in most cases (54.7%), while no electric burn was reported in this study. No significant differences were found between the two groups as regards age, sex, and total burn surface area. Superficial partial-thickness burns comprised 68.9% of our cases, while the rest were deep-partial thickness burns; there was no significant difference between the groups as regards the depth of the burn injury. We did not observe any significant differences in the pain felt after local ointment application or in hand movements inside the polyethylene bag in either

Fig. 3 - Bilateral burned hands showing maceration of skin of hand.

Fig. 4a - Deep partial-thickness burned hand treated with 1% SSD.

Fig. 4b - Crustation of 1% SSD over burn wound.

of the two groups (*Table I*). On daily wound evaluation we found hand maceration in both groups (*Fig. 3*), while local agent crustation (*Fig. 4*) over the wound was very evident in hands managed by local 1% SSD cream (69.8%); we did not however record such a finding when MEBO was used as the local agent, with easy hand healing assessment, and the difference was statistically significant (*Table II*).

Table II - Local findings at each dressing

Clinical findings	Group 1 (1% SSD)		Group 2 (MEBO)		*p*
	Number	Percentage	Number	Percentage	
Maceration	46	86.79	50	94.34	$p > 0.05$
Crustation	37	69.81	0	0.00	$p < 0.001$
Easy hand assessment	23	43.39	53	100	$p < 0.001$

$p < 0.001$ significant (chi-square or Fisher's exact test)

Table III - Hand burn wound healing period

Healing period (days)	Group 1 (1% SSD)	Group 2 (MEBO)	*p*
Superficial partial-thickness burned hand Mean ± SD	 14.53 ± 3.83	 10.48 ± 2.66	 $p < 0.001$
Deep partial-thickness burned hand Mean ± SD	 36.60 ± 5.08	 30.50 ± 5.10	 $p < 0.001$

$p < 0.001$ significant (Student's t-test)

Table IV - Daily cost of burned hand dressing medication

Daily cost (Egyptian pounds)	Group 1 (1% SSD)	Group 2 (MEBO)	*p*
Mean ± SD	2.17 0.16	9.00 0.00	$p < 0.001$

$p < 0.001$ significant (Student's t-test). 1 US dollar = 6.25 Egyptian pounds

Fig. 5 - Bilateral deep partial-thickness burned hand (right side healed faster with MEBO).

On follow-up, acute partial-thickness burned hands healed much more slowly with local SSD 1% cream than with MEBO in both superficial (14.53 ± 3.83 days versus 10.48 ± 2.66 days) and deep partial-thickness injury (36.60 ± 5.08 days versus 30.50 ± 5.10 days) (*Table III*) (*Fig. 5*).

The daily cost of the burned hand dressing was 9.0 Egyptian pounds (£E) with MEBO and £E 2.17 when 1% SSD cream was used. The total cost until complete hand healing was very expensive with MEBO in spite of the shorter hospitalization period (*Table IV*).

Discussion

Optimal hand function has a very positive impact on the quality of post-burn survival. In the present study, the acute partial-thickness burned hands were conservatively managed with local 1% SSD cream or MEBO and the hand

Table V - Post-burn hand deformities

Post-burn hand deformities	Group 1 (1% SSD)		Group 2 (MEBO)		*p*
	Number	Percentage	Number	Percentage	
Hypertrophic scar	12	22.64	5	9.43	
Metacarpophalangeal and interphalangeal joint contracture	7	13.21	4	7.55	
Wrist joint contracture	5	9.43	2	3.77	$p > 0.05$
Post-burn syndactyly	6	11.32	2	3.77	
Post-burn nail retraction	7	13.21	2	3.77	

$p > 0.05$ non-significant (chi-square or Fisher's exact test)

was kept freely mobile in a sterile polyethylene bag. We noticed that the patients soon moved their hands freely inside the bags - we were able to assess the burned hands easily as there was no bulky dressing but only a layer of topical agent over the wound. Other researchers, since 1940, have used gloves or bags containing sodium hypochlorite, silicone liquids, or local 1% SSD, reporting early hand mobilization with preservation of active hand function.[11,12] Recently, Haslik et al.,[13] using video-angiography, studied the influence of local dressings and topical ointments on evaluation of the burn wound and reported that burn wounds covered by dressings were difficult to evaluate clinically.

On application of the local agent, we did not record any significant difference in the local agent's analgesic effect when we used either 1% SSD cream or MEBO. MEBO's analgesic effect was tested and confirmed in earlier studies,[10] in which Ang et al.[14] reported that MEBO exerted a greater analgesic effect than 1% SSD cream, especially in the first five days post-burn, which was advantageous for the modulation of the acute immune response. Mild pain after 1% SSD cream application was reported by Lockhart et al.[15] and confirmed by Barret et al.[16] Many of our patients disliked the odour of the local agent and the appearance of the hand inside the bag, due to maceration of hand skin in the bag, without any significant difference between the two groups. The daily wound evaluation found more crustation of the agent used over the wound with 1% SSD cream, making the assessment of the burn wound healing more difficult than with MEBO. Superficial partial-thickness burned hand healed faster with MEBO (10.48 ± 2.66 days) with shorter hospital stay than with 1% SSD cream medication (*Table III*). Ang et al.[14] reported that MEBO accelerated burned hand healing and Zayzafoun[17] recorded the healing of similar wounds within a mean time of 6.5 days for superficial burns and 15 days for deep partial-thickness burns, while Kadry[18] found complete healing in such cases within 10-40 days.

The cost of the daily topical agent to dress the burned hands was significantly higher with MEBO than with 1% SSD cream (£E 9.0 versus £E 2.17) and the calculated cost for each hand dressing until complete burned hand healing was also higher with MEBO (*Table IV*). During the follow-up period, post-burn hypertrophic scarring and contractures were greater with 1% SSD cream, which confirmed the earlier results of Ang[10] in the mid-1980s.

Evaluating the active and functional range of the hand movements, we observed that MEBO had a positive impact on the final results. Healed burned hands treated with MEBO had a more or less normal functional range of movements with fewer post-burn hand complications, reducing post-burn hand surgery - this can compensate for the cost of the local MEBO dressing in the acute burn stage. Earlier studies from various centres were thus confirmed (*Table V*).[19-21]

Conclusions

In acute partial-thickness burned hands, a polyethylene bag used to cover the hand is a good tool, and 1% SSD cream as a topical agent for dressing is much cheaper than MEBO. However, crustation of the agent on the wound was commoner with 1% SSD cream, making daily clinical hand evaluation more difficult; also, hypertrophic scarring was recorded more often with 1% SSD cream. As a local agent in acutely burned hands, MEBO was more expensive but without any wound crustation, healing was faster, and functional hand movement was better, with fewer post-burn complications.

RÉSUMÉ. La plupart des brûlures de la main atteignent les jeunes adultes et pourtant exercent des effets sociaux et économiques très graves. Les Auteurs de cette étude ont considéré 106 patients atteints de brûlures en moins de 25% de la surface corporelle. Les mains atteintes de brûlures aiguës d'épaisseur partielle ont été traitées avec l'emploi de sacs de polyéthylène et de crème de sulfadiazine argentée locale (SDA) à 1% ou avec MEBO (sigle anglais de «moist exposed burn ointment», c'est-à-dire «onguent pour les brûlures exposées humides»). Le 61,3% des patients étaient du sexe féminin et la cause principale des brûlures était les flammes (54,7%). Aucune différence significative n'a été observée entre les deux groupes pour ce qui concerne soit l'effet anal-

gésique après l'application locale de l'onguent soit le mouvement de la main dans le sac de polyéthylène. L'encroûtement causé par l'agent local sur la lésion était très évident dans les mains traitées avec la crème locale SDA à 1% (69,81%). Dans le suivi les mains brûlées guérissaient plus rapidement avec MEBO local (10.48 contre 14.53 jours), avec une fréquence mineure de difformités post-brûlure et des mouvements actifs supérieurs de la main. Le coût total jusqu'à la guérison complète des brûlures de la main était plus élevé avec MEBO par rapport à la SDA à 1%, mais les résultats finals étaient supérieurs avec MEBO, avec un retour plus précoce au travail. Les Auteurs concluent que l'emploi de MEBO comme agent topique et des sacs de polyéthylène pour le pansement de la main atteinte de brûlures aiguës d'épaisseur variable accélérait la guérison; l'évaluation quotidienne de la brûlure était facile parce qu'il n'y avait pas d'encroûtement causé par l'agent. MEBO était plus coûteux par rapport à la crème SDA à 1% mais il présentait un nombre inférieur de complications post-brûlure et une guérison plus rapide, avec une hospitalisation moins prolongée.

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