

## Comparative Study between Sodium Carboxymethylcellulose Silver, Moist Exposed Burn Ointment or Saline Soaked Dressing for Treatment of Facial Burn

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### ABSTRACT

*Introduction:* Facial burns vary from relatively minor insults to severe debilitating injuries. Sustaining a burn injury is often a psychological trauma to the victim and it is especially menacing when the face and neck are involved.

*Methods:* This study was carried out on 60 patients with superficial dermal burn of the face admitted to Burn Unit of Tanta University Hospitals from September 2007 to July 2008.

The patients were allocated randomly in one of three groups; each group was treated with one of the following: Sodium carboxymethyl-cellulose silver (Aquacel Ag®), Moist Exposed Burn Ointment (MEBO®) or saline soaked dressing.

*Results:* We found that, patients managed with Moist Exposed Burn Ointment (MEBO®) had less pain, itching and easier movement than those managed with sodium carboxymethyl-cellulose silver (Aquacel Ag®). While Aquacel Ag® had shorter duration for healing and had no bad odour if compared with MEBO®. Quality of healing and patient's satisfaction were nearly equal between those managed with MEBO® and those with Aquacel Ag®. Saline soaked dressings were the worst, as they had more pain and itching, limit patient's movement, need longer time for healing and had the least patient's satisfaction.

*Conclusion:* Moist Exposed Burn Ointment (MEBO®) is an excellent choice for management of facial burns due to its soothing effect, ease of patient's movement, easy handling and good healing properties. Aquacel Ag® is comparable to (MEBO®) and is specially recommended when frequent dressings are difficult to patient and for those who do not accept its odour, while Saline soaked dressings are not recommended for management of facial burns due to pain, itching, limitation of patient's movement and delayed healing.

### INTRODUCTION

The head and neck has been identified as the site most frequently affected by thermal injuries and the very young, elderly and physically handicapped have been found to be the most vulnerable [1,2,3].

Facial burns vary from relatively minor insults to severe debilitating injuries. Objectives for reconstruction following a facial burn include restoration of function, comfort and appearance [2].

The high incidence of second-degree burns has led many researchers to explore more effective treatment protocols. A wide variety of agents are available for treatment of burn wounds, including ointments, creams, biological and non-biological dressings [4].

Wound healing is affected by the patient factors, the wound and cells in the wound, with overlapping problems of microcirculation, local immunity and dressing method. The desired result is healing with minimal scar and no functional defect [5].

The proper dressing should be cheap, alleviates pain, prevents infection, easy to handle, makes mobilization easy and early, has no toxicity or allergy, leads to quick and solid healing with a cosmetically acceptable scar [6].

The local pathological changes in facial burns do not differ from other areas of the body except in importance of this region and edema formation. Most tissue is lost from heat coagulation of the protein within the tissue. The final tissue loss, however, is progressive and results from release of local mediators, changes in blood flow, tissue edema and infection [7,8].

Sodium carboxymethyl-cellulose silver (AQUACEL AG®) Aquacel® is a moisture retentive topical dressing available as sheets from hydro fiber material that has been demonstrated to be safe and efficacious for the management of partial-thickness burns, showing parity for most dressing related aspects to cadaver skin for this indication. It is non-woven dressing composed of Sodium carboxymethyl-cellulose. Recently, 1.2% w/w silver has been added to the Aquacel®, to create Aquacel Ag® to release ionic silver within the dressing for up to two weeks and it is this duration

that differentiates it from other sustained release silver delivery products indicated for burn management [9,10].

Moist Exposed Burn Ointment (MEBO) was developed in the mid 80's by Professor Rongxiang of the Beijing Guangming Chinese Medicine Institute for Burns, Wounds and Surface Ulcers.

It is an ointment consisting of an oily base of sesame oil and bees wax with herbal components comprised of 18 amino acids, 4 fatty acids, 7 polysaccharides, vitamins and trace elements and an active substance consisting of 0.25% b-sitosterol. The mixture enhances re-epithelialization and repair by providing required nutrients and low partial pressure of oxygen, as well as removing necrotic tissues [11,12]. It isolates the wound bed from the invasive environmental factors and reduces body fluids loss [13].

Saline as a burn wound dressing aims to keep the burn wound constantly wet with saline until it heals. This method is said to reduce the time of hospital stay and to minimize equipments and materials of dressing allowing partial-thickness burns to heal promptly and eschar to separate early [14].

## PATIENTS AND METHODS

This study was carried out on 60 patients with superficial dermal burn of the face admitted to Burn Unit of Tanta University Hospitals from May 2004 to May 2006.

Flame or scald burns of the face were included not chemical or electrical burn. TBSA (Total Body Surface Area) of burn that exceeded 25% in adults (>12 years) or 15% in children (<12 years) were not included. Also patients with other serious injury e.g. spinal injury and those with systemic disease that affects healing of wounds e.g. Diabetes Mellitus type I or immunosuppressant drugs e.g. corticosteroids were excluded.

All patients received initial treatment in the form of thorough face wash by sterile 0.9% saline with removal of debris and foreign bodies then the face was dried by sterile gauze. Hair in the burned area was shaved with electric clippers. Blisters fluid was evacuated but the blister epithelium is left intact as biological dressing [15].

If there was burn in the ear, it was cleaned as above then gentamicin cream was applied, while for lips cocoa-butter was applied to help soothing and movement [16].

*Patients were allocated randomly in one of three groups:*

- *Group I:* 20 patients with facial burn treated by sodium carboxymethyl- cellulose silver (Aquacel Ag®):

After facial burn was washed with saline, sheets of Aquacel Ag® were directly applied to the wound with overlap of 2cm over non-burned surrounding skin.

Eyelids were not covered by Aquacel Ag® sheets to allow eyelid movement, so, they were covered by Moist Exposed Burn Ointment (MEBO®) or Api-Care® cream (twice daily).

If the wound was dry and Aquacel Ag® sheets were not fixed to the wound, saline was added to transform the hydrofiber into gel that can easily attach to the wound (Fig. 1). Aquacel Ag® sheets were secured in place with outer sterile dressing (two layers of gauze with thin layer of cotton in between) and the outer dressing was secured in place using surgi-net® (cylindrical elastic net that encircles the face fixing the dressing in place) (Fig. 2).

The sheets were checked every 3<sup>rd</sup> day for adherence of the Aquacel Ag® sheets and for changing outer dressing. In case of non-adherence or slippage, the sheets were removed and replaced after thorough wound cleansing with saline.

When complete re-epithelialization occurred in part of the wound, the Aquacel Ag® sheet over it was spontaneously dried and separated from the wound. When complete healing occurred most of the sheet was separated and removed spontaneously (Fig. 3a,b).

- *Group II:* 20 patients with facial burn treated by Moist Exposed Burn Ointment (MEBO®): After facial burn was washed with saline, a thin layer of Moist Exposed Burn Ointment (MEBO®) was applied over the burnt areas of the face. The same was done three times per day at nearly equal intervals after cleansing of the wound with saline. Application of MEBO® was continued until complete healing occurred (Fig. 4a,b,c).

- *Group III:* 20 patients with facial burn treated by saline soaked dressings:

After facial burn was washed by saline, sterile dressing (2 layers of gauze with cotton in between) soaked with sterile saline 0.9% were placed over the burnt area of the face. When the dressing became dry, another new soaked one was placed over the wound and so on. This procedure continued till healing occurs (Fig. 5a,b,c).



Fig. (1): Aquacel Ag® sheets were applied on the facial burn wounds and saline was added to transform sheets into gel.



Fig. (2): Aquacel Ag® sheets were secured in place using Surgi-net®.



Fig. (3-A): Group 1: 15 years old patient, 1<sup>st</sup> day post burn.



Fig. (3-B): Group 1: Same patient 3 months post burn.



Fig. (4-A): Group 2: 20 years old patient, 1<sup>st</sup> day post burn.



Fig. (4-B): Group 2: Same patient, 10<sup>th</sup> day post burn.



Fig. (4-C): Group 2: Same patient, 3 months post burn.



Fig. (5-A): Group 3: 14 years old patient, 1<sup>st</sup> day post burn.



Fig. (5-B): Group 3: Same patient, 17<sup>th</sup> day post burn.

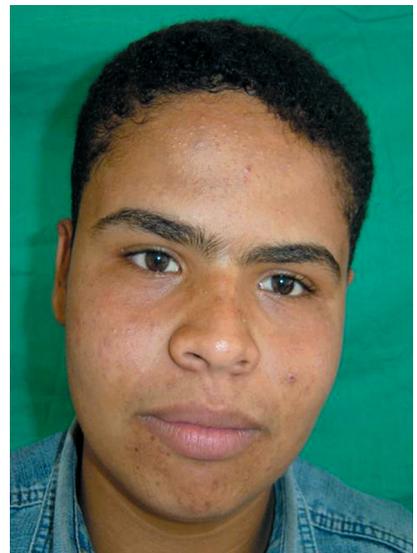


Fig. (5-C): Group 3: Same patient, 3 months post burn.

Patients were evaluated regarding pain, itching, ease of movement while dressing is in situ, odour, time for healing, quality of healing, cost of the dressing and patient's satisfaction.

**RESULTS**

There were no significant differences between the three groups as regards age, sex, TBSA as well as the cause of burn.

Pain was scored according to visual analogue scale (VAS). In the 1<sup>st</sup> 2 days post burn, pain rated by the patients was more severe than pain rated by the same patients from the 3<sup>rd</sup> day post burn onward. Group II was the least group to feel pain both in 1<sup>st</sup> 2 days (mean score = 3.1±1.9) and from 3<sup>rd</sup> day post burn (mean score = 1.3±1.5) (Figs. 6,7).

Difference between groups was significant both in 1<sup>st</sup> 2 days (*p*-value <0.05) and from 3<sup>rd</sup> day post burn (*p*-value <0.05).

There was no itching in 25% of cases in group (I), 65% of cases in group (II) and 10% of cases in group (III). Mild itching was rated by 45% of cases in group (I), 20% in group (II) and 50% in group (III). Moderate itching was rated by 20% of cases in group (I), 15% in group (II) and 25% in group (III). There was severe itching in 2 cases (10%) in group (I) and 3 cases (15%) in group (III). Difference between groups was significant (*p*-value <0.05) (Fig. 8).

Ease of patient's movements with dressing was found to be excellent in 70% of cases in group (II) while it was poor in 75% of cases in group (III), (Table 1). Difference between groups was highly significant (*p*-value <0.001).

Nearly all (95%) of cases in group (I) and 75% of cases in group (III) revealed "No odour", while 75% of cases in group (II) revealed "Acceptable odour" and 20% of the cases in group (II) also defined the odour as "Bad Odour", (Table 2). Difference between groups was highly significant (*p*-value <0.001).

Mean duration for complete healing in group (I) was 10.05±2.3 days, while in group (II), it was 10.35±2.8 days and in group (III), it was 12.05±2.4 days, (Figs. 9,10,11). There was significant difference between groups in healing time (*p*-value 0.034 <0.05).

The commonest score for quality of healing in all groups was "Excellent" forming 80% of cases in group (I) and group (II) while it was 55% of

cases in group (III), (Table 3). *p*-value was >0.05, so, there was no significant difference between groups in the quality of healing.

The cost of the dressing until healing occurred was evaluated for each patient "Total cost". In group I the total cost ranged from 140 Egyptian pounds to 420 Egyptian pounds with mean cost of 298.6±91.8 Egyptian pounds. In group II the total cost ranged from 108 Egyptian pounds to 432 Egyptian pounds with a mean cost of 236.5±81.2 Egyptian pounds, while In group III the total cost ranged from 30 Egyptian pounds to 66 Egyptian pounds with a mean cost of 40.1±13.1 Egyptian pounds, (Table 4). Difference between groups was highly significant (*p*-value <0.001).

Table (1): Ease of patient's movement while dressing in situ.

Ease of movement	Group I		Group II		Group III	
	No.	%	No.	%	No.	%
1 (Excellent)	4	20	14	70	0	0
2 (Good)	15	75	5	25	2	10
3 (Fair)	1	5	1	5	3	15
4 (Poor)	0	0	0	0	15	75

Table (2): Odour of the dressing.

Odour score	Group I		Group II		Group III	
	No.	%	No.	%	No.	%
0 (No odour)	19	95	1	5	15	75
1 (Acceptable odour)	1	5	15	75	2	10
2 (Bad odour)	0	0	4	20	3	15

Table (3): Quality of healing.

Quality of healing	Group I		Group II		Group III	
	No.	%	No.	%	No.	%
1 (Excellent)	16	80	16	80	11	55
2 (Good)	3	15	2	10	5	25
3 (Fair)	1	5	2	10	2	10
4 (Poor)	0	0	0	0	2	10

Table (4): Cost of the dressing.

Cost of the dressing	Group I	Group II	Group III
Cost range	140-420 LE	108-432 LE	30-66 LE
Mean cost	298.6±91.8	236.5±81.2	40.1±13.1

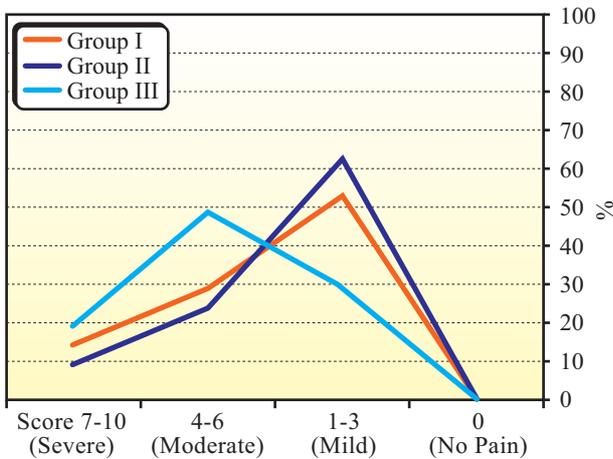


Fig. (6): Pain Scores in the 1<sup>st</sup> 2 Days Post Burn (VAS).

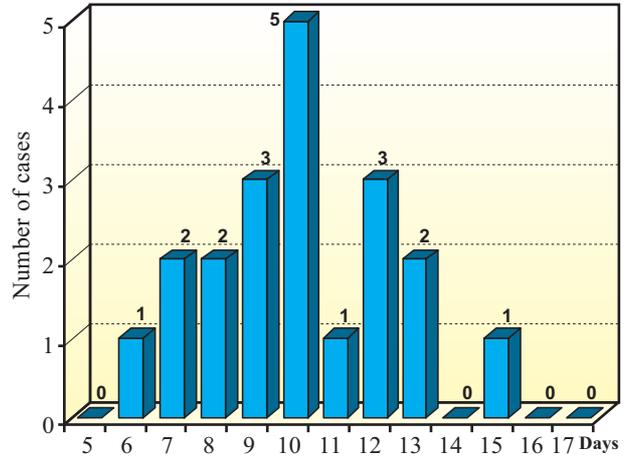


Fig. (9): Duration for Healing (Group I).

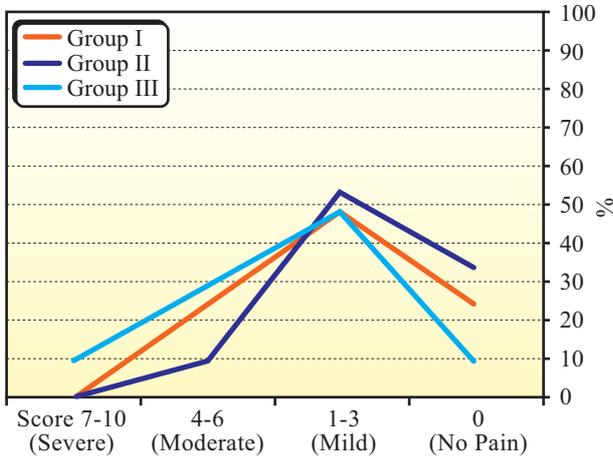


Fig. (7): Pain Scores from the 3<sup>rd</sup> Day Post Burn (VAS).

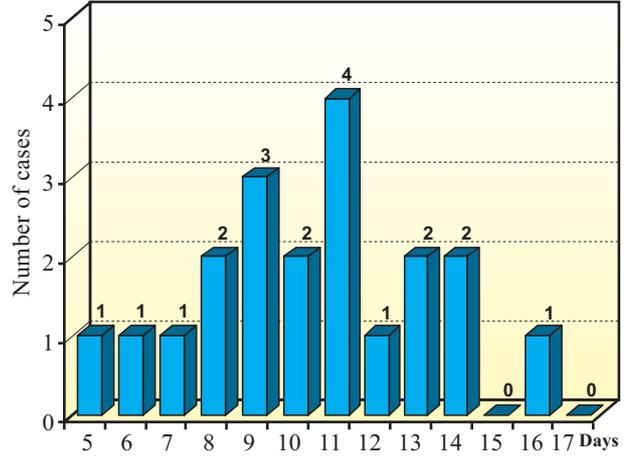


Fig. (10): Duration for Healing (Group II).

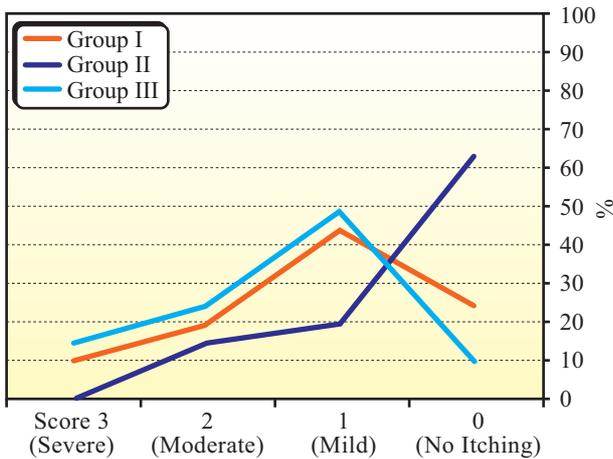


Fig. (8): Itching Scores.

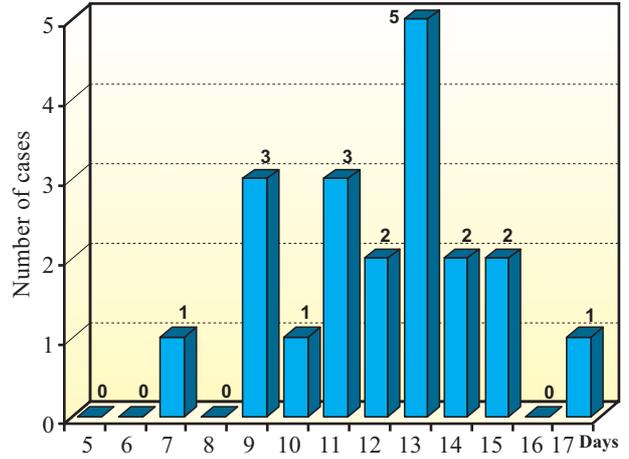


Fig. (11): Duration for Healing (Group III).

The commonest group in the score of patient's satisfaction was "Excellent" in group (I) (55% of cases) and group (II) (60% cases), while in group (III), it was "Fair" (45% of cases). Which means

that patients of group (II) and (I) were the most satisfied and those of group (III) were the least satisfied, (Table 5). *p*-value was <0.05 so, there was significant difference between groups.

Table (5): Patient satisfaction.

Patient satisfaction	Group I		Group II		Group III	
	No.	%	No.	%	No.	%
1 (Excellent)	11	55	12	60	2	10
2 (Good)	5	25	6	30	9	45
3 (Fair)	3	15	2	10	4	20
4 (Poor)	1	5	0	0	5	25

## DISCUSSION

The head and neck has been identified as the site most frequently affected by thermal injuries. Facial burns vary from relatively minor insults to severe debilitating injuries [12].

Sustaining a burn injury is often a psychological trauma to the victim and it is especially menacing when the face and neck are involved [17].

In our study, pain score was rated by the patients to evaluate the degree of pain for each dressing. There was significant difference between groups ( $p$  value  $<0.05$ ). Group (II) (Moist Exposed Burn Ointment MEBO®) was the least to feel pain. Many studies [5,18-22] showed that MEBO has analgesic effect with anti-inflammatory and anti-odema effect. In our study, Aquacel Ag® comes 2<sup>nd</sup> in analgesic effect. Hemeda et al. [23] used Aquacel Ag® for treatment of partial thickness burns and skin graft donor sites and found that 40% of patients experienced slight pain while the dressing was in situ and upon final removal of the dressing, pain records were none in 88.3% and slight in 11.7% of patients.

Daniel [24] compared the effect of Aquacel Ag® and silver sulfadiazine in treatment of partial thickness burn and revealed less pain and less anxiety during dressing changes with Aquacel Ag® and also fewer analgesics and narcotics used in patients treated with Aquacel Ag®.

There was mild itching in 50% of cases treated by saline soaked dressings, less frequently observed with Aquacel Ag® and there was no itching in most of cases treated by MEBO®. These results confirmed the previous studies [5,18,21,22].

Itching was observed in 1st few days of treatment with saline dressing (due to irritation of non epithelialized wound by saline) and reduced after that, while with Aquacel Ag®, itching was observed in the stage of healing (when Aquacel Ag® sheet started to separate). Another study [25] stated that itching is an annoying, often unrelenting manifestation of healing.

Another unpleasant impression was the odour of the dressing. While more or less no unpleasant odour perceived by patients treated with Aquacel Ag®, 75% of patients treated by MEBO® gave the impression of acceptable odour (odour of burned peanut) and 20% of the same group revealed bad odour.

Another previous study in our burn unit [26] revealed that most of patients treated with MEBO® disliked bad odour of dressing.

Regarding the ease of movement of the patients while dressing in situ, MEBO® gave excellent results followed by Aquacel Ag®, while saline soaked dressing seems to interfere with free patient movement as the dressing should be soaked with saline all the time and so should be changed frequently (while nothing is fixing the soaked dressing in situ). Daniel M. [24] revealed significantly greater flexibility during wear of dressing in patients treated with silver sulfadiazine than patients treated with Aquacel Ag®.

Depending on the previously mentioned data, overall patient satisfaction was the least with saline soaked dressings (more pain and itching sensation with limitations of patient's ambulation).

On the other hand, other studies gave positive results in patients' conformability both with Aquacel Ag® [8,24,23] and MEBO® [19,20,22,23].

Time needed for complete healing was comparable in Aquacel Ag® and MEBO® treated groups ( $10.05 \pm 2.3$  days and  $10.35 \pm 2.8$  days respectively), while there was longer duration needed for complete healing using saline dressing ( $12.05 \pm 2.4$  days). Longer duration needed in group (III) (saline soaked dressing) may be attributed to absence of definite barrier compared to Aquacel Ag® and MEBO®. Other studies [23,27] revealed that healing rates with Aquacel Ag® were comparable to those with allograft skin and other synthetic membranous materials. Also, many studies [5,14,22] stated that MEBO® prevents desiccation of denuded dermis and allow faster migration of keratinocytes thus significantly accelerates wound re-epithelialization.

Regarding quality of healed skin, there was no significant difference between the three methods of dressing. Vloemans [27] stated that it is difficult to draw conclusions with respect to the final cosmetic results, since this depends on a great number of variables that cannot be individually analyzed and correlated.

The cost of the dressing used for the whole course of treatment until healing occurred was evaluated. Aquacel Ag® was the most expensive (mean cost of 298.6±91.8 Egyptian Pounds for the whole course of treatment), saline soaked dressing was the cheapest method in the study (mean cost of 40.1±13.1 Egyptian Pounds), while MEBO® was comparable to Aquacel Ag® (mean cost 236.5±81.2 Egyptian pounds). In our study, we have studied only the cost of dressing material (not including personnel, hospital stay and other cost e.g. drugs).

Robinson B.J. et al. [28] stated that on studying the cost-benefit of hydrofiber dressing, it has been demonstrated significant savings in clinical time, as staff time comprises the largest component in the cost benefit equation. Daniel [24] studied the cost of primary and secondary dressings, labor and medications; this study revealed that the mean total cost in Aquacel Ag® was less than that for silver sulfadiazine. But in the same study, the cost of primary dressing materials was significantly greater for Aquacel Ag®.

#### Conclusion:

We found that, patients managed with Moist Exposed Burn Ointment (MEBO®) had less pain and itching and easier movement than those managed with sodium carboxymethyl-cellulose silver (Aquacel Ag®). While Aquacel Ag® had shorter duration for healing and had no odour if compared with MEBO®. Quality of healing and patient's satisfaction were nearly equal between those managed with MEBO® and those with Aquacel Ag®.

Saline soaked dressings were the worst, as they had more pain and itching, they limit patient's movement, need longer time for healing and had the least patient's satisfaction.

Lastly, regarding the cost of the dressing, we should note that Aquacel Ag® dressing had a cost slightly higher than that for MEBO® (comparable cost as regarding the whole duration of treatment). Also, MEBO® had a cost nearly triple that for saline soaked dressings.

#### Recommendations:

- Recognition of importance of facial burns in clinical practice, giving them more special care in our management of burned patients.
- There are many types of dressing materials for facial burn, but keeping the wound moist with avoidance of desiccation of newly formed tissues is the most important factor to promote healing.

- Moist Exposed Burn Ointment (MEBO®) is an excellent choice for management of facial burns due to its soothing effect, ease of patient's movement, easy handling and good healing properties. MEBO® is especially recommended for patients who can't accommodate with occlusive dressing used to cover Aquacel Ag® over the face. MEBO® is also easy to use by the patient when he is managed as outpatient.
- Aquacel Ag® is comparable to (MEBO®) and is specially recommended when frequent dressings are difficult to patient and for those who do not accept its odour.
- Saline soaked dressings are not recommended for management of facial burns due to more pain, itching, limitation of patient's movement and delayed healing.
- Further studies are needed to reach the ideal dressing for management of facial burns.

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