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A Study to Evaluate the Efficacy and Safety of a Herbal Preparation for Burn Wounds

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ABSTRACT

Background: Burn is a common medico-surgical problem all over the world, most devastating of all wounds, and imposes a serious burden on physical, mental and socioeconomic conditions of the victim. Rapid and effective treatment of burnt skin is vital to hasten wound closure and healing. The process of burn wound healing is divided into four consecutive and overlapping phases: hemostasis, inflammation, proliferation and remodelling. Local treatment of burn wounds includes cleansing, debridement and burn wound dressing, typically incorporating topical antimicrobial agents; however, there is no consensus on which agent or dressing is optimal for burn wound coverage to prevent or control infection or to enhance wound healing. Various silver preparations (monocrystalline and slow release) are the mainstay of many approaches but antimicrobial peptides, topical photodynamic therapy, chitosan preparations, new iodine delivery formulations, phage therapy and natural products, such as honey and essential oils, have all been tested. The continuous increase in antibiotic resistance, besides the high susceptibility of burn wounds to infection, and the difficulty of systemically administered antibiotics to reach the damaged tissue, have all made the development of new topical antimicrobials for burn infections a potential area of innovation for researchers. Use of medicinal plants for dressing wounds has been described by traditional medicine. **Objectives:** The purpose of this study was to evaluate the efficacy and safety of a herbal preparation in patients with burns in a prospective, noncomparative, open-label and single-center study design. The study population comprised of patients aged 18 years and above suffering from superficial and deep burns involving up to 30% total body surface area. **Methods:** After written informed consent and evaluation of inclusion/exclusion criteria, subjects were treated for 14 days. Efficacy assessments included wound epithelialization, wound microbiology, blood leukocyte counts and safety assessments included pain score and adverse events. **Results:** Over a period of 5 months, 26 patients, mainly between 20 and 30 years, and with female predominance, were enrolled in the study. At the end of treatment, almost 74% of the subjects showed more than 50% skin epithelialization. Approximately, 82.6% of patients had fall in blood leukocyte count. Wound colonization showed Klebsiella and Pseudomonas in a decreasing trend from 39.1% on Day 7 to 8.7% on Day 14, remarkably less than historical controls. All patients experienced burning pain after spraying the product which lasted for almost 15 minutes and demonstrated decreasing intensity from Day 1 to 14. No local adverse events were found in the patients, with high patient satisfaction. **Conclusion:** The herbal preparation was a very effective and safe treatment option in patients with superficial and deep partial-thickness burns involving up to 30% total body surface area. It prevented wound infection and significantly improved wound epithelialization.

Keywords: Burn wounds, total body surface area, herbal spray

Burns, one of the most common forms of injury, have devastating consequences. The detrimental outcomes of burns include physical disabilities as well as mental and emotional disorders.[1,2] There are several factors that guide the evaluation and management of burns. First, the type of burn, such as thermal, chemical, electrical or radiation. Second, the extent of the burn, characterized by the percentage of total body surface area (TBSA) involved. Third, the depth of the burn, whether superficial (first-degree), partial (second-degree) or full-thickness (third-degree). Other factors include patient characteristics such as the age of the patient (<10 or >50 years old); other medical conditions; specific locations of the burn (face, eyes,

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ears, nose, hands, feet and perineum) and presence of any associated injuries, such as smoke inhalation and other traumatic injuries.[3-6]

Despite the discovery of an array of topical antiseptic agents, healing of burns remains a challenge to modern medicine.[7] Topical antiseptic agents and disinfectants often cause allergic reactions, skin irritations and damage to healthy skin tissues, which decreases the rate of skin repair and increases the rehabilitation period.[2] Bacterial colonization versus infection is an area that needs to be appropriately understood by treating clinicians, in order to use antimicrobials and adjunct therapies effectively. While all wounds contain bacteria, colonization refers to a condition where bacteria are multiplying but their actions do not elicit an immune response.[8]

Local treatment of burn wounds involves cleansing, debridement and wound dressing, particularly using topical antimicrobial agents; however, there is a lack of consensus on the optimal agent or dressing for burn wound coverage in order to prevent or control infection or to hasten wound healing. Commonly used topical agents include combination antimicrobials, silver sulfadiazine, bismuth-impregnated petroleum gauze, mafenide and chlorhexidine. Other agents such as honey, povidone-iodine are less commonly used. Combinations of antimicrobials and topical antifungals have also been found to be effective for the local treatment of burns.

Many of the plants used in the herbal preparation used in this study have been shown to have very good antibacterial, anti-inflammatory, antioxidant, cell proliferative and angiogenic activities. The herbal oil is prepared from Chameli (*Jasminum grandiflorum*), Neem (*Azadirachta indica*), Mom (Wax), Daruharidra (*Berberis aristata*), Tutiya (Copper sulfate), Haridra (*Curcuma longa*), Yashtimadhu (*Glycyrrhiza glabra*), Sariva (*Hemidesmus indicus*), Nilofer (*Nymphaea alba*), Kutki (*Picrorhiza kurroa*), Karanj (*Pongamia glabra*), Padmakh (*Prunus cerasoides*), Manjistha (*Rubia cordifolia*), Lodhra (*Symplocos racemosa*), Haritaki (*Terminalia chebula*), Patola (*Trichosanthes dioica*), Kumari Oil (*Aloe barbadensis*) and Chandan oil (*Santalum album*).

This manuscript will highlight the current evidence on pharmacological and nonpharmacological therapeutic options for mixed depth thickness burns up to 30% TBSA. In Ayurveda, the Indian traditional system of medicine, the use of herb extracts or polyherbal formulations to treat various burns wounds have been mentioned. The herbal preparation in this study has shown to be effective in the treatment of patients with burns wounds.

OBJECTIVES

The purpose of this study was to investigate the efficacy and safety of herbal preparation for adult patients diagnosed with superficial and deep partial-thickness burns.

METHODS

This was a single-center, open-labelled, prospective clinical study. Patients aged 18 years or above were included in the study. Main inclusion criteria included patients diagnosed with superficial and deep partial-thickness burns up to 30% TBSA with the maximum extent of deep/full-thickness burn less than 10% TBSA. Major exclusion criteria included pregnant females and patients with comorbidities such as diabetes, hypertension, renal or hepatic dysfunction. Patients were treated for 14 days with the herbal preparation as a topical application.

A total of 26 subjects were enrolled in the study. All patients were clinically examined for height, body weight, vital signs, symptoms and adverse events at every visit. Patients were examined clinically, laboratory evaluations (white blood cell [WBC] count, biochemical and hematological parameters), wound epithelialization, wound microbiology and pain score evaluation at their follow-up visit accordingly at Day 1, 7 and 14. The primary and secondary efficacy and safety assessment were done before treatment (Day 0) and after the end of treatment (Day 14).

STATISTICAL ANALYSIS

Continuous data were described as mean ± SD (standard deviation) in case of normally distributed data and with median (minimum-maximum) otherwise. Categorical data were described by counts and percentages. A nonparametric Friedman test was used to detect changes over time for blocked continuous variables (local infection, pain and wound size).

RESULTS

A total of 26 subjects were enrolled in the study. Out of 26 subjects, 3 subjects could not complete the study due to various reasons (discharge without permission, leave without permission, etc.). Hence, these 3 subjects had not been included for further data analysis. The age of the patients ranged from 18 to 65 years with the maximum

number (n = 16) of patients in the age group 21-30 years as mentioned in Figure 1. With female predominance, 19 patients were female and 7 patients were male.

Out of a total of 26 enrolled patients, cause of burns was sustained accidental burns in 22 patients and suicidal attempt in 4 patients. The extent of burn ranged from 8% to 30% TBSA which is mentioned in Figure 2, with 12 (46%) patients having more than 20% TBSA burns. Ten patients had only partial-thickness burn while 16 patients had mixed depth burns with deep partial and full-thickness burn extent ranging from 4% to 10% TBSA.

WBC Counts

There was a decrease in the number of patients with clinically significant WBC count, which indicates the absence of invasive sepsis, as mentioned in Table 1. The number of patients with WBC count <10,000/mm^3 was significantly lower at Day 14 compared to baseline.

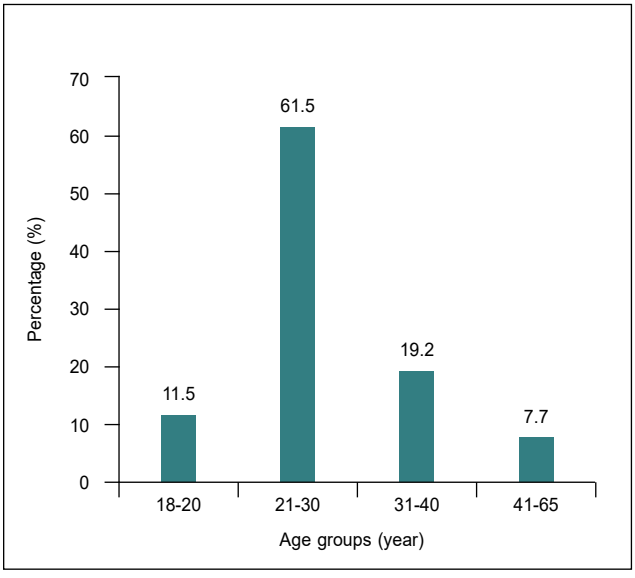

Figure 1. Age distribution of subjects.

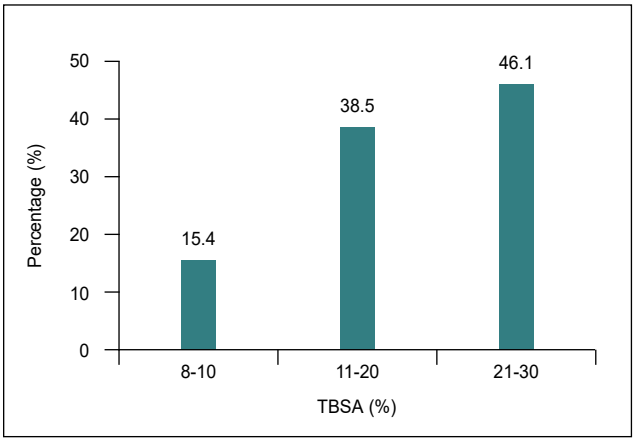

Figure 2. Burn extent.

Wound Epithelialization

The status of wound epithelialization in terms of percentage epithelialization of wound on the end of treatment (EOT) on Day 14 is mentioned in Figure 3.

In 11 patients out of 23 evaluable patients (48%), more than 75% of the wound had epithelialized at Day 14 and 10 patients of these did not need split skin grafting (SSG) for wound closure. Thirteen patients with the variable extent of deep partial and full-thickness burns required SSG for obtaining wound closure; the area receiving SSG ranged from 4% to 10% TBSA.

Wound Microbiology

On Day 7, wounds of 39.1% of patients grew various organisms such as Klebsiella, Pseudomonas Acinetobacter, methicillin-resistant *Staphylococcus aureus* (MRSA). *Pseudomonas aeruginosa* was the most common organism isolated in about 21.7% of patients. On Day 14, only 8.7% of patients were detected to grow organism from wound swab cultures and these were MRSA. The wounds appeared clean and while on Day 7, the colonization was detected in 39.1%,

Table 1. WBC Counts Indications

	WBC count <10,000/mm^3 (N)%	WBC count >10,000/mm^3 (N)%
Day 1	4 (17.4)	19 (82.6)
Day 14	16 (69.6)	7 (30.4)

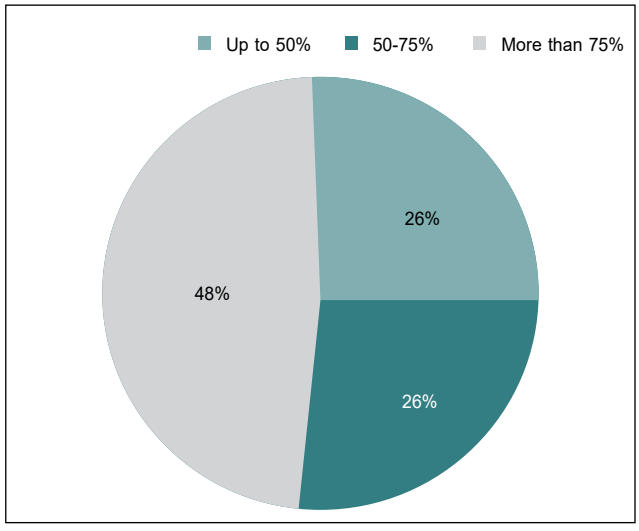

Figure 3. Wound epithelialization at end of treatment.

IJCP SUTRA: "Eat healthy and include lots of fresh fruits and vegetables in your diet. They contain fiber and substances that can help in flushing toxins out of your system."

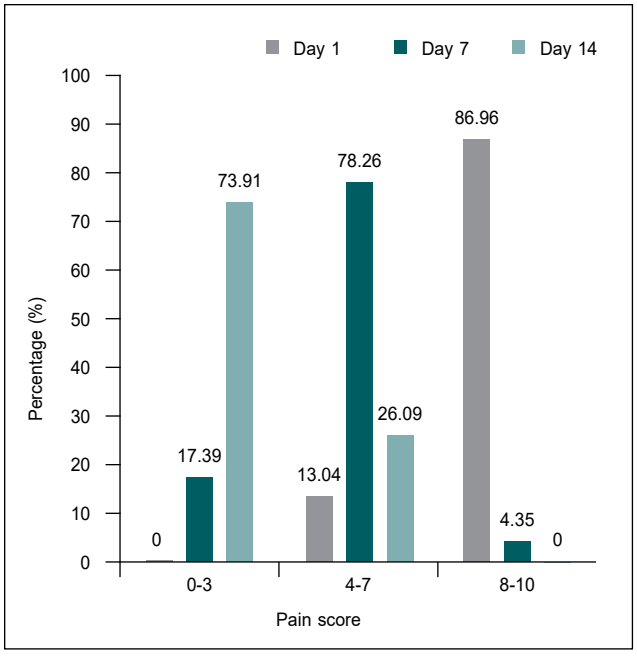

Figure 4. Pain score evaluation on the application of the investigational product .

it was controlled and decreased to 8.7% by Day 14. This difference was statistically significant. This was remarkably different from the usual observation of almost 95% wound colonization on 7th post-burn day.

Pain Score Evaluation

All patients experienced burning pain for about 10-15 minutes after spraying the investigational product on the burn wound. The pain score assigned by patients on Day 1, 7 and 14 is depicted in Figure 4. On Day 1, 87% patients experienced severe pain (score 8-10), which decreased to moderate pain (score 4-7) in 78% by Day 7 and to mild pain (score 0-3) in 74% by Day 14, which was the most significant difference observed during pain score evaluation.

Adverse Reaction and Patient Evaluation

None of the patients had suffered from any adverse effects due to investigational product and no subject had evidence of skin irritation, rash, itching or additional inflammatory changes around the wound. None of the patients expressed dissatisfaction with the treatment and no one requested discontinuation of the therapy.

Images of some selected patients are shown in Figure 5.

DISCUSSION

Despite several topical applications available for the management of burn wounds, there is a necessity to develop safer and more effective treatment options. The aim of the present study was to evaluate the efficacy and safety of a herbal preparation for burn wound management.

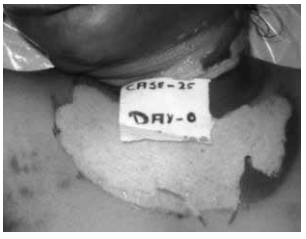

Figure 5 (A). Burn case no. 25 on Day 0.

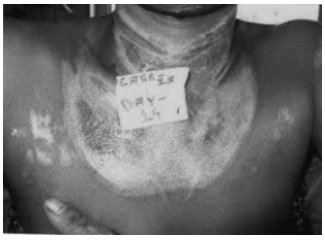

Figure 5 (B). Burn case no. 25 on Day 14.

Figure 5 (C). Burn case no. 17 on Day 7.

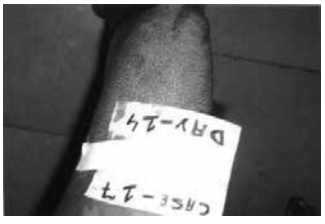

Figure 5 (D). Burn case no. 17 on Day 14.

A total of 26 patients with less than 30% of TBSA burns were enrolled in this open-labelled study over 5 months. There was female predominance and 16, i.e., 61.5%, patients were in the age group 21-30 years, with 12 (46%) patients having burn extent between 20 and 30% TBSA. From Day 1 to Day 14, the WBC count showed a significant reduction with 82.6% of patients having >10,000/mm^3 counts on Day 1 to 69.6% having <10,000/mm^3 counts on Day 14. More than 50% of the wound was epithelialized in 74% of patients on Day 14 of the study. A total of 43.4% of patients had complete epithelialization and did not require SSG for wound closure. A total of 56.5% of patients needed SSG for wound closure of 4-10% of TBSA burns.

Wound microbiology revealed positive swab cultures in 39.1% patients on Day 7 and in 8.7% patients on Day 14. This was significantly different from the usual observation of wound colonization in about 95% of patients on Day 7.

Wound infection adversely impacts wound healing. The diagnosis and management of wound infection are arguable and vary from clinician to clinician. Understanding the factors that affect the progression from colonization to infection can help clinicians with the interpretation of clinical findings and microbiological investigations in patients with chronic wounds. In the present study, the burn wounds appeared clean with progressive wound healing.

The wound colonization with bacteria was controlled effectively and was better than historical controls. This aided wound epithelialization. None of the superficial or deep thickness wounds got converted to full-thickness depth. This can be attributed to the inhibition of bacterial infection of wounds. The same has been supported by the increased number of patients with lower WBC counts.

The pain score decreased significantly in the majority of the patients from Day 1 to Day 7 to Day 14. No adverse effects or reactions were observed and the product was well accepted by all the patients.

The investigator experienced no difficulty in the use of the product. The investigator perceived the efficacy of the product as better than routinely used local agents (silver preparations).

CONCLUSION

The herbal preparation used in this study is an effective and safe topical treatment for mixed depth burn wounds involving up to 30% of TBSA. The burn wounds appeared clean with progressive wound healing. The wound colonization with bacteria was controlled effectively and better than historical controls.

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Disclosures: Dipesh Waghmare is the Medical Advisor Executive of Millennium Herbal Care Limited. All other authors have nothing to disclose and no relationship with the related industry.

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Laparoscopic Lavage is Safe in Perforated Diverticulitis

Long-term severe complications appeared to be similar with laparoscopic lavage and primary resection in perforated purulent diverticulitis patients, reported researchers in a study published in *JAMA Surgery*. However, recurrence was more frequent following lavage.

At a median follow-up of just below 5 years, results from the ongoing SCANDIV trial suggested no difference in severe complications (primary outcome) or in mortality, quality of life (QoL) and functional outcomes (secondary outcomes) between the treatment groups. Severe complications were noted in 36% (n = 26/73) in the laparoscopic lavage group compared to 35% (n = 24/69) in the resection group (p = 0.92). Recurrence of diverticulitis was more frequent following lavage, often resulting in sigmoid resection (30% in the lavage group proceeded to sigmoid resection), but with a lower stoma prevalence; stoma prevalence was 8% (n = 4) in the lavage group compared to 33% (n = 17, p = 0.002) in the resection group… (*Medpage Today*)

- Allergic Cough
- Cough with RTI
- Smoker's Cough
- Cough with Bronchial Asthma and Bronchitis
- Drug Induced Cough
- Cough with LPRD/GERD*

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℞ Grilinctus® Syrup

(Dextromethorphan HBr 5 mg, Chlorpheniramine Maleate 2.5 mg, Guaifenesin 50 mg and NH_4Cl 60 mg/ 5 ml)

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In Productive Cough

℞ Grilinctus®-BM Syrup

(Terbutaline Sulphate - 2.5 mg and Bromhexine HCL - 8 mg/5ml)

Grilinctus®-LS Syrup

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*Laryngopharyngeal/ Gastro-oesophageal reflux Disease
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