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Case Report

Ayurvedic management of second-degree firecracker burn injury in a diabetic patient: A case report

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ABSTRACT :

Background: Firecracker burn injuries are one of the common causes of thermal burns during festival time. Second-degree burn is common followed by first-degree burns. Burn wound management is challenging since healing is a complex slow-going process that needs timely care and timely management, which otherwise advances to the infectious stage especially in diabetic patients who are always at a high risk for delayed wound healing due to impaired immune response, neuropathy, infections etc. Ayurveda correlates burn wounds as *Dagdha Vruna* and is classified based on the degree of burns. **Case report:** This case report presents the successful Ayurvedic management of a 37-year-old diabetic male patient with a second-degree burn on the right wrist and fingers. The patient underwent *Ayurvedic* therapy, including *Murivenna Dhara*, JA ointment application (*Ayapana* and *Jathyadi Taila* formulation), and *Triphala Guggulu* oral administration. **Results:** The treatment resulted in significant wound healing within 10 days, as measured using the Bates-Jensen Wound Assessment Tool (BWAT), with scores improving from 24 (severe tissue damage) to 10 (near-complete healing). **Conclusion:** This case highlights the effectiveness of Ayurvedic therapies in treating burns, which may be beneficial, even in diabetic patients who typically experience delayed wound healing.

KEYWORDS: *Ayapana*, Bates-Jensen wound assessment tool, diabetic patient, Second-degree burn, Case report.

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1. INTRODUCTION

A burn is an injury to the skin or other organic tissue primarily caused by heat or due to radiation, radioactivity, electricity, friction, or contact with chemicals. [1] The burn from firecrackers is a common source of burn injuries especially during festival times. The number of patients reporting firecracker injury has almost doubled over the study period of 9 years (2002-2010), from 0.81 to 1.51 per 100,000 populations. [2] Among the classification of burn injury, significant portion of burn injuries seen in clinical practice is second-degree burn. Based on the depth of injury second-degree burn can be further classified as superficial partial-thickness and deep partial-thickness burns. In superficial partial-thickness burns it damages the epidermis and upper dermis characterized by the formation of blisters and healing typically occurs within two to three weeks with minimal scarring where as in deep partial thickness burns, it will penetrate deeper into the dermis distinguished by blisters with minimal pain and will take a longer time for healing with unavoidable scarring. [3] Diabetic mellitus has been identified as the most important independent risk factors causing poor outcomes after a burn injury. [4] Since diabetic patients have impaired microcirculation it can leads to weak inflammatory response and delayed wound healing. [5] Timely and precise management is needed in this type of burn which otherwise leads to a deep and infectious stage.

In *Ayurveda* burn injuries are compared with *Dagdha Vruna*. *Acharya Susrutha* has also classified *Dagdha Vruna* based on the degree of burns. [6] Among them, *Durdagdha Vruna(second degree burn)* presents with *Sphota* (blister), *Tivra Osha* (sucking pain), *Daha* (burning sensation), *Raga* (discolouration), *Paka* (exudations) and *Vedanachirashaya Upasamhathi* (pain subsiding after a long time) *lakshanas*(symptoms).Also, *Acharya Susrutha* has explained treatment modalities such as *Alepa* (anointment with moderate thickness), *Parisheka* (pouring medicated liquids over *the* body), *Ropana karmas* (healing procedures) for proper healing of the wound and restoring the healthy tissues. The following case report presents with successful management of a firecracker second-degree burn injury within a short span of time by *Ayurveda* line of management. Ayurvedic management of burns, particularly in diabetic patients, is not well documented in current literature. Upon thorough literature review, we came across a similar case report on the management of third degree burn wound in a diabetic patient [7] through Ayurvedic intervention. These studies solidify the evidence for the potential of Ayurvedic interventions in managing diabetic burn wounds.

2. PATIENT INFORMATION:

A 37-year-old male patient, with a known history of type 2 diabetes mellitus for the past 3 years, presented to the outpatient department (OPD) of an Ayurvedic Hospital on April 18, 2024, with complaints of burn injury on the dorsal aspect of right wrist and fingers caused by a firecracker explosion. The detailed injury history is shown in Table 1.

Table 1: Timeline of events

13/4/2024	Patient met with fire cracker burn injury

	causing a burn wound to the patient's right wrist and fingers .Patient experienced severe pain and burning sensation initially and immediately washed the burned hand in running cold water and done topical application too but found no relief.
14/4/2024	Patient noticed formation of blisters over the burnt area and bursting too with leakage of fluid followed by loss of skin with pinkish red in colour
15/4/2024	He felt complete loss of sensation over burned area associated with increased burning sensation, pain and edema.
18/4/2024	Patient received Ayurvedic treatment for burn injury from 18/4/2024 due to worsening symptoms and delayed healing despite initial care.

The patient had a history of type 2 Diabetic mellitus (fasting level was150mg/dl, post-prandial levels was 200 mg/dl and HbA1c level was 8%) and was under oral medications. He followed a balanced vegetarian diet and maintained a moderately active lifestyle. The patient had no history of smoking, alcohol consumption, or substance use.

3. CLINICAL FINDINGS:

Upon general examination, he was alert, well-oriented, and moderately built, with normal systemic vitals. His blood pressure was 130/80 mmHg, pulse rate was 78 bpm, and temperature was 98.6°F, indicating no signs of systemic infection or sepsis.

On local examination, multiple second-degree burn wounds of varying sizes were observed on the right wrist and fingers. The dorsal wrist area presented round burn wounds (1 cm × 1 cm each) with well-defined margins similarly in index finger with slightly peeled skin. The middle finger exhibited a larger wound (2 cm × 2 cm), appearing moist but without necrotic tissue or purulent discharge. The ring and little fingers had raised blisters (~3 cm in diameter), along with smaller vesicles (~0.5 cm in diameter). The surrounding skin was hyper-pigmented, oedematous, and atrophic, with partial loss of sensation in the affected areas (Figure 1).

Figure 1: Initial presentation of burn wound (Day 0)

4. DIAGNOSIS AND ASSESSMENT:

Based on clinical presentation, local examination, and diagnostic assessment, the patient was diagnosed with a second-degree partial-thickness burn (*Durdagdha Vruna* in *Ayurveda*), affecting approximately 1% of the Total Body Surface Area (TBSA).

To objectively assess wound severity and healing progression, the Bates-Jensen Wound Assessment Tool (BWAT) was utilized, [8] with an initial score of 24, indicating moderate to severe tissue involvement. The high score was attributed to the wound size, which measured more than 2 cm on the middle finger and 1 cm on the wrist area, along with the presence of clear fluid-filled blisters indicative of epidermal and dermal

layer damage. The symptom score as measured using BWAT tool is shown in Table2 and graphical representation of change in score from day 0 to day 10 is shown in Graph 1. Additionally, hyperpigmentation, edema, and partial sensory loss were noted, suggesting tissue inflammation and mild nerve involvement.

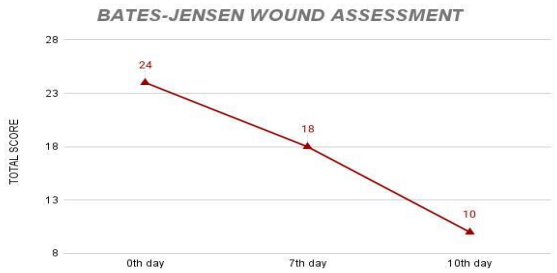
A differential diagnosis was conducted to rule out other potential conditions. A deep partial-thickness burn was excluded due to the absence of deep dermal damage and the presence of pain. Thus, a final diagnosis of second-degree superficial partial-thickness burn was confirmed, with diabetes as a complicating factor affecting wound healing.

Table 2: Changes in BATES-JENSEN WOUND ASSESSMENT TOOL (BWAT) Score from day 0 to day 10

Location: Right wrist of hand				
Shape : round/oval				
Item	Assessment	0^{th} day Score	7^{th} day score	10^{th} day score
1.size	1 = Length x width <4 sq cm 2 = Length x width 4--<16 sq cm 3 = Length x width 16.1--<36 sq cm 4 = Length x width 36.1--<80 sq cm 5 = Length x width >80 sq cm	1	1	0
2.depth	1 = Non-blanchable erythema on intact skin 2 = Partial thickness skin loss involving epidermis &/or dermis 3 = Full thickness skin loss involving damage or necrosis of subcutaneous tissue; may extend down to but not through underlying fascia; &/or mixed partial & full thickness &/or tissue layers obscured by granulation tissue 4 = Obscured by necrosis 5 = Full thickness skin loss with extensive destruction, tissue necrosis or damage to muscle, bone or supporting structures	2	2	0
3.edges	1 = Indistinct, diffuse, none clearly visible 2 = Distinct, outline clearly visible, attached, even with wound base 3 = Well-defined, not attached to wound base 4 = Well-defined, not attached to base, rolled under, thickened 5 = Well-defined, fibrotic, scarred or hyperkeratosis	2	2	0
4.under mining	1 = None present 2 =Undermining < 2 cm in any area 3 = Undermining 2-4 cm involving < 50% wound margins 4 = Undermining 2-4 cm involving > 50% wound margins	1	1	1

	5 = Undermining > 4 cm or Tunneling in any area			
5. Necrotic Tissue Type	1 = None visible 2 = White/grey non-viable tissue &/or non-adherent yellow slough 3 = Loosely adherent yellow slough 4 = Adherent, soft, black eschar 5 = Firmly adherent, hard, black eschar	1	1	1
6. Necrotic Tissue Amount	1 = None visible 2 = < 25% of wound bed covered 3 = 25% to 50% of wound covered 4 = > 50% and < 75% of wound covered 5 = 75% to 100% of wound covered	1	1	1
7. Exudate Type	1 = None 2 = Bloody 3 = Serosanguineous: thin, watery, pale red/pink 4 = Serous: thin, watery, clear 5 = Purulent: thin or thick, opaque, tan/yellow, with or without odor	1	1	1
8. Exudate Amount	1 = None, dry wound 2 = Scant, wound moist but no observable exudate 3 = Small 4 = Moderate 5 = Large	2	1	1
9. Skin Color Surrounding Wound	1 = Pink or normal for ethnic group 2 = Bright red &/or blanches to touch 3 = White or grey pallor or hypo pigmented 4 = Dark red or purple &/or non-blanchable 5 = Black or hyper pigmented	4	1	1
10. Peripheral Tissue Edema	1 = No swelling or edema 2 = Non-pitting edema extends <4 cm around wound 3 = Non-pitting edema extends >4 cm around wound 4 = Pitting edema extends < 4 cm around wound 5 = Crepitus and/or pitting edema extends >4 cm around wound	2	1	1
11. Peripheral Tissue Induration	1 = None present 2 = Induration, < 2 cm around wound 3 = Induration 2-4 cm extending < 50% around wound 4 = Induration 2-4 cm extending > 50% around wound	1	1	1

	5 = Induration > 4 cm in any area around wound			
12. Granulation Tissue	1 = Skin intact or partial thickness wound 2=Bright, beefy red; 75% to 100% of wound filled &/or tissue overgrowth 3 = Bright, beefy red; < 75% & > 25% of wound filled 4 = Pink, &/or dull, dusky red &/or fills < 25% of wound 5 = No granulation tissue present	1	1	1
13. Epithelializa-tion	1 = 100% wound covered, surface intact 2 = 75% to <100% wound covered &/or epithelial tissue extends >0.5cm into wound bed 3 = 50% to <75% wound covered &/or epithelial tissue extends to <0.5cm into wound bed 4 = 25% to < 50% wound covered 5 = < 25% wound covered	5	4	1
	TOTAL SCORE	**24**	**18**	**10**



Graph 1: **The graph depicting steady decrease in BWAT score from 24 to 10 over 10 days**

THERAPEUTIC INTERVENTION:

The treatment approach for this patient was based on *Ayurvedic* principles, focusing on *Vrana Shodhana* (wound cleansing), *Vrana Ropana* (wound healing), and *Shotha Hara* (anti-inflammatory) therapies. The summary of therapeutic interventions both external and internal is shown in Table 3.

Table 3: Therapeutic interventions and oral medications

Externally		
1.*Murivenna dhara*	100 ml once daily in morning	7 days (from 18/4/24 to 24/4/24)
2.JA ointment application	Twice daily	10 days (from 18/4/24 to 27/4/24)
Internally		
3.*Triphala guggulu*	250mg twice a day after food with luke warm water	10 days

Patient had applied only JA ointment and no other conventional treatment for wound dressing was done at the time of treatment. But he continued the conventional anti-diabetic oral medication along with the Ayurvedic intervention

5. OUTCOME AND RESULTS

There was a significant reduction in edema and erythema after the 7 days of intervention (Figure 2). The patient reported partial return of sensation over the dorsal wrist area, and the blisters on the ring and little fingers showed signs of drying. Wound size and depth showed visible signs of contraction, and epithelialization had begun. The BWAT score reduced to 18, reflecting early stages of healing.

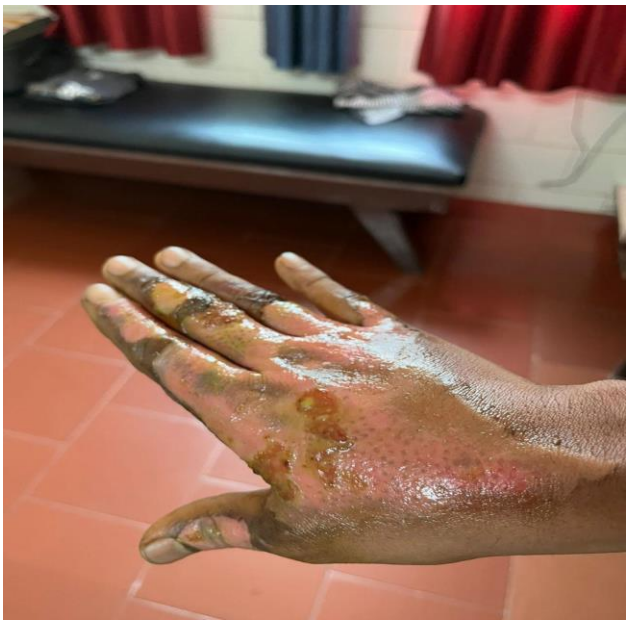


Figure 2: Condition of burn wound at Day 7

By 10th day, a complete restoration of sensation over the affected areas was noted. The wounds had epithelialized fully, with a marked reduction in wound size and a more normalized skin texture. The patient experienced minimal scarring, and the discoloration of the surrounding skin had significantly improved (Figure 3). The BWAT score further decreased to 10, indicating successful wound closure and near-complete healing.

Overall Outcome: By the end of the 10-day treatment period, the patient's burn wound had healed significantly, achieving nearly complete epithelialization with restored sensation and minimal scar formation. His FBS level was 100 mg/dl. The patient experienced no adverse effects or complications during or after the treatment.

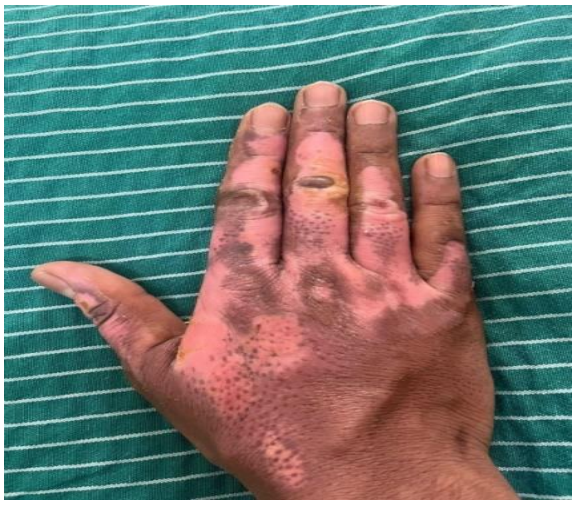


Figure 3: Condition of burn wound at Day 10

6. DISCUSSION:

The process of healing a burn wound is a complex long-lasting process dependent on immune system and involves the reconstruction of broken tissues.[9] *Acharya Susrutha* has told 60 *Upakramas* for the management of wounds from initial injury to complete recovery, which also include *Parisheka, Alepa, Vruna Sodhana* and *Ropana Karmas.* In addition, drug should have antioxidant, anti-inflammatory, anti-bacterial, anti-diabetic properties too.

Here *Parisheka* with *Murivenna* was done in initial 7 days along with other *Chiktsakrama* (treatment procedures) which resulted in regaining the patient's loss of sensation in hand. *Murivenna* is enriched with the ingredients like *Shigru (Moringa oleifera Lam) ,Paribhadra (Erythrina indica L.), Kumari (Aloe vera), Shatavari (Asparagus racemosa Wild), Palandu (Allium*

cepa L.), Nagavalli (Piper betel L.), Karanja (Pongamia pinnata L.), *Vasuka (Borreria hispidaL.)* and *Nalikera taila (Coconut oil).*[10]Research studies have proven that *karanjam, kumari* promotes wound contraction , *Nagavalli, paribhadra* supports re-epithelization , *Palandu, Shigru* have antimicrobial,antibacterial activity, *Shatavari* have antioxidant activity.[11] In addition *Narikera Taila* is used as the base for *Murivenna* which have *Ayurvedic* properties like *Madhura Rasa*(sweet taste), *Sheetha Veerya* (cold potency) [12] which alleviate *Pittaraktha Dusti* and thereby reduces *Raga, Paka*, and *Sphota*. Also, coconut oil increases skin permeability thereby increases bioavailability of drugs.

JA ointment which is a novel formulation with combination of *Ayapana plant* (80%) and *Jathyadi Taila* (20%) was used for external application in wound management. *Ayapana* is traditionally used for hemostatic, burn wounds, and antibacterial and nerve tonic purposes. A study conducted on the Zebrafish model has proven its anti-oxidant, wound healing, and tissue regeneration activity. [13] *Jathyadi taila* which is used as the base for the ointment is a polyherbal formulation classically formulated for *Dagdha Vruna, Sadhyovruna* conditions. [14] Many studies have proven its wound healing potential.If *Ayapana* and *Jathyadi Taila* is used together the effect of wound healing is anticipated to be faster.

Triphala guggulu is another classical formulation used for *Vranashothahara* was given orally. [15] It is composed of ingredients like *Triphala* (Combination of *Terminalia chebula Retz. Terminalia bellerica (Gaertn.)Roxb, Phyllanthus emblica L), Pippali (Piper longum L.), Guggulu (Commiphora wightii)* which individually accelerates the healing of wound by its anti -inflammatory, anti -bacterial, anti-diabetic properties. The patient had a history of diabetes for 3 years yet the wound healing was augmented, because diabetes is one of the risk factors that tend wounds to heal slowly and progress fastly. Probably *Pramehahara Karmas* (anti-diabetic activity) of the ingredients helps in overcoming this challenge of healing.

7. CONCLUSION

In this single-case observation, the Ayurvedic approach demonstrated healing outcomes that were comparable to or exceeded those typically observed with conventional burn management, which often relies on systemic antibiotics and frequent wound care interventions. Notably, the patient experienced complete wound resolution within 10 days without any secondary infections or adverse effects, suggesting the potential of Ayurvedic therapies as a natural, cost-effective adjunct or alternative in burn care—particularly in individuals with comorbidities such as diabetes mellitus. However, it is important to recognize the inherent limitation of deriving conclusions from a solitary case. Factors such as optimal glycemic control and the limited extent of total body surface area involvement may have contributed to the favorable outcome. To validate these preliminary observations, future research should include larger cohorts and controlled comparative studies to rigorously evaluate the efficacy, safety, and long-term outcomes—such as scar maturation, pigmentation changes, and functional

restoration—of Ayurvedic interventions in burn management.

Declaration of Patient Consent – The authors confirm that they have acquired a patient consent form, in which the patient or caregiver has granted permission for the publication of the case, including accompanying images and other clinical details, in the journal. The patient or caregiver acknowledges that their name and initials will not be disclosed, and sincere attempts will be undertaken to safeguard their identity. However, complete anonymity cannot be assured.

Patient perspective - Initially my condition was overwhelming with blister formation, pain and change in skin texture and in addition I am a diabetic patient too and I knew that it would increase the risk for wound healing. But the timely ayurvedic management remarkably healed my burn wound faster than expected. I am grateful and was fully satisfied after the completion of treatment.

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