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Evaluation of Healing effect of *Jalaukavacharana* on *Dushta Vrana* (CNHU) w.s.r to Wound Bed Preparation based on T.I.M.E Principle

Research Article

Balika Jotiram Bhatbhage[1*], Sheetal Asutkar[2], Yogesh Badwe[3]

1. PG Scholar, 2. Professor, 3. Professor and HOD,
Department of Shalyatantra, Shri Ayurved Mahavidyalaya, Nagpur, Maharashtra, India.

Abstract

Chronic non healing wounds represent a significant public health problem. A wound may be acute or chronic; the later could be defined as a wound that is not continuously progressing towards healing, which can be correlated with *Dushtavrana*. Various therapies are potentially conducive to wound healing, and according to T.I.M.E. principle of wound healing; E stands for edges of wound which is undermined due to chronicity and infection, corrected by debridement and Leech therapy is biological debridement therapy. It is a para-surgical procedure which serves debridement of the wounds by the blood sucking and oozing phenomenon. *Jalaukavacharana* possesses high efficacy in both *Vrana Shodhana* and *Ropana*, hence can be used for management of *Dushta Vrana*. *Jalaukavacharana* being a bio-purificatory method removes deep seated toxins, clearing *Srotasa* and pacifying vitiated *Doṣha*. Salivary gland secretions of leech have multiple actions like analgesic, anti-inflammatory and antibacterial which serve the purpose of wound healing. Keeping in mind, all the fundamentals & surgical applications of Leech therapy, a pilot study of 15 patients with chronic non healing wound was conducted. Observations were recorded on alternate days for 15 days. Within treatment analysis of the Chronic Non Healing Wound showed that T.I.M.E. principle reflected significant healing of wound after 7 days of leech therapy & supplementary protocol. The results of this pilot study in management of Chronic Non-Healing wound (*Dushta Vrana*) by Leech therapy (*Jalauakavacharana*) highlights the wound healing effects significantly.

Key Words: *Chronic non-healing wound, Dushtavrana, T.I.M.E. principle, Leech therapy, Jalauakavacharana, Wound healing, Wound bed preparation.*

Introduction

Chronic non healing wound is common chronic disease that significantly influences quality of life of patients and is often difficult to treat. Chronic wounds are those which do not follow the normal healing process and show no signs of healing in 4 weeks and remain in prolonged inflammatory stage (1). In Ayurveda wound that is not continuously progressing towards healing can be correlated with *Dushtavrana*. *Vrana* which has foul smell, has putrefied pus along with blood, with cavity, present since long time and has bad odor is *Dushta Vrana* (2) . It is estimated that 1 to 2 % of the population will experience a chronic wound during their lifetime in developed countries (3).

Various therapies are potentially conducive to wound healing, and according to T.I.M.E. principle of wound healing (4). Systematic wound management using the TIME acronym – T-tissue (non-viable or deficient), I-infection/inflammation, M- moisture (imbalance) and E-edge (non- advancing or undermined). E stands for undermined edges of wound which needs debridement of non-responsive wound cells.

Debridement is an essential component of wound therapy because non-viable tissue in the wound interrupts oxygen and nutrients delivery to healthy tissue which prevents healing. The primary goal of debridement is to remove all the devitalized tissue from the wound bed to promote wound healing and for removal of biofilm and bioburden (5). For which use of biological agents like leeches and maggots can be taken as adjunct therapy. *Acharya Sushruta* has explained *Shashti Upakramas* (6) (sixty type of treatment procedures) in *Dwivraniya Adhyaya* of *Chikitsasthana* for comprehensive management of *Vrana*. *Acharya Sushruta* also advised *Jalaukavacharana* (Leech therapy) in *Dushta vrana* (7) (chronic non healing wound). As *Ayurveda* got a remedy in the form of leech therapy as a para-surgical tool which acts like boon in various inflammatory conditions of skin and soft tissues. This procedure serves debridement of the wounds by the blood sucking and oozing phenomenon. *Jalaukavacharana* possesses high efficacy in both *Vrana Shodhana* and *Ropana,* hence can be used for management of *Dushta Vrana.* Wound bed preparation is the management of a wound in order to accelerate endogenous healing or to facilitate the effectiveness of other therapeutic measures (8).

*** Corresponding Author:**
Balika Bhatbhage
PG scholar,
Department of Shalyatantra,
Shri Ayurved Mahavidyalaya, Nagpur,
Maharashtra, India.
Email Id: bhatbhagebalika@gmail.com

Implication of wound bed preparation in skin grafting- Wound bed preparation is necessary for re-epithelialization of epidermal skin grafts. Hence the wound should be properly selected for skin grafting. The graft may not be effective in inflammatory or proteolysis wounds. Therefore, wound bed preparation is an essential requirement as a pre requisite for epidermal skin grafting and should include debridement, infection control and reduction of bio-burden (9). The purpose of this study was to observe the reduction in pain and formation of healthy granulation in wound. The overall goal was to prepare wound bed to create an optimal wound healing for skin grafting or by secondary means like *ropana* measures.

Methodology

- Total 15 patients were selected from the O.P.D. and I.P.D. of *Shalyatantra* Department.
- **Inclusion criteria-** Both male and female patients, Patient of age group 10-75 years and patients with clinical signs and symptoms of chronic non healing wound/ *Dushtavrana* (present for more than 4 weeks).
- **Exclusion criteria-** Wound with other disorders e.g. Malignant ulcers, Syphilitic ulcers, Lepromatous ulcers, Tubercular ulcers, Patients having history of bleeding disorders, Severe Anemia, Burns, HIV, HBsAg positive patients.
- **Routine investigations-** CBC, RBS, ESR, S. creatinine, Urine routine, BT, CT, HIV, HBsAg, and CRP, Pus culture and sensitivity as per need.
- **Materials used**
    1. *Jalauka* (Leech and Leech lab).
    2. *Haridra Churna.*
    3. Sterilized Gauze pieces, dressing pad, cotton, gloves.
    4. Kidney tray, distilled water, needle.
    5. Container of sterile water, for placing leeches after they have been fed.

Methodology of *Jalaukavacharana* (Leech therapy) (10): As described by *Sushrutacharya*

a) *Purva karma* - 2-3 *Jalaukas* (according to size of wound) of moderate size was first prepared for *Raktamokshana* by keeping it in *Haridra Jala*. Ulcerated site cleaned by *Triphala kwatha dhavan* 2-3 hours prior to leech therapy and then by dry gauze.

b) *Pradhana karma* - After wearing the latex gloves prepared active leeches were kept over the wound and its periphery. If needed, wound and non-ulcerated site were punctured with sterilized needle and when blood oozes the leeches were kept on it [(11)]. When leech started to suck blood by itself, then wet cotton pad were placed over it. The process of blood sucking confirmed by the peristalsis movements on the body of the leeches. When the leech completes blood sucking it detached itself from the bite site.

C) *Paschat karma*- *Haridra Churna* was applied over the bite lesions and pressure dressing done. *Haridra Churna* was sprinkled over the leech's anterior sucker (mouth) for inducing vomiting. After expelling all the blood from its gut, the leech became active again and was stored in fresh water container.

This procedure was done daily for 7 days with other treatment protocol which includes IV Antibiotic- Inj. Co-Amoxyclav 1.2 gm IV BD, *Triphala kwatha dhavan* once a day, Tab. *Triphala guggulu* 500 mg two times in a day, and Dry dressing once a day. And observations were taken alternate day upto 15th day.

Assessment criteria

The investigation focused on five controls of parameters like pain, odor, discharge, wound bed and granulation tissue as described in table no 1.

Table no.1: Parameters for assessment of wound healing

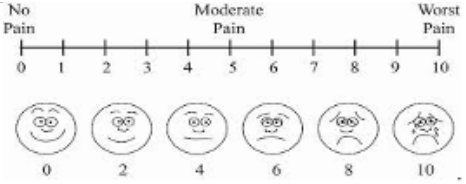
Sr. No.	Parameters for assessment	Gradation Criteria of observations (12)			
		0	1	2	3
1	Vranatala/ Wound bed	Smooth, irregular & with healthy granulation tissue	Smooth, irregular, slight discharge & less granulation tissue	Rough, regular wet with more discharge & having slough	Rough, irregular with profuse discharge & much slough
2	Gandha/ Odor	No smell	Bad smell	Tolerable unpleasant smell	Foul smell which is intolerable
3	Srava/ Discharge	The gauze is slightly moist	Bloody/sanguineous discharge	Sero-sanguineous discharge	Sero purulent
4	Varna/Granulation tissue	Pinkish red	Slight pinkish red	Slight Yellowish	Yellow to blackish
5	Pain (Vedana)	Calculated by visual analogue scale			

Fig. 1: Visual analogue scale

Observations and Results

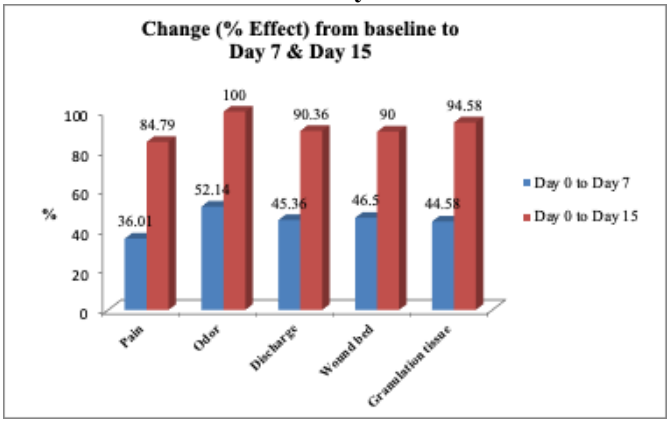
In present study, 7 out of 15 patients were from age group of 50-60 years. In analysis 12 (80%) patients were male and rest 3 (20%) patients are Females. Majority of the patients belonged to middle class i.e. 13(86.66%) whereas 2 (13.33%) patients were from poor class of society. 14 (93.33%) patients had wound at lower extremity and 1 (6.66%) patient had wound at sacral region. 5 (33.33%) patients had controlled diabetes, 1 (6.66%) patient had history of hemiplegia and 1(6.66%) patient had DVT , 1(6.66%) patient had Varicose vein and 3 (20%) patients had HTN while 4 (26.66%) patients doesn't have any history of other illness . This study reveals that 10 (66.66%) patients had *Nija vrana* while 5(33.33%) patients had *Agantuja vrana*. 2 (13.33%) patients had addiction of smoking while 6 (40%) patients had addiction of kharra and 3 (20%) patients are alcoholic while 4 (26.66%) patients don't have any addiction.

Table no. 2: Result and observations

Sr. no.	Assessment criteria	Day wise result	Mean	SD	% Effect change from baseline
1	Pain	B.T./ 0	4.8	2.81	-
		7th	3.07	1.94	36.01
		15th	0.73	0.88	84.79
2	Odor	B.T./ 0	1.4	0.91	-
		7th	0.67	0.72	52.14
		15th	0	0	100
3	Discharge	B.T./ 0	2.8	1.01	-
		7th	1.53	0.92	45.36
		15th	0.27	0.46	90.36
4	Wound bed	B.T./ 0	2.0	0.65	-
		7th	1.07	0.59	46.5
		15th	0.2	0.41	90.0
5	Granulation Tissue	B.T./ 0	2.4	0.63	-
		7th	1.33	0.72	44.58
		15th	0.13	0.35	94.58

- **Pain:** The initial mean score of pain observed was 4.8, which come down to 3.07 after 7 days and 0.73 mean after 15 days of treatment. At initial standard deviation was 2.81 which comes down to 1.94 after 7 days and 0.88 after 15 days. Change in effect from baseline up to 7th day was 36.01% and up to 15th day it was 84.79% that means significant relief in pain.
- **Odor:** The initial mean score of odor observed was 1.4, which come down to 0.67 after 7 days and 0 mean after 15 days of treatment. At initial standard deviation was 0.91 which comes down to 0.72 after 7 days and 0 after 15 days. Change in effect from baseline up to 7th day was 52.14% and up to 15th day it was 100% that means highly significant relief in odor.
- **Discharge:** The initial mean score of discharge observed was 2.8, which come down to 1.53 after 7 days and 0.27 mean after 15 days of treatment. At initial standard deviation was 1.01 which comes down to 0.92 after 7 days and 0.46 after 15 days. Change in effect from baseline up to 7th day was 45.36% and up to 15th day it was 90.36% that means significant relief in discharge.
- **Wound bed:** The initial mean score of wound bed observed was 2.0, which come down to 1.07 after 7 days and 0.2 mean after 15 days of treatment. At initial standard deviation was 0.65 which comes down to 0.59 after 7 days and 0.41 after 15 days. Change in effect from baseline up to 7th day was 46.5% and up to 15th day it was 90.0% that means significant improvement in wound bed.
- **Granulation tissue:** The initial mean score of granulation tissue observed was 2.4, which come down to 1.33 after 7 days and 0.13 mean after 15 days of treatment. At initial standard deviation was 0.63 which comes down to 0.72 after 7 days and 0.35 after 15 days. Change in effect from baseline up to 7th day was 44.58% and up to 15th day it was 94.58% that means significant improvement in granulation tissue.

Graph no.1: Change (% Effect) from baseline to Day 7 & Day 15



Patient's images:

Case 1: Patient had history of cellulites, had chronic non healing wound since 10 months, was taking treatment intermittently in other hospital and came to our department with CNHU. She was treated with TIME Principle and Leech therapy. Day 15 reflects prepared wound bed and later skin grafting done.

Fig.2: Day 1

Fig.3: Jalaukava-charana

Fig.4: Day 15

Fig.5: Skin grafting (Twak-Sandhan)

Case 2: This patient was known case of Deep Vein Thrombosis and Varicose Vein, treated in private hospital. History of cellulites and then necrotizing fasciitis over left foot. He came to our department with CNHU, treated with TIME Principle and Leech therapy. Day 15 reflects healthy granulation tissue with no exudates. Later on skin grafting was done.

Fig.6: Day 1

Fig.7: Jalaukava-charana

Fig. 8: Day 15

Fig.9: Skin grafting (Twak-Sandhan)

Case 3: Patient came with granulated inflammatory tissue on left heel, after excision wound got infected and was not healing since 1 month. He was treated with TIME Principle and Leech therapy, within 4 weeks wound healed with epithelialization.

Fig.10: Day 1

Fig.11: Jalaukava-charana

Fig. 12: Day 15

Fig.13: Epitheliali-zation

Discussion

Chronic non healing wounds are manifested as a complication of trauma or due to various pathological conditions and are difficult to manage because of their non-healing nature. In *Ayurveda*, chronic non healing wounds can be correlated with *Dusta vrana.* Besides other modalities of treatment, leech application has been emphasized in wound management. Easy availability of *Jalauka,* cost effectiveness, minimal complications, painless procedure, easy applicability are some advantages which makes it more convenient method for treating non healing wounds (13).

Salivary glands of medicinal leeches (*Jalauka*) have more than 100 bioactive substances (14). In which most potent and well known is "Hirudin". It has anticoagulant i.e. blood thinner, anti-inflammatory and vasodilator effect (15). Individual action of some other contents of saliva in leeches are as follows, Hyaluronidase facilitates penetration and diffusion of pharmacologically active substances into the tissue, Bdellins and eglins have anti-inflammatory and antibiotic effects. Trypsin, plasmin, Anaesthetic like substance reduce pain during biting by a leech, Histamine-like substances increases in flow of blood at bite site, complement inhibitors replace natural complement inhibitors if they are deficient and Acetylcholine acts as a vasodilator (16). It is performed via removing abnormal cells, reducing the bacterial load, decreasing the level of wound exudates and increasing the formation of healthy granulation tissue (17). All these in combination, possibly played a great role in wound healing. In chronic non healing wounds pain is due to stasis of blood flow, edema within the wound which is relieved by *Jalaukavacharana* by causing bio-debridement, by improving microcirculation within the wound and surrounding tissue and prolonged oozing for 8 to 24 hours (18). This along with the anti-inflammatory effects of Leech saliva causes significant pain relief in CNHU patients.

Supplementary treatment for 7 days included antibiotic, Tab. *Triphala guggulu*, *Triphala kwatha dhawana* and Dry dressing. According to *Yogratnakara* tab. *Triphala guggulu* helps early wound healing and reduction in pain (19) and according to *Acharaya Vagbhata Triphala kwath dhawana* has got wound healing property (*Vranaropana*) (20) and dry dressing's helps in control of moisture in the wound. In such a way, the combined effect of drugs as adjuvant therapy helps to alleviate the wound healing properties of leech therapy.

Conclusion

If the wound was taken care by TIME principle, T- Tissue rejuvenation done by debridement, I-Infection and Inflammation controlled by antibiotics and leech therapy, M-Moisture balance done with dry dressing, E-Edges which is undermined due to chronicity and infection, corrected by leech therapy as biotherapy. This combo therapy renders marvelous result to the needy patients. Still this claim requires a base of research study on large number of patients with Chronic Non Healing Wound.

The patients treated with *Jalaukavacharana* had significant outcome with statistically significant percentage of relief in pain, odor, discharge, wound bed and granulation tissue with highly significant p values in each parameter.

In this way it can be concluded that *Jalaukavcharana* (Leech therapy) is found to be a remedial therapy in patients with chronic non-healing wound (*Dushta vrana*) with a supplementary regimen given as per requirement.

Conflict of Interest - Nil
Source of support - Nil

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