

Leech Application in the Management of Chronic Wounds

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Abstract

Chronic wounds are always a major clinical challenge very frequently encountered by us in our clinical practice. These wounds are often infected with bacteria resistant to antibiotics, compounding the problem. A major problem in clinical studies of wound healing is that the factors which may affect wound healing tend to co-exist in patients, and it may be difficult or impossible to determine the significance of any one factor. So, keeping these points in mind, an elaborate review of Ayurvedic & Modern literature was done and based on the research, leech application was done on chronic wound. Results were obtained and evaluated using chi-square statistical calculations. It was observed that leech application not only improves the hypoxic condition but also provides a moist environment for wound healing.

Keywords: Chronic Wound, Leech Application and Hypoxia

The worldwide prevalence of wounds is believed to be 1% of world population. Most organs are liable to get affected by wounds. The lower extremities of our body are especially susceptible to them (Gupta *et al.*, 2004).

The process of healing which is a natural phenomenon starts right after an injury and continues in sequential manner till the formation of healthy scar. This uneventful normal pattern of healing is not uniformly present as a rule under different conditions of wounds. Certain general factors such as nutritional deficiency like proteins, vitamins, etc., hormonal imbalance and various systemic diseases retard and influence the sequence of the normal process of healing in wounds. Similarly some local factors like deficient blood circulation, hematoma, foreign bodies, infection and slough etc., also deviate the process of healing from its normal course (Barbara *et al.*, 2001).

Oxygen is critical for wound healing. Blood flow is the mechanism of oxygen transport to the tissues (Hartman *et al.*, 1992). Micro vascular angiopathy is one of the major factors for hypoxic condition

leading to non-healing (Donnelly *et al.*, 2000).

Treatment interventions that increase blood flow consequently will enhance oxygen delivery to the tissues, improve healing and possibly prevent tissue damage from tissue loads. Many new devices and techniques are evolved for this purpose like whirlpool, pulsatile lavage with suction, high voltage pulsed current (HVPC) and Hyperbaric oxygen therapy, latest and most talked about, but the efficacy in rectifying tiny micro vascular thrombus is still a matter of discussion (Pandya & Supea, 1992).

In *Sushruta samhita* (text book of Ayurvedic surgery) the management of wounds has been vastly elaborated as '*Sashti upakrma*' i.e. sixty methods of treatment of wounds (Atridev, 1997). For management of chronic ulcers (*Dushta vrana*) bloodletting was advised by means of leeches along with proper wound cleaning by Sushruta. *Charaka* was also of same opinion regarding the management of non healing ulcers (Chaturvedi & Shashtri, 2001).

Now western practitioners are adopting the ancient methods in the management of chronic

ulcers. Maggot therapy is now commonly used for treating chronic wounds (Dante, 2007). Leech application is also gaining popularity amongst plastic surgeons in the procedures such as skin graft, reattachment of body parts and reconstructive surgery (Smoot *et al.*, 1995).

So considering the wisdom of ancient Ayurvedic scholars as a way to cure chronic wounds, a clinical trial was conducted by applying leeches to the chronic wounds. A well defined, meticulously designed proforma was made and the clinical assessment was done on the basis of 'SWHT' score.

The observations & results obtained were evaluated using Chi-square statistical calculations.

MATERIAL & METHODS

A total 24 number of patients were selected randomly from the *Shalya* Out-Patient Department and indoor wards of S.S. Hospital. The criteria of selection of the cases was based in the symptomatology presented by the patients, according to the one described by *Sushruta* and modern medicine.

The following procedure was adopted in all the selected cases - on a special proforma patient's name, age, sex and address was noted. The chief complaints of the patient were noted along with duration. In the history of present illness, the mode of onset and the sequential changes, taking place in the illness were noted. The past history was enquired into, in order to rule out the concurrence of any specific disease, as diabetes, syphilis, tuberculosis etc.

General examination of the patient was conducted in the form of pulse, blood pressure, temperature, presence of jaundice or anemia and also the nutritional status. Clinically the systemic examination of cardio-vascular, respiratory, urogenital, gastrointestinal and central nervous system was carried out.

Local examination of the wound was then done in detail. Its anatomical site, size, colour, margins, presence of discharge, associated pain, tenderness, depth and edema etc., were noted down. Routine laboratory investigations were done, as below-

S. No.	Investigations
1.	Hb %
2.	TLC, DLC, ESR
3.	Blood Urea
4.	Blood Sugar
5.	Blood Albumin & Globulin
6.	Urine (Routine & Microscopic)
7.	Pus (Culture & Sensitivity)

After taking consent from the patients two clinical groups were made according to the management to which the patients were subjected to Group (i) Application of leech with sterile dressing. (In big gangrenous wounds one time sharp debridement was done before leech application). Group (ii). Conservative wound management with drugs & dressings.

Leech Application

Material

S. No.	Material Used
1.	Two Small Glass, Jar, Kidney tray, one big glass bowl & Turmeric powder
2.	Sterilized gauze, Swab and Gloves
3.	Sterile needle, Sterile dispovan (10 ml)
4.	Normal Saline and Dressing material

Applying leeches

First we purified the leeches by putting them in turmeric mixed water for 15 minutes. After that leeches were kept in plain water for 5 minutes. Then patient's wound was cleaned thoroughly with plain water. (If sterile water available is best suited for this purpose). Then adequate numbers of leeches were applied to the general area of maximal congestion. Then a wet gauze or thin cotton pad was placed covering the leech's body (head and mouth remained uncovered) and continuously pouring of fresh water was done. Once the leech attached, it will remain safely in place until fully distended and then detaches itself. (30-45 mm). After that the leeches were purified in the same manner as described above and wound was cleaned with normal saline and dressing was done. The same leeches that were used previously, were applied to the same patient on the 4th and 8th day. So a total of three times the same group of

leeches were applied to a single patient with dressing with normal saline. Non poisonous variety of leeches, named Kapila, was used during the procedure, according to the classification of leeches in *Sushruta samhita*.

Parameter of assessment

Assessment of wound healing was measured clinically by using the long form of 'SWHT' (Sussman Wound Healing Table) for wound assessment. ('SWHT' assessment was done on zero, one and second week).

Observations were evaluated by using statistical calculations. Chi-square test has been applied to test the significance of difference between proportions of two groups. Wherever the expected frequency came less than 5, chi-square has been computed after suitably pooling the rows or columns.

OBSERVATIONS & RESULTS**Evaluation of 'SWAT' Scoring:**

Table (1): Evaluation of "Not good attributes of wound" (SWHT Format)

Groups	'SWHT' Score 'Not good attributes of wound' Mean \pm S.D.			Intra-group (Paired t – test)	
	BT	F ₁	F ₂	BT-F ₁	BT-F ₂
Group I	5.75 \pm 3.28 (n=12)	3.42 \pm 3.87 (n=12)	1.42 \pm 2.50 (n=12)	2.33 \pm 1.67 t=4.84 P<0.01	4.33 \pm 1.77 t=8.46 P<0.001
Group II	8.33 \pm 4.83 (n=12)	7.67 \pm 4.94 (n=12)	5.92 \pm 5.73 (n=12)	0.67 \pm 0.78 t=2.97 P<0.02	2.42 \pm 1.62 t=5.16 P<0.001
Inter-group (Unpaired t-test)	t=1.53 p>0.05	t=2.35 p<0.05	t=2.49 p<0.05		

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In both groups, statistically highly significant reduction in “not good attributes” was observed, however in leech treated group this reduction was higher (t=8.46) in comparison to control group (t = 5.16). In leech treated group, highly significant reduction in “not good attributes” was observed in first follow up (t = 4.84) whereas in control group significant reduction in ‘not good attributes’ (t = 2.97) was found.

Before treatment no significant difference was found in both the groups. In first follow up, leech applied group had greater number of reduction in “not good attributes” in comparison to

control group and it was significant. In second follow up, leech applied group had greater number of reduction in “not good attributes” in comparison to control group and it was significant.

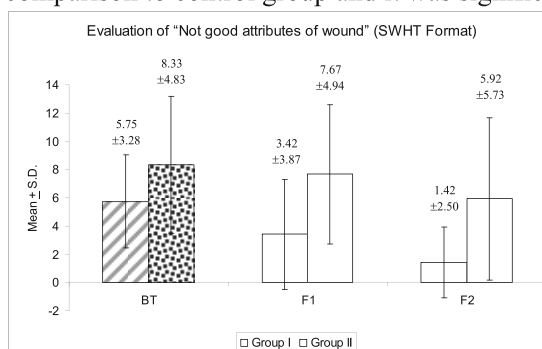
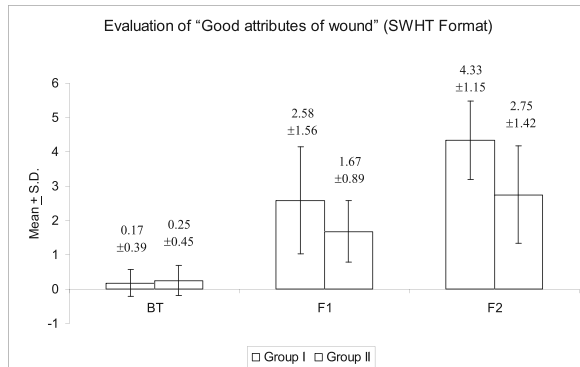


Table (2): Evaluation of “Good attributes of wound” (SWHT Format)

Groups	‘SWHT’ Score ‘Good attributes of wound’ Mean ± S.D.			Intra-group (Paired t – test)	
	BT	F ₁	F ₂	BT-F ₁	BT-F ₂
Group I	0.17 ± 0.39 (n=12)	2.58 ± 1.56 (n=12)	4.33 ± 1.15 (n=12)	-2.42 ± 1.38 t=6.07 P<0.001	-4.17 ± 1.11 t=12.95 P<0.001
Group II	0.25 ± 0.45 (n=12)	1.67 ± 0.89 (n=12)	2.75 ± 1.42 (n=12)	-1.42 ± 0.79 t=6.19 P<0.001	-2.50 ± 1.31 t=6.59 P<0.001
Inter-group (Unpaired t test)	t=0.48 p>0.05	t=1.77 p<0.05	t=2.99 p<0.01		

In both groups, statistically highly significant increment in “good attributes virtues of wound” was observed, however in leech treated group this increment was higher (t = 12.95) in comparison to control group (t = 6.59). In both groups, highly significant increment in “good attributes of wound” was observed in first follow up, however, in leech treated group this increment was higher (t = 6.07) in comparison to control group (t= 6.19).

Before treatment, no significant difference was found in both the groups. In first follow up, leech applied group had higher increment in “good attributes” in comparison to control group, however it was not significant. In second follow up, leech applied group had higher increment in “good attributes” in comparison to control group and it was highly significant.



DISCUSSION

Wound healing generally depends upon two kinds of factors, systematic and local. Systemic factors (Septicemia, Anemia & Nutritional deficiency) can be corrected by proper systematic medication.

Local factors play a major role in wound healing and their proper management is still a challenge before us. Keeping this in view, present study mainly focused on management of local factors with special reference to subjective factors. These were Necrosis, Edema, Discharge, Pain and Wound healing phase.

So after a thorough review of Ayurvedic and modern literature some of the astonishing facts came before us, these were Leech Saliva contain Hirudin, a direct thrombin inhibitor; helpful in resolving micro thrombi in wounds; Hyaluronidase, which increases the local spread of saliva through human tissue and also has antibiotic properties; A histamine-like vasodilator that promotes local bleeding; A local anaesthetic (Dente, 2007).

All these qualities make leech a perfect cure for chronic wounds by increasing the local blood supply and ultimately oxygenation to local wound. In a nutshell, leech application had statistically significantly reduced the intensity of pain and amount of discharge in comparison to control group. Leech application had diminished edema more efficiently in comparison to control

group. This could be because it improves generalize oxygen gradient in wound tissue and surroundings by rectifying micro vascular thrombi and fibrin clot and thus improves circulation. Leech application had minimized necrosis. This could be because it has more than 100 proteins in its saliva (Baskova *et al.*, 2004); probably some of them have debridement ability. This is a subject of further research.

Conclusion

We conclude that the role of leech application in treating chronic wounds is significant in comparison to control group. Though the work, was difficult and challenging, it has opened before us a field of work which certainly opens up new and interesting phenomenon for the experimental and clinical workers.

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