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Research Article

EVALUATION OF NIMBA TAILA AND MANJISTHA CHURNA IN NON HEALING ULCER

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ABSTRACT
This clinical study was done in fifty-one cases of non-healing ulcers of more than six weeks duration to evaluate the efficacy of Nimba taila (Neem oil) externally and Manjistha churna (powder) orally as well as its kwatha externally with an aim to provide an effective management in cases of non healing ulcers. For assessment, wound measurement was done before, during and after treatment and wound healing time as well as lab tests like swab culture, X-ray of affected part, Hemoglobin, Total Leucocytes Count, Differential Leucocytes Count, Liver Function Test, blood sugar level and HbA1c were recorded. Patients with tubercular, malignant ulcers and with ulcers of less than 6 weeks duration were excluded from the study. In the patients treated with only Nimba taila, 31.2% (5/16) patients had 50% healing at eight weeks therapy while with only Manjistha churna, 20.0% (3/15) patients had 50% healing at eight weeks therapy but in the cases, treated with both the drugs, 75.0% (15/20) patients had achieved 50% healing at eight weeks therapy. The study suggests that there is an added effect (quick healing of wound) of Nimba taila with Manjistha churna & its kwatha in cases of non healing diabetic ulcer and single use of Nimba taila or Manjistha churna is not much significant but it is observed keenly that use of Nimba taila alone is comparatively more beneficial than single use of Manjistha churna. It means that both the drugs together are more effective than their separate use.
KEY WORDS: Nimba (*Azadirachta indica* A. Juss.), Manjistha (*Rubia cordifolia* Linn.), Non healing ulcer (Dushta vrana), Taila (oil), Churna (powder), Kwatha (decoction)

INTRODUCTION

Human beings have been susceptible to wound from the very early stages of their development. Probably, after being exposed to injury, the first dressings ever used were the leaves etc, which were easily available from the surrounding. By their constant experiences, they might have found that leaves of some trees were useful in wound healing. Thereafter, our ancestors tried various dravya for wound healing & gave a vivid description about its management.

In Ayurveda, vrana has been described as a main subject in the Sushruta samhita by Sushruta (1000BC), the father of Indian surgery. He has described the wound from its different aspects right from the definition, causes etc. to the treatment of the scar tissues. Vrana (wound) is stated as[1]-"vrana gatravichurne" i.e. destruction and discolouration of viable tissue due to various etiology.

Agnivesha (1000BC) expanded the knowledge of wound and gave its detailed description including classification, sign, symptom, prognosis and thirty six upakrama (essential procedures) for management[2].

Most commonly the vrana can be classified into 2 types-

(a) Dushta vrana[3] (i.e. chronic wound/Non-healing ulcers) – are the contaminated wounds which require specific purification, called vrana shodhana, without which healing cannot be initiated in the wounds.

(b) Shuddha vrana[4] – The cause of such vrana is generally a surgeon's knife & this type of vrana does not require any specific treatment except its protection from various contaminations.

Wound healing is a natural phenomenon which starts immediately after injury and continues in sequential manner till the formation of a healthy scar. This event is not uniformly present as a rule under different conditions of wound.

Certain general factors such as age, nutritional deficiency, hormonal imbalance and various systemic diseases like anaemia, uraemia, jaundice, diabetes etc. and certain local factors like position of skin wound, blood supply, tension, infection, foreign body etc. either alone or in combination influences the normal sequence of wound healing[5].

Upon injury to the skin, a set of complex biochemical events takes place in a closely orchestrated cascade to

repair the damage. The classic model of wound healing is divided into three or four sequential, yet overlapping phases (1) haemostasis (2) inflammatory, (3) proliferative and (4) remodeling[6].

The phase of maturation and remodeling is not only complex but fragile, and susceptible to interruption or failure leading to the formation of chronic non-healing wounds. Factors which may contribute to this include diabetes, venous or arterial disease, old age, and infection.

Delayed wound healing in diabetes is due to microangiopathy, atherosclerosis, and proliferation of bacteria due to high blood sugar[7]

Healing methods are same in different system of medicine whatever it may be allopath or Ayurveda i.e. to protect vrana from microorganisms and to increase granulation tissue formation and epithelization.

The management of wound has been a major problem since the early stages of medical science. In spite of brilliant progress of surgery, wound management still remains a subject of speculation. The early manifestation of unsatisfactory healing gives rise to serious complications which can lead to prolonged healing and even death in surgical practice.

The development of pharmacological agents like antibiotics, antioxidants, vasodilators, vitamins have enhanced the healing of acute as well as chronic wounds. Reconstructive surgical techniques have further added boon to wound management. In spite of all these recent advances, lacunae still persist. For instance, wound infection has been one of the major impediments in the process of wound healing and after invention of antibiotics, it was thought that this problem would be conquered. Since then several antibiotics in form of systemic and local use have been tried but problems of chronic wound healing remains as such. Apart from this, antibiotics have their own limitations due to their adverse side effects.

Keeping in view of aforesaid problems, ancient (Ayurvedic) literature were explored to throw light regarding the wound and its management.

Among the various drugs mentioned for non healing ulcers in Ayurveda, Nimba and Manjistha were specifically selected for the study because both the drugs have been described in management of vrana at various places in all the three great treatise of Ayurveda as well as in nighantus. According to Charaka, Manjistha churna & its kwatha are better for shodhana karma[8] whereas Nimba seed in form of taila is externally applicable for wound and it performs good ropana (healing) in vrana[9] and also it has been seen in this study. Sushruta has said that Nimba purifies (shodhana) non healing ulcer and Manjistha causes ropana of vrana[10]. Moreover, these drugs have been described in one of the sixty essential procedures of wound management by Sushruta.

NIMBA (*Azadirachta indica* A. Juss, Family - Meliaceae)

In India, this tree is variously known as Devine Tree, Heal Tree, Nature's Drug store, Village Pharmacy, Panacea for all the diseases. The Nimba tree is widely distributed all over India, from Jammu & Kashmir in the North, Chennai in South and from Rajasthan in the West to Assam in the East.

Nimba is used in Ayurveda, Unani and Homeopathic system of medicines. For medicinal purposes, all parts of the plant such as leaf, stem, root, bark, gum, sap, flower, fruit and seed are used. Nimba preparations have been used to treat blood disorders, hepatitis, eye diseases, cancer, ulcers, constipation, diabetes, indigestion, sleeplessness, boils, burns, cholera, gingivitis, malaria, measles, nausea, snakebite, rheumatism and syphilis. Numerous formulations are used as antiseptic, astringents, emollients, febrifuge, anodynes, diuretics, purgatives, sedatives and tonics.

The Bark of Azadirachta indica is being used by several Indian tribes as an antifungal, antiseptic, astringent in several skin diseases, boils and blisters, eczema etc. from centuries[11]. Modern scientific research has proved it to be anti-microbial, fungi static, fungicidal, anti-inflammatory, antioxidant, and free radical scavenger, useful in ulcers, infections and skin diseases[12-16]. Bark of *Azadirachta indica* contains polyphenols which are antioxidant phytochemicals that tend to prevent or neutralize the damaging effect of free radicals.

They are well known powerful antioxidants that scavenge free radicals, promote dermal fibrosis, act as an anti-oxidant, and improve wound healing and acts as an anti-inflammatory reagent[17-19]. Furthermore, acetone-water Neem leaf extract showed antiretroviral activity through inhibition of cytoadhesion. The extract increased hemoglobin concentration, mean CD^+, cell count and erythrocyte sedimentation rate in HIV/AIDS patients[20].The ethanolic leaf extract of Neem also caused cell death of prostate cancer cells (PC-3) by inducing apoptosis[21]. Induction of apoptosis in rat oocytes was seen when treated with Neem leaf extracts[22]. Apart from this, antiviral activity of aqueous Neem leaf extracts against chikanguniya, group-B Coxsackie and measles virus has also been reported[23].

MANJISTHA (*Rubia cordifolia* Linn, Family-Rubiaceae)

This plant is commonly called as Majit, Manjit. It is a very variable, perennial herbaceous climber or creeper with spreading branches, which grows often many yards

long, having many branches with very long cylindrical roots. It is wild in the North-West Himalayas, Nilgiris, Mahabaleshwar and other hilly districts of India[24] & widely distributed in India, China, Malaya, Japan, Tropical Africa and tropical Australia.

Manjistha is used in visha, shleshma sotha, yoni roga, netra roga, karna roga, raktatisara, kustha, rakta dosha,visarpa, vrana, prameha[25].The root of Manjistha is sweet, bitter, astringent, thermogenic, anti-inflammatory, anodyne, antiseptic, digestive, carminative, antidysentric and diuretic etc. and useful in lerprosy, skin diseases, leucoderma, pruritus, wounds, ulcers etc[26].It is considered to be traditionally useful as an external application in inflammations, ulcers and skin diseases[27].

The methanolic extract of R. cordifolia has anticancer activity[28]. Diabetes patients have shown impairment in learning, memory, mental and motor speeds[29]. The triterpenes isolated from petroleum ether extracts of R. cordifolia posses anticonvulsant property[30].Tripathi and his associates have shown that the ethanolic extract of R. cordifolia has lipoxygenase inhibitory activity and its ethyl acetate fraction is most potent in this regard[31].

MATERIALS AND METHODS

It includes

Collection and Preparation of drugs

For Nimba taila, seed of *Azadirachta indica* was purchased from the local market of Varanasi (U.P.) after rainy season and then seed was given to extract oil.

For Manjistha churna, the root of Manjistha was purchased from the indigenous market, Varanasi and identified by the experts of the department of Dravyaguna, B.H.U. The yavakuta churna (coarse powder) and fine powder of root was prepared by Ayurvedic Pharmacy of B.H.U. Varanasi.

Drug administration

Nimba taila used topically.

The fine powder of root of Manjistha was given to the patients and they were directed to use its 6 gm twice a day orally with normal water while the coarse powder was advised to use as decoction. They were told to make decoction of 250 gm of drug in four liters of water till the content reduced to one fourth i.e. one liter. It was filtered through fine and clean cloth. The patients of non-healing ulcer were advised to dip the affected foot in lukewarm decoction (37-40°C) for 45 minutes. The affected part should be dipped fully in decoction. After this the foot ulcer was cleaned with sterilized gauze pieces and dressed with the drug according to their groups.

Washing the wound at the time of dressing by normal saline before application of Nimba taila

Design of study

Fifty one patients having chronic (non healing) wounds of more than six weeks duration who attended wound clinic, Sir Sundarlal Hospital, B.H.U. from Aug.2009 to Sept 2010 were included as subject of study.

Selection of patients

As per the proforma, detailed history, clinical examinations and investigations were done and recorded after enrollment of patients according to inclusion and exclusion criteria.

The patients were divided into three groups. In group I, sixteen patients were advised to use Nimba taila topically. In group II, fifteen patients were advised to take Manjistha churna orally & its kwatha externally while twenty patients of group III, were advised to use both drugs.

Inclusion criteria

Those patients having duration of ulcers more than six weeks (chronic/non healing ulcers) were included in this study.

Exclusion criteria

Patients with tubercular or malignant ulcers and with ulcers of less than six weeks duration were excluded from this study.

Follow up

Patients were followed up at two weeks interval and the wound was examined. Wound measurement and other findings were recorded as in the proforma. Some patients were admitted in the ward for proper wound care.

Maximum duration of observation was six months. Healing time was measured per two weeks and percentage of healing was noted as percentage of epithelization.

Assessment criteria

During the process of treatment, two parameters for assessment were used which are subjective and objective parameters.

Subjective parameters includes improvement of general condition, body temperature, blood pressure and other symptoms of wound like pain, discharge and healing time.

Objective parameters includes examinations like measurement of ulcer margin, swab culture, nutritional status by using Hemoglobin, TLC, DLC, LFT, biopsy, blood sugar level, X-ray of affected area in cases of deep ulcers where osteomyelitis is suspected and HbA1c (in cases of diabetic foot).

Statistical analysis

All the observations obtained were tabulated and interpreted in terms of percentage, mean, median and standard deviation to test the significance of association

and difference of mean, standard t-test, chi-square test, one way Anova and Post Hoc test had been applied.

OBSERVATION & RESULTS

Fifty eight patients registered for the study but only fifty-one patients completed follow up, so rest of seven patients were excluded from this study.

Observation & Results of present study are as follows

Demographic profile

- **Age-wise distribution of patients (Table 1)**

This study shows that most of the patients (31.4%) belong to 50-59 years age and then to 60 & above yrs (27.5%), 40-49 yrs (17.6%), 20-29 yrs (15.7%), 30-39 yrs (7.8%).

- **Sex-wise distribution of patients (Table 2)**

Most of the subjects were males 37 (72.5%) and the females were only 14 (27.5%).

- **Social status wise distribution of patients (Table 3)**

Patients from rural area were more 36 (70.6%) than from urban area 15 (29.4%).

- **Socio-economic status wise distribution of patients (Table 4)**

The socio-economic status of patients shows that most of them [25 (49.1%)] belong to lower status then middle status 17 (33.3%) & upper status 9 (17.6%).

- **Occupational status wise distribution of patients (Table 5)**

The occupational status of patients revealed that 50.9% (26 out of 51 patients) belong to labour class.

- **Distribution of patients according to duration of wound (Table 6)**

This study revealed that 23 out of 51 (45.1%) patients have the duration of wound for 6-7 weeks.

- **Distribution of patients according to etiology of wounds (Table 7)**

Most of the wound were diabetic (56.9%) wounds followed by venous ulcers (27.5%), leprotic ulcers (7.8%) and pressure ulcers (7.8%).

- **Distribution of patients according to anatomical location of wounds (Table 8)**

Study shows that the lower limb was the most common site (94.1%) for non healing wounds.

- **Distribution of patients according to ≥ 50% healing of wounds in three groups at different interval (Table 9)**

Study shows that time ranges from 2 weeks to 16 weeks to achieve ≥ 50% healing of wounds in three groups. Data shows that 15 cases in group III achieved ≥ 50% healing at 8 weeks while in group I, 5 cases and in group II, 3 cases showed ≥ 50% healing at 8 weeks.

- **Distribution of patients according to 50-75% & 75-100% healing at 8 wks and >8 wks therapy in three groups (Table 10,11,12)**

Study reveals that 5 cases (35.7%) in group I, 3 cases (30%) in group II and 10 cases (71.4%) in group III have shown 50-75% healing at 8 weeks therapy while no case (0.0%) in group I & II and 5 cases (83.3%) in group III have shown 75-100% healing at 8 weeks therapy.

- **Distribution of patients according to their etiology, duration and percentage of healing (Table 13)**

Study indicates that in group III, there is maximum number of cases of different etiology have shown 50-75% healing at 8 week of time interval.

- **Distribution of patients and comparison of three groups for ≥50% healing at <8 wks & >8 wks therapy (Table 14 & 15)**

On analyzing the data, significant difference was found among the three groups. By use of Fisher exact probability test and Chi-square test, difference was found statistically significant in between group I & III as well as in group II & III, it means group III is good for healing.

- **Mean area of wound (sq.cm) with the comparison of wound size among the three groups (Table 16 & 17)**

The mean area of wound which is measured at different intervals is shown in table 16. Study of this table clearly shows that in group III, wound contraction was relatively faster than other two groups.

When comparison of wound size done between three groups by using One way ANOVA test and Post-Hoc test, difference was found statistically significant in between group I & III as well as in group II & III up to fifth follow up which means group III is good for healing.

DISCUSSION

Wound healing is a normal physiological phenomenon starting just after injury but factors like nutritional deficiency, hormonal imbalance, systemic diseases and local factors such as infections, hematoma, and foreign body etc. delays normal healing resulting into non healing ulcer.

Regarding the treatment of an ulcer, the two steps in Ayurveda are very important which are the shodhana and the ropana and they have similar concepts with debridement, dressing and elevation of wound as mentioned in modern medicine.

Nimba taila and Manjistha churna were selected to evaluate their effect on non healing ulcer, because they have potent medicinal property, less or negligible adverse effect and are palatable for the use as well.

Involvement of maximum number of aged patients indicates that in old age wounds tends to become chronic because of poor blood supply. Most of the subjects were males which may be reflection of the fact that males go for more outdoor activities and thus are more prone to develop traumatic injuries. Patients from rural area are more prone to develop chronic wound probably due to poor hygiene and lack of awareness. Occupation of patient also delays healing of wound as seen in labour class patients who have to work in soil and which lead to recurrent infection of wounds.

Nimba taila promotes wound healing due to its high content of fatty acids. It keeps site moist and give a soft texture to the skin during the healing process and also it protects the newly formed epithelial tissue. It has a good penetration effect for the healing due to its oil base whereas Manjistha churna and its kwatha has a special action of blood purification (eliminating toxins), as well as it imparts better complexion to the skin by acting mainly on rasavaha and raktavaha srotas, alleviating the kapha and pitta dosas and ameliorating the vitiation of bhrajaka pitta (pitta present in the skin).

Due to neuropathy, the patient of diabetes and leprosy can develop trophic ulcers due to repeated trauma which is an important factor for delayed healing of ulcer.

Non-healing ulcers are mostly concerned with diabetes mellitus (as seen in this study) and in case of non healing diabetic ulcer, an added effect (quick healing of wound) of Nimba taila with Manjistha churna & its kwatha is seen and single use of Nimba taila or Manjistha churna is not much significant but it is observed keenly that use of Nimba taila alone is comparatively more useful than single use of Manjistha churna.

In spite of the use of several antibiotics and antiseptics in venous ulcers, wound was forming again and again but with the use of both drugs simultaneously (in group III), it showed good effect over healing which means both drugs have good antibiotic as well as antiseptic role in cases of venous ulcers.

In case of leprosy, topical use of Nimba taila (in group I) has shown good result with good granulating effect, sometimes leading to hypergranulation which was controlled by application of copper crystals, it means that there is something in Nimba taila which helps in fast wound healing that is like a growth factor which needs further researches to develop Nimba taila as a better wound healer.

Both the drugs have value in management of non healing wounds due to their ropana karma along with their antibacterial action.

On the basis of these findings it can be concluded that both drugs together are more effective than separate use.

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Table 1 AGE-WISE DISTRIBUTION OF PATIENTS

Age group (years)	No. of patients	Percentage
20-29	8	15.7
30-39	4	7.8
40-49	9	17.6
50-59	16	31.4
60 & above	14	27.5
Total	**51**	**100**

Table 2 SEX-WISE DISTRIBUTION OF PATIENTS IN PRESENT STUDY

S. No.	Sex	No. of cases	%
1	M	37	72.5
2	F	14	27.5
Total		**51**	**100**

Table 3 SOCIO-ECONOMIC STATUS WISE DISTRIBUTION OF PATIENTS

Socio-economic status	Group I		Group II		Group III		Total	
	No.	%	No.	%	No.	%	No.	%
Upper	2	12.5	3	20.0	4	20.0	9	17.6
Middle	5	31.3	5	33.3	7	35.0	17	33.3
Lower	9	56.2	7	46.7	9	45.0	25	49.1
Total	**16**	**100**	**15**	**100**	**20**	**100**	**51**	**100**

Table 4 SOCIAL STATUS WISE DISTRIBUTION OF PATIENTS

Social status	No. of cases	%
Rural	36	70.6
Urban	15	29.4
Total	**51**	**100**

Table 5 OCCUPATIONAL STATUS WISE DISTRIBUTION OF PATIENTS

Occupational status	Group I		Group II		Group III		Total	
	No.	%	No.	%	No.	%	No.	%
Labour	7	43.8	8	53.4	11	55.0	26	50.9
Service	2	12.4	3	20.0	3	15.0	8	15.7
Retired	3	18.8	2	13.3	2	10.0	7	13.7
Business	4	25.0	2	13.3	4	20.0	10	19.7
Total	**16**	**100**	**15**	**100**	**20**	**100**	**51**	**100**

Table 6 DISTRIBUTION OF PATIENTS ACCORDING TO DURATION OF WOUND IN THREE GROUPS

Duration of wound (weeks)	Group-I		Group-II		Group-III	
	No. of Pt.	%	No. of Pt.	%	No. of Pt.	%
6-7	7	43.7	9	60.0	7	35.0
8-9	5	31.3	3	20.0	6	30.0
10-11	2	12.5	2	13.3	5	25.0
≥12	2	12.5	1	6.7	2	10.0
Total	**16**	**100**	**15**	**100**	**20**	**100**

Table 7 DISTRIBUTION OF PATIENTS ACCORDING TO ETIOLOGY OF WOUND

Type of wound	No. of patients	Percentage
Diabetic	29	56.9
Venous	14	27.5
Leprotic	4	7.8
Decubitus	4	7.8
Total	**51**	**100**

Table 8 DISTRIBUTION OF PATIENTS ACCORDING TO ANATOMICAL LOCATION OF WOUND

Site	No. of patients	Percentage
Great toe	5	9.8
Heel	6	11.8
Plantar aspect	10	19.6
Dorsal aspect	8	15.7
Med. Malleolus	7	13.6
Lat. Malleolus	6	11.8
Leg	6	11.8
Lower back	3	5.9
Total	**51**	**100**

Table 9 DISTRIBUTION OF PATIENTS ACCORDING TO ≥ 50% HEALING OF WOUNDS IN THREE GROUPS AT DIFFERENT INTERVAL

≥50% healing of wound (wks)	Group-I		Group-II		Group-III	
	No. of Pt.	%	No. of Pt.	%	No. of Pt.	%
At 2 wks	0	0.0	0	0.0	1	5.0
4 wks	1	6.2	0	0.0	3	15.0
6 wks	1	6.2	1	6.7	4	20.0
8 wks	3	18.6	2	13.3	7	35.0
10 wks	3	18.6	4	26.7	2	10.0
12 wks	2	12.5	3	20.0	1	5.0
14 wks	4	25.0	3	20.0	1	5.0
16 wks	2	12.5	2	13.3	1	5.0
Total	**16**	**100**	**15**	**100**	**20**	**100**

Table 10 DISTRIBUTION OF PATIENTS ACCORDING TO 50-75% & 75-100% HEALING AT 8 WKS AND >8 WKS THERAPY IN GROUP I

Time to achieve ≥50% healing (wks)	Group I					
	50-75%		75-100%		Total	
	N	%	N	%	N	%
8 wks	5	35.7	0	0	5	31.2
≥8 wks	9	64.3	2	100	11	68.8
Total	**14**	100	**2**	100	**16**	100

Table 11 DISTRIBUTION OF PATIENTS ACCORDING TO 50-75% & 75-100% HEALING AT 8 WKS AND >8 WKS THERAPY IN GROUP II

Time to achieve ≥50% healing (wks)	Group II					
	50-75%		75-100%		Total	
	N	%	N	%	N	%
8 wks	3	30	0	0	3	20
≥8 wks	7	70	5	100	12	80
Total	**10**	100	**5**	100	**15**	100

Table 12 DISTRIBUTION OF PATIENTS ACCORDING TO 50-75% & 75-100% HEALING AT 8 WKS AND >8 WKS THERAPY IN GROUP III

Time to achieve ≥50% healing (wks)	Group III					
	50-75%		75-100%		Total	
	N	%	N	%	N	%
8 wks	10	71.4	5	83.3	15	75
≥8 wks	4	18.6	1	16.7	5	25
Total	14	100	6	100	20	100

Table 13 DISTRIBUTION OF PATIENTS ACCORDING TO THEIR ETIOLOGY, DURATION AND PERCENTAGE OF HEALING

Type of wound with no. of patients	Time to achieve ≥50% healing											
	<8 wks						>8 wks					
	50-75%			75-100%			50-75%			75-100%		
	I	II	III	I	II	III	I	II	III	I	II	III
Diabetes (29)	4	2	4	0	0	3	5	6	2	1	2	0
Venous (14)	1	0	4	0	0	2	3	1	1	1	0	1
Leprosy (4)	0	0	1	0	0	0	1	0	0	0	2	0
Pressure (4)	0	1	1	0	0	0	0	0	1	0	1	0

Table 14 & 15 DISTRIBUTION OF PATIENTS AND COMPARISON OF THREE GROUPS FOR ≥50% HEALING AT <8 WKS & >8 WKS THERAPY

Groups	Time to achieve ≥50% healing		Total
	<8wks	>8 wks	
I	5	11	16
II	3	12	15
III	15	5	20

Chi square = 12.278, df=2, p=0.002 (p<0.05 HS)

≥50% Healing	I Vs II	I Vs III	II Vs III
Fisher exact probability (p-value)	0.87 (NS)	0.01 (HS)	0.0016 (HS)
Chi square test (p-value)	0.093 (NS)	0.01 (HS)	0.004 (HS)

Table 16 & 17 MEAN AREA OF WOUND (SQ.CM) WITH THE COMPARISON OF WOUND SIZE AMONG THE THREE GROUPS

Weeks	Wound size (sq.cm.) Mean ±S.D.		
	Group-I	Group-II	Group-III
Initial	29.38±11.56	26.67±8.56	79.20±30.22
At 2 wks (f1)	24.25±10.74	21.80±7.73	64.70±24.96
4 wks (f2)	18.81±10.63	15.47±7.43	51.95±20.53
6 wks (f3)	12.56±9.49	9.53±6.75	41.65±17.35
8 wks (f4)	7.56±7.87	4.37±5.84	30.35±15.72
10 wks (f5)	5.09±6.22	4.75±6.41	13.16±2.94
12 wks (f6)	3.00±3.95	5.00±3.83	12.84±10.46
14 wks (f7)	1.33±2.31	0.00±0.00	7.73±7.44
16 wks (f8)	0.00±0.00	0.00±0.00	2.36±4.27

S. No.	Between group comparison One way ANOVA	To show significant pair between the groups Post-Hoc test
BT	F=57.49, p<0.001 (HS)	Group I &III, II & III
F1	F=35.17, p<0.001 (HS)	Group I &III, II & III
F2	F=33.86, p<0.001 (HS)	Group I &III, II & III
F3	F=34.94, p<0.001 (HS)	Group I &III, II & III
F4	F=27.44, p<0.001 (HS)	Group I &III, II & III
F5	F=10.85, p<0.001 (HS)	Group I &III, II & III
F6	F=3.39, p<0.05 (S)	Group I &III
F7	F=2.48, p>0.05 (NS)	-
F8	F=0.28, p>0.05 (NS)	-

SOME PHOTOGRAPH OF NON HEALING ULCERS TREATED IN THIS STUDY

Before Treatment

After Treatment



Fig. 1 Venous ulcer, duration-four month



After twelve weeks of treatment



Fig. 2 Venous ulcer, before treatment



Complete healing after eight weeks of treatment



Fig. 3 Diabetic ulcer, duration - three months



After twelve weeks of treatment



Fig. 4 Leprotic ulcer-duration one year



Complete healing after eight weeks of treatment



Fig. 5 Diabetic ulcer, treatment started after debridement and disarticulation, photo at two weeks of treatment



After ten weeks of treatment



Fig. 6 Diabetic ulcer, duration-one and half month



After ten weeks of treatment



Fig. 7 Diabetic ulcer, duration-three month



After eight weeks of treatment

Source of support: Nil, Conflict of interest: None Declared