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Research Article

PHARMACO-THERAPEUTIC STUDY OF *NEEM* (*AZADIRACHTA INDICA* A.JUSS.) IN THE MANAGEMENT WOUND HEALING

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ABSTRACT

Today in modern era, fast moving life, human being are more prone to injury. Wound is simply a disruption of any tissues: soft tissue or bone or internal organs. Wound may be produced by physical, chemical, thermal, microbial or immunological insult to the tissue. It is common problems from ancient time. Although wound healing is a natural restorative response to any kind of tissue injury but due to bacterial contamination of an open wound delays the process of healing. Therefore the aim of treating a wound is to either shorter the time required for healing or to minimize the undesired consequences. In present study 20 patients with classical signs and symptoms of wound were randomly selected in OPD/IPD of govt. Ayurved Hospital Patna. The fine powder of non woody parts (Leaf, bark of stem and root, flower and fruit) of *Neem* and decoction of its leaves were prepared. Decoction applied externally for dressing the wound and 3gm. fine powder given orally twice a day for 30 days. The area of wound measured manually by tracing methods. The values of scores of different variables i.e. signs & symptoms recorded before & after the treatment were statistically analyzed. It is observed that the size, pain, tenderness, smell, swelling, discharge, burning sensation, itching sensation and colour of wound all were decreased with statistically highly significant value at the level (P< 0.001). The study shows that *Neem* having excellent properties to accelerate the wound healing safely.

INTRODUCTION

The term wound is break in the continuity of soft parts of body structures caused by violence or trauma to tissues[1] In Ayurvedic classical texts term used for wound is *Vrana*[2] and defined as "The desruption/ break/ rupture/discontinuity of body tissue /a part of body'. Wound healing is a natural restorative response to any kind of tissue injury. But any further injury or infections the process of wound healing becomes prolong and complications may appear. Our ancestors in prevedic period had tried various *Dravyas* for wound healing and gave a vivid description about its management. In Ayurvedic texts various natural drugs were described by many ancient scholars. Sushruta the father of surgery given the detail protocol for wound management. He has also elaborated clinical presentation of wound, its pathogenesis (*Shata Kriyakala*)[3], prognosis and sixty essential procedures (*Shasti Upakrama*)[4] for management. *Neem* (*Azadirecta indica*) is very common evergreen plants, commonly found throughout India and is variously known as 'Devine Tree', 'Heal All', 'Nature's Drug store' and belong to family Meliaceae. Various classics of Ayurveda have described the role of the *Neem* (*Azadirachta indica* A Juss) in wound management [5]. According to Acharya Charaka and Vagbhatta decoction of *Nimb patra* has *Vrana shodhan (*Purification) properties.[6,7] *Neem panchang* (Non woody parts of *Neem*) have *Vrana Nashak* (wound healing) properties.[8]

Aims and Objectives

Present study is directed towards evaluation of therapeutic effect of *Neem* and discovering a natural agent, which accelerate wound healing safely.

Classification of wound

In Ayurveda *Vrana* (wound) is classified as according to aetiology[9] *Nija (Sharira vrana)* and *Agantuja vrana*. The Clinical classification[10] is *Suddha vrana* and *Dusta vrana.* According to prognosis *Sadhya, Krichhya sadhya, Yapya and Asadhya vrana.* [11-14]

Modern classification of wounds [15]

According to the modern medical texts wound is classified as:

According to the time elapsed: Acute is up to 8 hours of trauma and chronic is after 8 hours of trauma.

Classification of surgical wound: Clean, Clean contaminated and Contaminated wound.

Classification of wound based on involvement of Structures: Simple, Combined.

Rank and Wakefield classification: Tidy wound and untidy wound.

Classification base on type of wound: Clean incised, lacerated, bruising and contusion, haematoma, abrasion etc. Some other types of classification also described in modern medical texts.

MATERIALS AND METHODS

Selection of Patients

For the present study, 20 patients with classical signs and symptoms of wound who were attending the OPD/IPD of *Shalya Tantra* (Surgery) department of G.A.C.H. Patna, randomly selected for the study. Fine powder of *Neem panchanga* and decoction of *Neem patra* was prepared according to Ayurvedic texts in the pharmacy wings of Govt. Ayurved College and Hospital, Patna.

Table 1: Treatments planned for wound

Drugs	Form /Route of administration	Dose	Duration
Neem-panchang (Leaf, bark of Stem & Root, fruit and flower)	Fine powder (orally)	3 gm. twice a day	30 days
Neem Patra (Leaf)	Decoction (Externally on alternate day)	According to size of wound	

Images of drugs

fig. 1 *Neem* leaves

fig. 2 *Neem* flowers (dry)

fig. 3 *Neem* bark (stem)

fig. 4 *Neem* fruits (dry)

fig. 5 *Neem* root bark

fig. 6 fine powder of all five parts of drugs

fig. 7 decoction of *Neem* leaves

Inclusion criteria

1. Patients having signs and symptoms of the wound.
2. Age between 16 – 60 year

Exclusion criteria

Patient suffering from callus / tubercular / rodent ulcer, deep sinuses, diabetic, aids, cancer, leprosy etc.

Follow Up: Alternate day.

Local examination of wound

The wound was assessed by naked eye examination and size of wound was determined by manual tracing methods[16] on every alternate day. The wound were covered with transparent plastic sheet followed by tracing with permanent marker pen. Then the area in Sq. mm was calculated through placing the sheet on graph paper and counting the small squares. Squares, up to half were counted as complete square and less than half were omitted from counting.

Procedure adopted for dressing of wound

Wound was washed with decoction 4-5 times and cleaned with sterilized gauze pieces and finally wound was covered with thin gauze piece moistened with decoction of drugs. No other wound care or systemic antibiotic was provided to them.

Diet and Restrictions

Patients were advised to follow the *Pathyapathya* available in Ayurvedic literature.

Criteria of assessment

Subjective criteria

To assess the improvement or effect on subjective parameters grade/score system was designed according to severity were given marks (0-4).

Score system

To assess the improvement or effect on subjective parameters grade/score system was designed as below.

Symptoms Score/Grade

Size

0 = None

1 = ≤ 4 Sq.cm

2 = 4.1 - 9 Sq.cm

3 = 9.1 - 16 Sq.cm

4 = 16.1 Sq.cm and above

Pain

0 = No Pain

1 = Only during movement

2 = Localized feeling of pain even during rest but not disturbing the sleep

3 = Localized continuous feeling of pain and not relieved by rest.

Tenderness

0 = Tolerance to Pressure

1 = Little response on sudden pressure

2 = Wincing of face on super slight touch

3 = Resists to touch & rigidity

Discharge

0 = Absent

1 = Sanguineous

2 = Serosanguineous : thin, watery, pale red/pink

3 = serous: thin watery, clear

4 = purulent: thin or thick, opaque, tan / yellow, with or without odour

Odour (Smell)

0 = Absent

1 = Bad

2 = Unpleasant, Tolerable

3 = Foul smell which is intolerable

Colour

0 = Normal pigmentation of skin

1 = Slight red

2 = Reddish black

3 = Pale yellow/blackish/bluish

Burning sensation

0 = No burning

1 = little, localized & some time feeling of burning sensation

2 = More localized & often burning sensation which does not disturb sleep

3 = Continuous burning sensation with disturbed sleep

Itching Sensation

0 = No itching.

1 = Slight, localized itching sensation which is relieved by rest

2 = More localized & often itching but not disturbs sleep

3 = Continuous itching with disturbed sleep

Swelling

0 = Absent

1 = Slight red, tender & hot with painful movement & without indurations

2 = More red, having painful movement, with more local temperature &with indurations

3 =Angry look, hot, resist to touch & with more indurations

Statistical analysis

All information which was based on various parameters was gathered and statistical analysis was carried out in terms of Mean (X), Standard deviation (S.D.), Standard error (S.E.), Paired test (t) and finally results were incorporate in term of probability "p" as

Table 2: Criteria for assessment of result

$p > 0.05$	Insignificant
$p < 0.05$, $p < 0.01$	Significant
$p < 0.001$	Highly Significant

Criteria for assessment

The assessment was done on the basis of change in signs and symptoms of wound. To assess the effect of therapy on Subjective parameters, wound area, signs and symptoms level was assessed every follow up & finally after completion of treatment.

Table 3: Criteria for assessment of overall effect

Percentage of Relief	Overall effect
100%	Cured
More than 75% relief in signs and symptoms	Markedly improved
50-75% relief in signs and symptoms	Moderately Improved
25-50% relief in signs and symptoms	Partially Improved
Less than 25% relief in signs and symptoms	Unchanged

OBSERVATION AND RESULTS

The data collected and compiled from this clinical trial is sorted out and processed further by implying various statistical methods.. The observation found as follows.

Table 4: Mode of onset wise distribution of 20 patients of Wound

Mode of onset	No.	%
Sudden	16	80
Gradual	04	20

Table 5: Cause-wise distribution of 20 patients of Wound

Cause	No.	%
Endogenous	05	25
Exogenous	15	75

Table 6: Site -wise distribution of 20 patients of Wound

Site	No.	%
Head	02	10
Thorax	01	05
Abdomen	01	05
Hand	07	35
Pelvis	00	00
Lower limb	09	45

Table 7: Showing incidence of type of wounds of 20 patients

Type of wounds	No.	%
Incised	05	25
Lacerated	05	25
Penetrating	02	10
Contused	03	15
Burn	01	05
Other	04	20

Table 8: Showing the effect of drugs (Planned) on various signs & symptoms of wound

Signs & Symptoms	Mean		% relief	± S.D.	± S.E.	't' Value	'p' Value
	B.T.	A.T.					
Size	1.70	0.15	91.17	0.60	0.13	11.46	p < 0.001
Pain	2.45	0.30	87.75	0.93	0.20	10.30	p < 0.001
Tenderness	2.10	0.65	69.04	0.51	0.11	12.70	p < 0.001
Smell	1.71	0.14	91.66	0.53	0.20	07.77	p< 0.001
Swelling	1.56	0.12	88.00	0.61	0.15	08.88	p < 0.001
Discharge	2.00	0.14	86.66	0.70	0.18	09.53	p < 0.001
Burning sensation	2.00	0.22	88.88	0.44	0.14	12.09	p < 0.001
Itching sensation	1.87	0.12	93.33	0.46	0.16	10.69	p < 0.001
Colour(Abnormal)	2.50	1.50	40.00	0.91	0.20	04.87	p < 0.001

Table 9: Showing effect of drugs on Haematological value of 20 patients of Wound

Haematological value	Mean		% relief	± S.D.	± S.E.	't' Value	'p' Value
	B.T.	A.T.					
Hb%	12.64	12.89	02.01	1.08	0.24	1.05	p > 0.05
ESR	14.15	11.80	16.60	4.22	0.94	2.48	p < 0.05
TLC	8340	7452.6	10.64	1764.9	394.64	2.24	p < 0.05
Polymorph	61.90	60.65	02.01	2.22	0.49	2.51	p < 0.05
Lymphocyte	30.5	30.90	02.82	2.64	0.59	1.43	p > 0.05
Eosinophil	04.70	04.10	12.76	2.03	0.45	1.31	p > 0.05
Monocyte	03.45	03.60	04.34	1.08	0.24	0.61	p > 0.05

Images of wound

figure -showing the image of wound

fig. 8 Before treatment

fig. 9 After 4 weeks of treatment

Overall effect of trial drugs

Table 10: Table showing the overall effect in all three groups

Results	No.	%
Cured	00	00
Markedly Improved	10	50
Moderately Improved	10	50
Partially Improved	00	00
Unchanged	00	00

DISCUSSION

Discussion on subjective parameters

As per table no 8 the effect of therapeutics on clinical features of wound is discussed below:

The size was decreased by 91.17% with statistically highly significant (t – 11.46) value and all other signs and symptoms, pain, tenderness, smell, swelling, discharge, burning sensation, itching sensation, and the colour (Abnormal) were decreased with statistically highly significant value at the level (P< 0.001).

Discussion on objective parameters

The mean value of objective parameters such as Hb%, T.L.C., D.L.C. etc. was slightly changed during the course of study.

The overall effect

The total 50% patients got markedly improved and 50% patients got moderately improvement. There was no any wound which partially improved or unchanged.

Probable mode of action of drugs

In the management of Wound the two steps in Ayurveda are very important which are *Shodhana* and *Ropana* and they have similar concepts with modern medicine like debridement, dressing and elevation of wound. *Neem* have some special properties by which it protect wound from infection and accelerate wound healing this can be describe as follows:

The *Tikta Rasa* of *Neem* having *Shodhana, Lekhana* (Scraping), *Kleda-puyashoshana* (Absorbtion of liquid & pus) and *Krimighna* (Anti-microbial) action. It protect wound from contamination. That's why it reduces pus formation. *Laghu* property of drug it enters in *Srotas* (each cell) of the body and thus corrects the *Sroto* and *Dhatus dusty* by its actions like *Pachana* (digestion) etc. *Sheeta Virya*[17] (Potency) of drug pacifies *Pitta* and *Rakta*. Both *Pitta* and *Rakta* play an important role in inflammation. Other clinical study also revealed that *Neem* inhibit inflammation this effect further accelerates wound healing. [18] Decoction of *Neem-patra* (Leaf) have *Vrana Shodhana* (Purification) *action* so that it help in debridement of wound and also prevent as well as remove infection. Dressing of wound with this decoction provide a sterile moist environment that facilates granulation and epithelialization. It help the wound heal more quickly. Researchers have proved that the *Neem* leaf extracts has anti-microbial effect. [19] This action keep the wound free from secondary infections by microorganism. *Neem-panchanga Churna* is an excellent *Rasayana* drugs so it nourishes the tissues and help in quick restoration of damaged tissue. It has a special action of blood purification (elimination of toxins).[20]

CONCLUSION

At the end of the study, following conclusion can be drawn on the basis of observations made, results achieved. It can be summarized as follows:

Though wound healing is self controlled physiological process which normally does not requires much help, but its proneness to infections which may be external or internal is of great thought. Decoction of *Neem-patra* (Leaf) have *Vrana Shodhana* (Purification) *action* it help in debridement of wound and also prevent as well as remove infection. It helps the wound heal more quickly. *Neem-panchana* (Non woody parts of *Neem*) also have properties to accelerate the wound healing. *Neem* (*Azadirachta indica* A Juss) having properties to accelerate the wound healing safely.

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