



AZADIRACHTA INDICA (NEEM) IS AN EFFECTIVE OPTION FOR WOUND MANAGEMENT.

Pharmacology

Dr. Mona kumari Assistant Professor, Department of Pharmacology, Patliputra Medical College, Dhanbad.

Dr. Md Shadab Alam* Tutor, Department of Pharmacology, Patliputra Medical College, Dhanbad. -*Corresponding Author

Dr. Arun kumar Choudhary Professor and Head, Department of Pharmacology, Patliputra Medical College, Dhanbad.

Dr. Rajendra Kumar Tutor, Department of Physiology, Patliputra Medical College, Dhanbad.

ABSTRACT

As a matter of fact various antibiotics are present nowadays for wound management but more than 80% of the world's population especially developing countries still depend upon herbal medicine for this purpose. This may be because of resistance development in pathogen against antibiotics. Moreover, safe, effective, easily accessible and eco-friendly herbal medicine compel for its worldwide uses. Among these, Azadirachta Indica (neem) is the most useful traditional plant having potent anti-inflammatory, analgesic, antipyretic, antioxidant and antimicrobial properties which helps in accelerating the process of wound healing and is being used for this purpose from centuries. This study was conducted on thirty guinea pigs grouped randomly into three groups and following standard surgical procedures with the help of a sterile Bard Parker blade two incised wound of 2 cm long and 0.5 cm depth were made on opposite thigh muscle making a total of two wounds per animal. Control group was treated with Vaseline, treatment group with aqueous extract of "Azadirachta Indica" leaves and a reference standard had been treated with topical application of framycetin sulphate (1% w/w) twice daily for seventeen days. Estimation of wound healing was done by shrinkage of wound size on days 3, 5, 7, 9, 11, 13 and 17 by randomly selecting 10 guinea pigs on same site. The data were analyzed by applying unpaired t-test. On the basis of the outcome of the present study it has been observed that aqueous extract of Azadirachta Indica leaves are highly effective in accelerating wound healing process as compared to control (Vaseline treated). However, a further study is warranted in human.

KEYWORDS

Herbal Medicine, Azadirachta Indica (neem), Wound Healing, Anti-microbial.

INTRODUCTION:-

According to Ayurveda "Vrana"¹ that is wound or ulcer is the discontinuation of lining membrane that after healing leaves a scar for life, closely resembles the modern definition, which is wound is defined as breach or disruption in the continuity of normal tissue resulting in a variety of cellular and molecular events.² As a matter of fact various antibiotics are present nowadays for wound management but more than 80% of the world's population especially developing countries still depend upon herbal medicine for this purpose.³ This may be because of resistance development in pathogen against antibiotics.⁴ Moreover, safe, effective, easily accessible and eco-friendly herbal medicine compel for its worldwide uses.⁵ Among these "Azadirachta Indica" (Neem) is a large evergreen tree commonly found throughout the greater part of India and often cultivated since antiquity.⁶ Neem has been known for its medicinal properties from ancient time⁷ and is being used for the treatment of various diseases.^{8,9} Apart from being reported to possess wound healing properties it is also reported to possess antioxidant, antiprotozoal, nematocidal, antibacterial, antivenom, anti-human immunodeficiency viral and antineoplastic properties.¹⁰ Ofcourse, there are various reports which indicates wound healing properties of Azadirachta Indica (neem), but still there is limited publication regarding their evaluation in comparison with some established wound healing agent. Therefore, this study is a very humble way of exploring in depth the wound healing properties of Azadirachta Indica (neem) in surgically incised wound in guinea pigs in comparison with a patent antibiotic like framycetin, which is taken as a reference standard.

MATERIALS AND METHODS:-

The present work was conducted in the Postgraduate Laboratory of the Department of Pharmacology and Therapeutics of tertiary care centre after ethical approval from the Institutional Ethics Committee. The experiment was performed on a total of 30 apparently healthy guinea pigs (*Cavia Porcellus*) of male sex. The animals were 5-6 month old and on an average of 450-550 g body weight. The animals were kept at controlled laboratory conditions (22±2°C, 55±5% RH, and equal dark-light cycle, acclimatization period: 1 week). All the guinea pigs were divided into three equal groups (group A, B and C) randomly selecting 10 guinea pigs in each group. Group A were treated with aqueous

extract of Azadirachta Indica (neem) leaves, group B with framycetin sulphate ointment and group C with Vaseline. Following standard surgical procedures with the help of a sterile Bard Parker blade two incised wound of 2 cm long and 0.5 cm depth were made on opposite thigh muscle making a total of two wounds per animal. All the wounds were washed with pyrogen free distilled water and then treated accordingly with topical application of the above mentioned drugs. Estimation of wound healing was done by shrinkage of wound size on days 3, 5, 7, 9, 11, 13 and 17 by randomly selecting 10 guinea pigs on same site. The wound index was measured with an arbitrary scoring system at 5th and 11th day.¹¹

Table-1:- Wound index arbitrary scoring system

Gross changes	Wound index
Complete healing of wounds	0
Incomplete but healthy healing	1
Delayed but healthy healing	2
Healing has not yet started	3
Formation pus evidence of necrosis	4

Total 10

RESULT:-

Table-2:-Effect of different applications on surgically incised wound in guinea pigs at 3rd, 11th, 15th and 17th day.

	3 rd day		11 th day		15 th day		17 th day	
	Mean (cm)	Mean± S.D	Mean (cm)	Mean± S.D	Mean (cm)	Mean± S.D	Mean (cm)	Mean± S.D
Azadirachta indica	1.90	1.90 ±0.003	0.90	0.90 ±0.066	Compl ete healing		Compl ete healing	
Framycetin	1.70	1.70 ±0.006	Compl ete healing		Compl ete healing		Compl ete healing	
Vaseline	1.90	1.90 ±0.042	1.2	1.20 ±0.060	0.70	0.70 ±0.060	0.60	0.60 ±0.066

As shown in Table-2; mean ± SD of Azadirachta Indica was (1.90±0.03), Framycetin (1.70±0.006) and Control (1.90±0.042). On

3rd day; P value of Azadirachta Indica Vs control was not significant but P value of Framycetin Vs control was highly significant (< 0.001). On comparison to P value of Framycetin Vs Azadirachta Indica was found to be highly significant ($P < 0.001$). On 11th day; mean \pm SD of Azadirachta Indica was (0.90 ± 0.066), and control (1.20 ± 0.060), whereas there was complete healing in case of Framycetin treated wound. P value of Azadirachta Indica Vs control was highly significant (< 0.001). On 15th day; mean \pm SD of control (0.70 ± 0.060). There was complete healing in case of Framycetin and Azadirachta Indica treated group. On 17th day mean \pm SD of control was (0.60 ± 0.066) and complete healing of control group took place on 22.05 day.

Table-3:-Wound Index on 11th Day

	Mean	Mean \pm SD
Azadirachta Indica	0.69	0.69 ± 0.067
Framycetin	0.20	0.20 ± 0.285
Control (Vaseline treated)	2.50	2.50 ± 0.035

The wound index was measured with an arbitrary scoring system mentioned under Material and Methods. From table-3, it is clear that reductions in wound index were recorded in both treatment group as compared to control and Framycetin treated (reference standard) group. On 11th day, wound index of Azadirachta Indica (0.69 ± 0.067), Framycetin (0.20 ± 0.285) and control was (2.5 ± 0.035). Wound indices of Framycetin Vs control, Azadirachta Indica Vs control and Framycetin Vs Azadirachta Indica were found to be highly significant ($P < 0.001$).

Table – 4:- Time taken by the various groups in complete healing

	Time taken in days	
	Mean	Mean \pm SD
Azadirachta Indica	15.50	15.50 ± 0.527
Framycetin	11.25	11.25 ± 0.354
Control (Vaseline treated)	22.05	22.05 ± 0.550

Discussion:-

Skin the “organ of beauty” is the outermost covering of the body protecting it from the external environment. A break in continuity of the skin results in wound and this wound may have contamination and finally produce different diseases in human body. The process of wound healing is a complex and orderly phenomenon which includes Cellular infiltration, neovascularization, fibroblast proliferation, epithelialisation and collagenisation. Ofcourse, there are various antiseptic lotions and antibiotic ointment available to prevent contamination and provide the environment necessary for wound healing, but Azadirachta Indica (neem) is the most useful traditional plant having potent anti-inflammatory, analgesic, antipyretic, antioxidant, antibacterial, antifungal and antiviral properties which helps in accelerating the process of wound healing and is being used for this purpose from centuries. From above result it has been cleared that all the three investigational groups showed the wound healing effect, but the difference was in time period of wound healing and their efficacy. Table 4 shows the average time taken for complete wound healing in all the three groups. Minimum time for wound healing was taken by Framycetin treated (reference standard) group. Framycetin treated group significantly ($P < 0.001$) reduced healing time of (22.05 ± 0.550) control to (11.25 ± 0.354) days. Azadirachta Indica treated group also significantly reduced ($P < 0.001$) healing time to (15.50 ± 0.527) days. However healing time in Framycetin treated group was highly significant ($P < 0.001$) as compared to Azadirachta Indica and control group. This means that ofcourse topical application of Framycetin is an established drug for wound healing, but as far as the efficacy of Azadirachta Indica is concerned, the process of wound healing by its topical application is almost comparable to the established drug and is highly significant as compared to the control group. This is because Azadirachta Indica leaves have some unique compounds like nimbin, which is reported to possess anti-inflammatory¹² and antifungal and apart from nimbin there is nimbidin, which is also reported to possess antipyretic,¹³ antibacterial, antifungal and antiulcer properties.¹⁴ Nimbidol is also reported to possess antiprotozoan properties. Azadirachta Indica leaves are also reported to possess many important ingredients, which are necessary for wound healing like proteins, calcium and essential amino acids.¹⁵ Azadirachta Indica is reported to possess carotene and ascorbic acid. Carotene being an antioxidant may have helped in stabilization of lysosomal enzyme needed to synthesize collagen preventing free radical damage that appears to be detrimental to wound healing. Ascorbic acid enhances the synthesis of collagen and counterbalances collagen

breakdown, epithelialization, blood vessels formation and synthesis of mucopolysaccharides¹⁶. Azadirachta Indica has the ability to increase vascular permeability by increasing blood flow and by helping the body to rapidly create collagen fibres to close wounds and as a result wound heals faster¹⁷.

CONCLUSION:-

On the basis of the outcome of the present research it has been observed that aqueous extract of Azadirachta indica leaves is highly effective in accelerating wound healing as compared to the control and may be considered as an effective option for wound management with minimal side effect. Though “Azadirachta Indica” has many limitations as an antibiotic and further studies are needed to be done in this area.

References

- Sushruta, Sadyouvrana, In: Sushruta Samhita, Chikisthana Chapter 2, Verse 6.
- Short practice of surgery ;Belly and love,26 edition.
- Patel JD, Shrivastava AK, Kumar V. Evaluation of some medicinal plants used in traditional wound healing preparations for antibacterial property against some pathogenic bacteria. J Clin. Immunol. Immunopathol. Res. 2009; 1(1):07-12.
- Barua CC, Talukdar A, Barua AG, Chakraborty A, Sarma RK, Bora RS. Evaluation of the wound healing activity of methanolic extract of Azadirachta Indica (Neem) and Tinospora cordifolia (Guduchi) in rats. Pharmacologyonline. 2010; 1:70-77.
- Anjaria J, Parabia M, Dwivedi S. Ethnovet heritage: Indian ethno-veterinary medicine - an overview. Pathik enterprise, Ahmedabad. 2002, 610-612.
- Chopra R, Chopra I, Handa K et al. G. glabra, In: Chopra's indigenous drugs of India. 2nd reprint. Calcutta: Academic Publishers; 1994. p. 61-3, 351-3, 507, 673-4.
- Chopra RN, Chopra IC, Handa KL and Kapur LD, in Indigenous Drugs of India, U.N. Dhar and Sons, Calcutta, 1958, p. 325.
- Kirtikar, K. R., & Basu, B. D., (1975). In: Medicinal plants, editor Blatter E, Chains JF, Mhaskar KS. Vivek Vihar, New Delhi. 536.
- Chatterjee, A., Pakrashi, S., (1994). The treatise on Indian medical plants, editor, 3:76.
- Ravindranath and Satyanarayan, 1980.
- Biswas TK, Auddy B, Mukhrjee B et al. Wound healing activity of human placental extracts in rats. Acta Pharmacol Sin 2001; 22(12):1113-6.
- Bhargava, K. P., Gupta, M. B., Gupta, G. P., & Mitra, C. R. (1970). Anti-inflammatory activity of saponins and other natural products. The Indian journal of medical research, 58(6), 724-31. David, SN., (1969). Oil and nimbidin suppressed the secondary rise in temperature. Mediscope. 12:25-27.
- Ara, I., Siddiqui, B. S., Faizi, S., & Siddiqui, SJ., (1989). Isolation and Structure Elucidation of the Triterpene Azadirin from the Roots of Azadirachta indica. Chem.Soc. Perkin Trans.1:343.
- Pant, N., Garg, H. S., Madhusudan, K. P., & Bhakuni, DS., (1986). Sulfurous compounds from Azadirachta indica leaves. Fitoterapia. 57, 302-304.
- Bhandari and Mukherjee, 1959, Tiriranna, 1984.
- Singh H and Singh K (1999). Wound healing and tissue repair. Ruminant surgery, Edited by R. P. S. Tyagi and Jit Singh; CBS Publishers and Distributors.
- Van der Nat, J. M., Klerx, J. P. A. M., Van Dijk, H., De Silva, K. T. D., & Labadie, R. P. (1987). Immunomodulatory activity of an aqueous extract of Azadirachta indica stem bark. Journal of ethnopharmacology, 19(2), 125-131.