Original Research

An Experimental Evaluation on Wound Healing Property of Shigru Patra Ghanasatva (Leaf water extract of Moringa oleifera Lam)

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Abstract

All the parts of Shigru (Moringa oleifera Lam.) are having medicinal importance and it is traditionally used to treat various skin disorders, including wounds. This study was aimed at investigating the healing efficacy of Shigru Patra Ghanasatva (water extract of leaves). The results of controlled experimental study carried out on Swiss albino rats showed that Shigru Patra Ghanasatva caused better wound healing in terms of epithelization and tensile strength in comprise to control group. Thus it is considered that formulated water extract of Moringa oleifera Lam. leaf is effective in the treatment of wounds and thus supports its Ayurvedic literature & traditional use.

Key words: Shigru, Moringa oleifera, Shigru patra ghanasatva, wounds, Morton and melone method

Introduction:

The incidences of wound (Vrana) are common in childhood as well as any age, which is accompanied with pain, bleeding and sometimes oedema. Sushruta explains much detail about accidental wounds under the heading Sadyo-Vrana\(^1\) which is defined as wound with several margins, surface, caused by different types of instruments at different sites and with various shapes occurring as a consequence of external injury. Wound is a major case of physical disability and is disturbed state of tissue caused by physical, chemical, microbial or immunological insults or typically associated with loss of function. According to the wound healing society wounds are physical injuries that results in an opening or break of the skin that cause disturbance in the normal skin anatomy and function.\(^2\) Though healing of wound is a natural phenomenon but still it poses problem in clinical practice, Several factors

Materials and Methods:
Shigru (Moringa oleifera Lam.) tree was identified by Botanist and its leaves were collected from Koppa taluk, Chikmagalur district, Karnataka. Svarasa (fresh juice) was extracted from Shigru leaves by general method of extraction.\(^3\) Extracted svarasa of Sigru was heated in a vessel on moderate fire till it solidifies (Ghana) and rolled into Varti. The Ghana Sattva Vati was made into a paste by adding distilled water and delay or reduce the wound healing process including bacterial infection, necrotic tissue, & interference with blood supply, lymphatic blockage & diabetes mellitus; generally if the above factors could be altered by any agent, an increased healing rate could be achieved.\(^4\) The role of wound healing drugs are merely to prevent the infection as well as faster the healing process. Many Ayurvedic plants have a very important role in the process of wound healing. Plants are more potent healers because they promote the repair mechanisms in the natural way.\(^5\)

The leaves of Moringa contains various nutrients\(^5\) like Vitamin A & C, proteins, fats, carbohydrates, iron, copper, calcium, potassium etc. thus the leaves of Shigru \(^6,7\) have been selected for the present experimental study to evaluate its Vrana ropana (wound healing) action.

this paste was applied over the wound under all the hygienic precautions.

Experimental animals: Male Swiss albino rats (total twenty four) weighing 150-250 g were individually housed in clean polyethylene cages under standard experimental conditions of temperature 12 h light/dark cycle and fed on normal pellet diet and water \textit{ad libitum}. The rats were used for the experiment after one week of acclimatization period. The experiment was
conducted after prior permission from the institutional animal ethics committee and carried out according to the ethical guidelines for care and use of animals in health research. Experimental study was done with both Excision and Incision wound model. 

**Excision Wound Model:** This was conducted according to the technique developed by Morton and Malone. The animals were anesthetized. After the animals were sufficiently anaesthetized by using ketamine intra-peritoneal injection, they were secured to the dissection plate in prone position. The hairs were removed using fem hair removing cream from the part to be operated and subsequently the area was cleaned with betadine. A round seal of 2.5 cm in diameter was impressed on the dorsal thoracic central region 5 cm away from the ears of the anaesthetized rats. Full skin thickness from the marked area was excised in circular fashion with the help of forceps, surgical blade and scissors. The approximate area thus formed was 500 squares mm. After achieving full haemostasis, the animals were placed in individual cages.  

![0 - DAY](image1)

![4th DAY](image2)

![8th DAY](image3)

![12th DAY](image4)
Fig-1: Excision wound healing of Treatment Group (*Moringa oleifera*)

**Incision Wound Model:** This was conducted according to the technique mentioned by Hunts et al. The animals were anesthetized by using ketamin as intra-peritoneal injection; after the animals were sufficiently anaesthetized they were secured to the dissection plate in prone position. The hairs were removed using fem hair removing cream from the part to be operated and subsequently the area was cleaned with betadine. Two para-vertebral incisions measuring 6 cm in length of full skin thickness was made, then the incision was closed by interrupted sutures at an interval of 1cm. After achieving full haemostasis, the animals were placed in individual cages. 

Fig-2: Incision Wound Model (*Moringa oleifera Group*)
Results:

Table 1: Percentage of wound closure from original excision wound area (sq.mm)

<table>
<thead>
<tr>
<th>Groups</th>
<th>post wounding days</th>
<th>4th day</th>
<th>8th day</th>
<th>12th day</th>
<th>14th day</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control (Natural Recovery)</td>
<td>29.2± 1.406%*</td>
<td>50.2± 1.41%*</td>
<td>76.6± 0.74%*</td>
<td>88.0± 0.54%*</td>
<td></td>
</tr>
<tr>
<td>Treatment (Shigru Ghanasatva)</td>
<td>47.4± 1.44%*#</td>
<td>80.4± 0.51%*#</td>
<td>97.0± 0.38%*#</td>
<td>99.3± 0.09%*#</td>
<td></td>
</tr>
</tbody>
</table>

*= P<0.001 in same group comparison, #=P < 0.001 in inter group comparison

Fig 4: Bar diagram showing the Percentage of wound closure

Table 2: Tensile strength in gm of incision wound on 10th day of the wound:

<table>
<thead>
<tr>
<th></th>
<th>Control (Natural Recovery)</th>
<th>Treatment (Shigru patra Ghanasatva)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean</td>
<td>367.5 ±6.76</td>
<td>507.5 ±7.14</td>
</tr>
<tr>
<td>t-value</td>
<td>54.37</td>
<td>71.02</td>
</tr>
<tr>
<td>p-value</td>
<td>&lt;0.001</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>comparative tensile strength of incision wound</td>
<td>t-value=14.236 p-value= P&lt;0.001 Remarks=Highly significant</td>
<td>Remarks=Highly significant</td>
</tr>
</tbody>
</table>

Discussion

Present study was planned to evaluate the wound healing property of the trial drug Shigru Patra ghanasatva. While comparing the result of the experiment, Shigru showed highly significant wound healing property in comparison with the control group. In the excision wound model two parameters were assessed, Percent contraction of original wound area and Period of epithelization. Whenever a breach occurs in the continuity of tissue the surrounding connective tissue and capillaries grows to cover up the area damaged, to achieve the contraction of wound. In the trial group wound closure was achieved on 14th day, but in the control group it has been achieved by 18 -19 days.

The Period of epithelization is calculated by the scar formation and by falling off leaving no raw area behind. Once there is a break in the epithelium, it will proliferate and grow from the surrounding tissue before that due to the clotting and other factors a scar tissue will be formed on the wound, initially this will be covering the whole area of the wound, gradually when the new epithelium grows this will reduce in size and finally will fall off .The earlier the falling of the scar the faster the healing.

The mean period of epithelization in the treatment group was 14.66 days and that of control group was 17.16 days. This clearly shows that epithelization was achieved early in the trial group than the control group.

In the incision wound model, the strength of the granulation tissue was measured. Once a breach or gap
has occurred in the tissue, it is closed by the granulation tissue. Here the strength of the granulation tissue is assessed by using tensiometer in grams. The mean of the treatment group was 507.5 gm and that of control group was 367.5 gm. This clearly shows that the trial group was having better tensile strength than the control group.

Shigru possesses Katu (Pungent), Tikta (bitter) and Kashaya rasas (astringent tastes), Laghu (light), Ushna (hot) and Teekshna gunas (penetrating property). Ushna virya (hot in potency), Katu vipaka (Pungent post digestion effect), Katu rasa (Pungent taste), is mentioned as Vraanam Avasadayati (eschars the wound) in the major ayurvedic classics along with the properties like Mamsa Lekhana (scraping of the wound), Shodhana (cleansing of the wound), Chedana (cuts off the unhealthy tissue). Katu rasa (pungent taste) removes the unhealthy tissue formed at the site of Vrana (wound) and removes the sluff formation.

Tikta rasa (bitter taste) does the shoshana (drying up) of Kapha, Puya srava (pus) & Kleda (moisture). Twak mansa Shhrikarana (brings stability in the tissue) property mentioned for Tikta rasa (bitter taste) helps in providing strength to the tissues. Kashaya rasa (Astringent taste) helps in Sthambhana (stypic action) & both Tikta (bitter) and Kashaya rasas (astringent taste) does Shoshana (dries up) thus maintaining a dry locality at the site of Vrana (wound), which prevents the invasion of Krinis (microbes). Sandhanya karma (holding together of the tissue) of Kashaya rasa (Astringent taste) enhances the process of contraction and Ropana karma (healing process) helps in formation of healthy granulation tissue thus facilitating the Wound healing Process. The leaves of Moringa are rich with the contents like proteins, Vit.A & C, Iron, Copper etc. As far as the wound healing is concerned Copper is involved in collagen synthesis, iron is a cofactor, Vit.C has an important role in collagen synthesis, in the formation of bonds between strands of collagen fiber, helping to provide extra strength and stability. Vit.A is also involved in cross-linking of collagen and the proliferation of epithelial cells. Collagen is the main protein synthesized during the healing process and the strength of the collagen determines wound strength.\[[18]\]

**Conclusions:**

On the basis of experimental findings it could be concluded that topically application of Shigru Patra Ghana to an open wound induces significant wound contraction and accelerated epithelialization, tissue alignment and tissue strength at the later stage of wound healing. Thus herbal aqueous extract of Moringa leaves may be a promising medication as wound healer for various kinds of wounds.

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