



Case Report

Wound healing potential of bark paste of *Pongamia pinnata* along with hirudotherapy: A case reportDinusha Balasooriya^a, Chamil Karunarathna^b, Inoka Uluwaduge^{c,*}^a Department of Ayurveda Basic Principles, Gampaha Wickramarachchi Ayurveda Institute, University of Kelaniya, Sri Lanka^b Gampaha Ayurveda Clinic, Kadawatha, Sri Lanka^c Department of Basic Sciences, Faculty of Allied Health Science, University of Sri Jayewardenepura, Sri Lanka

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ABSTRACT

Chronic wound is one of a leading cause of amputation worldwide. Successful management of chronic wound has become a challenge to all existing medical systems across the world. Sri Lankan Traditional and Ayurvedic medicine reveals many promising herbal and alternative remedies for chronic wounds. We hereby report a successfully managed case of an 80-year-old female patient suffering from a chronic wound for two years, when presenting has advised for amputation of the leg. The treatment protocol included the application of hirudotherapy along with the bark paste of *Pongamia pinnata* followed by *Flueggea leucopyrus* with recommended other external and internal remedies. At the end of the treatment protocol, pain, exudates, odor, burning sensation, and itching were reduced completely while swelling and wound size was reduced remarkably and showed a significant healing in the wounded area. © 2021 The Authors. Published by Elsevier B.V. on behalf of Institute of Transdisciplinary Health Sciences and Technology and World Ayurveda Foundation. This is an open access article under the CC BY-NC-ND license (<http://creativecommons.org/licenses/by-nc-nd/4.0/>).

1. Introduction

Chronic wound is a persistent wound and it doesn't heal in an orderly set of stages within a predictable time frame [1]. They often remain in the inflammatory stage for a lengthy period of time and are frequently susceptible for the supuration by microorganisms [2,3]. *Streptococcus* sp. and *Staphylococcus* sp. are predominant and colonization and infection may further delay the healing process [4]. Chronic wound patients often report pain as a dominant complain in their lives' and persistent pain and associated discomfort may greatly hamper life style of the affected individual [5].

The treatment protocol used in this case is not recorded as it is in traditional or Ayurvedic medicine of Sri Lanka. However, the Ayurvedic clinician who met the case has correlated the benefits of familiar individual treatments (hirudotherapy, application of bark paste and leaf paste of *Pongamia pinnata* and *Flueggea leucopyrus* respectively) to formulate the modality with specific time windows and has treated the patient.

Hirudotherapy is a common intervention in Ayurvedic medicine while the herbal treatment of *Pongamia pinnata* traces its origin in traditional medicine of Sri Lanka. *Flueggea leucopyrus* is used in both Ayurvedic and traditional medical systems of Sri Lanka. Therefore, this treatment modality is a combination of traditional and Ayurvedic medicine practiced in Sri Lanka.

Pongamia pinnata (Family: Fabaceae, English: Indian Beech, Sinhala: *Magul karanda*) is a fast-growing tree that has been originated in India and is found throughout Asia including Sri Lanka [6]. In Sri Lankan traditional medicine bark of *Pongamia pinnata* is mentioned as an effective treatment against wounds and ulcers. In *Ola* leaf manuscripts (a collection of traditional herbal recipes written by ancient traditional practitioners in Sri Lanka) among the different preparations insisted for wound healing *Pongamia pinnata* was found in 40 remedies (unpublished data). As described in Ayurveda Pharmacopeia, the plant possesses following properties,

Rasa - Katu, Tikta, Kasaya.

Guna - Tiksna.

Veerya - Usna.

Vipaka - Katu.

Karma - Kaphahara, Pittahara, Vatahara.

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Modern literature has provided the scientific rationale for including this plant in wound healing remedies to be credible due to its anti-inflammatory, anti-oxidant and antimicrobial properties [7–10].

Flueggea leucopyrus Willd (Family Phyllanthaceae, English; Spinous fluggea Sinhala: Katupila) is a desert climatic medicinal plant that grows commonly in certain regions of South East Asian countries, as well as in Sri Lanka [11]. Aerial parts of this plant, specifically the leaves, are used traditionally to promote wound healing [12]. In traditional medicine the plant has been used to curtail the over growth of cells; scientifically this has been proven as effective against certain cancer cell lines [12,13].

As described in Ayurveda Pharmacopeia, the plant possesses following properties,

Rasa - Tikta, Kashaya.

Guna - Laghu, Ruksha.

Veerya - Ushna.

Vipaka - Katu.

Applying medicinal Leeches (*Hirudo medicinalis*) for bloodletting purpose have become one of the most effective treatment methods, mentioned in Ayurveda in the management of chronic wounds. According to traditional ayurvedic records leech therapy has described as an effective treatment which can be applied in all inflammatory, suppurative and painful condition to relieve pain and to inhibit suppuration. Medicinal leeches drain impure blood and enhance healing process [14,15].

2. Patient information

An 80-year-old female patient presented to the clinic for treatment complaining of non-healing wound which involved anterior tibial aspect of the right lower limb and around right ankle. She complained of burning sensation, pain in the wound, foul-smelling, pus discharge, difficulty in walking and itching. On examination a large wound (13 × 5 cm) was observed on the anterior side of the right leg, from the knee to the ankle joint. Local swelling was also noticed on examination. Past history revealed nothing about major systemic diseases or surgery. She had undergone many treatments throughout but was not successful and presented to the *Gampaha* Ayurveda clinic, Western Province, Sri Lanka; at the time she was advised for amputation.

3. Clinical findings

Patient was anxious at the time of presenting. She had normal rhythmic pulse, 80/min and respiratory rate, 20/min. Blood pressure was 110/80 mmHg and weight were 60 Kg. Body temperature was 98.4 °F (Table 1).

4. Diagnostic assessment

Before starting the treatment, investigations were done to ensure the normal clotting profile since the treatment therapy included hirudotherapy i.e. bleeding time- 3 min, clotting time-5 minutes. Her haemoglobin was 12.5 g/dL and platelets were 350,000/mm³.

5. Therapy and timeline

Pancha mooli laghu kwata, *Triphala kwata* and *Laghu manjistadi kwata* 30 ml each, morning and evening after food was used as the internal medicine. Treatment modality was continued for eight

Table 1
Clinical findings of the wound.

Inspection	Finding
Site	Anterior tibial aspect of the right lower limb and around right ankle joint
Size	13 × 5 cm
Shape	Irregular
Edge	Rough, irregular and swollen
Floor	Deep, irregular
Discharge	Mild pus discharge
Smell	Unpleasant
Surrounding area	Mild inflammation and swollen
Palpation	
Base	Tenderness
Edge	Tenderness
Temperature	Raised
Lymph nodes	Not palpable

weeks and consisted of traditional ayurvedic internal medicines and external medicines (Table 2). Bark paste of *Pongamia pinnata*, paste of the leaves of *Flueggea leucopyrus* and hirudotherapy are interventions added to the treatment modality. Hirudotherapy (*Hirudo medicinalis*) was continued once a week throughout the treatment period; application of bark paste of *Pongamia pinnata* continued for four weeks (4th to 7th week) and in the last week of the treatment, the external therapy was shifted to the topical application of paste of the leaves of *Flueggea leucopyrus*.

Patient was advised to take other Ayurvedic internal medicines prescribed and they are as follows.

Pancha mooli laghu kwata was given expecting *shodana guna* (Purification). It detoxifies body by removing vitiated *doshas* through purgation. *Triphala kwata* has many actions on body. It stimulates appetite, improve proper digestion and absorption of food, improve circulation and wound healing [17]. *Laghu manjistadi kwata* purifies blood and helps to correct vitiation of *Mamsa dhatu* [18].

6. Outcomes and follow-up

Clinical signs and symptoms pre and post treatment is depicted in the following table (Table 3). Grading system was based in accordance to the patient's relative perception of what she felt weekly on pain, burning sensation, tenderness and itching during the treatment procedure.

By the 6th week post treatment, complete relief of the pain was achieved while the other signs and symptoms also gradually resolved Fig. 1 illustrates the wound appearance pre and post treatment.

7. Discussion

The traditional approaches of *vrana* consist of *shodhana* (purification), *srava hara* (pus elimination), *daha hara* (relieve burning sensation) and *ropana* (healing) [19].

In theoretical approach, before applying a specific wound healing drug, it is necessary to clean the wound. Therefore, the wound was cleaned with the decoction of *Panchavalkala*. Recommendation of internal medicine had several aims. Intake of *Pancha mooli laghu kwata* as the first week and second week treatment was set in order to purify body. Second week onwards *Triphala kwata* was used as an internal medicine. *Triphala kwata* stimulates appetite, improve proper digestion and absorption of food, improve circulation and wound healing [17]. Fifth and sixth

Table 2
Treatment schedule.

Time window	Internal Medicine	External Medicine	Hirudotherapy
1st week	<i>Pancha mooli laghu kwata</i>	Butter biscuit + <i>Sarva vishadi oil</i>	Once a week
2nd week	<i>Pancha mooli laghu kwata</i>	<i>Roghan -e- kash + Neelyadi oil</i>	Once a week
3rd week	<i>Triphala kwata</i>	<i>Roghan -e- kash + Seethodaka oil</i>	Once a week
4th week	<i>Triphala kwata</i>	<i>Pongamia pinnata</i> bark paste + <i>Pinda oil</i>	Once a week
5th week	<i>Laghu manjistadi kwata</i>	<i>Pongamia pinnata</i> bark paste + <i>Pinda oil</i>	Once a week
6th week	<i>Laghu manjistadi kwata</i>	<i>Pongamia pinnata</i> bark paste + <i>Pinda oil</i>	Once a week
7th week	None	<i>Pongamia pinnata</i> bark paste + <i>Pinda oil</i>	Once a week
8th week	None	Paste of <i>Flueggea leucopyrus</i> leaves + <i>Pinda oil</i>	Once a week

week *Laghu manjistadi kwata* was used to purify blood and to correct vitiation of *Mamsa dhatu* [18]. In this treatment protocol the external drugs were applied during first week intending purification action. Second and third week external drugs have been applied to relieve burning sensation and eliminate more pus. From fourth week onwards, fresh bark powder of *Pongamia pinnata* mixed with *pinda oil* was applied on wound once a two day. *Pongamia pinnata* dressing was continued until complete healing was achieved and the result was assessed at regular intervals (shown in Table 3). Furthermore, application of the bark paste of *Pongamia pinnata* markedly reduced the size of the wound as expected. Since the healed area of the wound showed a mild over growth, at the 8th week, paste of leaves of *Flueggea leucopyrus* was applied expecting a scraping action (which exerted *Lekhana* action).

Bloodletting was done once a week using medicinal leeches throughout the two-month period.

Hirudotherapy (Leech therapy) is one of the oldest practices in medicine; it is known from the time of extreme antiquity and is still alive in Sri Lankan traditional medical system. During feeding, leeches secrete a complex mixture of different biologically and pharmacologically active substances into the wound and hirudin is the prominent constituent of leech saliva [14]. These substances possess analgesic, anti-inflammatory, platelet inhibitory, anticoagulant, and thrombin regulatory functions, as well as extracellular matrix degradative and antimicrobial effects [15]. Evacuation of impure blood from the wound improves the process of wound healing and it is assumed that the procedure will complement and enhances the efficacy of other treatments.

Several recipes were found when referring *Ola* leaf manuscripts prescribed by traditional healers for the cure of wounds that have included *Pongamia pinnata* as the major ingredient. According to Ayurveda classics, drugs with *Katu, Tikta, Kashaya rasa* offer beneficial effects of *Vrana*. Upon topical application, the paste reach to the deeper tissues through *Tikshna* property [18].

Due to its *Ushna, Tikshna*, properties it clears the obstruction in *Swedavahi Srotas* and allows the local toxins to flow out through the *Sweda*, thus clearing out the micro channels. The *Ushna, Virya* causes pacification of *Kapha* which forms the *Samprapti Vighatana* thus alleviating the symptoms [18]. Affording to the above view, *Katu, Tikta, Kasaya* properties of *Pongamia pinnata* might be responsible for enhanced wound healing. Modern scientific literature also put forth evidences to support the ability of *Pongamia pinnata* to heal wounds. An experimental study has been conducted to evaluate the wound healing potential of *Pongamia pinnata* bark [16]. The rats have been treated with 10% and 5% ointment-based formulation topically. The Ethanolic extract of stem bark has shown significant wound healing activity in incision (reduction in wound breaking strength) and excision wounds (reduction in percentage in wound area) in Albino rats. Stem bark has significant anti-oxidant potential and this could protect the newly formed tissue from oxidant stress and could potentiate the wound healing [10]. Anti-inflammatory activity of the bark powder has also scientifically proven and this may also enhance the healing of the wound [7–9]. The bark possesses anti-nociceptive activity and this could have played a positive role in reducing the pain in the wound [7,8]. Hence this strongly justifies the *ropana* property of *Pongamia pinnata*.

Leaves of *Flueggea leucopyrus* willd has been used for the treatment of chronic wounds and cancers in the traditional system of medicine in Sri Lanka [12]. Recently, traditional medical practitioners of Sri Lanka have become increasingly interested in the use of a decoction prepared from this plant as a treatment for a variety of cancers. Since the skin of the wound has shown a mild overgrowth in the healed area, paste of the leaves of this plant was applied expecting a possible scraping action (*Lekhana* property) and positive outcome was noted. The antiproliferative activity of the *Flueggea leucopyrus* willd is scientifically proven by several studies and this would have been the cause for diminished overgrowth in the wound [12,13]. Further it was noted that there were

Table 3
Assessment of clinical signs and symptoms; pre and post treatment.

Signs and symptoms	Before treatment	After treatment							
		1st week	2nd week	3rd week	4th week	5th week	6th week	7th week	8th week
Pain	Severe	Severe	Severe	Moderate	Moderate	Mild	None	None	None
Burning sensation	Moderate	Severe	Severe	Moderate	Mild	None	None	None	None
Tenderness	Moderate	Moderate	Moderate	Mild	Mild	Mild	None	None	None
Itching	Moderate	Severe	Moderate	Mild	Mild	Mild	Mild	None	None
Discharge	Moderate	Severe	Moderate	Mild	None	None	None	None	None
Smell	Severe	Severe	Moderate	Mild	Mild	Mild	Mild	None	None
Swelling	Moderate	Moderate	Moderate	Moderate	Moderate	Moderate	Moderate	Mild	Mild



Fig. 1. Visual observation of prognosis of wound as per assessment criteria.

no any adverse events observed throughout the treatment and healing occurred uneventfully.

8. Conclusion

With presenting case, the treatment protocol comprising leech therapy, bark paste of *Pongamia pinnata* and paste of leaves of *Flueggea leucopyrus* was very effective and shown excellent healing effect in chronic and nonhealing wound. Evidence based non-surgical alternative remedy and impressive out come of this treatment protocol could be an interesting approach in the management of chronic wounds.

9. Patient's perspective

The patient was satisfied with treatment protocol and was surprised to see the wound healing process within a short duration of two months compared to the past history that she had. Now she has a good mental condition and confidence to engage in normal routine work. The treatments helped her not only to cure wound but also to improve her quality of life.

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Conflict of interest

None.

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