



E-ISSN: 2278-4136
P-ISSN: 2349-8234
JPP 2016; 5(3): 214-216
Received: 16-03-2016
Accepted: 20-04-2016

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Leech therapy in Dermatology

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Abstract

Leech therapy gained worldwide acceptance because of its effect in graft transplant. However its efficacy is not restricted to grafts only but extends beyond dermatological implications into a holistic approach. Its fame is due to its bioactive enzymes packed saliva. But its secret weapon is in its ability to manipulate the haemodynamics via blood sucking. Thus evacuating the body of Morbid humour (Istifragh) and further propagating capillary networking.

Skin is an extraordinary structure. It is frequently damaged because it is directly in the "firing line" and for this reason, skin diseases are very common. There are more than 3000 known diseases of the skin. Although most of the chronic skin conditions, such as eczema, psoriasis, vitiligo and leg ulcers, are not immediately life-threatening, they are recognized as a considerable burden on health status and quality of life, having, physical, emotional and financial consequences. These make leeches a boon for a variety of dermatological diseases like *Qooba* (Ringworm), *Saafa* (Tinea corporis), *Namash* (Chloasma), *kalaf* (Warts), *Narfarsi* (Eczema), *Daul sadaf* (Psoriasis), *Bars* (Vitiligo), *Da us Salab* (Alopecia). Some of these have scientific backing too. The paper at length describes the effect leeching has on dermatological problems, its nature of mechanism, and its complications

Keywords: Leech therapy, dermatology, unani medicine, Hirudin

Introduction

Leeches are looked down as parasites but a more scientific evaluation of their parasitic nature helps us understand that they do not have parasitic relation but rather a symbiotic relation wherein they suck the blood and in return inject a vast array of bioactive molecules that work wonders in the host body. This principle was tapped since antiquity when using leeches for phlebotomy. The species used in India traditionally for therapeutic purposes is *Hirudinaria granulosa* [1]. Leeching is indicated if the congestion of metabolites that need to be evacuated is neither in the central circulation nor in peripheral but in between these two types of circulation [2]. The systemic effects of leeching that are evident because of this pumping in both the circulations.

Hirudotherapy has two phases of bloodletting, active bloodletting and passive bleeding from the bite site post removal, which can last for several hours. 15- 20 ml of blood is gulped by medicinal leeches and another substantial amount is removed during passive bleeding. This results in a marked decrease in venous congestion, an important threat to the viability of the affected area. The leech saliva is famous for a broad number of anticoagulant agents that decrease the venous congestion such as the thrombin inhibitor hirudin, apyrase, as well as collagenase, hyaluronidase, factor Xa inhibitor and fibrinase I and II [3, 4].

Mechanism of action

The bioactive molecules that make the leech bite work are:

Hirudin akin to heparin is the most potent known natural inhibitor of thrombin [1]. Hyaluronidase reduces the viscosity and renders the tissues more readily permeable to injected fluids [5, 6] increasing the speed of absorption. This promotes resorption of excess fluids and extravasated blood in the tissues. Hence, hyaluronidase from leech saliva helps increase the spread of all salivary secretions.

Calin has a rapid (1-10 min.) effect on collagen that is reflected in its ability to suppress collagen-induced platelet aggregation as well as adhesion of platelets to collagen coated micro-carrier beads [1].

Destabilase possesses glycosidase activity. It is famous for its antibacterial action [7] and the ability to dissolve blood clots [1]. Eglins is an inhibitor of alpha-chymotrypsin, subtilisin, chymosin, granulocyte proteinases, elastase, and cathepsin G. Eglin c is a potential therapeutic agent for the treatment of diseases associated with inflammation. Considering the role played by elastase in the process of leucocyte infiltration and accumulation in inflamed microvessels, eglin c could be used to prevent neutrophil infiltration (adhesion, penetration, and migration)

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into inflamed vessels and neutrophil mediated injury to the microvascular endothelium [1].

Bdellins--inhibitors of trypsin, plasmin, and sperm acrosin [1]. Leech saliva contains acetylcholine, histamine like vasodilators that prolong bleeding time [8]. It also contains enzymes that reduce scar tissue and adhesions. Two types of fibrinase and a collagenase that are also present reduce the density of scar tissue and help reduce fibroblast formation in hypertrophic scars and keloids [9].

Hirustasin accelerates reperfusion and prevents re-occlusion in a canine model of femoral arterial thrombosis [1].

Another mechanism of action of leeching is the evacuation of blood and metabolites congestion. It reduces the hemodynamic burden at the site and evacuates (Istifragh) [2].

The mechanism of action specific to dermatological problems can be demonstrated hence; the anti-inflammatory biomolecules of leech's saliva like Eglins and Bdellins [10] reduce the erythema (redness) and oozing. Leeching induces granulation tissue formation [11] thereby indirectly inducing collagen formation causing keratolysis. This results in reduction of acanthosis (thickened epidermis), a prominent feature of many skin ailments like eczema, psoriasis, keloids, etc. Leeching propagates microcirculation [12] and reduces inflammatory intermediates like lymphocytes; thereby reducing itch impulse; which is another feature in dermatological ailments. The hyaluronidase in leech saliva is antibiotic [10] which again helps in restriction of bacterial growth.

The leech saliva is a rich cocktail of hirudin, hyaluronidase, histamine like vasodilators, collagenase, destabilize, [13] inhibitors of kallikrein, super oxide production and poorly characterized anesthetic and analgesic compounds [14]. Hyaluronidase increases the permeability of the epidermis and dermis to these active biomolecules. Laser Doppler flowmetry has proved a significant increase in superficial skin perfusion after leeching, especially 16 mm around the bite area [15]. This increased perfusion causes a regional antiphlogistic, thrombolytic and antibiotic effect. The three pairs of jaws piercing the skin ensure maximum input of potent biologically active substances deep into the tissues.

Clinical Studies

Leech therapy due to its immense benefits was indicated in dermatological problems by ancient physicians too like Ibn Sina (Avicenna) recommended it in cicatricial alopecia, dermatophytes, chloasma, angioma where as Al-Razi (Rhazes) indicated its use in Scar, Cicatricial alopecia and chronic ulcers Ibn Al-kaf Al-Masihi advised leeching in Carbuncle, Varicose vein, elephantiasis and alopecia [16].

Its clinical efficacy is remarkable. A study by Shanker *et al* in 2014 was 55% effective in alleviating the symptoms of eczema and improving the quality of life [17]. In another study Iqbal *et al* in 2016 found hirudotherapy effective in the management of keloids [18]. Yet another study by Kumar P.R *et al* in 2012 concluded that re pigmentation was seen in 60% of vitiligo patients [19].

Pathak S *et al* in 2015 performed leeching on the scalp of a patient with alopecia areata; wherein 2 leeches were applied for 6 months every week. There was significant improvement in the hair pattern of the patient [20]. A similar study by Bhat *et al* in 2014 demonstrated similar effects with leeching done [21].

A study by Asutkar *et al* in 2015 established the efficacy of leeching in acne with a $p < 0.05$ and a reduction in symptoms of Size, Tenderness, Redness which was significant at 5% significance [22].

Adverse Effects

A leech causes bleeding and swelling of the invaded organs, may also interfere with swallowing and breathing and can tip to anemia or even death. Continued leech use and persistent bleeding from the wound can result in a significant loss in blood volume. Hemoglobin levels may drop by 1-2 g% over a five-day treatment due to the amount of blood lost due to leeching, thus requiring a blood transfusion [23]. Some patients experience anaphylaxis and allergic responses to the bioactive saliva of leeches, while others exhibited excessive scarring from the bite wound site [24]. The cutaneous lesions subsequent to the application of leeches are probably due to the combined action of different enzymes produced by their salivary glands: hirudin and fibrinase.

Hirudotherapy has been complicated by infections caused by *Aeromonas spp.*, which are considered to be obligatory endosymbionts of the leech [25]. Infections with *Aeromonas* have been observed in 7-20% of the patients treated with leeches after reconstructive surgery

Smolle *et al* described multiple pseudolymphomas on the lower legs of a woman receiving leech therapy for venous insufficiency. More recently, Choi and Kim [4] reported a similar case on the lower eyelids of a Japanese man who had infraorbital dark circles treated with *H. medicinalis* [26, 27, 28].

Conclusion

These are a few of the clinical success stories with leeching. Its effect on venous congestion packed with its bio molecules is definite to show more wonderful effects on other dermatological problems as well.

Skin disorders primarily of autoimmune kind make the dermis thick with poor tissue perfusion. The leech saliva prevents inflammatory mediators, decreases tissue thickness, accelerates reperfusion, and increases permeability of the tissue making it more acceptable to therapeutics. Hence making leech therapy an ideal mode of treatment in dermatology.

Leech is a boon to the dermatologists but its use must be with caution as it's known to have its own type of side effects.

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