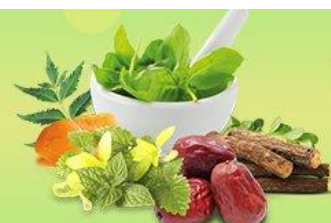


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***Irsal-E-Alaq* (Hirudotherapy) in Unani system of medicine and modern medicine an overview**

Abdul Khalique, MY Siddiqui and Mohd Azeem Ashraf

Abstract

Irsal-e-Alaq (Leech therapy, Hirudotherapy) has been one of the most important and widely practiced method of regimenal therapy for centuries being equally prevalent among the ancient, medieval and modern Unani physicians. Leech therapy involves an initial bite, which is usually a painless bite, followed by the sucking of 5 to 15 ml of blood. Its major therapeutic benefits are not only due to blood sucked during the biting, but also from the various bioactive substances, such as Hirudin, calin, Hyaluronidase, and Histamine-like substances. Greek and Arab physicians used leeches for a wide range of diseases starting from the conventional use for bleeding to systemic ailments, such as skin diseases, nervous system abnormalities, urinary and reproductive system problems, inflammation, and dental problems. Nowadays, they are being used for various therapies by Unani as well as allopathic practitioners. This paper is aimed to review and analyze the benefits, indications, mechanism of action, methods and complications of Leech therapy in Unani system of medicine.

Keywords: *Irsal-e-Alaq*, leech therapy, Hirudotherapy, Unani medicine

Introduction

According to Unani System of Medicine 3 different methods are described to treat the diseases, Regimenal therapy is one of them. *Irsal-e-Alaq* (Leech therapy, Hirudotherapy) has been one of the most important and widely practiced method of regimenal therapy for centuries being equally prevalent among the ancient, medieval and modern Unani physicians. In leeching medicinal leeches are applied usually on the affected body parts in order to get rid of the morbid humours. Hirudotherapy (HT), a Latin term, in which medicinal leeches (*Hirudo medicinalis*) are used, hence named "Hirudotherapy."^[1] Leeches were named *Hirudo medicinalis* by Linnaeus in 1758^[2] The word 'leech' is supposed to be derived from an old English word for physician, laece. The spelling later became leech. In 1668 the veterinarian was known as a horse-leech. The physicians were referred to as leeches and the medical profession was alluded to as Leech craft.^[3, 4] Leeches help humans in a number of medical treatments. It is actually a blood sucking process with the help of medicinal leeches for prevention and treatment of various diseases. The important advantage of leech therapy is that it may be advised on those areas of the body where other processes of blood-letting like venesection and cupping are not possible.^[5, 6]

Modern leech therapy differs from the ancient therapy; nowadays, only the leeches, which are grown in farms and which have undergone strict quarantine, are employed for the therapy. Wild leeches are not used anymore and a leech is used for a single treatment^[7, 8]. Leeches are among the most poorly studied invertebrates with respect to their evolutionary histories. There are 650 known species of leeches of which 45 species are found in India. Earlier it was believed that leeches just suck the blood but now with the advent of the science and technology it has been revealed that leeches not only suck but also inject a cocktail of biologically active compounds present in their saliva, which are responsible for the advantageous clinical effects.

Historical Perspective

It's impossible to accurately note the time, when man learnt about existence of leech. This non-invasive or minor invasive treatment methodology is known from the time of extreme antiquity, more than 2,500 years BC, and is still alive in the present scenario. The earliest conclusive evidence of leeching is in the form of an illustration discovered in an Egyptian tomb from 1500 B.C. First information about application of leeches dates back to Ancient Egypt. The data is represented by wall paintings, found in sepulcher of 18th dynasty

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(1567-1308 B.C) pharaohs on a patient's head. Leech therapy was documented in Sanskrit writings from 1300 BC. Therapeutic use of leeches has appeared in ancient Greece, China, India and Pre-Columbian America. Nicander of Colophon (200-130 BC) was probably the first medical practitioner to use leeches for therapeutic purposes [9]. Themison of Laodicea also reported Hirudotherapy in 50 BC [10]. Leech therapy is well documented in the works of Pliny, Galen, and Avicenna [11]. Greek physicians used leeches for bloodletting and for treating rheumatic pains, gout, all types of fever and hearing loss. The usage of leeches during that time depended upon the humor concept of Galen (130- 201 AD), which was an inspiration from Hippocrates (460- 370 BC) hypothesis about body fluids imbalance- related illnesses. Galen believed that illnesses alleviation can be achieved by restoring the balance between the body fluids when a leech withdraws blood from patients [1, 12]. Galen would prescribe bloodletting by leech for almost all illnesses such as simple inflammatory conditions, mental disorders and hemorrhoids [13]. Avicenna (980- 1037 AD) delineated in his book "Canon of Medicine" that leech can suck blood from deep veins which cannot be reached by the conventional wet cupping [1, 12]. The procedure has seen a first renaissance in the 18th and early 19th century when it became extremely popular again and reemerged in the 70ies of the last century as an adjuvant to surgery [14]. The major event in the history of leech therapy was the discovery by J.B. Haycraft, that the throat and mouth of the leech contained a substance that prevented the blood from coagulating in 1884. This compound was later isolated from leech saliva by Jacoby and was named hirudin around 1904 [15]. Hirudin was employed in a blood transfusion in 1915 [16]. In July 2004 the U.S. FDA approved medical leeches as medical devices in plastic and reconstructive surgery [17]. Nowadays, Hirudotherapy is being employed in the surgical field to treat venous congestions of microvascular replantation, reconstructive surgery and traumatology. In addition, leech therapy is used in neurology, dermatology, gynaecology, and is giving good results in these areas as well [2].

Leech Taxonomy and Zoology

Leeches are hermaphroditic, bloodsucking annelid worms. Medicinal leeches belong to the order *Arhynchobdellida*, family *Hirudinidae*. Only 15 of the more than 650 of the known species are classified as medical leeches, such as *Hirudo medicinalis*, *H. verbena* and *H. orientalis* [18]. In India, there are about 45 species. However, the species commonly cultured for medicinal use are *Hirudinaria granulosa* and *Hirudo medicinalis*. *H. medicinalis* has 33 to 34 body segments, is brown or black, and has six long reddish stripes on the back. Adult animals have two suckers at the end of their body, a large posterior sucker and a smaller disc-shaped on the head that contains the mouths with tree jaw. Each of the three jaws has 100 teeth, for a total of 300 teeth and salivary glands that release more than 100 known substances. Leeches usually remain attached to the host for 30 minutes to 6 hours for feeding, and during the course they get engorged with blood. It can suck about 5 to 15 ml of blood, but the bite continues to ooze for 4 to 24 hours [19]. According to Abdual kader, *et al.* leeches generally suck 2- 20 ml of blood within 10- 30 min, then drop- off spontaneously after being completely

engorged with no immediate desire of more feeding.

Characteristics of Medicinal and Poisonous Leeches

Medicinal Leech

In ponds and lakes various kind of leeches are found but they all are not useful for medicinal purpose. The leeches which are used for medicinal purpose are found in that water which consists of green algae and small frogs in it, only those leeches can be used for treatment purpose. *Ibn sina* states the following features of therapeutically usable leeches [20].

- Emerald green leeches, which are predominantly, green and have yellow stripes.
- Brown leeches with round sides.
- Leeches that have colour like liver.
- Leeches, which look like little locusts, and those, which resemble mouse tails.
- Leeches that are thin and have tiny heads.

Ibn-al-quf has additionally suggested the use of such leeches, which are in resemblance with yellow coloured locusts, mash color leeches, blackish red leeches. He further clarified Ibn sina's statement that the leeches from the water containing frogs are to be used because frog cleanse and softens the water and remove the toxic impurities [6].

Poisonous Leech

We should avoid those leeches which have following characteristics.

1. Those which have large heads.
2. Those which have blackish grey and green color.
3. Those which have hairs on their body.
4. those resembling eels (snake fish, Bam fish).
5. Those upon which are azure lines and those that change their colours.
6. Those which have red and green stomach especially when they are found in flowing water.

Use of these kind of leeches can result in various kind of diseases like syncope, hemorrhage, inflammation, paresis of limb, fever, malignant (intractable) ulcer [21-23].

Procedure of Hirudotherapy

Ibn Sina narrated that leeches should be collected one day prior to their use. If possible, they should be held upside down till the content of their stomach comes out. A more modern use of leech therapy was introduced by Abdul-Latif al-Baghdadi in the 12th century, who wrote that over use of leech might be risky. He suggested that leech need to be cleaned before being used and that the dirt or dust clinging to a leech must be wiped off before application. [24] *Abu-Al-Qasim Zahrawi* emphasized that, should not use the same leech on other patients. *Al-Zahrawi* was aware of infectious complication of leech therapy [25]. Patient is advised to take light semi-solid diet prior to the leech therapy.

Unani literature describes that the part to be treated should be washed with a solution of borax and rubbed until red or potter's clay should be applied and if the leech is reluctant to bite a tiny droplet of blood may be smeared on part to be treated, drawn from the wound site with a needle prick and then applied the leech [26]. According to modern concept the site where leeches are to be placed should be clean and free of ointments, pastes etc. Cleaning can be done by sterile ringer solution, physiological sodium chloride solution or

sterile water. One or more leeches are applied to the affected area and left usually for half to one hour. According to Mumcuoglu KY, one to 5 leeches are used for each session of treatment, depending on the clinical case and purpose of the treatment [27]. A patient can safely tolerate up-to 16 leeches in severe and resistant conditions. Once the leech is attached, it will likely remain safely in place until fully distended, but it is important that the site to be checked continuously to ensure that they has not moved. The leeches are allowed to remain till it removed spontaneously or can be removed by loosening their grip with sprinkling little salt, borax, ashes of burnt flax cloth, burnt sponge, burnt wool, or turmeric powder over it. Ibn-Sina acknowledged the particular vulnerability of children and recommended watching them overnight after leeching [26]. The used leeches are killed and disposed of [28, 29]. After the detachment of leech, affected part is cleaned with antiseptic solution and bandaged. Patient should be observed for further bleeding, allergic reaction or for any kind of possible infection. If bleeding persisted, Avicenna employed a dusting of burnt galls, quicklime, ashes, cobwebs, ground earthenware, or alum. Failing these, he suggested cautery. He also believed that following leech therapy, the place should be sucked by cupping, in order to extract some of the blood and thereby get rid of the toxic substances left in the wound [26].

Common Sites of Leeching

Imamuddin Pakpatani, has enumerated nearly forty-one parts of the human body where leeches can be applied or various diseases in his book *Kanz-al-mushilin*. Accordingly, to him the leeches may be applied on fontanel, behind the head and neck, forehead, between the shoulders, root of the ear, over the scapula, below the breasts, around the umbilicus and uterine region, the root of penis, the pelvis, below the axillaries, around the kidneys, below the thing

and the shanks, the sole of feet, the astragalus, the liver, the elbow, between the fingers and supra-aural parts, etc. [30].

Mechanism of Action

Based on the concepts of Unani medicine, leech therapy works on the principle of bloodletting. Leeching is used as one of the method of *Istifragh* (evacuation) for which leech is placed on the affected area. Leeches because of its special ability can remove morbid humors from the body and protect the body from various diseases. Hence, because of all these benefits Unani physicians adopt leeching as an effective mode of treatment [31]. It also improves circulation to the area and provides better nutrition to the area. Another one is *Imala-e-mavad*, refers to the diversion of the morbid fluids from the site of affected organ to the site where from it is easily expelled from the body tissues [32]. Based on this holistic approach, *Unani* physicians have been widely using this therapeutic regimen for a number of diseases. The effectiveness of this therapy may also be attributed to the *Mussakin* (sedative) and *Muhallil* (resolving) actions of saliva of leeches [5, 33, 34]. Earlier it was assumed that leech therapy depends mainly on two concepts. First, as the leech bites the skin of its prey, it injects the salivary gland secretion into the wound. Second, another part of these secretions will be mixed with the ingested blood to keep it in a liquid state [35, 36]. Whereas later on scientific researches revealed that the beneficial effects of leeching occur due to injection of some bioactive substance which are present in leech saliva (Abbas Zaidi, 2007). Their potential as living apothecaries has stimulated the isolation of scores of bioactive compounds including important anticoagulants, antistasisins and other protease inhibitors. At least 115 bioactive anticoagulants, antistasisins and other inhibitors and many more substances are studied so far. These bioactive substances produce different effects in the host.

Table 1: Showing Biological actions of leech's bioactive substances

Molecule	Biological action
Calin	Platelet aggregating inhibitor (Munro, <i>et al.</i> , 1991)
Bdellins	Trypsin and plasmin inhibitors (Seemuller, <i>et</i>
Destabilase	Fibrin de-polymerase factor (Baskova & Nikonov, 1985)
Ldti	Tryptase, trypsin, chymotrypsin (sommerhoff, <i>et al.</i> , 1994)
Hirudin	Thrombin inhibiitiro (Markwardt, <i>et al.</i> , 1995)
Hirustasin	Thrombin inhibitor trypsin, chymotrypsin, cathepsin G, kallikrein inhibitor (Mittl, <i>et al.</i> , 1997)
Guamerin I	Elastase inhibitor (jung, <i>et al.</i> 1995)
Piguamerin	Trypsin and kallikrein inhibitor (Kim & Kang, 1998)
Bufrudin	Thrombin inhibitor (Electricwala, <i>et al.</i> , 1991)
Gelin	Elastase, cathepsin G, chymotrypsin, subtilisin inhibitor (kim& Kang, 1988)
Haemadin	Thrombin inhibitor (Strube, <i>et al.</i> ,1991)
Guamerin II	Elastase, chymotrypsin inhibitor (kim, <i>et al.</i> , 1996)
Decorsin	Gpiib. Iiia inihibitor (Seymour, 1990)
Antistasin	Factor Xa inhibitor (Nut <i>et al.</i> , 1988)
Lapp	Platelet aggregating inhibitor factor (Mazur, <i>et al.</i> , 1991)
Ghilanten	Factor Xa inhibitor (Dunwiddie, <i>et al.</i> , 1993)
Hementin	Fibrinolytic enzme (Malinconico, <i>et al.</i> , 1984)
Ornatin	Gpiib / iia inhibitor (Mazur, <i>et al.</i> , 1997)
Cytin	Chymotrypsin inhibitor (Chopin, <i>et al.</i> , 1997)
Tessulin	Trypsin, chymotrypsin inhibitor (Chopin, <i>et al.</i> , 1997)
Therin	Trypsin inhibitor (Chopin, <i>et al.</i> , 1997)
Theromin	Thrombin inhibitor (Salzet <i>et al.</i> , 2000)
Thersotasin	Factor Xa inhibitor (Chopin, <i>et al.</i> , 2000)

Indication of Leech Therapy

The famous Unani physicians described various therapeutic

uses of leeches in numerous disorders ranging from Dermatology, Ophthalmology, Gynaecology, Synosteology,

Phlebology, pains, fissures, certain infections and Neurological disorders. They even locally applied dried powder of leeches in sore throat, haemorrhoids, urethritis [37]. Rufus (1st century) has recommended application of leeches in *Qurooh-e-kohna mota'affina* (chronic infected ulcers) and *Khanazeer -e mutaqarraha* (ulcerative cervical lymphadenopathy) at the periphery of the lesion but on the affected site in case of *Sartan* (carcinoma) Besides, he also suggested leeching around the nose in nasal diseases and at the medial canthus of eye in diseases of eye.

Razi (850-923) A.D) has recommended the use of leeches in *Quba* (fungal dermatosis), *sa 'afa* (Alopecia), *Qurooh-e balkhiya* (Chronic ulcers), *Waja-ul-mafasil* (Arthritis), chronic headache, paralysis, tonsillitis, sore throat, low backache, sciatica and scar [38-41]. Ibn Sina wrote that leeching is beneficial in skin diseases like cicatricial alopecia, dermatophytes, chloasma, angioma [42]. Ibn Al-quf-Almasihi advocated leeching in carbuncle, elephantiasis, alopecia and varicose vein [43]. Al-baghdadi mentioned the efficacy of leeching in venous congestion after surgical procedures [24]. Imamuddin prescribed leeching in early cataract, trichiasis, iris prolapse, blephritis, subconjunctival bleeding, pterygium, sore throat toothache, uvulitis, stomatitis and glossitis [30]. Hakeem Azam Khan advocated in elephantiasis, penile inflammation, pruritus ani and fissure in ano [44-46]. According to Razi, application of leeches on the post-auricular region is beneficial in migraine. Application of leeches on the hip joint has been described by Razi for relieving sciatic pain. Similarly, Razi advised the application of leeches on the affected area in a patient of backache [38-41]. Tabri advised that in psychosis caused due to combustion of sanguineous humours, leech application on the scalp is beneficial [47]. Ibn-hobal-al-baghdadi (1121-1213 A.D) suggested the use of leeches after the evacuation of deranged humors through *Fasd* (Venesection) and *Ishal* (Purgation). He also mentioned that leech removed bad blood from the site of fungal dermatosis, alopecia, chronic wounds and also relieves nasal pain.

Overall Unani scholars have recommended *Taleeq* (Leeching) for the skin diseases like *quba* (Fungal infections), *Da-ul-feel* (Filarississ), *Nar-e-farsi* (Eczema), *Sa 'afa* (Alopecia), *Daus 'salab* (Tinea Capitis), *Qurooh-e-muzmina ghair mundamila* (Chronic Non-heading ulcers), diseases of the eyes and nose, *khanazeer* (cervical lymphadenopathy), *waja-ul-mafasil* (arthritis), *irqun-nisa* (Sciatica), *dawali* (varicose vein) *Zatul-janb* (pleurisy), *Zatur-riya* (pneumonia), *Sozish-e-ghesha-ul-qalb* (pericardial pain), *Sozish-e-azlat-e-qalb* (myocardial pain), *Sozish-e-jigar* (hepatic pain), *Sozish-e-dimagh* (meningeal pain), *Sozish-e-khusiya-tur-raham* (ovarian pain), *sozish-e-Raham* (uterine pain), *sozish-e-lauzatain* (tonsillar pain), *Sozish-e-Halaq* (throat pain), *waja-ul-uzn* (earache) etc. to relieve these agonies.

Abdul Qasim Zahrawi (936-1036A.D) has suggested that leeching should be done at such sites where cupping cannot be performed like on lips and gums. They can also be applied over the parts having least flesh like finger and nose. He further suggested that sucking the part through cups or washing it with vinegar and plenty of water has additional benefits of this procedure. Akbar Arzani (16th century), an Indian physician, states that leeching is a substitute for venesection in case of children. He mentioned its main benefit in chronic dermatological disease like alopecia and infections.

For the treatment of sanguineous diphtheria, Azam Khan advised that if the patient is not weak or malnourished, then application of leeches on the neck and below both the ears is beneficial. If the patient had difficulty in swallowing, then he advised the application of leeches on the nape of the neck in young age patients [48]. The blood-sucking activity of leeches was also employed for relieving piles by Azam Khan. The best results, according to him, are obtained by applying leeches on the lowest part of the sacrum, or they may be applied around the swellings or even on the pile mass. It was also used in the treatment of anal fissure. Application of leeches on the affected area was also thought to be beneficial in orchitis. Leech therapy was even employed in certain paediatric diseases. According to Azam Khan, if an abscess is caused on the umbilicus, then application of leeches around the lesion may be done if the child is more than two months old. For drainage of stagnant secretions in *filariasis*, leech therapy may be done on the heels after the patient had undergone *istifragh* (evacuation of morbid humours) with medicines [49]. It is also mentioned in *Jarahate Zohrawia* that more often leeching can be done in that areas of the body where venesection and wet cupping is not possible. And because of its small size it can also be used in lips and gums and in those organs which are devoid of muscles e.g. finger and nose [50]. According to a study conducted at RRIUM, Srinagar, India, leech therapy has a definite prophylactic and curative role in the treatment of frost bite [51].

Indication in Modern Medicine

Hirudotherapy may be applied to various diseases known nowadays, due to its anticoagulant, vasodilator, thrombolytic, anti-inflammatory and anaesthetizing qualities. Indications cited by medical practitioners of leech therapy are as follows:

Inflammatory reactions, passive congestions and spastic conditions, plastic and reconstructive surgery, cardiovascular diseases, hypertension, varicose veins, haemorrhoids, arthrosis, osteoarthritis, periarthritis and rheumatoid arthritis, thrombophlebitis, thrombosis and embolism. hematomas, external ear and chronic ear infections, eye diseases, including cataracts, glaucoma, traumatic injuries and inflammation, dental problems, like gingivitis, paradontitis, gingival edema and stomatorrhagia, vertebrogenic pain syndromes. GI tract – hepatitis, cholecystitis, pancreatitis, stomach ulcers. Chronic skin diseases, like scabies, psoriasis, eczematous dermatitis, and chronic ulcers. Respiratory disorders - Asthma, acute rhinopharyngitis and spasmodic coryza. Gynecological disorders - male and female sterility, endometriosis, parametritis, mastitis, fibromastopathy [52].

Contraindications

Hirudotherapy cannot be employed in all the patients. The patients should be firstly examined for their health status. HT is not given under the following conditions:

Absolute hemophilia, Anemia, Leukemia, Hypotonia, Pregnancy, Children. Coagulopathy, Hypersensitivity reaction, HIV positive patient, Hypotension [52].

Complications

Leech therapy is generally recognized as a relatively safe and well tolerated treatment modality. In some patients, application of leeches may produce mild fever and slight

localized itching of the bite site persist for few minutes to several hours and up to 3 days, is the most common adverse effect (37.3%-75%) of leech therapy. Following biting and sucking of blood from the host animal, certain rare complications may occur. *A. hydrophila* is a normal flora symbiote in the gut of medicinal leeches. *A. hydrophila* is found in the mucous secretions, suckers, and gut of the medicinal leech. It can cause pneumonia, septicemia or gastroenteritis^[53]. Other reported complications are allergic reactions such as itching followed by burning and blister formation, bullae, pruritus, wheal formation, and ulceration. Scarring may also occur but is usually minimal. Necrosis with chronic progressive ulcer can be due to the leech bite toxin or to the antigens that exist in its saliva, or a foreign body reaction against the leech jaw, which usually remains in the person's body when the leeches forcibly removed^[54, 55].

Conclusion

Leech therapy has a long history, going from popular and well accepted, to falling out of favour and being thought of as an unscientific home remedy, to coming back into current medical practice with strong scientific support. Leech therapy can safely and effectively have used to evacuate peccant/morbid humours from deeper tissues and cure numerous disorders as indicated by Unani scholars. Nowadays, leech therapy came back to the contemporary medicine with fewer applications, which were proven and supported by a huge number of scientific studies and case reports. The most effective and suitable technique of leech therapy for each disorder and symptom should be optimized, while field of leech application should be explored. In addition, Unani clinician should set the standards of operating procedure (SOPs) for leeching and should validate leech therapy in different diseases on modern clinical parameters.

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