

A scientific appraisal on hirudotherapy- an evolution in life style disorders

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Abstract

Introduction: Hirudotherapy is a treatment with using of medicinal leech. This kind of therapy is known from the time of extreme antiquity and is still alive nowadays.

Aims: At the present era when the world is suffering from a number of disorders occurring due to faulty Life style, Hirudotherapy is an evolutionary mode of treatment. Scientifically it has been proved that Substances in Leech saliva can lower the blood sugar levels and improve pancreatic functions, so can use in diabetes and its complications. Scientific research of *Hirudo Medicinalis* by number of powerful enzymes extracted from leeches salivary gland secretions among them DESTABILASE which in nature can be found only in leeches. This also explains the Atherogenic Effect provided by the leeches, for they lower the level of Cholesterol and Triglycerides in blood.

Conclusion: As Leech Therapy is being used frequently in a number of disorders, the evidence based concept is the need of the hour. The present paper portrays the scientific substantiation of Hirudotherapy.

Keywords: Hirudotherapy, medicinal leeches, *Hirudo Medicinalis*, Destabilase.

1. Introduction

'Hirudotherapy' is a treatment with using of medicinal leech. The method of hirudotherapy is approved by many countries. *Hirudo Medicinalis* were frequently used by the Greeks to heal a variety of Medical Problems. The Greeks also appeared to use them recreationally to feel more active and energized, to look prettier and more young and healthy.

In our Ayurveda texts Sushruta and many more Acharyas has thrown a brief view on *Jalaukavacharana* for a number of diseases. Our Acharyas has mentioned *Jalaukavacharana* as the *Chikitsardha*.

2. A View on medicinal Leeches [1]:

Scientific classification :

Kingdom: *Animalia*

Phylum: *Annelida*

Class: *Clitellata*

Subclass: *Hirudinea*

Lamarck, 1818

Orders

Arhynchobdellida or *Rhynchobdellida*

Leeches are *Annelids* comprising the subclass *Hirudinea*. The medicinal leech, *Hirudo medicinalis*, which is native to Europe and its congeners have been used for clinical bloodletting for thousands of years. Leeches are known to release an anesthetic to remain unnoticed by the host. They use a combination of mucus and suction (caused by concentric muscles in those six segments) to stay attached and secrete an anti-clotting enzyme into the host's blood stream. It was long thought that bacteria in the gut carried on digestion for the leech instead of endogenous enzymes which are very low or absent in the intestine. Relatively recently it has been discovered that all leeches and leech species studied do produce endogenous intestinal exopeptidases which can unlink free terminal-end amino acids, one amino acid monomer at a time, from a gradually unwinding and degrading protein polymer. However, unzipping of the protein can start from either the amino (tail) or carboxyl (head) terminal-end of the protein molecule.

3. Disorders treated by hirudotherapy

3.1 Medicinal uses of Leeches in Ayurveda

- *Susrutha* has mentioned Leech application in *Dushta Vrana*, *Visaja Vrana*[2], *Kustha*, Five types of *Vidradhi*, *Ekdasaj shopha*, *Shlipada*, *Arbuda*, *Visarpa*, *Granthi*[2] etc.
- In *Charak Samhita Sannipataja jwara*, *Pittaj Gulma*, *Visarpa*, *Vrana*, *Vatarakta*. [3]
- *Vagabhatta* also mentioned in Abdominal Tumor, Haemorrhoids, Abscess, Eyes. [4]

3.2 *Hirudo Medicinalis* were frequently used by The GREEKS to heal a variety of Medical Problems, including

- Asthma
- Cough
- Epilepsy
- Headaches

The Greeks also appeared to use them recreationally to feel more active and energized, to look prettier and more young and healthy.

3.3 In Russia, Hirudotherapy is used for:

Cardiovascular Diseases: Such as

- Post-Infractional Cardio sclerosis
- Ischemia Disease
- Phlebogene diseases of the lower extremities[5]
- Thrombosis, Thrombophlebitis[5], Venous Congestion

Ophthalmologists: Inflammatory and traumatic processes such as

- Keratitis
- Periorbital Hematoma
- Sub retinal Hemorrhage
- Glaucoma and Cataract

Dermatologists

- To Treat Clinical Forms Of Dermatitis
- Dermatitis (Eczema, Psoriasis, Paronychia, Scleroderma)
- Boils And Abscess

Neurological Diseases

- Circulation –free encephalopathy
- Neuralgia
- Neuropathy

Proctology

- Hemorrhoids
- Prolapsed rectum

3.2 Mode of action of leech therapy in different disorders

3.2.1 Plastic Surgery[6]:

One of the biggest problems with this kind of surgery is blood clotting which stops the flow of fresh blood between old and new tissue. Leeches produce substances that overcome these problems. Leeches have been used to restore blood circulation to grafted or severely injured tissue. In plastic and reconstructive surgery to salvage tissue flaps and Skin grafts whose viability is threatened by venous congestion.

3.2.2 Fibrinolytic and anti-coagulation effect[7]:

Dr. Nikonov has enormously contributed to the scientific research of *Hirudo Medicinalis* by discovering a number of much more powerful enzymes extracted from Leeches salivary gland secretions, Among them Destabilase, which in nature can be found only in leeches *Medicinalis*. With the help of this enzyme the mechanism of the fibrinolysis is being exercised which has not been known to the science before. In practical terms of medicine it means that through the Destabilase a leech provides the dissolution of the old stabilized hrombs. This is a base for the thrombolytic effect of leeches *Medicinalis*.

This unique property of *Leeches* showed a dynamic effect in Cardio sclerosis, Ischemia Disease, Phlebogene Diseases of the Lower Extremities, Thrombosis, Thrombophlebitis, Venous Congestion and Arterial blood flow disorders in lower limbs and their complications.

3.2.3 Anti-aging Effect [7]

Destabilase complex (DC) is also an example of natural liposome. Liposomal nature of DC ensures an important

physiological role of this complex as a universal thrombolytic agent. DC provides fast penetration of the enzymes through the cell membrane. This unique property of the chemical was later used for the creation of BAC - based creams with the unique capacity to improve skin structure and rejuvenate it as quickly as no other anti-aging cosmetic does. So that *Leech Therapy* is a boon for a number of Dermatological Disorders.

3.2.4 A boon for extra deposited fat[7]:

The lipid component of the DC is responsible for the attachment to a damaged vessel wall and to the blood clot. Further blood clot formation is prevented due to the slow lyses of a fibrin because of the isopeptide activity of Destabilase. Thus, the natural responses are the thrombin creation, plasma blood kallikrein, and platelet aggregation and adhesion blocking. The multifunctional effect of the Destabilase complex is due to the ability to influence synthesis and lipids exchange [7]. This also explains the atherogenic effect provided by the leeches *Medicinalis*, for they lower the level of cholesterol and triglycerides in blood and stimulates regress of atheromatose clots.

3.2.5 A Therapy in diabetes mellitus:

The Destabilase complex also contains a unique substance called Prostaglandin (similar to Prostacycline) - a primarily low - molecular substance which in nature can be found only in leeches *Medicinalis*. They keep blood vessels healthy, the gastrointestinal tract functioning healthy and the blood sugar level stable.

3.2.6 A Mysterious effect in hypertension and hypotension [8]:

The most mysterious fact about these prostaglandin substances is that it works both ways: if the blood pressure is high - they diminish it. If the blood pressure is low it is brought back to normal. This mechanism of action is being studied at present; however, it may be assumed that a decrease of blood pressure is caused by Prostacycline stable analogue. While an increase is promoted by the species with Kininase activity (the nature of these species is still unidentified).

3.2.7 Analgesic effect [8]:

Analgesic effect provided by leeches *Medicinalis* is due to the attraction of human brain to the neuropeptides of a leech. These neuropeptides form a leech contain endorphins (Morphine - like substances, also commonly known as "Hormones of happiness"). The effects of endorphins as opioid agonists are many and they are very positive, among them effective analgesia.

- Relief of anxiety
- Euphoria
- Sedation and etc.

Psychological dependence, tolerance, physical dependence, mental clouding, dysphoria, nausea, vomiting, spasmogenic effects, respiratory depression etc., which are known as the negative side-effects of the narcotics from the opiate group are absolutely excluded.

- Also the leech's neuropeptides contain enkephalin, which are a smaller peptide naturally found throughout the brain of a human & his dorsal horn of a spinal cord. Enkephalin is considered to be neurotransmitter that modulates pain.
- Enkephalin are responsible for pain relief due to the inhibition of substance-P (a chemical responsible for sensation of pain).
- The anaesthetic effect produced by leeches is also due to the injection of Serotonin - which facilitates pain in Peripheral Nociceptors and also acts as one of the transmitters in descending pain inhibition system.

[Serotonin is supposedly produced by the leeches intestines, which is marked by extremely high amino-oxidase activity relating as scientists suggest to the metabolism of many other chemicals besides the serotonin which are not known to us yet & represent the never ending mystery of a leech.]

3.2.8 Proctological Diseases

As since the ancient time *Leeches* are being used in a number of proctological disorders like; Haemorrhoids, Rectal Prolapse etc. As *Leeches* suck out blood from inflamed pile masses and the Serotonin inserted by the *Leeches* produce analgesic effect as well, the inflammation get reduced so that prolapsed rectum get reduced to its normal structure.

4. Bioactive substances of the medicinal leeches

- **Hirudin**
- **Hyaluronidase** - breaks down hyaluronic acid, the bonding material of connective tissue, thus fostering the flow of blood and fluids from affected areas.
- Pseudohirudin
- **Destabilase**- isopeptidase, responsible for hypotensive, Anti-thrombotic and thrombolytic effects.
- Apyrase
- **Bdellines** } major components of the anti inflammatory effect
- **Eglines** }
- Kininases

- Histamine-like substances - vasodilator
- Leech prostanoids
- Proteases
- Lipolytic enzymes
- Lipase
- Phagocytosis activator
- Serotonin
- Stable Prostacycline Analogous (Prostaglandin).

5. Mode of Action

The leech's main therapeutic benefits are not derived from the average 5 ml. of blood removed during biting (although this may provide dramatic relief at first), but from the anticoagulant and vasodilator contained in the leech saliva.

These properties permit the wound to ooze up to 50 ml. of blood for up to 48 hours. Leech bites will bleed (ooze) an average of six (6) hours.

The goal then is to produce an adequate venous outflow from the tissue by adjusting the number of leech applications and thereby bite wounds to suit the clinical applications.

The existence of skin-visceral connections with the definite organs is well known. Biologically active substances act to organs during the blood-sucking work of medicinal leeches through veins. It promotes the improvement of blood circulation in the concrete organ, renders thrombolytic, anti-inflammatory, immune stimulating action, raises nutrition of tissues, and strengthens tissues immunity.

Everything comes to aspiration of a live organism to delimit the nidus of inflammation by deterioration of blood circulation and capillary-tissue permeability, creation of an inflammatory shift by cellular and conjunctive tissue structure and a temperature mode in the given area.

As a result of it, the concentration of drugs for example an antibiotic in the nidus of inflammation is much lower than in blood. The increase of a dose of a chemical drug doesn't solve a problem because leads to excessive allergy and strikes a blow on other organs.

Biologically active substances containing in saliva glands of medicinal leeches can restore blood circulation in the nidus of inflammation, remove an ischemia of organs, and provide capillary tissue exchange and due to it can carry out the transport of chemical drugs into the nidus of inflammation, improve immune protection and regeneration of tissues.

Hirudin: Hirudin is a protein originating from the medical leech. It is the most potent thrombin inhibitor with a dissociation constant below 10^{-12} mol/l. Due to the production of Hirudin through recombinant technology, this protein is now readily available in abundant amounts and hence it has become an interesting candidate as a new antithrombotic agent.

6. Evidences upon Hirudotherapy

In 1984-1989 it was experimentally proved that at long intravenous introduction of a secret of salivary glands of medicinal leeches to the rats which were in the condition of a strongly expressed atherosclerosis the last ones had reduction of lipids in abdominal and lung arteries.

Patients suffering from deep venous thrombosis in the legs could develop post-phlebotic syndrome, a complication that occurs as a consequence of venous valve destruction. Leech therapy has been successfully used for the treatment of such conditions (By Eldor-et-al. in 1996).

Hirudin is the principal anticoagulant in leech saliva. It is a polypeptide, which has highly potent anti-protease activity with a strict specificity for thrombin. Hirudin is now produced by recombinant DNA technology and is administered to patients undergoing coronary angioplasty, for the treatment of deep venous thrombosis and as a substitute for heparin in patients developing heparin-induced thrombocytopenia.

7. Conclusion

In Ayurveda, Acharya have explained about Leech Therapy in various diseases. Now as the modern system of medicine is also discovering new verities of treatment to crush the Life affecting Disorders, Hirudotherapy is a boon. Without cut and tear Hirudotherapy may be applied at any diseases known now days. It can be used as an independent method of treating and in complex with the others. This fact testifies to its efficiency at the decision of various problems of health.

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