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### A brief review on applications of leech therapy

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#### Abstract

*Leech therapy has been practiced over the past many years and its application in both medical and dental science is well recognized. Although its use may be associated with few potential complications, yet it provides an easy and non invasive means of treatment by its blood letting property in a variety of conditions. The following article presents a brief review on the applications of leech therapy, also highlighting its importance on the dental side.*

**Key words:** Leech, blood-letting, hirudin.

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#### INTRODUCTION

Leech has been historically documented in our literature from the very past and is recognized as both, a parasite and a therapeutic agent. This species survives well in temperate climates and muddy freshwater pools having weed growth serve as their natural habitat.

Medicinal leeches have gained popularity not only in the field of medical science, but also in dentistry. Their use had been practiced over the past in almost every region of the world. Different species of medicinal leeches are popular, among which, the most commonly known is the *Hirudo medicinalis*, a fresh water hermaphrodite, also known as the European Medical Leech. Other *Hirudo* species sometimes used as medicinal leeches are *H. orientalis*, *H. troctina*, *H. verbana*, *H. manillensis* or the Asian Medical Leech, and *Macrobdella decora* or the North American Medical Leech.

These annelids have a unique ability to remove blood pooled in various tissues. They use their proboscis to puncture through the skin and simultaneously release an anaesthetic to eliminate pain of the bite inflicted. Further, few more products are released which prevent the blood from clotting and allow maintenance of the blood letting procedure.[1]

**Mechanism of action of leeches:**

Leeches have various proteins in their saliva, which have different properties responsible for carrying out the desired medical effect. They have evolved highly specific mechanisms to feed on their hosts (both cold and warm blooded organisms) by blocking blood coagulation [2]. Its anticoagulant property is the most potent action which was explained in 1884 when John Berry Haycroft, a Birmingham chemist, discovered an anticoagulant, called "hirudin," from the saliva of leech. It is known to act at different points in the coagulation cascade, thereby preventing blood from clotting by inhibiting conversion of fibrinogen to fibrin. It is also known to inhibit platelet aggregation, which further contributes to the process [3]. In addition to this, it also has antiseptic qualities. There are also other proteins present in leech saliva which are said to exhibit analgesic effect and reduce numbness.

Leech saliva also contains several other bio-active substances including prostaglandins, vasodilators, anesthetics and proteins like calin, apyrase hyaluronidase, egline, destabilase, piyavit and kollaginase [1].

**Review on therapeutic uses of leeches:**

The history of therapeutic uses of leech therapy dates back to the 10<sup>th</sup> century, when the physicians used them to suck blood from engorged tissues. Avicenna in *The Canon of Medicine* emphasised on the use of leeches even for skin diseases. Later in the 12<sup>th</sup> century Abd-el-latif al-Baghdadi wrote that leech could also be used for cleaning the tissues after surgical operations.

Although the use of medicinal leeches had declined towards the end of the 19th century [4], recently their use has returned in the field of microsurgery. They provide an effective means to reduce blood coagulation, relieve venous pressure from pooling blood (venous insufficiency), and in reconstructive surgery to stimulate circulation in reattachment operations for organs with critical blood flow, such as eye lids, fingers, and ears [3].

In 1983, Henderson et al reported a case where leeches were used in the post-operative treatment of a scalp avulsion case [2]. In the 1990s researchers in Russia were finding new uses for leeches. Leech therapy has made resurgence in Russia for treatment of hypertension, migraines, phlebitis, varicose veins, arthritis, hemorrhoids and ovarian cysts. In the United States, plastic surgeons use them to drain blood from wounds after limb or tissue reattachment.

In cases of venous congestion in flap surgeries, the therapeutic benefit of leeches is achieved in series of events which first includes stimulation of blood flow by injecting salivary anticoagulants into the dermis. Then the mechanical application of leeches maintains active suction of blood with a negative pressure of upto 1/10 atm, followed by passive oozing of the bite wound after leech detachment. Hence, the evacuation of venous blood from engorged flaps is allowed and results in a temporary restoration of the capillary blood flow and thereby improved tissue viability [5].

Kubo et al. in their study have postulated that VEGF (vascular endothelial growth factor) when used in combination with blood exanguination technique such as leeching and hyperbaric oxygen therapy, may increase the survival of flaps by manyfold [6].

With respect to the use of medicinal leeches in acute trauma, medicinal leeches became common place in assisting revascularization of amputated fingers and toes after replantation procedures [7].

In Dentistry too, there are evidences on successful use of leech in treatment of various dental condition. In 1817, a case of facial swelling secondary to an oroantral fistula was reported to be treated by leech application on to the face. Their use was also extended to drainage of periodontal abscesses by application to the gums. Specific tubes were designed to carry and apply leeches to the desired site. Leeches were also used to treat common dental infections like periodontitis, and alveolar abscesses. In 1996, an interesting case report on treatment of a sublingual hematoma using leeches was published. Many skin disorders present with typical oral manifestations, among which of utmost interest to the dentists is pemphigus [3]. Literature mentions a reference to the use of medicinal leeches for preventing new blisters from forming in pemphigus patients although there is no reported case on its application so far.

### **Complications**

Although leech therapy is an innovative approach in medical science, its use is accompanied by various complications, the most common being prolonged bleeding. Other reported complications are allergic reactions and bacterial infections [4]. The bacteria *aeromonas-hydrophilia* present in gut of leech, can cause pneumonia, septicemia or gastroenteritis. Allergic reactions such as itching followed by burning and blister formation and ulcerative necrosis due to toxins present in leech saliva have also been reported after leech therapy [3].

Transmission of certain infections from one subject to the other is another probable complication of leech therapy [1]. Hence, it is mandatory to rule out the selected cases for certain conditions by performing a series of required hematological or serological investigations. Few such conditions include various blood borne infections like HIV and hepatitis, blood disorders like hemophilia, thrombocytopenia and conditions like pregnancy and anemia [3].

### **CONCLUSION**

Nowadays, leeches are used successfully for only a few conditions, notably in the field of reconstructive or microsurgery, to salvage tissue flaps and skin grafts whose viability is threatened by venous congestion. The anticoagulant properties of hirudin, contained in leech saliva, may lead to wider therapeutic applications in the prevention and treatment of thromboembolic diseases. However, its application in dentistry is yet unexplored and this should motivate further research on its use in treatment of various dental disorders. At the same time optimal care should be taken when applying leeches, because their use can be associated with serious complications [8].

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