

Leeches in Modern Medicine

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Most people consider leeching, along with other forms of bloodletting, a discredited medical practice of the past. And to a large extent, this view is correct. But not entirely. The fact is that leeches still have an important role in modern medicine. My associates and I routinely use leeches to control swelling and thus to promote healing following reattachment of severed fingers.

History of Bloodletting

The first records concerning bloodletting by cutting a vein, or venesection, were found in the Hippocratic collection in the fifth century B.C. In Greek times, the humoral theory proposed that when blood, phlegm, and yellow and black bile were in balance with the body, good health was ensured. Plethora, or an overabundance of body humors, was considered unhealthy. Galen suggested that venesection should be used to remove the blood directly instead of starvation, which required time and discomfort to the patient. Leeches were instrumental in helping to rid the body of plethora.

The Chinese used leeches as early as the tenth century. European medieval medicinal manuscripts illustrated the use of leeches for the treatment for a variety of disorders. The tyrant Heracleus was treated for his obesity with multiple applications of leeches.

In the fifteenth century, the common public bath was popular. Bloodletting became so common among the masses that it was done in these baths. The bathkeeper was usually a barber, surgeon, and bloodletter.

The first half of the nineteenth century saw an explosion of scientific works on leeches. The commercial trade in medicinal leeches (*Hirudo medicinalis*) became a major industry. Leeches were so scarce in France that some 4.5 million were imported in 1833. The main proponent of leeching during the early 1800s was Francois Broussais, a French doctor who once treated his indigestion with 15 applications of 50 to 60 leeches each.

The demand became so great that the medicinal leech almost became extinct in Europe. Leech gatherers typically collected their consignment by wading in water and allowing leeches to attach themselves to their legs. As many as 2500 per day could be harvested in this manner from a good pond.

When the natural supply gave out, the French and Germans took up leech farming. To feed these cultivated leeches, elderly horses were driven into the water. The horses later died of blood loss.

Therapeutic excesses of leech mania brought the use of leeching into disrepute. During his dying days, the Russian novelist Gogol was subjected to leeching in his nostrils. Gogol had to be restrained during these prolonged sessions, and a witness concluded that leeching "probably helped him die much faster."

Leeches were also used in cases of trauma. One of the few detailed accounts of the care of the wounded after the battle of Waterloo comes from a Lieutenant Simmons of the British Army. He was treated for a musket ball wound to the abdomen by being bled of a quart of blood. He also had his servant kill the leeches that he was supposed to apply daily.

The early American colonists firmly believed in bloodletting. George Washington probably lost his life as a result of bloodletting. He was bled four times in two days after contracting a severe inflammation of the throat.

It was not until the publication of a discourse on self-limited diseases by Bigali in 1854 that the practice of bloodletting was discouraged. However, venesection was considered standard treatment for congestive heart failure as late as the 1930s.

Biology of Leeches

The only serious misconception about leeches is that they are confined to equatorial swamps. In truth, leeches thrive in alpine lakes, desert watering holes, and polar oceans. There are some 650 species of leeches in the world. A leech has both male and female reproductive organs. It does not fertilize itself but mates with another leech. Most leeches have suckers at both ends for holding on to their hosts while feeding. Some leeches have teeth, while others have a proboscis that is inserted for sucking out fluids.

Bloodsucking leeches need to be devious to feed. Their saliva contains an anesthetic, an anticoagulant, and a chemical that aids in the diffusion of chemicals throughout the local tissues. This so-called spreading factor breaks down the cement that binds cells together and has been shown to be an effective antibiotic. The leech also harbors the bacterium *Aeromonan hydrophila*. This bacterium is used by the leech to digest the blood, and it actually produces an antibiotic to kill other bacteria that may cause putrefaction.

Medical research continues to find amazing properties of the chemicals in

the saliva of different species of leeches. An Amazonian leech produces an anticoagulant called hementin. This substance attacks fibrinogen and has the potential to be a very effective anticoagulant. Currently, genetic engineering is being used to produce hementin in large quantities.

Role in Microsurgery

With this background in mind, it can be seen why the leech can be beneficial as an adjunct to microsurgery. Technical difficulties encountered with microscopic rejoining of minute veins are formidable. With reattachment of distal parts, veins might not even be present to join together.

For these surgical problems, the leech has become a useful tool. The leech will drain 10 to 15 mm of blood per application. Most beneficial, however, is the continued bleeding at the puncture site, stimulated by the anticoagulant hirudin. Most wounds will ooze for 24 hours after application. This has been found to be very effective in reducing swelling in reattached or transplanted tissues. Generally, the leech feeds for a half hour and detaches, leaving the wound to bleed. This site is scraped frequently by the nursing staff to encourage continued bleeding.

Leeching promotes healing by enabling fresh, oxygenated blood to enter the wound area until veins can regrow and establish circulation.

Leeches can be reused on the same patient after several days; however, they do not seem to work as well after the first application. Caution in use and disposal are essential, as with any other blood product.

Leeches are kept in the refrigerator before use and do not need feeding for months at a time before application. When taken out of their artificial hibernation, they are generally very hungry and will attach readily to an engorged, replanted part. They seem to sense a lack of arterial input. Replanted digits that have poor arterial inflow are not very attractive to them.

Because of the constant oozing from the wound, significant decreases in blood volume can occur over a period of 5 to 10 days. Occasional blood transfusions have been necessary. In 5 to 7 days, the replanted part begins to make new veins, and decompression with leeches can then be tapered off.

In our institution we have used medicinal leeches on over 25 patients. There are no occurrences of infections or complications from their use. We've found the medicinal leech to be a useful adjunct to microsurgical procedures.

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Further Reading

Schwartz. J. 1986. The automation of leeches. *Texas Medicine* 82: 27-31.

Payton. B. W. 1984. An historical survey of illustrations of the medicinal leech. *Journal of Audiovisual Media in Medicine* 7: 105-112.

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