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Hirudoteraphy in pain management

Abstract

This study was conducted in order to evaluate the results of leech application in the treatment of chronic pain patients. The patients were subjected to leech therapy on the day of their visit on the most painful area. In the study, observations were conducted both before and after leech therapy, and Visual Analogue Scale (VAS) scores were recorded to assess pain levels. The VAS scores ranged from 0 to 10, with 0 indicating no pain and 10 representing the highest level of pain possible. Duration of effect and recovery times were also recorded. The results showed that leech application is effective in the treatment of pain complaints. There was a significant decrease in pain complaints with leech therapy in patients and the average pain intensity in a 10 mm VAS before treatment decreased from 5.75 to 1.45 after treatment. A positive effect was observed in the applied treatments in a short period of 2 hours on average, and improvement was observed in 1-2 days.

Keywords: hirudoteraphy, traditional and complementary medicine, pain, VAS score, analgesia

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Introduction

The practice of leech therapy has a rich and widespread history, as evidenced by various sources. Pharaonic tomb paintings dating back to 1500 BC, Sanskrit writings from 1300 BC, and classical Greco-Roman reports all bear witness to the long-standing tradition of leech therapy.[1] Leech therapy, mentioned as "Jalaukavacharan" in Ayurveda (Hirudotherapy), was used for medicinal "blood-letting" and "purification", believed to cure a variety of ailments such as gout, skin diseases, blood disorders, alopecia, filariasis, headaches, etc.,[2]

During medieval times in England, the term "leecher" was commonly used interchangeably with "healer," indicating the association of leech therapy with medical practitioners. By the mid-nineteenth century, leeching had gained immense popularity, particularly in France, to the extent that it nearly depleted the natural habitats of leeches. At its peak, leech therapy was widely embraced, utilized by ordinary individuals as well as notable figures like George Washington and Napoleon Bonaparte. The use of leech therapy experienced a remarkable resurgence in popularity since the 1970s. In Europe, three species of medicinal leeches exist in their natural habitats: Hirudo medicinalis, Hirudo verbana and Hirudo orientalis, with Hirudo verbana being the most prevalent. Hirudo verbana can be seen in river deltas and reservoirs in Romania, Turkey, and Serbia, or in dispersed communities across Northern Europe.[3]

For centuries, the use of leeches for medicinal purposes, known as hirudotherapy, has been a traditional practice in many cultures. Leeches, classified as members of the class Hirudinida and the phylum Annelida, are hermaphroditic, bloodsucking worms that find application in various medical fields. They have been used to treat a range of medical conditions, such as blood-clotting disorders, arthritis, varicose veins and other circulatory disorders.[4,5]

Leech therapy provides curative actions in offering pain relief to patients of various forms of arthritis, the agony related to pain, varicose veins, and post-surgical swelling. This is due to the anticoagulant and vasodilatory properties of their saliva, which help to increase blood flow and prevent blood clots. By removing excess blood and preventing clotting, leeches can help to prevent tissue death and promote healing.[6] Leech therapy has been successfully applied to treat severe lumbar pain due to cancer.[7]

A number of randomized controlled trials have demonstrated the efficacy of leech therapy in alleviating pain and improving function for patients with osteo - arthritis of the knee, osteoarthritis of the carpometacarpal joint of the thumb, and epicondylitis.[8] A metaanalysis has supported the effectiveness of leech therapy in osteoarthritis of the knee.[9]

The exact mechanisms through which leech therapy may exert analgesic effect are not well understood. Besides of a possible placebo effect, leech therapy may exert some direct anti-inflammatory and pain-killing effects through the components of the leech saliva. Platelet-derived growth factor (PGF) is assumed to play an important role in producing the signals of neuropathic pain in spinal cord and inhibition of its release by intrathecal injection of Hirudin has been reported to suppress thermal hyperalgesia and tactile allodynia in mice.[10] In osteoarthritis, the effect has been attributed particularly to the analgesic/antiinflammatory substances present in leech saliva. However, an anti- inflammatory action seems less likely to be relevant for chronic nonspecific back pain than for symptomatic osteoarthritis.[7] During the approximately 60 min of application the leeches release their saliva, containing more than 100 biologically active substances into the wound.[11]

Leech saliva contains various active compounds like peptides, proteins, small organic molecules, hirudin, hyaluronidase, histamine-like vasodilators, collagenase, kallikrein, superoxide development inhibitors and some poorly characterized anesthetics and analgesic compounds that have beneficial effects such as anticoagulation, improved blood circulation, thrombolysis, vasodilation, and anti-inflammatory properties. While the specific analgesic substance in leech saliva remains unknown, clinical evidence suggests its effectiveness. Leech bites are generally less painful than other wounds, indicating the presence of a pain-relieving agent during the biting process. Discomfort experienced during leech application subsides quickly after biting starts. The substances present in leech saliva impede the cascade of pain responses by opposing cytokines with anti-inflammatory agents, thereby delivering analgesic relief. Protease-inhibiting substances in leech saliva neutralize pain-inducing cytokines and suppress inflammatory reactions. Temporary itchiness, slight swelling, and localized inflammation may occur after leech application, while the therapeutic pain relief effects are expected to begin during this period.[12–14]

In medically high-risk/aged patients and those reluctant to undergo surgery, less aggressive treatments including leech therapy can be assumed as a temporary solution.[15] The aim of this clinical trial was to investigate the clinical effectiveness of leech therapy for chronic pain.

Materials and methods

This proof-of-concept study was planned, approved, and conducted in Tekirdağ Namık Kemal University Research Hospital Traditional and Complementary Medicine Center with patients having pain complaints in various forms.. Formally a pharmaceutical trial, it was carried out according to the requirements of the Turkish Medicines Act and the Ordinance on the Implementation of Good Clinical Practice in the Conduct of Clinical Trials on Medicinal Products for Use in Humans. Eligible for inclusion were male and female patients between 18 and 70 years of age with confirmed, previously diagnosed chronic pain. Patients were excluded on grounds of medicinal anticoagulation treatment, anemia, and for other reasons . For the purposes of this trial four to seven leeches could be applied on one single occasion in an area 3 to 15 cm from the painful area.

The patients (n=20) were subjected to leech therapy on the day of their visit on the most painful area. In the study, observations were conducted both before and after leech therapy, and Visual Analogue Scale (VAS) scores were recorded to assess pain levels. The VAS scores ranged from 0 to 10, with 0 indicating no pain and 10 representing the highest level of pain possible. Duration of effect and recovery times were also recorded. After the treatment, the procedures were followed up by communicating with the patients about the prognosis of their complaints:

The intensity/frequency of analgesic medication, as recorded by the patient in a diary Limitations on daily functioning imposed by pain and pain–related disability

General quality of life

Mood

Perception of pain

Statistical analyses

IBM SPSS Statistics 25.0 package program was used for statistical analysis of the data. Paired t-test was used to compare the dependent groups ($p<0.05$). Descriptive statistics were used for duration of effect and recovery times also presented.

Results

A significant improvement was observed in the level of reduction of pain to a level that will disappear in patients who have undergone leech therapy once or twice (Table 1 & 2).

Table 1 Descriptive statistics for VAS Scores

Paired samples statistics					
	VAS Scores	**n**	**Mean**	**SD**	**SEM**
Pair	VAS 1	20	5,75	1,585	,354
	VAS 2	20	1,45	1,099	,246

Table 2 Paired Sample t-Test for VAS Scores

	Paired differences			**t**	**df**	**Sig (2-tailed)**
	Mean	**SD**	**SEM**			
VAS 1-VAS2	4,30	1,129	0,252	14,039	19	0,000

The mean pain intensity was 5,75±1,585 on the 10-mm VAS for the leech therapy group before the treatment while it decreased to 1,45±1,099 after the treatment. Regarding the number of repeated treatments, 50% of the patients just took the treatment once, 25% twice and 25% three times (Figure 1). Mean value for the duration effect was found as 1,90 hr while it was 38,50 hr for recovery time (Table 3).

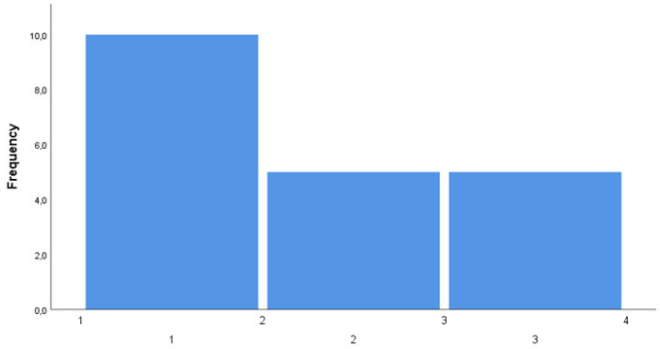

Figure 1 Number of repeated treatments.

Table 3 Descriptive statistics for duration of effect and recovery times

	n	**Mean**	**SD**	**Min**	**Max**
Duration of effect (hour)	20	1,90	0,74	1,0	3,5
Recovery time (hour)	20	38,50	14,82	24	72

Discussion

Leeches have been employed to alleviate pain from various sources, with rapid and sometimes long-lasting relief reported. Successful cases of leech therapy for severe cancer pain have been documented. Studies on osteoarthritis suggest that leech therapy may improve symptoms via its anti-inflammatory and analgesic effects.[15,16]

The findings obtained from this study have shown that leech application is effective in the treatment of pain complaints. There was a significant decrease in pain complaints with leech therapy in patients, and the average pain intensity in a 10 mm VAS before treatment decreased from 5.75 to 1.45 after treatment. It has been found that a positive effect was observed in the applied treatments in a short period of 2 hours on average, and improvement was observed in 1-2 days. Similar findings have been observed by other researchers.

There are many studies that show that the application of leeches in the treatment of pain gives positive results. In these studies, it has been proven that leech therapy is effective against different types of pain. For example, in an early article by Oberheid,[17] significant analgesic effects of leech therapy on different types of back pain were observed and reported based on clinical experience.

In a study by Kalender et al.[7] reported a case involving a 62-year-old male patient who had both leiomyosarcoma and synchronous renal cell carcinoma. Despite undergoing radiotherapy and receiving systemic and epidural analgesic infusion, the patient continued to suffer from intense pain in the lumbar region without any relief. However, after a period of two months, the patient returned to the clinic with no pain and in good overall condition. During this period, the patient revealed that he had resorted to self-treatment by applying seven leeches to the lumbar region, which remarkably alleviated the pain entirely.

In another study, an open trial involving 32 patients with osteoarthritis showed that leech therapy resulted in improved pain,

joint stiffness, and movement.[18] Nouri et al.[10] noted that recent randomized controlled trials have demonstrated the effectiveness of leech therapy in treating knee and metacarpal osteoarthritis. Furthermore, leech therapy has proven successful in treating severe lumbar pain caused by cancer. The local effects of leech therapy can be attributed to various anti-inflammatory substances present in leech saliva, aside from Hirudin, including histamine-like vasodilators, kallikrein, and tryptase inhibitors. Additionally, some researchers suggest that thrombin may play a role in pain control mechanisms, and Hirudin itself possesses anti-inflammatory effects by inhibiting thrombin.

Hohmann et al.[19] stated that the application of four to seven leeches to the lower back resulted in significant relief of chronic low back pain, as measured by a 100-mm visual analog scale four weeks after treatment. This was found to be more effective than a control treatment consisting of four hours of physiotherapy. Andereya et al.[20] used leech therapy on the 38 patients having osteoarthritis and compared with control group. Their conclusion states that leech therapy can alleviate symptoms associated with osteoarthritis. Furthermore, repeated utilization of the leeches seems to enhance the long-term outcomes.

According to Bakhshi et al.[21] a single session of leech therapy can provide similar pain-reducing benefits to drug therapy in women with migraine headaches. The therapy can also provide significant symptomatic relief, which can last for at least three months. Michalsen et al.[22] have provided evidence that the application of leech therapy can enhance joint function, reduce joint dryness, and improve overall quality of life.

Talebi et al. [23] reported that there were not significant therapeutic or remedial effects of leech therapy on pain and symptoms in the symptomatic treatment of knee osteoarthritis. Michalsen et al.[24] conducted a non-randomized controlled pilot study to evaluate the efficacy of leech therapy as an adjunctive treatment for osteoarthritic knee pain. The study included 16 patients who were hospitalized for two weeks and had been experiencing knee pain associated with osteoarthritis for at least six months. Among these patients, ten received a single leech therapy application in addition to their conventional treatment, while the remaining six control patients received only conventional treatment. Comparing the two groups, it was found that leech therapy led to faster pain relief, as assessed by the Visual Analogue Scale (VAS), within three days following the application. These improvements were clinically significant and significantly superior to the control group even after four weeks. The study did not report any serious adverse reactions during its course. A meta-analysis examining studies on osteoarthritic knee pain revealed compelling evidence supporting the immediate and short-term analgesic effects of leech therapy. Furthermore, the meta-analysis found moderate evidence suggesting the presence of longer-term benefits from this therapy.[25]

Zavalova et al.[26] reported that the analgesic effects of leech therapy in cases of pain caused by hematoma and swelling are primarily attributed to two factors: the thrombolytic effect of the salivary ingredients and the removal of excess blood. By removing excess blood, leech therapy helps relieve pain and reduce swelling. Additionally, the active components in leech saliva have thrombolytic properties, which aid in the breakdown of blood clots, further contributing to pain relief. The leech bite, in analogy with other invasive procedures such as injections and acupuncture, can be expected to have an antinociceptive action. Regional blood and lymph loss with resulting decongestion and improvement of the microcirculation may have a relaxing effect on the musculature.

Conclusion

In conclusion, hirudotherapy may seem like an unconventional medical practice, but its effectiveness in treating a variety of conditions has been well-documented. As research continues to uncover new applications for leeches, it is possible that they may become an even more important tool in modern medicine and environmental monitoring.

Leech therapy is less invasive, cost-effective, feasible and easily available therapy in clinics and hospitals to be offered to patients in need of pain relief as a locally given and systemically acting therapy in interdisciplinary sciences.

In medically high-risk/aged patients and those reluctant to undergo surgery, less aggressive treatments including leech therapy can be assumed as a temporary solution. Leech therapy should therefore be considered a useful option for the nonmedicinal/noninvasive management of pain. This trial provides further clear evidence that leech therapy probably represents an effective means of ameliorating chronic regional pain syndromes in the musculoskeletal apparatus as a whole. It may be worthwhile to try combining the pronounced relief of symptoms achieved by leech therapy with activating treatments. But it needs to be done in a bigger scale number of patients to bring out better conclusion and that low number is limitation for this current study.

Ethical approval

The current research was carried out in compliance with the regulations specified by the Animal Experiments Ethics Committees of Turkey. As per these regulations, Ethics Committees are responsible for reviewing and approving experiments only if they involve vertebrate animals. Since leeches are not classified as vertebrate animals, they did not require approval for use in this study. Regarding the ethical permission for the patients, the consent was received from each patient.

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None.

Conflicts of interest

The authors declare no conflict of interest.

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