

Raktamokshana through Siravedha: A Critical Review of Mechanism, Utility, and Clinical Applications



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Abstract Raktamokshana is a key procedure in Ayurvedic parasurgery, involving therapeutic bloodletting for Raktaja roga (blood-born disorders) and other disorders with impaired Rakta Dhatu and Pitta Dosha. Of the Raktamokshana methods, Siravedha (venepuncture) is defined as "Ardhachikitsa" (half the treatment) in Shalyatantra due to its efficiency and specificity. This review article summarizes the action, clinical uses and examination of Siravedha using Ayurvedic classical texts such as Sushruta Samhita, and contemporary scientific studies. The review examines physiological and biochemical processes relative to Siravedha use, clinical outcomes of the procedure for various conditions, contemporary scientific implications of these conditions, and obstacles to integration of the Siravedha procedure into contemporary clinical health practice. Additionally, this review proposes future research directions to help modernize the practice of Siravedha, especially in integrating Siravedha into clinical practice and further validating its clinical use.

Keywords: Raktamokshana, Bloodletting, Siravedha, Parasurgical procedure.

Introduction

Ayurveda, the traditional Indian way of life, encourages a balance of the Doshas (or humours) Vata, Pitta, and Kapha, Dhatus (or tissues), and Malas (or wastes) as a means to attain health, longevity, and to treat ill-health [1]. Of the seven Dhatus, Rakta (or blood) is believed to be critical to all the Dhatus and synonymous with life itself, providing vitality, strength, beauty, and longevity [2]. Raktamokshana, or therapeutic bloodletting, is a Shodhana (or purificatory) treatment that aims to remove vitiated or impure blood, and is carried out primarily in conditions associated with Rakta Dhatu and Pitta Dosha [3]. The modern practice of Siravedha, as an evacuated form of Raktamokshana, involves a controlled venepuncture for therapeutic bloodletting to remove impure blood, and is thought to alleviate numerous etiologies and conditions, ranging from musculoskeletal pain to long-term skin conditions [4]. Siravedha, was described by Sushruta Samhita in the ancient times and termed "Ardhachikitsa" by Charaka in Shalyatantra and has a therapeutic significance similar to Basti in Kayachikitsa [5]. Until more recently, bloodletting was utilized across cultures (Mesopotamian, Egyptian, Greek, Unani) from an overarching therapy to a more selective procedure [6]. There is also a recent gradual resurgence of probing the therapeutic uses of bloodletting in conditions like high-ferritin type 2 diabetes and musculoskeletal disorders, spreading interest to integrate with modern healthcare [7, 8].

This article will review the mechanisms of action, clinical applications, limitations, and future, for the body of literature surrounding Siravedha; as a bridge between the ancient and modern wisdom.

Historical Background of Raktamokshana and Siravedha

The practice of Raktamokshana has its origins in the Vedic era, with mention of leech therapy found in the Koushika Sutra of the Atharvaveda [9]. The father of Indian surgery, Sushruta, elaborated on bloodletting in his Sushruta Samhita, particularly in the Sharira Sthana (Siravarnavibhakti Sharira, Siravyadhvidhi Sharira). He categorized Raktamokshana procedures into the invasive (Shastra-based) ones which include Siravedha and Pracchan (scraping) and non-invasive (Anushastra-based) procedures which include Jalaukavacharan (leech therapy), Shringa (horn application), Alabu (gourd/cupping) and Ghati Yantra (cupping glass) [11]. Sushruta mentioned Siravedha to manage conditions when there was a systemic violation of Dosha, but particularly Pitta and Rakta [12]. Bloodletting historically was cornerstone of medical practice in other civilizations. In ancient Greece, bloodletting was advocated by Hippocrates and Erasistratus to treat "plethoras" (excess blood), and in Unani medicine bloodletting was one of the major regimental therapies [6, 13]. However, bloodletting was overused in the 18th and 19th century leading to skepticism about bloodletting as a "dead end" in medicine [14]. Recent reports have

focused on the applications of bloodletting, utilizing it for specific applications, primarily in Ayurveda where Siravedha, targeted bloodletting, upon specific disorders remains applicable [15].

Mechanism of Siravedha Ayurvedic Perspective

Siravedha has an effect by eliminating vitiated blood and restoring dosha balance, particularly in the context of Rakta-Pitta [4]. The Sushruta Samhita describes 700 siras (blood vessels), consisting of 602 vedhya (puncturable) and 98 avedhya (non-puncturable) vessels, classified into four types based on color—Arun (Vata), Neela (Pitta), Lohita (Kapha), and Sweta (Rakta) [10]. Umbilical blood vessels are formed during fetal life, and during post-natal life distributions, Siras are the vessels that allow for nutrients in Rasa and Rakta [10]. With Siravedha, specific veins in the body are targeted for treatment of conditions, for example, four angulas below the knee for Vatakantaka, or in the lumbosacral area for blood flow issues in Gridhrasi, to ease local inflammation and pain [16, 17]. It is important to puncture with control using sharp instruments (the original form was a Shashtra, but is now often a hypodermic needle) followed by a small draw of blood from the site of puncture [11]. Sushruta suggests hemostatic controls of ponto-toning the area of the procedure (the protocol for bleeding, which is highly original, includes, Sandhana (binding), Skandana (clotting), Pachana (dusted with ash), and Dahana (cauterization) this is a safe way to assure that the wound closes) [18]. These considered ways to prevent excessive bleeding that could remain outside of the body or aggravation of Vatta or possible fatal implications [18].

Modern Physiological Correlation

Siravedha functions similarly within contemporary understanding of hemostasis, which classes states of hemostasis in a three-phase model of vasoconstriction, a platelet plug, and fibrin clot formation [18]. Sandhana incites vasoconstriction and provides gauze for bridging injured vessels, Skandana promotes clotting, and Pachana/Dahana supports coagulation and homeostasis through heat or chemical means [17]. Siravedha decreases inflammatory mediators and oxidative stress through facilitating the removal of vitiated blood, which can be seen in studies of high-ferritin type 2 diabetes, in which bloodletting reduced systemic ferritin and helped normalize vascular reactivity [7, 8]. The removal of blood also mimics therapeutic phlebotomy used in modern care of hemochromatosis or polycythemia, in which excess iron or red blood cells are removed to re-normalize physiology [14]. In Ayurveda, vitiated blood is presumed to carry morbid Doshas, the removal of

which restores clarity to the Indriya, revitalizes the digestive fire, and promotes life [19]. This parallels findings from contemporary studies which demonstrated bloodletting as an effective method to reduce HbA1c and promote insulin sensitivity for those with metabolic disorders.

Utility of Siravedha Clinical Advantages

Siravedha's practical use is that it is straightforward, low-cost, and can be done in an outpatient setting. In this way it is a good alternative to modern interventions, such as taking anti-inflammatory medication or undergoing surgery. These modern interventions could have side effects, such as nausea or obesity or issues associated with osteomyelitis [20]. Siravedha can be performed by trained practitioners and offers almost immediate relief of symptoms related to pain or inflammation associated with Vata or Rakta-related ailments [21]. In addition, incorporating modern instruments, such as hypodermic needles or vacuum devices, can improve Siravedha's accuracy and patient comfort, as exemplified in integrative medicine [11]. Sushruta noted Siravedha was used for treating half of diseases of the body, especially Raktagata Vikar diseases relating to pitta-dosh. Siravedha was seen as well-suited for Raktagata vitiation, providing the practitioner a direct route to the blood [22]. In practical situations in rural areas for treating venoms, tapir or cupping is often a practical treatment option where modern practices may take time or be inaccessible [11]. The use of Siravedha for clinical interventions underscores relevance in its utility.

Comparison with Other Modalities

Among the Raktamokshana techniques, Siravedha is usually compared to leech therapy (jalaukavacharan). While leeches inject bioactive compounds (such as hirudin and bdellin) to decrease inflammation and clotting, Siravedha will directly rid this vitiated blood, which would achieve a quicker response in systemic conditions [13]. However, leeches are more successful with a localized skin disorder due to being non-invasive and provide additional biochemical advantages [13]. Pracchan (scraping) is rarely used, but it is effective for superficial conditions, and Shringa and Alabu are less exact but culturally significant, especially in a traditional setting [11].

Clinical Applications

Siravedha has been studied extensively for its efficacy with various conditions and a combination of Ayurvedic case reports and modern clinical trials support its use. Below is a number of specific clinical uses of Siravedha based on condition:

1. Vatakantaka (Plantar Fasciitis/Calcaneal Spur):

Identified as a heel condition caused by aggravation of Vata dosha from improper foot positioning or overuse, Vatakantaka has equivalent terminology with plantar fasciitis [16]. A case report of a 51-year-old woman who received treatment with Siravedha, Eranda Taila, and Kaishore Guggulu showed notable decline in symptoms (pain, tenderness, swelling, burning sensation, redness), which improved from 3/2 to 0/1 after two sittings [16]. A different case report noted that Siravedha was associated with a slowing of the disease process along with clinical improved symptoms, emphasizing its importance in interrupting the pathological process [22]. In addition, complementary treatment with Viddhakarma, Siravedha intervention significantly reduced scores on WOMAC (37), VAS (6), and Foot Function Index (96) in a calcaneal spur case in just 10 days [20].

2. Kati Sandhigata Vata (Lumbar Spondylosis)

Kati Sandhigata Vata, which is comparable to lumbar spondylosis, presents with low back pain, stiffness, numbness, and restricted movement [20]. A randomized study of 32 subjects, that were seen half as Raktamokshana (using a modified Shringa Yantra), provided an indication that subjects treated with the alternative showed a reduction in pain and stiffness as evaluated with Wilcoxon signed-rank test and paired t-test [20]. Agnikarma showed superiority over Siravedha treatment for pain and numbness; however, Siravedha scored significantly better for stiffness suggesting different clinical roles depending on the treatment modality [20].

3. Gridhrasi (Sciatica)

In a comparative analysis, Siravedha noted moderate improvement in 72.73% of Gridhrasi patients and marked improvement in 27.27%, while Agnikarma was superior (68.42% marked, and 21.05% complete) [23]. The utility of Siravedha comes from the capacity to reduce localized inflammation and improve circulation, especially when applied to the lumbosacral region [23].

4. Avabahuka (Frozen Shoulder)

A single session of Siravedha was performed on a 46-year-old female patient with Avabahuka, resulting in visual analog scale (VAS) score reduction and improvement in range of motion, suggesting its rapid ability to relieve pain and restore function [24]. This suggests Siravedha may have merit in musculoskeletal issues in the Vata context.

5. Chronic Skin Disorders

Siravedha in conjunction with topical Gandhakadruti Malahara demonstrated reduction in

hyperpigmentation in chronic Lichen Planus Pigmentosus over five months [25]. Available literature confirms the number of 30 studies involving bloodletting and 75 studies based on Jalaukavacharan for Vicharchika (eczema) suggests some similar role of Siravedha in general systemic Raktaja disorders [9]. Siravedha's ability in the treatment of systemic skin conditions such as eczema is likely due to the bloodletting quality moving abnormal blood in the body which in turn, reduces inflammatory mediators [19].

6. High-Ferritin Type 2 Diabetes

Recent investigations have substantiated the metabolic effects of Siravedha. In one study, three 500 mL phlebotomies over two weeks in individuals with high-ferritin type 2 diabetes were associated with a decrease in HbA1c (-0.61, $P < 0.01$), improvement in insulin sensitivity (80.6% vs. -8.6% in controls, $P = 0.049$), and a decrease in AUCC-peptide (-10.2% vs. +10.4%, $P = 0.032$) at 4 months that persisted at 12 months [7]. There was an improvement in vascular reactivity (GTN-induced vasodilation, $P = 0.006$) associated with a decrease in ferritin ($r = -0.45$, $P = 0.04$) [8]. These data suggest a role in metabolic dysfunction associated with iron overload.

7. Other Indications

Siravedha is indicated for gouty arthritis, filariasis, herpes, tumors, genital infections, abscesses, inflammatory diseases, cellulitis, and chronic ulcers, including snake-bite wounds [11]. Siravedha's general application across both local and systemic diseases illustrates its breadth of clinical use [12].

Research Trends

A systematic evaluation of 143 research papers from Ayurvedic institutions in India showed a strong preference for Raktamokshana, with 75 investigations on Jalaukavacharan and 28 on Siravedha [9]. Vicharchika (eczema) was the most studied condition (30 studies) and Vrana (wounds) was the second studied condition (8 studies), although there were 20 investigations that did not relate to a specific condition or disease [9]. The Indian Government Ayurvedic Medical College at Bangalore published 21 studies, which suggest a regional trend in research publications [9]. These studies endorse the use of Siravedha; however, there is a need for standardized and uniform methods to improve reproducibility.

Modern Correlations and Advances

Tool Modifications

Now there are advancements in using modern instruments in Siravedha, such as hypodermic

needles and a vacutainer device to improve accuracy and patient tolerance [11]. This action is consistent with modern integrative healthcare practices where Siravedha can be performed in a western medical practice or within a hospital setting [11]. For example, the modified Shringa Yantra was shown to be effective in Kati Sandhigata Vata, and it illustrates how the device can be used, modified, and adapted over time [20].

Modern Medical Parallels

Siravedha parallels phlebotomy found in contemporary medicine for hemochromatosis, polycythemia, and porphyria cutanea tarda [14]. The attribution of reduction in ferritin and inflammatory markers for patients with high-ferritin diabetes mirrors Ayurvedic notions related to the removal of vitiated Rakta [7, 8]. Additionally, the hemostatic techniques of Sushruta (Sandhana, Skandana, Pachana, Dahana) correspond with contemporary hemostatic approach too [18].

Integrative Potential

Integration of Siravedha with contemporary modern imaging and diagnostics (e.g., MRI, biomarkers) has the potential to optimize the selection of site, and ultimately outcome of treatment. For example, imaging guided venepuncture and targeted approach to Siravedha would be more precise with evaluation of an MRI imaging study and apply application to lumbar spondylosis [20]. Shared research between Ayurvedic and allopathic practitioners could establish reliability and efficacy of Siravedha in practice.

Limitations and Challenges

Historical Overuse

The historical overutilization of bloodletting in the 18th and 19th centuries resulted in the waning of it, whereas critics (or skeptics) dubbed it a “dead end” in medicine [14]. These perspectives are still present and require stronger evidence to help the bloodletting application. Thus, targeted use, as demonstrated in Ayurveda, is essential in the evolution of this bias.

Variable Efficacy

Comparative studies demonstrate Agnikarma procedures afford better improvements in pain than the Siravedha for Gridhrasi as well as Kati Sandhigata Vata [20, 23]. Evidence also supports that the efficacy of Siravedha is limited for metabolic disorders such as DIOS, since lifestyle changes proved more effective than reduction in ferritin levels alone [26]. Results support the value of conditions specific bloodletting applications, as well as combined interventions.

Research Gaps

As only 20 of the 143 studies from India with bloodletting, i.e. Raktamokshana, focus on bloodletting camp had no specificity [9]. A glaring omission in standardization of blood volume, puncture point, and other outcome measures. Inability to reproduce investigations limits not only randomization but also external validity, and also exposes investigators to safety issues. The DIOS trial recently reported outcomes such as fatigue (25.3% vs 2.3% in controls, $P < 0.0001$) and weight gain (over short-term), while clarifying and concluding what is known about BI cannot be safely concluded until it is assessed in a study [26]

Contraindications

Siravedha is contraindicated in patients with hemophilia, anemia, pregnancy, leukemia, arterial insufficiency, and previous exposure to leeches due to risk of anaphylaxis [13]. Patient selection is critical to predict adverse events/symptoms and develop a successful treatment.

Future Directions

To optimize the clinical utility of Siravedha the following recommendations are proposed:

1. **Standardized protocols:** Develop a standard set of protocols for puncture sites and volume, and selection of tools used for blood collection, to create consistency and safety [11].
2. **Randomized Controlled Trials (RCTs):** Large RCTs that examine the efficacy of Siravedha across populations and symptomologies such as musculoskeletal disorders, skin disorders, and metabolic disorders.
3. **Biochemical & Molecular Studies:** To explore the mechanism of Siravedha's efficacy there is an opportunity to look at biomarkers of inflammation (e.g. inflammatory cytokines, oxidative stress markers, etc.) to better align Siravedha with contemporary pathophysiology [7,8].
4. **Integration with Diagnostic Testing:** The use of imaging (MRI, ultrasound) and laboratory testing will create a better tool for honing treatment sites and tracking outcome, and with promote precision [20].
5. **Training & Education:** Incorporate training in Siravedha within standard Ayurvedic and integrative medical degree programs to ensure sufficient training to practitioners and create broader acceptance.
6. **Cross-disciplinary Collaboration:** Encourage engagement between Ayurvedic researchers and allopathic researchers collaborating to foster integrative healthcare practice and evaluate implementation of Siravedha as a relevant disciplinary facet of holistic healthcare.

Conclusion

Siravedha is one of the key procedures Raktamokshana, which is a part of Ayurveda's whole person approach to treatment of Raktaja and Vata disorders. Its mechanisms, engaged in balancing the Doshas and purifying the blood, are consistent with modern treatments aiming to control hemostasis and decrease underlying inflammation. The many clinical applications, ranging from Vatakantaka to diabetes with elevated ferritin levels, have shown efficacy in numerous areas, with an emphasis on the use of Siravedha for pain relief and restoring functional activity. Challenges remain, such as the historical overuse, diminishing efficacy, and general absence of research, yet there are an abundance of new tools and interventional strategies available today hold the promise of revitalizing Siravedha. The method can be advanced into contemporary medical practice if the protocols are standardized, and rigorous clinical research are undertaken with primary focus on Siravedha's place in modern medicine, while maintaining a respectful integration of Ayurveda's evidenced-based history.

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