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A CASE STUDY OF *JALAUKAVACHARANA* (LEECH THERAPY) FOR POST-OPERATIVE COMPLICATION IN DRY AND WET LIP LACERATION

Ashwani Sharma*[1], Gopikrishna B. J.[2]

[1]PG Scholar, Dept. of Shalya Tantra, SDM College of Ayurveda and Hospital, Hassan.

[2]Professor, Dept. of Shalya Tantra, SDM College of Ayurveda and Hospital, Hassan.

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***Corresponding Author**
Ashwani Sharma

PG Scholar, Dept. of Shalya Tantra, SDM College of Ayurveda and Hospital, Hassan.

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ABSTRACT

The management of traumatic maxillofacial injuries, specifically complex lip lacerations, demands an intricate balance between precise surgical reconstruction and the meticulous mitigation of post-operative physiological complications. In *Sushruta Samhita*, such traumatic injuries are comprehensively classified as *Sadhyo Vrana*, representing acute wounds that frequently provoke severe localized inflammatory responses characterized by pronounced edema, intractable pain, and critical venous congestion that threatens tissue viability and delays the healing cascade. To counteract these microvascular complications, *Jalaukavacharana* (Medicinal Leech Therapy) serves as an unparalleled, para-surgical Ayurvedic intervention specifically indicated for the extraction of vitiated blood and the rapid attenuation of inflammation. This report details the clinical trajectory of a 35-year-old male who presented with severe facial trauma resulting from a high-velocity fall, sustaining a 10x1 cm dry lip laceration and a 5x1 cm wet lip laceration that deeply involved the intraoral mucosa and the superior labial frenulum. Following a rigorous four-layered primary surgical closure to re-establish anatomical continuity, the patient developed severe post-operative edema and cyanotic venous congestion. To salvage the microcirculation, the patient underwent *Jalaukavacharana* over three consecutive days, supplemented by the topical mucosal application of *Yashtimadhu Taila Gandusha*. The intervention yielded a precipitous and significant reduction in pain, swelling, localized hyperthermia, alongside the complete

restoration of capillary perfusion. The traumatic wound achieved full epithelialization rapidly and without secondary complications or hypertrophic scarring. Consequently, medicinal leech therapy emerges as a highly efficient, cost-effective, and minimally invasive adjunct to modern reconstructive surgery for traumatic facial wounds, profoundly promoting accelerated healing while circumventing the need for systemic anticoagulants.

KEYWORDS: *Jalaukavacharana*, *Sadhyo Vrana*, *Raktamokshana*, Hirudotherapy, *Yashtimadhu Taila*.

INTRODUCTION

The intersection of ancient Ayurvedic surgical wisdom and contemporary maxillofacial reconstructive techniques offers a profoundly synergistic approach to managing complex traumatic injuries. Traumatic wounds, systematically classified within the Ayurvedic lexicon as *Sadhyo Vrana*, represent acute structural disruptions of the body's tissues caused by extrinsic physical forces.[1] Acharya Sushruta, universally venerated as the pioneer of surgical science, dedicated extensive treatises within the *Sushruta Samhita* to the etiopathogenesis, morphological classification, and comprehensive management of such injuries. According to the *Chikitsasthana* (Chapter 2, *Sadyo Vrana Chikitsitam*), these traumatic wounds are broadly categorized into six distinct morphological types: *Chinna* (excised or cut wounds), *Bhinna* (punctured wounds involving viscera), *Viddha* (punctured extremities), *Kshata* (crushed or unevenly lacerated wounds), *Picchita* (contused wounds), and *Ghrista* (superficial abrasions or lacerations).[2] Facial injuries, and more specifically those afflicting the highly vascularized and architecturally complex tissues of the lips, frequently manifest as a combination of *Chinna* and *Ghrista* wounds, characterized by sharp structural severance accompanied by localized tissue contusion and extreme neurovascular disruption.[3]

The human lip possesses a unique and unforgiving anatomical architecture that complicates surgical repair. It is composed of three functionally distinct layers: the outer cutaneous aspect (frequently termed the dry lip or vermilion), the central muscular foundation provided by the *orbicularis oris*, and the inner oral mucosal lining (the wet lip).[5] The precise transition zone between the dry vermilion and the wet mucosal layer, along with the highly visually sensitive vermilion border (the "white roll"), demands absolute surgical precision.[7] While meticulous multi-layered surgical closure is the indisputable gold standard for restoring the anatomical continuity and sphincteric competence of the oral cavity[5], the post-operative healing phase is frequently jeopardized by the localized physiological response to trauma. The kinetic energy

absorbed during the impact, compounded by the subsequent surgical manipulation, invariably induces a massive release of inflammatory cytokines, localized tissue hypoxia, and critical venous congestion.[5] Because the venous outflow in traumatized facial tissues is often inadequate to match the robust arterial inflow, blood pools within the interstitial spaces, rendering the tissue cyanotic, edematous, and at high risk for ischemic necrosis.[12]

From the perspective of Ayurvedic pathology, this phenomenon is elegantly explained through the *Tridosha* paradigm. The initial trauma (*Abhighata*) instantaneously provokes an aggravation of the *Vata Dosha*, which is responsible for the acute, throbbing pain (*Ruja*) experienced by the patient.[14] Subsequently, the localized pooling of blood triggers a severe vitiation of the *Pitta Dosha* and *Rakta* (blood tissue), which drives the inflammatory cascade, manifesting clinically as localized burning sensations (*Daha*), profound edema (*Shotha*), and the potential for purulent suppuration (*Paka*).[14] In such instances of acute *Rakta* and *Pitta* vitiation, classical surgical closure alone is insufficient to address the underlying humoral imbalance, making the management of the subsequent inflammatory response critical for optimal healing and the prevention of hypertrophic scarring.

To effectively counteract these microvascular and humoral complications, *Jalaukavacharana* (Medicinal Leech Therapy) emerges as a highly specific and potent therapeutic adjunct. Classified as an *Ashastrakrita Raktamokshana* (non-surgical bloodletting procedure), it is exhaustively detailed by Acharya Sushruta in the *Sutrasthana* (Chapter 13, *Jalaukavacharaniya Adhyaya*).[17] The classical text explicitly states.

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This foundational *shloka* translates to the understanding that because leeches (*Jalauka*) naturally dwell in cold water ecosystems, possess a sweet (*Madhura*) biochemical taste profile, and are fundamentally cold (*Sheeta*) in their therapeutic potency, they represent the absolute optimal modality for extracting blood that has been pathologically vitiated by the heat-inducing *Pitta dosha*.[17] Furthermore, *Jalaukavacharana* is advocated as the gentlest and most convenient method for removing excess vitiated *Rakta* and *Pitta*, making it exceptionally suitable for highly innervated, delicate anatomical regions such as the face, and for individuals with a tender constitution who may not tolerate invasive sharp surgical bloodletting (*Siravedha* or *Pracchana*).[17]

In the domain of modern reconstructive and microsurgery, the application of the medicinal leech (*Hirudo medicinalis*) has experienced a profound revival due to the discovery of the highly complex biochemical matrix contained within its saliva.[20] Leech saliva is not merely a mechanical anticoagulant; it is a sophisticated pharmacological cocktail containing over one hundred distinct bioactive peptides and enzymes.[20] Molecules such as hirudin, calin, eglins, bdellins, and hyaluronidase work synergistically to exert unparalleled anticoagulant, anti-inflammatory, antiplatelet, and vasodilatory effects.[24] These bioactive compounds actively dismantle the localized microvascular thrombosis, restore capillary perfusion, neutralize destructive oxidative enzymes, and rapidly evacuate the interstitial edema that threatens the surgical repair.[24]

This comprehensive case study meticulously explores the integrative efficacy of *Jalaukavacharana* utilized in tandem with primary multi-layered surgical reconstruction to reduce severe post-operative complications in a patient presenting with a highly complex dry and wet lip laceration. Furthermore, it highlights the adjunctive utilization of *Yashtimadhu Taila Gandusha* to optimize the intraoral mucosal microenvironment, providing a holistic, evidence-based model for the management of traumatic facial *Sadhyo Vrana*.

CASE PRESENTATION

Patient Profile

A 35-year-old male patient, employed locally as a mason and residing in the district of Hassan, presented to the emergency triage of the Shalya Tantra outpatient department. The patient's chief complaint centered on a continuously bleeding, deeply incised and contused cut located on the face, specifically circumscribing the perinasal region and heavily involving the upper lip.

History of Injury: Upon taking a detailed clinical history, the patient reported sustaining an accidental self-fall from the first floor of an active building construction site approximately one hour prior to his hospital admission. The biomechanical force of the impact was absorbed primarily by the right mid-face and perioral region against a blunt, uneven concrete surface. The patient experienced immediate, excruciating pain, profound localized bleeding, and significant functional discomfort. Crucially, neurological assessment revealed no loss of consciousness, no episodes of emesis, no amnesia, and no subsequent acute headaches, effectively ruling out an immediate, severe traumatic brain injury or intracranial hemorrhage.

Past Medical History: A thorough review of the patient's past medical history was entirely unremarkable. The patient reported no known pharmacological or environmental allergies, no prior surgical interventions, and no chronic systemic metabolic disorders such as diabetes mellitus, hypertension, or ischemic heart disease that might impede the normal physiological phases of wound healing. Furthermore, the patient denied any habitual addictions to alcohol, tobacco, or illicit substances, suggesting a robust baseline physiological reserve.

Clinical Findings

A comprehensive localized physical examination of the maxillofacial region was conducted under sterile conditions. The examination revealed a severe, gaping laceration situated on the right upper lip, extending superiorly and laterally toward the alar base of the nose, resulting in significant anatomical distortion of the perioral subunits.

Dimensions and Anatomical Involvement

The traumatic insult was characterized by a bifurcated injury pattern involving distinct tissue beds.

1. **Dry Lip Laceration:** A substantial linear and deep defect measuring approximately 10 cm in length and 1 cm in depth. This laceration completely transected the cutaneous aspect of the upper lip, critically breaching the vermilion border (the mucocutaneous junction), a cosmetically and functionally vital landmark.[5]
2. **Wet Lip Laceration:** An interconnected, deep mucosal defect measuring 5 cm in length and 1 cm in depth. This aspect of the injury heavily involved the intraoral mucosal lining and extended deeply to tear the superior labial frenulum, exposing the underlying vascular networks and minor salivary glands.[6]

***Vrana Pariksha* (Wound Examination):** The macroscopic condition of the wound appeared relatively clean regarding massive foreign body impaction; however, given the etiology of a construction site fall, the potential presence of microscopic particulate debris necessitated rigorous irrigation.[5] In accordance with classical Ayurvedic wound assessment parameters (*Vrana Pariksha*), the presentation aligned perfectly with an acute *Sadhyo Vrana* exhibiting mixed features of a *Chinna* (cleanly cut) and *Ghrista* (friction-induced laceration) wound.[3] The *Vrana Varna* (color of the wound bed) was deeply erythematous and cyanotic at the margins, indicating acute vascular stasis.[16] The *Vrana Srava* (exudation) was characterized by active bleeding (*Rakta*) mixed with serous fluid (*Lasika*). The *Vrana Vedana* (pain profile)

was characterized by severe, unremitting throbbing (*Ruja*) and localized burning sensations (*Daha*), clinically confirming the acute, simultaneous aggravation of both *Vata* and *Pitta Doshas* resulting from the severe tissue trauma.[14] The surrounding tissues were already exhibiting rapid onset, tight edema (*Shotha*), distorting the natural facial contours.

Figure 1: Pre-Operative View.

View of the traumatic Sadhyo Vrana involving dry and wet lip mucosa before intervention, demonstrating active bleeding and loss of anatomical continuity.

Figure 2: Extent of Injury.

Deep laceration involving the superior labial frenulum and the highly vascularized intraoral wet mucosa.

Diagnostic Assessment

To evaluate the patient's systemic physiological response to the trauma and to ensure absolute safety prior to the initiation of parasurgical bloodletting interventions, routine hematological investigations were ordered.[12] The results indicated an anticipated acute inflammatory response but were otherwise within normal, healthy limits.

- **Hemoglobin (Hb):** 12.8 Gm/dL.
- **White Blood Cell Count (WBC):** 16,100 Cells/Cmm.
- **Coagulation Profile:** Both Bleeding Time (BT) and Clotting Time (CT) parameters were evaluated and found to be strictly within normal limits(that are BT-2’15 min, CT-3’45min).
- **Viral Markers:** Standard screening for Hepatitis B surface antigen (HBsAg), Human Immunodeficiency Virus (HIV), and Hepatitis C Virus (HCV) were all non-reactive, ensuring occupational safety for the surgical team and ruling out systemic immunocompromise.

Therapeutic Intervention

The therapeutic strategy was conceptualized as a highly integrated, sequential protocol. It combined the immediate, mechanically necessary modern surgical reconstruction with traditional Ayurvedic parasurgical and topical pharmacological interventions designed to manipulate the biological microenvironment, optimize perfusion, and accelerate cellular regeneration.

Surgical Management

Given the severe disruption of the critical functional and aesthetic subunits of the lip, a precise, 4-layered surgical closure was performed under local anesthesia (infraorbital and mental nerve blocks to avoid tissue distortion caused by direct local infiltration).[5] The primary objective was to eliminate all subcutaneous dead space, restore the sphincteric competence of the *orbicularis oris* muscle, and meticulously align the vermilion border to prevent permanent cosmetic deformity.[5]

The layers were reconstructed sequentially from deep to superficial.

1. **Intraoral Mucosa (Wet Lip):** The deep mucosal tears, including the frenulum, were approximated using 4-0 absorbable chromic gut and Vicryl sutures. Absorbable materials were explicitly chosen for the wet mucosa to eliminate the need for painful suture removal in this highly sensitive, continuously moist environment.[6]
2. **Muscular Layer:** The severed fibers of the *orbicularis oris* muscle were carefully identified, aligned, and plicated using deep, buried 3-0 and 4-0 Vicryl (polyglactin) sutures. This step is functionally critical to restore the dynamic movement of the lip and prevent the wound edges from pulling apart under normal muscular tension.[5]
3. **Deep Dermal Layer:** Subcutaneous dermal approximation was achieved using 4-0 Vicryl sutures. This layered technique significantly offloads the mechanical tension from the superficial epidermal layer, reducing the risk of wound dehiscence and mitigating the formation of widened, hypertrophic scars.[9]
4. **Cutaneous Layer (Dry Lip & Skin):** The final epidermal layer and the critical vermilion cutaneous border were re-established using 5-0 Prolene (polypropylene), a non-absorbable monofilament suture known for causing minimal tissue reactivity.[5] The "white roll" of the lip was aligned flawlessly to ensure aesthetic symmetry.

Figure 3: Immediate Post-Surgical Closure.

The completed 4-layered closure achieved utilizing deep Vicryl 3.0 for tension relief and

superficial Prolene 5.0 for precise epidermal approximation.

Ayurvedic Adjunct Therapy (*Jalaukavacharana*)

The patient developed severe post-operative tissue swelling, cyanotic venous congestion at the flap margins, and intractable throbbing pain. The venous outflow pathways were severely compromised, unable to drain the arterial blood entering the repaired tissues, thereby threatening the viability of the surgical reconstruction.[12]

To rapidly salvage the microcirculation, decompress the engorged capillary beds, and halt the progressive inflammatory cascade, *Jalaukavacharana* was initiated. The intervention adhered strictly to the Standard Operating Procedures derived from classical Ayurvedic literature.[17]

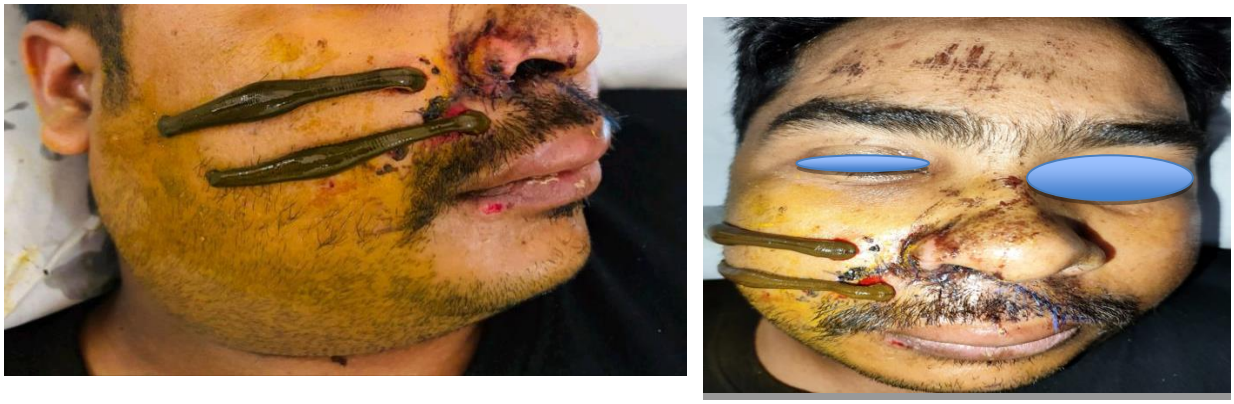
Procedure Details

- **Purva Karma (Preparation):** The perioral surgical site was gently cleansed with sterile water to remove any chemical residues that might repel the leeches. In accordance with Sushruta's classification, robust, non-poisonous (*Nirvisha*) leeches belonging to the *Hirudo medicinalis* species were carefully selected.[17] To remove their physiological fatigue and stimulate their appetite, the leeches were placed in a basin of clean water containing a light dispersion of turmeric powder approximately one *muhurta* (48 minutes) until they exhibited highly active, vigorous swimming movements.[17]
- **Pradhana Karma (Application):** Two active leeches were applied to the maximally congested, cyanotic regions immediately adjacent to the suture lines on the upper lip and right cheek. Successful attachment was visually confirmed when the leeches raised their anterior segments, assuming the characteristic arched shape resembling a horse's hoof (*Aśvakhuravadanā*), a clinical sign explicitly detailed in the *Sushruta Samhita*.[17] Once attached, the leeches were covered with a soft, moist white cotton cloth to simulate their natural humid habitat and maintain their feeding efficiency.[17] The patient reported an almost instantaneous cessation of the severe throbbing pain within minutes of the bite, indicating the rapid localized delivery of the leech's salivary analgesic compounds.[24]
- **Duration and Frequency:** The leeches were allowed to feed actively for 30 minutes per sitting until they reached satiation and spontaneously detached. This entire protocol was repeated for three consecutive days (3 sittings total) to ensure sustained vascular decompression.
- **Paschat Karma (Post-Procedure):** Following spontaneous detachment, it is imperative to ensure the survival of the medicinal leech by inducing emesis (*Vamana*) of the ingested

blood. The leeches were dusted with turmeric. The physician then performed a gentle, systematic downward massage along the leech's body from the tail toward the anterior sucker until the dark, coagulated blood was entirely expelled.[17] Complete emesis is critical; failure to do so results in a fatal condition for the leech known as *Indramada*.[17] The patient's bite sites were wiped clean, and a sterile dressing infused with turmeric powder was applied to achieve final hemostasis and provide local antimicrobial protection.[34]

DAY 1.

DAY 2



DAY 3

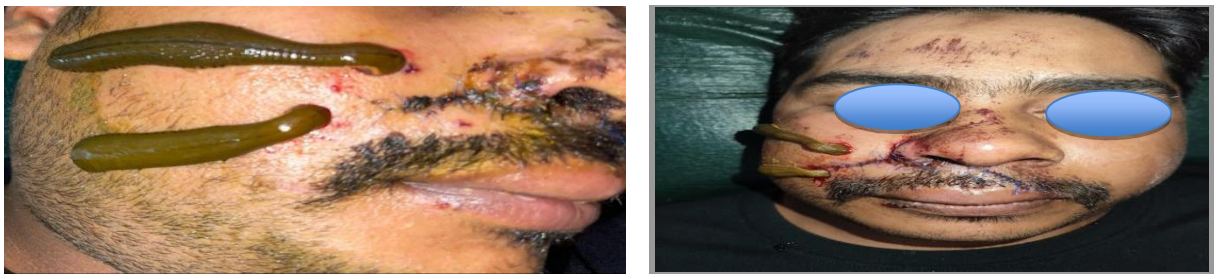


Figure 4: Leech Therapy Application.

Strategic application of Jalauka (Medicinal Leeches) adjacent to the Prolene suture lines to aggressively reduce venous congestion and interstitial edema.

Adjunct Therapy: *Yashtimadhu Taila Gandusha*

While the external cutaneous layers were managed via leech therapy, the extensive intraoral mucosal trauma (the wet lip laceration) posed a high risk for secondary bacterial colonization from the oral microbiome, which could precipitate wound breakdown.[5] To optimize the intraoral microenvironment and accelerate mucosal regeneration, an Ayurvedic oral intervention, *Yashtimadhu Taila Gandusha* (medicated oil pulling/gargling), was prescribed thrice daily.[37]

The patient was instructed to hold the medicated sesame oil infused with *Yashtimadhu* (*Glycyrrhiza glabra*) in the oral cavity without swallowing, allowing it to coat the sutured mucosa. This process utilizes hydrostatic pressure to gently dislodge metabolic debris and slough from the wound crevices without the shearing forces of brushing.[38] Furthermore, the formulation bathes the raw tissues in bioactive lipids, forming a protective barrier against acidic oral secretions while delivering targeted, localized anti-inflammatory therapy.

RESULTS AND OBSERVATIONS

The patient was subjected to rigorous clinical monitoring throughout the three days of active *Jalaukavacharana* therapy, followed by scheduled outpatient assessments to evaluate suture integrity and long-term scar maturation. The integration of traditional and modern modalities yielded extraordinarily positive outcomes, characterized by the accelerated resolution of all pathological inflammatory markers.

Assessment of Clinical Signs

The cardinal signs of acute inflammation—pain (*Ruja*), swelling (*Shotha*), and localized hyperthermia—were systematically assessed daily and recorded using a qualitative grading scale. The tabulated data reveals a precipitous and sustained decline in all symptomatic parameters following the initiation of leech therapy.

Table 1: Daily Assessment of Cardinal Clinical Signs.

Clinical Symptom	Day 1 (Pre-Therapy)	Day 2 (Post-1st Sitting)	Day 3 (Post-Therapy)
Pain (*Ruja*)	+++ (Severe, throbbing, requires analgesia)	+ (Mild, easily tolerated)	- (Completely Absent)
Swelling (*Shotha*)	+++ (Severe, tight, distending edema)	++ (Moderate, tissue softening)	- (Normal anatomical contour)
Local Temperature	+++ (Significantly raised, hot to touch)	+ (Slightly warm)	- (Normal, matches surrounding skin)

Venous Congestion	+++ (Cyanotic, dark purple wound margins)	+ (Pinkish hue returning, improved refill)	- (Healthy, robust capillary perfusion)

Detailed Clinical Outcomes

- **Profound Analgesia and Pain Relief:** The most immediate and striking result was the profound analgesic effect. The patient, who initially presented with severe, unremitting throbbing pain secondary to the tight tissue edema and *Vata* aggravation, reported complete pain relief shortly after the leeches attached.[24] Consequently, the administration of synthetic systemic analgesics and non-steroidal anti-inflammatory drugs (NSAIDs) was entirely withheld, demonstrating the potent, localized analgesic properties of the leech saliva. The patient reported absolutely no pain or discomfort during the 30-minute extraction procedures.
- **Rapid Resolution of Edema and Congestion:** The severe venous engorgement that threatened to necrose the delicate *orbicularis oris* and cutaneous flaps resolved with remarkable speed. Following the detachment of the leeches, the Y-shaped bite wounds continued to passively ooze a serosanguinous fluid for several hours.[22] This prolonged, controlled passive bleeding is a hallmark of successful hirudotherapy; it serves to mechanically offload the stagnant, deoxygenated blood trapped within the interstitial spaces, visibly shrinking the swelling and restoring the pink, well-perfused appearance of healthy tissue.[39]
- **Accelerated Intraoral Healing:** The adjunctive application of *Yashtimadhu Taila Gandusha* yielded excellent results for the wet mucosal laceration. The continuous lipid barrier prevented any intraoral mucosal sloughing, halitosis, or secondary stomatitis.[41] The deep mucosal tear exhibited rapid, healthy epithelialization without the formation of aphthous-like secondary ulcers or painful fibrotic contractures that often plague intraoral wounds.
- **Suture Removal and Tissue Remodeling:** The external non-absorbable Prolene sutures were safely removed on post-operative Day 7. The wound edges showed flawless approximation, with the critical vermilion border perfectly aligned. By Day 14, both the internal wet and external dry lip lacerations had healed completely, achieving full functional competence of the mouth.[5]
- **Absence of Complications:** Throughout the entire therapeutic course, no adverse events were recorded. There were no instances of secondary bacterial infections (specifically *Aeromonas hydrophila*, a known risk of leech therapy)[12], no episodes of prolonged

uncontrollable hemorrhage requiring intervention[42], and no allergic or hypersensitivity reactions to the leech saliva.[42] The procedure proved to be highly time-saving, required no complex surgical infrastructure beyond standard sterile precautions, and placed no undue financial burden on the patient.

Day 4

Day 7

Figure 5: Healing Wound.

Figure 6: Healed Wound (Day 14).

Post-operative view at Day 14 demonstrating excellent anatomical approximation, restoration of the vermilion border, and minimal, highly acceptable cosmetic scarring.

DISCUSSION

The remarkably successful management of this complex, multi-layered maxillofacial *Sadhyo Vrana* emphatically underscores the immense clinical potential of integrating the precision of modern anatomical reconstructive surgery with the profound physiological modulation offered by ancient Ayurvedic parasurgical techniques. Traumatic lip lacerations inherently present a formidable dual challenge to the clinician: first, the absolute necessity for precise, tension-free mechanical closure of functionally distinct anatomical layers (mucosa, muscle, and skin) to preserve facial aesthetics and oral competence[6]; and second, the critical need to manage the aggressive physiological inflammatory response and microvascular congestion unique to the densely perfused tissues of the face.[10]

While the meticulous 4-layered suturing technique effectively re-established the structural integrity of the *orbicularis oris* sphincter and seamlessly aligned the vermilion border[5], the subsequent vascular congestion posed a severe threat to the ischemic wound edges. The timely application of *Jalaukavacharana* elegantly bridged this critical physiological gap, saving the flap from potential necrosis and expediting the regenerative phase.

Pharmacodynamics and Biochemical Mechanisms of Leech Saliva

The extraordinary clinical efficacy of *Jalaukavacharana* cannot be attributed to simple

mechanical bloodletting; rather, it is fundamentally rooted in the sophisticated biochemical matrix of leech saliva. Transcriptomic and proteomic analyses have revealed that the saliva of *Hirudo medicinalis* contains a highly specialized, synergistic cocktail of over 100 distinct bioactive proteins and peptides.[20] The rapid resolution of the patient's severe post-operative symptoms can be directly correlated to the pharmacological actions of these specific compounds.

Table 2: Comprehensive Pharmacodynamics of Key Bioactive Peptides in Leech Saliva.

Bioactive Peptide	Molecular Weight	Primary Biochemical Target / Pathway	Dominant Pharmacological Property & Clinical Effect
Hirudin	7 kDa	Thrombin active/exosite binding	**Potent Anticoagulant:** Irreversibly blocks fibrin clot formation; restores microcirculation and prevents ischemic necrosis.[23]
Calin	65 kDa	von Willebrand factor, Collagen	**Antiplatelet:** Inhibits platelet adhesion and aggregation; facilitates the therapeutic prolonged passive oozing necessary for venous decompression.[24]
Eglin C	8.1 kDa	Neutrophil elastase, Cathepsin G	**Anti-inflammatory:** Neutralizes destructive immune proteases; mitigates oxidative tissue damage and halts progressive edema.[23]
Bdellins	~6-10 kDa	Plasmin, Trypsin, Acrosin	**Anti-inflammatory & Cytoprotective:** Modulates the inflammatory cascade and protects regenerating tissues from autolysis.[23]
Hyaluronidase	27.5 kDa	Extracellular Matrix (Hyaluronic acid)	**Tissue Permeability Enhancer:** Acts as a "spreading factor"; rapidly resolves interstitial edema and facilitates the deep diffusion of other active drugs.[23]
Destabilase	12.6 kDa	Stabilized Fibrin, Bacterial Peptidoglycans	**Fibrinolytic & Antimicrobial:** Dissolves existing micro-clots and provides localized bacteriostatic defense against opportunistic pathogens.[24]

Ayurvedic Pathophysiology of *Sadhyo Vrana* and the Rationale for *Raktamokshana*

To fully appreciate the efficacy of this intervention, one must examine the injury through the lens of classical Ayurvedic pathology. The sudden, high-velocity physical trauma (*Abhighata*) caused an immediate and profound derangement of the local *Vata dosha*. In Ayurvedic etiology, *Vata* is the sole driver of pain, which explains the sharp, shooting, and throbbing pain (*Ruja*) the patient experienced upon impact.[14] Following the initial shock, the severe tissue disruption and localized pooling of blood triggered a massive, secondary accumulation of *Pitta dosha* and vitiated *Rakta* (blood tissue). This specific *Dosha-Dushya* (humoral-tissue) interaction is responsible for the cardinal signs of an acute, vitiated wound (*Dushta Vrana*): intense erythema, localized burning sensation (*Daha*), and tight, hot swelling (*Shotha*).[14]

According to the comprehensive surgical treatises of the *Sushruta Samhita*, the management protocol (*Shashti Upakrama*) for such acute, *Pitta-Rakta* dominant swellings mandates the immediate evacuation of these toxic local accumulations.[47] While various methods of *Raktamokshana* (bloodletting) exist, *Jalaukavacharana* is specifically prescribed as the therapy of absolute choice for *Pitta* vitiation.[17] This is because the leeches themselves possess inherent *Sheeta* (cooling) and *Madhura* (sweet) pharmacological properties, which directly and potently antagonize the *Ushna* (hot) and *Teekshna* (sharp, penetrating) qualities of the aggravated *Pitta* and *Rakta*.[17]

Furthermore, leeches exhibit a remarkable biological selectivity; they naturally seek out and extract venous, deoxygenated, and biochemically "vitiated" blood pooled in the congested capillary beds.[49] By actively removing this stagnant, inflammatory fluid, the therapy effectively eliminates the physiological blockage (*Avarana*). Once the stagnant blood is cleared, the normal, unhindered flow of *Vata* can resume, which immediately and profoundly resolves the acute pain.[14] This ancient pathophysiological framework flawlessly mirrors the modern understanding of relieving compartmental pressure and halting the inflammatory cytokine cascade.

The Synergistic Role of *Yashtimadhu Taila Gandusha*

While the external cutaneous layers of the lip were managed via the systemic and local effects of leech therapy, the extensive internal laceration involving the wet mucosa and frenulum presented a distinct challenge. The oral cavity is a highly moist environment teeming with a diverse microbiome, placing intraoral wounds at an exceptionally high risk for

secondary bacterial colonization, plaque accumulation, and delayed healing.[5] Rather than relying solely on aggressive systemic antibiotics or caustic chemical mouthwashes—which can disrupt the delicate oral flora and delay epithelialization—the integration of *Yashtimadhu Taila Gandusha* provided a multifaceted, biologically harmonious therapeutic shield.[37]

Yashtimadhu (*Glycyrrhiza glabra*, Licorice) is globally revered in the Ayurvedic pharmacopeia as a supreme *Rasayana* (rejuvenating) and *Vrana Ropana* (wound-healing) botanical.[50] Its primary active biochemical constituent, glycyrrhizin, has been extensively documented in modern pharmacological studies to exert pronounced anti-inflammatory, antioxidant, and mucosa-soothing effects.[51] Furthermore, *Yashtimadhu* possesses *Madhura* (sweet) taste and *Sheeta* (cooling) potency, making it an excellent *Vata-Pitta Shamaka* (pacifier of *Vata* and *Pitta*), directly addressing the burning sensation and pain within the mouth.[41]

When utilized in the form of *Gandusha* (the practice of holding medicated liquid in the mouth to capacity), the sesame oil base of the *Taila* plays a crucial mechanical role. The fluid dynamics of the oil generate gentle hydrostatic pressure that penetrates deep into the mucosal crevices and suture lines.[38] This action effectively dislodges necrotic tissue slough, trapped food debris, and metabolic toxins without subjecting the fragile, newly sutured wound edges to the abrasive, shearing forces of a toothbrush.[38] Moreover, the highly unctuous (*Snigdha*) nature of the lipid formulation bathes the raw, exposed mucosal tissues, forming a durable, hydrophobic barrier. This barrier protects the healing wound from the acidic variations of oral secretions and enzymatic digestion, thereby preventing the formation of painful, aphthous-like secondary ulcers or rigid fibrotic contractures, and ultimately accelerating the flawless epithelialization of the wet lip.[41]

Integrative Clinical Relevance and Future Outlook

This specific case serves as a powerful testament to the necessity of shifting toward integrative protocols in modern trauma and reconstructive care.[54] While the surgical repair of the lip undeniably requires a high degree of technical mastery to achieve the correct approximation of the *orbicularis oris* and avoid aesthetically disastrous step-off deformities at the vermilion border[6], mechanical suturing alone cannot resolve post-operative physiological crises. Tissue survival is frequently put at risk by venous congestion—a hemodynamic complication that scalpels and sutures simply cannot fix.[11]

The current landscape of microsurgical literature heavily corroborates the use of *Hirudo medicinalis* as an invaluable tool for flap salvage.[57] Systematic reviews demonstrate remarkable success rates, often exceeding 70-80%, in congested, partially avulsed tissues of the ear, nose, lip, and scalp, specifically in scenarios where arterial inflow is preserved but venous return is critically compromised.[11]

By strategically applying *Jalaukavacharana* both prophylactically and symptomatically, the reconstructive surgeon can effectively circumvent the need to perform extraordinarily complex and high-risk secondary microvascular venous anastomoses. Furthermore, it eliminates the necessity of administering heavy doses of systemic anticoagulants like intravenous heparin, which carry profound risks for uncontrollable systemic bleeding and other iatrogenic complications.[13] *Jalaukavacharana* is exceptionally cost-effective, demands minimal specialized technological infrastructure beyond standard sterile clinical precautions, and consistently yields extraordinarily high patient satisfaction metrics due to its painless application, rapid symptomatic relief, and superior cosmetic healing outcomes.[24]

CONCLUSION

The holistic management of complex, multi-layered maxillofacial trauma fundamentally necessitates clinical interventions that extend far beyond basic anatomical approximation. This exhaustive case study robustly and conclusively validates the integrative application of *Jalaukavacharana* (Medicinal Leech Therapy) as an indispensable adjunct to a meticulous, 4-layered primary surgical closure for severe dry and wet lip lacerations. The profound array of bioactive salivary peptides secreted by the medicinal leech—most notably hirudin, eglins, calin, and hyaluronidase—proved exceptionally effective at rapidly reversing acute post-operative venous congestion, neutralizing the destructive inflammatory cascade, and evacuating localized interstitial edema. When synergistically supplemented by the mucosal-regenerative, antimicrobial, and soothing properties of *Yashtimadhu Taila Gandusha*, this highly calibrated therapeutic regimen culminated in complete, complication-free tissue epithelialization within a remarkably short 14-day window. Ultimately, *Jalaukavacharana* stands as a remarkably safe, scientifically validated, and highly efficient parasurgical adjunct in the arsenal of modern reconstructive surgery. It elegantly bridges the historical chasm between classical Ayurvedic surgical wisdom and contemporary microvascular wound care, offering an optimized pathway for the restoration of both form and function in the treatment of severe facial trauma.

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Conflict of Interest

The authors hereby declare that there are no conflicts of interest regarding the research, authorship, or publication of this case report. No financial grants or funding were received from any commercial entity or organization that would in any way influence the clinical outcomes, data interpretation, or the scientific integrity of the research presented herein.

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