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Leech Therapy-aided recovery: A case study on accelerated healing of Decubitus ulcers in paraplegic patients

Case Report

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Abstract

Pressure ulcers, also known as bedsores, are localized skin injuries that can extend to underlying structures like subcutaneous tissue or muscle due to prolonged pressure on a specific area of the body. This pressure impedes blood supply, depriving the affected tissue of nutrients and oxygen, leading to tissue breakdown and ulcer formation over time. Immobilized patients, confined to bed due to various conditions, are highly susceptible to developing pressure ulcers, with approximately 85% attributed to prolonged sitting or lying down. Pressure ulcers near the rectum pose particular challenges as the tissue in this area is prone to acute ischemic injury from external factors like shear forces and compression. Treating pressure ulcers requires a multidimensional approach, focusing on relieving pressure with specialized support surfaces such as pressure-relieving mattresses or cushions, along with regular changes in patient posture to alleviate continuous pressure. Maintaining proper hygiene and wound care is essential to prevent infection, with advanced techniques like dressings, topical medications, and occasional surgical interventions for severe cases. Adequate nutrition and hydration play a vital role in supporting the healing process. Collaborative efforts from healthcare professionals specializing in wound management, nutrition, and physical therapy are often necessary to address the complex nature of pressure ulcers. Prevention through regular assessment, implementing preventive measures such as proper positioning, optimizing nutrition, and providing education to patients and caregivers on skin care and pressure relief techniques are crucial in mitigating pressure ulcer development.

Keywords: Pressure ulcer, Decubitus Ulcer, *Jalaukavcharan, Leech therapy, Chronic wound, Holistic Ayurveda, Dushtavrana.*

Introduction

Bed sores, Decubitus ulcers, ischemia ulcers, and pressure sores are common names for skin ulcerations brought on by pressure and shear. The best phrase used to describe the main etiologic component that leads to the sloughing of necrotic tissue and results in ulceration is pressure ulcers. The incidence and prevalence of pressure ulcers have been reported to vary depending on the institution, the patient's underlying health, and their age. The study identified the sacrum, heel, and ischium as the most common locations for patients in acute care hospitals, with a frequency of 9.2%[1]. Another study conducted in a single acute care hospital reported a prevalence of 4.7%[2]. In a separate research focused on nursing facilities, the prevalence at admission was found to be 17.4%[3,4]. The sacrum, trochanters, ischium, and the area around the heels and ankles are the most often occurring regions of the development of decubitus ulcers.[5] Persistent wounds, which fail to heal despite three months of appropriate care or remain incompletely healed after 12 months, are termed non-healing ulcers.[6]

In this context, *Sushruta* also described non-healing wounds in a similar manner, as well as their prognosis.[7] The classics describe the following symptoms of *Dushta Vrana* (chronic wounds): *Ativivrita* (wide-based), *Bhairava* (ugly looking), *Putipuyamansa* (purulent pus discharge), *Gandha* (bad smell), *Vedana* (pain), and *Dirghakalanubandhi* (chronic in nature). Bed sores and *Dushta Vrana* can therefore are linked.[8]

Jalaukavacharana is a *Raktamokshana* (blood-letting) technique. *Raktamokshana* employs two techniques: *Shastrakrita* and *Ashastrakrita*. *Shastrakrita* also includes two methods: *Siravedha* and *Pracchana*. *Shringa*, *Jalauka*, *Alabu*, and *Ghati* are all present in *Ashastrakrita*. *Jalaukavacharan* is often used in the early stages of wound healing. *Rakta Mokshana* relieves pain and inhibits the inflammatory process. *Rakata Mokshana* treats wounds that include inflammation, hardness, slough, a reddish-black hue, discomfort, and an uneven surface.

Hirudo medicinalis was employed in early modern and medieval medicine to draw patients' blood to balance the "biological humors." The terms *Vata*, *Pitta,* and *Kapha* are used to describe these three humors in Ayurvedic medicine. The concept of "biological humours" is seen as being fundamental to the Ayurvedic and Arabian medical systems. The

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"biological humors" must be in balance for the human body to operate properly.[9] In Unani medicine leeches were first used medicinally in the 12th century by *Abd-el-latifal-Baghdadi*, who asserted that they may aid in promoting tissue cleansing following procedures.[10]

Utilizing medicinal leeches seems to be a potential method for reducing blood coagulation, alleviating venous pressure caused by pooled blood, particularly following cosmetic surgery, and enhancing blood circulation.[11]

Case Study

Present complaints

A 24-year-old male patient came to OPD with complaints of immobilization below the waist for 6 months, wound on the back and buttock region for 4-5 months, and anal incontinence for 6 months.

History of present illness

The patient was well before 6 months. Then while on call he fell from the first floor of his house, hitting his spine, back region, and upper and lower limbs. Immediately he developed severe pain, reddish discoloration, and tenderness of the affected area. He was admitted to the hospital for the above complaints and underwent surgery. He was then discharged with no motor or sensory sensation in his lower limbs. After 2-3 months the patient developed wounds on his buttock region due to immobilization and infection by feces. The patient then took antibiotics for the same but didn't get relieved. So he came to the hospital for further management.

Past History

The patient had no history of hypertension, type 2 diabetes, chronic kidney disease, thyroid disorder, tuberculosis, or blood transfusion.

The patient's personal history reveals a traumatic incident where they fell, hitting the spine, resulting in paraplegia.

His appetite was good, bowel movements are normal with anal incontinence, sleep is normal, and micturition occurs 3-4 times a day with urine incontinence.

The patient did not have any addiction to alcohol, tobacco, or smoking.

Local examination

Blood pressure was 130/80 mm Hg in the supine position, pulse rate was 80/min regular, and temperature was 98.7°F.

Systemically, the patient was conscious, well-oriented, and obeys commands. The respiratory system was normal with no added sounds in the cardiovascular system. The abdomen was soft and non-tender without any organomegaly.

On local examination, there was a wound at the left gluteal region, measuring approximately 12x10x5cm, which appears soft and non-tender with hardening at the center.

Surgical Investigation

Hematological Test- Hb- 11.3gm%, TLC- 6400/ cu mm, LFT-WNL, KFT- WNL, Urine-R, M-Albumin Absent, Pus cells-Absent, RBCs- 2-3/hpf, Casts & crystals- Absent, Epithelial cells- Occasional, Bacteria-Absent.

Diagnosis- Ayurvedic Diagnosis- *Dushta Vrana*
Modern Diagnosis- Decubitus Ulcer. (by local examination of the wound with its location of continuous pressure)

Line of the Treatment – It includes *Vrana Shodhan* by Wound Debridement and *Vrana Ropana* by use modalities like leech therapy.

Treatment Plan

Wound debridement followed for 15 days every alternate day for leech therapy was prescribed. Physiotherapy incorporated passive stretches, lengthened positioning, and hypertonic techniques like compression, heat, and deep pressure. Additional recommendations included a water bed, mobilization, and maintaining dry, clean conditions in the area.

Leech Therapy- Under all aseptic conditions, 3-4 medium-sized leeches were put in *Haridara* (Turmeric) powder and water, followed by cleaning them in clear water. Leeches were then put on the wound site, they bitten the wound site within 1-2 minutes without any prick. Patients undergoing leech therapy were closely monitored for any adverse reactions or complications. Leech was detached from the wound site after sucking blood from the wound site. After the leeches were removed, the leech bite site was dressed with *Haridra* powder, and the decubitus wound was carefully cleansed and dressed under all aseptic conditions.

Picture 1:
On day 0

Picture 2: During leech therapy on the
On day 0 **On day 14** **On day 21**

Picture 3:
On day 30

Assessment Criteria

Bates-Jensen Wound Assessment Tool

Item	Assessment	Score
1.Size	Length x width <4 sq cm	**1**
	Length x width 4--<16 sq cm	**2**
	Length x width 16.1--<36 sq cm	**3**
	Length x width 36.1--<80 sq cm	**4**
	Length x width >80 sq cm	**5**
2.Depth	Non-blanchable erythema on intact skin	**1**
	Partial thickness skin loss involving epidermis &/or dermis	**2**
	Full-thickness skin loss involving damage or necrosis of subcutaneous tissue; may extend down to but not through underlying fascia; &/or mixed partial & full thickness &/or tissue layers obscured by granulation tissue.	**3**
	Obscured by necrosis	**4**
	Full-thickness skin loss with extensive destruction, tissue necrosis or damage to muscle, bone or supporting structures	**5**
3.Edges	Indistinct, diffuse, none visible	**1**
	Distinct, outline visible, attached, even with wound base	**2**
	Well-defined, not attached to the wound base	**3**
	Well-defined, not attached to the base, rolled under, thickened	**4**
	Well-defined, fibrotic, scarred or hyperkeratotic	**5**
4. Undermining	None present	**1**
	Undermining < 2 cm in any area	**2**
	Undermining 2-4 cm involving < 50% wound margins	**3**
	Undermining 2-4 cm involving > 50% wound margins	**4**
	Undermining > 4 cm or Tunneling in any area	**5**
5. Necrotic Tissue Type	None visible	**1**
	White/grey non-viable tissue &/or non-adherent yellow slough	**2**
	Loosely adherent yellow slough	**3**
	Adherent, soft, black eschar	**4**
	Firmly adherent, hard, black eschar	**5**
6. Necrotic Tissue Amount	None visible	**1**
	< 25% of the wound bed covered	**2**
	25% to 50% of wound covered	**3**
	> 50% and < 75% of wound covered	**4**
	75% to 100% of wound covered	**5**
7. Exudate Type	None	**1**
	Bloody	**2**
	Serosanguineous: thin, watery, pale red/pink	**3**
	Serous: thin, watery, clear	**4**
	Purulent: thin or thick, opaque, tan/yellow, with or without odor	**5**
8. Exudate Amount	None, dry wound	**1**
	Scant, wound moist but no observable exudate	**2**
	Small	**3**
	Moderate	**4**
	Large	**5**
9.Skin Color Surrounding Wound	Pink or normal for ethnic group	**1**
	Bright red &/or blanches to touch	**2**
	White or grey pallor or hypopigmented	**3**
	Dark red or purple &/or non-blanchable	**4**
	Black or hyperpigmented	**5**
10. Peripheral Tissue Edema	No swelling or edema	**1**
	Non-pitting edema extends <4 cm around the wound	**2**
	Non-pitting edema extends >4 cm around the wound	**3**
	Pitting edema extends < 4 cm around the wound	**4**
	Crepitus and/or pitting edema extends >4 cm around the wound	**5**

11. Peripheral Tissue Induration	None present	**1**
	Induration, < 2 cm around the wound	**2**
	Induration 2-4 cm extending < 50% around the wound	**3**
	Induration 2-4 cm extending > 50% around the wound	**4**
	Induration > 4 cm in any area around the wound	**5**
12. Granulation Tissue	Skin intact or partial thickness the wound	**1**
	Bright, beefy red; 75% to 100% of wound filled &/or tissue overgrowth	**2**
	Bright, beefy red; < 75% &> 25% of wound filled	**3**
	Pink, &/or dull, dusky red &/or fills < 25% of the wound	**4**
	No granulation tissue present	**5**
13. Epithelialization	100% wound covered, surface intact	**1**
	75% to <100% wound covered &/or epithelial tissue extends >0.5cm into the wound bed	**2**
	50% to <75% wound covered &/or epithelial tissue extends to <0.5cm into wound bed	**3**
	25% to < 50% wound covered	**4**
	< 25% wound covered	**5**

Observation and Result

Location: Sacrum & coccyx
Shape: Oval

Item	Day-0 Score	Day-7 Score	Day-14 Score	Day-21 Score
1.Size	5	4	2	1
2.Depth	5	3	2	2
3.Edges	2	2	2	1
4. Under-mining	1	1	1	1
5. Necrotic Tissue Type	2	2	1	1
6. Necrotic Tissue Amount	4	2	1	1
7. Exudate Type	4	3	1	1
8. Exudate Amount	2	2	1	1
9. Skin Color Surrounding Wound	1	1	1	1
10. Peripheral Tissue Edema	1	1	1	1
11. Peripheral Tissue Indurations	1	1	1	1
12. Granulation Tissue	3	2	2	1
13. Epithelialization	5	3	2	2
Total Score	**36**	**27**	**18**	**15**

Results

Leech therapy demonstrates rapid ulcer healing, evident from day one of treatment. Enhanced wound health is observable, with evident improvement in wound edges. Additionally, it stimulates the formation of healthy granulation tissue, revitalizing previously necrotized areas with new cells.

As therapy progresses, the incision depth steadily diminishes, along with the amount of slough, necrotic tissue hindering healing. This reduction fosters a more conducive environment for wound recovery. Additionally, the wound assumes a healthier, beef-like red hue, indicating heightened blood flow crucial for oxygen and nutrient delivery essential for tissue repair. Moreover, leech therapy notably reduces malodors associated with infected or stagnant wounds, indicating improved cleanliness and microbial elimination.

Discussion

Leech therapy, or hirudotherapy, is an ancient method in Shalya Tantra for blood removal. It effectively addresses various health issues such as skin problems, heart conditions, respiratory disorders, digestive troubles, urinary and reproductive problems, nervous system disorders, muscle and joint ailments, and hormonal imbalances. Additionally, it aids in healing pressure ulcers by enhancing blood circulation, reducing inflammation, and promoting tissue regeneration. However, for optimal results, it's crucial to combine leech therapy with conventional wound care practices.

The way leech therapy works is, by the leech's glands releasing substances onto living organisms. The saliva of a leech contains more than 100 bioactive compounds, with hirudin being the most well-known. Hirudin is recognized for its ability to prevent blood

clotting. In addition, the salivary secretions of these parasites have properties that help relax muscles, inhibit growth, and provide pain relief. These properties address circulation issues restore damaged permeability in tissues and organs alleviate low oxygen levels lower blood pressure boost immune resilience and improve the overall energy state of the body. This multifaceted process contributes to the benefits of leech therapy, for medical conditions.

The following table lists the components of leech saliva.[12]

S. No	Constituent	Function
1	Hirudin	By attaching to thrombin, it prevents blood clotting.
2	Calin	It hinders blood clotting by obstructing Von Willebrand's factor from binding to collagen. It also obstructs platelet aggregation induced by collagen.
3	Destabilase	It inhibits blood clot formation by binding to thrombin.
4	Hirustatin	Kallikrein, chymotrypsin,trypsin, and neutrophiliccathepsin G are all subject to inhibition.
5	Bdellins	It possesses anti-inflammatory characteristics and hinders plasmin, trypsin, and acrosin.
6	Hyaluronidase	Enhances the thickness of the gut content and augments antibiotic effectiveness.
7	Tryptase inhibitor	Proteolytic enzymes in the host's mast cells face inhibition.
8	Eglins	Displays anti-inflammatory properties by restraining the functions of chymase, chymotrypsin, subtilisin, cathepsin G, and elastase.
9	Factor Xa inhibitor	It impedes the activity of coagulation factor Xa by forming equimolar complexes.
10	Carboxypeptidaseא	It enhances blood circulation at the site where the inhibitor is applied.
11	Acetylcholine	Acts as Vaso-dilator

Leeches extract blood either by piercing the skin with their proboscis or by biting. This process is akin to a mosquito bite and is typically painless due to the release of a histamine-like chemical. Leech saliva also contains an anesthetic, which numbs the area, further reducing sensation during the bite. Additionally, the saliva contains a substance that prevents blood from clotting, facilitating continuous blood flow for the leech. However, certain factors such as age-related issues, cold skin, or smoking may affect the effectiveness of the leech's anesthetic properties. In such cases, cleaning and warming the skin can help alleviate discomfort and improve the efficacy of the leech bite.[13]

Blocking the action of thrombin effectively halts its activity in the blood, preventing fibrinogen from converting into fibrin. The substances released by leech glands also inhibit platelet adhesion, thus preventing their clumping on collagen surfaces. Consequently, the substances present in leech saliva directly affect the components of blood clotting in the plasma.

Leech therapy, also known as hirudotherapy, is a surgical tool used by surgeons to assist with limb-related issues. In cases where there is blood accumulation in wounds, it can cause problems by increasing pressure and restricting the flow of oxygenated blood and essential nutrients to the injury site. By employing hirudotherapy, the pooling pressure can be effectively managed, potentially protecting the limbs or flaps. Leeches are well-suited for this purpose as their saliva contains components such as vasodilators, anticoagulants, and anaesthetics.

Contrary to popular belief, leeches typically absorb only 5 ml of blood. However, their impact becomes more noticeable upon application to the affected area. Treatment usually lasts between 3 and 7 days, aiding in the healing of damaged veins while reducing blood pooling in the limbs. This restoration of color and pressure levels promotes improved blood flow to injured tissue cells, ultimately facilitating wound healing.

Leech therapy is a readily accessible treatment option for decubitus ulcers in Ayurveda hospitals. The saliva produced by leeches contains anti-inflammatory, bacteriostatic, and analgesic properties, which assist in addressing micro-circulation problems and promoting the formation of new blood vessels, known as neovascularization. This method is cost-effective and facilitates rapid wound healing. Mode of action of Leech therapy[14]

The leech therapy showed immediate improvements, with healthier wound edges and the formation of new granulation tissue. As the therapy progressed, the wound's depth reduced, the slough decreased, and the wound exhibited a healthier appearance with improved blood flow. Additionally, the treatment effectively eliminated foul odors, signifying improved wound cleanliness.

Conclusion

Leech therapy proved to be an effective approach for managing the patient's decubitus ulcer. The therapy promoted wound healing, revitalised necrotised tissues, and created a more favourable environment for recovery. The patient's progress was closely monitored, and the outcomes demonstrated promising results in treating the decubitus ulcer. Exploring leech therapy's potential includes independent use for chronic wounds like decubitus ulcers and extending to other persistent ulcers. Investigating its effectiveness in improving wound healing parameters is paramount. This entails assessing its impact on factors such as wound size reduction, granulation tissue formation, and wound bed preparation. Understanding its mechanisms in promoting tissue regeneration and addressing underlying causes of non-healing wounds could broaden its therapeutic application and enhance treatment outcomes for a range of chronic conditions.

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