

# An Innovative Approach for the Management of DVT Ulcer- A single case study

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## KEYWORDS -

Venous Ulcer,  
Chronic Ulcer,  
DVT Ulcer,  
Chronic venous  
insufficiency (CVI),  
Venous Leg Ulcers  
(VLUs),  
Leech Therapy,  
Jalaukavacharana,  
Ayurveda,  
Wound Healing,  
4- Layer Bandage,  
Vrana

## ABSTRACT

Venous Ulcer Occurs due to increased venous hydrostatic pressure. It generally manifests on the medial side of lower one third of the leg in case of long saphenous varicosity and on the lateral aspect of lower leg in case of short saphenous varicosity. Venous ulcer is known as Gravitational ulcer and it is challenging problem in medical field. Leech therapy is an ancient way of treatment of various chronic wounds and skin disorder, which has been used in this study. The four-layer bandage system is mainly used in the management of venous ulcer which achieves healing in patients of both Deep, Superficial Venous Ulcers (DVT and Varicose Ulcers), is also used in this case. Our aim is to develop an effective new approach for the management of venous ulcer.

In this case study a patient of DVT Ulcer was treated with Leech Therapy and 4- Layer Bandage which shows significant improvement within 6 weeks of treatment. Leech therapy and 4-layer bandaging helps to improve blood circulation at the site of ulcer and reduces the venous stasis respectively which promotes the wound healing process in venous ulcer. This study was an observational single case study.

After Leech therapy with 4- LB, proper cleaning & dressing the ulcer healed completely within 6 weeks of treatment.

Discussion: Leech therapy corrects venous hypertension, reduces venous congestion. All the biochemical effect of medicinal Leech saliva prevents leakage of proteins and isolation of extra cellular matrix molecules and other healing factor and allows for healing of the wound. Along with Leech therapy, daily cleaning and dressing with compression bandage promotes wound healing by formation of new healthy tissue.

## Introduction: -

Venous ulcers are defined as an ulcer between the knee and ankle joint that occur in the presence of venous disease (Varicose vein and DVT). Venous insufficiency ulcers are the primary cause of leg ulcers, making up approximately 60-80% of cases. Several studies on venous ulcers have shown that chronic inflammation is the main cause. The Pathophysiology behind the inflammation on microcirculation level that it occurs due to increased venous hydrostatic pressure (venous insufficiency).The presentation of Venous ulcer is normally located on the medial side of lower one-third of the leg in gaiter area in case of long saphenous varicosity and on the lateral aspect of the leg in short saphenous varicosity<sup>1</sup>. Initially, these ulcers are typically small and oval, but as they progress, they become irregular, shallow, and superficial. Characteristics include- Red granulation tissue, Fibrin slough (yellow-white exudates) at the

ulcer base, usually painless, surrounding skin on the lower leg often exhibits pigmentation. These ulcers never penetrate deep fascia. The four-layer bandaging system is a high-compression therapy applying 35-40 mmHg of sub-bandage pressure at the ankle, utilizing elastic layers to maintain consistent compression over an extended period. For Venous Ulcers, compression therapy (Four-layer bandaging) considered as gold standard for wound healing<sup>2,3</sup>.

In ayurveda classics Acharya Sushruta, while describing management of Vrana (wound/ Ulcer) in the context of Shashthi Upakrama (60 methods of wound management) has very elaborately explained Rakta-Visravana (bloodletting or Leech Therapy) for the Management of vrana<sup>4</sup>(wounds). Leech therapy (raktamokshana or Jalaukavacharana) is a minimal-invasive method of blood purification, where leeches are used to suck the impure blood from the infected part of body. Leech therapy indicated in Raktaja Roga (diseases caused by impure blood), Pitta dushita Rakta disease, various skin disorder and all type of inflammatory condition. It is considered most unique and effective way of Raktamokshana (bloodletting).

### **Review of literature-**

Chronic Venous Insufficiency (CVI) is a primary risk factor for the development of Venous Leg Ulcers (VLUs).<sup>5</sup> Chronic Venous Insufficiency (CVI) arises from blood reflux, obstruction, or a combination of both, leading to impaired macro- and micro-circulatory function.<sup>6</sup> Increased pressure within the blood vessels causes proteins to leak out and form fibrin cuffs around capillaries, restricting the diffusion of essential oxygen and growth factors. This process activates an inflammatory response.<sup>7,8</sup> A healthy vascular network is vital for tissue integrity and overall circulatory function. Pathological changes or trauma affecting blood vessels can compromise skin perfusion, leading to breakdown or delayed healing of existing wounds. Veins carry deoxygenated blood towards the heart and are often closer to the skin than arteries. The venous valvular system facilitates unidirectional hemodynamics, thereby precluding retrograde flow and venous congestion in the lower limbs. Valvular incompetence due to disease or damage enables retrograde blood flow, elevating pressure within the deep venous system. This increased pressure induces venous dilation, exacerbating valvular dysfunction and perpetuating a cycle of venous hypertension. The great saphenous vein, the predominant superficial vein of the lower extremity, originates from the dorsal vein of the first toe and terminates at the sapheno-femoral junction, converging with the femoral vein in the proximal thigh. Deep veins, situated within the muscular compartments of the leg, are accompanied by corresponding arteries with analogous nomenclature, forming veno-arterial pairs. Examples are the perineal and femoral veins. Deep vein thrombosis (DVT), typically originating within the deep venous system, precipitates venous hypertension due to clot formation and resultant obstruction. Perforating veins, equipped with unidirectional valves, integrate the deep and superficial venous systems. Incompetence of superficial veins and/or perforators, resulting from trauma, congenital anomalies, or phlebitis, contributes to 40-50% of venous leg ulcers.<sup>9,10</sup> Venous integrity can be compromised by surgical intervention, traumatic injury, or deep vein thrombosis (DVT), resulting in retrograde blood flow and venous reflux at the site of damage. Other causative factors which includes -obesity, congenital vein abnormalities, multiple pregnancies and varicose veins. Severe complications such as -cellulites, osteomyelitis, and malignant change. The refractory nature of these ulcers increases the risk of morbidity and mortality and can have significant changes on patient quality of life and on costs.<sup>11,12</sup>

Treatment available for venous ulcers include conservative management (Compression therapy, elastic Compression Therapy, intermittent pneumatic compression, leg elevation, dressing,), mechanical treatment, medications (Pentoxifylline, Aspirin, oral Zinc, hyperbaric oxygen

therapy) and surgical treatment (Debridement, skin grafting and flap coverage, phlebectomy, stripping, sclerotherapy, or laser therapy).

**Biochemistry of medicinal Leech saliva and their mode of action<sup>13</sup>.**

Component of Leech saliva	Mode of action on Human
Hirudin	Inhibits blood coagulation by binding to thrombin
Calin	Inhibits blood coagulation by blocking the binding of Von will- brand factor to collagen inhibits collagen, inhibits collagen mediated platelets aggregation
Dactabilase	Monomerizing activity, dissolve fibrin, thrombolytic effects
Hirustatin	Inhibits Kallikrein, trypsin, chymotrypsin.2
Hyaluronidase	Increase interstitial viscosities, antibiotic effect
Typtase inhibitor	Inhibits proteolytic enzymes of host mast cells
Eglins	Anti-Inflammatory,Inhibits the activity of chymotrypsin, chymase, subtilisin, electase and cathepsin G
Factor xa inhibitors	Inhibits the activity of coagulation factor xa by forming equimolar complex
Histamine like substance	Vasodilators, increases the blood flow at leech bite site
Anesthetic substances	Anesthetic effect

**Methods:**

**Case Report:**

A 60 years old female from presented with complaints of long standing wound in her left ankle just above the medial malleolus from past 1 year. Patient had a history of dilated, tortuous and superficial veins in her left lower limbs with swelling since last 5 years. Patient had symptoms like dragging pain, skin colour changes, resting pain with heaviness in left lower limb. For which patient was on conservative treatment but no relief. She is a known case of hypothyroidism and on treatment since eight years. Patient was examined thoroughly. Appetite, micturition and bowel habit were normal. Her vital signs and systemic examination were within normal limits. The patient examination done in standing position. Dilated veins were present in the left leg and knee. Bilateral pitting edema was present during examination. A thorough palpation examination was conducted along the entire vein length. Cough impulse test and Trendelenburg test I& II was positive. A 3×2×2 cm single and oval ulcer was located in gaiter area on medial aspect of left lower limb (just above medial malleolus) with less pain associated with minimal serous discharge with and Pigmentation around ulcer was present. Local temperature around was normal. The ulcer was superficial with slopping edge. Arterial pulsation (Dorsalis pedis and Posterior tibial artery) was normal. Dilated veins were present in left lower limb. All the routine hematological investigation was normal. Colour Doppler of bilateral lower limb shows Sapheno-femoral junction (SFJ) incompetent with multiple perforators (5 cm above ankle which is of 2.2 mm and 10 cm above ankle with 2.6 mm in diameter) on right side. On left side competent SFJ with dilated GSV (great saphenous vein) at mid-thigh 7.3 mm in diameter. Deep Venous system shows bilateral common, superficial and deep femoral, popliteal, anterior and posterior tibial

veins with normal course, calibre, wall thickness with anechoic and compressible lumen. On colour Doppler study, monophasic waveform is noted with normal respirophasic variations and augmentation of flow on distal compression. Left common femoral vein shows partially filling intraluminal echogenic content and is non compressible with reduced flow, suggestive of partial thrombosis. Left GSV (great saphenous vein) shows intraluminal echogenic content and is partially compressible suggestive of thrombophlebitis (left common femoral vein partial thrombus at sapheno-femoral junction). No evidence of arterial insufficiency was noted.

After the thorough assessment of ulcer debridement of unhealthy granulation tissue was done. Ulcer was cleaned with normal saline. The ideal leech (Nirvisha Jalauka/ Hirudo-medicinalis) was selected and kept in the turmeric water for a few minutes. Later it was transferred to fresh water & observed for active movements. Then leech was applied on ulcer bed for 30 min. when leech left the ulcer site, it was cleaned with normal saline and dressing done. Later 4- layer bandage was applied. Leech therapy and 4-Layer bandage was done weekly once for 6 weeks. Treatment assessment done on 1<sup>st</sup> day, 7<sup>th</sup> day, 14<sup>th</sup> day, 21<sup>th</sup> day, 28<sup>th</sup> day, 35<sup>th</sup> day, 42<sup>th</sup> day. Later patient was followed- up for 6 months. The patient was advised for leg elevation at night while sleeping and encouraged for simple leg exercises with daily walking as a supportive therapy.

NO.	TREATMENT	NO. OF APPLICATION	DAYS
	4- Layer Bandage	6 times	1 week interval
	Leech application	6 times	1 week interval

**Observation of different parameters during treatment according to VCSS (Venous clinical severity score) –**

S.N.	Observations	Before treatment	After 1 week	After 2 week	After 3 week	After 4 week	After 5 week	After 6 week
1	<b>Pain</b>	6	4	3				0
2	<b>Tenderness</b>	3	3	2				0
3	<b>Edema</b>	3	3	3				1
4	<b>Ulcer size</b>	(3x2x2cm)	2	2				0
5	<b>Skin pigmentation</b>	3	3	3				2
6	<b>Colour Doppler</b>	Lt common Femoral vein partial thrombus at sapheno-femoral junction	-	-				No evidence of DVT is noted

**Result:**

**(According to reduction in VCS score after treatment):-**

S. N.	Observation	Before Treatment	After Treatment	Percentage
	<b>Pain</b>	6	<b>0</b>	<b>100 %</b>
	<b>Tenderness</b>	3	<b>0</b>	<b>100%</b>
	<b>Edema</b>	3	<b>1</b>	<b>75 %</b>
	<b>Ulcer size</b>	2 (3x2x2cm)	<b>0</b>	<b>100 %</b>
	<b>Skin pigmentation</b>	3	<b>2</b>	<b>25 %</b>
	<b>Colour Doppler</b>	Lt common femoral vein partial thrombus at sapheno-femoral junction	<b>No evidence of DVT is noted</b>	<b>100 %</b>

After Leech therapy with 4- LB, proper cleaning & dressing the ulcer healed completely within 4 weeks of treatment. There was 25 % reduction in skin pigmentation and 75 % reduction in pedal edema.

**Discussion:**

Leech therapy corrects venous hypertension, reduces venous congestion due to presence of corboxypeptidase A inhibitor, histamine like substances etc. All the biochemical effect of medicinal Leech saliva prevents leakage of proteins and isolation of extra cellular matrix molecules and other healing factor and allows for healing of the wound. Along with Leech therapy, daily cleaning and dressing with compression bandage promotes wound healing by formation of new healthy tissue.

Leech application has peripheral vasodilator effects due to vasodilator constituent which are present in the leech saliva, that improves blood circulation and corrects ischemia around the wound, compression therapy decreases the venous hydrostatic pressure and improves the venous return, thus promotes wound healing. Leech application has Anti- inflammatory action on nerves due to presence of substance like Bdellins & Eglins in the saliva which prevents leukocyte accumulation in the surrounding vessels, thus inhibits release of inflammatory factors which is cause of delayed wound healing. Substances like acetylsalicylic acid derivatives helps behind the probable mechanism of action of leech therapy. Leech application corrects venous hypertension, reduces vascular congestion due to presence of Carboxypeptidase A inhibitor, Histamine-like substances and acetylcholine modulate vascular permeability, minimizing protein leakage and preserving extracellular matrix integrity, thereby facilitating ulcer healing.

Leech application facilitates removal of toxic blood, reducing localized accumulation of harmful metabolites and toxins. Similarly, it facilitates more fresh blood supply & promotes wound healing by formation of new tissues. Due to improved blood circulation by 4- Layer Bandage and

Leech therapy ulcer is healed, skin discoloration is corrected and venous incompetency is also pacified. Thus, it interrupts the pathophysiological cascade of varicosity at the cellular level, concomitantly augmenting wound healing and tissue restoration.

### **Conclusion:**

In this patient the venous ulcer was completely healed after 6 weeks of continuous treatment. No recurrence was noted even after 6 months of follow-up. This suggests that Leech therapy and 4-Layer Bandage in combination has a better effect on venous ulcer. However, there is need of detailed study for the same with larger sample size to formulate a treatment protocol for venous ulcer. There was 25 % reduction in skin pigmentation and 75 % reduction in pedal edema so further study can be done to find out a approach to overcome these complaints.

**Limitations and future research:** Single case reports cannot be conclusive for such conditions. But such case reports are initiative of successful treatment protocol, which can be further evaluated on large sample size using various scientific parameters.

### **Ethical Approval:**

Ethical approval was taken by competent authority.

### **Consent:**

Informed consent has been obtained from patient.

### **Source of Funding:**

No source of funding.

### **Author Contribution:**

Present work was originally done by the authors in their respective department. No part of the data has been taken from any published or unpublished research work.

### **Conflict of interest/ Declaration of Interest Statement:**

We hereby declare that the research work “**An Innovative Approach for the Management of DVT Ulcer- A single case study.**” was originally conducted at our hospital. All information derived from literature has been properly acknowledged in the reference list, and the text has been thoroughly cited to avoid any instances of plagiarism. Furthermore, we affirm that this research work has not been previously published or submitted for publication elsewhere.

### **Research registration unique identifying number (UIN):**

Not applicable.

### **Guarantor:**

Not applicable.

### **Data Availability Statement:**

The original data is available for verification or clarification on demand.

### **Provenance and peer review:**

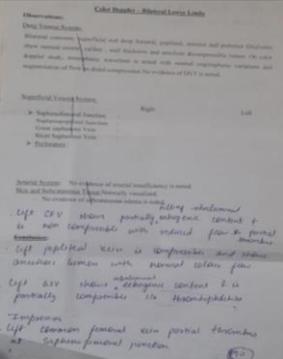
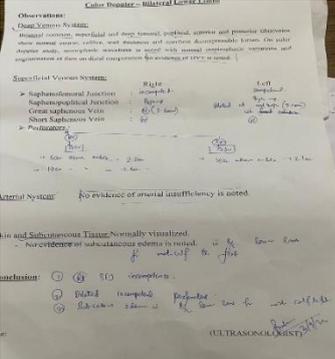
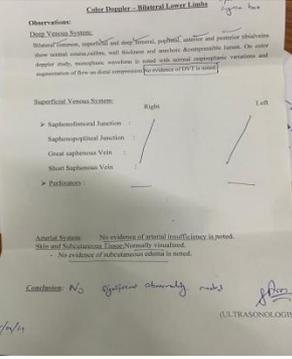
Not applicable.

**Acknowledgement:**

We would like to acknowledge the help and cooperation received from patient during the data collection phase. We would like to extend our sincerest gratitude to the patient for her valuable contribution to this research work, autonomy for her experience and insights has significantly enhanced the quality and validity of our research. Her participation has not only advanced our understanding of An Innovative Approach for the Management of DVT Ulcer but also has the potential to improve the lives of others. We are deeply grateful for her trust, time, and generosity. I also express sense of gratitude to all staff members who helped in the study for their generous support. Their contributions have been invaluable and their support has enabled us to achieve our research goals and has made a significant impact on the success of our project. Thank you for your hard work, expertise, and kindness.

**Legends to Figures:**

**Figure 1**

(a)Before Treatment	(b)During Treatment with Leech application (1 <sup>st</sup> Week)	(c)After Treatment(6 <sup>th</sup> Week)
		
		

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