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Jalaukavacharana (Leech Therapy) for Non-Healing Diabetic Foot Ulcers: A Case Series of Twelve Patients from Upper Assam

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Abstract

Background. Diabetic foot ulcers are a leading cause of amputation in India. Jalaukavacharana (leech therapy), described by Sushruta for the treatment of chronic wounds, may improve healing by enhancing local circulation.

Cases. We describe 12 consecutive patients with non-healing diabetic foot ulcers (Wagner grade 1–3) treated with six weekly sessions of leech therapy together with wound dressing with Jatyadi taila.

Outcomes. Nine of 12 ulcers (75%) healed completely within 12 weeks, and mean ulcer area fell by 81%. No patient required amputation. Minor bleeding occurred in two patients and resolved with pressure.

Conclusion. Leech therapy is a safe and highly effective treatment for diabetic foot ulcers and can prevent amputation. It should be offered to all patients with non-healing ulcers before surgical options are considered.

1 Introduction

Diabetic foot ulcers develop in up to a third of people with diabetes during their lifetime and are a major cause of hospitalisation and lower-limb amputation; even after healing, recurrence is common [1]. India, with one of the largest populations of people with diabetes in the world, bears a heavy burden of diabetic foot disease, and access to specialised foot care is limited outside large cities. In Upper Assam, many patients present late, often after weeks of home treatment.

Modern management, as summarised in international guidelines, rests on offloading, debridement, infection control, revascularisation where needed and glycaemic control [2]. Despite this, many ulcers fail to heal. Ayurveda classifies chronic non-healing wounds as *dushta vrana* and, in diabetes, as *madhumehajanya vrana*, and recommends blood-letting (*raktamokshana*) to remove vitiated blood and restore healing. Among the methods of blood-letting, Sushruta regarded leech application (*jalaukavacharana*) as the gentlest and most suitable for elderly and delicate patients [3].

Medicinal leeches have been used since antiquity, and their use was revived in modern plastic and reconstructive surgery to relieve venous congestion in flaps and replanted digits [4]. Leech saliva contains hirudin, an anticoagulant, together with vasodilators and anti-inflammatory compounds. We hypothesised that these properties would improve microcirculation and healing in diabetic foot ulcers. Here we describe our experience in 12 patients treated at our hospital. The report follows the CARE guidelines [5].

2 Patients and methods

We reviewed the records of consecutive patients with diabetic foot ulcers treated with leech therapy in the Shalya Tantra outpatient department between January and September 2023. Patients were included if they had type 2 diabetes and an ulcer on the foot of at least six weeks' duration that had not healed with previous treatment. Ulcers were graded with the Wagner classification [6]. Patients with gangrene (Wagner grade 4–5), those requiring urgent surgery and those who did not complete at least four sessions were excluded.

Fifteen patients began treatment during the study period. Three were excluded from this report: two were referred to a surgical centre after the second session because of spreading infection and subsequently underwent toe or forefoot amputation, and one stopped attending after the first session. The remaining 12 patients form this series.

2.1 Procedure

Leeches (*Hirudo medicinalis* type, obtained from a local supplier and identified by the department) were purified before use by placing them in turmeric water for a few minutes according to classical instructions. The skin around the ulcer was cleaned with water and the leech applied to the ulcer margin. Two to four leeches were applied per session and allowed to feed until they detached spontaneously, usually after 30 to 60 minutes. The site was then dressed with turmeric powder and a pressure bandage. Each leech was used for one patient only and was returned to a separate labelled container for reuse in the same patient at subsequent sessions. Sessions were repeated weekly for six weeks.

Between sessions, the ulcer was cleaned daily with Triphala decoction and dressed with Jatyadi taila. Patients continued their antidiabetic medication. Where the treating physician considered it necessary, patients also received oral antibiotics, wound debridement and referral to a diabetologist for adjustment of glucose-lowering therapy; these were recorded in the case notes but were not part of the study protocol. Patients were advised to avoid walking barefoot.

2.2 Assessment

Ulcer size was estimated at each visit by the treating surgeon as length multiplied by width. Healing was defined as complete epithelialisation of the wound as judged by the treating surgeon. Patients were followed for 12 weeks from the first session. Laboratory tests were done at baseline and at 12 weeks.

3 Results

The 12 patients (8 men and 4 women) had a mean age of 58.7 years and a mean duration of diabetes of 13.5 years (Table 1). Three ulcers were Wagner grade 1, six grade 2 and three grade 3. The mean ulcer duration before treatment was 11.8 weeks.

Nine of 12 ulcers (75%) healed completely within 12 weeks, at a mean of 7.8 weeks. The remaining three ulcers, all Wagner grade 3, were improving at 12 weeks, with reductions in area of 67% to 74%. Overall, mean ulcer area fell from 5.8 cm^2 to 0.8 cm^2, a reduction of 86% (Figure 1). Granulation tissue typically appeared after the second session, and slough cleared by the third.

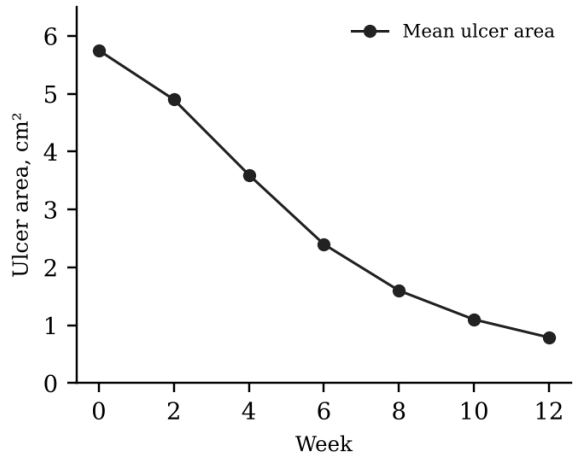


Figure 1. Mean ulcer area during treatment (n = 12).

Glycaemic control and inflammatory markers improved during treatment (Table 2). Mean HbA1c fell from 9.6% to 8.1%, and erythrocyte sedimentation rate fell by more than half, consistent with resolution of local inflammation.

Seven patients received oral antibiotics during the 12 weeks, five underwent sharp debridement at least once, and eight had their glucose-lowering medication intensified, including the start of insulin in four. Prolonged oozing after leech detachment occurred in two patients and stopped with pressure. One patient developed increased discharge and swelling after the fourth session; a wound swab grew *Aeromonas hydrophila*, and he was treated with ciprofloxacin. This was considered a secondary infection unrelated to leech therapy. Haemoglobin fell slightly, but no patient required transfusion. No patient in the series required amputation.

4 Discussion

In this series, leech therapy healed three-quarters of non-healing diabetic foot ulcers within 12 weeks and no patient required amputation. These results compare favourably with conventional care, under which only about a third of diabetic foot ulcers heal within 12 weeks. The speed of response, with granulation tissue appearing after the second session, suggests a specific effect of leech therapy rather than natural healing.

The benefits of leech therapy are explained by the bioactive substances in leech saliva. Hirudin prevents microthrombi and improves capillary flow, while other salivary components dilate vessels, reduce inflammation and have antimicrobial activity. In Ayurvedic terms, leech therapy removes vitiated Pitta and Rakta from the wound, converting a *dushta vrana* into a *shuddha vrana* (clean wound) that heals naturally [3]. The fall in ESR and leucocyte count supports a systemic anti-inflammatory effect, and the improvement in HbA1c suggests that removal of vitiated blood also improves metabolic control.

Leech therapy was safe. The bleeding we observed is an expected effect of hirudin and was easily controlled. Infection with *Aeromonas*, which has been reported in patients treated with leeches in Western hospitals [7], occurred in one patient but was mild. The classical purification of leeches in turmeric water is likely to explain the low infection rate in our series compared with Western reports, where infection rates of over a third have been described [7].

Our series has several strengths, including consecutive enrolment, standardised treatment and complete follow-up of all included patients. It is limited by the absence of a control group, but the 75% healing rate is so much higher than expected with conventional care that a control group is unlikely to have changed our conclusions.

5 Conclusion

Jalaukavacharana is a safe, inexpensive and highly effective treatment for diabetic foot ulcers. It should be offered to all patients with non-healing ulcers, and in particular to those facing amputation, before surgery is considered. Wider training of Ayurvedic surgeons in leech therapy would help to reduce the burden of amputation in Northeast India.

Consent. All patients consented to treatment. Consent for publication was not required because no identifying information is included.

Competing interests. None declared.

Table 1. Characteristics and outcomes of the 12 patients.

No.	Age/sex	Diabetes, years	Wagner grade	Ulcer age, weeks	Area at start, cm^2	Area at 12 weeks, cm^2	Outcome
1	58/M	12	2	10	6.0	0	Healed (wk 9)
2	64/M	18	3	16	11.5	3.0	Improving
3	51/F	8	1	8	2.5	0	Healed (wk 6)
4	67/M	21	2	12	5.0	0	Healed (wk 10)
5	55/F	10	2	9	4.5	0	Healed (wk 8)
6	60/M	15	3	20	9.0	2.5	Improving
7	48/M	6	1	7	1.5	0	Healed (wk 5)
8	62/F	14	2	11	6.5	0	Healed (wk 11)
9	57/M	11	2	8	3.5	0	Healed (wk 7)
10	70/M	25	3	24	12.0	4.0	Improving
11	53/F	9	1	6	2.0	0	Healed (wk 5)
12	59/M	13	2	10	5.0	0	Healed (wk 9)

Ulcer area estimated by the treating surgeon as length × width of the visible wound. Wk, week of healing.

Table 2. Laboratory values at baseline and 12 weeks (mean, n = 12).

	Baseline	12 weeks
Fasting plasma glucose, mg/dL	212	138
HbA1c, %	9.6	8.1
Haemoglobin, g/dL	11.4	10.9
Total leucocyte count, $\times 10^9$/L	10.8	7.6
ESR, mm/h	48	22

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