

A CASE STUDY EFFECT OF LEECH THERAPY IN DIABETIC FOOT ULCER

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ABSTRACT

Diabetic foot ulcer is a common complication of diabetes mellitus. There is a significant risk of loss of limb as a result of delayed and improper treatment. In our country a large number of cases have to suffer from amputation, out of them maximum amputations can be prevented by timely intervention. Ayurvedic texts describe leech therapy (a type of bloodletting) as an effective way to treat infected ulcers. Diabetic ulcers have been mentioned as *Madhumehaja vrana* in Ayurvedic texts. A male patient named Radheshyam, aged 45 years visited DSRRAU with diabetic foot ulcer with gangrene of two lateral toes, who was initially treated at some private hospitals and AIIMS jodhpur, but could not get much relief. He was put on leech therapy along with conservative management. After almost 3 months of therapy his ulcer was healed completely and his foot was saved. Thus it can be concluded that leech therapy is a potent, safe and cost effective way to deal with diabetic foot ulcers and it can save many limbs from amputation.

KEYWORDS: Diabetic foot, Sushruta samhita Madhumehaj Vrana, Leech therapy, Bloodletting.

What is already known about the topic:- diabetic foot ulcers have to be treated by debridement, anti-septic dressings and surgical intervention. A large number of cases need to get the limb amputations. In Ayurveda, although bloodletting (raktavsechan) has been described in treatment of infected ulcers, no single set parameter has been followed to treat diabetic foot ulcers. This study has been conducted to validate use of leech therapy in preventing the foot/limb amputation and healing the ulcers of diabetic patients. It has been observed that leech therapy also prevents the further spread of impending gangrene and further damage in such cases and significantly shortens the recovery time, which is a great benefit of leech therapy. Leech therapy increases the blood flow and neovascularisation.

INTRODUCTION

Diabetic foot is the one of the commonest chronic complications of diabetes. It is leading indication for hospital admission and prolonged stay. A classical triad of neuropathy, ischemia and infection characterises the diabetic foot. The presence of infection rapidly worsens the clinical picture, often requiring limb amputation. Diabetic foot ulcers are common and estimated to affect 15% of all diabetics. In India, it is estimated that approximately 40,000 legs are being amputated every

year; of which 75% are neuropathic feet which are potentially preventable.

Risk factors for diabetic foot ulcers

- Male above 50 years.
- DM of more than 10 years duration.
- Blood glucose levels not controlled.
- Peripheral neuropathy.
- Abnormal structure of foot.
- Peripheral vascular disease (16% of patients have this).
- Smoking and hypertension.
- Increased level of lipids.
- Genetic factors.

Patho-physiology of diabetic ulcer

1. High glucose level in the tissue is a good culture media for bacteria, so infection is common.

2. Diabetic Microangiopathy causes blockade of micro-circulation leading to hypoxia.

3. Diabetic Neuropathy Due to sensory neuropathy, minor injuries are not noticed, so infection occurs. Due to motor neuropathy dysfunction of muscles, arches of foot and joints occurs and loss of reflexes of foot occurs causing more prone for trauma and abscess. Due to

autonomic neuropathy, skin will be dry causing defective skin barrier so more prone for infection.

4. Diabetic Atherosclerosis itself reduces the blood supply and causes gangrene. Thrombosis can be precipitated by infection causing infective gangrene. Blockage occurs at plantar, tibial and dorsalis pedis vessels. Increased glycosylated haemoglobin in blood causes defective oxygen dissociation leading to more hypoxia.

Clinical Features

1. Pain in the foot
2. Ulceration
3. Absence of sensation
4. Absence of pulsation in the foot (posterior tibial and dorsalis pedis artery)
5. Loss of joint movements
6. Abscess formation
7. Change in temperature and colour when gangrene sets in
8. Patient may succumb to keto-acidosis, septicaemia and MI

Grading of diabetic foot ulcers (modified Wagner grading system)

Grade 0- No skin changes.

Grade 1- Superficial ulcer

Grade 2- Ulcer extension

a. Involves ligament, tendon, joint capsule or fascia.

b. No abscess, no osteomyelitis.

Grade 3- Deep ulcer with ulcer or osteomyelitis.

Grade 4- Gangrene of the portion of fore-foot.

Grade 5- Extensive gangrene of foot.

Management of diabetic foot ulcers

- Remove callus skin.
- Treat infection.
- Avoid weight bearing.
- Ensure good glycemic control.
- Control oedema.
- Assess feasibility of vascular re-construction where indicated.

Ayurvedic Perspective: *Ayurvedic* texts describes the ulcers of diabetic patients as '*Madhumehaj vrana*'.

Samprapti of diabetic ulcer: In *Madhumeha*, the lower limbs vessels become weakened and unable to expel *doshas*. This leads to accumulation of *doshas* (*meda* and *rakta* along with other *dosha-dushyas*) followed by formation of *Prameha Pidika* which converts into wounds after purification i.e. Diabetic Ulcer⁶. (This *samprapti* has been presumed on bases of *samprapti* of *madhumeha* as *prameha pidika* is a complication of *madhumeha* and they are commonly found over lower limbs clinically.)

Prognosis: During description of prognosis of *vrana*, Acharya Sushruta has stated that "*madhumehaja vrana*" i.e. diabetic ulcers are *kashtsadhya* (difficult for management). Further, *Sushruta* specified that the wounds over the lower limbs too delays its healing.

Components of medicinal leech (*Hirudo medicinalis*) saliva⁶

Hirudin	Inhibits blood coagulation by binding to thrombin.
Calin	Inhibits blood coagulation by blocking the binding of von willebrand factor to collagen. Inhibits collagen mediated platelet aggregation.
Destabilase	Monomerizing activity dissolves fibrin, thrombolytic effects.
Hirustasin	Inhibits kallikrein, trypsin, chymotrypsin neutrophilic cathepsin G
Bdellins	Anti-inflammatory. Inhibits trypsin, plasmin, acrosin.
Hyaluronidase	Increases interstitial viscosity, antibiotic.
Tryptase inhibitor	Inhibits proteolytic enzymes of host mast cells
Eglins	Anti-inflammatory, inhibit the activity of alpha- chymotrypsin, chymase, substilisin, elastase, cathepsin G
Factor Xa inhibitor	Inhibits the activity of coagulation factor Xa by forming equimolar complexes
Complement inhibitors	May possibly replace natural complement inhibitors if they are deficient
Carboxydase A inhibitors	Increase the inflow of blood at the bite site
Histamine like substances	Vasodilator. Increases the inflow of blood at the bite site
Acetylcholine	Vasodilator
Anesthetic substances	Anesthetic

Leech therapy: Leech therapy (*Jalauka avacharan*) has been mentioned as a type of bloodletting (*Raktavsechan*). It is an effective, safer and non-surgical way of blood-letting and can be used in children, females, pregnant patients and elderly⁷.

References of Leech Therapy in wounds:

Sushruta has advocated that bloodletting by means of Leech can be practised in all inflammatory, suppurative and painful conditions to relieve pain and inhibit suppuration including that of diabetic ulcerative lesions⁸. *Sushruta* further describes that in case of diabetes, if *sanshodhan* is not done, the *doshas* get aggravated, vitiate blood and muscles and produce

swelling or other complications. The treatment prescribed for swelling and vene-puncture should be done. If these are not done, the swelling increases greatly, give rise to pain and burning sensation, then it should be treated by sharpinstruments followed by treatment of wound9.

CASE REPORT

A male patient aged 45 years resident of distt. jodhpur, rajasthan, visited the hospital approximately 4 months back with a hope to save his foot. Patient was a diagnosed case of Type 2 diabetes mellitus for last 5 years and was on Oral Hypoglycaemic Agents. He was admitted in the *Shalya ward* (OPD/IPD No.-57654/1856). The presenting complaints were a large non-healing ulcer over dorsum and an ulcer over middle of the sole of right foot associated with pus discharge and foul smell. The 4th and 5th toe were black in colour with no sensations or movement. The foot was swollen and painful.

On examination, he was found to be suffering from wet gangrene of 4th and 5th toes with a large ulceration over right foot extending from toes to middle and lateral aspect of dorsum of foot almost upto lateral malleolus. A small ulcer was also present over middle sole of the foot with foul smelling discharge. There were multiple pus discharging points over the sole. The arterial pulsations (i.e dorsalis pedis and posterior tibial artery were feeble).

Brief history: Patient was a farmer by profession and used to work bare feet in the fields and got a small ulcer over the foot few months back which gradually increased in size because of negligence and improper medical care. His blood sugar level was uncontrolled. Later on, he visited few hospitals in rajasthan but couldn't get much relief. Then he moved to jodhpur and was treated at AIIMS jodhpur, where his blood sugar level was managed and he was put on antibiotics, OHA's and anti-septic dressings. But the condition of foot didn't improve much and later on he was advised for amputation. Then patient came to our hospital with a hope to save his foot from amputation and was taken up as a challenge.

Treatment Plan: The gangrenous toes were amputated in the beginning of the treatment to prevent further spreading of gangrene. Initially daily dressings were done with normal saline along with proper debridement on regular basis till the wound became clean. Later on dressings were done on alternate days with *Jatyadi Oil*. He was put on intermittent leech therapy as per the description in *Ayurveda* texts, where leech therapies is described as very useful in management of non-healing ulcers. Leech therapy was done once every week for 3 months (12 sittings) and 2 leeches were applied on the foot per sitting (one over the wound and other near the margins of wound after cleaning the site with NS. The hypoglycaemic drugs were continued (Tab Metformin-500mg 1 BID). He was put on Ayurvedic

drugs – *Kaishore gugglu* 2 BID, *Dhatri Lauh*-2 BID and *Ashwagandha Churan*-3 gm BID.

RESULTS

The healing started gradually during the course of treatment and slowly wounds became healthier with the dis-appearance of foul smell and pus discharge. The swelling was also reduced. The wound healed completely after almost 3 months of therapy.

Probable Mechanism of Action of Leech Therapy: Leech application improves blood circulation and reduces congestion due to presence of carboxy-peptidase-A inhibitor, histamine like substances and Ach; thus it corrects Diabetic Microangiopathy. It has peripheral vasodilator effect due to presence of vasodilator constituent in saliva, which improves blood circulation and corrects ischaemia due to diabetic atherosclerosis. It has anti-inflammatory action on nerves, hence corrects diabetic neuropathy.

Probable Mechanism of Action of Leech Therapy (Ayurvedic Perspective)

Vrana Shodhak Effect: expulsion of impure blood leads to removal of local vitiated *doshas* (dushit rakta, toxins, metabolites, etc).

Vrana Ropan: fresh blood supply is facilitated which promotes healing and healthier, newer tissues.

Madhumeha Pacifying Effect: Bloodletting with leech application pacifies *madhumeha* i.e. it breaks the pathogenesis at cellular level and inhibition of infection, thus promotes wound healing (in diabetes, the tissues are glucose laden which promotes propensity of bacteria to multiply).

CONCLUSION

Leech therapy is an effective, economical and safer way to improve the healing in infected, chronic wounds/ulcers. Statistics reveal that about 30% of DM neuropathic ulcers receiving standard care requires around 20 weeks for healing, whereas the ulcers healed completely in about 3 months with leech therapy. Thus, this therapy shall be used confidently in cases of infected and chronic ulcers. This therapy can save a large number of patients from limb amputation and can prove to be a breakthrough in the management of such cases.

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