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A CASE REPORT DISCUSSION ON LEECH APPLICATION IN DIABETIC FOOT ULCER

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ABSTRACT:

In diabetes, slight injury to the glucose laden tissue may cause chronic infection and ulcer port factor includes increased sugar level, diabetic microangiopathy and peripheral neuropathy. The diabetic foot may be defined as a group of syndrome in which neuropathy, ischemia and infection lead to tissue breakdown, resulting in morbidity and possible amputation. The main stay of treatment includes antibiotics, debridement and local wound care or foot wear improvisation. In spite of all advances in health science, statistics reveals that about 3% patients yet have to undergo lower limb amputation.

In *Sushruta samhita*, we get the most scientific description of wound and its management. Similarly *Sushruta* has given the importance to bloodletting therapy and considered leech as the most unique and effective method of bloodletting even in infected wounds and abscess.

Thus with this aim a case report is discussed here.

INTRODUCTION:

The term diabetic foot is somewhat a misnomer. Diabetic foot ulcer (DFU) is one of the common presentation of diabetic foot. The diabetic foot may be defined as a group of syndrome in which neuropathy, ischemia and infection lead to tissue breakdown, resulting in morbidity and possible amputation (world health organization,1995), Diabetic ulcer tend to occur most commonly on the plantar weight bearing surface of the foot underneath the pressure point.

EPIDEMIOLOGY:

Most common cause of diabetic patient get hospitalization is diabetic foot ulcer. Out of 62 million diabetics in India, 25% develop DFU (Diabetic Foot Ulcer) of which 50% become infected, requiring hospitalization while 20% need amputation. DFUs contribute to approximately 80% of all non-traumatic amputation in India, annually (www.valueinhealthjournal.com).

Cause of DFU -

Diabetic foot ulcers basically occurs due to bare foot walking, absence of sensation and ignorance.

However the prime etiological factors are –

1. Increased sugar - In diabetes slight injury to the glucose laden tissue may cause chronic infection and ulcer formation. Also increased sugar favors propensity of bacteria to multiply and cause severe spreading infection.
2. Diabetic micro angiopathy – Ulceration in diabetes may be precipitated by ischemia due to diabetic atherosclerosis, as a result of which blood supply to the tissue is affected. Increased glycosylated hemoglobin in blood causes defective oxygen dissociation leading to more hypoxia. At tissue level there will be increased glycosylated tissue protein which prevent proper oxygen utilization and so aggravates hypoxia.
3. Diabetic neuropathy – Since the peripheral nerves are affected, there are diminished or no sensation as a result the patient experiences no pain sustains injury and hence do not seek medical advice. Due to motor neuropathy, dysfunction of muscle, arches

of foot and joints and loss of reflexes of foot causing them more prone for trauma and abscess, also due to autonomic neuropathy skin will be dry causing defective skin barrier.

Risk factor for diabetic foot ulcer –

- a. Above 50 years.
- b. Diabetes Mellitus (DM) of more than 10 years.
- c. Uncontrolled blood glucose level.
- d. Peripheral neuropathy.
- e. Abnormal structure of foot.
- f. Peripheral vascular disease.
- g. Smoking and hypertension.
- h. Genetic factor.

Clinical features-

- a. Pain in the foot
- b. Ulceration
- c. Absence of sensation
- d. Absence of pulsation in the foot
- e. Loss of joint movement

Grading of diabetic foot ulcer (modified Wagner's grading system)-

Grade 0 – no skin change

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 osteomyelitis

Grade 4 - gangrene of the portion of the forefoot.

Grade 5- extensive gangrene of the foot.

Diagnostic interpretation:

For the confirmation of diagnosis certain other condition causing delayed healing are considered like atherosclerosis, chronic venous insufficiency, vasculitic neuropathy, metabolic neuropathy, autonomic neuropathy.

In all the diabetic patient through examination especially around nail beds and in between webs of finger is done to check any swelling, rash, cut or any underlying fungal infection is mandatory. However advanced diagnostic modalities like hand held Doppler, Biothesiometry and podioscan are also helpful for the confirmation of diagnosis.

Ayurvedic aspect of madhumehaj vrana/ DFU-

Diabetic foot ulcer can be correlated with *Madhumehaja vrana* in *Sushruta samhita* and *Charak samhita*. During its description, *Sushruta* stated that the management of these *vranas* are difficult to cure i.e. *kashtasadhya*. According to *Sushruta*, *meda* and *rakta* along with other *dosha* and *dushya* lead to the formation of *prameha pidaka* which later convert to non-healing wounds and also further specified that wound over lower limb are difficult to heal.

Samprapti of madhumehaj vrana /diabetic ulcer-

In *madhumeha* the lower limb 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 *pramehaja pidaka* which converts into wounds after putrification i.e. diabetic ulcer.

Prognosis of madhumehaja vrana:-

While describing the prognosis of *vrana* in *sutrasthan*, chapter 23, *Sushruta* had stated that the *madhumehaja vrana* i.e. *kashtasadhya* (difficult) for management. Further, *Sushruta* specified that the wounds over the lower limb too delays in healing.

Treatment:

Diabetes is due to the vitiation of *tridosha*, so there is need of *shodhana* and *vanavast chikitsa* to be adopted. In *Sushruta samhita, chikitsasthana*, it is found that leech therapy is advocated in all the inflammatory condition of ulcer. If *samshodhana* is not done, the *doshas* get aggravated, vitiating blood and muscles and produce swelling and other complications. The treatment prescribed for swelling is venepuncture. If these are not done, the swelling increases greatly giving rise to pain and burning sensation, then it is to be treated by sharp instrument followed by general treatment of wound.

About leech therapy- It is considered most unique and most effective method of bloodletting. It can be tried in all mankind including females, children, old and patients having poor threshold to pain. It drains impure blood, thus useful in pitta *dushita rakta* diseases or various skin disorders and all type of inflammatory conditions.

References of indication of leech therapy in wounds-

In *Sushruta Samhita, Chikitsasthan*, chapter 12 and 16, *Sushruta* has advocated that Bloodletting by means of leech can be practiced in all inflammatory, suppurative and painful condition to relieve pain and inhibit suppuration including that of diabetic ulcer lesions.

Table: component of medicinal leech (*Hirudo medicinalis*) saliva.

Hirudin	Inhibit blood coagulation by binding to thrombin.
Calin	Inhibit blood coagulation by blocking the binding of von willebrand factor to collagen. Inhibit collagen mediated platelet aggregation.
Destabilase	Monomerising activity. Dissolve 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, subtilisin, elastase, cathepsin G.
FactorXalpha inhibitor	Inhibits the activity of coagulation factor Xa by forming equimolar complexes.
Compliment inhibitors	May possibly replace natural complement inhibitors if they are deficient.
Carboxypeptidase alpha inhibitors	Increase the inflow of blood at the bite site.
Histamine like substances	Vasodilators increases the inflow of blood at the bite site.
Acetylcholine	Vasodilator
Anesthetics substances	Anesthetic

CASE STUDY REPORT -

Aims and objectives of case study -

- To evaluate clinical efficacy of 'Leech therapy' in the patient with diabetic foot ulcer.

Type of study : Observational single case design without control group.

Study centre: Govt. P.G. Ayurved College & Hospital, Varanasi, UP, India.

Study detail (Case Report File Protocol in brief) -

Age- 50 years, Gender- Male, Religion- Muslim, Date of admission – 20/12/2018.

Occupation- Egg seller, Diet- Mixed, irregular, spicy diet.

Chief complaints - Patient had non healing ulcer over right foot (dorsum aspect) since 6 months. Pain and swelling on and off over right foot dorsum since 5 month. Mild discharge on and off from ulcer with foul, intolerable smell since 5 month.

Observation-

Patient is a case of controlled DM (On oral anti-diabetic drugs) and it was observed -

Before treatment -

General Examination - All the vital parameters were within normal limits. Patient was haemo-dynamically stable except slight increase in blood sugar level. Blood sugar Fasting- 173 mg/dl, PP-282 mg/dl. X-ray of right foot dorsum (AP/Lateral/Oblique) – No abnormal finding.

Local examination -

a. Inspection

Number of ulcer - Single

Site - Right foot dorsum aspect

Size - Length- 2 inch, Width- 1.5inch, Depth- 1/4 centimeter

Shape - Irregular

Edge - Rough, irregular with fibrosed tissue

Floor - Unhealthy with less granulation tissue and slough

Discharge - Often blood discharge mixed with mild pus

Smell- Foul, intolerable.

Surrounding area- Mild inflammation

State of Vrana- Partially *Dushta*

b. Palpation :

Tenderness - ++

Local temperature - Raised

Treatment plan:

After careful examination of wound, 4 leeches were applied once in a week for 42days (5 consecutive weeks and follow up after 1 week). Leeches after proper sucking of impure blood (for approximately 30 min) when leave the site, then the wound was washed with *Panchavalka Kashaya* and latter *Jatyadi taila* was applied and bandaging done. Dressing

was done on alternate day, whereas leech therapy was repeated on weekly basis for 5 sitting. Patient was advised to continue oral anti-diabetic medicines along with this therapy.

Changes occurred during the treatment has been noted on the basis of the assessment criteria.

Gradation criteria for assessment-

Table: Showing Gradation criteria for assessment of ulcer

Parameters for assessment	Gradation criteria			
	0	+	++	+++
Size	No discontinuity of skin/mucus membrane	$\frac{1}{4}$ of previous area of ulcer	$\frac{1}{2}$ of previous area of ulcer	$>\frac{1}{2}$ of previous area of ulcer
Pain	No pain	Localized pain during movement but relieved on rest	Tolerable localized pain even during rest	Intolerable localized pain even during rest
Discharge	No discharge/ Dry dressing	Scanty, occasional discharge/ Little wet dressing	Often but not continuous discharge needs daily dressing	Profuse, continuous discharge needs frequent daily dressing
Smell	No smell	Bad smell	Tolerable, unpleasant smell	Foul and intolerable smell
Edge	Adhered edge	Smooth, even and regular	Rough, irregular edge	Very rough,uneven, irregular
Floor	Smooth, regular with granulation tissue, no need for dressing	Rough, regular, mild discharge, less granulation tissue, needs dressing	Unhealthy, less granulation tissue, needs daily dressing	Unhealthy, no granulation tissue

On the basis of assessment following points were observed and shown in tabular form.

OBSERVATION & RESULT-

Local sign & symptoms	B.T.	A.T	A.T	A.T	A.T.	A.T
Duration in week	Day 1	1 Week	2 Week	3 Week	4 week	5 week
Size	+++	+++	++	+	+	-
Pain	++	+	-	-	-	-
Edge	++	++	+	+	+	-
Floor	++	++	+	+	-	-
Discharge	++	++	+	-	-	-
Smell	+++	++	+	-	-	-
Blood Sugar - F	173mg/dl					107mg/dl
PP	282mg/dl					127mg/dl

Result - With leech therapy the wound completely healed in 42 days.

Discussion -

Probable mechanism of action of leech therapy -

a. Modern perspective :

Leech application improves blood circulation and reduces congestion due to presence of carboxypeptidases, histamine like substances and acetylcholine thus it corrects the diabetic micro angiopathy.

Leech application has anti-inflammatory action on nerves due to presence of substances like Bdelins and eglins in the leech saliva hence it corrects diabetic neuropathy.

Leech application has peripheral vasodilator effect due to presence of vaso dilator constituents in its saliva which improves blood circulation and corrects ischemia occurring due to diabetic atherosclerosis.

b. Ayurvedic perspective :

Vrana shodhan effect- After leech application and expulsion of impure blood, the local vitiated doshas (toxins and unwanted metabolites) are removed.

Vrana ropan effect- leech application facilitates fresh blood supply and promotes formation of healthy new tissues.

Madhumeha pacifying effect- Bloodletting with leech application pacifies *madhumeha* i.e. it break the pathogenesis of *madhumeha* at cellular level, and thus inhibition of infection and promotes wound healing.

The *Jatyadi tail* and *Panchvalkal kashaya* have both *shodhan* and *ropan* property, hence it helps in simultaneously cleansing and healing of infected wounds.

However, further study with large sample size is required to evaluate the exact impact of leech therapy on promoting wound healing w.s.r. diabetic foot ulcer.

SUMMARY -

After leech therapy, the expulsion of impure blood takes place, due to which, toxin and other unwanted metabolites are removed from the body. It improves the blood circulation and thus enhances the process of wound healing which in turn normalizes the skin colour. From modern perspective, the saliva of leech contains about hundred biological active substances. The saliva of leech consists of many chemicals which improves blood circulation and reduces congestion. Thus it corrects Diabetic micro-angiopathy. Leech application has peripheral vasodilator effect due to presence of vasodilator constituent in the saliva which improves blood circulation and corrects ischemia due to Diabetic atherosclerosis. Leech application has anti-inflammatory action on nerves due to presence of substance like Bdelins and Eglins in the saliva hence corrects Diabetic neuropathy.

CONCLUSION-

With leech therapy the wound completely healed within 45 days, whereas statistics reveals that about 30% of DM neuropathic ulcers receiving standard care requires around 20 weeks for healing. Thus leech therapy proves to be effective, time saving, affordable and acceptable treatment. Though treating diabetic foot is a difficult task, we have managed to treat it with leech therapy along with conventional methods of wound care.

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