



Review Article

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A REVIEW ON DIABETIC FOOT ULCER: COMPLICATION OF DIABETES MELLITUS

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ABSTRACT

In present scenario sedentary life style, lot of stress and over nutrition are important etiology of diabetic mellitus, as one of the most prevalent disease in the world. Diabetic foot ulcer is often quite dreaded disability cause of non traumatic lower extremity amputation. It occurs in 15% of all patient with diabetes mellitus and precedes 84% of all lower leg amputation. The classical triad such as angiopathy, neuropathy & infection in the formation of Diabetic foot ulcer vividly explained. The pathogenesis of foot ulcer is complex. Preventing of this condition should be first priorities. To help reduce the enormous burden of foot ulceration on both patient and health resource. The management of Diabetic foot ulcer required based on Blood sugar control, debridement, advanced dressing, and offloading modalities. Furthermore, surgery to heal chronic ulcer and recurrence should be considered as essential component of management. Also, Hyperbaric oxygen therapy, electrical stimulation could be used as adjacent therapies for rapid healing of Diabetic foot ulcer. In Ayurveda literature, Acharya Sushruta has described sixty treatment modalities for Vrana. Shodhana (purification) by *guduchyadi kwatha* and Lepana (coating) by *tiladi lepa* having excellent result in diabetic foot ulcer.

Keywords: Diabetic foot ulcer, Angiopathy, Neuropathy, Shodhana (purification), Lepana (coating).

INTRODUCTION

Diabetic foot ulcer common problem through the world, resulting the major medical, socio and economic consequences for the patient¹. It is the major complication of diabetes mellitus. diabetic foot is inherited and acquired are characterized by hyperglycemia, a relative lack of insulin. It is estimated prevalence of 12-15% among all individuals with diabetes and precedes 84% of all lower leg amputation². Diabetic foot ulcer has classical triad of neuropathy, ischemia and infection. For diabetic foot ulcer many classification has given Wagner-Megits, Gibbons, Coleman's classifications etc.³

In Ayurveda literature, Acharya Charaka⁴, Acharya Sushruta⁵, Acharya Vagbhatta⁶, Acharya Madhava⁷ has described DUSTA VRANA. Dusta vrana having following symptom like foul smell, continuously pus discharge, formation of cavity⁸ etc. All symptom are similar to diabetic foot ulcer. Ayurveda gives many preventative measure and complete curing of diseases with minimum chance of recurrence. For better wound healing and minimum scar forming Acharya Sushruta explained treatment modalities like Shashti upkrama (sixty types of treatment modalities)⁹, Saptopkrama (seven modalities of

treatment)¹⁰. Shodhana (purification) with Guduchi kasaya¹¹ & Tiladi lepa (external application)¹² is great management procedure to achieve the main goal of wound healing.

Etiology

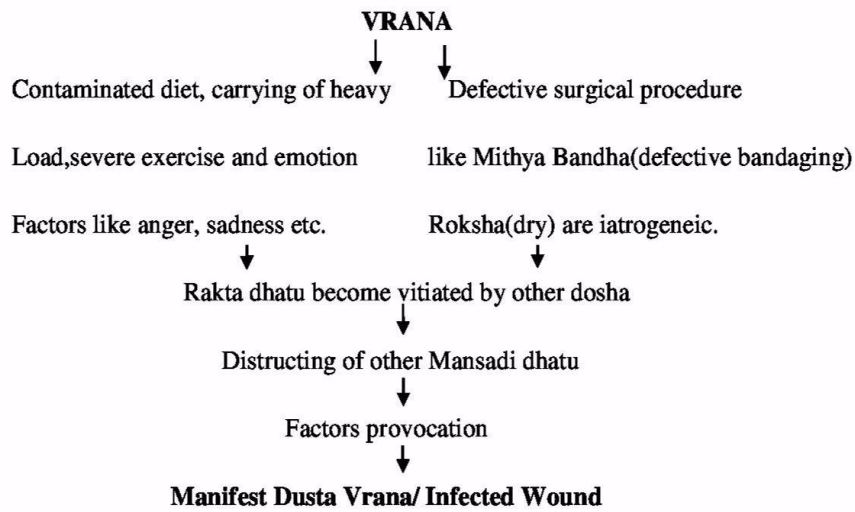
Vrana having doshik involvement known as a dushta vrana¹³. Nija vrana from the beginning is in the awastha having signs and symptoms of vitiated doshas. Agantuja vrana, though i.e. initially shuddha, gets transformed into this awastha after vitiation of doshas. Dushta is one of which there is localization of doshas or getting vitiated by doshas Vrana which smell foul, has abnormal colour with profuse discharge, intense pain and takes long period to heal is said to be dushta, the feature of dushta Vrana will according to the predominant doshas present in it.

In modern review¹⁴

Slightly injury to glucose laden tissue, Diabetic atherosclerosis, Peripheral neuritis they are three main causes leading diabetic foot ulcer.

Pathogenesis

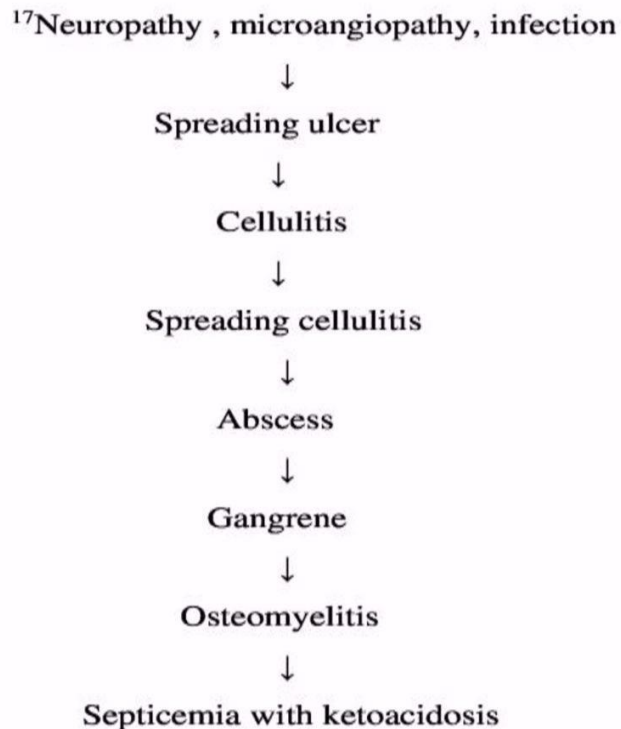
Probable samprapti of dusta vrana¹⁵



According to modern review

1. Increased glucose in the tissue precipitates infection.
2. Diabetic microangiopathy
3. Increase glycosylated hemoglobin decreases the oxygen dissociation and oxygen utilization.
4. Diabetic neuropathy involving all sensory, motor, and autonomous components¹⁶.
5. Associated atherosclerosis

Following Pathology occur due to diabetic foot ulcer



Sites of ulcer

Commonest site is foot-planter aspect, Lower limb, scrotum, perineum, back also affected¹⁸.

Clinical Feature

1. Diabetic foot ulcer has thick margin of keratinized tissue ¹⁹.
2. Ulcer is spreading and deep, edge callus & scales, copious discharge.

3. Foot deformity-hammer toe, clawing of toe.²⁰
4. Local pain in deep infection, burning, shooting type pain present.
5. In autonomic neuropathy- dry skin with cracks, bounding pulses, dilated dorsal vein warm foot.
6. In motor neuropathy- altered gait.

Table 1: Symptom as per the different Ayurvedic literatures

Sushruta samhita ²¹	Charaka Samhita ²²	Astanga samgraha ²³	Astanga hridaya ²⁴	Madhava nidana ²⁵
vedanyukta associated with shravva (pain with discharging excessively)	Shvetatva(pale)	atisamvrita (excessive narrow mouth)	atisamvrita (excessive narrow mouth)	does not posses may feature of sudhha vrana (fresh wound).
deerga kala anubandhi(chronic)	Avasannaa (depressed edge)	Ativivrutha (excessive wide mouth)	Ativivrutha (excessive wide mouth)	Pootigandha (unpleasant smell)
daha (burning sensation)	Atishoola Vartmatava (thickened edge)	Atimrudu (soft)	Atimrudu (soft)	Arushaka
Paaka(suppuratation)	Atipinjara (yellowish)	Kathina(hard)	Kathina(hard)	Utsangi (tortuous tracks)
Kandu(itching)	Neelava (blue)	Atiutseda (excess sweat)	Atiutseda (excess sweat)	Chirshitha (chronic)
Shopha (inflammation)	shyavatava (dusky red)	Avased (sweating absent)	Avased (sweating absent)	
Pidika(pockets)	Atipootitava (excess pus)	Aatisheeta(excess cold)	Aatisheeta (excess cold)	
Atisamvrita (excessive narrow mouth)	Kumbhimukhaatva vranas (pin- pointed)	Ushana(hot)	Ushana(hot)	
Ativivrutha(excessive wide mouth)	Vivarna (discolouration)	rakta, krushna or panduta(reddish, black, pale in colour)	rakta, krushna or panduta(reddish, black, pale in colour)	
Atimrudu(soft)	Bahusraava (profuse discharge)	pootimamsa sira. snayu etc (discharges)	pootimamsa sira. snayu etc. (discharges)	
Kathina(hard)	Maharaja (excessive pain)	Kandu(itching)	Kandu(itching)	
		vedana pitika (painful pockets)	vedana pitika (painful pockets)	

Classification

According to Wagner Meggitts classification²⁶

- Grade 0-foot pain only
- Grade 1-Superficial ulcer of foot
- Grade 2-deep ulcer of foot
- Grade 3-ulcer with bone involvement
- Grade 4- forefoot gangrene
- Grade 5-whole foot gangrene.

Investigation

1. Complete Blood Count usually demonstrates high total count with low Hb% (in infection)²⁷
2. Blood sugar test
3. Urine ketone bodies.
4. Discharge for culture & sensitivity
5. Arterial Doppler of the limb
6. X-Ray of part to see osteomyelitis.

Prevention

Life style modification, Blood pressure control, Lipid management, Glycemic control, Smoking cessation etc. are preventive measures for diabetic foot ulcer²⁸.

Treatment

Diabetic foot ulcer is a one of the of wound (dusta vrana). Wound healing is natural process but inhibited by many factors like infection, foreign bodies, vitiation of doshas. The management of Diabetic foot ulcer required based on Blood sugar control, debridement, advanced dressing, and offloading modalities. If Diabetic foot ulcer is neglect lead chronic ulcer and recurrence. If once complication develop the treatment

choice is surgery and also, Hyperbaric oxygen therapy, electrical stimulation could be used as adjacent therapies for rapid healing of Diabetic foot ulcer²⁹. These therapies are costly and produce many other side effects.

Acharya Sushruta described lots of treatment for dusta vrana like Shasthi Upkrama (sixty types of treatment modalities), Saptokrama (seven types of treatment). In Shasthi upkrama, shodhan (purification)³⁰ lepan (external use) ³¹ are elaborate as bahya chikitsa for wound healing. Number of drug of different properties is described as shodhan & lepan.

Wound cleaned with *guduchi kasaya* and freshly prepared tiladi lepa applied daily on ulcer & kept till it starts drying, later lepa was removed followed by regular gauze dressing with jatyadi taila.

Guduchi Kasaya

Guduchi³²

Botanical name - *Tinosphora cardifolia*

Roghagnata - Shotha (Inflammation), Raktavikara (Bleeding), Shoola(Pain).

Karma – Vednasthapana(Analgesic), Raktashodhaka (Blood purifier).

Pharmaceutical action - Aqueous extract of stem of *Tinosphora cardifolia* have anti- hyperglycemic effect probably by stimulation of insulin release via modulation of beta cell & ca²⁺ concentration.²⁶

Mode of application – External use for vrana- Shodhana (purification).

Table 2: Description of content of Tiladi lepa

Drug	Botanical name	Rogaghanata	Prabhava	Pharmacological action
Nimba ³⁴	<i>Melia azadirachta</i>	Kustha, shotha, updamsa, madhumeha	Vranaropana, vrana Shodhana (purification) (purification), kusthaghna, krimighna, madhumehanasaka	Antiulcer, anti-inflammatory, anti-viral, antibacterial, antihyperglycemic ³⁵
Tila ³⁶	<i>Sesamum indicum</i>	vrana, vataroga	Vatakaphashamka twakprasadan, vranopana, vrana Shodhana (purification)	Antihyperglycemic
Haridra ³⁷	<i>Curcuma longa</i>	Shotha, kustha, kandu, prameha	Pramehaghna, krimighna, shothhara, raktaprasadaka, kusthaghna, vrnya, vrana Shodhana (purification) (purification), vranaropana.	Angiogenesis, in hence fibroblast proliferation
Daruhari-dra ³⁸	<i>Berberis aristata</i>	vrana, kandu	Kapha pitta shamka shothhara, vedna shapana, vrana Shodhana (purification)	Anti-fungal, local anesthesia, antimicrobial, anti-inflammatory
Trivitta ³⁹	<i>Operculina turpathum</i>	Shotha, sthulya,	Shothahar, lekhana,	Ulcer protective, anti-secretory, antimicrobial, anti-inflammatory, antioxidant.
Saindhava ⁴⁰	-	Vatanulomana, Avidahi, Vrishya.	Virechana, Hridya	Antiseptic, antipyretic, antiviral, antiulcer, Anthelmintic, anti-poisonous.
Yasthimadhu ⁴¹	<i>Glycyrrhiza glabra</i>	Vranashotha, prameha, kandu, skin diseases,	Vranaropana, dahaprashmana, raktashodhaka	Anti-inflammatory, immunomodulator ⁴² , reduce serum cholesterol, hepatic cholesterol, anti-atherosclerotic
Ghrita ⁴³	-	Visha, krimi,	Rasayana, rakshoghna, medohara, lekhana	⁴⁴ healing processes like collagenation and epithelization, immunomodulator, antimicrobial

Mode of application

Lepa (Local application on wound)

For the treatment of Diabetic foot ulcer- Shodhan by Guduchi kasaya & Tiladi lepa for local application is may be beneficial due having some following property-

- 1.Vedana shamaka
- 2.Raktashodhaka
- 3.Vranashodhka
- 4.Vranaropka
- 5.Madhumehanashaka

DISCUSSION

Diabetic foot comes under dusta vrana (infected ulcer). If Diabetic foot ulcer will not treat; the most common complication will be happened like non traumatic amputation in lower extremities. Guduchi kasaya shodhan (purification) & Tiladi lepa has lots of properties which help to treat diabetic foot ulcer. Properties of component of guduchyadi kasaya and tiladi lepa -

Guduchi- Its having anti hyperglycemic effect

Nimba- antiulcer anti-inflammatory anti hyperglycemic property

Tila – anti hyperglycemic

Sandhawa – Antiseptic, antipyretic, antiviral, antiulcer

Haridra – Ant diabetic, Angiogenesis, enhance fibroblast proliferation

Daruharidra – anti fungal, local anesthesia, antimicrobial, anti-inflammatory

Trivitta – Ulcer-protective, anti-secretory, antimicrobial

Ghrita –increase healing processes like collagenation and epithelization, immunomodulator, antimicrobial

Yasthimadhu –Anti-inflammatory, reduce serum cholesterol & hepatic cholesterol, anti-atherosclerotic

All prosperities of drugs help to enhance wound healing in diabetic foot ulcer.

CONCLUSION

Diabetic foot ulcer is a debilitating disease with severe consequences in diabetic patient. It is important to carefully and completely foot care to all diabetic patient. Acharya Sushruta

has explained vrana (wound) in detail as a concourse of wound healing procedures i.e. sixty upakrama (sixty modalities of treatment) which includes local as well as systemic use of different drugs & treatment modalities one of such purification therapy Shodhan chikitsa by Guduchi kasaya (anti hyperglycemic action) & Lapan Chikitsa (coating) by Tiladi lepa (antibacterial property with enhance wound healing) have excellent result in dusta vrana treatment.

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