



A Comprehensive Study on Diabetic Foot Ulcer & its Management

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ABSTRACT:

A devastating side effect of diabetes, diabetic foot exacerbates the patient's health and has a big socioeconomic impact. The current review aims to describe the pathogenetic mechanisms and causes of diabetic foot while concentrating on its management as a significant health concern. Along with good foot care, raising doctors' awareness and, consequently, their capacity to recognize the "foot at risk" may lower the likelihood of amputation by preventing diabetic foot ulcers.

Keywords: Neuropathy, Debridement, Diabetic foot, Dressings, Pathogenesis, Peripheral arterial disease, Ulceration

INTRODUCTION

Diabetes Mellitus is a common chronic disorder prevalent all over the world. It has turned to be the biggest silent killer today in the world. DM comprises a group of a common metabolic disorder that shared the phenotype of hyperglycemia. Depending upon the etiology of the DM, factors contributing to hyperglycemia may include reduced insulin secretion, decrease peripheral utilization of glucose and increased glucose production. The greatest fear of diabetic patients is loss of eyesight and amputation.

In modern era sedentary life style attributed a lot of stress and over nutrition which made diabetes, as one of the most prevalent diseases in the world.¹ Foot complication and amputations represent one of the most important among all the long-term problems of diabetes medically, socially and economically. More than 60% of diabetic ulcers are the result of underlying neuropathy characterized by neurogenic ulcer.² The diabetic foot ulcer can be

considered as *Dushta vrana* in *Ayurvedic* classics and the need to look for the management through *Ayurveda*.

Diabetes is a group of metabolic diseases characterized by hyperglycemia resulting from defects in insulin secretion, insulin action or both. Although there are a lot of advances in the area of risk reduction and management of diabetes, the complications of diabetes like diabetic foot ulcers (DFU) are inevitable.³ The DFUs are complex, chronic wounds, which have a long-term effect on the morbidity, mortality and quality of patient's lives. The majority of foot ulcers start as a result of minimal trauma in the presence of sensory neuropathy. This famous but simple quote from McNeely et al.⁴ best describes the critical triad most commonly seen in patients with DFUs: peripheral sensory neuropathy, deformity and trauma. DFU resemble *Dusta Vrana* in *Ayurveda* science. *Acharya Sushruta* has explained the *Shashti Upakramas* (60 modalities) for the management of *Dusta Vrana*. *Yoga* and *Pranayama* on the



other hand helps to control the blood sugar level in the patient of diabetes. *Panchavalkala Kwatha Prakshalana* (cleaning with the decoction of bark of astringent trees) decreases the microbial load, controls infection, fastens wound debridement and can be recommended in the management of chronic non-healing ulcers.⁵

Diabetic Foot Ulcer is a serious condition and leads to Gangrene a potential life-threatening condition that arises when a considerable mass of body tissue dies. It is reduced blood supply to the affected tissues which results in cell death.⁶

MATERIALS AND METHODS

Review of *Ayurvedic* Literature and their corresponding commentaries have undergone in-depth. Peer-reviewed medical publications and textbooks of contemporary medical sciences have also been cited as sources for this topic.

Etiology

Diabetes-

The high blood sugar level eventually damages the nerves especially in the feet. When the nerves are damaged the patient does not feel pain and will not know if he has an injury. The patient may continue walking without protecting the wound, the wound may aggravate and develop in Foot ulcer. High blood sugar levels damages blood vessels, resulting in poor blood supply to the area, less blood supply means less nutrients-oxygen for the tissue cells. So, the ulcer becomes more infected, the infection grows rapidly and gangrene develops.⁷

Due to *Kapha*, *Pitta Hetu Rakta*, *Mamsa*, *Mada*, *Lasika*, *Rasa*, *Ambu* became *Dusht*. *Rasa* and *Meda Dushti kleda utpatti* increases and *Rakth dushti*, *Siragat dushti* occurs. From that further *mamsa dushti* occurs which produces *Dusht vran* (diabetic foot ulcer)⁸

Diabetes mellitus is similar to *Madhumeha* which is a subtype of *Vataja Prameha*. In *Madhumeha* mainly the *Vata* and *Kapha* are predominant though the disease is *Tridoshakopanimitaja*. The Diabetes mellitus has been broadly classified as type I and type-II. The type I Diabetes mellitus is nearer to *Dhatuapakarshanajanya Madhumeha* while the type II Diabetes mellitus resembles to *Avaranajanya Madhumeha*.⁹

Avaranjanya pathogenesis can be disrupted. Here in the pathogenesis etiological factors mainly vitiates *Kapha*, *Pitta* and *Meda*. Complications arises due to the long-time association of *Prameha* disease. If *sodhana* like proper management is not done the doshas get aggravated and

vitiated by *mamsa* and *rakta* producing *pidaka* like upadras. *Charaka* has mentioned 7 types of *Pidakas* while *Sushruta* and *Vagbhata* have mentioned 10 types of *Pidakas* as complications of *Madhumeha*.¹⁰ If timely management is not done, the swelling advances severely the pus tearing the interior creates a big cavity and become advanced and thus incurable.

According to *Susruthacharya*, *Saravika* like 9 boils are curable if the patient is strong and they are a few, located in the skin, and muscles, soft, with little pain, and suppurating and rupturing in short time. The patient should be evacuated through both passages. If this is not done, doshas get aggravated and by vitiating muscle and blood cause inflammatory swelling and other complications. This should be managed with *Sodhana* and venipuncture.¹¹

Non suppurated boil should be treated like inflammatory swelling while the suppurated ones like the *vran*. *Vagbhatacharya* mentioned *Eladigana Taila* for *Vranaropana* in *Pramehajanya vran*.

According to *Sangrahaakara* the physician should treat carbuncle first, for they quickly kill the patient of diabetes; the rest of the complications can be treated later, depending on their strength.

Vrana implies damage of the part leading to discolorations –hence the term *Vrana*.

- **Samprapti Ghataka Dosa:** *Tridosaja*
- **Dusya:** *Tvacha, Mamsa, Sira, Snayu, Sandhi, Koshta and Marma.*
- **Srotas:** *Annavaha, Rashavaha, Raktavaha, Mamsavaha, Svedavaha.*
- **Agni:** *Mandya, Visama.*
- **Marga:** *Sakha.*
- **Adhithana:** *As Dusya.*
- **Udbhavasthana:** *Anywhere in the body.*
- **Pratamy Lakshana:** *Gatracurnane.*

Symptoms-

- Severe pain in the area (in primary stage)
- Burning sensation
- Increased frequency of urination
- *Alasya, Arochak*
- Swelling of Bilateral feet
- Loss of sensation in the area (in advance stage)
- Discoloration of skin (first red then blue and last black color)
- Foul smelling discharge.

- Fever

Investigations

- X-Ray – vascular calcification / bony erosion in the area.
- CBC – total WBC may be high.
- Arteriogram to see blockage in blood vessels.
- Tissue microscopy exam to look for cell death.
- Physical exam- inspect color of affected area.

Clinical presentation

Acharya Susruta has given detailed description on the pathogenesis of *vrana* under *vrana prasna adhyaya* in *Susruta Soothrasthana*. Like other diseases *vrana* also have six stages in *samprapti*. These are *sanchayam, prakopam, prasaram, sthanasamsrayam, vyakthi and bheda*. In reality *nija vrana* is the *bhedavastha* of many diseases; and *aganthu vrana* passes through these six stages when it becomes chronic i.e., *Dushta vrana*. From this it is clear that only on the basis of *shad kriya kala* one can understand the pathogenesis of *Dushtavrana*. Based on *nidana vrana* is broadly classified into two types by both *Susrutha* and *Charaka*.

Nija vrana occurs as a complication in *Prameha, Kushta, Vidradhi, Vatarakta, Arbuda and Apachi*.

If the *aganthu vrana* is not properly treated it reaches to the sixth stage of *samprapthi* i.e., the *Dushta vrana*. Also, *Dushta vrana* is the *bhedavastha* of diseases like *prameha pidaka, vidhradhi, visarpa, kushta* and many other similar diseases. Different meanings of the word *dushta vranas* are – *Dushta (dushyateeti + dushu + karthari), durbala, Adhama* (degraded) damaged spoiled, injured, deprived etc. *Sudhavrana* has no dosha involvement. *Dushta vrana* shows derangement of dosha and *dhathus*

Fifteen types of *nija vrana* are *dushtavrana*, because they occur due to *dosha dooshya sammoorchana*.

Dushta Vrana lakshana according to different Acharyas are given in Table 1

Management: -

Acharya Susrutha has mentioned 60 *upakramas* for the treatment in *vrana*. In the treatment of *vrana sophera*, *acharya* mentioned 7 *upakramas* which are elaborately explained in the 60 *upakramas*. *Acharya charaka* has mentioned 36 *upakramas* for the treatment of *vrana* and explained *samanya* and *visesha chikitsa*. *Acharya Susruta* described *dushta vrana chikitsa*^[29] as¹²

- *Urdha & Adha sodhna*
- *Visoshanam and visoshana ahara*

- *Sonita mokshana*

According to *susruthacharya*, *prameha upadravas* should be properly managed with *sodhana* procedures otherwise it will turn incurable. *Acharya Susruta* has advised to follow *Dushtavrana Cikitsa for Meha kushta Vrana in Cikitsasthana sadyovrana Adhyaya*. *Prameha janya dushta vrana* is having *Tridosha prakopa, pradhana Raktadushti* and *Chirakari* manifestation. For excess vitiated *Dosha, Shodhana* is must. Clinical observation reveals that *Raktamokshana* among the *Shodhana* may provides better relief than other *Shodhana karma*. Ref from *Ashtanga Hridaya* is giving more weightage on this sentence, particularly when *Raktadhatu* is involved. *Susrutha* stated that *Raktamokshana* is not only purifies the channels, but also let the other parts becomes free from diseases and action is so fast than other remedies. *Susrutha* recommended *Jalaukavacharana* better for the superficial blood (*Avagadha grathita Rakta*). *Susrutha* has given great emphasis to *Jalaukavacharana* in the therapy for *Raktapradoshaja Vyadhi* (Blood originated disease), *Tridosha Prakopajanya* (vitiated all three-body humor) and *Chirakari* (chronic) diseases. *Chakrapanidatta* opines that *Shastra karma* is not advisable to expel out the blood as it may damage the *Sparshanendriya*. Among the *Anushastras* (Para surgical measures) *Vagbhata* considers *Jalauka* (leeches) as the best one that provide comfortable bloodletting.¹³

Jalauka expels out vitiated blood, very sharply from selected part of the body. So, Leech therapy (*Jalaukavacharana*) takes a pride of place in the list of *Panchakarma* like *Shodhana Chikitsa* from the sunrise of medical history. *Saliva of Jalauka*; containing properties of anti-coagulant, analgesic, anesthesia etc. are much helpful in removing congested blood from local lesion quickly and from general circulation also.

A medicinal leech is a small “factory” of biologically active substances, its actions on an alive organism are-

- Normalization and improvement of capillary circulation.
- Expressed anti inflammation effect.
- Anti-stressful and adaptogen effects.
- Blood purification effect by expel out the vitiated blood.
- Immune stimulation and immuno modulating effects.
- Improvement of an endocellular exchange.
- Early wound healing effect.

- Reduces the high blood pressure and blood viscosity.
- Positive haemopoietic effect.
- Anesthesia.
- Anticoagulation.
- Anti bacterial effect.

Amrita

It is *Rasayana* (General body tonic). It eliminates the toxic metabolites accumulated in the body. It maintains the level of white blood cells and builds up the body's defense mechanism, it is immune modulator. It inhibits bacterial growth and increase protective white cells and macrophages so it is effective in wound healing process.

Guggulu

It is *Lekhya, Ksharan, Klednashak* & reduces *Dhatwagnimandya*.¹⁴

CONCLUSION

Jalaukaavcharan and oral medicines do noticeable work in symptoms of Diabetes Foot Ulcer Which are prone to gangrene or amputation by its various properties. The outcome of study reveals the identical therapeutic efficacy of leeches and oral medicine in Diabetes Foot Ulcer.

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Table 1 Dushta Vrana lakshana according to different Acharyas are given below:¹⁵ -

<i>Susrutha</i>	<i>Charaka</i>	A.S	A.H
<p><i>Atisamvrita ativivruta atikatina or atimrudu utsanna avasanna atiseeta or ushna.</i></p> <p>Having one of the colors of <i>krushna rakta peeta sukla</i> etc. Filled with <i>pootipooya maamsa sira snayu</i> etc. moving in oblique track (<i>unmargi</i>) Having <i>amanoghna darsana, atigandha, veadanayuktha,</i> associated with <i>daaha paaka raga kandu sopho pidaka</i> etc discharging excessively <i>dushta sonita deetrgha kalanubandhi.</i></p>	<p>Mentioned 12 characteristic features indicating the advanced stages of morbidity of <i>vrana. svedatva avasanna, vartmatva, athisthoola varmathva, ati pinjaratva, neelatva, syaavata, ati pidakatva, rakta krushnatva, ati pootitva, ropyatva kumbhikamukhatva.</i></p> <p><i>Vranas with pooti gandha vivarna , bahu sraava, maharuja</i></p>	<p>Either <i>ati samvrutha or ativivrutha atimrudu or atikatina athyutsaadha avasadha atiseeta or ushna rakta krushna or pandutha</i> covered with <i>poothi maamsa, sira snayu</i> etc discharges <i>pooti pooya , daha , paka kandu svayathu vedana pitaka etc</i> appearing as <i>upadravas deergha kalanubandha</i></p>	<p>Either <i>samvrutha or vivrutha katina mrudu, atyutsanna avasanna atyushna atiseeta raktatva pandutva discharges pooti pooya covered with pooooti maamsa sira snayu</i> associated with <i>atiruk daha swayathu kandu and other complications deergha kalanubandhatha</i></p>