

DIABETIC FOOT ULCER – AN AYURVEDIC PERSPECTIVE**Dr. Indu P. P.***

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ABSTRACT

The greatest fear of diabetic patients is loss of eyesight and amputation. Diabetic foot is a quiet dread of disability with the ever dangling end of an amputation, thus makes the diabetic foot the most feared and devastating complication of diabetes. Current therapies have a limited success rate and fall short in addressing the micro vascular pathology present in diabetics. The circumstances have never been better for the preservation of diabetic lower extremity. The challenge is to get these patients back on their feet. So there is an urgent need for the proper understanding of pathogenesis of Diabetic foot as per the principles of Ayurveda for finding out a safe and effective Ayurvedic management. The concept of Prameha, Dushta vrana, Rakta dushti and Sonitha Mokshana are the key factors that should be addressed during the Ayurvedic management of Diabetic Foot.

KEYFACTORS: *Dushta vrana, Rakta Dushiti, sonata Mokshana.***INTRODUCTION**

Diabetes affects approximately 415 million people had diabetes worldwide,^[1] with type 2 DM making up about 90% of the cases.^[2,3] This represents 8.3% of the adult population,^[3] with equal rates in both women and men.^[4] In diabetic patients the problems involving lower extremities are common, affecting one out of four patients. Impaired wound healing is a major clinical problem in patients with diabetes and is the leading cause of lower extremity amputation. Diabetic foot ulcers (DFUs) are estimated to occur in 15% of people with diabetes,^[5] and precedes 84% of all diabetes-related lower-leg amputations.^[6] The triad of peripheral neuropathy, peripheral arterial disease and infection is responsible for foot problem. This triad leads to the final event of gangrene and amputation. 85% of leg amputations in diabetes are preceded by a trivial looking leg ulcer. In Ayurveda prameha has been described as a Mahavyadhi by all acharyas and 20 types of Pramehas are mentioned. According to Sangrahakara Prameha is a dreadful disease, because of arising from all three doshas, of being localised in the most vital organs, of persisting for a long time and of being accompanied with many complications.^[7] Vrana may be considered as an upadrava of Prameha. Pramehajanya vranas mostly fall in to the category of Dushta vrana. Current therapies have a limited success rate and fall short in addressing the micro vascular pathology present in diabetics. The circumstances have never been better for the preservation of diabetic lower extremity. The challenge is to get these patients back on their feet.

The moment a person with diabetes suffers a break in the skin of their foot, they become at danger for amputation. Most commonly, patients have neuropathy, which could be causative. When coupled with an impaired ability to fight infection, these patients become largely unable to mount an adequate inflammatory response. Thus, the DFU that may look like a healing wound becomes a portal for infection that can lead to sepsis and require limb amputation. Factors such as age, obesity, malnutrition n, and macrovascular and microvascular disease may contribute to wound infection and delayed wound healing especially in the type II diabetic patient. In addition, hyperglycaemia caused by decreased insulin availability and increased resistance to insulin can affect the cellular response to tissue injury. Studies of the immune cells necessary for wound healing, such as PMN leukocytes and fibroblasts, as well as studies of injured tissue suggest that there is a delayed response to injury and impaired functioning of immune cells in diabetes mellitus.^[8] There is evidence that these impairments may be the result of an inherent (genetic) defect as well as decreased insulin availability and increased blood glucose concentration.^[9] One undisputed structural change that occurs in people with diabetes is thickening of the basement membrane, the extracellular matrix (ECM) below the cells lining the vessels. This is a consistent finding in the capillaries and arterioles of people with diabetes.^[10]

Etiology of diadetic foot ulcer

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. In the pathogenesis of the Avaranajanya Madhumeha, the Kapha and Pitta are the main Dosha, whereas the most important Dushyas are Meda and Kleda. In Madhumeha, the Dhatukshaya is also predominant. Though Dhatukshaya pathogenesis leads to incurability while Avaranajanya pathogenesis can be disrupted. Here in the pathogenesis etiological factors mainly vitiate Kapha, Pitta and Meda. They in turn obstruct the path of Vata. Vyana the sub-component of Vata mainly perform the functions related to gati and transportation of various vital essence at required place. Obstruction to the path of Vata leads its aggravation causes severe depletion of vital dhatu. Oja carried out towards Basti. Along with this, vitiation of various body elements like Meda, Mamsa, Kleda, Vasa and Lasika occurs which causes various symptom and signs. Medadosha were also manifests as the disease progress. Moreover, according to Sushruta,^[11] the Dosha in the patients of Madhumeha accumulates in the lower part of the body owing to the incompetence of the Dhamanis. Complications arise 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^[12] has mentioned 7 types of Pidakas while Sushruta and Vagbhata^[13] have mentioned 10 types of Pidakas as complications of Madhumeha. 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,^[14] 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 venepuncture. If this is not observed, the swelling advances severely and produces pain and burning sensation. Then surgical interference and managed as prescribed for wound be employed. If this is not done, the pus tearing the interior creates a big cavity and become advanced and thus incurable.

Non suppurated boil should be treated like inflammatory swelling while the suppurated ones like the vrana. Vagbhatacharya mentioned Eladigana Taila for Vranaropana in Pramehajanya vrana.^[14]

According to Sangrahakara 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.^[16]

Vrana implies damage of the part leading to discolorations –hence the term Vrana.^[17] It is better understood in terms of discontinuity of skin, muscles, mucus membrane etc. According to onset of wound, pathogenesis and characters; it can be established in the form of Agantuja (Traumatic wound) & Nija (Ulcers) Vrana. Though no specific Samprapti regarding Vrana exists in any Ayurvedic text an attempt is made here to checkout a specific Aetiopathogenesis of the disease 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.

Pratamya Lakshana: Gatravicurnane.

Clinical presentation

Acharya Susrutha has given detailed description on the pathogenesis of vrana under vrana prasna adhyaya in Susruta Soothrasthana.^[18] 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. First type is sareera or nija, here the aggravation and vitiation of vata, pitta, kapha, rakta and sannipatha is the root cause of vrana. Second type is aganthu; here vrana is caused by the external forces in the form of fall, violence, burns, alkalies, poison, and drugs having penetrating action, weapons and attack by various animals including man. In addition to above said nidanas nija vrana occurs as a complication in Prameha, Kushta, Vidradhi, Vatarakta, Arbuda and Apachi.^[19] In aganthu vrana dosha vitiation will occur after initial stage.^[20]

If the aganthu vrana is not properly treated it reaches to the sixth stage of samprapti i.e., the Dushta vrana. Also Dushta vrana is the bhedavastha of diseases like prameha pidaka, vidhradhi, visarpa, kushta and many other similar diseases.^[21] 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 lakhana according to different Acharyas are given below.

Susrutha ^[22]	Charaka ^[23]	A.S ^[24]	A.H ^[25]
Atisamvruta ativivruta atikatina or atimrudu utsanna avasanna atiseeta or ushna. Having one of the colours of krushna rakta peeta sukla etc. Filled with pootipooya maamsa sira snayu etc. moving in oblique track (unmargi) Having amanoghna darsana, atigandha, veadanayuktha, associated with daaha paaka raga kandu sopho pidaka etc discharging excessively dushta sonita deetrgha kalanubandhi.	Mentioned 12 characteristic features indicating the advanced stages of morbidity of vrana. svedatva avasanna, vartmatva, athisthoola varmathva, ati pinjaratva, neelatva, syaavata, ati pidakatva, rakta krushnatva, ati pootitva, ropyatva kumbhikamukhatva. Vranas with pooti gandha vivarna , bahu sraava, maharuja	Either ati samvrutha or ativivrutha atimrudu or ati katina athyutsaadha avasadha atiseeta or ushna rakta krushna or pandutha covered with poothi maamsa, sira snayu etc discharges pooti pooya , daha , paka kandu svayathu vedana pitaka etc appearing as upadravas deergha kalanubandha	Either samvrutha or vivrutha katina mrudu, atyutsanna avasanna atyushna atiseeta raktatva pandutva discharges pooti pooya covered with poooooti maamsa sira snayu associated with atiruk daha swayathu kandu and other complications deergha kalanubandhatha

Treatment principle

The science of “Vrana Ropana” seems to be a serious matter of concern to the ancient healers. This fact can be very well understood while going through the surgical compendium – Sushruta Samhita where a good number of chapters deal with the science of Vrana alone. Similarly a sufficient number of recipes in one or the other form both for local as well as general use have been advocated

Acharya Sushruta has mentioned 60 upakramas for the treatment in vrana.^[26] In the treatment of vrana sopho, acharya mentioned 7 upakramas which are elaborately explained in the 60 upakramas.^[27] Acharya charaka has mentioned 36 upakramas for the treatment of vrana and explained samanya and visesha chikitsa.^[28] Acharya Susrutha described dushta vrana chikitsa^[29] as

- 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.^[30] Acharya Susrutha has advised to follow Dushtavrana Cikitsa for Meha kushta Vrana in Cikitsasthana sadyovrana Adhyaya.^[31]

Prameha janya dushta vrana is having Tridosha prakopa, pradhana Raktadushti and Chirakari manifestation. For excess vitiated Dosha, Shodhana is must.^[32] Clinical observation reveals that Raktamokshana among the Shodhana may provides better relief than other Shodhana karma. Ref from Ashtanga Hridaya^[33] is giving more weightage on this sentence, particularly when

Raktadhatu is involved. Sushruta 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.^[34] Sushruta recommended Jalaukavacharana better for the superficial blood (Avagadha grathita Rakta).^[35] Sushruta has given great emphasis to Jalaukavacharana in the therapy for Raktapradoshaja Vyadhi (Blood originated disease), Tridosha Prakopajanya (vitiated all three body humour) and Chirakari (chronic) diseases. Chakrapanidatta opines that Shastra karma is not advisable to expel out the blood as it may damage the Sparshanendriya^[36] Among the Anushastras (Para surgical measures) Vagbhata considers Jalauka (leeches) as the best one that provide comfortable bloodletting.^[37]

Wound healing represents a well orchestrated reparative response where biochemical energy supply is a basic requirement. The initial barrier to healing is an increased blood glucose level, which causes the cell walls to become rigid, impairing blood flow through the critical small vessels at the wound surface and impeding red blood cell permeability and flow. Impairment release of oxygen by hemoglobin results in oxygen and nutrient deficits in the wound. Oxygen is essential for the production of biological energy equivalents (e.g. adenosine triphosphate, ATP) in aerobic glycolysis, the citric acid cycle, and the oxidation of fatty acids. In healing tissue, sufficient oxygenation is particularly relevant because of the increased energy demand for reparative processes such as cell proliferation, bacterial defence and collagen synthesis. A less optimal immune function also contributes to poor wound healing in patients with diabetes. Over 100 known physiologic

factors contribute to wound healing deficiencies in individuals with diabetes. Hence there arises mans need to have an effective, easily available method which is having microcirculation restoration effect, for wound healing.

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. Dead cells with superficial layer are also been removed from the skin due to rubbing and bloodletting process. Moreover, regeneration of new vessels with pure blood circulation at the site of lesion, may clean up the real skin layer and so derangement of lesion like, Pidika, Kharata, Rukshata may reduce application of drug is not only given by orally, but also may others root of administration. Viz. parentally, nasal, intrathecal, intradermal etc Leech therapy has no properties like Langhana, Pachana, though it 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. Acharya Sushruta has described Jalauka under the heading of Anushastra (Para sharp instrument). The therapeutic effect is not only released by a loss of blood but also by the secretions, which the leech emits into the wound.

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 adaptogene effects.
- Blood purification effect by expel out the vitiated blood.
- Immuno stimulation and immuno modulating effects.
- Improvement of an endocellular exchange.
- Early wound healing effect.
- Reduces the high blood pressure and blood viscosity.
- Positive haemopoetic effect.
- Anesthesia.
- Anticoagulation.
- Anti bacterial effect.

CONCLUSION

In diabetic patients, microcirculatory damage is apparent in the skin and subcutaneous tissue, leading to impaired wound healing. An intact microcirculation is required for tissue nutrition, removal of waste products, inflammatory responses and temperature regulation therefore, logically any defect in micro vascular function adversely affects

tissue repair. Tissue oxygenation is a prerequisite for successful wound healing due to the increased demand for reparative processes. This scenario makes Acharya Susruta's concept of adopting Dushtavrana cikitsa for mehaja vrana, the most brilliant. Leech therapy (Jalaukavacharana) takes a pride of place in the list of Shodhana Chikitsa because 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. Dead cells with superficial layer are also been removed from the skin due to rubbing and bloodletting process. Moreover, regeneration of new vessels with pure blood circulation at the site of lesion, may clean up the real skin layer. Hence by this way Ayurvedic principle of Raktha sodhana especially the Jalukavacharana provides an effective, easily available method which is having microcirculation restoration effect, for wound healing.

REFERENCE

1. "Update 2015". ID F. International Diabetes Federation. p. 13. Archived from the original on, 22 March 2016.
2. Williams's textbook of endocrinology (12th). Elsevier/Saunders, 1371–1435. ISBN 978-1-4377-0324-5.
3. Shi, Yuankai; Hu, Frank B (7 June). "The global implications of diabetes and cancer". *The Lancet*, 2014; 383(9933): 1947– 8. doi:10.1016/S0140-6736(14)60886-2. PMID 24910221.
4. Vos T, Flaxman AD, Naghavi M, Lozano R, Michaud C, Ezzati M, Shibuya K, Salomon JA, Abdalla S, Aboyans V, et al. (15 December 2012). "Years lived with disability (YLDs) for 1160 sequelae of 289 diseases and injuries 1990–2010: a systematic analysis for the Global Burden of Disease Study". *Lancet*, 2010; 380(9859): 2163–96. doi:10.1016/S0140-6736(12)61729-2. PMID 23245607.
5. Brem, H.; Tomic-Canic, M. "Cellular and molecular basis of wound healing in diabetes" *Journal of Clinical Investigation*, 2007; 117(5): 1219–1222. doi:10.1172/JCI32169.PMC 1857239.PMID 174763 53.
6. Turns M "Diabetic foot ulcer management: the podiatrist's perspective". *Br J Community Nurs*, 2013; S14: S16–9. PMID 24796080.
7. Dr. Ravidutt Tripathi Ashtanga Sangraha cikitsasthana 14/25, The Vrajajivan Ayurvijnan Granthamala 6, Chaukhamba Sanskrit Pratisthan Ashtanga Sangraha cikitsasthana, 14/25.
8. Rosenberg CSWound healing in the patient with diabetes mellitus. *Nurs Clin North Am*, 1990; 25(1): 247-61.Pubmed.
9. Rosenberg CSWound healing in the patient with diabetes mellitus. *Nurs Clin North Am*, 1990; 25(1): 247-61.Pubmed.
10. Flynn MD, Tooke JE. Aetiology of diabetic foot ulceration: a role for the microcirculation. *Diabet Med*, 1992; 9: 320–329. [PubMed].

11. P.V Sarma, Susruta samhita Nidanasthana 6/4 (vol.2) chaukhambha Viswabharati haridas ayurveda series, 9.
12. P.V Sharma, charakasamhita sutrastana Chaukhambha orientalia, Varanasi, Jaikrishnadas ayurveda series 36 sutrastana, 17/83.
13. P.V Sarma Susruta samhita Nidanasthana 6/14 (vol.2) chaukhambha Viswabharati haridas ayurveda series 9; Prpf K. R srikandamurthy, Vaghbhatas ashtanga hridaya Nidanastana 10/24-25, chaukhambha krishnadas academy Varanasi, krishnadas ayurveda series, 27.
14. P.V sarma Susruta samhita cikitsasthana 12/3 (vol. 2); chaukhambha Viswabharati haridas ayurveda series, 9.
15. Prof. K. R srikandamurthy, Vaghbhatas ashtanga hridaya Cikitsasthana 12/38-40, chaukhambha krishnadas academy Varanasi, krishnadas ayurveda series, 27.
16. Dr. Ravidutt Tripathi Ashtanga Sangraha Cikitsastana 14/24, the Vrajajivan Ayurvijnan Granthamala 6, Chaukhamba Sanskrit Pratisthan.
17. P.V Sarma Susruta samhita Sutrastana 21/40 (vol.1) chaukhambha Viswabharati haridas ayurveda series, 9.
18. P.V Sarma Susruta samhita Sutrastana 21/40 (vol.1) chaukhambha Viswabharati haridas ayurveda series, 9.
19. P.V Sarma Susruta samhita Sutrastana 21/ 34(vol.1) chaukhambha Viswabharati haridas ayurveda series, 9.
20. P.V Sarma Susruta samhita Cikitsasthana 1/ 4(vol.2) chaukhambha Viswabharati haridas ayurveda series, 9.
21. P.V Sarma Susruta samhita Sutrastana 1/4 (vol.1) chaukhambha Viswabharati haridas ayurveda series, 9.
22. P.V Sarma Susruta samhita Sutrastana 22/7 (vol.1) chaukhambha Viswabharati haridas ayurveda series, 9.
23. P.V Sharma, charakasamhita cikitsastana 25/11, Chaukhambha orientalia, Varanasi, Jaikrishnadas ayurveda series, 36.
24. Dr. Ravidutt Tripathi Ashtanga. Sangraha. Utharasthana 29/4, the Vrajajivan Ayurvijnan Granthamala 6, Chaukhamba Sanskrit Pratisthan Ashtanga. Sangraha. Utharasthana, 29/4.
25. Dr. Ravidutt Tripathi Ashtanga. Sangraha. Utharasthana 25/2-4, the Vrajajivan Ayurvijnan Granthamala 6, Chaukhamba Sanskrit Pratisthan.
26. P.V Sarma Susruta samhita Cikitsasthana 1/8 (vol.2) chaukhambha Viswabharati haridas ayurveda series, 9.
27. P.V Sarma Susruta samhita Cikitsasthana 1/8 (vol.2) chaukhambha Viswabharati haridas ayurveda series, 9.
28. P.V Sarma Susruta samhita Sutrastana 17/ 17-18 (vol.1) chaukhambha Viswabharati haridas ayurveda series, 9.
29. P.V Sharma, charakasamhita Cikitsasthana 25/20 Chaukhambha orientalia, Varanasi, Jaikrishnadas ayurveda series, 36.
30. P.V Sarma Susruta samhita Cikitsasthana 2/86 (vol.2) chaukhambha Viswabharati haridas ayurveda series, 9.
31. P.V Sarma Susruta samhita Cikitsasthana 12/4 (vol.2) chaukhambha Viswabharati haridas ayurveda series, 9.
32. P.V Sarma Susruta samhita Cikitsasthana 2/94 (vol.2) chaukhambha Viswabharati haridas ayurveda series, 9.
33. P.V Sharma, charakasamhita Vimanastana 3/44, Chaukhambha orientalia Varanasi, Jaikrishnadas ayurveda series, 36.
34. Prof. K.R srikandamurthy, Vaghbhatas ashtanga hridaya Sutra stana 14/5 chaukhambha krishnadas academy Varanasi, krishnadas ayurveda series, 27.
35. P.V Sarma Susruta samhita Cikitsasthana 1/44 (vol.2) chaukhambha Viswabharati haridas ayurveda series, 9.
36. P.V Sarma Susruta samhita Sarirastana 8/25-26 (vol.2) chaukhambha Viswabharati haridas ayurveda series, 9.
37. P.V Sharma, charakasamhita Chakrapani on Charaka. Chikitsastana 7/54, Chaukhambha orientalia, Varanasi, Jaikrishnadas ayurveda series, 36.
38. Prof. K. R srikandamurthy, Vaghbhatas ashtanga hridaya Sutrastana 26/35 chaukhambha krishnadas academy Varanasi, krishnadas ayurveda series, 27.
39. P.V sarma Susruta samhita sutra sthana (vol.1) ni, saree, cik (vol.2), kalpa, uthara (vol.3) chaukhambha Viswabharati haridas ayurveda series, 9.
40. Prpf K.R srikandamurthy, Vaghbhatas ashtanga hridaya chaukhambha krishnadas academy Varanasi, krishnadas ayurveda series, 27.
41. Pv Sharma, charakasamhita, Chaukhambha orientalia Varanasi, Jaikrishnadas ayurveda series, 36.
42. Pv Sharma Chakradatta, Chaukhambha orientalia, Varanasi, Kashi Ayurveda Series, 17.