



AYURVEDIC PERSPECTIVE ON DIABETIC FOOT ULCERS: A CONCEPTUAL REVIEW

Mayur S Patil

Dr. Abhilasha
Lagad

ABSTRACT

Diabetic considering silent killer for human body, it affects body gradually if not taken medical care properly. Main complication of diabetic is its neuropathy in which patient does not having proper sensory pathway, minute trauma also can lead to big clinical tragedy i.e. amputation of foot after non healing ulcer. Diabetic ulcer can be due to neuropathy as well as ischemia also. More than 60% diabetic ulcers are results from neuropathy characterised by neurogenic ulcers. Consideration of signs and symptoms of diabetic ulcer, It can be understood as a *Dusta Vrana* or *Bheda* of *Prameha Pidika*. Ayurveda has mentioned broad term '*Vrana*' which covers all kinds of ulcers and wounds mentioned in modern science. As prevention is first aspect of Ayurveda, it is better if we can decode condition of diabetic ulcer as per Ayurveda terms and also get management for the same. Aim of this review article is to understand Ayurveda concepts of diabetic ulcer and its perspective of its management.

KEYWORDS : Ayurveda concept; Diabetic ulcer; *DustaVrana*; *PramehaPidika*.

INTRODUCTION

Diabetes is the leading cause of non-traumatic lower extremity amputations due to non-healing ulcers. The diabetic foot is one of the most significant and devastating complications of diabetes. It is defined as a foot affected by ulceration associated with neuropathy and/or peripheral arterial disease of the lower limb in a patient with diabetes. The prevalence of diabetic foot ulceration in the diabetic population is 4–10%, and the condition is more frequent in older patients. It is estimated that about 5% of all patients with diabetes present with a history of foot ulceration, while the lifetime risk of diabetic patients developing this complication is 15%.

The majority (60–80%) of foot ulcers will heal, while 10–15% remain active, and 5–24% finally lead to limb amputation within a period of 6–18 months after the first evaluation. Neuropathic wounds are more likely to heal over a period of 20 weeks, whereas neuroischemic ulcers take longer and more frequently result in limb amputation. Studies have found that 40–70% of all non-traumatic amputations of the lower limbs occur in patients with diabetes. Furthermore, many studies report that foot ulcers precede approximately 85% of all amputations performed in diabetic patients.

The risk of foot ulceration and limb amputation increases with age and the duration of diabetes. The prevention of diabetic foot is crucial, considering its negative impact on a patient's quality of life and the associated economic burden on the healthcare system. Diabetic foot ulceration is a major health problem, and its management involves a multidisciplinary approach. This review aims to provide an Ayurvedic concept for understanding these types of ulcers and a synopsis of Ayurvedic management strategies, spanning from prevention to treatment options.

Conceptual study of Diabetic ulcer

Key source for understanding of any kind ulcer is majorly found in Sushruta Samhita (Texts book of Ayurveda). Here, understanding can be started with broad term '*Vrana*', A concourse of deranged humours, affecting and appearing in a particular part of the body, is called an ulcer (*Vrana*) which is derived from the root "Vr" to cover and is so called from the fact of its covering a particular part of the body or from its leaving a cicatrix which remains the whole life time of the patient.⁹

Role of *Nidana* (Etiological factor) in manifestation of Diabetic Ulcer

Basic stratification of *Vrana* according to *Nidana* is *Nija* (Internal) and *Agantuj* (External).¹⁰ This concept can be matched up with modern concepts of pathological insult and traumatic cause of Ulcer/ Wound, with or without cellular death. Condition of non healing diabetic ulcer is emblematic of *Dustavrana* (Non healing ulcer). One more reference which is indicative of clinical conditions mentioned in diabetic ulcer, appellate as a *PramehaPidika*.¹¹ Classical texts describe manifestation of Diabetic ulcers either as a complication of *Madhumeha* or by direct *Tridosha* (*Vata*, *Pitta*, *Kapha*) *Dusti*. *Madhumeha* or *JanyaVrana* (Ulcer due to diabetes) are described as a very difficult to treat, because due to major *Dhatu* (major structural components of the body) vitiation, *OjaKshay* will occur and *Oja* is main nutritional source of the body elements.¹²

Considering *Agantuj Nidana*, any kind of external trauma will lead to discontinuity of any body tissue. Due to involvement of major number of *Dhatu* with *Tridosha* vitiation will hamper normal physiology of body organs. Normal body physiology with growing body elements are only necessity for wound healing, This aspect is indirectly mentioned by Acharya in prognosis section that *Vaidhya* (Doctor) can treat *Vrana* (Wound) very easily in *Vayastha* (Younger age), *Drutha* (Strong), *Prana vata* and *Satva vata*; these all are examples of healthy and growing state of body elements.¹³ That's why, in known case of *Prameha*, external traumatic wound will also converts in *DustaVrana* and become *Kasta Sadhya* (Difficult to treat).¹⁴

Role of *Dosha* and *Dushya* in manifestation of Diabetic Ulcer

Medo Dhatu is majorly involved in expression of *Prameha*¹⁵, which also carried in *Prameha Pidika* along with *Vasa Dushti* by *Tridosha*.¹⁶ *Tej*, *Paka* and *Raga Karma* of *Pitta* and *Puran*, *Ropan Karma* of *Vata* and *Kaphawill* overcome to discontinuity of *Vrana*, by doing localised *Pachan* of debris as well by *Puran* and *Ropan Karma* of *Dhatu*.¹⁷ This concept itself indicates that imbalance in such *Dosha* will lead to late healing as well bad scarring. Due to obstructions of *Rasayani* in *Prameh Rogi* (Diabetic patient), there will be hampered circulation of all *Dosha* including *Rakta* which is essential for *Puran karma*. So, it will ultimately leads to late healing of ulcers. This vitiated *Dosha* will further dovitation of *Dhatu*¹⁸ which are the essential part of block building.

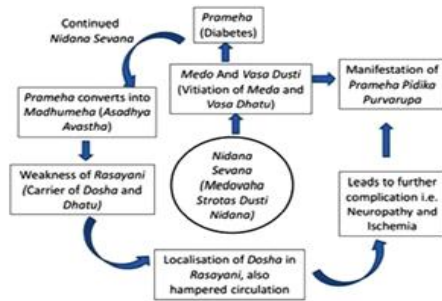
Role of *Rasayani* in manifestation of Diabetic Ulcer

Due to *Daurbalyath* (weakness) of the *Rasayani* (various vessels) in the patients of *Madhumeha* (diabetes), *Doshas* do

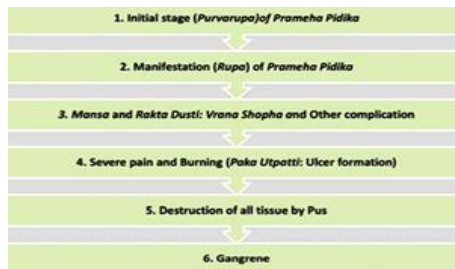
not move upwards and will be stagnated as a *Dushya* over that area and as a complication of it further disease manifestation will appear in lower parts of the body.¹⁹ Here, '*Rasayani*', it is a carrier of *Rasa*, *Pitta*, *Kapha*, *Rakta* according to Acharya Dalhan.²⁰ Some other Acharya also believes that '*Rasayani*' means '*Rasaharini*'.

By this reference, *Rasayani* can be considered as blood vessels or may be nerves. Due to *Doshasanchay* in *Rasayani*, it gets more weakened and not able to carry all necessary elements in aspect of supply as well drainage. This condition can lead to *Dhatu-kshaya* by means of ischemia, or neuropathy.

Samprapti of Diabetic ulcer according to Ayurveda²¹



Stages of Diabetic ulcer



Correlation of Various stages of Vrana with modern concepts

Table 1: Vrana Lakshana correlation with modern science

Vrana & Lakshana	Modern correlation
Dusta Vrana	Inflammatory Phase
	Callous Wound
	Non-Healing Ulcer
	Contaminated Wound
Mentioned in Table no. 2	
Shudhha Vrana	Proliferative Phase (Epithelization)
Not vitiated by Tridosha	No infective organism present
Shyavara Osthha (Due to Rakta Prasada)	Fibroblast activity with the production of collagen and ground substance (glycosaminoglycan and proteoglycans), and the re-epithelialisation of the wound surface.
Resembles Jihvatalaabha	Formation of granulation tissue, which consists of a capillary bed; fibroblasts; macrophages; and a loose arrangement of collagen, fibronectin, and hyaluronic acid.
Mruudu	Healthy granulation which touch on bleed
Snigdha, Shlakshan	Moisture due to serous discharge
Avedana, Nirasava	No Pain and no discharge other than

Samapridika	serous
Ruhyaman Vrana	Remodelling Phase
Kapota Varna	The remodelling phase is
Kleda Varjita	Sthira Pidika
Rudha Vartma	The tension that is exerted by the fibroblasts' attempt at contraction appears to stimulate the actin-myosin structures in their cytoplasm. So, no hypertrophical or contracted scar formation occur in healthy wound healing.
Agrathi	
Ashun- Arja	Inflammatory sign relieved and no pain
Twaksantvarna	Wound gap bridging occurs by centripetal movement of the whole thickness of the surrounding skin and reduces the amount of disorganized scar. Wound contraction appears to take place as a result of a complex interaction of the extracellular materials and fibroblasts.
Santal	

Table 2: Comparison of Dusta Vrana Lakshan with Modern science.

Category	Dusta vranalakshna	Modern justification
Shape of wound	Anyat	Vertical oval (Venous ulcer)
	Chakrasta	-
	Vridha	Circular (Tuberculous)
	Tribhuta	-
Number of wound	Other than above mentioned	Irregular shape (Malignant Ulcer)
	Not particular mentioned	Single: Not specified
		Multiple: venous ulcer
Margin	Vranosthika	Suggestive of acute inflammation or spreading ulcer
Edge	Atismurhatt, Unmargi	Undermined (tuberculous ulcer)
	Ativimurhatt	Everted or rolled out (Rodent ulcer)
	Utsanna, Anasanna	Raised and beaded (Malignancy or inflammatory condition)
	Utsangi	Punched out (Gummatous ulcer or trophic ulcer)
Discharge	Dushtashonit	Bloody opalescent/ Serosanguinous (Malignant)
	Pati-mava	Purulent (infective ulcer)
		Multiple - venous ulcer Yellowish/creamy (Sp. Staphylococcus infection)
Floor	Seems Amongdardhan and Bhairav due to Patimansa/ Pativiva	Slough / debris or Necrosis or Gangrenous tissue with foul smell
	mayu	

Smell	<i>Amoghghandha</i>	Unpleasant smell due to tissue degradation resulting from infective organism
Palpation	<i>Afishetya</i>	Decreased temperature (Ischemic ulcer)
	<i>Afishona</i>	Increased temperature (Acute inflammation)
	<i>Afishatma</i>	Induration due to malignancy resulting from fibrosis or bony base
	<i>Afishradhi</i>	Base of soft tissue

Management of Diabetic ulcer by Ayurveda

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 Sushruta's concept of adopting *Dusta-vranachikitsa* for *Mehajavrana*, the most brilliant. *Dusta Vranacana* can be considered as a broad terminology for all kinds of time taking or difficult to treat ulcers/wounds. Classics manifest its management aspects as a *Shasti-Upkrama*, and mentioned that clinical application should be done by own intellectual. Here all aspects are summarized, which are useful in the treatment of diabetic ulcer:

Rogi Pariksha (General Examination)

By performing a clinical examination of *Vrana* (wound) and *Vranit* (patient who is having wound), a conclusion can be made about *Dosha-Dushya Samurchhana* (involvement of *Dosha* and *Dushya*) and *Vrana Avastha* (stage of wound).²² (Management of uncontrolled diabetes) If diabetes is well controlled, then the only wound can be healed by local measures. So at the same time management of *prameha* (Systemic management of DM) is must simultaneously with wound management.²³

Vrana Chikitsa (Management of ulcer/ wound) Acharya Sushrutahad described a complete prescription for diabetic foot ulcer.²⁴

Utsadna: Aaragvadhadi Kashaya Parishechan:
Shalsaradi Kashaya Pan-bhojan: Pipalyadi Kashaya

Prashan: *Patha, Chitraka, Shangeshta, Kshudra, Bruhati, Sariva, Somvalk, Saptaparna, Aragvadhya, Kutajamula*. Protocol with sequence of ulcer management by *Shasti Upkrama* (60 measures) for *Vrana Chikitsa* (treatment of *Vrana*) is mentioned below.²⁵

Vrana shodhana (cleaning of wound) and Vrana ropana (Measures for tissue healing):

With the aim of wound care Acharya Sushruta mentioned many of herbs or herbo mineral combinations for a *Vrana Shodhana* and *Vrana Ropana* activities. For proper care of wound; it is essential to decrease microbial burden, removing unhealthy slough, necrotized tissue, and maintenance of wound moisture. Presence of replicating microorganism results in pus, foul smell and discharges leads to delayed wound healing. In Ayurveda texts *Vrana Shodhana* and *Ropana Upakrama* are mentioned to manage wound as wound care principle.

Appropriate cleaning agent is needed for each clinical entity. Elements used for *Sthanik Shodhana* purposes are various *Kashaya, Kalka* or *Avachurnana* of some drugs which contains properties of *Vrana Shodhana*.

With reference to *Sthanik Shodhana*, Leech therapy

(*Jalaukavacharana*) takes a pride of place in the list, because saliva of *Jalauka*; containing properties of anti-coagulant, analgesic, anesthesia, etc are much helpful in removing coagulated blood from local lesion quickly and also will help to improvise general circulation by doing macro debridement. 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 *Rakta Shodhana* especially the *Jalaukavacharana* provides an effective, easily available method which is having microcirculation restoration effect, for wound healing.

If wound cannot be cleaned by above mentioned *Shodhana* measures, surgical intervention is needed. For that among *Astavidh Shastra Karma* (8 type of surgical procedure), suitable surgical procedure should be carried out i.e. *Lekhan* (scrapping of slough), *Vistravana* (drainage of pus) etc. Many evidence based researches has been conducted to prove efficacy of Ayurvedic herbs which found effective for wound healing.²⁶

Measures for Asepsis

Concept of asepsis during wound care was originally come from ancient science which depicts awareness of microorganism and its effect on wound. Many aspects such as *Vrana Dhupana* (Fumigation of wounds), *Raksha Vidhana* (Surgical ward, instruments etc. should be sterilized by fumigating with *Guggulu* etc herbs and *Mantra Uccharana* to kill the small pathogenic organisms) and concept of *Krimighna Dravyas* were used for asepsis purpose of ward and procedure room. These ideologies are used to decrease bacterial load which is playing major role in delaying of the wound healing process.

Measures for healthy scar

Ayurveda is not only focusing on wound healing, it focuses on healthy wound healing with cosmetic scar. For sake of that purpose many procedures has been developed, which are ***Mrudu Karma*** (Softening procedures: Wound margins and edges are made soft with the help of various medications), ***Daaruna Karma*** (Hardening the margins of the wounds: Some wounds have less tensile strength so that the wound margin easily separate causing early dehiscence and wound healing delayed. To avoid long time wound healing, *Daaruna Karma* is done), ***Krushna Karma*** (Inducing black colour-Hypo-pigmentation area made normal like surrounding tissue), ***Pandu Karma*** (inducing white colour-Hyper-pigmentation area made normal like surrounding tissue).

Table 3: Different measures for the Management of diabetic ulcers according to different stages.

According to Acharya Sushrut ²⁷	Grading	Treatment according to Ayurveda ²⁸
	According to Wagner ²⁹	
<i>Puravanga</i>	Grade 0 (no ulcer in high risk foot)	<i>Antaranga</i> (procedure of alleviation of disease by depletion of bodily tissues)
<i>Vyadhi</i>	Grade 1 (superficial ulcer involving the full skin thickening but not underlying tissue)	<i>Ubhayat Sarvashodhana</i> (major purification therapy/ bio cleansing therapy/ detoxification therapy)
<i>Manasa Shonit Pradushya Shulpha</i>	Grade 2 (deep ulcer penetration down to ligament and muscle, but no bone involvement and abscess formation)	<i>Shiravaleha</i> (bloodletting with Vein puncture)
<i>Attoradha Shulpha, Rajya, Vidadhi</i>	Grade 3 (deep ulcer with cellulitis and abscess formation, often with osteomyelitis)	<i>Shashtamandhana, Vranavriya</i> (Wound debridement and dressing)
<i>Prayashyataravarnamandaryoutasangamaha utasaksh</i>	Grade 4 (localized gangrene)	<i>Asaditya</i> (Incurable)
	Grade 5 (extensive gangrene involving the whole foot)	

Recent Ayurvedic evidences for management of Diabetic foot ulcers

Wide acceptance of Ayurvedic treatment protocol indicates its effectiveness. Only theoretical concepts are not accepted in today's era, evidence based data is the only tool to make it

globally accepted. Ayurvedic science presents so many evidence of Ayurvedic management of such complicated clinical conditions. Some of highlights are presented over for management of diabetic ulcers/wounds

i.e. evidence found on Katupila²⁹ (*Securinega leucopyrus*), *Jatyadi taila*³⁰, *Panchvalkal Kashay*³¹, *Tiladilepa* and *TriphalaKashya*³², *Nimb Kalka*³³ and many more.

DISCUSSION

Being an ancient tradition science, Ayurveda is able to manage most of clinical conditions in better way, Just need to decode that science. All basic principles are mentioned very well in Samhita.

Just need to crack idea where to use which one. In this conceptual study effort has been made to understand diabetes ulcers in easy way with Ayurvedic approach.

CONCLUSION

Ayurveda is only science where one can get clear clinical picture and complete line of treatment. Here, Acharya Sushruta has given all kind of diagnostic tools and treatment for every clinical conditions of foot ulcer.

Treatment strategies for diabetic foot ulcer include metabolic control of diabetic mellitus, eradication of infection, promotion of ulcer healing, and removal of pressure from ulcer.

Ayurvedic medicines have been used for skin wounds, including foot ulcers and aim to clean heat and eliminate toxins, improve circulation and dispel blood stasis, and promote healing of wound. They can be used orally or topically.

REFERENCES

- Abbott CA, Carrington AL, Ashe H, North-West Diabetes Foot Care Study et al. The North-West Diabetes Foot Care Study: incidence of, and risk factors for, new diabetic foot ulceration in a community-based patient cohort. *Diabet Med.* 2002;19:377–384. doi: 10.1046/j.1464-5491.2002.00698.x.
- Centers for Disease Control and Prevention Lower extremity disease among persons aged ≥40 years with and without diabetes—United States, 1999–2002. *MMWR Morb Mortal Wkly Rep.* 2005;54:1158–1160.
- Lauterbach S, Kostev K, Kohlmann T. Prevalence of diabetic foot syndrome and its risk factors in the UK. *J Wound Care.* 2010;19:333–337
- Katsilambros N, Dounis E, Makrilakis K, Tentolouris N, Tsapogas P Atlas of the diabetic foot. 2. Oxford: Wiley-Blackwell; 2010.
- Moxey PW, Gogalniceanu P, Hinchliffe RJ, et al. Lower extremity amputations—a review of global variability in incidence. *Diabet Med.* 2011;28:1144–1153. doi: 10.1111/j.1464-5491.2011.03279.x.
- Lavery LA, Armstrong DG, Vela SA, Quebedeaux TL, Fleischli JG. Practical criteria for screening patients at high risk for diabetic foot ulceration. *Arch Intern Med.* 1998;158:157–162. doi: 10.1001/archinte.158.2.157
- Malgrange D, Richard JL, Leymarie F, French Working Group On The Diabetic Foot Screening diabetic patients at risk for foot ulceration. A multi-centre hospital-based study in France. *Diabetes Metab.* 2003;29:261–268. doi: 10.1016/S1262-3636(07)70035-6.
- Prompers L, Huijberts M, Schaper N, et al. Resource utilisation and costs associated with the treatment of diabetic foot ulcers. Prospective data from the Eurodiale Study. *Diabetologia.* 2008;51:1826–1834. doi: 10.1007/s00125-008-1089-6.
- Kaviraj Ambika Datt Shastri, Sushrut Samhita, Ayurveda Tattva Sandipika Hindi commentary, Chaukhambha Publication, Edition 2009, Part 1, Sutrastana 22/44
- Kaviraj Ambika Datt Shastri, Sushrut Samhita, Ayurveda Tattva Sandipika Hindi commentary, Chaukhambha Publication, Edition 2009, Part1, Chikista Sthan 01, page no-01
- Kaviraj Ambika Datt Shastri, Sushrut Samhita, Ayurveda Tattva Sandipika Hindi commentary, Chaukhambha Publication, Edition 2009, Part 2, Chikista Sthan 13
- Kaviraj Ambika Datt Shastri, Sushrut Samhita, Ayurveda Tattva Sandipika Hindi commentary, Chaukhambha Publication, Edition 2009, Part 1, Sutrastana.15/28
- Kaviraj Ambika Datt Shastri, Sushrut Samhita, Ayurveda Tattva Sandipika Hindi commentary, Chaukhambha Publication, Edition 2009, Part 1, Sutrastana.23/3
- Kaviraj Ambika Datt Shastri, Sushrut Samhita, Ayurveda Tattva Sandipika Hindi commentary, Chaukhambha Publication, Edition 2009, Part 1, Sutrastana.23/7
- Dhatudustilakshan
- Kaviraj Ambika Datt Shastri, Sushrut Samhita, Ayurveda Tattva Sandipika Hindi commentary, Chaukhambha Publication, Edition 2009, Part 1, nidan sthan.6/16
- Kaviraj Ambika Datt Shastri, Sushrut Samhita, Ayurveda Tattva Sandipika Hindi commentary, Chaukhambha Publication, Edition 2009, Part 1,

- Sutrastana.15/4-6
- Kaviraj Ambika Datt Shastri, Sushrut Samhita, Ayurveda Tattva Sandipika Hindi commentary, Chaukhambha Publication, Edition 2009, Part 1, Sutrastana.15/36
- Kaviraj Ambika Datt Shastri, Sushrut Samhita, Ayurveda Tattva Sandipika Hindi commentary, Chaukhambha Publication, Edition 2009, Part 1, Chikista Sthan 12/6
- www.woundeducators.com
- Kaviraj Ambika Datt Shastri, Sushrut Samhita, Ayurveda Tattva Sandipika Hindi commentary, Chaukhambha Publication, Edition 2009, Part 1, Chikista Sthan 12/8
- Kaviraj Ambika Datt Shastri, Sushrut Samhita, Ayurveda Tattva Sandipika Hindi commentary, Chaukhambha Publication, Edition 2009, Part 1, Chikista Sthan 01
- Kaviraj Ambika Datt Shastri, Sushrut Samhita, Ayurveda Tattva Sandipika Hindi commentary, Chaukhambha Publication, Edition 2009, Part 1, Chikista Sthan 12/4
- Kaviraj Ambika Datt Shastri, Sushrut Samhita, Ayurveda Tattva Sandipika Hindi commentary, Chaukhambha Publication, Edition 2009, Part 1, Chikista Sthan 12/10
- Kaviraj Ambika Datt Shastri, Sushrut Samhita, Ayurveda Tattva Sandipika Hindi commentary, Chaukhambha Publication, Edition 2009, Part 1, Chikista Sthan 01
- Dr. TS Dudhamal. Monograph on Vrana Ropan (wound healing) drugs in Ayurveda, 1st edition IPGT & RA, Jamnagar, March -2020. [ISBN - 978-81-943799-2-8]
- Kaviraj Ambika Datt Shastri, Sushrut Samhita, Ayurveda Tattva Sandipika Hindi commentary, Chaukhambha Publication, Edition 2009, Part1, Chikista Sthan 12/4
- www.woundeducators.com
- Snehal et al, Katupila (*Securinega leucopyrus*) A Boon for Bedsore- A Case Report, January 2021, *Journal of Natural Remedies* 20(4):198
- Management of Chronic Diabetic foot ulcer by Vimlapana with Jatyaditaila- A case report Ramesh Shivappa Killedar, Sharmistha Mandal, Pradeep Shahjirao Shinde, *Annals Ayurvedic Med.* 2018, 7 (3-4) 104-108
- Vislavath, Srikanth. (2019). Ayurvedic intervention in diabetic foot gangrene, *International journal of trend in scientific research and development*, 3. 515.
- Saurabh Et Al: Ayurvedic Intervention In The Management Of Diabetic Foot Ulcer – A Case Report. *International Ayurvedic medical Journal {online}* 2016 {cited 2016 July}
- Tripathy, Rabinarayan. and Nair, Saranya. and Lakshman, Vivek. and Raj, Shaithya. and Otta, Susmita, Wound-healing potential