

CASE STUDY

# Management of Diabetic Foot Ulcer and Diabetic Gangrene through Ayurvedic Intervention: A Case Report

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## ABSTRACT

Diabetes is one of the most complex illnesses requiring continuous medical care with multifactorial risk reduction strategies. Diabetic patients are prone to develop major foot complications like non-healing foot ulcer, cellulitis, abscess, gangrene and necrotizing fasciitis. Wound healing becomes a challenging task to biomedical science when associated with diabetic peoples. It becomes delay in diabetic conditions. Graded medical care like lowering blood sugar level, appropriate debridement of wound and treatment of infection, reducing friction and pressure and restoring adequate blood supply are the key measures for its successful management. In Ayurveda *Vranashodhana* and *Ropana* and *Pathya-Apathya* (diet and regimen) are preliminary step of wound management. In this study we have treated a case of diabetic foot associated with diabetic gangrene of 48 years female with *Vranashodhana* by *Panchavalakala* and *Triphalakwatha* followed by *Vranaropana* with *Jatyaditaila*, local bandage and some oral Ayurvedic medications. The patient is controlled diabetic under modern medications on doctor's prescription. The complete wound healing was achieved in 30 days and gangrenous condition of ankle totally resolved without any complications and side effects.

**Key Words** *Diabetic foot ulcer, Dushtavrana, Diabetic Gangrene*

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## INTRODUCTION

International Diabetic Federation (IDF) Atlas confirms that Diabetes is one of the fastest growing global health emergencies of 21<sup>th</sup> century. Now it is the major cause of morbidity and mortality worldwide and it is associated with devastating complications that affects the quality

of life. In 2021, approximately 537 million adults (20-79 years) are living with diabetes. The total number of people living with diabetes is projected to rise to 643 million by 2030 and 783 million by 2045.<sup>1</sup> People with diabetes usually report poorer health status compared to those not affected.

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Diabetes mellitus is a chronic and life-threatening metabolic disorder associated with multiple short-term and long-term complications affecting almost every system of the body. The increase in the prevalence of diabetes is accompanied by an increase in its complications and lower extremity amputations. Moreover, the risk of complications is 10 to 20 times higher in diabetics than nondiabetics.<sup>2</sup> The risk of foot ulcer is increased with age due to decreased inflammatory response, delayed macrophages and lymphocytes infiltration, delayed re-epithelization, delayed collagen deposition and angiogenesis. The burden of amputation is quite higher globally with one million amputation occurs every year, approximately one amputation every 30 seconds.<sup>3</sup> The concept of diabetes mellitus as known in biomedical science would reveal that this disease was fairly well known even in the classical period of Ayurveda with highly advanced manner.<sup>4</sup>

Diabetic foot ulcers are considered as *Madhumeha Janya Krichsadhya Dushtavrana* in encyclopedia of Ayurveda. *Dushta Vrana* is one in which there is localization of *Dosha* (morbid factors) that may lead to bad smell, has abnormal color with profuse discharge, intense pain and takes a long duration to heal.<sup>5</sup> Ayurveda has given detailed explanation of wound management starting from its pathogenesis, types, clinical features, complications and management. Acharya Sushruta has explained *Vrana* in details in the context of *Shashti Upakrama* (60

measures) for the comprehensive management of *Vrana*.<sup>6</sup>

This case report refers to a cost-effective management of wound on IPD basis with positive outcomes without any outward adverse effects.

## CASE PRESENTATION

### Case History

A female patient of age 45 years from Saranath, Varanasi reported to the OPD No. 22 *Kayachikitsa*, S. S. Hospital, IMS, BHU wing with chief complaints of non-healing wound on left great toe and blackish discoloration of over ankle region (left lateral malleolus) with gradual onset of 2 months associated with pain, swelling and pus discharge. She took the contemporary foot ulcer care and management but did not get effective response and the condition of wound had worsened day by day. So, she switched to *Ayurveda* management to prevent further complications.

She was a known case of diabetes mellitus type-2 and was already on modern antidiabetic medication. She was apparently healthy 2 months before. Sudden, she got mild external injury over dorsal aspect of great toe of left foot, which gradually increased and converted into wide open non-healing wound. After some days she also developed blackish discoloration over left ankle region (left lateral malleolus). She was suffering from fever, pain and swelling in affected foot. No other past medical, surgical and family history was there.

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On general examination, all the vitals were within normal limit. She was conscious, well oriented for time, place & person and no other abnormalities were found in systemic examination. Clinical findings of wounds suggested the case as a trauma induced diabetic foot ulcer and dry gangrene (*Madhumeha Janya Krichsadhya Dushta Vrana*) on the basis of diagnostic methods and prognostic values. [Table 2,3,4]. Grading of wound had been done according to Maggitt-Wagner classification-Grade 2. Ulcer extends to involve such structures as ligaments, tendons, joint capsule or deep fascia.

### Case Management

For 30 days, the case was managed according to *Ayurvedic* principles of wound management

**Table 1** Management Protocol

DATE	DAY	UPAKRAMA	DETAIL
8/2/2021	Day 0	Patient visited OPD, Indian Medicine Wing, IMS, BHU	Clinical assessment of the case and patient, admitted in IPD.
9/2/2021	Day 1	Cleaning and scraping of wound	Removing all infected, dead skin and pus.
	Day 1 to 30	Local- <i>Vrana Prakshalana</i>	Wound wash with <i>Panchvalakala</i> and <i>Triphalakwatha</i> .
	Day 1 to 30	Systemic- <i>Vrana RopanaAushadhi</i>	Internal Medicine- Oral Hypoglycemic drugs to be continued + <i>TriphalaGuggulu</i> 500mg- 2 BD <i>Gandhakarasyana</i> 500mg- 1BD with Lukewarm water.
	Day 1 to 30	Local- <i>Tail, Kavalika and Vrana Bandhana</i>	Dressing with <i>Jatyadi Taila</i> .

### Local management

Patient was managed through *Ayurvedic* principles by using wound *Prakshalana, Chedana, Lekhana, Ropana* and *Bandhana*. First day, efforts were made to clean the wound and removing all infected dead tissue, debris and pus. Wound wash was done with the help of *Panchvalakala* and *Triphalakwatha*. After

mentioned in table 1. Along with this, the conventional treatment was continued (Cap. Glimepiride 1 mg + Metformin hydrochloride 500mg twice a day after meal) till the complete course of treatment.

### Systemic management

Patient was advised to take some oral medicine and follow specialized diet plan for 30 days. Patient was prescribed to take *TriphalaGuggulu* 500mg in the dose of 2 tab twice a day, *GandhakaRasayana* 500mg in the dose of 1tab twice a day with Luke warm water after meal for 30 days. The conventional treatment of oral hypoglycemic was continued till the complete course of treatment. [Table 1]

that, *Jatyaditaila* (medicated oil), *Kavalika* (gauze piece application) was applied over the affected part and light *Vrana Bandhana* (bandaging) was applied on daily basis morning and evening for 30 days up to complete wound healing. All the management was carried out on IPD of *Kayachikitsaat* Sir Sunder Lal Hospital, IMS, BHU, Varanasi. During complete course of

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management, the patient was advised to avoid long time standing, unnecessary ambulation, bare foot walking and follow prescribed dietary regimen. After 30 days all oral medication (excluding oral hypoglycemic drug) were

stopped. Patient had been reported symptom free and had not developed any untoward effects during the course of regular hospital visit. [Table 1]

#### Assessment of case before and after treatment

**Table 2** Ulcer examination

SR. NO.	FEATURS	BEFORE TREATMENT	AFTERTREATMENT
1.	Site	Left toe ulcer	Healthy toe
2.	Size	Approx. 3.9*3.1*1.0 cm	Ulcer healed
3.	Margin	Inflamed, irregular	Absent
4.	Appearance	Open, non-healing	Healed
5.	Edema	Present	Absent
6.	Discharge	Sero-purulent	Absent
7.	Tenderness	++	Absent
8.	Itching	Mild	Absent
9.	Pulsation of Posterior Tibial artery of left lower limb	Feeble	Feeble
10.	Pulsation of Dorsalis pedis artery of left lower limb	Not feeble due to swelling	Feeble

**Table 3** Gangrene examination

SR. NO.	FINDINGS	BEFORE TREATMENT	AFTER TREATMENT
1.	Site	Left lateral malleolus	Healthy skin
2.	Size	Approx. 5.1*3.0cm	Healed
3.	Appearance	Dark black, dry, shrunken	Normal skin
4.	Margin	Clear line of separation	Absent
5.	Pain	Absent	Absent
6.	Discharge	No	No
7.	Sensation	Absent in affected area	Restore
8.	Progression	Slow growing	Stop, Healed

**Table 5** Investigations

SR. NO.	FINDINGS	BEFORE TREATMENT (8/2/2021)	AFTER TREATMENT (10/3/2021)
1.	TLC	12,500/cumm	10,590/cumm
2.	DLC	53/35/5.7/04/00	63/26/6/05/00
3.	Hb%	11 gm%	11.7 gm%
4.	ESR	32 mm/hr	18 mm/hr
5.	FBS	188 mg/dl	74 mg/dl
6.	PPBS	236.8 mg/dl	134 mg/dl

### RESULTS AND DISCUSSION

With the step wise management of the case as described in table 1, the complete wound healing was achieved in 30 days. Wound healing progress: On first consultation the patient was having non healing diabetic ulcer in left great toe with **Wagner's** classification **grade II** and

**diabetic gangrene.** With regular wound washing, cleaning and dressing with medicated oil, the DFU on left great toe [Figure 1] and diabetic gangrene over left ankle region (left lateral malleolus) [Figure 2] were completely healed by day 30 without any adverse effects. [Figure 1, 2]

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Figure 1 Ulcer



Figure 2 Gangrene

Wound healing is challenging task in biomedical science, while Ayurveda an indigenous system of medicine elaborately described the management of diabetes and its associated complication including *Dushta-varana*. Acharya Sushruta described *Shashti-Upakrama* to treat different type of *Vrana* including *Dushta-vrana*.

**Role of Panchavalakala Kwatha**– The ingredients are the bark of *Nyagrodha* (*Ficus bengalensis*), *Udumbara* (*Ficus glomerata*), *Ashvatha* (*Ficus religiosa*), *Parisha* (*Thespesia populanea*), *Plaksha* (*Ficus lacor*). It acts as *Rakta-Pittashamaka*, *Dahahara*, *Medohara*, *Shothhara*, *Shodhaka*, *Ropaka* and *Twakprasadaka*. It has high antimicrobial properties and high efficacy of quick recovery of wound and infections. Majority of the drugs are astringent in nature. It is very helpful in healing of ulcer due to presence of tannin, silica and

phosphorus. It has glycosides, flavonoids, gums and tannins which having anti-inflammatory action, reduces microbial loads and promote healing process by optimizing neo-angiogenesis and facilitating wound contraction.<sup>7</sup>

**Role of Triphala Kwatha**– The ingredients are *Amalaki* (*Embllica officinalis*), *Haritaki* (*Terminalia chebula*), *Bibhitaki* (*Terminalia bellirica*). It is effective in *Dushta-Vrana* by its *Shodhana*, *Ropana*, *Sravahara*, *Vedanahara* and *Rasayana* property. It inhibits bacterial growth. It also increases collagen, hexosamine and uronic acid, thereby promotes healing of infected dermal wound, increases thermal stability, water uptake capability, faster wound closure and improve tissue regeneration, inhibits endotoxins. It contains active compounds such as Gallic acid, Chebulinic acid, Ellagic acid, Tannin and polyphenols which are responsible for

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antibacterial, antifungal and immune stimulatory property. It reduces risk of infection and improves healing.<sup>8</sup> Experimental study reveals that intraperitoneal injection of *Terminalia chebula* (*Haritaki*) seed extract resulted in enhances wound healing in diabetic mice. In term of reduction of wound area in thirteen days as compare to control the wound closure was found to be maximum in the mice treated with 400mg/kg closeto *Terminalia chebula* extract.<sup>9</sup>

**Role of *Jatyadi Taila*** – *Jatyadi Taila* has been mentioned in the treatment of boils, wounds, burns, piles and fistula. *Jatyadi Taila* mentioned by Acharya Sharangdhara mainly contains – *Jati* – *Myristica fragrans*, *Nimba* – *Azadirachta indica*, *Patola* – *Stereospermum suaveolens*, *Naktamala leaf* – *Pongamia pinnata*, *Sikta* – Honey bee wax, *Madhuka* – *Glycyrrhiza glabra*, *Kushta* – *Saussurea lappa*, *Haridra* – *Curcuma longa*, *Daruharidra* – *Berberis aristata*, *Manjishta* – *Rubia cordifolia*, *Katuruhini* – *Picrorhiza kurroa*, *Padmaka* – *Prunus pudum*, *Lodhra* – *Symplocos racemosa*, *Abhaya* – *Terminalia chebula*, *Nilotpala* – *Nymphaea stellata*, *Tutthaka* – *Copper sulphate*, *Sariva* – *Hemidesmus indicus*, *Naktamalabeeja* – *Seeds of Pongamia pinnata*, *Taila* – Sesame oil. It has good Shodhana and Ropana properties.<sup>10</sup> It has antibacterial and anti-slough properties which facilitates wound healing by improving granulation tissue over the wound.<sup>11</sup>

**Role of *Triphala Guggulu***– The ingredients are *Guggulu* (*Commiphora mukul*), *Amalaki*

(*Emblika officinalis*), *Haritaki* (*Terminalia chebula*), *Bibhitaki* (*Terminalia bellirica*), *Pippali* (*Piper longum*). It acts as *Kledahara*, *Pachaka*, *Sravahara*, *Gandhahara*, *Rujahara* and *Shothahara*. It showed antibacterial activity in-vitro studies against gram positive and gram-negative organisms. It has found potent antibacterial activity along with anti-inflammatory and anti-atherosclerotic activity.<sup>11,12</sup>

**Role of *Gandhaka Rasayana*** – The ingredients are *Gandhaka* (*sulphur*), *Twak* (*Cinnamomum zeylanicum*), *Ela* (*Elettaria cardamomum*), *Tejpatra* (*Cinnamomum tamala*), *Nagakeshar* (*Mesua farrea*), *Guduchi* (*Tinospora cordifolia*), *Haritaki* (*Terminalia chebula*), *Amalaki* (*Emblika officinalis*), *Bibhitaki* (*Terminalia bellirica*), *Bhringaraja* (*Eclipta alba*) and *Ardraka* (*Zingiber officinale*). It has anti-biotic, anti-microbial, anti-inflammatory and blood purifier properties. Its antibacterial and anti-fungal activity was found in in-vitro study. It removes toxicity from blood and promotes wound healing by controlling infection.<sup>11,13,14</sup>

Recent evidences suggest that medicinal plants play a key role in the indigenous system of medicine for diabetes and in the related complications such as wound healing due to presence of natural antioxidant.<sup>15</sup> These medicinal plants contain a major group of antioxidative compounds i.e., phenolic glycosides, alkaloids, flavonoids, tannin and steroids. Phenolic glycosides significantly inhibit the

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generation of reactive oxygen species such as superoxide anion and hydrogen peroxide ( $H_2O_2$ ) that promote the delayed wound healing in diabetic condition. The constituents such as alkaloids, triterpenoids and tannins of the medicinal plants may play a major role in the process of wound healing in diabetic mice. Tannins and triterpenoids are also known to promote the wound healing process mainly due to their astringent and antimicrobial property,<sup>16</sup> which seems to be responsible for wound contraction and increased rate of re-epithelization.

therapy for the management of DFU & diabetic gangrene.

### CONCLUSION

No doubt biomedical sciences have oral hypoglycemic drug at one side and insulin therapy at others for the management of diabetics. But have no significant outcome for the management of DFU and diabetic gangrene. In this case, we concluded that regular washing & cleaning with *Panchavalakala Kwatha* & *Triphala Kwatha* and dressing with *Jatyadi Taila* promotes wound healing activity without any side effect. Further, *Triphala guggulu* and *Gandhakarasayana* drugs have used in this case potentiate the process of wound healing and exerts bio-balancing effect of *Tridoshas*. The case study had showed that non-healing diabetic ulcer and gangrene can be best treated with Ayurvedic approach. Overall, it is safe, cost effective and easy to apply without any side effects and it can be emerged as an adjuvant

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