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Ayurvedic Intervention in the Management of Post-Operative Diabetic Foot Gangrene – A Case Study

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ABSTRACT
Surgical procedures normally carry a risk of wound infection, excessive bleeding or tissue damage. Diabetes has higher risk of wound healing complications following surgery. Wound tends to require more time to heal due to poor blood circulation, nerve damage, or a compromised immune system. In such conditions, non-healing wounds can lead to osteomyelitis, sepsis and even death also. Ayurvedic literature has given detailed explanations on wound management from its manifestation to the complete healing, shown good results in Non-healing wounds. Acharya Sushruta, explained Shodana (purification), Ropana (healing) procedures for wounds with Ayurvedic formulations includes Panchavalkala Kashaya and Jatyadi Taila. This is a case of 45-years old male, diabetic presented with the complains of non-healing wound on 5th right toe with swelling, discharge, foul smell and blackish discoloration of skin, diagnosed as diabetic foot gangrene. Ray's amputation done and post-operative wound management was carried under Ayurvedic treatment procedures. Significant improvement seen in wound healing within a short period. In this case Panchavalaka Kashaya and Jatyadi Taila show its Shodhana and Ropana properties.

KEY WORDS: *Diabetes, Foot gangrene, Ayurvedic treatment, Panchavalkala Kashaya, Jatyadi Taila.*

INTRODUCTION
Diabetic Mellitus is a chronic clinical syndrome characterised by hyperglycaemia, due to deficiency or defective response of insulin. It was estimated that approximately 1% of world population suffers from Diabetes. A consequence of hyperglycaemia of Diabetes, every tissue and organ of body undergoes biochemical and structural alterations causes severe complications. A number of systemic complications may develop after a period of 15-20yrs. These late complications are largely responsible for morbidity and premature mortality. Diabetic foot ulcer is one of the infectious complication.[1] In this slight injury to the glucose laden tissue may cause chronic infection and ulcer formation. Ulceration in diabetes may be precipitated by ischemia due to diabetic atherosclerosis, infection or peripheral neuritis. [2]

Diabetes is linked to gangrene, which occurs as a complication of a pre-existing health condition. Gangrene happened, when lack of oxygenated blood causes tissue to die in some parts of body, often the hand or feet. In these cases, patient, who have an injury may not notice the dead tissue infection due to diabetic neuropathy. It is a serious condition results in amputation of limb.[3] Post-amputated wound management is serious problem in diabetic patients due to infection, wound becomes complicated and sometimes needs skin grafting.[4]

Ayurvedic literature has given detailed explanation regarding wound management starting from its pathogenesis, types, clinical features, complications and management. Acharya Sushruta mentioned the term Dushta Vrana which showed similar clinical features of the non–healing wounds according to present medical science. He explained 60 Upakramas(measures) for wound management from its manifestation to the complete healing, which shown good results in chronic wounds aka Dusta Vrana.[5]

The present case is diabetic foot gangrene which was amputated in SDM Hospital and post operative wound management carried under Ayurvedic wound treatment protocol.

CASE REPORT

This is a case of 45years old male, diabetic patient came to SDM Ayurvedic hospital with the **chief complaints of** – Blackish discoloration over the 5th right little toe for 4 days.

Pain during pressure on toe,
Foul smell with watery discharge,
Swollen, reddish discoloration over the ulcer since 5days

Associated symptoms: General weakness, numbness in the hands and feet, Irregular constipation since 1month.

History of present illness: The patient had noticed blackish discoloration, pain during pressure at toe and foul smelling with watery discharge at 5th right toe since 4-5days. The onset of symptoms was developed rapidly. Patient was not aware of changing in skin colour until pressure pain felt and noticed blackish discoloration on 5thright toe. After that, he went to allopathic hospital and diagnosed with diabetic foot gangrene of 5thright toe and suggested amputation by Diabetalogist. Patient refused and came to Ayurvedic hospital to seek conservative management.

Past history

He was known diabetic and on oral hypoglycaemic medications since 10 years, continued till today. He had previous history of amputation of 2nd toe of right foot, done 1year back in allopathic hospital due to chronic non-healing ulcer.

Personal history

Name :XYZ	Bala : Madhyama	B.P: 130/88 mm of Hg.
Age:45years	Sleep: Disturbed due to pain	P.R: 68/min.
Gender : Male	Appetite :Good	Weight:54kgs
Marital status : Married	Bowel: Irregular	Height:5.7ft
Occupation: Revenue officer	Addictions : No	

Systemic Examination: Not significant

Local Examination:

Site – over 5th right toe
Size - Length: 2.5 cm, Width: 1.6cm
Number : 1
Edge and margin –Inflamed with irregular border
Floor : Covered with slough and unhealthy granulation tissue
Base : Indurated
Discharge : blood stained pus discharge with foul smelling - on and off
Surroundings : Blackish in colour
Bleeding (-)
Tenderness : Present
Regional Lymph node : Not palpable.
Rogaadhishtanam: Adhahkayam (Twak, Mamsam, Asthi, Sira)
Avastha : Pakwam.
Provisional diagnosis: Dushta Vranam.
Clinical diagnosis: Dushta Vranam (diabetic foot gangrene)
Prognosis : Krichra Sadhyam.

Examination of Gangrene:

Symptoms such as claudication and rest pain are present.

Inspection:

Change in colour : Blackish in colour
Extension : Up to metatarsal
Signs of ischemia : Thinning of skin noted
Loss of subcutaneous fat

Trophic changes in nails such as-brittle nail with transverse ridges noted.
Burger's Angle was $>60^0$.

Palpation:

Skin temperature-cold
Capillary filling test-slow
Venous refilling time-12sec
Fuching test-negative, normal popliteal artery pulsation felt with oscillatory movements of foot.

TREATMENT

After careful examination and clinical findings, it is diagnosed as Dushta Vrana [gangrene wound] and patient admitted in surgical word of SDM hospital. A thorough counselling was done to the patient regarding severity of wound and future complications of gangrene. After consent of patient, Ray's

amputation procedure was performed on 5th right toe. Healing of amputated wound in diabetic patient is major challenge in practice. Patient has similar history of delayed wound healing during 2nd right toe amputation, which took 4 months to heal. The post-amputated wound was treated under Sushruta's Dushta Vrana management protocol. Based on need we performed Chedana, Bhedana, Shodana and Ropana measures from Sushruta's 60 Upakramas for this case. The management of amputated wound protocol summarized in table no.1. At the end of 2nd month wound healed completely without need of skin grafting with minimal scar formation. The details of treatment are explained in discussion.

Table No.1: Chronology of Treatment Protocol

Type of treatment	From—to	Intervention
Local	2.1.2018 to 12.1.2018	Panchavalkala Qwatha to wash wound
Local	5.1.2018 to 15.2.2018	Applied Jatyadi Taila over the wound
Systemic treatment	2.1. 2018 to 16.1.2018 Then again on 2.2.2018 to 16.3.2018	Tab Gandhak Rasayana 500 mg 2 BD
	2.1.2018 to 2.2.2018	Triphala Guggulu 250 mg BD

Local treatment

The wound was washed with the decoction of Panchavalkala Kashaya daily, which was made up of barks of Vata (Ficus bengalensis Linn), Udumbara (Ficus glomerata Roxb.), Ashwatha (Ficus religiosa Linn.), Parisha (Thespesia populenea Soland ex corea.) and Plaksha (Ficus lacor Buch-Ham). After washing the wound dried, then by aseptic technique Jatyadi Taila was applied daily up to complete heal.

Systemic treatment

Depending on symptoms and for better healing of wound following medications were given orally.

- Tab Gandhak Rasayana 500 mg 2 BD for 15 days with 15 days gap, repeated twice.
- Triphala Guggulu 250 mg BD for 1 month

Follow up advices

Advice to review every 7 days

Pathya: Shali, Patolam, Karavellaka, Amalaki.

Apathyam: Masha, sour and salty food, curd, oily and spicy foods and day sleep are adviced to avoid.

OBSERVATION AND RESULT

Healthy granulation tissue was formed within one week. Washing of the wound was continued with Panchavalkala Kashaya till the end as mentioned above. Healthy granulation tissue was observed after 10 days. The wound started to contract by filling of tissue from the base of wound day by day. The Jatyadi Taila dressing was continued till complete healing. on 31st day, it was observed that wound size was markedly reduced with normal skin coloration at the healed area. On the 50th day, the wound was healed completely with minimum scar tissue formation. It is observed that patient's associated symptoms also reduced markedly.

Figure 1: ***Diabetic foot gangrene before treatment***

Figure2: D*iabetic foot gangrene* after treatment

DISCUSSION

Diabetic foot ulcers (DFU) are a fairly common complication of Diabetes mellitus. These are two forms: Neuropathic ulcers and Ischemic ulcers, although most DFUs are a mixture of both. Neuropathic Diabetic Foot Ulcer is because of high blood sugar levels damaging the nerves known as peripheral neuropathy. As the incidence of Diabetes mellitus is increasing globally, increase in complications is also unquestionable. Overall 15% of individuals with Diabetes mellitus will have foot ulcer during their lifetime and the annual incidence is 2-3%. The general line of treatment includes antibiotics to treat infections, revascularisation if associated with ischemia, to improve the condition of the wound or ulcer by wound-bed preparation, topical applications, and removal of callus. Amputation is the last option for complicated wounds.[6] Foot gangrene is a frequent complication in diabetes mellitus. It results from various factors such as atherosclerosis, neuropathy, infection and angiopathy.[7] Gangrene happened, when lack of oxygenated blood to the tissue in some parts of body, often the hand or feet. In these cases, patients who have an injury may not notice the dead tissue infection due to Diabetic neuropathy. It is a serious condition results in amputation of limb.[8] As with any surgery, an amputation carries a risk of complications. Such as Wounds infection, Pain, Muscle weakness, contractures and Autonomic dysfunction. The frequent symptom is Oedema. Foot amputation in Diabetes, have challenging problem of healing in surgical practice.[9]

In Ayurvedic science, the comprehensive management of all Vrana(wounds/ulcer) were exclusively described by Acharya Sushruta under Shashti Upakrama (sixty procedures). He has explained wound from its different aspects right from the definition, causes, types and their management in detail. While describing the types of Vrana, mentioned the term Dushta Vrana which is having similar clinical features of chronic non-healing wounds according to present medical science. In the Vrana management along with Upakrama, lot of medications in different formulations for wound healing were explained.[10] The sixty measures are for wound management are incorporated in Sapta Vidha Upakrama. These 7 main procedures are carried when swelling of wound present. Vimlapana is done with thumb or bamboo reeds, i.e. local application of pressure. Avasechana done with Jalouka (leeches), Sringa, Alabu or Shastra, i.e. removing impure blood from wound. Upanaha done with poultice to induce paka of wound. Patana is a surgical or para surgical procedure used to remove slough from wound. Shodhana is one of the important procedures in wound management. Wound cleaning is done with medicated decoctions, paste, medicated ghee, oil etc. Ropana procedure done for wound healing. Medicated oil or ghee or honey or medicated churna used as dressing in ropana, usually done after shodana. Vaikrutapaha used after wound healing, known as cosmetic treatment do for the getting normal skin colour with hair growth.[11]

In the present study, we used Patana Karma to do amputation of 5th right toe. Shodana with Panchavalkala Kashaya and Ropana with Jatyadi Taila carried till the end of healing. Based on symptoms like constipation, skin itching and to control infection Triphala Guggulu and Gandhaka Rasayana given orally and healing of wound achieved within a short period.

ROLE OF PANCHAVALKALA KASHAYA

Panchavalkala is one of the ideal combinations for a vast range of therapeutics focused in Ayurveda like Vranaropana, Shothahara, Graahi, Visarpahara etc. It was prepared with barks of five trees viz. Vata (Ficus bengalensis Linn), Udumbara (Ficus glomerata Roxb.), Ashwatha (Ficus religiosa Linn.), Parisha (Thespesia populenea Soland ex corea.) and Plaksha (Ficus lacor Buch-Ham.). Researchers in recent and past evaluated that The barks of these plants contain anti-inflammatory, anti-bacterial and healing properties due to the presence of Tannin, Silica and phosphorus.[12] Extraction of barks of these plants reduced blood sugar in normal as well as in alloxan induced diabetic rabbits[13] and hypoglycaemic activity seen in albino rats.[14]

ROLE OF JATYADI TAILA

The wound dressing was done with Jatyadi Taila formulation, which has good Shodhana (cleansing) and Ropana (healing) properties as per Ayurvedic classics. This Traditional oil-based formulation acts as antiseptic, fungicidal and a good healer used in boils, cuts, wounds, burns, piles & fistula. Jatyadi Taila of SDM Pharmacy (udupi), Karnataka, India was used.

Jatyadi Taila ingredients: Jati – Myristica fragrans; Nimba – Neem – Azardirachta indica; Patola – Stereospermum suaveolens; Naktamala – leaves of

Pongamia pinnata; Sikta – Honey bee wax; Madhuka – Licorice – Glycyrrhiza glabra; Kushta – Saussurea lappa; Haridra – Turmeric – Curcuma longa; Daruharidra – Berberis aristata; Manjishta – Rubia cordifolia; Katurohini – Picrorhiza kurroa; Padmaka– Prunus puddum; Lodhra – Symplocos racemosa; Abhaya – Terminalia chebula; Nilotpala - Nymphaea stellata; Tutthaka – Copper sulphate; Sariva – Hemidesmus indicus; Naktamala beeja – Seeds of Pongamia pinnata; Taila & Water.[15,16] All of these dravyas(drugs) have anti- bacterial, anti-slough properties and the combined effect of all of them facilitated wound healing by improving granulation tissue. Nimba bark extract produced significant anti-inflammatory activity, aqueous extract of leaves decreased blood sugar in dogs.[17] Haridra has antibacterial activity against gram-positive and gram-negative organism and anti-inflammatory activity.[18] The leaf juice of Jati plant showed antibacterial activity against Staphylococcus Aureus.[19]

ROLE OF GANDHAKA RASAYANA

Gandhaka Rasayana is broad spectrum Ayurvedic antibiotic, anti-microbial, anti-inflammatory and is blood purifier also. The ingredients used in this formulation are Gandhaka(sulphur), Twak (Cinnamomum zeylanicum), Ela (Elettaria cardmomum), Tejpatra (Cinnamomum tamala), Nagakeshar (Mesua farrea), Guduchi (Tinospora cordifolia), Haritaki (Terminalia chebula), Amalaki (Phyllanthus emblica), Bibhitaki (Terminlia bellirica), Bhringaraja (Eclipta alba) and Ardraka (Zingiber officinale). A study was done for screening of antibacterial and antifungal activity of Gandhaka Rasayana. Its in-vitro antifungal and antibacterial activity was found that Gandhaka Rasayana solution in different concentrations showed a significant zone of inhibition against three strains of bacteria and four strains of fungi. As per classics, it acts on blood and skin. It removes toxicity from blood and promotes wound healing by controlling infection. Gandhaka Rasayana has known hepatotoxicity, therefore it cannot be given for longer period.[20]

ROLE OF TRIPHALA GUGGULU

It is a popular safe and effective formulation for mitigation of Tridosha, mainly Vatadosha. It was indicated in Shota (inflammation), haemorrhoids and in fistula treatment.

Contents of Triphala Guggulu are- Haritaki, (Terminalia chebula) Bibhitaki, (Terminala belerica) Amalaki, (Emblica officinalis) Pippali, (Piper longum) Suddha Guggulu (Commiphora mukul).[21] Components of Triphala Guggulu showed antibacterial activity in invitro studies against gram positive and gram negative organisms. Haritaki, Amalaki found to possess hypoglycaemic activity on glucose-induced hyperglycaemia in rats. Amalaki has found potent antibacterial activity along with anti-inflammatory activity and anti-atherosclerotic activity.[22]

CONCLUSION

Foot gangrene is a frequent complication in Diabetes mellitus. It results from various factors such as atherosclerosis, neuropathy, infection and angiopathy. The present case diagnosed as diabetic foot gangrene and after amputation of toe post-operative wound management carried under Ayurveda treatment. Shodhana and Ropana Karma carried with Panchavalkala Kashaya and Jatyadi Taila, showed significant improvement in wound healing.

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