

A Study of Papaya Dressings Efficacy in Management of Diabetic Ulcers

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Abstract:

Background: Prevalence of diabetes mellitus in adults is around 4th world wide and this means that over 150 million persons are affected. Diabetic foot problems are a common complication of diabetes. Diabetic foot problems increase the mortality and morbidity of the diabetic patients. Diabetic foot is the major cause of nontraumatic lower limb amputations. The patho-physiology of diabetic foot disease includes peripheral neuropathy, peripheral arterial disease and infection. These pathologies lead to development of ulceration, charcot foot, painful diabetic neuropathy, gangrene and amputation.

Materials and Methods: Source of subject was patients with diabetic ulcers admitted in the department of General Surgery at NRI Medical College and General Hospital, Chinakakani. A sample size of 50 patients who are admitted in the department of General Surgery. Initial management included empirical antibiotics, surgical debridement or amputation, control of glycemia with the help of physicians and then wound care with the help of papaya dressings.

Skin and seeds of the papaya were discarded and the flesh mashed into a paste. The pastes were applied to the wounds over a sterile gauze and covered with sterilized gauze pieces for dressing. Dressings were changed after every 48 hours.

Results: Healing time ranged from 18 to 29 days. Mean healing duration was 19.23 days with Standard Deviation (SD) of ± 3.624 . Majority of the patients (52%) had healing duration of 18 to 20 days.

Conclusion: Topical papaya dressing provides cost effective and favourable outcome in patients with diabetic foot ulcer by decreasing the healing duration, reducing surgical interventions.

Key Word: Enzymatic debridement; Papaya dressing; Diabetic ulcers; Diabetic foot.

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I. Introduction

Diabetes Incidence of diabetes mellitus in grownups is around 4th world wide and that means over 150 million persons are effected. [1,2] Diabetic foot ulcers are a common complication of diabetes. Diabetic foot increases the mortality and morbidity in diabetic patients. Diabetic foot is the commonest cause of nontraumatic lower limb amputations. The pathophysiology of diabetic foot ulcers include peripheral neuropathy, peripheral vasculopathy and infection. These pathologies together lead to development of ulcer, charcot foot, painful diabetic neuropathy, gangrene and amputation. [3] More than one third (33%) of diabetic patients are found to be at high risk for future foot ulceration.[4] Diabetic foot disease frequently leads to substantial long-term complications, imposing a huge socioeconomic burden.[5]

Among persons diagnosed as having diabetes mellitus, the lifetime risk of developing a foot ulcer is estimated to be 15%. Relative Risk of amputation is forty times sophisticated among persons with diabetes than with non-diabetics.

Diabetes Mellitus (DM) is a complex and complicated metabolic disorder with several components that share the phenotype of hyperglycemia. Different types of diabetes mellitus are due to an interaction of genetics and environmental factors. Factors contributing to hyperglycemia include reduced insulin secretion, decreased glucose utilization, and increased glucose production. [6] The metabolic abnormalities associated with diabetes mellitus cause secondary pathophysiological changes in multiple organ systems and impose an alarming burden on the person with diabetes and the health care system.

A high numeral of people with diabetes translates into a high burden of complications like Lower limb extremity complications and Microvascular, Renal, Cardiac, Ophthalmic, other systemic complications of diabetes. Lower limb extremity disease, peripheral neuropathy, peripheral vasculopathy, foot diabetic ulcers, infections, and lower extremity amputations are two times more common in the diabetic population compared to the non-diabetic population. [7]

These complications require hospitalization and may lead to disability among diabetic patients. The age-standardized disability-adjusted life year (DALY) rate for diabetes mellitus in India has increased by 39.6% during 1990-2016, which was the maximum rise among the major non-communicable diseases. [8]

II. Material And Methods

This study was carried out on patients of Department of general surgery at NRI Medical College and General Hospital, Chinnakakani, Andhra Pradesh from November 2019 to October 2021. A total 50 adult subjects (both male and females) were in this study.

Study Design: Prospective Observational Study

Study Location: NRI Medical College and Hospital, Chinakakani.

Study Duration: November 2019 to October 2021.

Sample size: 50 patients.

Subjects & selection method: The study population was drawn from diabetic patients who presented to NRI Medical College and General Hospital with diabetic ulcers and papaya dressings were done for every 48hrs after initial surgical debridement.

Inclusion criteria:

1. Chronic diabetic ulcers with slough.
2. Superficial and deep ulcers
3. wounds for which debridement is required for healing

Exclusion criteria:

1. Malignant ulcers
2. Conditions which impair wound healing as renal, hepatic, haematological conditions.
3. patients on steroids, immunosuppressive agents, radiation or chemotherapy.

Procedure methodology

Initial management included empirical antibiotics, surgical debridement or amputation, control of glycemia with the help of physicians and then wound care with the help of papaya dressing. Skin and seeds of the papaya were discarded and the flesh mashed into a paste. The pastes were applied to the wounds over a sterile gauze and covered with sterilized gauze pieces for dressing. Dressings were changed after every 48 hours. The wounds were declared healthy when they were filled with healthy granulation tissue and had epithelial growth on their edges. After that papaya dressings were discontinued and simple dressings without any medications were carried out till the complete closure of wound.

Statistical analysis

Data was presented as absolute numbers, mean, and standard deviation, or percentages. Patient characteristics were analysed using descriptive statistics. In all patients, Age, Sex, BMI, haemoglobin levels, HbA1c, Surface area of ulcer, Duration of hospital stay.

Data collected was analysed with percentages.

III. Result

Age ranged from 40 years to 70 years. Maximum number of patients was in the age group of 50 to 60 years. Majority were males (72%) with male to female ratio of 2.6:1. Males – 36(72%), Females – 14(28%)

Table 1: Age distribution

Age group	No. of cases	Percentage
1to10	-	-
11to20	-	-
21to30	-	-
31to40	6	12%
41to50	19	38%
51to60	21	42%
61to70	4	8%
71to80	-	-
81to90	-	-
91to100	-	-

Table 2: Demographic distribution

Sex	Number of patients	Mean age	Standard deviation	Minimum age	Maximum age
Male	36	50.64	7.22	35	65
Female	14	54.8	9.13	34	70
Total	50	51.82	7.94	34	70

Table 3: Grades of diabetic foot

Grade of diabetic foot	Number(percentage)
Grade II Diabetic Foot	28(56%)
Grade III Diabetic Foot	15(30%)
Grade IV Diabetic Foot	7(14%)

Table 4: Surgical procedures performed in patients with diabetic foot

Initial surgery performed	Number(percentage)
Debridement	38(76%)
Amputation and Debridement	12(24%)

Thirty eight patients (76%) were operated for debridement and 12 patients (24%) for amputations.

Table 5: Further surgeries

Further surgery after initial treatment	Number(percentage)
No Further Surgery	44(88%)
Debridement	4(8%)
Amputation	2(4%)

After the initial surgical treatment and dressing 88% needed no further surgery. Four patients (8%) were operated for further debridement and two (4%) patients were operated for amputations.

Table 6: Papaya dressing - duration in days

Duration in days	Frequency	Percentage
14	4	8%
16	8	16%
18	15	30%
20	11	22%
22	4	8%
24	4	8%
26	2	4%
28	2	4%

Healing time ranged from 18 to 29 days. Mean healing duration was 19.23 days with Standard Deviation (SD) of ± 3.624 . Majority of the patients (52%) had healing duration of 18 to 20 days.

IV. Discussion

Diabetic foot ulcers are a common complication of diabetes. The pathophysiology of diabetic foot ulcers include peripheral neuropathy, peripheral vasculopathy and infection. These pathologies together lead to development of ulcer, charcot foot, painful diabetic neuropathy, gangrene and amputation. [3]

Study results were reduction in wound size, wound disinfection and appearance of Granulation tissue. Early management comprised empirical antibiotics, surgical debridement or amputation, glycemic control with the help of physicians and then wound care with the help of papaya dressings. Skin and seeds of the papaya were castoff and the flesh mashed into a paste. The paste is applied to the wounds over a sterile gauze and roofed with sterilized gauze pieces for dressing. Dressings were altered for every 48 hours.

The wounds were acknowledged healthy when they were full with healthy granulation tissue and had epithelial growth on their edges. After that papaya dressings were withdrawn and simple dressings deprived of any medications were carried out till the complete closure of wound. Efficacy of papaya dressing was assessed in terms of peri wound cellulitis reduction and necrotic tissue to wound granulation. Granulating tissue was assessed by direct clinical observation by the appearance of pink/red, moist connective tissue comprised of new blood vessels.

Papaya induces development of healthy granulation tissue, as the fruit is rich in vitamin C which helps in conversion of proline to hydroxyproline which is a specific indicator of collagen content laid during wound healing. [9] It doesn't act on normal tissue as it acts only on tissues lacking α -1 antitrypsin plasmatic antiprotease that inhibits proteolysis in healthy tissues. [10] Papaya extract breaks down the biofilm defences, as

this biofilm gives protection to bacteria from ultraviolet rays and oxygenation. Bacteria in chronic wounds live within these biofilm communities protecting them from host immune response. [11] Other preparation in the market is papain urea chlorophylline copper complex which acts by inhibiting hemagglutination, inflammatory properties of protein degradation and decreases pain and wound odour. [12]

V. Conclusion

Treatment of Diabetic Foot Ulcer with multidisciplinary tactic can totally alter the clinical result in Diabetic Foot Ulcer. In this study it has been detected that Diabetic Foot Ulcer shows more fast de-sloughing with papaya dressing which is being attributed to different bioactive enzymes present in Papaya (*Carica papaya*), which are known as papain and chymopapain. Wounds treated with papaya dressing had a faster granulation tissue formation and is also a cost-effective choice for diabetic foot management.

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