

## Outcome of Management of Diabetic Foot Ulcers

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### Abstract

**Background:** To assess outcome of management of diabetic foot ulcer. **Methods:** Eighty- six diabetic patients (males- 54, females- 32) with occurrence of diabetic foot ulcers were enrolled and managed with collagen as primary dressing. It was covered with gauze and bandage and tape. The size of the ulcer was measured at 1 month and 2 months interval. **Results:** Mean age of patients was 45.8 years, duration of diabetes was 10. 2 years, Wagner grading 1 was seen in 5, 2 in 22, 3 in 36, 4 in 16 and 5 in 7. Fasting blood glucose level was 132.4 mg/dl and random blood glucose was 180.2 mg/dl. The mean size of ulcer was 10.2 cm<sup>2</sup> at 1 month and it decreased to 3.2 cm<sup>2</sup> at 2 months. Healing response was complete responders was seen in 62, partial responders was seen in 18 and non- complete responders were 6. A significant difference was observed (P< 0.05). **Conclusions:** Collagen dressing found to be effective in management of diabetic foot ulcer. A reduction in size of ulcer was achieved, hence collagen dressing can be used safely.

**Keywords:-** Collagen dressing, Diabetes, Wagner grading.

## INTRODUCTION

Diabetes is one of the most prevalent chronic diseases: in 2010, one study reported that 285 million adults worldwide had diabetes and this figure is projected to rise to 439 million by the year 2030.<sup>[1]</sup> Such a profound demographic shift is likely to yield a corresponding increase in the prevalence of diabetes chronic complications, including those in the lower extremity, the diabetic foot.<sup>[2]</sup>

It is estimated that the annual population-based incidence of a diabetic foot ulcer (DFU) ranges from 1.0% to 4.1%. The lifetime incidence may

be as high as 25%. Despite the efforts of conservative therapy, there will always be a percentage of ulcers that necessitate hospitalization.<sup>[3]</sup> These cases may require surgical debridement, resection of distal osseous and soft tissue structure, endovascular intervention, daily dressings, strict glycemic control, and intravenous antibiotic therapy for eradication of infection. Outcome measures are of two broad types: those that relate primarily to the ulcer and those that relate more to the patient.<sup>[4]</sup> Ulcer-related outcome measures are commonly used in clinical trials and are appropriate for studies designed to assess either

the efficacy or the effectiveness of interventions directed to improving wound healing. Such ulcer-related outcome measures include healing, a change in ulcer area, and resolution of the ulcer by amputation.<sup>[5]</sup> Several new treatment strategies have been developed to stimulate wound healing in the diabetic foot ulcers. These are topical growth factors, extra cellular matrix products, bioengineered human skin, hyperbaric oxygen therapy, granulocytes macrophage colony stimulating factors and collagen granules.<sup>[6]</sup> Collagen is a main structural protein component of connective tissue. There is a growing body of knowledge about the biochemical aspects of collagen and its role in wound healing. Collagen is available as spherical hydrophilic particles of collagen, 0.1 to 0.3 mm in diameter. It is available as 5, 10, 15 ml packets.<sup>[7]</sup> Considering this, the present study was started with the aim to assess outcome of management of diabetic foot ulcer.

### MATERIAL AND METHODS

A total of Eighty- six diabetic patients (males- 54, females- 32) with occurrence of diabetic foot ulcers were enrolled with the written consent of all. The research proposal was approved from institutional ethical review and clearance committee.

Laboratory tests performed were glycated hemoglobin, fasting blood glucose, random blood glucose. Antibiotic was instituted when there were clinical signs of infection. Those with a superficial skin ulcer were treated conservatively by local debridement. Collagen was applied as primary dressing. It was covered with gauze and bandage and tape. The size of the ulcer was measured at 1 month and 2 months interval. Results of the study was tabulated and subjected to statistical inference, where level of significance was set significant below 0.05.

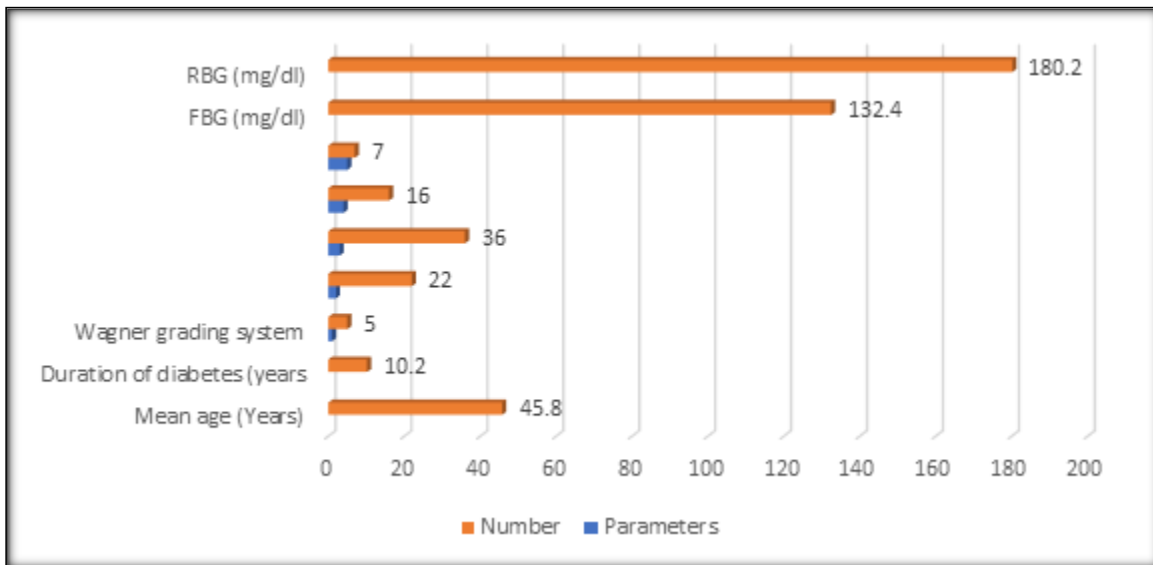
### RESULTS

Mean age of patients was 45.8 years, duration of diabetes was 10.2 years, Wagner grading 1 was seen in 5, 2 in 22, 3 in 36, 4 in 16 and 5 in 7. Fasting blood glucose level was 132.4 mg/dl and random blood glucose was 180.2 mg/dl [Table 1, Figure 1].

The mean size of ulcer was 10.2 cm<sup>2</sup> at 1 month and it decreased to 3.2 cm<sup>2</sup> at 2 months. Healing response was complete responders was seen in 62, partial responders was seen in 18 and non-complete responders were 6. A significant difference was observed ( $P < 0.05$ ) [Table 2, Figure 2].

**Table 1:** Patient characteristics

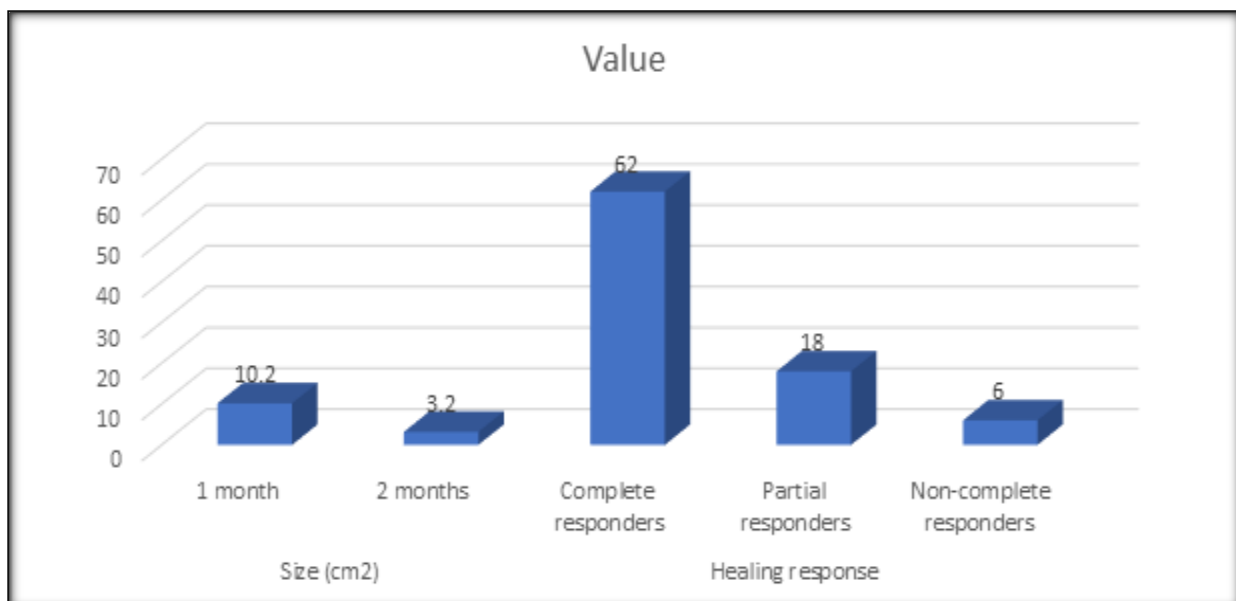
Variables	Parameters	Number
Mean age (Years)		45.8
Duration of diabetes (years)		10.2
Wagner grading system	1	5
	2	22
	3	36
	4	16
	5	7
FBG (mg/ dl)		132.4
RBG (mg/ dl)		180.2



**Figure 1: Patient characteristics**

**Table 2: Outcome of management**

Variables	Parameters	Value	P value
Size (cm <sup>2</sup> )	1 month	10.2	<0.05
	2 months	3.2	
Healing response	Complete responders	62	<0.05
	Partial responders	18	
	Non-complete responders	6	



**Figure 2:**

## DISCUSSION

The present study was started with the aim to assess outcome of management of diabetic foot ulcer. We studied 86 diabetic foot ulcers patients of both genders. Diabetic foot ulcers are the result of a fierce interplay between vascular, neurological and musculoskeletal alterations, causing high forces and huge pressures on the foot.<sup>[8]</sup> As the number of people developing diabetes increases, so does the relative risk of developing long-term complications of the disease. The microvascular and macrovascular changes, which precede diabetic retinopathy, central cardiac disorders.<sup>[9]</sup>

Callus surrounding the foot ulcer inhibits wound drainage and closure, and prevents the migration of epithelial cells across the base of a wound, which delays wound healing and leaves the patient at risk of infection for longer.<sup>[10]</sup> Several approaches exist for the debridement of diabetic foot ulcers, yet there is little evidence to support one method over another, and the requirements vary greatly from patient-to-patient.<sup>[11]</sup> Despite the lack of evidence, sharp debridement is commonplace in diabetic foot ulcer management protocols, and is supported by experiential evidence and belief among professionals regarding the benefits to wound healing.<sup>[12]</sup> New topical dressings are emerging that may improve wound care. Such dressings are designed to modulate levels of biological molecules, such as growth factors, that may promote wound healing.<sup>[13]</sup>

It was seen in our study, mean age of patients was 45.8 years, duration of diabetes was 10. 2 years, Wagner grading 1 was seen in 5, 2 in 22, 3 in 36, 4 in 16 and 5 in 7. Fasting blood glucose level was 132.4 mg/dl and random blood

glucose was 180.2 mg/dl. Abbott et al,<sup>[14]</sup> reported that more than 2% of diabetic patients will develop new foot ulcers annually. The prevalence of DFU varied between 4% and 20.4% among hospital-based studies in individuals with diabetes. According to some authorities, diabetic foot problems are responsible for 23–50% of the hospital bed occupancies by diabetic patients.

We found that the mean size of ulcer was 10.2 cm<sup>2</sup> at 1 month and it decreased to 3.2 cm<sup>2</sup> at 2 months. Healing response was complete responders was seen in 62, partial responders was seen in 18 and non- complete responders were 6. Pemayun et al,<sup>[15]</sup> determined the disease burden in terms of clinical profile and outcome of diabetic foot ulcer (DFU) admissions at a tertiary care hospital. Foot problems accounted for 16.2% of total diabetic admission (n = 1429). All patients had type 2 diabetes with no gender predominance. The mean age was 54.3 ± 8.6 years and diabetes control was very poor. Before admission, the ulcers had already developed for 4.7 ± 2.9 weeks; however, the majority of patients were unaware of the preceding causes. Ulcers were neuropathic in 42.2% of cases, neuroischemic in 29.9%, and pure ischemic at lesser percentage. More than 70% of ulcers were in Wagner grade ≥3 with infection event in nearly all patients. The most common isolates from culture were Gram-negative bacteria. A total of 98 (36.3%) lower extremity amputations (LEAs) at various level of the foot were carried out, including major LEA in 24 patients and multiple amputations in seven patients. Mortality rate due to DFU reached 10.7%.

Munish et al,<sup>[16]</sup> compared the efficacy of collagen granules in diabetic foot ulcers. 50

patients were divided into 2 groups of 25 patients each. One group received collagen dressing and the other group received standard saline dressings. The wound was reviewed on weekly basis for the maximum period of 12 weeks or till the wound healed spontaneously (whichever was earlier). They found collagen dressing to have statistically significant impact

on the ultimate outcome (healing) in diabetic foot ulcers.

## CONCLUSIONS

Collagen dressing found to be effective in management of diabetic foot ulcer. A reduction in size of ulcer was achieved, hence collagen dressing can be used safely.

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