Original Research Article

Comparative study between collagen dressings with non-collagen dressings on clean surgical wounds

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Abstract

Background: Abnormal wound healing becomes evident when optimized local and systemic conditions are absent, leading to a "non-ideal" wound-healing environment. Acute wounds have the potential to progress from the acute wound to chronic wounds.

Objective: To compare the efficacy of collagen granule dressings with that of non-collagen or conventional dressings in terms of healing time, number of dressings, size of wound, pain, healing quality like scar formation and the complications like seroma in clean surgical wounds.

Material and methods: A hospital-based, prospective, comparative, controlled study at the surgical wards. Data regarding various surgical procedures and wound dressing in patients admitted in the Surgery Department was analyzed.

Results: A total of 70 patients undergoing dressing for clean surgical wounds were studied. Sample size was calculated. Wound area on day one, seven, 14, 21 and 28 after dressing in group CL and group CV were compared.

Conclusion: Treatment of collagen granule dressings in clean surgical wounds is highly efficacious in terms of wound healing, lower pain related to wound, lower healing time, less number of dressings and good appearance of scar and minimal complications compared to non-collagen (Betadine) dressings.

Key words

Collagen dressings, Non-collagen dressings.

Introduction

Proteins are the natural polymers, which make up approximately 15% of the human body. Amino acids are the building blocks of all proteins. Collagen is the major protein of the extracellular matrix. The key characteristic of all collagen molecules is their strong, triple-stranded helical structure. Types I, II, and III are the three main types of collagen found in the connective tissue and constitute 90% of all the collagen in the human body. It is obvious that collagen controls many cellular activities including maintenance of cell shape and differentiation, migration, and synthesis of other proteins [1-3]. Hence, collagen plays a central role at each stage of wound healing. Collagen granule dressing has better advantage over conventional dressing in terms of early collagen formation with greater reduction in inflammatory cells thus, resulting in decreased days of healing, whereas others have minimal collagen formation, high grade of inflammation with maximum exudates formation resulting in increased days of healing. They have another advantage over conventional dressings, in terms of non-immunogenic, non-pyrogenic, being natural, easy application, hypo-allergic and pain free [4, 5].

Materials and methods

It was a hospital-based, prospective, comparative, controlled study among 70 patients undergoing dressing for clean surgical wounds who visited the surgical department from January 2019 till December 2019.

Inclusion criteria

- Patients of either sex aged between 20 to 60 years.
- Patients undergoing various surgical procedures.
- Patients with only clean wounds that is, wound of any etiology, which is free of infection.
- Patients with type 1 or type 2 diabetes with controlled glycemic levels.

Exclusion criteria

- Any clinical signs of infection.
- Any concurrent illness or a condition that may interfere with wound healing (for example, carcinoma, vasculitis, connective tissue disease, or an immune system disorder).
- Any known current abuse of alcohol, smoking or other drugs or treatment with dialysis, corticosteroids, immunosuppressive agents, radiation therapy, or chemotherapy at a dose that may interfere with wound healing, within the last thirty days before the study enrollment.
- Any known hypersensitivity to any of the dressing components.

Methodology

Patients fulfilling the selection criteria were interviewed for demographic data and clinical symptoms. Further they were subjected for clinical examination followed by detailed wound examination for appearance, size, presence of discharge and surrounding skin. The following investigations were done-CBP, HIV, HbsAg, Blood sugar levels, renal function test, Liver function test, Imaging techniques: Color Doppler of the limb - arterial and venous. Microbiological: Culture and sensitivity with swab taken from wound. All these findings were recorded on a predesigned Proforma.

Informed consent

The patients fulfilling selection criteria were informed about the nature and purpose of the study and counseled regarding their disease, the need for dressing and follow up plan. A written informed consent was obtained prior to the enrolment.

Ethical clearance

The study was approved from the Ethical and Research Committee (IEC), Government General Hospital, Nizamabad.

Results

A total of 70 patients undergoing dressing for clean surgical wounds were divided into two

groups of 35 each as Group CL (treated with collagen granule dressing) and Group CV (treated with non-collagen (Betadine) dressing). The data was analyzed and the final results were interpreted.

Wound area on day one, seven, 14, 21 and 28 after dressing in group CL and group CV were comparable (p>0.050). The wound area after treatment was significantly low in group CL (6.09±1.147 vs 7.81±0.83 cm2; p<0.001). Pain scores on day one and day seven after dressing in group CL and group CV were comparable but on day 14 (0.42±0.50 vs 0.97±1.01; p=0.007), day 21 (0.08±0.28 vs 0.57±0.85; p=0.003), and day 28 (0.00±0.00 vs 0.28±0.66; p=0.016), the mean pain scores were significantly low in group CL compared to group CV.

The mean healing time (5.52±1.42 vs 7.78±1.16; p<0.001), and number of dressings required (10.34±2.07 vs 12.68±4.06; p=0.004), were significantly low in group CL compared to group CV. Majority of patients in group CL (85.71%) had good appearance of scar compared to 62.86% of the patients in group CV. (p=0.054). The rate of complications was high in group CV (11.43%) compared to group CL (2.86%) (p=0.164).

Discussion

The present hospital based, prospective, comparative, controlled study was performed in the department of general surgery, Government General Hospital, Nizamabad, from January 2019 till December 2019. A total of 70 patients undergoing dressing for clean surgical wounds were divided into two groups of 35 each as Group CL (treated with collagen granule dressing) and Group CV (treated with non-collagen (Betadine) dressing).

In the present study, male preponderance was noted as most of the patients in group CL and CV were males. (62.86% vs 57.14%) with the male to female ratio of 1.69:1 compared 1.33:1 respectively. The male preponderance observed in the present study can be explained by exposure to outdoor activities. However, this difference was statistically not significant (p=0.626) suggesting that both the groups were comparable in terms of sex distribution. The common age group was 51 to 60 years in both the groups that, is, 51.43% of the patients in group CL and 54.29% of the patients in group CV. However, this difference was statistically not significant (p=0.493). Further the mean age in group CL was 47.48±11.88 years compared to 49.88±8.71 years in group CV. However, this difference was statistically not significant (p=0.514) suggesting that both the groups were comparable in terms of age. These observations suggest that both the groups were comparable in term of demographic characteristics ruling out the possible bias in the study results.

In this study, diabetes mellitus was the common comorbidity noted in group CL and group CV (25.71% vs 31.43%). However, the comorbidities noted in both the groups were comparable (p=0.395). These observations suggest that, both the groups were comparable in terms of medical history. The association between cigarette smoking and delayed wound healing is well recognized in clinical practice, although extensive controlled studies have yet to be performed. The documented effects of the toxic constituents of cigarette smoke-- particularly nicotine, carbon monoxide, and hydrogen cyanide--suggest potential mechanisms by which smoking may undermine expeditious wound repair [6-8]. Nicotine is a vasoconstrictor that reduces nutritional blood flow to the skin, resulting in tissue ischemia and impaired healing of injured tissue. Nicotine also increases platelet adhesiveness, raising the risk of thrombotic microvascular occlusion and tissue ischemia. In addition, proliferation of red blood cells, fibroblasts, and macrophages is reduced by nicotine. Carbon monoxide diminishes oxygen transport and metabolism, whereas hydrogen cyanide inhibits the enzyme systems necessary for oxidative metabolism and oxygen transport at the cellular level. Slower healing has been observed clinically in smokers with wounds

resulting from trauma, disease, or surgical procedures. Compared with nonsmokers, smokers have a higher incidence of unsatisfactory healing after face-lift surgery, as well as a greater degree of complications following breast surgery. Smokers should be advised to stop smoking prior to elective surgery or when recovering from wounds resulting from trauma, disease, or emergent surgery [9-11]. Furthermore, tissue injury due to acute and chronic alcohol consumption has extensive medical consequences, with the level and duration of alcohol exposure affecting both the magnitude of injury and the time frame to recovery. While the understanding of many of the molecular processes disrupted by alcohol has advanced, mechanisms of alcohol-induced tissue injury remain a subject of intensive research. Alcohol has multiple targets, since it affects diverse cellular and molecular processes. Some mechanisms of tissue damage due to alcohol may be common to many tissue types, while others are likely to be tissue specific. Considering these facts in this study, patients with history of smoking and alcohol consumption were excluded.

Although, patients with clean wound were enrolled, a few developed infection in the course of treatment which was found in routine management i.e., check for culture and sensitivity of wound on every 4^{th} day, 17 which might be due to nosocomial or opportunistic infections as most of the patients enrolled were with some comorbidities (commonly diabetes mellitus) [12].

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