

ROLE OF COLLAGEN DRESSING IN CHRONIC WOUNDS

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Abstract

Background: Chronic wounds lead to significant and prolonged stress due to non-healing collagen, which plays an important role in healing because it is structurally and functionally a key protein of the extracellular matrix and is also involved in scar formation. **Materials and Methods:** The 85 patients with chronic wounds were studied. Histopathological, biochemical, and microbiological tests were carried out to rule out the aetiology of wounds. Collagen particles of bovine origin were used. The measurement of ulcer size and area was done by putting a transparent plastic cover over the ulcer. Initial debridement was done in the case of unhealthy wounds with extensive sloughing. Collagen particles were sprinkled sufficiently to cover the wound surface. Healing was observed before 7 weeks. **Result:** In the study of aetiology, the highest was type-II DM 28 (32.9%), and the least was tubercular ulcer 3 (3.52%). In the study of complications, the highest prevalence was 20 (41.6%) and least were 2 (4.16%) were bony changes, haemorrhages. The isolation of the organism was carried out. The highest was *Staphylococcus aureus* 35 (41.17%), and the least was 5 (5.88%) *Klebsiella*. **Conclusion:** The present pragmatic study will be useful to surgeons to treat such patients efficiently with collagen and heal chronic wounds with various aetiologies without amputations. The patients can lead a normal life after treatment.

INTRODUCTION

Collagen is structurally and functionally a key protein of the extracellular matrix, which is also involved in scar formation during the healing of connective tissues.^[1] Many collagen dressings have been developed to enhance wound repair because they inhibit or deactivate matrix metalloproteinase's (MMPS) increase in fibroblast production and permeation, help in the uptake and bioavailability of fibronectin, preserve leukocytes, macrophages, fibroblasts, and epithelial cells, and maintain the chemical and thermostatic microenvironment.^[2]

Skin, with its inherent epidermis and dermis, provides the ideal cover for any wound.^[3,4] For this reason, a whole range of antilogous skin graft techniques are available to replace the lost skin, but these grafted wounds are at risk of failure or infection (of both donor and recipient) with considerable morbidity; hence, an attempt was made to evaluate the role of collagen in different infected patients at different age groups and in both sexes.^[5]

MATERIALS AND METHODS

85 (eighty-five) patients aged between 25 to 65 years regularly visited the surgery department of Sri

Siddhartha Institute of Medical Sciences T Begur Karnataka were studied.

Inclusive Criteria

Patients with chronic, non-healing wounds (venous and arterial ulcers). The patients who gave their consent in writing for treatment were selected for study.

Exclusion Criteria

Patients with acute wounds, allergies to dressing constituents, immune compromised patients, and malignant wounds were excluded from the studies.

Method: The majority of the patients belonged to the middle socioeconomic class. Histo-pathological, biochemical, and microbiological tests were carried out to classify the aetiology of patients with chronic wounds.

Application of methodology: collagen particles of intact collagen of bovine origin were used. The wound bed was cleaned with normal saline, to the extent that it did not cause any trauma. The measurement of ulcer size and area was done by putting a transparent plastic cover over the ulcer, and markings were made along the margin. The cover was then placed on the graph paper and assessed periodically.

Initial debridement was done in cases of unhealthy wounds with extensive slough; later, depending on

the amount of dead tissue, periodic debridement was done.

Collagen particles were sprinkled sufficiently to cover the wound surface in cases of tunnelled and undermined wounds. The collagen particles were made into paste or a solution with normal solution to ensure that the particles penetrated into the wound and were covered with absorbent dressing. The frequency of collagen particle application was done initially on a daily basis. Subsequent dressings were changed every 3–4 days and the healing was assessed on a weekly basis, and complete healing was observed before 7 (seven) weeks.

The duration of study was from March '23 to November '23.

Statistical Analysis: The aetiology of chronic wound complications observed in the wounds. The various organisms isolated from the wound are classified by percentage. The statistical analysis was carried out in SPSS software. The ratio of males and females was 2:1.

RESULTS

[Table 1] Aetiology of Chronic Wounds 28 (32.9%) had type II DM, and 24 (28.2%) had venous 3 (3.52%) had arterial, 12 (14.1%) had tropic, 3 (3.52%) were tubercular, and 15 (17.6%) had traumatic.

[Table 2] Complications were observed in 48 patients – 6 (12.5%) had gangrene, 14 (29.1%) had sloughing and exposure to tendon, 20 (41.6%) had eczema and dermatitis, 2 (4.16%) had bony changes, 2 (4.16%) had hemorrhage, and 4 (8.33%) had sub-cutaneous calcification.

[Table 3] Organisms isolated from chronic wounds – 35 (41.1%) had Staphylococcus aureus, 9 (10.5%) had Streptococcus pyogenes, 11 (12.9%) had Escherichia coli, 5 (8.88%) had Klebsiella, 9 (10.5%) had Proteus mirabilis, and 16 (18.8%) had no organism.

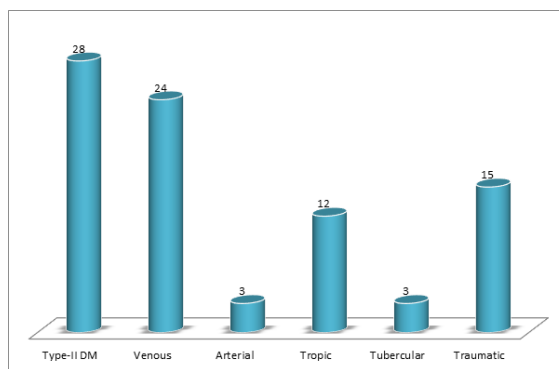


Figure 1: Etiology of chronic wounds

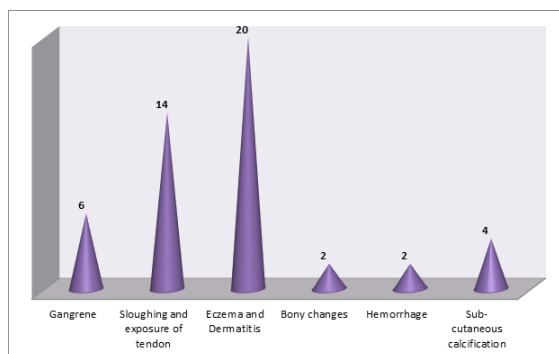


Figure 2: Complication observed in the chronic wounds

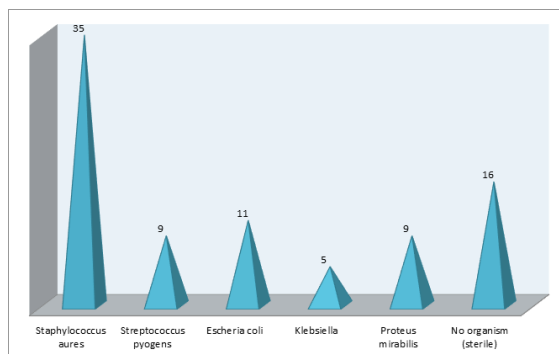


Figure 3: Organism isolated from wounds

Table 1: Etiology of chronic wounds. Total no of patients: 85

Sl. no	Etiology	No of patients	Percentage %
1	Type-II DM	28	32.9
2	Venous	24	28.2
3	Arterial	3	3.52
4	Tropic	12	14.1
5	Tubercular	3	3.52
6	Traumatic	15	17.6

Table 2: Complication observed in the chronic wounds, Total no of patients: 48

Sl. no	Complication	No of patients	Percentage (%)
1	Gangrene	6	12.5
2	Sloughing and exposure of tendon	14	29.1
3	Eczema and Dermatitis	20	41.6
4	Bony changes	2	4.16
5	Hemorrhage	2	4.16
6	Sub- cutaneous calcification	4	8.33

Table 3: Organism isolated from wounds. Total no of patients: 85

Sl. no	Organism	No of patients	Percentage (%)
1	Staphylococcus aureus	35	41.7
2	Streptococcus pyogenes	9	10.5

3	Escherichia coli	11	12.9
4	Klebsiella	5	5.88
5	Proteus mirabilis	9	10.5
6	No organism (sterile)	16	18.8

DISCUSSION

In the present study of the role of collagen dressing in chronic wound healing, the aetiology of chronic wounds was that 28 (32.9%) were type II DM, 24 (28.8%) had venous, 3 (3.52%) had arterial, 12 (14.1%) had tropic, 3 (3.52%) had tubercular, and 15 (17.6%) had traumatic [Table 1]. Complications were observed in 48 (56.4%) patients: 6 (12.5%) had Gangrene, 14 (29.1%) had sloughing and exposure to tendon, 20 (41.6%) had eczema and dermatitis, 2 (4.16%) had bony changes, 2 (4.16%) had haemorrhage and 4 (8.33%) had subcutaneous calcification [Table 2]. Organisms isolated from wounds: 35 (41.7%) had *Streptococcus aureus*, 9 (10.5%) had *Streptococcus pyogenes*, 11 (12.9%) had *E. coli*, 5 (5.88%) had *Klebsiella*, 9 (10.5%) had *Proteus mirabilis*, and 16 (18.8%) had no organism [Table 3]. These findings are more or less in agreement with previous studies.^[6-8]

Collagen deposition and remodelling contribute to the increased tensile strength of the wound, which is approximately 20% of normal by three weeks after injury, gradually reaching a maximum of 70% of normal skin.^[9] Although epithelial structures can heal through regeneration, connective tissues cannot and depend on the process of repair, mostly through the formation of collagenous scar tissue. Collagen serves to restore tissue continuity, strength, and function. Collagen is a brittle substitute for unwounded tissue, and scar tissue rarely exceeds 70% of unwounded tissue strength.

Poor healing or wound healing is due to retarded or slow collagen metabolism enhanced by hyperglycaemia, which reduces collagen production and induces non-enzymatic glycosylation of collagen and keratin, leading to the formation of abnormally rigid collagen and tissue breakdown.^[10] In elderly patients, delayed wound healing is due to impaired collagen synthesis and increased degradation of collagen.^[11] Intrinsic factors include variations in oxygen tension, which can alter fibroblast proliferation and collagen production.

CONCLUSION

The present study examines the role of collagen in healing chronic wounds / ulcers. Collagen is effective

in hastening the healing process by forming early granulation tissue and wound contraction through stimulation of fibroblast activity and the MMPS enzyme. Moreover, there were no adverse effects or reactions when collagen particles were applied to wounds. The number of debridement's and daily dressings required was reduced to one in 3 to 4 days, depending on the wound burden. A significant decrease in wound size and complete healing were observed within 3 to 4 weeks. But this study demands further patho-physiological, nutritional, biochemical, genetic, and microcellular study because factors that heal wounds / ulcers are still obscure.

Limitation of Study: Owing to the tertiary location of the research centre, the small number of patients, and the lack of the latest techniques, we have limited findings and results.

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