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Original Research Paper

Surgery

COLLAGEN DRESSING VERSUS CONVENTIONAL DRESSINGS IN BURN AND CHRONIC WOUNDS: A COMPARATIVE STUDY

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Abstract

Objective: Biological dressings are water-resistant to bacteria, and generate the most physiological interfacebetween the wound surface and the environment. Collagen dressings have other superiority over conventional dressings in terms of ease of application and being natural, non-immunogenic, non-pyrogenic, hypo-allergenic, and pain-free.

Materials And Methods: The data of 120 patients with chronic wounds of diverse aetiologies and with signify age 43.7 years were accumulated and analyzed. The patients had been treated with collagen or other conventional dressing substance. The patients were split into two groups; 'Collagen group' and 'Conventional group', For the cause of comparison. 60 patients wereincluded in both groups. For assessment the wound characteristics in size, edge, floor, granulation tissue, and wound swab were recorded. With starting treatment, appearance of granulation tissue, completeness of healing, require for skin grafting, and patients' satisfaction was noted in both groups.

Results: Sixty percentage of the 'collagen group' wounds and only forty-two percentage of the 'conventionalgroup' wounds were sterile (P=0.04) within two weeks of treatment. Healthy granulation tissue seemed earlier over collagen-dressed woundsthan over conventionally treated wounds (P=0.04). After eight weeks, (87%) of 'collagen group' wounds and (80%) of 'conventional group' wounds were >75% healed (P=0.21). In the 'collagen group' eight patients and twelvein the 'conventional group' required partial split-skin grafting (P=0.05). Collagen-treated patients enjoyed early.

Conclusion: No remarkable better results were found in terms of complete of healing of burn andchronic wounds between collagen dressing and conventional dressing. Collagen dressing, however, mayavoid the require of skin grafting, and provides additional benefit of patients' comfort.

KEYWORDS : Burns, Chronic Wounds, Collagen Dressing

INTRODUCTION:

During the last decade, many new dressing substancesexpanded, like calcium alginate, hydro-colloidmembranes and fine mesh gauze. These have a disadvantage in that they become permeable to bacteria.Biological dressings like collagen on the other hand,create the most physiological interface between thewound surface and environment, and are impermeable to bacteria.[1] Collagen dressings have other advantages over conventional dressings in terms of ease of application and being natural, non-immunogenic, nonpyrogenic,hypo-allergenic, and pain-free.[2,3] This study has been conducted to compare the efficacy of collagen dressing with that of conventional dressing materials like silver sulfadiazine, nadifloxacin, povidone iodine, or honey (used traditionally), in the management of chronic wounds including those due to burns.

MATERIALS AND METHODS:

We collected the records of the patients with chronic wounds on different parts of the body and of many aetiologies, treated in our department withthe conventionaldressing materials/ honey, over a period of four years. The total number of patients was 120. Thepatients with co-morbidities that could grossly affectthe wound healing like uncontrolled diabetes mellitus,chronic liver or renal disease, other collagen diseaseor major nutritional deprivation were excluded. For the sake of analysis the patients were split into two groups; 'Collagen group' and 'Conventional group'. Wound swab or pus culture was done every three to five days or when specifically required (hospital protocol). Before applying collagen dressing, the affected area was thoroughly cleaned for removal of external contamination, and infected wound was debrided properly. Then, one or more collagen sheets (manufactured from intestine of cattle by The Central Leather Research Institute, Adyar, Chennai)of appropriate size are selected. Collagen sheets were rinsed in normal saline before application. Sheets were applied firmly so as to cover the whole raw area of wound/ulcer. Care should be taken to remove any air bubbles. This can be facilitated by using the back of the thumb-forceps to apply a little pressure from one end of the dressing to the other. The movement of the forceps should be just similarto the movement of a knife while applying butter on a toast. Dressing was then dried with a warm-air dryer.Wounds of the patients in the 'Conventional group' were dressed with povidone iodine, honey, nadifloxacin, or silver sulfadiazine etc. The results were analyzed using 'Mann-Whitney test' and 'Pearson Chi-Square test' depending on the type of data.

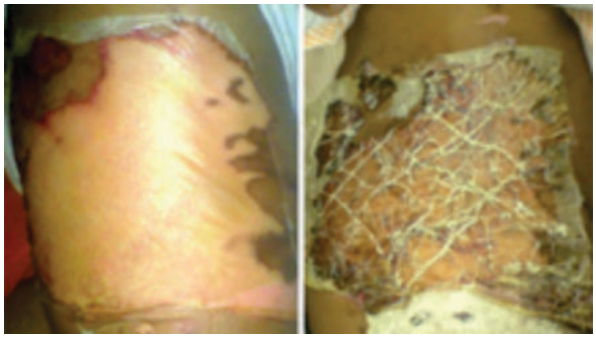
RESULTS:

A total of 120 patients were included. Seven different aetiologies of chronic wounds were recognized: decubitus ulcer, post-traumatic wound, venous ulcer, post-burn, postoperative, post-infection, and miscellaneous. Out of 120 patients, 24 (20%) belonged to the age group 01-20 years, 68 (57%) to 20-40 years, and 28 (23%) were more than 40 years of age. Eighty-two (68%) were males and 38(31%) were females. There was no significant difference in the age and sex distribution of patients and aetiology of the wounds in both groups [Table 1]. The most common pathogens found on wound swabcultures (taken from three different sites in all patients) of patients with burn, postoperative, venous ulcers and post-traumaticwound/ulcers were Staphylococcus and E. coli. Decubitus and post-infectious ulcers were mostly infected by E. coli and Pseudomonas. Overall Staphylococcus was the pathogen most often isolated (45%), followed by E. coli (20%), Pseudomonas (20%) and Klebsiella (8.3%). Sixty percent of the 'collagen group' wounds showed complete clearance of organisms withintwo weeks, 90% (54) in four weeks while only six wounds did not show clearance of organisms at the end of four weeks. On the other hand, only 42% of the wounds in the 'conventional group' were found sterile after two weeks of treatment. After four weeks of conventional treatment 12 (20%) wounds were still found to harbour pathogenic organisms. The average time for appearance of healthy granulationtissue over the wounds that were treated with collagen dressing was eight days. The post-infective wounds healed fastest (average time to healthy granulation tissue: six days) and the decubitus

wounds slowest (average time to healthy granulation tissue: 13 days).

Table 1: Characteristics of the patients in the 'Collagen Group' and 'Conventional group'

Patient characteristics		Collagen group n=60 No. of case in	%	Conventional Group n=60 No. of case in	%	P Value
Sex	Male	42	70	40	67	0.9
	Female	18	30	20	33	
Type of wound	Decubitus	12	20	9	15	0.067
	Post traumatic	5	8	4	7	
	Venous	3	5	3	5	
	Post burn	16	27	20	33	
	Post-operative	7	11	3	5	
	Post infection	13	22	16	27	
Age	>40	14	23	14	23	



A B

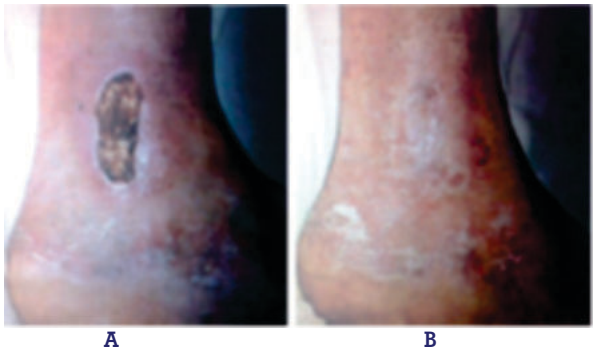


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Figure 1: A superficial burn wound on day one (a) and on 21st day (b) of collagen dressing

Figure 2: A deep wound on leg before (a) and after 28 days (b) of collagen dressing

It was found that out of 60 patients of the collagen group, 42 (70%) wounds showed complete closure with collagen dressing [Figures 1,2]. Collagen sheets in these patients were found almost fully incorporated in the wounds. The remaining eight (four-decubitus, four-post-burn) achieved less than 75% closure even at the end of eight weeks, and underwent split-skin grafting (SSG). In the conventional group, a total of 48 patients (80%) showed 75–100% closure at the end of the eighth week while the remaining 12 (four- decubitus, five- post-burn, three- post-infection) were less than 75% closed and thus required SSG. Therefore, although a greater number of collagen-treated wounds achieved more than 75% healing after eight weeks (52 versus 48), the difference was not statistically significant (P- 0.21). However, only eight collagen-treated wounds required SSG as compared to 12 wounds treated with other materials (P- 0.04). Time required for complete healing did not have a linear relationship with pre-treatment size of the wound. Also, wounds of the same aetiology did not show a similar healing pattern, progression of healing, appearance of granulation tissue etc. Grossly smaller wounds healed faster.

DISCUSSION:

Chronic wounds take a longer time for healing as all chronic wounds have elevated levels of matrixmetalloproteinases, which result in increased proteolytic activity and inactivation of the growth factors involved in the wound-healing process. Thus, a chronic wound due to any cause is a situation that needs the use of a temporary cover for the raw surface. The use of collagen dressing has been found to inhibit the action of metalloproteinases. [4] Collagen is a biomaterial that encourages wound healingthrough deposition and organization of freshly formed fibres and granulation tissue in the wound bed thus creating a good environment for wound healing. [5] Collagen sheets, when applied to a wound, not only promote angiogenesis, but also enhance body's repair mechanisms. [1,2] While acting as a mechanical support these reduce oedema and loss of fluids from the wound site, along with facilitation of migration of fibroblasts into the wound and enhancing the metabolic activity of the granulation tissue.[1,6,7] Moreover, it is easy to apply and has the additional advantage of stopping bleeding. [8] Other commonly used biological dressings include amniotic membrane and homograft skin.[9] Human amniotic membrane is easy to obtain, has a low price and provides good wound coverage and has distinct advantages compared with other biologic dressings. [9] Although the risk of transmission of viral infectionse.g. hepatitis, syphilis and HIV are an important concern with the use of amniotic membrane, but with routine screening of each and every patient this risk can be easily avoided. Thus, different authors have recommended amniotic membrane strongly.

In this study, significantly more collagen-treated woundswere rendered sterile as compared to those treated withconventional dressings, after two weeks (P- 0.03) andfour weeks (P- 0.04) of treatment. This is due tothe fact that collagen dressings cover the wound and actas an effective barrier to infection.[8] Healthy granulationalso appeared significantly earlier in collagen-treatedwounds as compared to conventionally treated ones(P- 0.03). The bacterial colonization of a wound mayprogress to an active infection in a wound and thereforeaffect healing. Thus, regular surveillance of the bacterialprofile and their antibiotic susceptibilities should alsobe a part of the overall management strategy of woundcare units, so as to guide appropriate antibiotic therapywhile the dressings are doing their part. In the presentstudy, this was done every three to five days or whenspecifically indicated. Lastly, the present study has a few drawbacks. First, it is a retrospective study. The ideal scenario is to treat and compare two different wounds one with and the other without collagen dressing in the same patient in a prospective study. Also, this study did not include an important and more useful issue of the cost and availability of collagen dressings. These issues warrant further randomized studies. Furthermore, although in the 'collagen group' SSG was needed for significantly lesser number of patients (8 compared to 12), this is based on the findings of a small number of patients. Thus, this result cannot be generalized with high confidence. Therefore, the need for further randomized controlled studies that have a large number of patients, and are accurately designed has to be recognized from the present study.

CONCLUSION:

Collagen sheet dressing does not offer significant better results over conventional dressings in terms ofcompleteness of healing of burns and chronic wounds. However, it may avoid the need of skin grafting,although this finding needs further substantiation by appropriately designed randomized studies of largegroups.

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