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A Comparative Study of Collagen Granules Vs Conventional Saline Dressing In the Management of Chronic Wound

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ABSTRACT
Background: *a continual/chronic ulcer or wound is the only that doesn't heal in an orderly set of degrees and in a predictable quantity of time the manner most wounds do; wounds that don't heal within 03 months are regularly considered as persistent.Aim of this study is to establish the efficacy of collagen granules in healing these chronic wounds.*
Methods: *In this prospective study, a total of 178 patients were divided into two groups, according to type of dressing i.e., for group A patients collagen granules were used and for group B patients normal saline dressing was used. Collagen granules used for this study was "Biofil".*
Results: *There has been a significant decrease in the size and depth of the ulcers treated with collagen granules as compared to the normal saline soaked dressing.*
Conclusions: *The usage of collagen granules dressing has elevated the rate of wound recuperation in chronic ulcers; in this study the author has observed that the rate of wound restoration changed into notably higher in using collagen granules for chronic wound management.These materials are promising new technology in the field of wound healing which is cost effective too.*
Keywords: *Biological dressing, collagen, chronic wound*

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I. INTRODUCTION

Collagen is the most abundantly foundprotein in the human body. The functioning of mostly all systems and organs of the body is dependent on collagenous structures and about 70 percent of the dry weight of the skin is collagen. Use of collagen for wound healing has drawn recent interest from researchers in recent years and because of the involvement of various chemical and biological factors, no wholistic single research work on the role of collagen in wound healing has been completed. In almost every instance, conclusions were drawn from various references.

a continual/chronic ulcer or wound is the only that doesn't heal in an orderly set of degrees and in a predictable quantity of time the manner most wounds do; wounds that don't heal within 03 months are regularly considered as persistent or chronic wound.[1] Authors now know that wounds re-epithelise much faster or develop granulation tissue faster when treated with dressings which allow moist wound healing. Authors recognize that occluding wounds does not lead to infection. Even though many modalities of wound care have come up to assist a surgeon e.g., the use of compression bandages to treat venous ulcers, the problem of chronic wounds management remains to ponder.[2,3]

II. METHODS

Study area: Department of surgery of a military hospital of the Indian armed forces.
Study design: Prospective cohort study
Study period: Nov 2020- Sep 2022
Study population: The study population comprised of the patients having chronic ulcers and reported to the hospital as per the following data:

Inclusion criteria:

a. Patients presenting with ulcers
b. Age>18 y

Exclusion criteria:

a. Age<18 y
b. Patients not giving consents of newer modality of dressing
c. Untreated osteomyelitis
d. Malignancy related wound
e. Enterocutaneous fistulae
f. Patients with Tuberculosis/Leprosy

Sample size: Total 178 patients were included in this study.

Method of collection of data:

I. Patients were divided into two groups viz. Group A and Group B consisted of 89 patients each, where Group A was treated with collagen granules while Group B was treated with 0.9% normal saline dressings respectively.
II. A proper written and informed consent were obtained before treatment.
III. Wounds were measured using sterile transparent paper placed on the wound to mark the borders. The remaining paper was kept in formalin chamber for other dressing. The two largest perpendicular diameters were measured using a ruler (in millimetres) and multiplied for obtaining total area of the wound.
IV. The depth was calculated with vernier calliper (in millimetres).
V. Wound was closed using occlusive dressing after irrigation with normal saline, surgical debridement, and application of collagen granules or 0.9% normal saline soaked gauze and re-opened for examination on day 3,5,7,10 & 15.

III. RESULTS

Age distribution

Most of the patients presenting with wounds were between 25-30 years of age (25.84%) followed by 30-35 years of age(19.66%). (Table 1 and Fig 1.)

Location of the wound

Wounds were mostly located on fingers and hand followed by forearm. (Table 2 and Fig 2.)

Aetiology of wound

Based on aetiology determined by history and clinical examination, wounds were classified into different groups of which majorities were of post-mechanical trauma (37%) followed by post-infectious origin (33%) and thermal burns (30%) respectively. (Table 3 and Fig 3.)

Outcome of the study

In the present study, it was concluded that there is a significant decrease in the size as well as depth of the wound after using collagen granules as a dressing material than with normal saline. (Table 4-7 and Fig 4-7)

IV. DISCUSSION

Ulcer size was compared between the test and the control group on day 0, day 3, day 5, day 7, day 10 and day 15. The results were analysed and inferred that the wounds were healed better which are treated with collagen dressings. Various aetiologies that were considered in this study were post-traumatic ulcers, post-infectious ulcers and post-thermal burns causing ulcers. In a similar study done by Singh et al, it was found that out of 60 patients of the collagen group, 42 (70%) wounds showed complete closure with collagen dressing in six weeks or lesser.[4] This was comparable with this study, however, there was found to be a good healing rate within first week of collagen dressing. In another study done by Veves and Sheehan on 276 patients of diabetic foot ulcer divided equally into two groups of which one group was managed with collagen while another group was with other dressing materials.[5] They found no significant difference in the completeness of healing of wounds when wounds of more than six months were compared. But the healing was better in wounds of less than six months duration treated with collagen dressings. Although in this study authors found that after 2 weeks, there was a significant improvement in ulcer size even in older ulcers. A Study by S Bhattacharya et al showed excellent results by using Collagen sheets on patients with toxic epidermal necrolysis (TEN).[6] Mason and read demonstrated that microfibrillar collagen triggered adhesiveness of platelets and stimulated the release phenomenon producing aggregation of nearby platelets.[7] Piatkowski et al established that pressure ulcers treated with collagen dressings showed a superior response of healing by having a positive effect on angiogenesis and superior reduction of inflammation.[8] Elgharably et al presented first evidence from a preclinical setting explaining how a collagen-based dressing may improve wound closure by targeting multiple

key mechanisms.[9] Martorell-Calatayud et al established that the use of porcine type I collagen dressings as an adjunct or definitive tool for the closure of surgical defects on the scalp measuring more than 5 cm in which periosteum has been removed proved to be simple, inexpensive, and effective.[10] Mathangi et al used collagen based dressings in superficial and partial thickness burns. 73% of all cases healed without any infection and complete epithelialisation was seen within 6 weeks.[11] The collagen dressing has been observed to reduce the action of metalloproteinases on healing of the wound.[12] Also, collagen provides a favourable healing environment by encouraging a scaffold upon which healing can occur.[13]

V. CONCLUSION

The use of collagen granules dressing accelerated the rate of wound healing in chronic ulcers. In this study authors found that the rate of wound healing was significantly better in using collagen granules. Thus, reducing the ulcer size can help patient to early return to work and reduction in financial burden on the institution or organization.

DECLARATIONS

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Conflict of interest: None declared

Ethical approval: Approved by Institutional Ethical Committee

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Age group(in years)	No. of Patients	Percentage
<20	1	0.56
20-25	35	19.66
25-30	46	25.84
30-35	42	23.6
35-40	26	14.61
>40	28	15.73

Table 1. Age distribution of patients

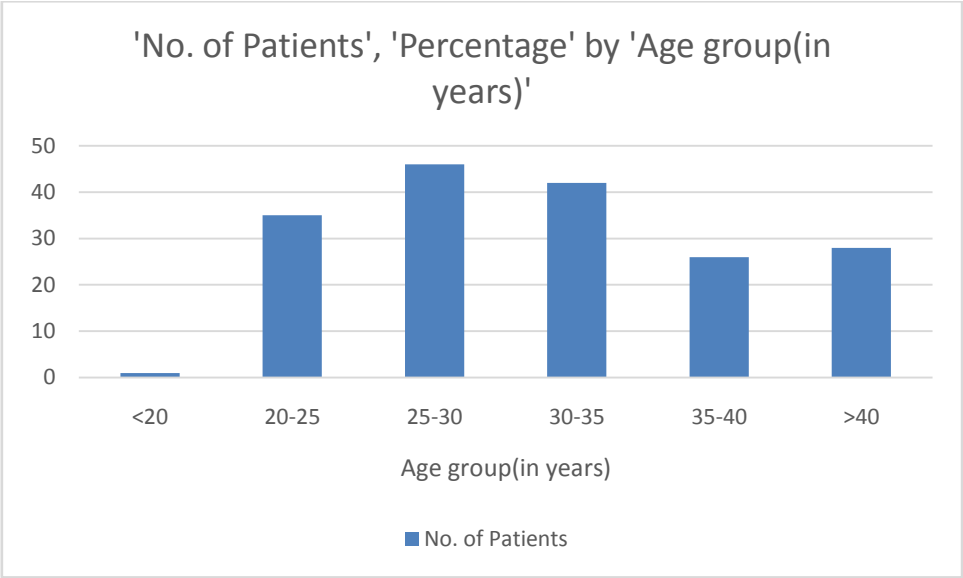


Fig 1. Age distribution of patients

Location of Wound	No. of Patients
Chest	4
Back	4
Scrotum	5
Abdomen	12
Gluteal region	17
Foot	22
Leg	24
Hand	27
Forearm	30
Finger	33

Table 2. Location of wound

Fig 2. Location of wound

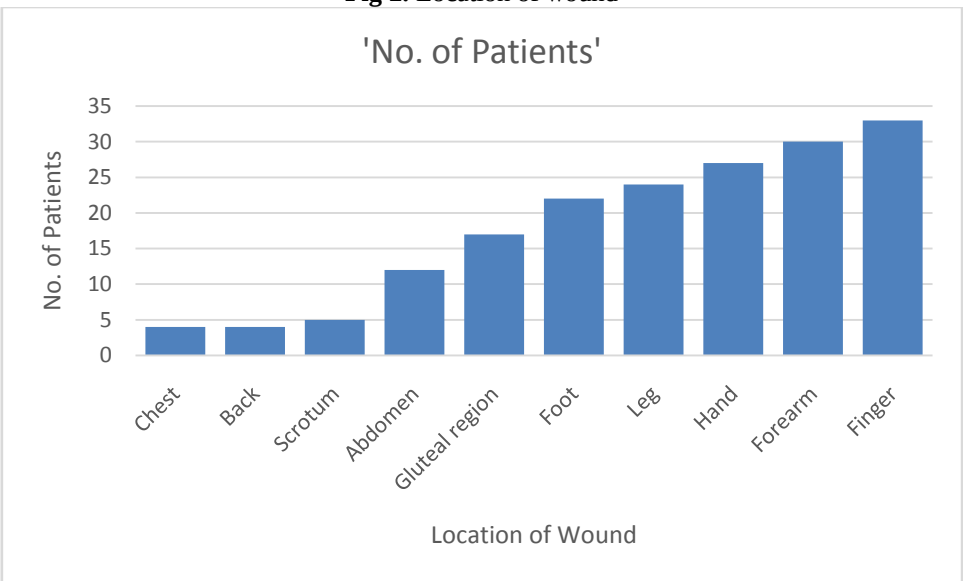


Table 3. Aetiology of wound

Aetiology of Wounds	No. of Patients
Mechanical Trauma	66
Thermal burns	54
Post infectious	58

Fig 3. Aetiology of wound

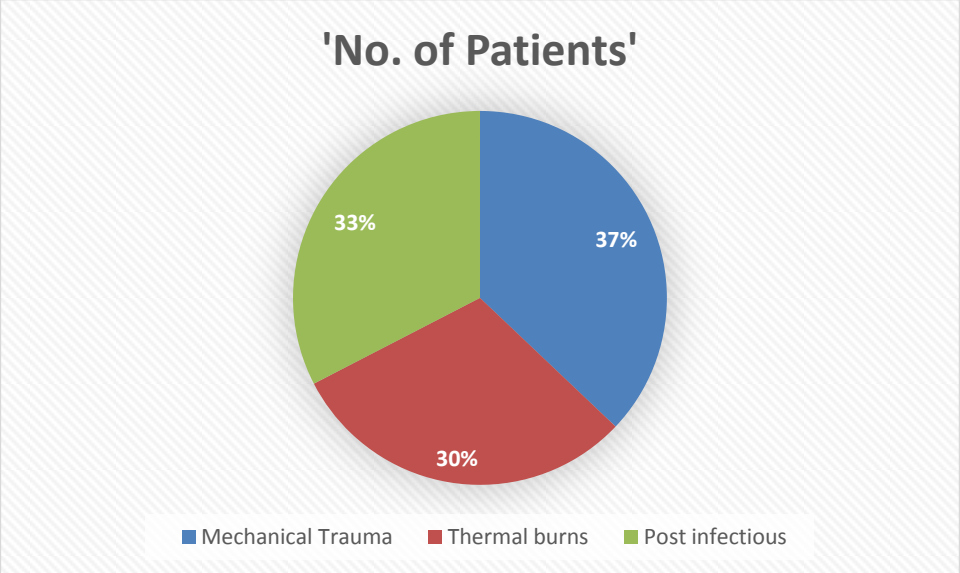


Table 4. Comparison of wound size after collagen dressing

Days after collagen dressing	<20 sq cm	20-40 sq cm	>40 sq cm
Day 0	16	46	27
Day 3	22	42	25
Day 5	37	32	20
Day 7	59	18	12
Day 10	76	8	5
Day 15	84	4	1

Fig 4. Comparison of wound size after collagen dressing

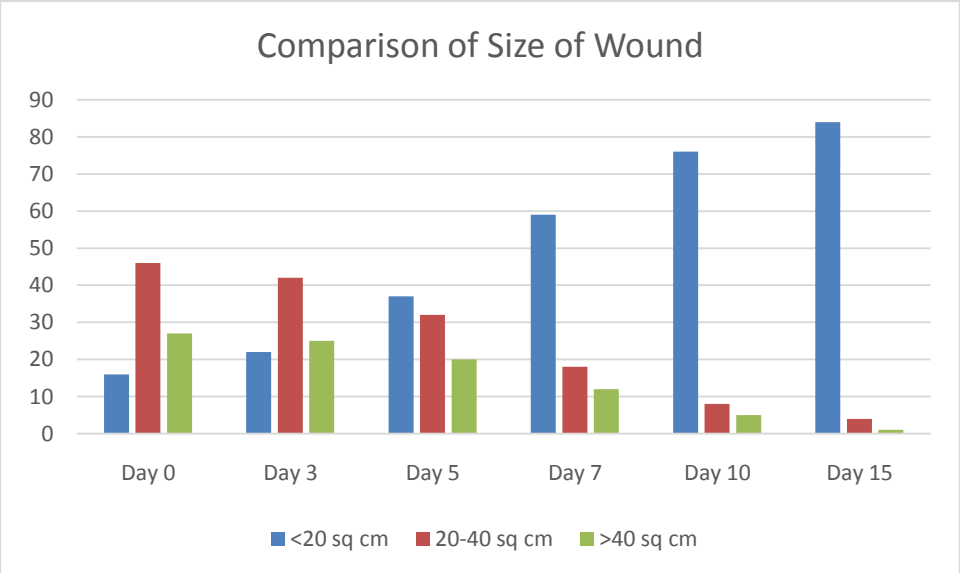


Table5. Comparison of wound size after normal saline dressing

Days after Normal saline dressing	<20 sq cm	20-40 sq cm	>40 sq cm
Day 0	17	48	24
Day 3	20	47	22
Day 5	24	45	20
Day 7	28	49	12
Day 10	26	55	8
Day 15	27	54	6

Fig5. Comparison of wound size after normal saline dressing

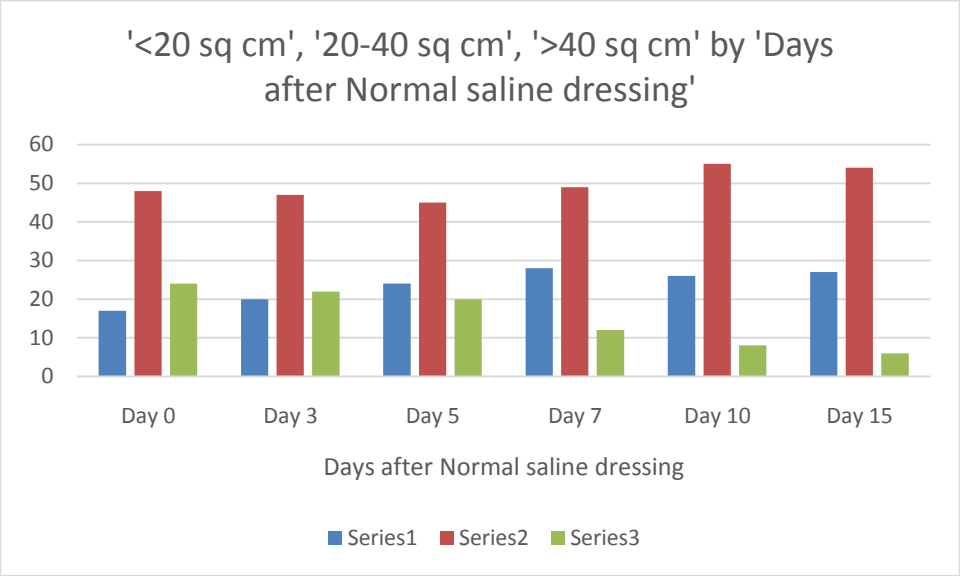


Table 6. Comparison of wound depth after collagen dressing

Days after collagen application	<2 mm	2-5 mm	>5mm
Day 0	14	52	23
Day 3	25	46	18
Day 5	43	34	12
Day 7	59	24	6
Day 10	73	12	4
Day 15	85	4	0

Fig 6.Comparison of wound depth after collagen dressing

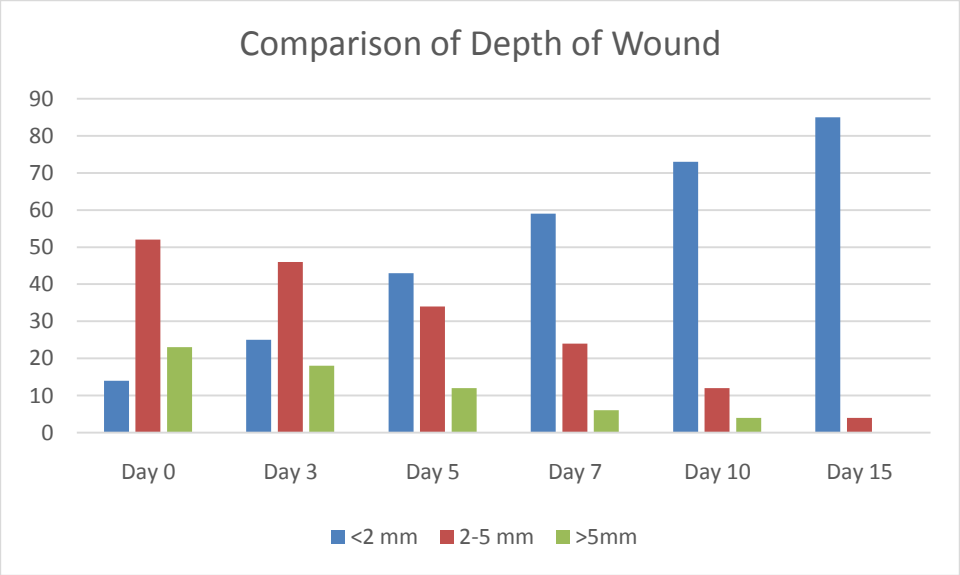
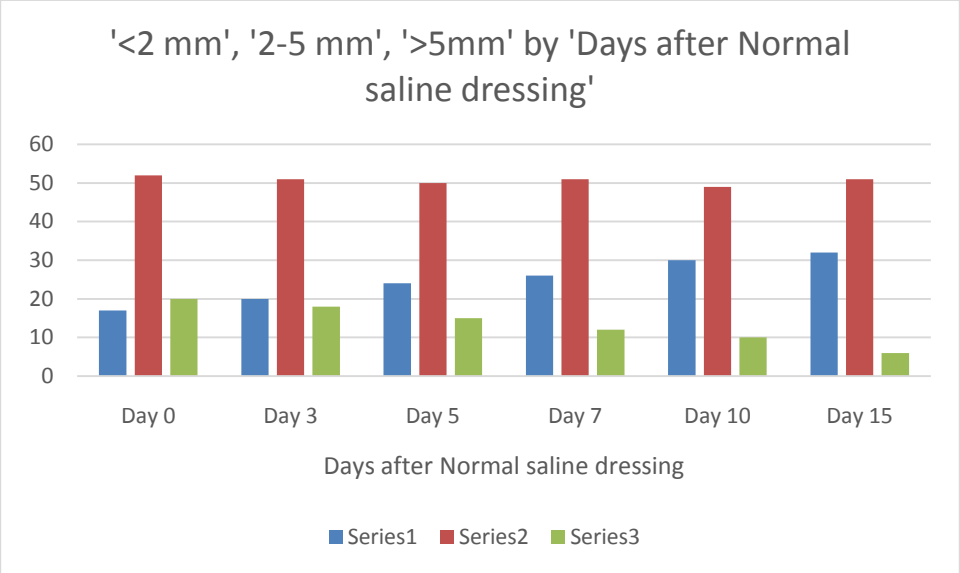


Table7. Comparison of wound depth after normal saline dressing

Days after Normal saline dressing	<2 mm	2-5 mm	>5mm
Day 0	17	52	20
Day 3	20	51	18
Day 5	24	50	15
Day 7	26	51	12
Day 10	30	49	10
Day 15	32	51	6

Fig7. Comparison of wound depth after normal saline dressing



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