

# Comparative Study of Collagen Granules Dressing Versus Conventional Dressing in Wound Healing

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**Abstract:** Introduction: Collagen, a proline - rich protein, is crucial in wound healing due to its role in debridement, angiogenesis and re - epithelialization. This study compares the effectiveness of collagen granule dressing versus conventional dressing in wound healing. The prospective cohort study involved 68 patients divided into test and control groups. Results showed a significant decrease in healing time for the collagen group, with faster granulation and reduced need for skin grafting. Collagen dressing demonstrated non - immunogenic, being natural, easy application benefits making it superior to conventional methods. Aim: This study main objective to compare the effectiveness of collagen granule dressing versus conventional dressing in the healing of deep wounds, focussing on healing time, granulation tissue formation, and the need for skin grafting. Methods: This is a prospective cohort study. After obtaining ethical clearance from Institute's ethical committee, all the patients fulfilling inclusion criteria were enrolled, and written consent was obtained from all the patients. Detailed history was enquired and recorded on a predesigned proforma. The wound healing, analysed as - Time required for appearance of healthy granulation tissue, 50% reduction in wound size, complete healing time, requirement of skin grafting, time required in return to daily activities. Results: A significant decrease in time required for 50 % reduction in wound size with a mean difference of 18.5 in collagen group patients when compared to 37.5 in Normal saline group patients. Chi square test was applied to assess the difference in proportions between groups t test was applied to compare the mean between the groups.  $P < 0.05$  was considered as statistically significant. Conclusions: Healing with collagen particles is early, compared to the conventional dressings with lesser requirement of skin grafting, number of dressings, shorter hospital stay. Dressing changed every 3 - 4 days. Healing occurs by formation of early granulation tissue and wound contraction.

**Keywords:** Collagen granule Dressing, Healthy granulation tissue, Skin grafting, wound healing, conventional dressing

## 1. Introduction

Wound Healing is a dynamic process involving soluble mediators, a variety of cells, and extracellular matrix. Wound result from precise disruption of tissue by the surgeon's knife (incision) to widespread damage of tissue (e. g. major trauma, burns). It also results from a contusion, hematoma, laceration or an abrasion. The continuity of the skin must be restored expeditiously because it plays a crucial role in maintaining homeostasis.

Deep Wound are defined as wound which extending deeper, across deep fascia into muscle or deeper structure. Deep wounds are extremely complex and optimal treatment requires an understanding of nutrition, immunology, psychological issues, the physiology and the metabolic interactions among all the major organ systems. Wounds are difficult to treat includes compound wounds, diabetic ulcers, venous ulcers, trophic ulcers, pressure sores and necrotizing fasciitis. An ideal dressing used in the wound management should be economical, easy to apply, readily available dressing or method or coverage that will provide good pain relief, protect wound from infection, promote healing, keep moisture, be elastic, and non - antigenic and adhere well to the wound and waiting for spontaneous epithelisation and healthy granulation tissue.

Among newer type of wound dressings - Biological Dressings Like Collagen create the most physiological interface between the wound surface, environment and impermeable to bacteria. Collagen, the most abundant protein in the body,

plays a critical role in the successful completion of adult wound healing. Its deposition, maturation, and subsequent remodelling are essential to the functional integrity of the wound Collagen is defined as an endogenous substance, which forms an important structural component in connective tissue and is of special importance in the skin.

### Aim and Objective

This study highlights the significant advantages of collagen granules dressing in wound healing, such as faster healing times and reduced need for skin grafting, demonstrating its potential as a superior alternative to conventional dressings.

## 2. Materials and Methods

**Source of Data:** Data was collected from all patients with deep wounds, who were admitted during period of December 2022 to November 2023 for study considering the inclusion and exclusion criteria. A total of 68 indoor orthopaedics ward patients with deep compound wounds were considered for the study. Selection of the patients were done randomly. Cases were allocated randomly into test group and control group, test group treated with collagen granule dressing and control group treated with conventional dressing. Groups were done taking into account the confounding factors, which are matched.

**Study Type:** Prospective Randomized Controlled Study

**Method of Collection of Data:** Information was collected through predesigned pretested proforma for each patient. All

patients were interviewed as per the Proforma and a complete clinical examination was done.

**Sample Size:** A total of 68 indoor surgical ward patients with deep compound wounds were considered for the study. Selection of the patients were done randomly. Where 34 patients were selected under Collagen dressing studies and the rest 34 patients selected under conventional dressing studies.

**Statistical Tests:** The collected data will be evaluated using appropriate statistical methods. Unpaired student's "t" test and Chi Square test were used to find out the statistical significance. A "p" <0.05 was taken as significant.

### 3. Observation

In this study, the Mean age of the patients ranged from 14 to 80 years. Mean age is  $43.55 \pm 18.05$  years in cases and  $50.41 \pm 15.6$  years in controls. The difference in mean age between cases and controls was not statistically significant ( $p=0.261$ ).

Mean WBS (WOUND BED SORE) at 2 weeks in cases was  $14.2 \pm 1.63$  and in controls  $10.09 \pm 2.45$ . There is statistically significant difference of the wound bed score - WBS at 2 weeks between the cases and controls ( $P < 0.01$ ).

Mean initial WBS in cases was  $4.82 \pm 1.37$  and in controls  $5.50 \pm 1.58$ . There is no statistically significant difference of the initial wound bed score - WBS ( $p=0.060$ ). Mean WBS at 2 weeks in cases was  $14.2 \pm 1.63$  and in controls  $10.09 \pm 2.45$ . There is statistically significant difference of the wound bed score - WBS at 2 weeks between the cases and controls ( $P < 0.01$ ).

Mean % of granulation tissue at 2 weeks in cases was  $93.68 \pm 10.09$  and in controls was  $65.59 \pm 15.80$ . There was statistically significant difference of mean % of granulation tissue at 2 weeks among study groups ( $p < 0.01$ ).

#### Patient Photographs

##### Case – 1



Initial Wound



Healed Scar

### 4. Discussion

Wound healing is a complex process involving a number of chemical and biological events. Collagen serves as the key extra cellular component for repair and remodelling of skin tissue. As a biomaterial, collagen offers several advantages over traditional dressings, growth hormones and biological coverings. The use of collagen as a drug delivery system is very comprehensive and diverse. Collagen can be extracted into an aqueous solution and moulded into various forms of delivery systems. Due to its excellent biocompatibility and safety, the use of collagen in biomedical application has been rapidly growing and widely expanding to bioengineering areas. Collagen appears to be a good material for use as a biomedical implantable device and is used to form a matrix for regenerating tissue outside of the body, for example in regenerating skin for use in burns treatment, but increasingly it is also used in the development of other tissues offering the prospect of growing replacements for damaged organs. Collagen membranes are also chemotactic for regenerative cells and may enhance the migration and attachment of fibroblasts through its space - making ability. Present study is a prospective study regarding collagen dressing versus conventional dressing.

Healthy granulation tissue appeared earlier over collagen - dressed wounds than over conventionally treated wounds ( $P=0.03$ ). After eight weeks, 52 (87%) of 'collagen group' wounds and 48 (80%) of 'conventional group' wounds were >75% healed ( $P=0.21$ ).

Majority of wounds showed more than 90% granulation tissue at 2 weeks among cases and 51 - 60% among controls. Also, Majority (17) of wounds healed by wound contracture in cases followed by skin grafting and majority (21) by split skin grafting among control group. The percentage of wound size reduction was also compared between the cases and controls in 2 weeks. Though there was no statistically difference that was recorded between the groups based on the percentage of wound size reduction, the cases group recorded a higher percentage of reduction in wound size compared to the control group. The case group in the study recorded 100% in wound size compared to 93% in the control group.

The study, in spite of its shortcomings, does indicate that topical application collagen particles is more effective than conventional dressing therapy in healing a deep wound and that it has the potential to be a useful and safe adjunct to wound healing.

## 5. Conclusion

The use of collagen granule dressings significantly improves wound healing compared to conventional dressings, collagen dressings resulted in faster granulation, reduced need for skin grafting, and overall shorter hospital stays, proving to be a superior method for managing deep wounds.

## References

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