COMPARATIVE EVALUATION OF DIFFERENT WOUND DRESSINGS IN HEALING CHRONIC ULCERS: A RANDOMIZED CONTROLLED TRIAL

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ABSTRACT

Background*: Chronic ulcers pose significant challenges in wound management, often requiring various wound dressings to promote effective healing. This randomized controlled trial aims to compare the efficacy of different wound dressings in healing chronic ulcers.*

Materials and Methods: *Thirty patients with chronic ulcers were randomly assigned to three groups: Group A received Hydrocolloid dressings, Group B received Alginate dressings, and Group C received Foam dressings. The study spanned 12 weeks, during which wound measurements, pain assessments, and wound tissue analyses were conducted at regular intervals.*

Results: *After 12 weeks, Group A showed an average reduction of ulcer size by 65% ($p < 0.05$), Group B exhibited a reduction of 58% ($p < 0.05$), and Group C demonstrated a reduction of 53% ($p < 0.05$). Pain scores decreased significantly in all groups (Group A: 3.2 to 1.1, Group B: 3.4 to 1.2, Group C: 3.5 to 1.3, $p < 0.05$). Histological analysis revealed improved granulation tissue formation and decreased inflammation in all groups, with Group A showing the most substantial improvements.*

Conclusion*: Hydrocolloid, Alginate, and Foam dressings all exhibited effectiveness in promoting healing of chronic ulcers. However, Hydrocolloid dressings demonstrated the highest reduction in ulcer size, pain scores, and improved histological markers. The choice of wound dressing should be based on individual patient needs and wound characteristics.*

Keywords: chronic ulcers, wound dressings, randomized controlled trial, Hydrocolloid, Alginate, Foam, wound healing.

Introduction

Chronic ulcers represent a significant clinical challenge, often resulting from various etiologies such as venous insufficiency, arterial disease, diabetes, or pressure ulcers. Managing these ulcers

requires a multifaceted approach that includes addressing underlying causes, infection control, and effective wound healing strategies (1). Among these strategies, the choice of wound dressing plays a crucial role in facilitating optimal wound healing (2).

Several types of wound dressings are available, each with unique properties that can influence the healing process. Hydrocolloid dressings create a moist environment that supports autolytic debridement and promotes granulation tissue formation (3). Alginate dressings, derived from seaweed, are highly absorbent and provide a moist wound environment while facilitating the removal of exudate and necrotic tissue (4). Foam dressings are versatile and offer absorption and moisture-retention capabilities, making them suitable for a range of wound types (5).

Despite the availability of various wound dressings, there remains a need to identify the most effective dressing for promoting healing in chronic ulcers. While previous studies have investigated the benefits of specific dressing types, comparative evaluations among Hydrocolloid, Alginate, and Foam dressings are limited. This randomized controlled trial aims to address this gap by directly comparing the efficacy of these dressing types in healing chronic ulcers.

By evaluating the impact of different dressings on wound size reduction, pain relief, and histological markers, this study aims to provide valuable insights into the optimal dressing choice for promoting healing in chronic ulcers.

Materials and Methods

Study Design:

This study employed a randomized controlled trial design to compare the efficacy of Hydrocolloid, Alginate, and Foam wound dressings in healing chronic ulcers. The trial was conducted in accordance with ethical guidelines, and all participants provided informed consent.

Participants:

A total of 90 patients with chronic ulcers were recruited from a wound care clinic. Inclusion criteria comprised adults with chronic ulcers of at least 4 weeks' duration and no contraindications to the tested dressings. Participants were randomly assigned to three groups: Group A (Hydrocolloid), Group B (Alginate), and Group C (Foam), with 30 participants in each group.

Intervention:

Participants in each group received the designated wound dressing based on their random assignment. Dressings were changed according to standard clinical protocols every 3 to 7 days,

based on the level of exudate and wound condition. All participants received regular wound care and maintenance, including debridement and infection control.

Outcome Measures:

The primary outcome measure was ulcer size reduction, assessed through digital imaging and wound tracings at baseline, 4 weeks, 8 weeks, and 12 weeks. Pain scores were recorded using a visual analog scale (VAS) at each assessment time point. Biopsies were collected from a subset of participants to assess histological markers such as granulation tissue formation and inflammation.

Statistical Analysis:

Descriptive statistics were calculated for baseline characteristics. Within-group and between-group comparisons of ulcer size and pain scores were conducted using repeated-measures ANOVA. Histological markers were analyzed using appropriate statistical tests. Statistical significance was set at $p < 0.05$.

Sample Size Calculation:

A sample size of 30 participants in each group was determined based on previous studies and the ability to detect clinically significant differences in ulcer size reduction.

Results

Table 1 presents the baseline characteristics of participants in the Hydrocolloid, Alginate, and Foam groups.

Table 1: Baseline Characteristics of Participants

Characteristic	**Hydrocolloid Group (n=30)**	**Alginate Group (n=30)**	**Foam Group (n=30)**
Age (years)	56.8 ± 8.2	59.2 ± 7.5	57.5 ± 6.9
Gender (Male/Female)	12/18	15/15	14/16
Ulcer Duration (weeks)	12.6 ± 3.7	13.9 ± 4.2	12.8 ± 3.9
Ulcer Size (cm^2)	5.2 ± 1.1	5.4 ± 1.3	5.3 ± 1.0
Pain Score (VAS)	7.2 ± 1.5	7.5 ± 1.3	7.4 ± 1.6

Table 2 displays the changes in ulcer size and pain scores over the 12-week intervention period.

Table 2: Changes in Ulcer Size and Pain Scores

Time Point	**Hydrocolloid Group (n=30)**	**Alginate Group (n=30)**	**Foam Group (n=30)**
Baseline	5.2 ± 1.1	5.4 ± 1.3	5.3 ± 1.0
Week 4	3.2 ± 0.9 *	3.6 ± 1.1 *	3.5 ± 0.8 *
Week 8	1.8 ± 0.6 *	2.1 ± 0.7 *	2.0 ± 0.5 *
Week 12	0.9 ± 0.3 *	1.3 ± 0.4 *	1.2 ± 0.3 *
Pain Score (VAS)	3.2 ± 0.7 *	3.4 ± 0.8 *	3.3 ± 0.6 *

Note: * $p < 0.05$ compared to baseline within the same group.

Over the 12-week intervention period, all three groups exhibited significant reductions in ulcer size and pain scores ($p < 0.05$). The Hydrocolloid group showed the most substantial reduction in ulcer size, reaching 0.9 cm^2 at Week 12. Alginate and Foam groups also demonstrated significant reductions in ulcer size, with values of 1.3 cm^2 and 1.2 cm^2, respectively, at Week 12. Pain scores decreased significantly in all groups, with the Hydrocolloid group experiencing the highest reduction (3.2 to 1.1), followed by the Alginate group (3.4 to 1.2) and the Foam group (3.5 to 1.3).

Discussion

Chronic ulcers are a significant clinical concern, often requiring appropriate wound dressings to facilitate healing and prevent complications. This study aimed to compare the effectiveness of Hydrocolloid, Alginate, and Foam dressings in promoting the healing of chronic ulcers.

Ulcer Size Reduction:

Our findings demonstrated consistent reductions in ulcer size across all three dressing groups over the 12-week intervention period. However, the Hydrocolloid group exhibited the most substantial reduction, with a final ulcer size of 0.9 cm^2. This result aligns with previous studies indicating that Hydrocolloid dressings create a moist wound environment that supports autolytic debridement and granulation tissue formation (3). Alginate and Foam dressings also contributed to significant ulcer size reduction, indicating their potential effectiveness in chronic wound management.

Pain Scores:

Pain reduction is an important aspect of wound care, as pain can significantly impact patients' quality of life. In this study, all three dressing groups demonstrated significant reductions in pain

scores over the 12-week period. The Hydrocolloid group showed the highest reduction in pain scores, followed by the Alginate and Foam groups. These findings suggest that all three dressing types contribute to improved patient comfort during the healing process.

Histological Analysis:

Histological analysis revealed improved granulation tissue formation and decreased inflammation in all three dressing groups. Notably, the Hydrocolloid group exhibited the most pronounced improvements in histological markers. This observation is consistent with the moist wound environment created by Hydrocolloid dressings, which is conducive to optimal wound healing (3). Alginate and Foam dressings also demonstrated favorable histological outcomes, reinforcing their potential as effective wound care options.

Clinical Implications:

The results of this study have important clinical implications for wound care professionals. While all three dressing types showed effectiveness in promoting chronic ulcer healing, Hydrocolloid dressings appeared to offer advantages in terms of ulcer size reduction, pain relief, and histological improvements. However, the choice of dressing should be tailored to individual patient needs, wound characteristics, and cost considerations (2).

Limitations and Future Research:

This study has limitations, including the relatively short follow-up period and the lack of blinding. Future research could investigate the long-term effects of these dressings on chronic ulcer healing and explore their cost-effectiveness in larger patient populations.

Conclusion

In conclusion, this randomized controlled trial provides valuable insights into the comparative effectiveness of Hydrocolloid, Alginate, and Foam dressings in healing chronic ulcers. While all three dressing types exhibited benefits in terms of ulcer size reduction, pain relief, and histological improvements, Hydrocolloid dressings demonstrated superior outcomes. Clinicians should consider these findings when selecting the most appropriate dressing for individual patients.

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