

Use of a Chitosan Based Gel Forming Silver Wound Dressing* for the Management of Chronic Diabetic Wounds

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Study # LIT017WC



This study was sponsored by:

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MKT1443066/LIT017WC/2.5M/K&M7

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INTRODUCTION

Wound management often involves the use of fibrous dressings because these dressings offer numerous benefits.^{1,2} Fiber dressings tend to be soft, conformable, and their numerous interstices and generally porous nature coupled with the hydrophilic properties leads to efficient exudate management. The gelling properties of fiber dressings provide a moist wound-dressing interface. Optimal moist wound management of diabetic wounds includes the use of soft dressings that efficiently absorb wound exudate.^{3,4} Advanced moist wound dressing materials aid in chronic wound management, and many such dressings are based on natural polymers such as alginates that carry a negative charge at physiological pH.⁵ Chitosan is a marine polysaccharide that is known to be polycationic at physiological pH.⁶ A non-woven fabric chitosan based dressing is composed of marine sourced polysaccharide polymers and contains ionic silver to help manage bioburden. This chitosan based wound dressing absorbs fluids and forms a soft, translucent gel that holds its structure even when wet. This dressing is conformable to the wound bed, providing intimate contact. Retention of original dressing size upon wetting (i.e., lack of "shrinkage"), and the property to remain integral (i.e. "in one piece") during the removal process is important. We believe these material properties can be beneficial in dressings used for the management of diabetic wounds.

METHODS

To study the clinical efficacy of a chitosan based silver wound dressing, 9 patients with 13 diabetic wounds, which were contaminated but not infected, were selected. One patient was hospitalized after four weeks of treatment, so he was lost to follow up. Sharp debridement was performed at physician discretion. The patients were seen weekly, and wound size was monitored over time.

RESULTS

- Patient 1, DM, had a left lateral leg wound and a right anterior leg wound, which closed completely in seven weeks and three weeks, respectively. This correlates to a 14.3% and 33.3% wound size reduction per week.
- Patient 2, RG, had a right lateral ankle wound and a right lateral heel wound. After 4 weeks of treatment, the right lateral ankle wound had increased in size by 53.1% (13.3% increase/week), but the right lateral heel wound had decreased in size by 20% (5% reduction/week). Patient 2 was then hospitalized and lost to follow up.
- Patient 3, LT, had a right heel wound and a left lateral leg wound. After six weeks of treatment, the right heel wound and the left lateral leg wound had decreased in size by 45.6% (7.6% reduction/week) and 60% (10% reduction/week), respectively.
- Patient 4, JW, had a right lateral heel wound and a left heel wound. After two weeks of treatment, the right lateral heel wound had decreased in size by 12.5% (6.3% reduction/week), and the left heel wound had decreased 9.1% (4.6% reduction/week) in total area and 39.4% (19.7% reduction/week) in total volume.
- Patient 5, BE, had a right medial ankle wound. After two weeks of treatment, the wound had decreased in size by 36.9% (18.4 % reduction/week).

Case: LT 3.1



Figure 1: Wound Area Progression

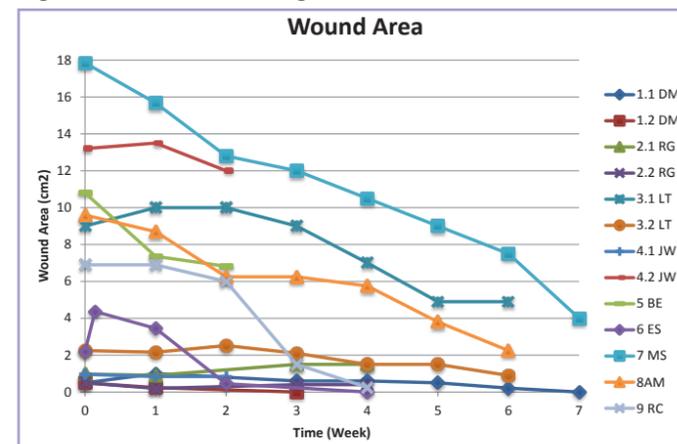
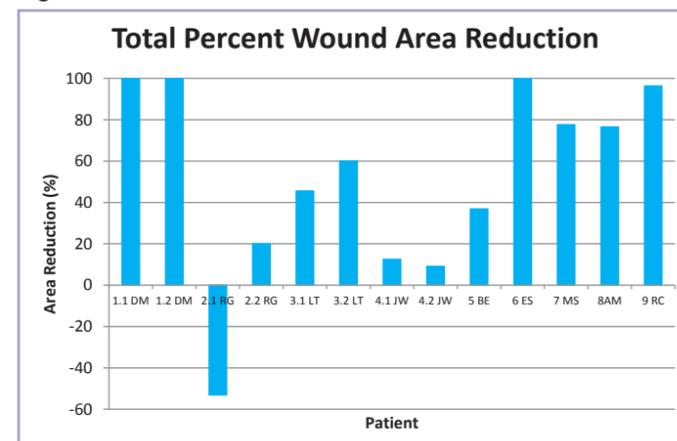


Figure 3: Total Percent Wound Area Reduction



- Patient 6, ES, had a right posterior leg wound. After four weeks of treatment, the wound had closed (25% reduction/week).
- Patient 7, MS, had a left anterior leg wound. After seven weeks of treatment, the wound had decreased by 77.6% (11.1% reduction/week) in total area and 92.5% (13.2% reduction/week) in total volume.
- Patient 8, AM, had a left lateral foot wound. After six weeks of treatment, the wound had decreased in size by 76.6% (12.8% reduction/week) in total area and 92.2% (15.4% reduction/week) in total volume.
- Patient 9, RC, had a right heel wound. After four weeks of treatment, the wound had decreased in size by 96.4% (24.1% reduction/week) in total area and 98.2% (24.6% reduction/week) in total volume.

There were visible qualitative changes in the wound bed, with a reduction in wound redness and inflammation. Wound sizes reduced over time for a majority of the wounds, though a few increased in size in the early stages because sharp debridement was performed. The chitosan based wound dressing was easy to apply, extremely conformable, and easy to remove without disintegration. Compared to the other gelling fiber dressings, there was no "shrinkage" of the dressings as it absorbed exudate from the wound.

The wound area progression and wound volume progression can be seen in Figures 1 and 2, respectively. The total percent wound area reduction and the total percent wound volume reduction can be seen in Figures 3 and 4, respectively.

Case: RC 9



Figure 2: Wound Volume Progression

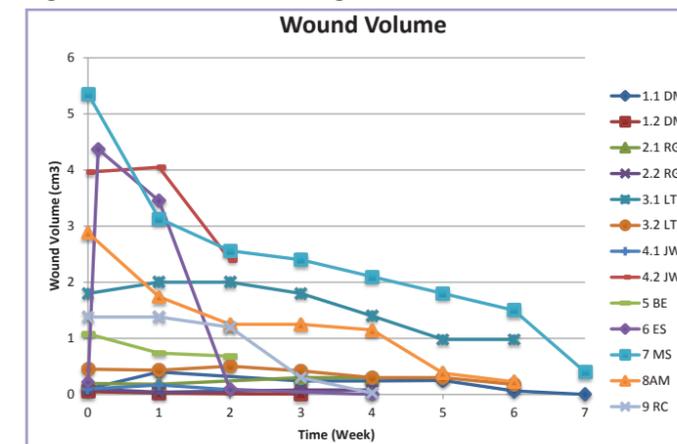
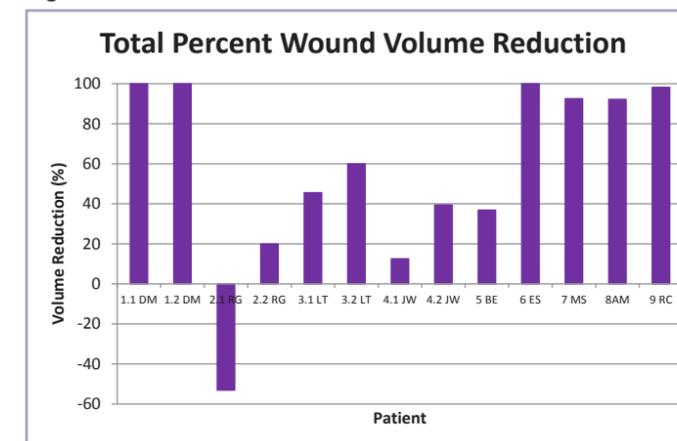


Figure 4: Total Percent Wound Volume Reduction



DISCUSSION

When compared to our experience with the very familiar alginate and carboxymethylcellulose based dressings, the chitosan based silver dressing was found to be more conformable, and it did not shrink from its original dimension when saturated with wound exudate or saline prior to application, a common observation compared to carboxymethylcellulose based dressings. The chitosan based silver dressing did not disintegrate upon removal and was therefore deemed to have high integrity. These qualitative differences were ascribed to the material compositions of the cationic chitosan and anionic carboxymethylcellulose dressings.

CONCLUSION

The chitosan based silver dressing was used on 9 patients with 13 wounds for a period of 2-7 weeks. All but one wound belonging to a patient who was later hospitalized, decreased in size. The chitosan based silver dressing was conformable, maintained its original size, and had a high integrity. Head to head trials between the various dressings are warranted to better understand any clinical implications of these qualitative differences, caused by the dressing composition. We believe that a new type of dressing in the clinician's tool kit is a positive development.

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