

Impact of the wound hygiene concept on wound contraction: an experience by ‘Vulnologia ASL3 Regione Liguria’

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ABSTRACT

The number of non-healing wounds has been growing during the post-COVID-19 period posing serious socioeconomic and healthcare issues. Objective. To implement strategies to tackle hard-to-heal wounds. We have introduced a strategy comprising 4 steps, wound hygiene (WH), to make the intervention on patient outcomes more effective, following a full holistic assessment of the individual and taking into account organizational difficulties at the same time. WH allowed us to address biofilm thus promoting the wound healing process. We assessed the evolution of 101 wounds with varying etiology and location, and that had been showing no signs of improvement for at least 3 weeks in spite of being treated in compliance with the wound bed preparation

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latest guidelines. We improved our practice by implementing the four steps suggested by the WH approach: from cleansing to dressing the potentially biofilm-infected wounds with a dressing made of Sodium carboxymethylcellulose containing silver and an antibiofilm agent (CmcNaAg+). The contraction percentage rate of wounds was recorded weekly. As a control we used 44 wounds treated with the same dressing (CmcNaAg+) but without performing WH. We observed i) a decrease in the number of patients' visits from 3 to 1 per week in 30% of treated wounds; ii) a faster wound contraction rate vs. previously used non-standardized procedures (the weekly contraction percentage changed from 0.04 in the group treated without WH to 0.14 in the group treated with WH, showing a 63% improvement in the second group); iii) a decrease in the number of days of treatment (the average treatment duration was 154 days in the group treated without WH and 71 days in the group treated with WH, showing a 54% reduction). We believe that this approach can be a useful strategy to improve the management of wounds potentially containing biofilm, thus strengthening the clinical reasoning of every healthcare professional. WH allowed us to bring theory closer to practice for a quicker achievement of the treatment goal.

Introduction

To date, between 2 and 6% of the world population is reported to have a wound and this figure is expected to grow rapidly.^{1,2} It is estimated that by 2050 the number of people aged 65 years and older will be significantly higher; that age group is the most affected by wounds.^{1,2}

Hard-to-heal wounds are equally increasing and pose serious socioeconomic and healthcare issues. Specifically: i) the costs related to the lengthening of treatment

due to incorrect wound management are heavy.^{3,4} Also, the inappropriate use of antibiotics has been observed to incur additional costs,^{4,5} as well as the increased hospital admissions and the worsening of patients' socio-psychological conditions;⁶⁻⁹ ii) Biofilm has been reported to be one of the major causes of the interruption in the healing process;^{10,11} iii) Distress for patients and healthcare professionals.

With this in mind, we have decided to embed the 4-step Wound Hygiene (WH) protocol into current strategies in order to manage biofilm and hard-to-heal wounds more effectively.^{12,13}

Wound hygiene insight

The WH concept comprises four key activities - cleansing, debridement, refashioning the wound edges, and dressing the wound initially with an antibiofilm technology - and has proven effective in promoting the healing process of wounds likely to contain biofilm. It is a best practice technique that should be applied at every dressing change for the whole duration of care until full healing and with varying intensity appropriate for the wound needs.¹²⁻¹⁴

Our own experience and management system

In our local health authority - ASL3 Liguria - wound care is implemented based on continuity of care across the hospital and community and has been centralized for many years in a wound care department (Vulnologia) transversal to all care settings. Data collection has been carried out through the implementation of a computerized monitoring system, the Wound Observatory.

The Wound Observatory is a tool used to monitor wounds in the area covered by our Local Health Authority, and to assess the management of clinical risk in order to drive a more effective management system from both the clinical and economical points of view.

The Observatory has been recognized by AGENAS as best practice in the integrated management of wound care across hospital clinic and community.

The Observatory has been central to the collection of the data presented in this study.

Materials and Methods

We provided clinicians and healthcare professionals with education and training on WH in order to consolidate the best practice in the management of hard-to-heal wounds.

As many as 144 patients were enrolled with 145 wounds of various etiology and locations, that had not shown any signs of improvement for at least 3 weeks in spite of being treated in compliance with the wound bed preparation latest guidelines (Table 1).

For each group, the number of treatment days was recorded as well as the percentage of weekly wound contraction.

Statistical analysis

The statistical significance for the percentage of weekly wound contraction in the 2 groups was assessed using the Mann-Whitney non-parametric test for independent data, two-sided and with $P < 0.05$. The statistical significance for the treatment duration in the 2 groups was instead assessed using the parametric two-tailed t-Test, with $P < 0.05$ (GraphPad Prism).

Results

In total, 145 wounds in 144 patients were assessed (Figure 1).

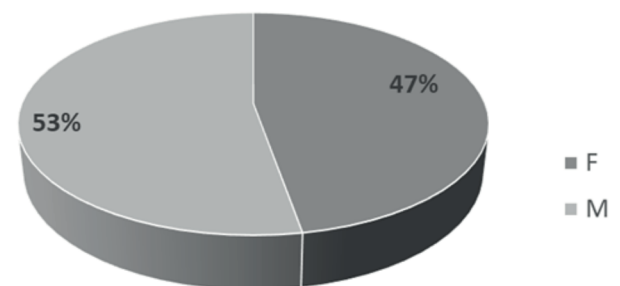


Figure 1. Gender (in %) of treated patients.

Table 1. Wounds and type of treatment.

N. of treated wounds	Type of treatment
44	Treated with advanced wound dressings made of sodium carboxymethylcellulose containing ionic silver with Benzethonium chloride and EDTA (Control CmcNaAg ⁺). Treatment performed before the publication of the International Consensus Document "Defying hard-to-heal wounds with an early antibiofilm intervention strategy: wound hygiene". ¹³
101	Treated with absorbent antimicrobial dressings made of CmcNaAg ⁺ and the application of the WH technique for the entire healing process (CmcNaAg ⁺ and WH treatment).

ETDA, ethylenediaminetetraacetic acid; WH, wound hygiene.

The treated wounds had different etiology and locations (Figures 2, 3).

We observed i) a decrease in the number of patients' visits from 3 to 1 per week in 30% of treated wounds; ii) a faster wound contraction rate *vs.* previously used non-standardized procedures; iii) a decrease in the number of days of treatment (average duration of treatment).

The weekly contraction percentage changed from 0.04 in the group treated without WH to 0.14 in the group treated with WH, showing a 63% improvement (Figure 4).

The wound treatment duration was significantly lower in the group treated with WH (71 days) compared to the group treated without WH (154 days), showing a 54% reduction (Figure 5).

Discussion

It is known from literature that biofilm is present in 78.2% of chronic wounds.⁷ We decided to test this new antibiofilm strategy to encourage healthcare professionals to treat non-healing wounds focusing on the appropriate

cleansing of the wound bed and periwound skin, the most effective management of non-viable tissue, of biofilm and/or critical colonization. This allowed us to integrate and standardize our approach to fragile patients with wounds across the hospital-community settings.

From the collected data analysis, we can state that the WH technique, implemented in association with a specific antimicrobial and antibiofilm dressing, allowed us to tackle biofilm and promote the wound healing process, significantly improving the treatment of hard-to-heal wounds and patient outcomes.

Conclusions

We believe that the WH concept can be a useful strategy to enhance the practical approach to potentially biofilm-infected wounds and can contribute to strengthening the clinical reasoning of every healthcare professional. WH allowed us to bring theory closer to practice for a quicker achievement of the treatment goal. It proved to be an effective tool, easy to use also by less skilled pro-

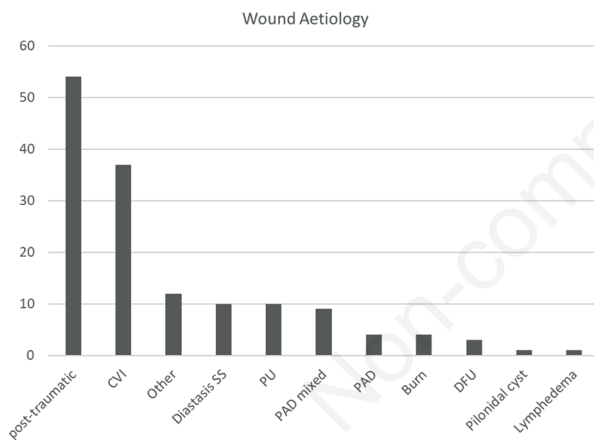


Figure 2. Aetiology of treated wounds.

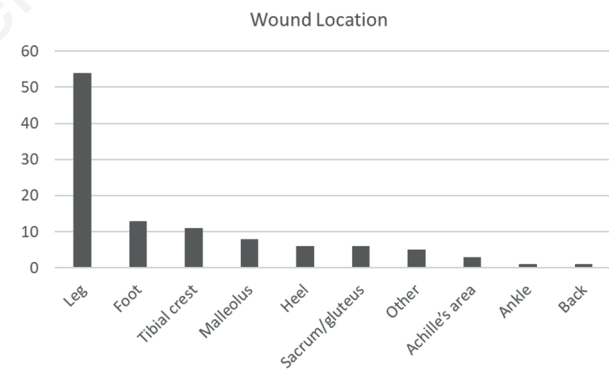


Figure 3. Location of treated wounds.

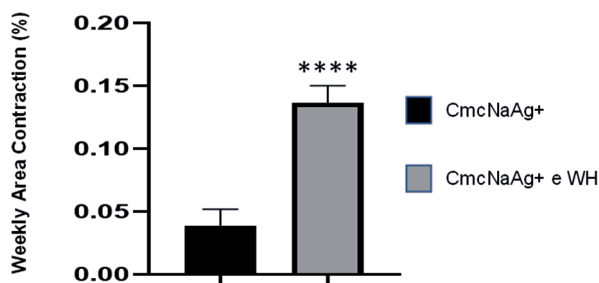


Figure 4. Weekly contraction average percentage of wounds treated with CmcNaAg+ with and without wound hygiene.

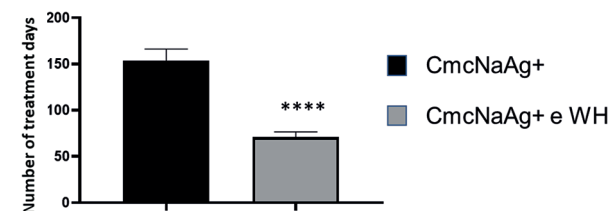


Figure 5. Number of treatment days of wounds treated with CmcNaAg+ with and without wound hygiene. Data are expressed as mean value \pm SEM. The sample size of the 2 groups was $n=44$ in the group CmcNaAg+ and $n=101$ in the group CmcNaAg+ and wound hygiene. **** $P<0.0001$ (parametric two-tailed t-Test).

professionals, therefore we have decided to embed this strategy in our procedures currently performed on all the patients posing wound healing challenges.

The objective is to reactivate the healing process in non-healing wounds and to enhance the proactivity of healing wounds in order to reduce the duration of the clinical/diagnostic path across the hospital/community settings and improve the appropriateness of treatment.

Our results surely represent a starting point and will be the subject of more extensive studies, including the assessment of the evolution of the wound care phenomenon over the years, also with respect to the different care settings and wound etiology.

References

1. Järbrink K, Ni G, Sönnnergren H, et al. The humanistic and economic burden of chronic wounds: a protocol for a systematic review. *Syst Rev* 2017;6:15.
2. Campbell D. Chronic wounds: the hidden health crisis hitting 2m Britons. *The Guardian* 2019. Available from: <https://tinyurl.com/yy2xtjfn> (access January 2022)
3. Nussbaum SR, Carter MJ, Fife CE, et al. An economic evaluation of the impact, cost, and Medicare policy implications of chronic nonhealing wounds. *Value Health* 2018;21:27-32.
4. Dolk FC, Pouwels KB, Smith DR, et al. Antibiotics in primary care in England: which antibiotics are prescribed and for which conditions? *J Antimicrob Chemother* 2018;73:ii2-10.
5. Centers for Disease Control (CDC). The biggest antibiotic-resistant threats in the U.S. Centers for Disease Control and Prevention 2019. Available from: <https://tinyurl.com/6za6zu96> (access January 2022)
6. Posnett J, Gottrup F, Lundgren H, et al. The resource impact of wounds on healthcare providers in Europe. *J Wound Care* 2009;18:154-61.
7. Olsson M, Järbrink K, Divakar U, et al. The humanistic and economic burden of chronic wounds: A systematic review. *Wound Repair Regen* 2019;27:114-225.
8. Purwins S, Herberger K, Debus ES, et al. Cost-of-illness of chronic leg ulcers in Germany. *Int Wound J* 2010;7:97-102.
9. Hjort A, Gottrup F. Cost of wound treatment to increase significantly in Denmark over the next decade. *J Wound Care* 2010;19:173-84.
10. Bjarnsholt T, Eberlein T, Malone M, et al. Management of biofilm. *Wounds Int* 2017;8.
11. Malone M, Bjarnsholt T, McBain AJ, et al. The prevalence of biofilms in chronic wounds: a systematic review and meta-analysis of published data. *J Wound Care* 2017;26:20-5.
12. Embedding Wound Hygiene into a proactive wound healing strategy *J Wound Care Consensus Document* vol. 31, aprile 2022.
13. Murphy C, Atkin L, Swanson T, et al. International consensus document. Defying hard-to-heal wounds with an early antibiofilm intervention strategy: Wound Hygiene. *J Wound Care* 2020;29:S1-S28.
14. Murphy C, Mrozikiewicz-Rakowska B, Kuberka I, et al. Implementation of Wound Hygiene in clinical practice: early use of an antibiofilm strategy promotes positive patient outcomes. *J Wound Care* 2022;31:S1-S32.