

# The role of therapeutic dressings with silver in chronic wounds therapy

MAJA MIHELIČ and TANJA PLANINŠEK RUČIGAJ<sup>1</sup>

*University of Ljubljana, Medical Faculty and <sup>1</sup>University Medical Centre, Dermatovenerological clinic, Ljubljana, Slovenia*

Healing is a complex process itself; however, impaired healing of chronic wounds is even more difficult and associated with imbalance of a number of factors. Of them, most prominent are inflammatory cytokines, free radicals, proteases, especially matrix metalloproteinases and their tissue inhibitors. Silver is very useful in difficult cases as it supports wound healing in many ways. Furthermore, it is known to protect growth factors, scavenge matrix metalloproteinases and free radicals and inactivate destructive proteases, along with other favorable actions. It exerts antimicrobial and anti-inflammatory effects. In low concentrations, it protects from recurrent infections, which is very important for patients at risk, such as those with diabetes, burns and impaired immunity. Five patients with different etiology and duration of venous ulcers were included in a small clinical trial. Silver dressing (Promogran Prisma™, Johnson & Johnson) was chosen as the treatment of choice. Ulcer size was reduced by a mean of 34.11% in 17 days of trial, with maximum reduction of 90.91% within 7 days. Accordingly, silver has important effects on the healing process in non-healing wounds of different etiology.

**KEY WORDS:** silver dressings, chronic wounds

**ADDRESS FOR CORRESPONDENCE:** Maja Mihelič, dr. med.  
Medical Faculty  
University of Ljubljana  
Zaloška 2  
1 000 Ljubljana, Slovenia

## INTRODUCTION

For a wound to heal properly, several elements have to be in present in right amount and proportions to each other. If any of them is increased or decreased, healing of the wound can be aggravated. Because healing is complex process itself implying many steps, non-healing ulcers pose a great problem in dermatology. Silver is therefore very useful in such treatment because supports those steps in many ways (1-3).

## ELEMENTS INVOLVED IN WOUND HEALING

Impaired healing of chronic wounds is associated with imbalance of the reduced levels of active growth factors on the one hand and excess levels of free radicals and inflammatory cytokines on the other hand. Another failed proportion that is otherwise important in correct healing is imbalance between excessive proteases and their physiological inhibitors, such as tissue inhibi-

tors of metalloproteinases (TIMPs), but also the high levels of bacteria. The proteases required for sore recovery are elastases, plasmin and matrix metalloproteinases (MMPs). All these factors and proportions contribute to decomposition of the newly formed extracellular matrix because they not only cause crumbling of growth factors and their receptors within the wound but also disturb granulation tissue formation and angiogenesis. In contrast to active MMP-1 (interstitial collagenase), MMP-2 (gelatinase A), MMP-9 (gelatinase B) and MMP-14 (membrane MMP type), which all are needed for normal wound healing, excessive formation of MMP-3 (stromelysin 1) and MMP-13 (collagenase) or reduced levels of their TIMPs are correlated with non-healing wounds (4-8).

## EFFICACY OF DRESSINGS CONTAINING SILVER

Five risk patients (mean age 56.8 years) with ulcers of different etiology were included in a small clinical trial.

Table 1. Clinical trial showing efficacy of silver dressing therapy

| Patient no. | Sex (M/F) | Age (yrs) | Presence of ulcer before th. [months] | Diagnosis                                | Size before th. [cm <sup>2</sup> ] | Time of trial [days] | Size after th. [cm <sup>2</sup> ] | Size regression [%] |
|-------------|-----------|-----------|---------------------------------------|--|------------------------------------|----------------------|-----------------------------------|---------------------|
| 1           | M         | 58        | 36                                    | Ulcer with GVHD                          | 33                                 | 11                   | 19                                | 42.42               |
| 2           | M         | 73        | 7                                     | Ulcer post radio th.                     | 155                                | 14                   | 131                               | 15.48               |
| 3           | M         | 72        | 12                                    | Venous leg ulcer                         | 89                                 | 14                   | 50                                | 43.82               |
| 4           | F         | 53        | 4                                     | Posttraum. ulcer on arm with A-V fistula | 39                                 | 39                   | 12                                | 69.23               |
| 5           | F         | 28        | 1.5                                   | Posttraum. ulcer                         | 5.5                                | 7                    | 0.5                               | 90.91               |
|             | Mean      | 56.8      | 12.1                                  |  | 64.3                               | 17                   | 42.5                              | 34.11               |

Th – therapy; GVHD – graft versus host disease; Posttraum. – posttraumatic; A-V fistula – arteriovenous fistula

In this study, neither the etiology nor duration of ulcer before therapy was considered important and was therefore different among ulcers. However, the same silver dressing (Promogran Prisma™, Johnson & John-

son) was used in all study patients. This is a multimodal dressing composed of 55% collagen, 44% oxidized regenerated cellulose and 1% silver (0.25% ionically-bound silver). Silver is efficacious in the process of healing as it acts as an MMP scavenger, thus protecting growth factors from being destroyed by different proteinases. Furthermore, it inactivates destructive proteases, scavenges free radicals and reduces levels of proinflammatory cytokines. Above all, it exerts antimicrobial and anti-inflammatory effects. Taking all this in account, it is obvious that silver has important effects on the healing process, especially in non-healing wounds of different etiology that are difficult to treat. To demonstrate it, we chose 5 ulcers of different etiology (Table 1). The average time of treatment in the trial was 17 days.

At the beginning of the study, ulcer areas were drawn into film dressings and precisely measured with a digital planimeter (Placom KP-90N, Japan); it was repeated at the end of trial. Upon treatment with silver dressings, ulcer size reduced from a mean of 64.3 cm<sup>2</sup> to 42.5 cm<sup>2</sup> (statistically, by a mean of 34.11%). In one case, post-traumatic ulcer persisted for 1.5 month before thera-



Fig. 1. Patient no. 2: ulcer post radiotherapy for epithelioma at study entry.



Fig. 2. Patient no. 2: ulcer post radiotherapy for epithelioma during the study.



Fig. 3. Patient no. 2: ulcer post radiotherapy for epithelioma at the end of the study.

py. In just 7 days of treatment with silver, it improved from 5.5 cm<sup>2</sup> to 0.5 cm<sup>2</sup> in size or impressive 90.91%. Study results are illustrated by one example (patient no. 2: ulcer post radiotherapy for crural epithelioma (Figures 1-3) (9).

## CONCLUSION

It is clearly shown that silver has great influence on the healing process of non-healing wounds or wounds at risk for another infection. Silver supports many steps of wound recovery and is therefore the method of choice for complicated ulcers irrespective of etiology.

## REFERENCES:

1. Planinšek Ručigaj T, Kecelj N. Bolezni ven spodnjih udov. U: Kansky A, Miljković J. Kožne in spolne bolezni. 2. dopolnjena izd. Ljubljana: Združenje slovenskih dermatovenerologov, cop. 2009, 335-346. [COBISS.SI-ID 21609272]
2. Planinšek Ručigaj T, Kecelj N, Slana A. Priročnik za zdravljenje venskih golenjih razjed s sodobnimi oblogami. Ljubljana: Dermatovenerološka klinika, 2011.
3. Kecelj N, Planinšek Ručigaj T. Priporočila za sodobno zdravljenje in preventivo venske golenje razjede. Ljubljana: Društvo za oskrbo ran Slovenije, 2008. [16] str. ISBN 978-961-91808-6-0. [COBISS.SI-ID 240803840]
4. Planinšek Ručigaj T. How to Choose the Proper Dressings in Venous Leg Ulcers care. Reviews in Vascular Medicine. Rev Vasc Med 2014; 2: 58-61.
5. Planinšek Ručigaj T., Pečenković-Mihovilović S. Potporne obloge – vrsta i indikacije za primjenu. Acta Med Croatica 2009; 63(supl 4): 37-8.
6. Triller C, Huljev D, Planinšek Ručigaj T. Suvremena pokrivala za rane. Acta Med Croatica 2013; 67(Supl. 1) 81-8
7. Planinšek Ručigaj T, Pečenković-Mihovilović S. Značenje potpornih obloga. Acta Med. Croatica, 2008; 62(Supl 2): 59-67. [COBISS.SI-ID 25759961]
8. Planinšek Ručigaj T. Odabir suvremene potporne obloge za liječenje i lokalni tretman kronične rane. Acta Med Croatica 2010; 64(Supl. 1): 99-102.
9. Šmuc Berger K, Planinšek Ručigaj T. Postradiation leg ulcer treated with wound balancing matrix [poster presentation] 251. EWMA J 2009; 7(suppl) 2, 220. [COBISS.SI-ID 21337912]

## SAŽETAK

### MJESTO TERAPIJSKIH OBLOGA SA SREBROM U LIJEČENJU KRONIČNIH RANA

M. MIHELIČ I T. PLANINŠEK RUČIGAJ<sup>1</sup>

*Univerzitet u Ljubljani, Medicinski fakultet i Univerziteti klinički centar Ljubljana, Dermatovenerološka klinika, Ljubljana, Slovenija*

Proces zacjeljivanja je sam po sebi kompleksni postupak, a poremećeno zacjeljivanje kroničnih rana je čak još više otežano i povezano s neravnotežom između nekoliko čimbenika. Među njima su najznačajniji upalni citokini, slobodni radikali, proteaze, naročito matriks metaloproteinaze i njihovi tkivni inhibitori. U teškim slučajevima je vrlo korisno srebro jer utječe na zacjeljivanje rane na nekoliko načina. Osim toga, poznato je da štiti faktore rasta, čisteći matriks metaloproteinaze i slobodne radikale, inaktivirajući destruktivne proteaze, a ima i mnogo drugih kvaliteta. Ima antimikrobne i protuupalne učinke. U malim koncentracijama štiti od recidivirajućih infekcija što je vrlo važno za rizične bolesnike kao što su osobe s dijabetesom, oštećenim imunitetom, bolesnici s ranama. U maloj kliničkoj studiji izabrali smo 5 pacijenata s različitim tipovima etiologije i trajanja venskih vrijedova. Kao lijek izbora korištena je srebrna obloga (Promogran Prisma<sup>TM</sup>, Johnson & Johnson). Vrijedovi su se statistički smanjili u prosjeku za 34,11 % u 17 dana trajanja studije. Najizrazitiji vrijed se u sedam dana liječenja stisnuo za 90,91 %. Uzevši u obzir sve prije spomenuto, očito je da srebro značajno utječe na proces zacjeljivanja rana različite etiologije koje teško zaraštaju.

**KLJUČNE RIJEČI:** obloga sa srebrom, kronična rana