

Healing hard-to-heal wounds and improving quality of life

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Some patients experience hard-to-heal wounds that fail to improve despite standard care. Copper-impregnated dressings can offer both antimicrobial activity and support for wound healing processes. This paper explores an evaluation undertaken by the author of the effect of copper dressings on wound healing, pain reduction, and quality of life in patients with hard-to-heal wounds who had previously been unresponsive to silver-based dressings. Four patients with chronic wounds (six to nine months' duration) were treated with silver dressings for six to nine weeks when hospitalised with no significant improvement. Their care plan was then changed to copper dressings for three to four weeks. Wound size and pain were assessed at baseline, week one and four. A cost analysis was also performed. All patients showed $\geq 50\%$ wound size reduction within seven days, with full closure by week four. Mean pain scores dropped significantly from 4.75 to 0.25. Improved mobility and daily function were also reported. Treatment costs fell from £2,606 to £365 on average — an 86% reduction. The copper dressing used enhanced healing, lessened pain, improved mobility, shortened treatment time and reduced costs in these four hard-to-heal wounds which had been unresponsive to conventional care.

KEYWORDS:

■ Copper ■ Silver ■ Wound healing ■ Pain ■ Patient quality of life

Hard-to-heal wounds are wounds which have failed to respond to treatment despite addressing factors that affect healing, such as wound aetiology and comorbidities (Murphy et al, 2020). They often severely affect quality of life due to pain, limited mobility, and increased risk of wound infection (World Union of Wound Healing Societies [WUWHS], 2025). Their prevalence in developed countries is estimated at 1–2% (Nussbaum et al, 2018; Martinengo et al, 2019). Major wound types include:

- ▶ Venous leg ulcers (~3% in individuals >65 years)
- ▶ Diabetic foot ulcers (15–25% lifetime risk in diabetics)

- ▶ Pressure ulcers (5–10% of hospitalised patients) (Sen et al, 2009; Armstrong et al, 2017; Nussbaum et al, 2018).

Such wounds impose a substantial burden on healthcare systems (Guest et al, 2015; Nussbaum et al, 2018). In the UK alone, 3.8 million wounds were treated by the NHS in 2017/2018 (Guest et al, 2020), an increase of 71% since 2012/2013 (Guest, 2020).

The key to preventing a wound from becoming hard-to-heal is conducting comprehensive holistic assessment, reaching an accurate diagnosis for the wound and addressing underlying factors that can reduce the capacity to heal, such as comorbidities, limited mobility, poor nutrition and infection, among others (Wounds UK, 2022). Infection

is often a contributing factor in a hard-to-heal wound (Atkin et al, 2019) and is frequently managed with antimicrobial dressings, particularly silver-based products (May et al, 2022; Yousefian et al, 2023). However, these do not always lead to healing (Luo et al, 2022; May et al, 2022). A wound that shows less than a 40% reduction in size within four weeks is indicative of poor treatment response (Cardinal et al, 2008; Coerper et al, 2009; Snyder et al, 2010) and should prompt reassessment to determine whether a change in management is warranted (Atkin et al, 2019).

Correct use of antimicrobial dressings is essential, as prolonged or inappropriate application can be costly and is not consistent with evidence-based clinical recommendations (International Wound Infection Institute [IWII], 2022).

Copper, in a similar way to silver, possesses broad-spectrum antimicrobial properties (Salvo and Sandoval, 2022). The mechanism of action is multifactorial: copper ions released from dressings interact with microbial cell membranes, causing structural damage and leakage of essential cell contents. Additionally, copper generates reactive oxygen species (ROS), which further damage proteins, lipids, and nucleic acids within pathogens, ultimately leading to cell death (Salvo and Sandoval, 2022). Emerging evidence also suggests that copper may play a role in angiogenesis and extracellular matrix remodelling, potentially supporting wound healing beyond its antimicrobial effects (Salvo and Sandoval, 2022).

With the rise in antimicrobial resistance (AMR), it is interesting

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to note that, unlike traditional antibiotics, copper's broad-spectrum antimicrobial activity has not been associated with the development of AMR — hence its applicability for healthcare (Borkow and Gabbay, 2009; Bisht et al, 2022).

This article discusses four patients with hard-to-heal wounds unresponsive to silver dressings who achieved rapid healing after switching to copper dressings, highlighting their potential to accelerate healing, improve outcomes, and reduce costs.

CASE REPORTS

Four patients with hard-to-heal wounds of six to nine months' duration were admitted to the author's hospital (Table 1). Upon admission, they were treated with silver-impregnated and other superabsorbent dressings for six to nine weeks (this was to address concerns about potential biofilm and to provide prophylactic protection against infection), alongside standard wound care protocols, including appropriate support surfaces, regular repositioning and, for the patient with a venous leg ulcer (patient D), compression therapy following comprehensive holistic leg assessment. Despite these

measures, the wounds significantly impaired daily function due to pain and restricted mobility, and failed to heal within the seven weeks (approximately) while on standard of care (SoC).

Subsequently, the wounds were managed with copper dressings (MedCu antimicrobial wound dressings, Creed Health) for three to four weeks (Melamed et al, 2021a; 2021b). Wound dimensions (length, width, depth) were measured using sterile disposable tape measures at baseline (when copper dressings started to be used), week one, and week four. Pain was assessed using the numeric pain rating scale (NPRS), ranging from 0 (no pain) to 10 (worst imaginable pain). Creed Health conducted a cost analysis for the author using current NHS prices to compare the cost and duration of previous dressings used with MedCu, as well as associated nursing time. Ethics approval was not required for this evaluation.

Results

Table 1 shows the patients' wound conditions at baseline. All wounds reduced in size in seven days once the copper dressings were introduced into their care plans (Table 2), from a mean $9.18 \pm 5.76 \text{ cm}^3$ at baseline

Practice point

Copper dressings have been found to improve wound healing, especially in non-infected, hard-to-heal wounds which have previously been treated with silver dressings (Gorel et al, 2023).

to $0.84 \pm 0.61 \text{ cm}^3$ (mean \pm SD). Full wound closure was achieved within four weeks in all four patients. Pain scores decreased significantly, from 4.75 ± 0.96 at baseline to 0.25 ± 0.5 at week four (Table 2). Two patients reported improved ability to sit and mobilise as wound healing progressed. Quality of life was assessed by identifying patients' engagement with therapists for increased rehabilitation on the wards. Better interaction with other patients, nurses and activities was also noted.

A cost analysis of the four patients, accounting for both dressing costs and nursing time, showed that SoC had a mean treatment cost of £2,606, whereas copper dressing management reduced this to £365 — an 86% cost reduction. Furthermore, the duration of the SoC, which was based primarily on silver containing dressings, took on average seven

Table 1: Wound conditions at baseline (before start of treatment with copper dressings; see overleaf)

Patient	Wound type	Wound dimensions (length x width x depth, cm)	T	I	M	E	S
A	Category 4 pressure ulcer to the sacrum	3x2x1	100% granulating, with no slough present in the wound bed	No malodour or clinical signs of infection	Low exudate	Slightly macerated	Fragile
B	Category 4 pressure ulcer to the spine	1.5x1x0.5	Thin layer of slough in the wound bed with granulation tissue; no bone visible	No clinical signs of infection; mild erythema and inflammation	Minimal thick amber exudate	Slow to advance	Red but blanching to touch
C	Category 3 pressure ulcer on the left ischial tuberosity	1x4	50% moist slough and 50% granulating tissue	No clinical signs of infection	Low exudate	Edges are flat and appear slightly macerated	Fragile
D	Venous leg ulcer	2x1.5x1	Superficial and granulating, with minimal moist, yellow slough	No clinical signs of infection	Moderate exudate	No undermining noted	No signs of cellulitis

*T = tissue; I = infection; M = moisture; E = wound edges; S = surrounding skin

Patient A

Patient A was admitted to hospital with a category 4 pressure ulcer to the sacrum, measuring 2.8cm (length) x 3cm (width) x 2cm (depth), with 2cm undermining between 5–8 o'clock. The plan was to cleanse the wound bed with normal saline and pat dry and lightly pack the wound cavity and undermining areas with a hydrofiber dressing and cover with a self-adherent soft silicone foam dressing to facilitate healing from the base of the wound bed. The wound was to be redressed every two days or sooner if soiled.

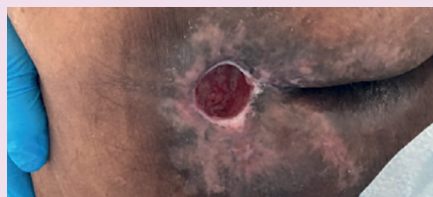


Figure 1.
Patient A on admission.

As wound was slow to progress (see wound dimensions in *Table 1*), it was decided to lightly pack the wound with an antimicrobial wound dressing with copper (MedCu) and cover with a foam dressing. The copper dressing was to be left in place and only the foam dressing changed if soiling occurred. After one week of this treatment regimen, patient A was discharged to the community to continue treatment with the MedCu dressing.

Patient B

At initial assessment, this patient's category 4 pressure ulcer to the spine measured 1.5cm (length) x 1cm (width) x 0.5cm (depth). A thin layer of slough was noted in the wound bed. There were no clinical signs of infection or malodour — mild erythema was observed due to inflammation. At dressing change, minimal thick amber exudate was present and the wound edges were slow to advance due to chronicity. Although the surrounding skin was red, it was not painful.



Figure 2.
Patient B on admission.



Figure 3.
Patient B after three weeks' treatment with MedCu.

Patient C

This patient had a category 3 pressure ulcer to the left ischial tuberosity measuring 1cm (length) x 4cm (width) on admission. Tissue types present were 50% moist slough and 50% granulation tissue. There were no clinical signs of infection and the wound was producing a low volume of exudate. The edges were flat and slightly macerated and the surrounding skin was fragile.



Figure 4.
Patient C prior to treatment with MedCu.

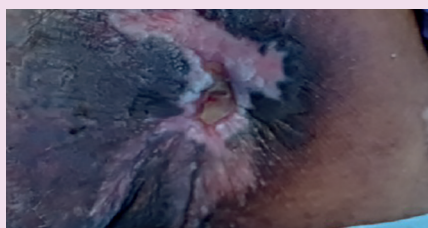


Figure 5.
Patient C after one week's treatment with MedCu.



Figure 6.
Patient C after three weeks' treatment with MedCu.

Patient D

On admission, patient D had a venous leg ulcer to the right lower leg of six months' duration, which was being treated with a negative pressure wound therapy system. The moist, yellow slough was debrided at the bedside with a curette, which revealed full-thickness

skin loss, granulation tissue and minimal slough remaining on the wound bed. No malodour or clinical signs of infection were noted and there was a low volume of exudate on the NPWT dressing. There was no undermining to the wound edges or bleeding. Healed pink scar tissue was noted at the wound edges, and the leg was not hot to touch or cellutic.



Figure 7.
Patient D before treatment with MedCu. Wound measured 2cm (length) x 1.5cm (width).



Figure 8.
Patient D after one week's treatment with MedCu. Wound now measured 1.6cm (length) x 1cm (width).

After three weeks' treatment with the copper antimicrobial dressing, the wound had 100% epithelial tissue present and the wound bed was moist with a moderate volume of exudate. The wound edges had healed and the surrounding skin was fragile.

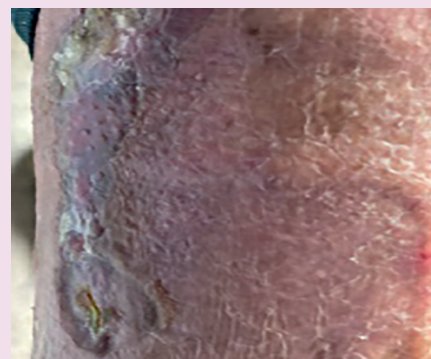


Figure 9.
Patient D after three weeks' treatment with MedCu.

The Habit of Silver VS The Healing of Copper¹



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Table 2: Wound size and pain scores

Patient	Wound dimensions (cm ³)			Pain scores	
	D0	D7	D30	D0	D30
A	6.0	0.2	0	5	0
B	15.75	0.45	0	6	1
C	12	1.2	0	4	0
D	3	1.5	0	4	0
Mean ± SD	9.18±5.76	0.84±0.61	0	4.75±0.96	0.25±0.5

weeks without closing the wounds, while wound management with the copper dressings closed the wounds in 3.8 weeks, i.e. approximately half the time of the SoC period (Table 3).

DISCUSSION

Chronic wounds pose a significant challenge in clinical practice, often persisting despite standard care, including antimicrobial dressings such as silver-based products. Here, all four patients with longstanding (six to nine months' duration), non-healing wounds showed minimal to no improvement during a six–nine-week period of standard wound care, including silver-impregnated dressings. However, after switching to copper-based dressings, all patients demonstrated rapid improvement in wound healing, pain reduction, and functional mobility.

The mean wound volume reduction of over 90% within one week, followed by complete closure within four weeks, highlights the potential efficacy of copper dressings in reactivating stalled wound healing. This result is consistent with previous cases seen by the author and her team in the management of chronic wounds. The concurrent decrease in pain scores and reported improvement in mobility suggest that copper dressings may not only provide antimicrobial benefits, but also contribute to overall wound resolution and improved quality of life.

Importantly, the cost analysis indicated a substantial 86% reduction, with copper dressings achieving wound closure in approximately half the time required

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by silver-based management. This has significant implications for both resource allocation and healthcare system burden.

These findings are consistent with previous literature on copper's role in antimicrobial defence, angiogenesis, and extracellular matrix remodelling (Borkow and Gabbay, 2005; Borkow et al, 2022), as well as other studies reporting improved healing of hard-to-heal wounds — mainly diabetic ulcers — when using copper dressings (Borkow and Melamed, 2021; Borkow and Melamed, 2025; Melamed et al, 2021a; Melamed et al, 2021b). While larger controlled

studies are warranted, these results suggest that copper dressings may offer a valuable alternative in cases where conventional treatments fail.

CONCLUSION

The author's findings support the potential of copper dressings as a promising intervention for managing stagnated, hard-to-heal wounds, particularly in cases where traditional antimicrobial dressings are ineffective. JCN

Declaration of interest

The author does not have any conflict of interests, financial or otherwise.

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Table 3: Summary of treatment duration and cost comparison between SoC and copper dressings

Patient	Total duration of treatment (weeks)				Total cost of treatment			
	SoC (not healed)	Copper dressings (healed)	Weeks less	% less	SoC (not healed)	Copper dressings (healed)	Cost less	% less
A	6	3	3	50%	£1,870	£313	£1,557	83%
B	8	4	4	50%	£3,057	£417	£2,6398	86%
C	5	3	2	40%	£2,830	£417	£2,413	85%
D	9	3	6	67%	£2,666	£313	£2,353	88%
Average	7	3.3	3.8	54%	£2,606	£365	£2,241	86%

Available online: <https://medcu.com/wp-content/uploads/2024/02/Enhanced-Healing-of-Wounds-that-Responded-Poorly-to-Silver-Dressing-by-Copper-Wound-Dressings.pdf>

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