

Mupirocin ointment in the treatment of chronic non-healing wounds: a case series



Authors:

Harikrishna KR Nair,
Wan Sakinah, Alina Md Isa

Abstract: Mupirocin ointment (Supirocin ointment) is a topical antimicrobial that contains an active substance called mupirocin. It is used in adults, adolescents, children and infants aged ≥ 4 weeks to treat infections on the skin such as infected hair follicles that form pimples containing pus (folliculitis), skin infection with blistering and crusting (impetigo) or recurring boils (furunculosis). Mupirocin (pseudomonic acid A), derived from the common Gram-negative bacteria, *Pseudomonas fluorescens*, inhibits bacterial protein and RNA synthesis by binding to bacterial isoleucyl-tRNA synthetase. Once the formation of the isoleucyl-tRNA synthetase is blocked, the cellular levels of the isoleucine charged transfer RNA are depleted, stopping protein and RNA synthesis in bacteria. It is a potent inhibitor against Gram-positive skin flora such as coagulase-negative *Staphylococci* and *Staphylococcus aureus*. Its rapid systemic metabolism means it can only be used topically which, combined with its novel chemical structure, should make cross-resistance less likely to occur than with other currently available antibiotics. It is available as topical preparations only and has no oral derivative, providing a lower risk of resistance and, therefore, may be beneficial in wound care management.

Key words:

- Chronic wounds
- Mupirocin ointment
- Non-healing
- Wound bed preparation
- Wound care management

Harikrishna KR Nair is a Professor and Head of Wound Care Unit, Department of Internal Medicine, Hospital Kuala Lumpur;
Wan Sakinah is a Medical Officer, Wound Care Unit, Department of Internal Medicine, Hospital Kuala Lumpur
Alina Md Isa is a Registered Staff Nurse, Wound Care Unit, Department of Internal Medicine, Hospital Kuala Lumpur

Chronic wounds are wounds where the normal healing process has been disrupted at one or more points in the phases of haemostasis, inflammation, proliferation, and remodelling. In these wounds, there is usually an underlying pathology, which produces a delay in the healing process. Some of the pathologies are infection, ischaemia, metabolic conditions, immunosuppression, and radiation (Leveriza-Oh and Phillips, 2012).

Wound infection can lead to the interruption of several processes along the wound healing pathway. Most community-acquired infections are caused by methicillin-resistant *Staphylococcus aureus* (MRSA) and beta-hemolytic streptococci. Initial antimicrobial choice is empiric and, in simple infections, should cover *Staphylococcus* spp. and *Streptococcus* spp (Ramakrishnan et al, 2015).

Bacteria can form a biofilm that goes unrecognised by host cells and is impermeable to most systemic and topical antimicrobials (Andrews et al, 2021). A biofilm develops when microorganisms adhere to and begin to grow on the surface of a wound. Bacteria within a

biofilm secrete a glue-like matrix, which allows the biofilm to establish itself more completely on the wound and makes it more resistant to antimicrobial treatment and the patients' immune system (Percival et al, 2015).

Bacteria also produce inflammatory mediators that inhibit the inflammatory phase and the epithelialisation phase of wound healing. Bacteria in an infected wound causes cell death, leading to an increase in the local inflammation response and prolonged acute inflammatory phase. The presence of necrotic tissue prevents the in-growth of new tissue. In addition, necrotic tissue also serves as a culture for bacterial proliferation, leading to a vicious pathologic cycle (Swezey, 2022).

With the increasing trend in the prevalence of microbial antibiotic resistance, the use of topical antimicrobials has become favoured for infected or open wounds healing by secondary intention. It is imperative for good clinical practices to help in minimising the possibility of bacteria developing resistance to antimicrobial therapies.

To combat the antimicrobial resistance issue, a multimodal approach has been introduced,

Table 1. Summary of patient data

Patient	Age	Gender	Comorbidities	Wound size reduction (%)
1	50	Male	Diabetes mellitus	30
2	33	Male	Diabetes mellitus	90
3	40	Male	Diabetes mellitus below the knee amputation	50
4	63	Female	Diabetes mellitus, hypertension	50
5	61	Female	Excision of a left frontal anaplastic astrocytoma followed by surgical site infection	80
6	47	Male	None known	100

known as antimicrobial stewardship (AMS) that focuses on prevention of infection and promotion of judicious use of antimicrobials, as well as improving the safety and quality of patient care (Fletcher et al, 2020).

Mupirocin has a wide spectrum of activities against Gram-positive bacteria, including *staphylococci* and *streptococci*, and against certain Gram-negative bacteria, including *Haemophilus influenzae* and *Neisseria gonorrhoeae* (Roghamann et al, 2021), but is much less active against Gram-negative bacilli and anaerobes. Rode et al (1989) concluded that mupirocin, with its novel mode of action, lack of cross resistance with other antibiotics, active penetration through eschar, and *in vivo* efficacy, may play an important role in the future treatment of MRSA wound infections.

In this report, we aim to describe a case series of six patients with simple skin and soft tissue infection and a chronic wound that were treated with mupirocin ointment as a topical

antimicrobial at the Wound Care Clinic, Kuala Lumpur Hospital, Malaysia.

Methods

Patients attending the Wound Care Clinic, Kuala Lumpur Hospital were recruited by simple randomisation. Their wounds were assessed using the TIME concept (Dowsett and Newton, 2005), and were cleansed with non-toxic cleansers such as a topical disinfectant. If necessary, debridement/desloughing were performed. Mupirocin ointment (Supirocin ointment, Glenmark Pharmaceuticals (M) Sdn Bhd) was applied over the wound bed and covered with a low-adherent absorbent secondary dressing and crepe bandage.

Patients were seen twice a week in the Wound Care Clinic during appointments for dressing, wound bed and wound healing assessment. Digital photography, wound assessment and measurement were documented during every

Case 1. Diabetic foot ulcer (right foot)

- A 50-year-old Indian gentleman with underlying
- Comorbidities: diabetes mellitus (on an oral hypoglycemic agent)
- Treatment with mupirocin ointment for 4 weeks, there was a 30% reduction in wound size.

Day 1 Wound size: 7cm x 5cm	Day 21 Wound size: 5cm x 3cm	Day 27 Wound size: 5cm x 3cm
		

Your Prescription, Our Pride

Supirocin™

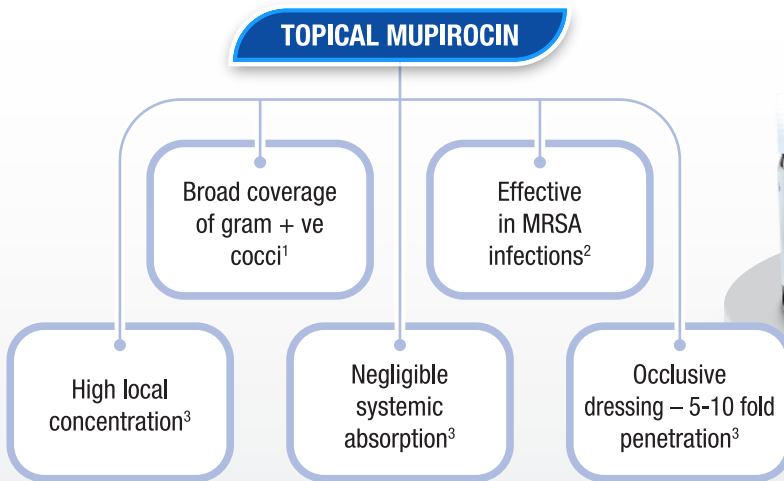
Available across
45 countries, 4 continents
& one of the highest used brands in
USA



CALLS FOR CHANGE FROM CONVENTIONAL TREATMENTS TO MUPIROCIN



TOPICAL MUPIROCIN



REFERENCES

1. Kavitha KV, Tiwari S, Purandare VB, et al. Choice of wound care in diabetic foot ulcer: A practical approach. *World J Diabetes*: 2014;5(4):546–556
2. Edmonds M. The treatment of diabetic foot infections: Focus on ertapenem. *Vasc Health Risk Manag*. 2009;5:949–963
3. Conly JM, Johnston BL. Mupirocin - Are we in danger of losing it? *Can J Infect Dis*. 2002;13(3):157–159

For healthcare professionals only. Full prescribing information is available upon request.

THANK YOU FOR YOUR CONTINUOUS SUPPORT

Case 2. Chronic wound (dorsum of the left foot)

- A 33-year-old Malay gentleman
- Comorbidities: diabetes mellitus, wound on the left dorsum of the foot present since 2019
- Treatment with mupirocin ointment for 4 weeks, there was an 80% increase in healthy granulation tissue.

Day 1 Wound size: 7cm x 5cm	Day 38 Wound size: 5cm x 5cm	Day 43 Wound size: 4cm x 5cm
		

visit for the period of the study. The study period was 2–4 weeks; however, we continued to monitor the wounds to assess the effect of wound bed preparation on healing.

Results

A total of six patients of aged 33 to 63 years old

with various wounds, including diabetic foot ulcers and post-surgery wounds ($\geq 10\text{cm}^2$ and $\leq 100\text{cm}^2$) were randomly selected and assessed using the TIME concept. All patients completed the study within the study period and were included in the analysis. A summary of patient data can be found in [Table 1](#). All six patients

Case 3. Lateral ulcer (sole of left foot)

- A 40-year-old Malay gentleman with a previous below the knee amputation and diabetes
- Left lateral side ulcer of the sole since July 2020
- After 3 months of treatment with mupirocin ointment, there was a 50% reduction in wound size.

Day 1 Wound size: 5cm x 8cm	Day 7 Wound size: 4.5cm x 8cm	Day 12 Wound size: 4.5cm x 7cm
		
Day 26 Wound size: 3.5cm x 6cm	Day 53 Wound size: 3cm x 5.5cm	Day 90 Wound size: 2cm x 5cm
		

Case 4. Chronic wound dorsum of the left foot

- A 63-year-old woman with diabetes mellitus, hypertension and left foot necrotising fasciitis in 2012
- Chronic wound dorsum of the left foot since 2012
- Wound dressed and treated with mupirocin ointment, the wound had reduced in size to 2cm x 4cm by day 48.

Day 1 Wound size: 2.5cm x 6cm	Day 3 Wound size: 2cm x 6cm	Day 6 Wound size: 2cm x 5.5cm
		
Day 31 Wound size: 2cm x 5cm	Day 45 Wound size: 2cm x 4.5cm	Day 48 Wound size: 2cm x 4cm
		

showed improvement in terms of prevention of infection and biofilm and promotion of wound healing assessed using the TIME concept, with 1 patient achieving wound closure within 4 weeks of treatment (*Table 1*).

Case 1

A 50-year-old Indian gentleman with diabetes mellitus was admitted with a left diabetic foot ulcer of 27 days' duration. The patient underwent wound debridement after blisters and pus discharge presented over the lateral aspect of his left ankle in early November 2020.

Following 4 weeks of treatment with mupirocin ointment, the wound had reduced in size from 7cm (length) x 5cm (width) to 5cm (length) x 3cm (width) and increased granulation tissue was observed. The wound bed remained clean throughout the study (*Case 1*).

Case 2

A 33-year-old Malay gentleman with underlying diabetes mellitus presented with a chronic wound over the dorsum of his left foot following a motor vehicle accident in 2019. He had also sustained left foot compartment syndrome and underwent a fasciotomy in 2019. He had a split-thickness skin graft, but the skin

graft became infected and the wound failed to close.

The wound bed was clean following 4 weeks of treatment with mupirocin ointment, with 20% healthy granulation tissue visible by day 12 and up to 80% by day 43. The wound had reduced in size from 7cm (length) x 5cm (width) to 1cm (length) x 1cm (width) and healing had progressed well (*Case 2*).

Case 3

A 40-year-old Malay gentleman with underlying diabetes mellitus for the past 13 years underwent a below knee amputation in 2018. He presented with a lateral ulcer on the sole of his left foot, which had appeared between July and December 2020. Wound debridement was done once under the orthopaedic team and he was referred to the Wound Care Clinic for further ulcer management.

Following application of the mupirocin ointment, an improvement was noted in terms of granulation tissue growth, reduction in wound size, and thinning of the wound edges. Initial wound size was 5cm (length) x 8cm (width); however, after 3 months of treatment with mupirocin ointment, the wound had reduced in size to 2cm (length) x 5cm (width), a

Case 5. Surgical site infection post tumour excision

- A 61-year-old women, who underwent tumour excision for a left frontal anaplastic astrocytom
- Presented with pus discharge from the scalp at the previous surgical site.
- Treatment with mupirocin ointment, the scalp infection significantly improved approximately 80%.

Day 1 Wound size: 7cm x5cm	Day 21 Wound size: 3cm x2cm	Day 49 Wound size: 2cm x 2cm
		
Day 65 Wound size: 1cm x1 cm	Day 86 Wound size: 1cm x1 cm	Day 107 Wound size: 1cm x1 cm
		

total reduction of 50% (Case 3). Offloading the affected foot was advised and callus debridement was regularly performed.

Case 4

A 63-year-old lady with underlying diabetes mellitus and hypertension had necrotising fasciitis of her left foot in 2012 when debridement was performed. Post-necrotising fasciitis, she had a chronic wound at the dorsum of the left foot.

Following treatment with mupirocin ointment, the wound reduced in size and increased epithelialisation was observed by day 31 (Case 4).

Case 5

A 61-year-old lady had an underlying left frontal anaplastic astrocytoma tumour, which was removed by excision surgery in June 2016. This was complicated by a surgical site infection (SSI), post-surgery. The last wound debridement for the SSI was done in September 2017, after which she was free of infection.

She first presented to our clinic in March 2020 with pus discharge from the scalp at the surgical site. The scalp infection significantly improved following 15 weeks of treatment with mupirocin ointment (Case 5).

Case 6

A 47-year-old gentleman with no known comorbidities underwent saucerization of a right mid-thigh carbuncle in July 2020. The wound healed significantly following treatment with mupirocin ointment and wound closure occurred after 4 weeks of treatment (Case 6).



Discussion

Increasing evidence has implicated biofilms in at least 70% of chronic infections in humans (Boisvert et al, 2016). Increasing antibacterial resistance, along with insufficient number of antibiotics being developed by the pharmaceutical industry, has made biofilm eradication strategies increasingly important (World Health Organization, 2020). Ha et al (2008) performed a study on drug susceptible isolates of *Staphylococcus aureus* and allowed them to form biofilms *in vitro*. They found that topical mupirocin concentrations of 125 µg/ml could reduce *Staphylococcus aureus* biofilm mass by more than 90%.

A study done by Gilbert et al (1989) showed bacteriologic irradiation rates were 97% (30 of 31 patients) in the mupirocin-treated group, compared with 87% (27 of 31 patients) in the fusidic acid-treated group. Another study done by White et al (1989) showed *Staphylococcus aureus* and/or beta-haemolytic streptococci appeared

Case 6. Saucerization of right mid-thigh carbuncle

- A 47-year-old man with no known medical illness
- Saucerization of a right mid-thigh carbuncle was carried out
- Complete closure occurred after 4 weeks of treatment with mupirocin ointment.

Day 1 Wound size: 8cm x 8cm	Day 24 Wound size: 4.5cm x 6cm	Day 27 Wound size: 4cm x 5.5cm
		
Day 34 Wound size: 4cm x 5cm	Day 37 Wound size: 4cm x 4cm	Day 53 Wound size: Closed
		

to be eliminated significantly in more patients treated with mupirocin (96%) compared with those treated with sodium fusidate (88%; $p=0.03$).

When treatment with topical mupirocin was compared with oral antibiotics in skin infections in general practice, mupirocin ointment cured 86% and improved 13% (Villiger et al, 1986). This was significantly better than erythromycin (47% cured, 26% improved) and similar to flucloxacillin (76% cured, 23% improved).

Conclusion

In this study, all six patients showed improvement in terms of prevention of infection and biofilms and promotion of wound healing by reduction in the bacterial bioburden. Out of six patients, only one achieved wound closure within four weeks of treatment, the others had a reduction in wound size, an increase granulation tissue and no signs of infection. Hence, it can be suggested that topical antimicrobial mupirocin ointment helps to promote wound healing and treats wound infection.

References

- Andrews KL, Derby KM, Jacobson TM et al. Prevention and management of chronic wounds. Cifu DX (ed): In Braddom's Physical Medicine and Rehabilitation (6th edn), 2021
- Fletcher J, Edwards-Jones V, Fumarola S et al (2020) Best Practice Statement: Antimicrobial stewardship strategies for wound management. *Wounds UK*, London

Dowsett C, Newton H (2005) Wound bed preparation: TIME in practice. *Wounds UK*. 1(3):58–70. <https://tinyurl.com/yckwazwt> (accessed 10.05.2022)

Ha KR, Psaltis AJ, Butcher AR et al (2008) *In vitro* activity of mupirocin on clinical isolates of *Staphylococcus aureus* and its potential implications in chronic rhinosinusitis. *Laryngoscope* 118(3):535–40. <https://doi.org/10.1097/mlg.0b013e31815bf2e3>

Leveriza-Oh M, Phillips TJ (2005) Dressings and postoperative care. *Surgery of the Skin*:117–35. <https://doi.org/10.1016/b978-0-323-02752-6.50013-4>

Percival SL, McCarty SM, Lipsky B (2015) Biofilms and wounds: an overview of the evidence. *Adv Wound Care (New Rochelle)* 4(7):373–81. <https://doi.org/10.1089/wound.2014.0557>

Ramakrishnan K, Salinas RC, Higuera NIA (2015) Skin and soft tissue infections. *Am Fam Physician* 92(6):474–83. <https://www.aafp.org/afp/2015/0915/p474.html>

Rode H, Hanslo D, de Wet PM et al (1989) Efficacy of mupirocin in methicillin-resistant *Staphylococcus aureus* burn wound infection. *Antimicrob Agents Chemother* 33(8):1358–61. <https://doi.org/10.1128/aac.33.8.1358>

Roghamm MC, Lydecker AD, Shardell M et al (2021) Effect of mupirocin for *Staphylococcus aureus* decolonization on the microbiome of the nose and throat in community and nursing home dwelling adults. *PLoS one* 16(6):e0252004

Swezey L (2020) Necrotic wounds: Overview and treatment options. *WoundSource*. <https://www.woundsource.com/blog/necrotic-wounds-overview-and-treatment-options> (accessed 24.04.2022)

Villiger JW, Robertson WD, Kanji K et al (1986) A comparison of the new topical antibiotic mupirocin ('bactroban') with oral antibiotics in the treatment of skin infections in general practice. *Curr Med Res Opin* 10(5):339–45. <https://doi.org/10.1185/03007998609111100>

White DG, Collins PO, Rowsell RB (1989) Topical antibiotics in the treatment of superficial skin infections in general practice—a comparison of mupirocin with sodium fusidate. *J Infect* 18(3):221–9. [https://doi.org/10.1016/s0163-4453\(89\)80058-1](https://doi.org/10.1016/s0163-4453(89)80058-1)

Declaration of interest:

The mupirocin samples in this study were supplied by Glenmark Pharmaceuticals (M) Sdn Bhd. The authors have no conflict of interest to report.