INTERNATIONAL **CASE REPORT**

Retrospective case series: Management of diabetic foot ulcers using Prontosan®

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AUTHOR DETAILS

Mr Somboon Jermsujarit, Somdech Phra Pinklao Hospital, Bangkok, Thailand

Mr Chinnawut Sutsawong, Enterostomal Therapy Nurse, Somdech Phra Pinklao Hospital, Bangkok, Thailand

Dr Martha Camille Dollete, Consultant, Hilom Wound Care Clinic, Mandaluyong City, Philippines

Dr Charles Richard R. Cabuquit, MD, Specialist, Orthopedics and Advanced Wound Care, Orthopedic Surgeon, Hilom Wound Care Clinic, Mandaluyong City, Philippines

Dr Bianca Criselda M. Carilo, MD, Specialist, Orthopedics and Advanced Wound Care, Hilom Wound Care Clinic, Mandaluyong City, Philippines

Prof Dr Mandika Wijeyaratne, Professor of Surgery, National Hospital of Sri Lanka

Dr Dilki Liyanage, Research Fellow, University Vascular Unit, National Hospital of Sri Lanka, Sri Lanka

Dr Vinula Gunawardena, Research Fellow, University Vascular Unit, National Hospital of Sri Lanka, Sri Lanka

Dr Navanesan Gowcikan, Senior Registrar in Vascular Surgery, University Vascular Unit, National Hospital of Sri Lanka, Sri Lanka

Dr Nagenthiram Harivallavan, Senior Registrar in Vascular Surgery, University Vascular Unit, National Hospital of Sri Lanka, Sri Lanka

Dr Damitha Fonseka, Senior Registrar in Vascular Surgery, University Vascular Unit, National Hospital of Sri Lanka, Sri Lanka

Jirapa Khawyai, Registered Nurse, Chaophraya Yommarat Hospital, Suphan Buri , Thailand

Enoka Wijeratne, Registered Enterostomal Therapy Nurse, Wound Care Nurse Practitioner, Care and Cure Wound Management Center, Sri Lanka

Dr Poovasit Klinoubol, Podiatric Medicine and Surgery, Vimut-Theptarin Hospital, Thailand

Dr Thushan Gooneratne, Consultant, Vascular and Transplant Surgery, University Vascular Unit, National Hospital of Sri Lanka, Sri Lanka

Yafei Zhao, China

EXPERT PANEL DETAILS

Foreword

Diabetic foot ulceration is a preventable complication of diabetes. It is reported that people living with diabetes have up to a 40% risk of undergoing a lower-extremity amputation, while the lifetime risk of developing a diabetic foot ulcer is around 25% (Jogheea-Jutton et al, 2022). If left untreated, or not treated appropriately, diabetic foot ulcers may lead to amputation and increased disability, with poor outcomes and significant implications for the individual, their family and carers, the community and health systems (Nair et al, 2020; Jogheea-Jutton et al, 2022).

In response to this growing challenge, B. Braun launched the Excellence Case Sharing Award in April 2023, inviting independent healthcare professionals from the Asia-Pacific region to share their expertise in diabetic foot ulcer management. The theme for the award, 'Management of Diabetic Foot Ulcers: UndeFEETed' sought to highlight innovative, person-centred approaches and cost-effective practices aimed at improving wound outcomes. The award encouraged healthcare professionals to submit abstracts focused on preventing infection, promoting healing, preserving quality of life and achieving cost-effective savings in the management of diabetic foot ulcers.

A distinguished panel of independent experts; Professor Marco Romanelli, Professor Yan Liu and Michelle Gibb (PhD) reviewed the submitted abstracts and selected the winners and finalists. Their decisions were made independently, without any affiliation to B. Braun, ensuring an unbiased evaluation process.

This case series supplement features 10 clinical assessments of the Prontosan® product range, used in various types of diabetic foot ulcers for cleansing and wound bed preparation. The cases span a wide spectrum. Many of the wounds presented in this case series were infected and several patients were at risk of amputation when they initially presented for treatment. However, following the introduction of a new cleansing protocol using the Prontosan® product range, all wounds showed good progress towards healing or achieved complete healing.

Prof Marco Romanelli, Prof Yan Liu and Dr Michelle Gibb (PhD)

Introduction

The global prevalence of diabetes and diabetic foot ulcers is increasing, with a growing threat to patient health and healthcare systems worldwide. In 2021, the International Diabetes Federation estimated there were 537 million adults living with diabetes, a figure projected to increase by 46% to 783 million by 2045. Diabetic foot ulcers are a severe complication of diabetes, often leading to lower-extremity amputations and poor patient outcomes (Nair et al, 2020). A meta-analysis found that 31% of diabetic foot ulcer cases result in amputation, with 20% of moderate-to-severe cases requiring surgical intervention (Akkus and Sert, 2022; Luo et al, 2024).

The severity of diabetic foot ulcers is starkly highlighted by Armstrong et al (2020), who reported that individuals with diabetes-related lower-extremity complications face 5-year mortality rates comparable to, or worse than, those of most common cancers. Additionally, up to 85% of diabetes-related lower-extremity amputations are preceded by foot ulcers (Jupiter et al, 2016), highlighting the need for early intervention.

The pathophysiology of diabetic foot ulcers involves a combination of neuropathy, trauma and, in many cases, peripheral arterial disease (PAD; Akkus and Sert, 2022). PAD is present in approximately 40% of cases (Prompers et al, 2009), and is associated with delayed healing, higher rates of major amputation and increased mortality (Azhar et al, 2021). A recent study reported that limb salvage rates were significantly lower in patients with PAD (48.3%) compared to those without PAD (82.3%; Azhar et al, 2023). Beyond the physical complications, diabetic foot ulcers have a profound and long-lasting impact on quality of life, contributing to pain, reduced mobility and social isolation, with 68% of people with type 2 diabetes reporting pain-related concerns (AbuAlhommos et al, 2022).

In the Asia-Pacific region, where healthcare disparities further complicate diabetic foot ulcer management, diabetes prevalence is particularly high (Jodheea-Jutton et al, 2022; Twigg et al, 2024). The Organisation for Economic Co-operation and Development (2020) reported that over 60% of global diabetes-related deaths in 2013 occurred in this region. The prevalence of diabetic foot ulcers in Asia is estimated at 5.5% (Zhang et al, 2017; Lo et al, 2021), with the Western Pacific and Southeast Asia regions expected to see the most rapid rise in diabetes rates (International Diabetes Federation, 2021). Limited access to specialist care, variations in healthcare infrastructure and economic disparities highlight the urgent need for standardised diabetic foot ulcer treatment strategies.

Managing diabetic foot ulcers is complex and requires a multidisciplinary team approach to prevent complications such as amputation, reduced quality of life and potential loss of life. Consensus recommends that it can be reasoned that biofilm is present in all wounds, including surgical incisions. This includes not only dehisced or open surgical wounds, where slough is a visible indicator of biofilm, but also closed incisions, as biofilm can migrate from wound edges regardless of whether they have been properly closed (Murphy et al, 2024). Biofilms are defined as aggregates of microorganisms that attach to biotic (living surfaces, e.g. biological tissue), abiotic surfaces (non-living surfaces, e.g. wound dressings) or to each other. While the exact role of biofilm in chronic wound healing is still under investigation, it is becoming widely accepted that most chronic wounds contain biofilm. Studies suggest that between 60% and 100% of chronic wounds contain biofilm, with the 'true' prevalence likely approaching 100%, indicating that all chronic wounds may have biofilm on at least part of the wound bed (Bjarnsholt et al, 2017; Malone et al, 2017).

The principles of wound bed preparation promote the maintenance of a healthy wound bed through therapeutic wound cleansing, disruption of biofilm and removal of devitalised tissue through debridement. Wound bed preparation has been clinically proven to accelerate wound healing by removing slough, devitalised tissue and biofilm (Wilcox et al, 2013; Schofield and Ousey, 2021; Barrigah-Benissan et al, 2022). A proactive wound bed preparation strategy aligned with biofilm-based wound care can improve outcomes and quality of life.

This case series supplement presents 10 clinical assessments demonstrating the use of the Prontosan® product range in diabetic foot ulcer cases for wound cleansing and wound bed preparation [Table 1].

Table 1. Summary of case studies.

Case	Clinician(s)	Country	Case Title	Pages
1	• Mr Somboon Jermsujarit • Mr Chinnawut Sutsawong	Thailand	Management of a necrotic diabetic foot ulcer to prevent amputation	6–7
2	• Dr Martha Camille Dollete • Dr Charles Richard Cabuquit • Dr Bianca Criselda Carilo	Philippines	Outpatient management of a diabetic foot ulcer	8–9
3	• Prof Dr Mandika Wijeyaratne • Dr Dilki Liyanage • Dr Vinula Gunewardene • Dr Navanesan Gowcikan • Dr Nagenthiram Harivallavan • Dr Damitha Fonseka	Sri Lanka	Management of a sloughy diabetic foot ulcer	10–11
4	• Jirapa Khawyai	Thailand	Management of an infected diabetic foot ulcer	12–13
5	• Dr Charles Richard Cabuquit	Philippines	Management of complicated diabetic foot ulcer	14–15
6	• Enoka Wijeratne	Sri Lanka	Management of a forefoot amputation wound in a patient with long-standing diabetes	16–17
9	• Dr Poovasit Klinoubol	Thailand	Offloading strategies for a neuropathic diabetic foot ulcer	18–19
8	• Dr Bianca Criselda Carilo • Dr Charles Richard Cabuquit • Dr Martha Camille Dollete	Philippines	Outpatient management of a diabetic foot ulcer following a double ray amputation	20–21
9	• Dr Thushan Gooneratne • Dr Vinula Gunawardena • Dr Dilki Liyanage • Dr Navanesan Gowcikan • Dr N Harivallavan • Dr Damitha Fonseka	Sri Lanka	Management of a non-salvageable neuropathic diabetic foot ulcer	22–23
10	• Yafei Zhao	China	Management of gangrene and infected toes	24–25

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CASE 1: Management of a necrotic diabetic foot ulcer to prevent amputation

Author details: Mr Somboon Jermsujarit; Mr Chinnawut Sutsawong, Thailand

Patient presentation and history

- 63-year-old male
- Infected foot ulcer on the left ankle following surgical debridement due to necrosis [Figure 1]
- Previous treatment included wound cleansing with normal saline, with limited success
- **Medical history:** Diabetes mellitus.

Ulcer presentation

- **Ulcer size:** 12cm (length) x 7cm (width) x 1cm (depth)
- **Tissue composition:** 54% fibrin, 20% granulation tissue, 26% necrotic tissue.

Treatment objectives and clinical outcomes

Treatment objectives: Reduce slough, biofilm and excess moisture while achieving a clean wound bed.

Management plan: Cleanse with Prontosan® Wound Irrigation Solution.

Following initial assessment, the wound was cleansed with Prontosan® Wound Irrigation Solution for 10 minutes to promote soft debridement, create a clean wound bed and surrounding skin and minimise tissue irritation. A sterile primary dressing, consisting of ionic silver alginate matrix paste, was applied and covered with a secondary gauze dressing. Dressing changes were performed 3 times weekly.

By day 12 [Figure 2], there was a visible reduction in wound size, indicating a positive response.

By day 23 [Figure 3], a decrease in exudate and slough was noted, resulting in a cleaner wound bed. Continued improvement was seen by day 37 [Figure 4] and day 63 [Figure 5], with increased granulation tissue, indicating progression towards closure.

Active wound management using Prontosan® Wound Irrigation Solution and Askina Calgitrol® Paste was carried out over 69 days. The wound was then monitored through follow-up appointments until day 84 to evaluate sustained healing and final granulation. By day 84 [Figure 6], the wound had decreased to 7.7cm x 3.7cm, showing healthy granulation and epithelialisation, with no signs of biofilm, exudate or slough, suggesting successful management of infection and promotion of healing.

Figure 1. Ulcer at initial presentation, with biofilm, necrotic tissue and poor granulation tissue.

Cost-benefit analysis

Over the 69-day treatment period, approximately 29ml of Prontosan® Wound Irrigation Solution was used per dressing change. Clinical outcomes with normal saline were limited, with minimal improvement in wound condition.

In contrast, wound cleansing with Prontosan® Wound Irrigation Solution was associated with improved wound progression, including reduced signs of infection and enhanced tissue viability. Total product usage over the treatment period included 3 bottles of Prontosan® Wound Irrigation Solution and 9 tubes of Askina® Calgitrol® Paste (15g per tube).

Although Prontosan® Wound Irrigation Solution incurred a higher per-session cost, its efficacy in biofilm disruption and infection control suggests a favourable cost–benefit ratio in the management of chronic wounds. The improved healing trajectory potentially reduced the need for systemic antibiotics and mitigated the risk of limb amputation, supporting long-term cost savings and improved patient outcomes.

Figure 2. Day 12: Reduction in wound bed size already visible.

Figure 3. Day 23: Visible reduction in exudate and sloughy tissue.

Figure 4. Day 37: Further reduction in exudate and sloughy tissue, with increased healthy red granulation tissue visible.

Figure 5. Day 63: Wound bed reduced to 9.3cm x 5.3cm. Granulation tissue visible.

Conclusion

The use of Prontosan® Wound Irrigation Solution and appropriate dressings contributed to wound healing by maintaining a clean bed, supporting debridement and promoting granulation tissue. Regular dressing changes 3 times per week resulted in increased granulation tissue, reduced biofilm and a 66% reduction in wound size. No adverse effects were reported during the course of treatment. The clinicians noted, "Good wound care can reduce the need for hospitalisation, additional surgery and medication costs." Structured wound management protocols that incorporate Prontosan® Wound Irrigation Solution can, therefore, offer significant potential for effectively treating complex diabetic foot wounds.

Figure 6. Follow-up at day 84: Wound bed size decreased to 7.7cm x 3.7cm. Good granulation and epithelialisation. Good blood supply visible, with no biofilm, exudate or sloughy tissue.

CASE 2: Outpatient management of a diabetic foot ulcer

Author details: Dr Martha Camille Dollete; Dr Charles Richard Cabuquit; Dr Bianca Criselda Carilo, Philippines

Patient presentation and history

- 59-year-old male
- Non-healing wound of 1 month's duration over the second toe, which had progressed to wet gangrene [Figure 1]
- After undergoing a ray amputation of the second toe at a separate institution, he was referred for outpatient wound management
- **Medical history:** Type 2 diabetes.

Ulcer presentation

- **Ulcer size:** Wound over the second metatarsal measured 13cm (length) x 8cm (width), with exposed tendon and bone. A separate wound was also present over the big toe measuring 3cm x 3cm
- **Tissue composition:** Biofilm, significant necrotic tissue and poor granulation tissue.

Treatment objectives and clinical outcomes

Treatment objectives: Reduce slough, promote granulation tissue and achieve a clean wound bed and surrounding skin.

Management plan: Initial wound cleansing was carried out using Prontosan® Wound Irrigation Solution. Serial low-frequency ultrasonic-assisted wound (UAW) debridement was then initiated with the Sonoca 185, using Prontosan® as the transmission medium and for post-debridement cleansing.

Wounds were assessed 3 times weekly [Figure 2], with sharp debridement performed as necessary to remove necrotic tissue. Following debridement, a thin layer of Prontosan® Wound Gel was applied to the wound bed, followed by sterile gauze. This was secured with an elastic bandage to maintain an undisturbed wound edge.

The patient was instructed to perform daily wound care at home by applying gauze soaked in Prontosan® Wound Irrigation Solution to the wound for 15 minutes, followed by a Prontosan® Wound Gel dressing.

By day 14 [Figure 3] and day 23 (10th debridement session; Figure 4), there was notable improvement in granulation tissue over the second metatarsal. Eschar formation was observed on the plantar aspect of the big toe. Despite progressive deterioration of the big toe wound, the wound over the second metatarsal continued to improve.

Figure 1. Wounds at initial presentation, exhibiting biofilm, significant necrotic tissue, and poor granulation tissue.

By day 105, during the 18th debridement session, eschar over the big toe had demarcated completely, revealing exposed flexor tendons. The patient transitioned from thrice-weekly assessments to monthly follow-up visits, as wound stability improved.

Wound healing of the second metatarsal site continued, with steady granulation tissue formation observed by day 136 [Figure 5].

At the final consultation (day 191; Figure 6), the wound over the second metatarsal had reduced by 95%, with skin bridges forming between viable tissue beds. Meanwhile, the big toe wound had reduced by approximately 50%.

Cost-benefit analysis

All expenses related to the procedure, including dressing materials, Prontosan® Wound Irrigation Solution, Prontosan® Wound Gel, medications, use of the ultrasound machine and professional fees, were fully subsidised by the government-run health insurance programme. Over the 191-day treatment period, total expenditure was Philippine peso (PHP) 204,300. This is consistent with recent studies from the Philippines (Cruz et al, 2024).

Figure 2. Day 10: Post-cleansing of the second metatarsal and big toe wound showing well-defined wound beds.

Figure 3. Day 14: Visible granulation tissue forming over the second metatarsal wound, indicating early positive response to treatment.

Figure 4. Day 23: Notable improvement in granulation tissue formation over the second metatarsal and big toe.

Figure 5. Day 136: Further improvement of the second metatarsal; post-eschar removal of the plantar aspect of the big toe.

Conclusion

This case demonstrates the effectiveness of Prontosan® and outpatient ultrasound-assisted debridement in promoting wound healing and minimising hospitalisation costs. The antimicrobial and antibiofilm properties of Prontosan® enhanced wound bed preparation and healing. Additionally, providing the patient with these products for home care ensured continuity of treatment.

Figure 6. Day 191: second metatarsal reduced by 95%, while the big toe had decreased by 50%.

CASE 3: Management of a sloughy diabetic foot ulcer

Author details: Prof Dr Mandika Wijeyaratne; Dr Dilki Liyanage; Dr Vinula Gunawardena; Dr Navanesan Gowcikan; Dr Nagenthiram Harivallavan; Dr Damitha Fonseka, Sri Lanka

Patient presentation and history

- 78-year-old female
- Right foot ulcer present for 5 years [Figure 1]
- Previous treatment included wound cleansing and the application of metronidazole gel dressings 3 times a week for 2 years, with limited success
- **Medical history:** Poorly controlled diabetes.

Ulcer presentation

- **Ulcer size:** 8cm (length) x 5cm (width) x 1cm (depth)
- **Tissue composition:** 80% slough and 20% necrotic tissue, with thick, heavy exudate
- **Additional:** Microbiological studies revealed a *Pseudomonas aeruginosa* infection. Clinical parameters indicated low-grade sepsis. Distal foot pulses were present.

Treatment objectives and clinical outcomes

Treatment objectives: Reduce slough, establish a clean wound bed and promote granulation tissue.

Management plan: Cleanse with Prontosan® Wound Irrigation Solution and Prontosan® Wound Gel.

The ulcer was initially cleansed using sterile gauze soaked in Prontosan® Wound Irrigation Solution, then lightly coated with Prontosan® Wound Gel [Figure 2]. A secondary dressing was applied, and dressing changes were performed 3 times a week for 2 weeks, following the patient's previous routine [Figures 3–5 show wound progression].

By day 20, there was a noticeable reduction in slough and an increase in granulation tissue [Figure 6]. The frequency of visits reduced to twice a week.

At each subsequent visit, progressive improvement was observed in the ulcer bed. By 2 months of treatment, slough had reduced to 20% and granulation tissue had increased to 80%. The decision was made to continue treatment with Prontosan® until complete wound closure.

Cost-benefit analysis

Over the treatment period, total expenditure, including dressing materials, Prontosan® Wound Irrigation Solution, labour and medication, was Indian rupee (Rs) 35,000. These costs were lower than the cumulative cost of Rs 528,000 for the patient's previous treatment over 2 years.

Figure 1. Ulcer at initial presentation, with 80% slough and 20% necrotic tissue.

Conclusion

Prontosan® wound products effectively removed devitalised tissue, promoted granulation tissue and established a clean wound bed.

The reduction in dressing change frequency from 3 to twice weekly proved economically advantageous. The patient also experienced reduced wound pain during dressing procedures. This approach not only reduced hospital costs but also improved patient wellbeing.

The clinician noted that "the use of Prontosan® wound products in the management of the chronic ulcer demonstrated a remarkable efficacy in wound healing."

Figure 2. Ulcer post-cleansing with Prontosan® Wound Irrigation Solution and lightly coated with Prontosan® Wound Gel.

Figure 3. Day 3: Reduction in slough and improved signs of granulation tissue observed.

Figure 4. Day 6: Slough continues to reduce, with a noticeable increase in granulation tissue formation.

Figure 5. Day 13: Good granulation and slough reduction.

Figure 6. Day 20: Healthy ulcer bed with low levels of slough.

CASE 4: Management of an infected diabetic foot ulcer

Author details: Dr Jirapa Khawyai, Thailand

Patient presentation and history

- 47-year-old male
- Infected foot ulcer on his left foot [Figure 1]
- The patient, a vendor by occupation, initially attempted self-treatment at home but sought medical care as the ulcer deteriorated
- **Medical history:** Diabetes with poorly controlled blood glucose levels, ranging from 160–420mg/dL (fasting).

Ulcer presentation

- **Tissue composition:** 40% necrotic tissue, 40% slough, 20% granulation tissue, with biofilm present. Tissue culture identified a *Proteus mirabilis* infection.

Treatment objectives and clinical outcomes

Treatment objectives: Reduce slough, control infection and promote granulation tissue formation.

Management plan: Cleanse with Prontosan® Wound Irrigation Solution and Prontosan® Wound Gel.

Following assessment, the wound was initially cleansed with normal saline, and one-week course of antibiotics (silver sulfadiazine) was prescribed to manage the infection. The patient underwent 4 rounds of excisional debridement in the operating theatre to remove necrotic tissue caused by the *Proteus mirabilis* infection. Extensive necrotic tissue beyond the wound margins was excised, exposing tendons and calf tissue. The wound measured 10cm x 31cm x 6cm [Figure 2]. Insulin therapy was initially administered on a sliding scale and later adjusted to Mixtard 26-0-18 units subcutaneously for blood sugar control.

The wound care protocol was revised to include the application of Prontosan® Wound Irrigation Solution during each dressing change, followed by Prontosan® Wound Gel. Vacuum-assisted closure (VAC) therapy was introduced, with Prontosan® Wound Gel applied every 3 days to promote tissue regeneration [Figure 3].

Over time from day 11 [Figure 4], day 25 [Figure 5] and day 28 [Figure 6], the wound demonstrated marked improvement, with visible granulation tissue, reduced wound size and more defined wound edges. The decision was made to prepare the wound bed for skin grafting.

Figure 1. Ulcer at initial presentation, with biofilm, significant necrotic tissue and poor granulation tissue.

Cost-benefit analysis

Over the 28 day treatment period, the patient required 2 bottles of Prontosan® for wound cleansing and dressing. Each dressing session utilised 5 packs of small gauze pads, 3 packs of large gauze pads and 5 packs of cotton balls. Labour costs were not charged for the management of the wound, which contributed to a reduction in the overall treatment costs. The primary drug-related expense was the inclusion of antibiotics.

This treatment strategy demonstrated cost-effectiveness, helping to achieve favourable clinical outcomes without incurring significant additional costs, thus avoiding the need for more expensive interventions.

Conclusion

This case demonstrates that with proper wound care and glycaemic control, Prontosan® products can help to reduce the need for costly interventions, improve wound healing and prevent amputation. The patient was able to retain his limb, despite the severity of the wound at first presentation, return to work and continue supporting his family and community.

Figure 2. Wound after cleansing and first session of excisional debridement to remove necrotic tissue and prepare wound bed for treatment.

Figure 3. Day 2 post-excisional debridement and cleansing: Vacuum dressing using Prontosan® Wound Gel applied post-excisional debridement.

Figure 4. Day 11 post-excisional debridement: Continued improvement visible.

Figure 5. Day 25: Granulating wound with bright wound edges and ongoing improvement.

Figure 6. Day 28: Prominent granulation tissue and clean, well-defined wound edges.

CASE 5: Management of complicated diabetic foot ulcer

Author details: Dr Charles Richard Cabuquit, Philippines

Patient presentation

- 60-year-old female
- Large plantar ulcer over the heel, extending to the medial and lateral aspects of the midfoot [Figure 1]
- She had previously undergone 2 sharp debridement procedures at another healthcare institution and was advised to undergo major amputation.

Ulcer presentation

- **Tissue composition:** Necrotic and non-viable tissue, with malodour and high levels of exudate.

Treatment objectives and clinical outcomes

Treatment objectives: Prevent infection, reduce frequency of dressing changes and promote wound healing.

Management plan: Cleanse with Prontosan® Wound Irrigation Solution and Prontosan® Wound Gel. Serial low-frequency ultrasonic-assisted wound (UAW) debridement was performed using the Sonoca 185 device. Prontosan® Wound Irrigation Solution was used as the transmission medium (Vallejo et al, 2022) during UAW debridement and as part of post-treatment cleansing.

UAW debridement was performed 3 times per week under topical anaesthesia. The first session removed superficial biofilm and loose necrotic tissue. Controlled microbleeding was observed during the procedure [Figure 2], indicating effective stimulation of the wound bed. Following each UAW debridement session, the wound was dressed with Prontosan® Wound Gel and Askina® DresSil Border.

By week 4, granulation tissue had significantly increased compared to necrotic tissue [Figure 3], prompting a reduction in UAW debridement frequency from 3 times per week to bi-weekly, and later to monthly sessions.

By week 7, significant improvement was noted, with wound edges contracting and re-epithelialising [Figure 4].

By week 10, the wound had reduced significantly in size due to rapid re-epithelialisation.

By week 18, the lateral aspect of the wound had achieved closure, and the heel ulcer was progressing towards healing [Figure 5].

Figure 1. Large plantar ulcer at initial presentation, with significant necrotic and non-viable tissue.

By week 24, the wound was nearly fully healed, measuring approximately 90% of its original size [Figure 6].

Cost-benefit analysis

Over the 24-week treatment period, total expenditure, including dressing materials, Prontosan® Wound Irrigation Solution, Prontosan® Wound Gel, medication and professional fees, was PHP 257,310. This is comparable to figures reported in a recent study from the Philippines (Cruz et al, 2024).

Conclusion

This case demonstrates the effectiveness of UAW debridement with Prontosan® products as a limb-salvage strategy for complicated diabetic foot ulcers, preventing the need for major amputation, resulting in wound healing, limb preservation and enhanced the patient's independence. The clinicians noted, "Due to the antimicrobial properties of Prontosan® Wound Gel, there was no need to apply expensive, antimicrobial-laden secondary dressings or topical antimicrobial treatments."

Figure 2. Wound post-UAW debridement and cleansing with Prontosan® Wound Irrigation Solution.

Figure 3. Week 4: Significantly reduced necrotic tissue, with clean and robust wound edges. Exudate production is minimal.

Figure 4. Week 7: Improved granulation tissue, with no visible sloughy tissue. Wound edges are contracting.

Figure 5. Week 18: Lateral aspect of the wound had achieved closure. Improved granulation tissue, with no visible sloughy tissue.

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Figure 6. Week 24: wound reduced to 90% of its original size and is nearly fully healed.

CASE 6: Management of a forefoot amputation wound in a patient with long-standing diabetes

Author details: Enoka Wijeratne, Sri Lanka

Patient presentation and history

- 67-year-old male
- Infected forefoot amputation wound [Figure 1]
- Despite a 1-week course of ciprofloxacin and daily povidone-iodine dressings, the wound continued to deteriorate. The patient reported low mood due to a loss of appetite and disrupted sleep from wound pain and frequent dressing changes. Wound pain was rated as 6 on the visual analogue scale (VAS; 0 = no pain, 10 = worst pain imaginable)
- **Medical history:** Diabetes

Wound presentation

- **Wound size:** 9.5cm (length) x 7cm (width)
- **Tissue composition:** Malodorous (yellow tissue covering over 80% of the wound bed) with slough present, suggesting potential biofilm presence.

Treatment objectives and clinical outcomes

Treatment objectives: Reduce slough and promote granulation tissue.

Management plan: Cleanse with Prontosan® Wound Irrigation Solution.

Following assessment, the wound was cleansed with Prontosan® Wound Irrigation Solution for 15 minutes. Post-cleansing, the wound was dried and a skin protection cream was applied to the periwound skin. A non-Prontosan® hydrogel and non-adherent gauze dressing was used as the primary dressing. The secondary dressing consisted of 5–6 gauze swabs secured with a cotton crepe bandage.

Dressings were changed every third day for the first 15 days [Figure 2–4]. Sloughy tissue in the wound bed and hyperkeratotic periwound skin were debrided weekly with a scalpel. The patient was also referred to the endocrine clinic and a nutritionist to support systemic management.

By day 23, dressing frequency was reduced to every 4 days [Figure 5].

After ten dressing changes over 4 weeks, the wound had reduced in size to 8cm x 5cm [Figure 6].

Figure 1. Wound at initial presentation showing significant volumes of sloughy tissue and poor granulation.

Cost-benefit analysis

Over the 1-month treatment period, total expenditure, including dressing materials, Prontosan® Wound Irrigation Solution, labour and medication, was Rs 45,114.

Conclusion

The use of Prontosan® Wound Irrigation Solution highlights the importance of effective wound cleansing and appropriate dressing selection in promoting wound healing and improving patient quality of life. By implementing wound bed preparation techniques, infection prevention measures and biofilm control strategies, the patient's mood and quality of life improved.

During treatment, frequency of dressings reduced from 3 times a week to twice a week, proving economically advantageous. The patient reported reduced wound pain during dressing changes and improved quality of life.

The clinician noted that "Prontosan® Wound Irrigation Solution plays a crucial role in wound bed preparation."

Figure 2. Day 3: Second visit for wound dressing and cleansing using Prontosan® Wound Irrigation Solution.

Figure 3. Day 6: Third visit for wound dressing and cleansing. Reduction in slough and improved signs of granulation tissue.

Figure 3. Day 9: Wound assessment following the fourth dressing change. Reduction in slough and improved signs of granulation tissue.

Figure 4. Day 15: Marked improvements to wound bed, including reduced slough and signs of healing.

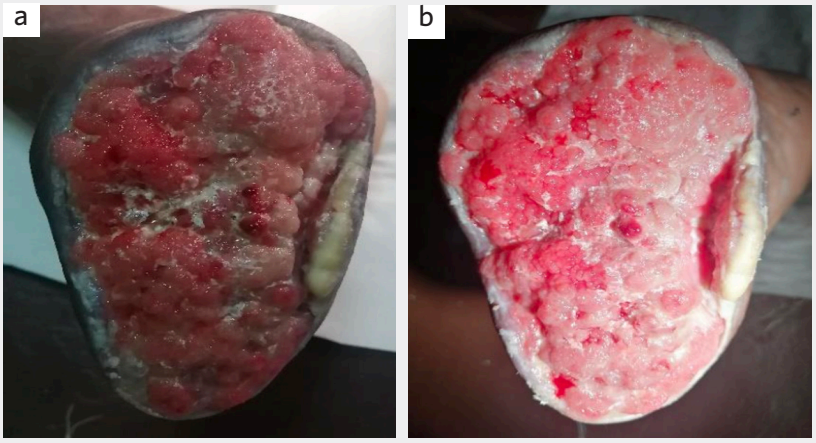

Figure 5. Day 23: (a) Pre-cleansing and (b) post-cleansing with Prontosan® Wound Irrigation Solution, showing a brighter wound with healthy granulation tissue and minimal slough.

Figure 6. Day 31: Healthy wound bed with clean wound edges and reduced wound size.

CASE 7: Offloading strategies for a neuropathic diabetic foot ulcer

Author details: Dr Poovasit Klinoubol, Thailand

Patient presentation

- 80-year-old female
- Ulcer of 1 year's duration, located on the plantar aspect of the right fifth metatarsal head
- Despite self-management using iodine solution and normal saline daily for a year, the wound continued to deteriorate, affecting the patient's mobility and independence [Figure 1].

Ulcer presentation

- **Ulcer size:** 3cm (length) x 3.3cm (width)
- **Tissue composition:** Malodourous (yellow slough covering 100% of the wound bed), suggesting potential biofilm presence and periwound hyperkeratosis
- **Additional:** Neuropathy and flexible hammer toes were present in both feet. A deep wound swab culture was performed due to visible signs of infection. Despite this, blood circulation to the area remained adequate.

Treatment objectives and clinical outcomes

Treatment objectives: Achieve a clean wound bed and periwound skin to support debridement and minimise tissue irritation.

Management plan: Cleanse ulcer with Prontosan® Wound Irrigation Solution.

Following assessment, the ulcer was sharply debrided with a scalpel in an outpatient setting, revealing microbleeding and an improved wound bed [Figure 2].

After debridement, the ulcer was soaked with Prontosan® Wound Irrigation Solution while a custom-cut felt pad was prepared to offload pressure from the forefoot and support mobility and independence (without the use of a total contact cast).

Following cleansing, the wound was dressed with a protease-modulating dressing and protected using the custom-cut adhesive felt pad, which was trimmed 5–10mm beyond the ulcer edge to allow for anticipated reductions in ulcer size [Figure 3]. This approach avoided the additional cost of cast shoes or alterations to the contralateral foot.

Weekly treatment sessions were carried out.

Figure 1. Ulcer at initial presentation with significant volumes of exudate, sloughy tissue, poor granulation tissue, biofilm, malodour, and periwound hyperkeratosis.

Over the first 3 weeks, the ulcer remained stable, with reduced exudate and increased granulation tissue [Figure 4].

By week 5, the wound measured 2cm x 2.3cm x 0.1cm. At this point, the dressing was switched to an extracellular matrix dressing, while cleansing and offloading protocols remained. This process continued weekly until the wound healed completely.

By week 6, exudate had significantly reduced, malodour had resolved, and the wound size had decreased by 81%, now measuring 1cm x 1.9cm [Figure 5].

By week 12, the wound had fully healed [Figure 6].

Cost-benefit analysis

Over the 6-week treatment period, total expenditure, including dressing materials, Prontosan® Wound Irrigation Solution, labour and medication, was Rs 41,180.

Conclusion

The patient had been receiving daily dressing changes with iodine and normal saline at another hospital for 1 year without any improvement.

Figure 2. Ulcer following first debridement and cleansing with Prontosan® Wound Irrigation Solution.

Figure 3. (a) Cleansed and debrided wound dressed with a custom-cut adhesive felt dressing. (b) Samples of custom-cut adhesive felt.

Figure 4. Week 3: Reduced exudate and slight hyperkeratosis.

Figure 5. Week 6: Well-developed granulation tissue; no biofilm.

Figure 6. Week 12: Wound fully healed, with skin coverage and slight callus formation.

Following the introduction of Prontosan® Wound Irrigation Solution to cleanse the skin at least 20cm beyond the wound, the results of the deep wound culture confirmed the effectiveness of cleansing both the wound and periwound skin. This case demonstrates how an evidence-based cleansing protocol, combined with practical offloading using custom adhesive felt, can significantly accelerate healing while reducing the financial burden on the patient.

CASE 8: Outpatient management of a diabetic foot ulcer following a double ray amputation

Author details: Dr Bianca Criselda Carilo; Dr Charles Richard Cabuquit; Dr Martha Camille Dollete, Philippines

Patient presentation

- 49-year-old male
- Gangrene resulting from a severe diabetic foot ulcer
- Underwent a double ray amputation, leaving a soft tissue defect on the dorsolateral aspect of the forefoot extending to the plantar area [Figure 1a].

Ulcer presentation

- **Ulcer size:** 10cm (length) x 11.5cm (width), with depth extending from the plantar ulcer, with a positive probe to bone and the dorsal soft tissue
- **Tissue composition:** Full-thickness skin defect with necrotic tissue, sloughy tissue, serosanguineous discharge and malodour.

Treatment objectives and clinical outcomes

Treatment objectives: Reduce slough and promote granulation tissue.

Management plan: Initial management included sharp scalpel debridement, followed by cleansing with Prontosan® Wound Irrigation Solution [Figure 1b]. Assessment found dead space and sinus tract connecting to the dorsum of the foot. Treatment was switched to ultrasonic-assisted wound (UAW) debridement with Prontosan® Wound Irrigation Solution. Probing of the plantar forefoot revealed dead space and a sinus tract connecting to the dorsum of the foot.

Debridement was performed at frequent intervals on an outpatient basis using the Sonoca 185, with a topical anaesthetic applied before each procedure. Sinus tracts and dead spaces were flushed repeatedly, and conservative sharp debridement was carried out.

Prontosan® Wound Gel was applied to the wound bed before being packed with sterile gauze. The patient was instructed to cleanse the wound twice daily at home using Prontosan® Wound Irrigation Solution and Prontosan® Wound Gel to maintain a clean wound bed.

By week 1, there was a reduction in wound size, slough and exudate, with increased granulation tissue [Figure 2]. However, probing the plantar forefoot revealed a dead space and sinus tract communicating with the dorsum of the foot. By week 2, new sinus tracts and increased exudate were observed. By week 4, the wound had reduced to 7cm x 5cm

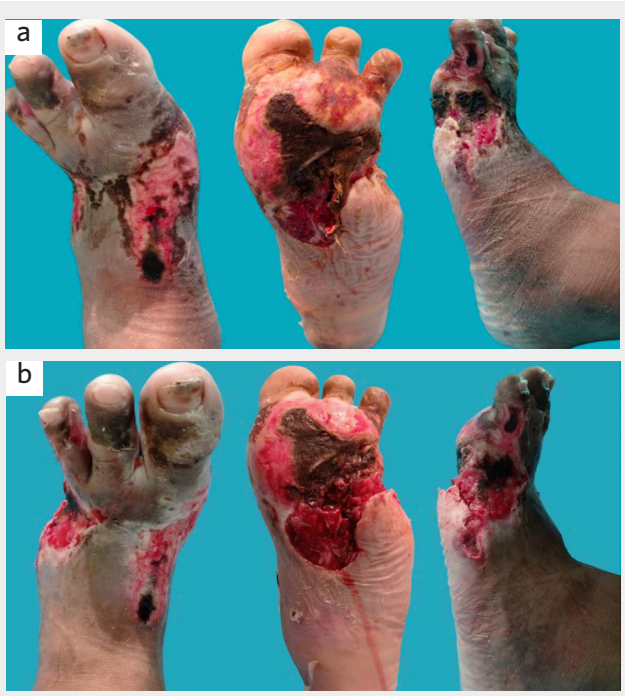

Figure 1. Wound at initial presentation (a) pre-debridement and (b) post-debridement, with biofilm and necrotic tissue.

x 3cm, although the sinus tract remained visible [Figure 3]. By week 8, the wound further reduced to 5.5cm x 4.5cm [Figure 4]. By using Prontosan® alongside Sonoca 185, non-viable, low-tensile-strength tissue was selectively debrided, infection and biofilm were suppressed, and healthy granulation tissue was promoted.

By week 9 [Figure 5], a new sinus developed and by week 12, a new wound appeared [Figure 6]. Despite these setbacks, the rest of the wound continued to heal with healthy granulation tissue. Treatment was maintained diligently, infection remained controlled and overall healing progressed steadily. Culture-guided antibiotic therapy was prescribed for 4 weeks to effectively manage osteomyelitis in the remaining metatarsals.

After 15 weeks, the plantar ulcer measured 4cm x 1.5cm, with even, moist and healthy granulation visible, despite callus formation peripherally.

Cost-benefit analysis

Over the 15-week treatment period, total expenditure,

Figure 2. Week 1: Reduction in necrosis and cleaner wound edges.

Figure 3. Week 4: Approximately 70% wound reduction visible. Treatment with Prontosan® Wound Gel continued for the sinus tract.

Figure 4. Week 8: Reduction in size of the plantar ulcer, showing approximately 78.5% wound area reduction.

Figure 5. Week 9: New sinus developed (see arrow); however, surrounding tissue shows continued healthy granulation and ongoing healing.

including dressing materials, Prontosan® Wound Irrigation Solution, Prontosan® Wound Gel and medication, amounted to PHP 177,343.

Conclusion

Surgical debridement is standard for diabetic foot ulcers but can cause anxiety due to hospitalisation, costs, absence from work and potential amputation. This anxiety may result in delayed consultations, neglect of the condition and disease progression. This case demonstrates that serial, outpatient wound care with Prontosan® and UAW debridement can manage diabetic foot ulcers effectively. This approach reduces the need for higher-level amputation, lowers treatment costs, supports quality of life, and promotes

Figure 6. Week 12: Continued healing and overall improvement. A new wound is identified during treatment (see arrow).

CASE 9: Management of a non-salvageable neuropathic diabetic foot ulcer

Author details: Dr Thushan Gooneratne; Dr Vinula Gunawardena; Dr Dilki Liyanage; Dr Navanesan Gowcikan; Dr Nagenthiram Harivallavan; Dr Damitha Fonseka, Sri Lanka

Patient presentation and history

- 68-year-old male
- Neuropathic plantar ulcer of 9 months' duration [Figure 1]. The patient self-managed with daily gauze dressings due to increasing discharge. Social and economic pressures, alongside poor sleep from frequent dressing changes, led him to consider amputation
- **Medical history:** Diabetes mellitus with poorly controlled and fluctuating blood glucose levels.

Ulcer presentation

- **Tissue composition:** Malodourous discharge with an unhealthy wound bed, thick exudate and purulent discharge. The periwound skin was macerated
- **Additional:** Biochemical parameters confirmed sepsis and impaired glycaemic control. Radiological imaging showed a Charcot foot deformity with Lisfranc dislocation, but no evidence of osteomyelitis was found.

Treatment objectives and clinical outcomes

Treatment objectives: Reduce slough, promote granulation tissue and avoid amputation.

Figure 1. Ulcer at initial presentation showing high levels of exudate, slough-covered wound bed, poor granulation tissue, suspected biofilm, malodour and periwound hyperkeratosis.

Management plan: Cleanse with Prontosan® Wound Irrigation Solution and Prontosan® Wound Gel.

Following assessment, surgical debridement was performed to remove necrotic and infected tissue [Figure 2a]. Empirical antibiotic therapy was initiated after obtaining deep tissue samples and shavings from the cuneiform bones. Concurrently, the patient's nutritional status and glycaemic control were optimised.

Wound bed preparation involved twice-weekly cleansing with Prontosan® Wound Irrigation Solution and application of Prontosan® Wound Gel as the primary dressing, with secondary gauze padding.

Gradually a noticeable improvement in the quality of granulation tissue was observed [Figure 2b]. Zinc oxide paste was used to protect the periwound skin from maceration, although a high volume of exudate persisted.

By week 6, clean-bone samples were negative for infection, but tissue samples grew *Pseudomonas aeruginosa,* and antibiotics were changed accordingly. Despite best practice, the patient's continued weight-bearing meant the ulcer parameters were not improving. Therefore, surgical intervention was performed to correct the structural abnormality using bone osteotomy and Kirschner wire fixation [Figure 3a].

However, once weight-bearing resumed, the patient returned on multiple occasions with a deterioration of the ulcer, primarily due to poor offloading. Customised offloading footwear was costly for the patient; therefore, a modified total contact cast was devised [Figure 3b].

Following this, the patient maintained good engagement with the total contact cast, which was changed weekly.

Exudate improved, and epithelialisation was rapid by week 12 [Figure 4a]. The patient continued using Prontosan® products. Subsequent cultures showed complete resolution of the infection. The multi-pronged therapeutic approach, together with improved patient and family awareness, allowed infection control, exudate management, better offloading and, finally, ulcer healing [Figures 4b and 5].

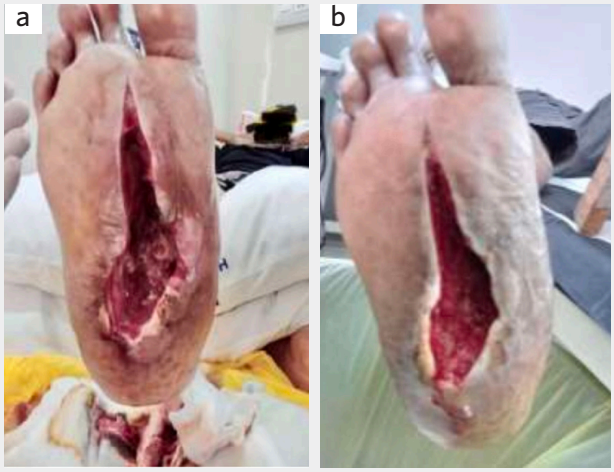

Figure 2. Ulcer progression following cleansing with the Prontosan® range: (a) Week 1 and (b) Week 2 with visible improvement in wound bed quality and early granulation.

Figure 4. Ulcer progression: (a) Week 12 showing significant epithelialisation; (b) Week 14 with continued improvement and reduced exudate.

Cost-benefit analysis

Over the nearly 4-month treatment period, total expenditure, including dressing materials, Prontosan® Wound Irrigation Solution, labour and medication, was Rs 98,000, with an additional Rs 350,000 for surgical intervention.

Prior to treatment with Prontosan®, the patient spent Rs 3,500 per visit for dressings and transport, attending daily for 9 months, totalling Rs 288,000. In-hospital care costs reached Rs 450,000, significantly increasing the total financial strain up to Rs 738,000 prior to treatment with Prontosan®.

Figure 3. Ulcer progression: (a) Week 6 post-surgical realignment via bone osteotomy and Kirschner wire fixation; (b) Week 8.5 following application of a modified total contact cast.

Figure 5. Week 15: Full ulcer closure and restoration of skin integrity.

Hence, treatment with Prontosan® considerably reduced the cost burden of the patient.

Conclusion

The combination of Prontosan® products for wound bed optimisation with offloading resulted in the control of wound infection, reduced dressing changes, ulcer healing and limb salvage. The patient regained mobility and avoided limb loss, continuing to support his family through a structured approach combining offloading and the Prontosan® product range.

CASE 10: Management of gangrene and infected toes

Author details: Yafei Zhao, China

Patient presentation and history

- 70-year-old male
- Gangrene affecting the toes [Figure 1]
- **Medical history:** Diabetes and a history of amputations.

Wound presentation

- **Tissue composition:** Gangrenous tissue with clear signs of infection
- **Additional:** Surrounding skin was red, swollen and tender, indicating local infection. Skin temperature, bacterial culture and drug susceptibility testing confirmed a *Klebsiella pneumoniae* infection.

Treatment objectives and clinical outcomes

Treatment objectives: Remove biofilm, achieve a clean wound bed and preserve the surrounding skin.

Management plan: Cleanse wound with Prontosan® Wound Irrigation Solution and Prontosan® Wound Gel. Prescribe targeted antibiotics, involve the endocrinology team to optimise blood glucose levels and manage the patient's diabetes.

A local incision and drainage procedure was performed on the plantar area beneath the second and third toes of the dorsal foot. Due to complications from atherosclerotic occlusion and diabetic neuropathy in the right lower extremity, a femoral artery balloon dilation was carried out to improve blood flow.

Following debridement under general anaesthesia, the gangrenous toes were surgically amputated. After each debridement session, the wound was cleansed with Prontosan® Wound Irrigation Solution and treated with Prontosan® Wound Gel. A silver-containing dressing was applied for its antimicrobial properties.

The wound was covered with bone cement and managed with negative pressure wound therapy (NPWT).

After 10 days, the bone cement was removed [Figure 2].

Infection was successfully controlled, and, by week 14, the wound bed had re-epithelialised completely [Figure 3–5], preserving the structure and function of the foot.

Figure 1. Initial presentation of gangrenous toes following debridement, characterised by active infection and high levels of exudate.

Cost-benefit analysis

Diabetic foot ulcers are associated with prolonged hospital stays and substantial financial costs. In this case, the patient was hospitalised for 29 days, with surgery costing 14,050 yuan. Over the 20-week treatment period, total expenditure, including hospitalisation, dressing materials, Prontosan® Wound Irrigation Solution, Prontosan® Wound Gel, labour and medication, was 21,270 yuan. This cost was significantly lower than the reported average per-patient cost of treating diabetic foot ulcers in China, which stands at 42,040.60 yuan (Lu et al, 2020).

Conclusion

This case study demonstrates the effectiveness of a multidisciplinary approach in managing diabetic foot ulcers. Prompt and targeted treatment not only improved the patient's quality of life but also successfully preserved the

Figure 2. Wound 10 days post-amputation, following bone cement removal, with no visible biofilm or necrotic tissue.

Figure 3. Day 19 of treatment with Prontosan® products, with reduced levels of exudate, visible granulation tissue and a clean wound bed.

Figure 4. Day 52 of treatment, with reduced wound bed size and healthy granulation tissue.

foot, avoiding major amputation. The use of Prontosan® products for wound cleansing and biofilm removal played a central role in infection control and healing, while diabetes management, vascular intervention and surgical debridement contributed to optimal outcomes.

This holistic treatment strategy not only reduces the likelihood of rehospitalisation but also eases the financial burden on patients and healthcare systems.

Figure 5. Day 101 post-treatment initiation. The wound bed is nearly healed, with complete closure of the lateral aspect.

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Summary of cost reduction with Prontosan®

Prontosan® has demonstrated cost-reduction potential in wound management by efficiently controlling exudate and infection, thereby reducing the need for prolonged hospitalisation and additional interventions.

This is evident in several case studies. In the Philippines, a 59-year-old male with a diabetic foot ulcer complicated by gangrene (Case 2, pages 8–9) accrued a total treatment cost of PHP 204,300 over 27 weeks. Notably, these costs were fully covered by the government's health insurance programme, in line with findings from Cruz et al (2024), which highlight that multidisciplinary, government-subsidised care for diabetic foot ulcers can significantly reduce long-term healthcare costs by preventing severe complications, such as amputations.

A similar outcome was seen in Sri Lanka, where a 78-year-old woman with a foot ulcer present for 5 years (Case 3, pages 10–11) incurred a total cost of Rs 35,000 using Prontosan® Wound Irrigation Solution, labour, dressing materials and related items — substantially lower than her previous cumulative treatment cost of Rs 528,000 over 2 years.

In another case in the Philippines, a female patient with a large plantar ulcer (Case 5, pages 14–15), initially recommended for major amputation, achieved near-total healing by 24 weeks following treatment with Prontosan® Wound Irrigation Solution, Prontosan® Wound Gel and ultrasound-assisted debridement. The total cost of care was PHP 257,310, comparable to national averages (Cruz et al, 2024), while avoiding amputation and preserving limb function.

Other individual cases reinforce the economic benefits of Prontosan®. For example, a 67-year-old man with a deteriorating forefoot amputation wound (Case 6, pages 16–17) was able to reduce dressing frequency and financial strain after introducing Prontosan®, while an 80-year-old woman with a 1-year non-healing ulcer (Case 7, pages 18–19) achieved full wound closure within 6 weeks — at a dressing cost of just Rs 10,480 — after switching from daily iodine and saline to Prontosan® and custom-cut adhesive felt pad offloading.

Similarly, in Case 9 (pages 22–23), a patient who had previously incurred Rs 738,000 in combined treatment and hospitalisation costs over 9 months was able to significantly reduce expenses by incorporating Prontosan® with surgery and offloading strategies. The approach led to fewer hospital visits, reduced dressing changes and limb preservation, allowing the patient to return to work and support their family.

In China (Case 10, pages 24–25), a patient with a diabetic foot ulcer incurred a total treatment cost of 21,270 yuan over 20 weeks (including hospitalisation, surgery, dressing materials, Prontosan® products, labour and medication). This was significantly lower than the national average of 42,040.60 yuan per patient for similar wounds (Lu et al, 2020).

Complementing these case studies, Cooper et al (2023) conducted a cost-effectiveness analysis using a Markov model to compare Prontosan® Wound Irrigation Solution to saline for the treatment of venous leg ulcers. Although monthly treatment costs were initially higher for Prontosan® (£29.53–36.47) compared to saline (£2.69–3.33), patients treated with Prontosan® spent less time with open and infected wounds. The analysis concluded a net saving of £867.87 per patient per year, attributed to the reduced duration of wound infection and a greater proportion of time spent in the healing state.

A model-based health economic evaluation by Mehl et al (2013) further supports the economic viability of Prontosan® in the Brazilian private health system. The analysis showed that Prontosan® significantly reduced total treatment costs by improving healing times and minimising complications such as secondary infections. When comparing the total treatment costs rather than just product prices, Prontosan® was found to be a feasible and cost-effective solution.

Findings from South Korea (Suh and Ghosh, 2020) align with this trend. In a reimbursement-based healthcare setting, substituting 0.1% polyhexanide/betaine solution for saline reduced total wound healing costs by 63.6%, despite the higher price of the irrigation solution itself. These savings were primarily driven by reduced technical fees, dressing use and antibiotic-related costs. Given South Korea's rising incidence of infectious wounds, broader adoption of this solution could lead to substantial national savings.

In a large retrospective cohort study using real-world data from England, Gansen et al (2024) found that patients initiated on polyhexanide/betaine cleansing solution experienced 0.44 fewer inpatient admissions (95% CI -0.54 to -0.35; $P<0.001$), 1.1 fewer outpatient attendances (95% CI -1.3 to -0.89; $P<0.001$) and 2.5 fewer primary care consultations (95% CI -3.2 to -1.9; $P<0.001$) within the first year, compared to those treated with saline. The adjusted mean all-cause healthcare cost was £605 lower for the polyhexanide/betaine cleansing solution group, driven by reduced healthcare resource utilisation and faster wound healing.

Finally, the National Institute for Health and Care Excellence (NICE, 2021) reported an estimated cost saving of GBP 951.01 per patient over 1 year when using Prontosan® compared with normal saline for chronic wounds. Their model, based on real-world clinical scenarios (Andriessen and Eberlein, 2008), reinforces the conclusion that despite a higher upfront cost, Prontosan® leads to overall healthcare savings.

Together, these findings suggest that Prontosan® is a clinically effective and economically choice for chronic wound management across diverse healthcare systems. Its ability to shorten healing times, reduce infections and avoid high-cost complications presents a compelling case for broader adoption in both public and private settings.

Prontosan® range in practice

The prevention and management of biofilm in chronic wounds is increasingly recognised as a key objective in wound care. The presence of biofilm is acknowledged as a leading cause of delayed wound healing (Durante et al, 2014; Bjarnsholt et al, 2017; Malone et al, 2017).

Prontosan® Wound Irrigation Solution and Prontosan® Wound Gel/Wound Gel X [Figure 1] are among the few products specifically indicated for the prevention and removal of biofilms. These products contain 2 key ingredients:

- **Betaine:** a gentle yet effective surfactant (detergent) which is able to penetrate, disturb, clean and remove biofilm and wound debris.
- **Polyhexamethylene biguanide (PHMB):** a highly effective broad-spectrum antiseptic that is active against gram-negative bacteria (e.g. Pseudomonas aeruginosa) and gram-positive bacteria (e.g. methicillin-resistant Staphylococcus aureus (MRSA) and vancomycin-resistant Enterococci; Kaehn, 2010). PHMB has been in use for approximately 60 years and has demonstrated good clinical safety, low toxicity and no evidence of bacterial resistance (Hirsch et al, 2010). PHMB has low to no absorption by human cells and tissue; therefore, interference with the metabolism of the body is negligible. Existing evidence shows that topical PHMB may promote the healing of chronic stalled wounds, reduce bacterial burden, eliminate MRSA and alleviate wound-related pain (To et al, 2016).

The choice between Prontosan® Wound Gel and Gel X allows for optimal application on both large surface areas and deep wounds.

Recommendations on soaking time and product combination

A proactive approach using a combination strategy with Prontosan® as part of wound bed preparation can help reduce biofilm burden (Prontosan® Wound Irrigation Solution) and prevent the reconstitution of biofilm (Prontosan® Wound Gel/Wound Gel X; Seipp et al, 2005; Davis et al, 2017).

To achieve the best possible results, it is important to consider the individual condition of the wound before application (Gist et al, 2009).

Figure 1. The Prontosan® product range, including Prontosan® Wound Irrigation Solution, Prontosan® Wound Gel, Prontosan® Wound Gel X and Prontosan® Debridement Pad. These products work together to cleanse, decontaminate and maintain a moist wound environment while preventing biofilm formation.

The following recommendations [Table 2] on product use and application timing are based on an observational study conducted in Italy (Ricci, 2018).

Table 2. Chronic/hard-to-heal wound management guide with Prontosan® range (based on Ricci, 2018).

Wound type	Wound characteristics	Treatment	Benefits
Epithelialising	• No slough • Low exudate • Highly fragile epithelial tissue	1. Cleanse 2. Soak (for 0–5 minutes) 3. Cleanse with Solution	• Cleanses the wound • Helps to prevent biofilm
Granulating	• Light slough • Low/medium exudate	1. Cleanse 2. Soak (for 5–10 minutes) 3. Cleanse with Solution 4. Apply Gel/Gel X	• Mechanically removes debris and slough • PMBH promotes wound healing (Phillips et al, 2010)
Exuding/ Colonised	• Slough • Medium/high exudate • Stalled wound	1. Cleanse 2. Soak (for 10–15 minutes) 3. Cleanse with Solution 4. Apply Gel/Gel X	• Mechanically removes debris and slough (ideally use the Prontosan® Debridement Pad) • PHMB promotes wound healing (Phillips et al, 2010) • Reduces odour

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