

# Sequential wound management of chronic wounds with polyabsorbent fibre dressing coated with technology lipido-colloid and silver, and then with sucrose octasulfate dressing: a case series

India currently has a major problem with diabetes — there are an estimated 101 million people with diabetes in the country and a further 136 million individuals with pre-diabetes (Anjana et al, 2023). Out of the 101 million individuals, 25% will experience foot problems in their lifetime. Around 85% of higher-level amputations are due to infected neuropathic ulcers, which are preventable (Arun, 2014). An estimated 200,000 higher-level amputations are carried out every year in India (Arun, 2014). Considering these facts, it is essential to prevent diabetic foot ulcers from occurring in the first place and to heal them as quickly as possible. Routine dressing modalities carry a risk of contamination leading to stalled healing process and increased risk of amputation. To avoid this problem, an easy-to-use dressing that provides effective antimicrobial protection and has antibiofilm and debriding properties has gained widespread acceptance among patients and healthcare professionals. Once the wound is in the granulation phase, a silver dressing is not required. Switching over to NOSF-impregnated dressing can be a better option to enhance wound closure. As witnessed from the different cases treated by this continuum of care by experts across India and the personal experience of the authors, this is a very useful combination modality to achieve faster wound closure.



**Dr Sanjay Vaidya,**

Consultant Plastic and Diabetic Foot Surgeon, S. L. Raheja Hospital, Mumbai, India;  
Vice President APADLP; Treasurer DFSI

Diabetes has been described as a 'silent pandemic', with the World Health Organization stating that 537 million people globally are living with diabetes in 2021 (Mnif et al, 2022). It is suggested that it is of a bigger concern in developing economies like India, mainly driven by the increasing prevalence of overweight and obesity, and unhealthy lifestyles (Pradeepa and Mohan, 2021). In India, there were 101 million people living with diabetes and 136 million people with prediabetes in 2021, suggesting that the prevalence of diabetes in the country is considerably higher than previously estimated (Anjana et al, 2023). The limitations and impairments associated with diabetes include vascular, neurological, cardiac and renal impairments. However late diagnosis, failure to meet treatment objectives and non-adherence to treatment can lead to severe complications such as nephropathy, neuropathy, retinopathy,

amputations and stroke (Oyewole et al, 2023).

Worryingly, diabetes-related ulcers (DRUs) are very prevalent, with a 6.3% global prevalence among adults with diabetes, equating to approximately 33 million people (McDermott et al, 2023). Ghosh and Valia (2017) estimate that, in India, 25% of people with diabetes develop DRUs, of which 50% become infected, requiring hospitalisation, while 20% need amputation, with DRUs contributing to approximately 80% of all non-traumatic amputations in the country.

## Slough and prolonged inflammatory process in DRUs

An integral part of wound management and wound bed preparation involves debridement, which is defined as the removal of non-viable wound components, including necrotic material, slough and biofilm. This can be sometimes achieved by autolytic or mechanical methods



**Narendranadh Meda,**

Head of Department and Senior Consultant – Vascular and Endovascular Surgery, Podiatric surgeon, KIMS, Hyderabad, India

**Anoop Vasudevan Pillai**

Assistant Professor, Department of General Surgery, Amrita Institute of Medical Sciences, Kochi, India

**Riju R. Menon**

Professor, Department of General Surgery, Amrita Institute of Medical Sciences, Kochi, India

**Bharat Kotru**

Podiatrist and Wound Care Specialist, Max and Amandeep Hospitals, Punjab, India

**Vikas Kakkur**

Plastic and Reconstructive Surgeon, Kakkur Clinic, Amritsar, India

**Govind Singh Bisht**

Principal Consultant – Podiatry (Foot care) at Max Multispecialty Hospital, Panchsheel park, New Delhi & Max Hospital Gurgaon, India

(Eriksson et al, 2022). Slough is a common feature of non-healing wounds (Townsend et al, 2024), and is a major barrier to wound progression (Angel, 2019). It contributes to delayed wound healing by prolonging the inflammatory response, which results in high levels of protease and pro-inflammatory cytokine production inflammation (Angel, 2019; McGuire et al, 2019). Slough also attracts microorganisms to the wound site (Percival and Sulaiman, 2015). Bacteria can form biofilm in wound slough, which further delays and complicates wound healing (Percival and Sulaiman, 2015).

Consequently, desloughing is a necessary procedure to improve the wound healing process and is deemed a lower-risk alternative to debridement, using wound cleansing agents and wound care products (Angel, 2019). Evidence suggests that slough-trapping fibre dressings remove of slough and can reduce treatment costs, improve patient outcomes and maintain patient safety by preventing further complications (Grothier, 2015).

Moreover, in DRUs, there is an increase in matrix metalloproteinases (MMPs) and a down-regulation of their inhibitors (tissue inhibitors of metalloproteinases; Chakraborty et al, 2022). In this proteolytic environment, DRUs fail to heal due to a reduction in extracellular matrix formation, matrix degradation, delayed cell migration and inhibition of collagen deposition (Chakraborty et al, 2022). Treatments that enhance DRU healing are often associated with reducing inflammatory process in the diabetic wound environment (Andrews et al, 2015). Considering the damaging role of high levels of MMPs in complicated wounds, dressings that reduce these proteinases may support the healing process (Dissemond et al, 2020a).

In view of this, the authors sought a local treatment protocol that would sequentially provide desloughing of the wound, management of local infection, as well as reduce the inflammatory process, to hasten wound closure.

### **Polyabsorbent fibres dressings with technology lipido-colloid and technology lipido-colloid silver**

The polyabsorbent fibres dressing pad (UrgoClean®, Laboratoires Urgo) supports the absorption of wound exudate as well as the trapping of sloughy residue (Meaume et al, 2012b; Sigal et al, 2019) and is considered to offer a safe and effective method to remove debris from the wound bed (Milne, 2015). The desloughing properties of the polyabsorbent fibre dressings have been demonstrated to be significantly superior to that of hydrofibre

dressings in a European randomised controlled trial involving 159 patients (Meaume et al, 2014). A non-controlled open-label prospective, multicentre clinical trial has also reported wound area reduction associated with effective and rapid desloughing of the wound bed tissue with these fibres (all venous leg ulcers and pressure ulcers treated were debrided by week 3; Meaume et al, 2012b).

The polyabsorbent pad is coated with a soft-adherent lipido-colloid layer (TLC) that promotes healing and enables atraumatic removal (Trudigan et al, 2014). To provide an antimicrobial effect, silver sulfate is included in the TLC matrix to produce polyabsorbent fibre dressings – the TLC-Ag dressing (UrgoClean Ag®, Laboratoires Urgo). The controlled supply of Ag+ at the surface into the lipido-colloid gel, provides a constant antimicrobial activity strictly in contact with the wound (Adolphus et al, 2015).

This combination has been shown to possess an antibiofilm action, as reported by an in vitro study conducted with biofilms of *Staphylococcus aureus* (MRSA) and *Pseudomonas aeruginosa* (Desroche et al, 2016). The results show a significant decrease of the biofilm population by a log reduction of 4.6 after 24 hours of exposure, which was maintained for 7 days, with reduction values up to 4 log (reduction of biofilm superior to 99.99%). The combined action of polyabsorbent fibres and TLC-Ag matrix of this polyabsorbent silver dressing has been shown to enable a more rapid disruption of in vitro biofilms when compared to carboxymethylcellulose dressing, which combines ionic silver, a metal chelating agent, and a surfactant (Hydrofiber Ag + Extra; Desroche et al, 2017).

A prospective, multicentre, non-comparative clinical trial was also conducted with this silver dressing in patients with wounds at high-risk of infection (Dalac et al, 2016). Over a maximum period of 4 weeks of treatment, wound surface area, mostly covered by sloughy tissue, was reduced by 32.5%, and 54.1% of wounds were debrided (defined by <30% of sloughy tissue covering the wound bed). In a multicentre study of 2,270 patients with exuding wounds of different aetiology at risk of infection or with clinical signs of local infection, an improvement in healing process was reported after a mean duration of treatment of  $22 \pm 13$  days in 90.6% of cases, along with a reduction in all clinical signs of local infection, regardless of exudate level and proportion of sloughy tissues in the wound bed at baseline (Dissemond et al, 2020a).

### **TLC-nano-oligosaccharide factor (sucrose octasulfate) dressings**

The TLC-nano-oligosaccharide factor (TLC-

#### **Key words**

- Chronic wounds
- Lipido-colloid and silver dressing
- Polyabsorbent fibres dressing

NOSF)/sucrose octasulfate dressing has MMP-reducing properties and has been shown in literature to promote healing in various types of chronic wounds (Munter et al 2017; Edmonds et al 2018).

In a 2021 systematic review of TLC-NOSF dressings (UrgoStart® Treatment Range, Laboratoires Urgo, France), 21 clinical studies assessing these dressings were identified, ranging from double-blind randomised control trials (RCTs) to real-life series, involving more than 12,000 patients. The authors showed that TLC-NOSF dressings are an evidence-based solution for the management of chronic wounds, enhancing wound healing, reducing healing times, and increasing patients' health-related quality of life, while being a cost-effective, and even cost-saving, treatment (Nair et al, 2021).

TLC-NOSF dressings are currently recommended by several guidelines, including the International Working Group on the Diabetic Foot (2023), the UK's National Institute for Health and Care Excellence (2023) and Diabetes Feet Australia (2021).

### Sequential treatment

Interestingly, the report of two cases with complex DRUs has highlighted the potential benefits of a sequential treatment with the polyabsorbent fibres with TLC-Ag dressings followed by TLC-NOSF dressings (Galea and Khatib, 2020). Dowsett (2023) also presented two venous leg ulcer cases that were initially managed with the polyabsorbent fibres dressings coated with TLC-Ag for 6 weeks and 9 weeks respectively to manage infection and biofilm, and then continued with a TLC-NOSF dressing for wound closure and improvement in patient outcomes.

Wong et al (2023) presented a prospective cohort study with 28 patients included in the final analysis on patients with venous leg ulcers who received sequential therapy, consisting of 2 weeks of a polyabsorbent fibre with TLC-Ag dressing followed by TLC-NOSF dressings and a two-layer compression bandage, until complete wound healing. Median time to wound healing was 10 weeks, and 57.1% of patients achieved complete wound closure at 3 months. There was significant wound area reduction after 1 month (mean area decreased from 8.44 cm<sup>2</sup> to 5.81 cm<sup>2</sup>, 31.2% decrease) and after 3 months (mean area decreased from 8.44 cm<sup>2</sup> to 2.53 cm<sup>2</sup>, 70.0% decrease), with a mean monthly wound area reduction of 28.9%. The patients' self-rated health on a vertical visual analogue scale also improved following the sequential therapy. The authors concluded that the sequential therapy is feasible option, with good wound healing and improvement in patients' quality of life.

Guidelines from the Ministry of Health in Vietnam (2023) recommend polyabsorbent fibres with TLC-Ag dressings. They are described as "clinically effective in treating local infections and promoting wound healing" and "fast antibacterial with a broad spectrum and effective against biofilm". The guidelines state: "polyabsorbent fibres keep the wound bed clean, optimising the effectiveness of silver ions at the wound bed." TLC-NOSF dressings are recommended as "the first choice to significantly shorten ulcer healing time compared to other dressings, stressing out the cost-effectiveness of these dressings compared to other treatments."

### Aim

The authors were already using the two evaluated dressings based on their experience of clinical outcomes and integrated them in their standard of care. However, based on the above-mentioned papers, they aimed to evaluate the dressings as a sequential treatment to confirm/validate its effectiveness in the management of chronic wounds they encounter in their clinical practices in India. Six clinicians from different regions in India, with vast experience in managing DRUs and other chronic wounds authoring this paper, provide the results achieved in 10 challenging cases.

All patients consented to the evaluation of the sequential treatment. The wounds chosen were leg or foot ulcers in diabetic patients and a pressure injury with suspected clinical signs of local infection, and were followed-up till healing. This was a multicentre prospective evaluation to provide a representation of different settings in different regions of India.

### Cases discussion

In cases 1 and 2, the clinician remarked that, after the application of polyabsorbent fibre dressing with TLC-Ag, there was a significant reduction in exudate and slough, and gradual improvement of granulation tissue. After a clean wound bed had been achieved, the treatment was shifted to a TLC-NOSF dressing which reduced the wound surface in a short period of time.

For cases 3 and 4, the application of polyabsorbent fibre dressing with TLC-Ag was associated with a significant reduction in exudate, slough, and continuous reduction in pain while an improvement of granulation tissue was evident. Once the infection subsided, the treatment switch to TLC-NOSF dressing led to a drastic wound area reduction and rapid closure of the wound, allowing a return to a more normal life for the patients.

In cases 5 and 6, the clinician emphasised the significant reduction in exudate levels and



## Case 1

- A 65-year-old man with type 2 diabetes of 10 years' duration and hypertension presented with an 8-month-old diabetes-related ulcer covering the medial and central forefoot plantar area of the right foot with suspected local signs of clinical infection, previously treated with traditional wound care and oral antibiotics for 1 week.
- On presentation, the wound was debrided and the polyabsorbent fibre dressing with TLC-Ag was applied as the primary dressing with an absorbent secondary dressing which was changed every alternate day for the first week and then every 3 days. Antibiotics were prescribed for an additional 5 days. Offloading was also implemented as part of the standard of care.
- At week 4, the signs of local infection subsided and the TLC-NOSF contact layer dressing was initiated, with dressing changes every 3 days.
- The wound healed by week 7.



**On presentation.** 4 × 3 cm, Exudate ++; pain 6/10



**Week 1.** 4 × 3 cm. Exudate ++; pain 5/10



**Week 3.** 3.5 × 2.5 cm. Exudate ++; pain 4/10



**Week 4.** 3.5 × 2.5 cm. Exudate nil; pain 2/10. TLC-NOSF started



**Week 6.** 1 × 1 cm. Exudate nil; pain 0/10



**Week 7.** Healed

## Case 2

- A 48-year-old man with an 8-year history of type 2 diabetes presented with a recurring diabetes-related ulcer (age of the wound unknown) on the posterior aspect of the right foot, above the calcaneum, previously self-managed.
- On presentation, the wound was debrided and the polyabsorbent fibre dressing with TLC-Ag was applied as the primary dressing, changed every alternate day for the first week and then every 3 days. Antibiotics were prescribed for 1 week. A second debridement was performed in week 3.
- At week 4, the signs of local infection subsided and TLC-NOSF contact layer dressing was started, with dressing changes every 3 days.
- The wound healed by week 9.



**On presentation.** 7 × 3 cm. Exudate ++; pain 6/10



**Week 2.** 6 × 3 cm. Exudate +++; pain 3



**Week 4.** 5 × 2.5 cm. Exudate nil; pain 0/10. TLC-NOSF started



**Week 5.** 2 × 1 cm. Exudate nil; pain 0/10

Anoop Vasudevan Pillai, Assistant Professor and Riju R Menon, Professor, Department of General Surgery, Amrita Institute of Medical Sciences, Kochi, India.

### Case 3

- A 63-year-old man with uncontrolled type 2 diabetes of 6 years' duration, peripheral vascular occlusive disease status post (S/P) left anterior tibial artery (ATA) and peroneal artery (PTA) angioplasty, critical limb ischaemia Rutherford VI (severe chronic limb-threatening ischaemia, with little to no revascularisation or pharmacological options; Lee et al, 2022)
- On presentation, the patient was in sepsis due to wet gangrene of the fourth and fifth toes. Left ATA and PTA angioplasty was initially performed, followed by cleansing and debridement of pus and slough, tracking into the deep plantar space, along with amputation of two gangrenous toes.
- The polyabsorbent fibre dressing with TLC-Ag was applied as the primary dressing and a secondary dressing with absorbent cotton pads, with dressing changes every 5 days until week 3, and every 7 days from week 4. Offloading was implemented with a plaster slab. Antibiotics were given for 2 weeks as per the sensitivity reports.
- The treatment was changed to TLC-NOSF foam dressing from week 5, with dressing changes every 7 days.
- The wound healed by week 12.



**Post debridement & amputation.** 12 × 6 × 3 cm. Exudate +++; pain 7-8/10



**Week 3.** 12 × 6 × 3 cm. Exudate +++; pain 5/10



**Week 4.** 10 × 5 × 1 cm. Exudate ++; pain 4/10



**Week 5.** 10 × 4 × 1 cm. Exudate ++; pain 4/10. TLC-NOSF started



**Week 7.** 8 × 3 cm. Exudate +; pain 1/10



**Week 9.** 4 × 3 cm. Exudate +; pain 1/10



**Week 10.** 2 × 3 cm. Exudate +; pain 1/10



**Week 12.** Healed

### Case 4

- A 78-year-old woman with type 2 diabetes for 18 years, systemic hypertension, Alzheimer's disease, hypothyroidism and dyslipidaemia. She had been bedridden for 1 year and developed a pressure injury over the right calcaneum, present for 5 months, which was not healing and increasing in size. The wound was previously managed with traditional wound care.
- On referral, the wound, with suspected local infection, was debrided, and the polyabsorbent fibre dressing with TLC-Ag was applied as the primary dressing and absorbent pads as secondary dressing, with changes every 5 days. Antibiotic therapy was also given for 10 days as per the sensitivity report. Heel offloading was also implemented.
- The treatment was changed to TLC-NOSF foam dressing from week 6, with dressing changes every 5 to 7 days.
- The wound healed by week 7.



**On presentation.** 7 × 6 × 2 cm. Exudate ++; pain 6/10



**Week 3.** 6 × 5 × 1 cm. Exudate ++; pain 4/10



**Week 6.** 3 × 1 cm. Exudate +; pain 2/10. TLC-NOSF started



**Week 7.** Healed

reduced pain scores after the application of the polyabsorbent fibre dressing with TLC-Ag dressing. After the application of TLC-NOSF dressing, there was a rapid reduction in wound surface area.

In cases 7 and 8, the clinician remarked that after the application of the polyabsorbent

fibre dressing with TLC-Ag, there was a significant reduction in exudate levels, gradual improvement of granulation tissue and complete removal of slough, with reduced pain scores. Thereafter, the TLC-NOSF dressing rapidly improved the quality of granulation and facilitated a quick resolution of the wounds.



## Case 5

- A 75-year-old man with type 2 diabetes for 15 years, hypertension and previous history of right foot diabetes-related ulceration, presented with a 3-month-old diabetes-related ulcer on the medial plantar area of the right foot.
- The wound had been previously treated with debridement, topical antibiotics, and offloading.
- On presentation, the wound showed clinical signs of local infection. Sharp debridement was done where undermining and tunnelling were identified which were managed with negative pressure wound therapy at 125 mm of Hg for 7 days.
- Antibiotics were prescribed for 1 week and offloading support was initiated.
- The polyabsorbent fibre dressing with TLC-Ag was applied as the primary dressing with a secondary absorbent dressing, and changed every 2–3 days.
- By week 5, the signs of local infection had subsided, and the local treatment was changed to TLC-NOSF contact layer dressing, with dressing changes every third day.
- The wound healed by week 12.



**Week 1.** 6 × 3 cm. Exudate ++; pain 6/10



**Week 3.** 5 × 2.5 cm. Exudate ++; pain 5/10



**Week 4.** 3 × 2 cm. Exudate +; pain 3/10. TLC-NOSF started



**Week 7.** 3 × 1.5 cm. Exudate 0; pain 0



**Week 9.** 1 × 0.5 cm. Exudate 0; pain 0



**Week 12.** Healed

## Case 6

- The patient is a 88-year-old man with type 2 diabetes for 33 years, hypothyroidism, hepatitis C reactive, hypertension, benign prostatic hyperplasia, chronic heart failure and peripheral vascular disease. He presented with an 8-month-old left hallux amputation non-healing ulcer, previously managed with debridement and amputation, with offloading.
- On presentation, local infection was suspected, sharp debridement was performed and undermining and tunnelling were identified; these were managed with negative pressure wound therapy at 100–125 mm Hg for 7 days
- Antibiotics were prescribed for a week and offloading initiated. The polyabsorbent fibre dressing with TLC-Ag was applied as the primary dressing, with dressing changes every 2–3 days. TLC-NOSF contact layer dressing was started once the signs of local infection subsided (week 8), with dressing changes every third day. The wound healed by week 12.



**Week 1.** 11.7 cm²  
Exudate +++; pain 5/10



**Week 3.** 10.2 cm²  
Exudate ++; pain 5/10



**Week 6.** 9.8 cm²  
Exudate +; pain 3/10



**Week 10.** 4.9 cm².  
Exudate 0; pain 0. TLC-NOSF started by week 8



**Week 12.** Healed

In cases 9 and 10, the clinician underlined that, after the application of polyabsorbent fibre with TLC-Ag dressing, there was a significant reduction in exudate levels, gradual improvement of granulation tissue and complete removal of the slough tissue, as well as a reduction of pain scores. After the application of a TLC-NOSF

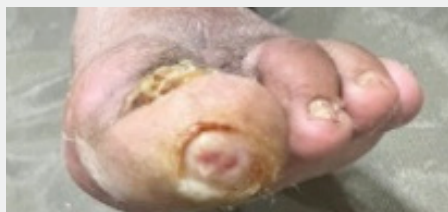
dressing, there was significant rapid wound closure, preventing any new adverse events or local infection episodes.

Pain scores in all these cases were based on the Numerical Rating Scale (Boonstra et al, 2016).

Vikas Kakkar, Plastic and Reconstructive Surgeon, Kakkar Clinic, Amritsar, India.

### Case 7

- A 58-year-old man with hypertension and type 2 diabetes of 15 years' duration presented with a 4-month-old diabetes-related ulcer on the left hallux, previously managed with povidone-iodine dressings, which was not improving.
- On presentation, the wound was cleansed with normal saline and the polyabsorbent fibre dressing with TLC-Ag was applied as the primary dressing, with a gauze and cotton pad secondary dressing. This was changed every alternate day for the first week and thereafter every 3 days.
- No antibiotics or offloading were prescribed.
- Once the signs of local infection subsided (week 4) the local treatment was changed to a TLC-NOSF contact layer dressing, with dressing changes every 3 days.
- The wound healed by week 14.



**On presentation.** 1.5 × 2 cm. Exudate ++; pain 4/10



**Week 1.** 1.5 × 2 cm. Exudate ++; pain 3/10



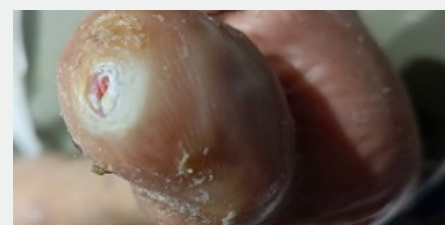
**Week 5.** 1 × 1.5 cm. Exudate +; pain 1/10. TLC-NOSF started week 4



**Week 7.** 0.5 × 0.5 cm. Exudate nil; pain 0/10



**Week 11.** 0.3 × 0.3 cm. Exudate nil; pain 0/10



**Week 12.** 0.2 × 0.2 cm, Exudate nil; pain 0/10

### Case 8

- A 76-year-old man, with a 10-year history of type 2 diabetes, presented with a 4-month-old stump wound following a below-knee amputation due to snake bite cellulitis. The stump wound was recurrently infected and was not healing with management that included gauze dressings with regular debridement.
- On referral, the wound was debrided, cleansed with normal saline and the polyabsorbent fibre dressing with TLC-Ag was applied as the primary dressing, changed every alternate day for the first week and then every 3 days. Antibiotics were prescribed for 1 week.
- Once the wound was considered clean (week 2), TLC-NOSF contact layer dressing was started, with dressing changes every 4-5 days.
- The wound healed by week 16.



**On presentation.** 8 × 7 cm. Exudate ++; pain 6/10



**Week 2.** 8 × 7 cm. Exudate +; pain 1/10. TLC-NOSF started



**Week 4.** 6 × 6 cm. Exudate nil; pain 0/10



**Week 9.** 2 × 5 cm. Exudate nil; pain 0/10



**Week 13.** 1 × 2 cm. Exudate nil; pain 0/10



**Week 16.** 0.5 × 0.5 cm. Exudate nil; pain 0/10



# Case 9

- A 55-year-old man with type 2 diabetes and hypertension of unknown duration, presented with a diabetes-related ulcer on right foot dorsum and right lateral malleolus that had been present for 2 months. He had been treated previously in another hospital with traditional dressings and debridement for more than 6 weeks. Hospital admission was advised, but the patient was not able to afford this.
- On presentation, antibiotics were given for 1 week according to the culture and sensitivity report. The polyabsorbent fibre dressing with TLC-Ag was applied as the primary dressing with gauze and cotton pad secondary dressing, which was changed alternate days for the first 2 weeks, and every 3 days in the third week.
- Once the signs of local infection subsided at week 5, TLC-NOSF contact layer dressing was started with dressing changes every 3 days. The wound healed by week 9.



**On presentation.** 6 × 6 cm. Exudate ++; pain 6/10



**Week 2.** 5 × 5 cm. Exudate ++; pain 3/10



**Week 3.** 4 × 3 cm. Exudate +; pain 1/10



**Week 5.** 1 × 1 cm. Exudate 0; pain 0. TLC-NOSF started



**Week 7.** 0.5 × 0.5 cm. Exudate 0; pain 0

# Case 10

- The patient is a 58-year old man with a 15-year history of type 2 diabetes, hypertension and varicose veins. He runs a bakery, requiring long hours of standing. He presented with a 15-day-old diabetes-related ulcer on the left second toe, plantar aspect, with suspicion of local infection. The wound was being self-managed with antibiotic cream.
- On presentation, the polyabsorbent fibre dressing with TLC-Ag was applied as the primary dressing, with gauze and cotton pad as a secondary dressing, and changed on alternate days. Antibiotics were given for 2 weeks according to the culture and sensitivity report. Offloading was initiated with front wedge footwear.
- Once the signs of local infection subsided (week 3), the local treatment was changed to TLC-NOSF contact layer, with dressing changes every 3 days. The wound healed by week 8.



**On presentation.** 1 × 1 cm. Exudate +++; pain 0



**Week 2.** 1 × 1 cm. Exudate ++; pain 0



**Week 3.** 0.5 × 0.5 cm. Exudate +; pain 0. TLC-NOSF started



**Week 5.** Wound healed



## Discussion

DRUs are a serious and expensive complication of diabetes, and are a significant cause of mortality and morbidity, with added emotional distress, socioeconomic problems and low quality of life (Jalilian et al, 2020; Akkus and Sert, 2022). Managing a DRU requires good clinical care which incorporates adequate and frequent debridement/desloughing, offloading (when indicated), moist wound environment, treatment of infection and revascularisation for ischaemia when necessary (Kavitha et al, 2014). Wound healing can be enhanced by the appropriate choice of a dressing regime, which is a crucial step in the standard of care of these ulcers (Kavitha et al, 2014). Although there is a considerable range of dressing products available, robust evidence regarding the mode of action and effectiveness is available for only few dressings (Vowden and Vowden, 2017).

The evaluated dressings assessed as a sequential management protocol in the management of these cases, have robust supporting evidence, ranging from *in vitro* to *in vivo* clinical studies, including rare double-blind trials (Meaume et al, 2012a; Edmonds et al, 2018) and several real-life studies (Dissemond et al, 2020b; Gupta et al, 2021).

The polyabsorbent fibre dressing with TLC-Ag has been shown to effectively reduce slough and infection, and acts as an anti-biofilm (Dowsett, 2023). Moreover, the TLC-NOSF treatment range has been demonstrated to enhance wound closure, reduce healing times, and improve patients' health-related quality of life, while also being cost-effective (Nair et al, 2021).

In this prospective evaluation, the choice of the clinicians to apply this sequential treatment was based on this wealth of evidence. These dressings have been already used as part of the evidence-based standard of care in their clinics and hospitals, and evaluating them as a sequential management of DRUs was a progression to strive to provide the best solutions for their patients.

The wounds with clinical signs of local infection were initially managed with the polyabsorbent fibre with TLC-Ag dressing, which rapidly resolved these symptoms. The move from the antimicrobial dressing to a TLC-NOSF dressing was done once these signs were resolved (on average after 4.9 weeks), while patients also benefited from a rapid reduction in sloughy tissue, exudate and pain.

Although the TLC-NOSF dressing was initiated as the second part of the sequential therapy, it was immediately initiated after the antimicrobial treatment. It should be noted that, in a pooled data analysis of 10,220 patients

with chronic wounds, it was shown that the shortest time-to-closure was reached when wounds were treated with first-line TLC-NOSF dressings regardless of severity and nature of chronic wound (Munter et al, 2017).

Early closure of DRUs is considered crucial in order to prevent further complications, with Edmonds et al (2020) highlighting that "time is tissue". Moreover, Hwang (2023) iterated that early treatment equals fewer complications and earlier healing.

## Conclusion

The management of DRUs is always challenging. The authors have been managing these types of wounds for many years, but wanted to explore new local treatment strategies in the management of DRUs presenting with or suspicion of local clinical signs and symptoms of infection to get even better results. The evaluated dressings have robust evidence behind them and are also recommended by expert panels, boards and governmental entities.

The results achieved in all cases were satisfactory, with a rapid reduction of clinical signs of infection, slough, exudate and pain, and a rapid wound closure, with no adverse events reported during the course of treatment. The sequential treatment may help to reduce morbidity and mortality in patients with infected DRU by resolving these wounds in a shorter period. ●

## Conflicts of interest

The authors have no conflicts of interest to declare.

## References

- Adolphus K, Toner L, Stephen-Haynes J, Deeth M (2016) An open-label, non-comparative, multicentre evaluation of the performance of a hydro-desloughing technology lipido-colloid silver wound dressing. Poster presentation: Wounds UK Annual Conference, 14–16 November, Harrogate, UK
- Akkus G, Sert M (2022) Diabetic foot ulcers: a devastating complication of diabetes mellitus continues non-stop in spite of new medical treatment modalities. *World J Diabetes* 13(12): 1106
- Andrews KL, Houdek MT, Kiemle LJ (2015) Wound management of chronic diabetic foot ulcers: from the basics to regenerative medicine. *Prosthet Orthot Int* 39(1): 29–39
- Angel D (2019) Slough: what does it mean and how can it be managed. *Wound Pract Res* 27(4): 164–67
- Anjana RM, Unnikrishnan R, Deepa M et al (2023) Metabolic non-communicable disease health report of India: the ICMR-INDIAB national cross-sectional study (ICMR-INDIAB-17). *Lancet Diabetes Endocrinol* 11(7): 474–89
- Arun B (2014) Amputations. In (ed.): S Pensey. *Contemporary Management of the Diabetic Foot*. Delhi: Jaypee Brothers Medical Publishers.
- Boonstra AM, Stewart RE, Köke AJ et al (2016) Cut-off points for mild, moderate, and severe pain on the numeric rating scale for pain in patients with chronic musculoskeletal

- pain: variability and influence of sex and catastrophizing. *Front Psychol* 7: 1466
- Chakraborty R, Borah P, Dutta PP, Sen S (2022) Evolving spectrum of diabetic wound: mechanistic insights and therapeutic targets. *World J Diabetes* 13(9): 696
- Dalac S, Sigal L, Addala A et al (2016) Clinical evaluation of a dressing with poly absorbent fibres and a silver matrix for managing chronic wounds at risk of infection: a non comparative trial. *J Wound Care* 25(9): 531–8
- Desroche N, Dropet C, Janod P, Guzzo J (2016) Antibacterial properties and reduction of MRSA biofilm with a dressing combining polyabsorbent fibres and a silver matrix. *J Wound Care* 25(10): 577–84
- Desroche N, Dropet C, Janod P, Guzzo J (2017) Comparison of In vitro biofilm activities of a new poly-absorbent dressing with silver matrix and silver containing CMC dressing. Poster presentation at the European Wound Management Association, Amsterdam, the Netherlands, 3–5 May
- Diabetes Feet Australia (2021) *Australian evidence-based guidelines for diabetes-related foot disease*. Diabetes Feet Australia, Australian Diabetes Society. Available at: <https://www.diabetesfeetaustralia.org/wp-content/uploads/2021/12/2021-Australian-guidelines-for-diabetes-related-foot-disease-V1.0191021.pdf> (accessed 02.04.2024)
- Dissemond J, Augustin M, Dietlein M et al (2020a) Efficacy of MMP-inhibiting wound dressings in the treatment of chronic wounds: a systematic review. *J Wound Care* 29(2): 102–18
- Dissemond J, Dietlein M, Neßeler I et al (2020b) Use of a TLC-Ag dressing on 2270 patients with wounds at risk or with signs of local infection: an observational study. *J Wound Care* 29(3): 162–73
- Dowsett C (2023) A multidimensional approach to wound bed preparation using UrgoClean Ag. *Wounds UK* 19(4): 78–85
- Edmonds M, Lázaro-Martínez JL, Alfayate-García JM et al (2018) Sucrose octasulfate dressing versus control dressing in patients with neuroischaemic diabetic foot ulcers (Explorer): an international, multicentre, double-blind, randomised, controlled trial. *Lancet Diabetes Endocrinol* 6(3): 186–96
- Edmonds M, Phillips A, Holmes P et al (2020) To halve the number of major amputations in people living with diabetes, “ACTNOW”. *Diabetes Primary Care* 22(6): 1–5
- Eriksson E, Liu PY, Schultz GS et al (2022) Chronic wounds: Treatment consensus. *Wound Repair Regen* 30(2): 156–71
- Galea E, Khatib M (2020) Addressing wound chronicity factors: UrgoClean Ag® and UrgoStart® case studies. *Wounds Middle East* 7(1): 25–9
- Ghosh P, Valia R (2017) Burden of diabetic foot ulcers in India: evidence landscape from published literature. *Value Health* 20(9): A485
- Grothier L (2015) Improving clinical outcomes and patient experience through the use of desloughing. *Br J Comm Nurs* 20(Suppl 9): S25–31
- Gupta PC, Pavan B, Kesavan R et al (2021) *UrigoClean Ag in real life*. London: Wounds Asia. Available at: <https://woundsinternational.com/wp-content/uploads/sites/8/2023/02/5620be66a2b4e14b740943c6ea048b31.pdf> (accessed 02.04.2024)
- Hwang JM (2023) Time is tissue. Want to save millions in wound care? Start early: a QI project to expedite referral of high-risk wound care patients to specialised care. *BMJ Open Qual* 12(1): e002206
- International Working Group on the Diabetic Foot (2023) *IWGDF guidelines on the prevention and management of diabetes-related foot disease*. Available at: <https://iwgdfguidelines.org/wp-content/uploads/2023/07/IWGDF-Guidelines-2023.pdf> (accessed 02.04.2024)
- Jalilian M, Ahmadi Sarbarzeh P, Oubari S (2020) Factors related to severity of diabetic foot ulcer: a systematic review. *Diabetes Metab Syndr Obes* 13: 1835–42
- Kavitha KV, Tiwari S, Purandare VB et al (2014) Choice of wound care in diabetic foot ulcer: a practical approach. *World J Diabetes* 5(4): 546
- Lee RE, Patel A, Soon SX et al (2022) One year clinical outcomes of Rutherford 6 chronic limb threatening ischemia patients undergoing lower limb endovascular revascularisation from Singapore. *CVIR Endovasc* 5(1): 32
- McDermott K, Fang M, Boulton AJ et al (2023) Etiology, epidemiology, and disparities in the burden of diabetic foot ulcers. *Diabetes Care* 46(1): 209–21
- McGuire J, Nasser JJ (2021) Redefining slough: a new classification system to improve wound bed assessment and management. *Wounds* 33(8): e61–6
- Meaume S, Truchetet F, Cambazard F et al (2012a) A randomized, controlled, double-blind prospective trial with a lipido-colloid technology-nano-oligo saccharide factor wound dressing in the local management of venous leg ulcers. *Wound Repair Regen* 20(4): 500–11
- Meaume S, Perez J, Rethore V et al (2012b) Management of chronic wounds with an innovative absorbent wound dressing. *J Wound Care* 21(7): 315–22
- Meaume S, Dissemond J, Addala A et al (2014) Evaluation of two fibrous wound dressings for the management of leg ulcers: results of a European randomised controlled trial (EARTH RCT). *J Wound Care* 23(3): 105–16
- Milne J (2015) Wound-bed preparation: the importance of rapid and effective desloughing to promote healing. *Br J Nurs* 24(Sup20): S52–8
- Ministry of Health Vietnam (2023) Medical Examination and Treatment Administration. Decision No. 1530/QĐ-BYT dated March 24, 2023 on the issuance of the professional document “Guidelines for diagnosis and treatment of diabetic foot ulcers”. Available at: <https://kcb.vn/tai-lieu/huong-dan-chan-doan-dieu-tri/quyet-dinh-so-1530-qd-byt-ngay-24-3-2023-ve-viec-ban-hanh-tai-lieu-chuyen-mon-huong-dan-chan-doan-dieu-tri-loet-ban-chan.html> (accessed 02.04.2024)
- Mnif F, Zargni A, El Arbi K et al (2022) IDF21-0555. Diabetes mellitus: The silent epidemic overrunning developing countries. *Diabetes Res Clin Pract* 186(Suppl 1): 109572
- Münter KC, Meaume S, Augustin M et al (2017) The reality of routine practice: a pooled data analysis on chronic wounds treated with TLC-NOSF wound dressings. *J Wound Care* 26(Suppl 2): S4–15
- Nair H, Venkateshwaran N, Seetharaman SS et al (2021) Benefits of sucrose octasulfate (TLC-NOSF) dressings in the treatment of chronic wounds: a systematic review. *J Wound Care* 30(Suppl 4): S42–52
- National Institute for Health and Care Excellence (2023) *Review of MTG42: UrgoStart for treating diabetic foot ulcers and leg ulcers*. London: NICE. Available at: <https://www.nice.org.uk/guidance/mtg42/evidence/review-decision-march-2023-pdf-11428155181> (accessed 02.04.2024)
- Oyewole OO, Ale AO, Ogunlana MO, Gurayah T (2023) Burden of disability in type 2 diabetes mellitus and the moderating effects of physical activity. *World J Clin Cases* 11(14): 3128
- Percival SL, Suleman L (2015) Slough and biofilm: removal of barriers to wound healing by desloughing. *J Wound Care* 24(11): 498–510
- Pradeepa R, Mohan V (2021) Epidemiology of type 2 diabetes in India. *Indian J Ophthalmol* 69(11): 2932
- Townsend E, Cheong JA, Razieta M et al (2024) What is slough? Defining the proteomic and microbial composition of wound slough and its implications for wound healing. *Wound Repair Regen* [online ahead of print]
- Trudigan J, Law P, Tarbox B (2014) Evaluation of UrgoClean® for the treatment of sloughy, exuding wounds. *Wounds UK* 10(1): 56–62
- Vowden K, Vowden P (2017) Wound dressings: principles and practice. *Surgery (Oxford)* 35(9): 489–94
- Wong NS, Tan AH, Chan KS et al (2023) A prospective study on the efficacy of sequential treatment of technology lipido-colloid impregnated with silver and technology lipido-colloid nano-oligosaccharide factor in the management of venous leg ulcers. *Health Sci Rep* 6(8): e1488