A case series: Application of 100% activated carbon cloth dressings in patients with chronic wounds with systemic comorbidities

Chronic wounds in patients with systemic comorbidities are notoriously difficult to manage, due to impaired vascularisation, immune dysfunction and delayed repair. This case series evaluates the use of 100% activated carbon cloth (ACC) dressings in two patients with chronic non-healing wounds.

This retrospective case series involved two patients with chronic lower-limb wounds (more than 6 years' duration) treated at the Wound Care Clinic, Hospital Teluk Intan, Malaysia. Wounds were assessed using the Tissue, Infection, Moisture, Edge (TIME) framework, with serial measurements calculated as length × width (cm²) and supported by photographic documentation. ACC dressings were applied twice weekly, with daily secondary dressings.
Both cases showed clear wound size reduction with no infection and preserved periwound integrity. Case 1 reduced from 15.75 cm² to 6.0 cm² over 151 days (61.9% reduction), while Case 2 reduced from 49.3 cm² to 25.6 cm² over 98 days (48.0% reduction). Healing was faster in Case 2, likely due to a healthier wound bed at baseline. These outcomes reflect ACC's role in improving the wound environment by adsorbing bacteria and proteases, helping to maintain moisture balance and supporting granulation. The results suggest that wound bed quality may be as important as wound size in predicting response to therapy.

ACC dressings promoted wound reduction and preserved periwound integrity in long-standing, comorbidity-associated wounds. These findings support their role as an adjunctive therapy and emphasise the need for larger controlled studies to confirm their clinical value.

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Key words
- Activated carbon cloth
- Chronic leg wounds
- Advanced wound dressing
- Matrix metalloproteinases
- Wound bed preparation

Chronic wounds are a major clinical challenge, particularly in patients with systemic comorbidities such as diabetes, hypertension, ischaemic heart disease and chronic kidney disease. These conditions impair immune responses, compromise vascular supply and delay cellular repair, contributing to prolonged healing trajectories and an increased risk of infection. Beyond the physical burden, chronic wounds significantly diminish quality of life and incur substantial healthcare costs (Han et al, 2017; Carney et al, 2020).

Conventional wound management often proves insufficient in these complex cases, highlighting the need for adjunctive strategies that can optimise the wound microenvironment. Advanced dressings are increasingly employed to regulate moisture, reduce microbial burden and modulate biochemical imbalances associated with impaired healing (Wounds International, 2011; Han et al, 2017; Carney et al, 2020). Among these, activated carbon cloth (ACC) dressings have emerged as a promising option. Their high adsorption capacity enables sequestration of bacteria, toxins and proteolytic enzymes, thereby supporting a more favourable environment for granulation and tissue repair (Murphy, 2016; Scheer et al, 2017; Bajuri and Nordin, 2024).

This case series reports the application of a commercially available 100% activated carbon cloth dressing (Zorflex, Chemviron) in two patients with chronic non-healing lower limb wounds complicated by multiple comorbidities. The aim was to illustrate clinical outcomes achieved with ACC in an outpatient wound care setting.

Methods

This is a retrospective, descriptive case series

Figure 1. Case 1 clinical images at baseline (A), day 81 (B) and day 151 (C). Percentage area reduction at final visit: 61.9%.

conducted in an outpatient setting at Wound Care Clinic, Hospital Teluk Intan involving two patients with chronic non-healing wounds and comorbidities. Wound were managed using the TIME (Tissue, Infection, Moisture, Edge) framework. Wound dimensions (length × width, cm^2) were recorded at each visit, supported by photographic documentation.

Following assessment, the wound was cleansed using a surfactant-based antimicrobial solution. A 100% ACC dressing (Zorflex) was applied directly in contact with the wound bed as the primary dressing. The ACC dressing was then covered with a layer of roller gauze and sealed in place. A secondary absorbent dressing was applied over the roller gauze and secured using a crepe bandage.

The ACC dressing was replaced twice weekly during clinic visits. The secondary absorbent dressing was changed daily by the patient to manage exudate. During daily secondary dressing changes, the roller gauze and ACC layer were left undisturbed unless clinically indicated, in order to preserve a stable and moist wound environment.

All wound care was delivered as part of routine outpatient management, with patients followed over time and wound healing assessed using serial measurements and clinical observation.

Case studies

Case 1

Mr AA, a 67-year-old man with type 2 diabetes mellitus, hypertension and chronic kidney disease (not on renal replacement therapy), presented with a chronic non-healing wound of 6 years' duration on the right lateral leg following surgical debridement for necrotising fasciitis.

On initial assessment at our wound care clinic, two irregular wounds were identified on the right lateral leg. The largest measured 3.5 × 4.5 cm (15.75 cm^2) and demonstrated approximately 30% healthy granulation tissue with 70% pale granulation tissue. The wound bed was moist with an intact, healthy periwound. There were no clinical signs of infection.

Following application of ACC dressings, progressive wound area reduction was achieved. At day 81, the wound measured 3.0 × 3.0 cm (9.0 cm^2), a 42.9% reduction from baseline. By day 151, the wound size had further reduced to 6.0 cm^2, a 61.9% reduction, with a mean healing rate of 0.065 cm^2/day (0.45 cm^2/week). The periwound remained healthy throughout follow-up. **Figure 1** shows the wound progression throughout this study.

A. Day 1: 3.5 cm x 4.5 cm; area 15.75 cm^2

B. Day 81: 3 cm x 3 cm; area 9 cm^2

C. Day 151: 3 cm x 2 cm; area 6cm^2

Figure 1

Case 2

Madam NH, a 61-year-old Malay woman with type 2 diabetes, hypertension and ischaemic heart disease, presented with a chronic non-healing wound of 6 years' duration on the left leg. The wound originated following surgical debridement for a left leg abscess in 2019.

At presentation, prior to initiation of ACC dressing, examination revealed a wound on the lateral aspect of the left leg measuring 49.3 cm^2. The wound bed consisted of approximately 90% healthy granulation tissue and 10% pale granulation tissue. The periwound was intact and there were no clinical signs of infection.

With ACC therapy, progressive wound

reduction was observed. At day 35, the wound area had decreased to 40.56 cm², a 17.7% reduction. By day 98, the wound further contracted to 25.60 cm², a 48.0% reduction, with a mean healing rate of 0.242 cm²/day (1.69 cm²/week). Figure 2 shows the wound progression.

Results

Two patients with chronic lower-limb wounds (>6 years) received 100% ACC dressings in an outpatient setting. Table 1 summarises the baseline patient characteristics and healing outcomes. Wound trajectories are shown in Figure 3.

Case 1 demonstrated a 61.9% reduction in wound area over 151 days, corresponding to a mean healing rate of 0.065 cm²/day. In contrast, Case 2 showed a 48.0% reduction over a shorter follow-up period of 98 days, with a substantially faster healing rate of 0.242 cm²/day. Despite the larger baseline wound size in Case 2, the rate of healing was notably higher, suggesting that baseline wound bed quality may play a more significant role in healing trajectory than wound size alone.

Discussion

In this case series, both patients with long-standing chronic wounds of more than 6 years' duration demonstrated substantial wound size reduction following the application of 100% ACC dressings. Despite a larger baseline wound size, the faster healing trajectory observed in Case 2 may reflect a healthier wound bed at presentation, with approximately 90% granulation tissue providing a more favourable environment for wound healing, whereas Case 1 demonstrated predominantly pale granulation. The presence of predominantly pale granulation tissue in Case 1 was considered likely multifactorial, potentially reflecting impaired microvascular perfusion related to underlying diabetes and chronic kidney disease, although formal vascular or nutritional assessments were not performed. These observations suggest that baseline wound bed quality, rather than wound size alone, plays a critical role in influencing healing outcomes, supporting the potential value of ACC dressings as an adjunctive therapy in complex chronic wounds.

The observed healing progression can be attributed to the physicochemical properties of ACC dressing. Its high adsorption capacity, mediated through Van der Waals forces, enables effective binding of bacteria, endotoxins, proteases and inflammatory mediators within wound exudate (Lazarus et al, 1994; Carney et al, 2020). Chronic wounds are

A. Day 1: 5.8 cm × 8.5 cm; area 49.3 cm²

B. Day 35: 5.2cm × 7.8 cm; area 40.56 cm²

C. Day 98: 4.0 cm × 6.4 cm; area 25.6 cm²

Figure 2

Figure 2. Case 2 clinical images at baseline (A), day 35 (B) and day 98 (C). Percentage area reduction at final visit: 48.0%.

Table 1. Baseline characteristics and wound healing outcomes of two patients with chronic lower-limb wounds treated with activated carbon cloth dressings in an outpatient setting

Characteristics	Case 1	Case 2
Age (years)	67	61
Sex	Man	Woman
Aetiology and site	Post-necrotising fasciitis, right lateral leg	Post-abscess debridement, left lateral leg
Chronicity	>6 years	>6 years
Wound size at baseline (cm^2)	15.75	49.30
Wound bed	Predominantly pale granulation	≈90% healthy granulation
Periwound	Intact	Intact
Clinical infection at baseline	None	None
Duration of follow-up (days)	151	98
Total area of reduction (%)	61.9	48.0
Mean healing rate (cm^2/day)	0.065	0.242

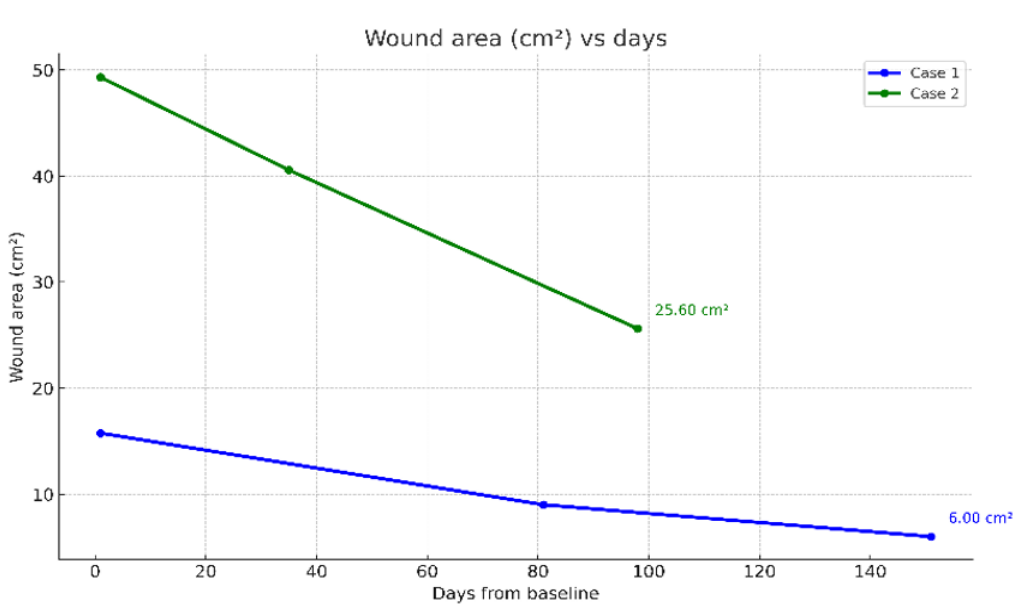

Figure 3

Figure 3. Wound surface area (cm^2) over time for Case 1 and Case 2 following application of activated carbon cloth dressings. Wound area was calculated using length × width measurements obtained at each clinic visit.

frequently stalled in the inflammatory phase due to elevated matrix metalloproteinases (MMPs) and neutrophil elastase, which degrade extracellular matrix components and growth factors essential for repair. It is estimated that up to two-thirds of non-healing wounds exhibit protease activity above the threshold associated with poor healing outcomes (Wounds International, 2011). By adsorbing these proteases, ACC may reduce proteolytic burden, allowing restoration of the balance between tissue degradation and regeneration, thereby promoting repair.

In vitro studies support these mechanisms, showing that ACC can significantly reduce MMP and elastase activity within 24 hours (Carney et al, 2020). Both cases in these case series reflect with these findings, as both patients demonstrated progressive granulation tissue formation and wound contraction without evidence of local infection. Furthermore, the porous structure of ACC facilitated effective exudate management. Maintaining a moist wound environment is critical for cell migration

and angiogenesis, but excessive moisture predisposes to periwound maceration. In our cases, wounds remained moist while the periwound areas stayed intact, underscoring the ability of ACC to balance moisture while protecting surrounding skin.

These findings are particularly important in patients with systemic comorbidities such as diabetes, hypertension, ischaemic heart disease and chronic kidney disease, which are known to impair vascularisation, immune function and inflammatory resolution (Han et al, 2017). Despite these adverse factors, both cases achieved substantial wound size reduction with ACC therapy, supporting its potential as an effective adjunct in the management of complex, hard-to-heal wounds (Murphy, 2016; Scheer et al, 2017; Bajuri and Nordin, 2024)

A limitation of this case series is the absence of direct assessment of biochemical markers of wound chronicity, including matrix metalloproteinase or protease activity. Therefore, the mechanistic effects of activated carbon cloth dressings on proteolytic burden in this cohort are interpreted in the context of existing in vitro evidence and previously published clinical studies.

Conclusion

The use of ACC dressings was associated with substantial wound area reduction and preservation of periwound integrity in chronic wounds complicated by multiple comorbidities. These findings suggest that ACC dressings may represent a useful adjunctive approach for optimising the wound microenvironment in complex, hard-to-heal wounds. Nevertheless, larger prospective studies are required to confirm these findings and further establish their clinical effectiveness.

Ethical statement

Written informed consent was obtained from the patients for both treatment and publication of anonymised clinical data and images.

Conflict of interest

The authors declare no conflict of interest related to the material or methods used in this case series.

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