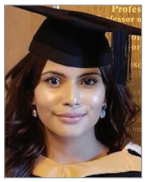
The use of an organic wound ointment as a topical therapeutic to aid wound healing in chronic wounds



The incidence of chronic wounds among patients with diabetes continues to pose a burden to healthcare systems worldwide (Game, 2016). Conservative management in wound care has been shown to improve the severity of amputations related to diabetic wounds (Xie et al, 2018). This evaluation looked at the impact of a newly formulated organic ointment on the healing process in chronic diabetes-related wounds. The ointment was used as a therapeutic wound dressing in five patients with diabetes-related chronic wounds.

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Wound healing requires the complex integration of cellular responses to inflammatory mediators such as cytokines and growth factors (Velnar et al, 2009). This process is composed of a carefully curated balance between immunological and biological responses that can be divided into the following stages: an inflammatory reaction, cell proliferation and synthesis of extracellular matrix elements and cell remodeling (Bonnans et al, 2014). In a healing wound, these stages are not mutually exclusive but instead can overlap considerably. Although inflammation is a key aspect of normal wound healing, this process occurs abnormally in a patient with diabetes, where a decrease in the secretion of cytokines and growth factors, as well as a prolonged inflammatory phase, is observed (Falanga, 2005). Over the past decade, the number of patients diagnosed with diabetes continues to increase at an alarming rate worldwide (Järbrink et al, 2017). One of the most common complications associated with chronic diabetes are diabetic foot ulcers (DFUs) and venous leg ulcers (VLUs), which impact negatively on patients' quality of life and may result in lower limb amputations (Zhang et al, 2017). Diabetes-associated lower extremity complications are emerging as a significant health concern that should be addressed by both developing and developed countries alike (Schaper, 2004). Conservative management in wound care has been shown to dramatically reduce the risk of amputations through simple procedures, such as ensuring the cleanliness of the wound, the use of appropriate wound dressings, debridement procedures, and ulcer management, hence showing that diabetic foot is a preventable problem if handled well from the start (Ahmed, 2019). Wound dressings form an integral aspect of wound care, its main function is to act as a protective barrier, prevent bacterial contamination and absorb excess exudate (Junker et al, 2013). The primary aim of this evaluation is to assess the use of an organically derived wound ointment as a topical therapeutic, in order to accelerate the healing process of chronic wounds, such as DFUs, VLUs and pressure ulcers (PUs) experienced by patients.

Different wound types

A DFU is an open sore or wound which commonly occurs at the bottom of the foot. Statistically, DFUs are one of the most common complications associated in patients with diabetes and have an annual prevalence of 6.3% globally (Suthar et al, 2017). Over 50% of these foot ulcers go on to become infected, with 20% of them resulting in amputation (Ahmed, 2019). In Malaysia, 3.5 million adults were diagnosed with diabetes in the year 2017 alone, with 80% of diabetes-related amputations being preceded by a DFU (International Diabetes Federation, 2018). Patients with DFUs often develop complications due to the inability to tolerate stress well (Armstrong, 2017). Often, associated factors such as diabetic neuropathy, peripheral arterial disease, ischemia and continuous trauma to the foot increase the risk by precipitating a break in the skin surface (Aksenov, 2004). These

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factors combined with increased susceptibility to infections are classical characteristics of a chronic wound.

VLUs are also prevalent among this patient cohort. VLUs are caused by hypertension built up within the veins of the calf that often results in deep venous thrombosis and the destruction of the venous valve (McLaine and Moore, 2015). Such damage to the valve results in high venous pressures, which are in turn transmitted back to capillaries or skin surface veins, where leakage and increased permeability lead to the accumulation of hemosiderin on the skin predisposing the skin to the formation of an ulcer (Marston et al, 2016). While it is unknown what specific condition results or triggers this phenomenon, the wound is often associated with a history of trauma or injury that results in skin damage. In patients with diabetes, due to the impaired healing process, these wounds often progress for the worse (Saaristo et al, 2006).

Another type of chronic wound is known as PU. These are often found to occur in immobilized patients and are primarily observed in elderly patients (Moore and Cowman, 2008). It is defined as a localized area of tissue necrosis that occurs as a result of compression between soft tissue and bone structures against an external surface for a prolonged period of time. Anatomically these ulcers frequently develop at sites such as the gluteal region at the tailbone, scapula region between the shoulders, along the spinal region, as well as along the ankles or behind the knee (Lewis, 2014). While many factors contribute to the development of a PU, the final common pathway always involves the occurrence of ischemia. Often the treatment of these ulcers aims to reverse the factors which initially contributed to its occurrence (Qing, 2017).

Moist wound healing

Diligent wound care contributes to an essential part of chronic wound treatments. Wound dressings form an integral part of this treatment as they act as occlusive barriers that provide a moist environment for wound healing to occur. Previous research has shown this technique to contribute to rapid re-epithelialization of the wound (Butcher, 2013). The successful treatment of a wound relies on the precise control of the wound environment (Zhang et al, 2017). Providing wounds with a moist environment during the healing process has been shown to promote better re-epithelialization and, in turn, results in faster healing with reduced scar formation compared to dry treatments of wounds. This is explained as moist wound healing which aids in reducing inflammation within the wound, hence limiting injury progression (Junker et al, 2013). In addition to this, a moist environment also prevents dehydration, thereby enhancing the angiogenesis process, while also increasing collagen synthesis and increased breakdown of dead tissue (Butcher, 2013). Dressings function to provide a protective barrier which aids to prevent infections as well as absorb wound exudate (Baranoski et al, 2012). Although wounds may be divided into subcategories such as VLUs, DFUs, and PUs to name a few, the fundamental principle of caring for these wounds remains unchanged (Dhivya et al, 2015). The primary aim of this evaluation is to assess the use of an organically derived wound ointment as a topical therapeutic to accelerate the healing process of chronic wounds, such as DFUs, VLUs and PUs experienced by patients.

Methods

A consecutive, observational case series design was selected. Because this evaluation involved the use of a particular therapeutic intervention on participants with a similar diagnosis, a control group was not required. Eligible subjects were recruited from a clinical setting population to achieve the small sample size required. Both quantitative and qualitative methods were used in this evaluation in order to increase the accuracy of the data analysis and minimize any bias.

A standard wound care routine that consisted of a wound cleanse and debridement was performed, as required, before the wounds were treated with the organic wound dressing. Dressing changes were carried out between once to twice a week at the clinic, subject to the clinician's judgment. A follow-up routine was then done weekly at the Wound Care Unit in Hospital Kuala Lumpur during the entire span of the evaluation. At the baseline evaluation, all previous or existing medical conditions were reviewed. These included measurements of wound dimensions, location, and signs of infection. During the duration of the evaluation, all participants were advised to refrain from the use of any other type of wound dressings. During each dressing change, the wound was cleansed using saline solution and sterile gauzes. The organic wound ointment was then applied to the wound, using a sterile medium and then covered with a bandage.

Table 1. A pair wise comparison of wound surface area pre-treatment and post treatment	
Variable	**Wound area**
Pre-treatment Mean + SD	90.10 + 65.64 cm^2
Post-treatment Mean + SD	6.26 + 10.32 cm^2
Mean of score difference (95% CI)	79.78
t-statistic (df)	-3.21 (95*)
p-value	<0.016

Table 1. Summary of the patient demographic				
Case	**Age**	**Sex**	**Wound aetiology**	**% Change wound size**
1	52	F	DFU	100.00
2	47	M	DFU	95.47
3	38	F	DFU	85.00
4	48	M	PU	100.00
5	56	M	VLU	95.83

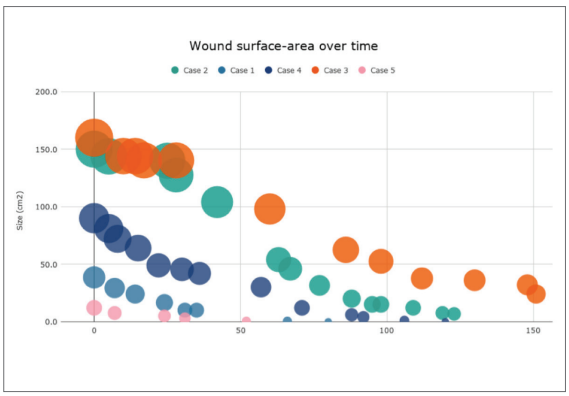

Figure 1. Graph depicting change in size of wound surface area over time. The gradient can be calculated to show the rate at which the wound's size changes.

Assessment tools

Wound dimensions were measured, the length and width of the wound were recorded for each patient during every dressing change. At the end of the evaluation, the wound dimensions recorded were used to calculate the average value which was then used for further data analysis *Table 1*.

Results

Five patients were recruited for this evaluation from the Wound Care Unit, Hospital Kuala Lumpur. A summary of the patient demographic is found in *Table 2*. The participants' mean ages were 48.2 and the patients consisted of three male participants and two female participants. The wounds were divided into three subtypes of chronic wounds namely: DFU n=3, VLU n=1, and PU n=1.

Discussion

Clinical and experimental data have shown diabetic ulcers and other types of chronic wounds to deviate from a normal healing path whereby different areas of the ulcer are found to be in different phases of healing, losing the synchronized pathway of events which allow for normal rapid wound healing to occur (Falanga, 2005). In DFUs, healing impairment is thought to be influenced by intrinsic and extrinsic factors such as the uneven distribution of weight load, peripheral neuropathy, ischemia and altered inflammatory responses (Alexiadou, 2012). Often, these wounds are treated as minor wounds by the patients and may be left untreated. In other cases, due to the loss of sensation and numbness patients might be unaware of the ulcerated wound and hence minimal or no care is given, resulting in bacterial infection, continuous trauma and poor management, which in turn causes the formation of a chronic wound (Waldecker, 2016).

This consecutive case series looked at the use of an organic wound ointment as a therapeutic dressing to accelerate the healing process within chronic wounds. Based on the surface area measurement of the wounds, the results obtained display a significant reduction of wound size over time as observed from the graph in *Figure 1* and images from *Figures 2 to 6*. Regardless of wound type, a significant reduction in wound size was observed across all patients and this was proven to be statistically significant as a paired sample T-test revealed a *p*-value of (p <0.002). Initial changes in wound physiology showed a reduced appearance in necrotic tissue and an increase in healthy tissue granulation. In addition to this, no reoccurrence of infection was recorded across all patients, indicating that the organic wound dressing may aid to control and prevent further infection to the wounded site.

Conclusion

The use of this newly formulated organic ointment provides the wound with a moist environment needed for conducive healing. As observed in the results, the chronic wounds experienced by the patients who previously remained non-healing began to show improvements upon starting treatment, as healthy tissue granulation and a decrease in inflammation was observed. This may also further be attributed to the ingredients of this ointment, which consist of elements that aid in providing an occlusive barrier to the wound, as well as anti-inflammatory ingredients. The organic wound ointment used appears to have successfully aided the healing process of these patients' chronic wounds which previously remained non-healing. WAS

References

Ahmed J (2019) The Diabetic Foot. *Diabetes & Metabolic Syndrome: Clinical Research & Reviews* 10(1): 48–60

Alexiadou K, Doupis J (2012) Management of diabetic Foot Ulcers. *Diabetes Ther* 3(1): 4

Armstrong D, Boulton A, Bus S (2017) Diabetic foot ulcers and their recurrence. *N Engl J Med* 376(24): 2367–75

Aksenov IV Boulton A (2004) Neuropathic Diabetic Foot Ulcers. *N Engl J Med* 351(16): 1694–5

Baranoski S, Ayello EA (2012) Wound dressing: an evolving art and science. *Adv Skin Wound Care* 25(2): 87–92

Bonnans C, Chou J, Werb Z (2014) Remodelling the extracellular matrix in development and disease. *Nat Rev Mol Cell Biol*15(12): 786–801

Butcher M (2013) Moist wound healing, exudate and management of the wound bed. *J Wound Care* 19(Sup1): 10–13

Dhivya S, Padma V, Santhini E (2015) Wound dressings – a review. *Biomedicine (Taipei)* 5(4): 22

Falanga V (2005) Wound healing and its impairment in the diabetic foot. *Lancet* 366(9498): 1736–43

Game F (2015) *Classification of Diabetic Foot Ulcers.*

Patient 1

A 52-year old female patient presented with a DFU on her left toe post-Ray's amputation which had been performed a year earlier in 2018. Upon presentation at the clinic, the wound size was 7 cm x 5.5 cm with the underlying bone and tendons exposed, and swelling observed *[Figure 2a]*. The patient attended wound dressing changes twice a week. After 8 weeks of treatment, there was 100% re-epithelialization, the wound was completely healed, and wound closure was recorded *[Figure 2b]*.

Figure 2. The image above depicts the wound before (a) and after (b) treatment. 8 weeks post treatment complete wound closure occurred.

Patient 2

A 47-year old male presented with a DFU on the plantar and lateral aspect of the foot. Prior to treatment with wound dressing wound debridement was performed. Wound dressing changes were performed twice a week. Prior to starting the treatment, the wound measured 15 cm x 10 cm *[Figure 3a]*. After 16 weeks of treatment, the wound measured 4.5 cm x 1.5 cm, with more than 95% of the tissue re-epithelialized. The surrounding skin exhibited a healthy colour *[Figure 3b]*.

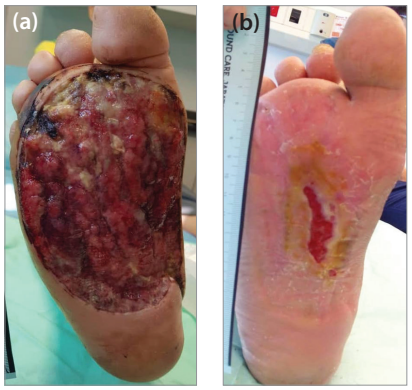

Figure 3. The wound covered a large surface of the plantar aspect of the foot with necrotic tissue observed (a). After 16 weeks of treatment, the surface area of the wound significantly reduced with a majority of the surface area completely re-epithelialized (b).

Patient 3

A 38-year old female patient presented with a DFU on the plantar aspect of the foot. The patient underwent three wound debridement sessions, the last just before treatment with the wound dressing. The wound size was large and had to be divided and measured 10 cm x 10 cm on the plantar aspect and 6 cm x 5 cm on the lateral aspect of the foot *[Figure 4a]*. The surrounding skin was necrotic and decolourized. By the fourth week of treatment, the wound had joined up to form a single wound with healthy tissue granulation and epithelialization. On the 21st week of the treatment, 85% of the wound had fully healed with the remaining 25% measuring 8 cm x 3 cm. The surrounding skin was no longer necrotic, and the skin revealed a healthy colour *[Figure 4b]*.

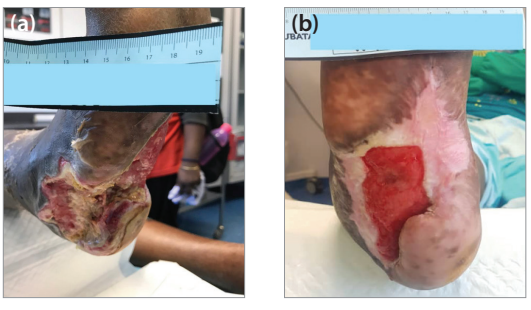

Figure 4. A DFU observed to be infected and exposed the underlying bone and tendons (a). After 21 weeks of treatment, a 85% surface area of the wound fully healed with complete re-epithelialization. The remaining area of the wound was observed to be covered with healthy tissue granulation (b).

Patient 4

The patient is a 48-year old male who developed a PU on the gluteal region six months earlier as a result of 28-day paralysis as a result of obstructive sleep apnea. Prior to treatment, the wound was necrotic and measured at 10 cm x 9 cm. A wound debridement was performed. After 12 weeks of treatment, the wound was completely healed with a 100% re-epithelialization. The surrounding skin which had been dark and necrotic was also fully healed and regained a healthy state *[Figure 5a and b]*.

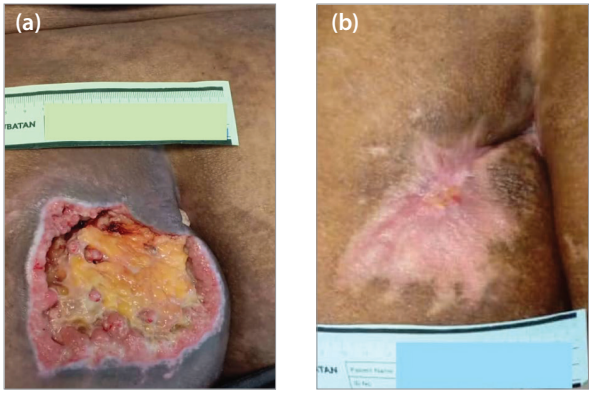

Figure 5. A PU developed at the gluteal region, exposing a layer of fat tissue, and discolouration of surrounding skin (a). 12 weeks after treatment, complete wound closure was achieved (b).

Patient 5

A 56-year old male, who is a stroke patient developed a venous ulcer on his shin. The wound had been present for a year and had been treated with standard wound care and self-daily dressings. Prior to the start of treatment, the wound measured 4 cm x 3 cm. After 16 weeks of treatments, the wound measured 1 cm x 0.5 cm. The size and depth of the wound can be seen to significantly decrease. The swelling and redness surrounding the wound prior to treatment were also decreased *[Figure 6a and b]*.

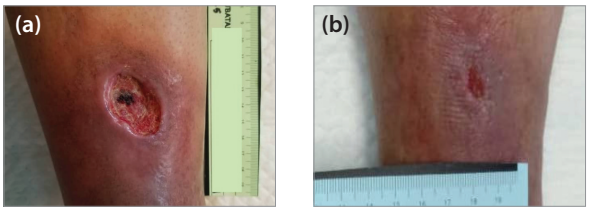

Figure 6. VLU located on the shin of the leg. A comparison of images before (a) and after (b) treatment clearly demonstrates a significant reduction in wound size and also the depth of the wound.

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Järbrink K, Ni G, Sönnergren H et al (2017) The humanistic and economic burden of chronic wounds: a protocol for a systematic review. *Syst Rev* 6(1):15

Junker J, Kamel R, Caterson E, Eriksson E (2013) Clinical Impact Upon Wound Healing and Inflammation in Moist, Wet, and Dry Environments. *Adv Wound Care (New Rochelle)* 2(7): 348–56

Lewis R (2014) Reducing harm from pressure ulcers. *Nurs Stand* 29(12): 74–4

Marston W, Tang J, Kirsner R, Ennis W (2016) Wound healing society 2015 update on guidelines for venous ulcers. *Wound Repair Regen* 24(1): 136–44

McLain N, Moore Z (2015) Wound cleansing for treating venous leg ulcers. *Cochrane Database Syst Rev* 2015(4): CD011675

Moore Z, Cowman S (2008) A systematic review of wound cleansing for pressure ulcers. *J Clin Nurs* 17(15): 1963–72

Qing C (2017) The molecular biology in wound healing & non-healing wound. *Chin J Traumatol* 20(4): 189–93

Saaristo A, Tammela T, Färkkilä A net al (2006) Vascular Endothelial Growth Factor-C Accelerates Diabetic Wound Healing. *Am J Pathol* 169(3): 1080–87

Schaper N (2004) Diabetic foot ulcer classification system for research purposes: a progress report on criteria for including patients in research studies. *Diabetes Metab Res Rev* 20(S1): S90–S95

Suthar M, Gupta S, Bukhari S, Ponemone V (2017) Treatment of chronic non-healing ulcers using autologous platelet rich plasma: a case series. *J Biomed Sci* 24(1): 16

Velnar T, Bailey T, Smrkolj V (2009) The Wound Healing Process: An Overview of the Cellular and Molecular Mechanisms. *J Int Med Res* 37(5): 1528–42

Vowden K, Vowden P (2014) Wound dressings: principles and practice. *Surgery (Oxford)* 32(9): 462–67

Waldecker U (2016) Factors predicting a foot ulcer in the diabetic neuropathic foot. J Foot Ankle Surg 22(2): 102

Xie T, Ye J, Rerkasem K, Mani R (2018) The venous ulcer continues to be a clinical challenge: an update. *Burns Trauma* 6(1):18

Yarwood-Ross L (2013) Theory of Moist Wound Healing. *Independent Nurse* Feb (2)

Zhang P, Lu J, Jing Y et al (2016) Global epidemiology of diabetic foot ulceration: a systematic review and meta-analysis. *Ann Med* 49(2): 106–16