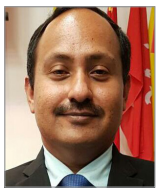
Wondaleaf Adhesive Pouch (WLAP) and Wondaleaf Flat Dressing in the treatment of wounds in patients with diabetes: a single-centre study



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Abstract: Diabetic wounds pose a significant social and economic burden to healthcare systems globally. Film dressings have been known to aid the healing of diabetic foot ulcers by creating a clean, moist wound environment. This study aims to investigate the efficacy of Wondaleaf Adehesive Pouch (WLAP) and Wondaleaf Flat Dressing in wounds in patients with diabetes. This study recruited patients with diabetic wounds from the Wound Care Unit, Kuala Lumpur General Hospital. Wondaleaf Flat Dressing and WLAP were used in the management of the diabetic wounds. We recruited 30 patients and, in all but one case, the diabetic wounds showed either improvement or total healing. This study suggests that WLAP and Wondaleaf Flat Dressing were effective in wound healing in patients with diabetes, as it served as a barrier to help prevent contamination. However, as this is a small-scale, single-centre study, further studies are required to support these findings.

Key words:

- *Diabetic foot ulcer*
- *Dressings*
- *Wound healing*
- *Wondaleaf Flat Dressing*
- *Wondaleaf Adehesive Pouch*

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Polymer films are thin, self-adhesive, transparent sheets of polyurethane or other synthetic semipermeable material (Wound Source, 2022). Transparent film dressings are of varying thicknesses and are coated on one side with an adhesive. This enables permeability, allowing for the exchange of oxygen, carbon dioxide and water vapour, but ensures impermeability to larger molecules due to pore size (Xie et al, 2022). Therefore, bacteria, proteins and exudate are barred from moving across the dressing. Its permeability to water vapour allows for the release of inert water and sweat from the skin, hence providing the benefit of preventing maceration of the wound and periwound. Its transparency also allows for better visualisation of the wound. It is also proven to enhance re-epithelialisation of graft donor sites, with a stated increase in healing rates of 25–45% (Ezzelarab et al, 2019).

Wondaleaf has a unique property of 360-degree coverage of an appendage or site adhesive barrier dressing (Wondaleaf, 2022a). It is made of breathable polyurethane film, making it strong, inert, ultra-thin, and waterproof, hence it is very comfortable for the patient at the site of the wound. Wondaleaf Adhesive Pouch (WLAP) has a number of beneficial properties, including being waterproof, acting as a barrier against contamination and infection, as well as being cost-effective (Nair et al, 2022).

The Wondaleaf Flat Dressing is a film dressing that provides compression for superficial or closed wounds and can also be used in wounds with mild-to-moderate exudate and is able to secure all kinds secondary dressing (Nair et al, 2022). The surface has a matte texture, making the dressing almost invisible once applied, which improves the overall cosmetic appearance.

WLAP allows for contour dressing (e.g. on sites such as joints, limbs, penis, or nipple), and as it does note excert pressure on the wound surface. The pouch also acts as a holder for exudate, a reservoir for topical medications, or potentially a space for biological wound debridement using maggots, as the pouch is completely permeable to oxygen (Wondaleaf, 2022b).

WLAP can also be connected to a suction, with or without a filter/sponge for negative pressure wound therapy (Wondaleaf, 2022b). Additionally, it can be used as an umbilical pouch, faecal retention unit (for the prevention of faecal contamination at perineal surgery) or as a colostomy bag.

OBJECTIVE

This study investigates the effectiveness of Wondaleaf Adhesive Pouch (WLAP) and Wondaleaf Flat Dressing at the Wound Care Unit, Hospital Kuala Lumpur, Malaysia. We aim to assess healing rate, percentage wound area reduction and complete healing as end points.

Methods

We report a case series of patients with diabetes and a variety of wounds over the lower limb, selected by convenience sampling. The inclusion criteria was patients with diabetes and a wound on the lower limb, especially below knee.

Wondaleaf dressings were applied on the wound, together with other advanced wound care products such as topical gel, cream, solution and use in conjunction with a secondary dressing, such as gauze or foam. Patients with diabetic wounds who presented to Wound Care Unit, Kuala Lumpur General Hospital were recruited for this study by

Table 1. Patient characteristics and wound location

Case number	Age (years)	Gender	Wound location
1	73	F	Right toe
2	64	M	Left foot
3	89	M	Left foot
4	75	M	Left knee (bka)
5	61	F	Left foot
6	66	M	Right foot
7	69	F	Right foot
8	69	F	Left foot
9	67	M	Right foot
10	63	M	Left foot
11	42	F	Right foot
12	51	M	Right toe
13	82	M	Left foot
14	54	F	Right foot
15	33	M	Left foot
16	71	M	Left foot
17	56	M	Right foot
18	50	M	Right foot
19	52	M	Left foot
20	82	M	Left foot
21	40	F	Left foot
22	58	M	Left foot
23	63	M	Left foot
24	70	M	Left foot
25	71	M	Left foot
26	61	F	Right bka site
27	72	F	Left bka site
28	68	F	Left foot
29	43	M	Right foot
30	67	F	Right foot

Table 2. Wound size pre- and post-treatment, duration of therapy and percentage wound area reduction						
Case number	**Pre treatment wound size (cm)**	**Post treatment wound size (cm)**	**Wound therapy start date**	**Wound therapy end date**	**Duration of wound therapy, wound healing (weeks)**	**Wound size reduction (%)**
1	3x3	0x0	1/12/2020	15/12/2020	2	100
2	5x1.3	0x0	27/11/2020	31/12/2020	4	100
3	3x3	0x0	3/2/2021	5/4/2021	8	100
4	3.2x2	0x0	18/2/2021	17/5/2021	12	100
5	4x3	3x3.5	10/3/2021	24/3/2021	2	12.5
6	2.3x3	1.5x2.5	4/3/2021	26/4/2021	6	45
7	3x4	0.5x2	23/3/2021	27/4/2021	4	91.7
8	2x2	0x0	5/3/2021	30/4/2021	7	100
9	3x2	1x0.3	4/3/2021	19/4/2021	6	95
10	5.5x3	3x2.5	11/3/2021	26/4/2021	6	54.5
11	12.5x6	7x2.5	11/3/2021	24/5/2021	10	76.7
12	2x2	0x0	19/3/2021	2/6/2021	10	100
13	4x2	1.5x0.5	26/4/2021	3/6/2021	6	90.6
14	7x3	0.5x0.3	17/2/2021	26/4/2021	10	99.3
15	4x5	6.5x5.5	23/3/2021	4/5/2021	6	-78.75
16	1.5x2	0x0	23/3/2021	25/5/2021	8	100
17	3x2	2.5x1	5/3/2021	28/5/2021	10	58.3
18	3x2.5x1	0x0	8/2/2021	23/4/2021	10	100
19	14x4x2.5	3x1	11/2/2021	19/3/2021	5	97.9
20	1x4.5	0x0	15/2/2021	17/3/2021	4	100
21	5x7	3.5x4	23/2/2021	11/5/2021	6	60
22	6x7.5	0x0	9/3/2021	17/5/2021	9	100
23	1.5x4	2x1	4/3/2021	28/6/2021	16	66.7
24	6x2.5	2.3x1	16/3/2021	27/4/2021	6	84.7
25	7.5x2.5	0x0	9/3/2021	18/5/2021	9	100
26	3x1	0x0	10/2/2021	25/3/2021	6	100
27	7x15	4x11	29/1/2021	23/3/2021	7	58
28	3x2	0x0	8/2/2021	15/4/2021	9	100
29	5x2.5x1	0x0	10/2/2021	24/3/2021	6	100
30	6x2	3.5x1	30/6/2021	18/8/2021	6	70.8

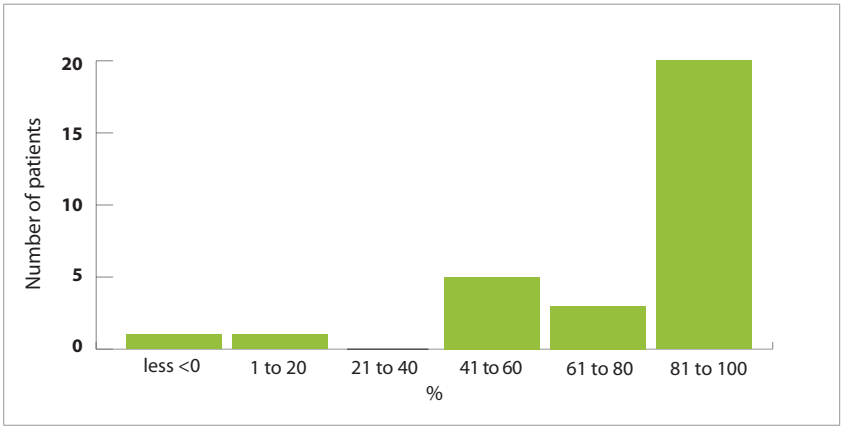


Figure 1. Number of patients and wound size changes (%)

convenience sampling. The wounds were cleaned with sterile water and debridement was carried out as per standard of care. Wondaleaf dressings were applied on the wound, together with advanced wound care products depending on the T.I.M.E. assessment of the wound (Nair et al 2017). Wondaleaf can be used for a patient who has an off-loading shoe, such as a total cast contact (TCC). The patients were treated for up to 16 weeks.

Results

We recruited 30 patients with diabetes and a lower limb wound. The age ranged from

Case 1. Diabetic foot ulcer

- A 73-year-old Chinese female, with underlying diabetic mellitus/hypertension
- She presented with fever (pyrexial), warm to touch at right foot, pain and tenderness, and noted to have redness and swollen over the right great toe. Diagnosed with a right diabetic foot ulcer
- Treatment: In this case, polymeric membrane dressing was applied after cleansing, with barrier cream applied at wound periphery, covered with foam and Wondaleaf flat dressing
- Complete re-epithelialisation seen *(Figure 1D)*.

1/12/2020 Wondaleaf applied	1/12/2020 3cm X 3cm	4/12/2020 2.8cm X cm	15/12/2020 Healed
			

Case 2. Diabetic foot ulcer after ray amputation

- A 64-year-old unemployed Indian gentleman, with underlying with diabetes mellitus/hypertension/dyslipidemia presented with left diabetic foot ulcer, and a ray amputation over the left 4th and 5th toes performed in September 2020
- Presented with fever (pyrexial), warmth over the left foot, pain and tenderness and noted to have ulcer over the lateral side of the left foot. Size at presentation: 5x1.3cm *(Figure 2B)*
- Treatment: In this case, collagen gel was applied after cleansing, with barrier cream applied around the wound, and covered with foam and Wondaleaf flat dressing
- Complete re-epithelialisation seen *(Figure 2D)*.

27/11/2020 Wondaleaf applied	27/11/2020 5cm x 1.3cm	10/12/2020 3.5cm x 0.5cm	31/12/2020 healed
			

30 years old to 89 years old, with a mean age of 65.7. Of the 30 patients assessed in the study, 11 were female and 19 were male. The study was conducted up to 16 weeks, but each patient had different healing duration.

The patients' characteristics and locations of wounds are shown in *Table 1*. Of those patients, 25 had wounds over the foot region, two patients had wounds over the great toe and two patients had wounds over the stump after a below-knee amputation. Out of 30 patients, 27 patients showed more than 50% wound reduction *(Figure 1)*. Approximately, 1/3 of patients had 100% healing during the study, while only 1 out of 30 patients had an increase in wound size.

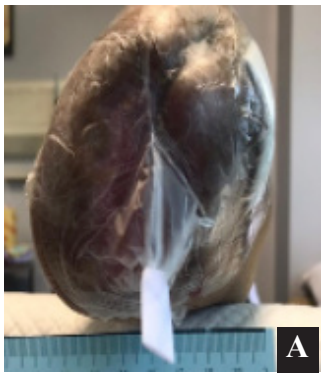
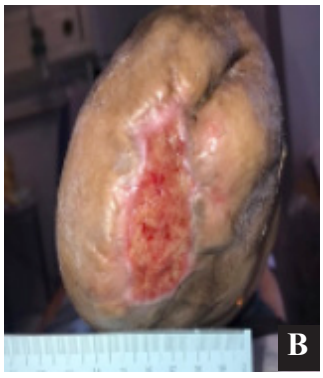
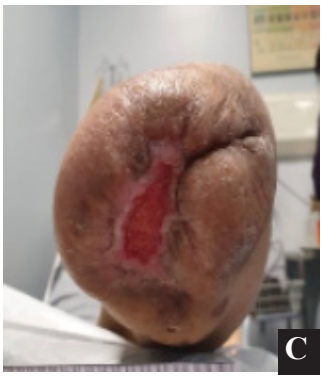
At the end of study, 27 out 30 patients showed more than 50% wound reduction from week 2 to week 16, with 10 patients showing 100% healing during the studies. Only one patient showed a 78.75% increase in wound size during the study, which we believe may have ben related to uncontrolled diabetes, resulting in poorer healing. *Cases 1–5* show selected patients from this study.

Discussion

This study demonstrated the Wondaleaf Flat Dressing and WLAP were effective in promoting diabetic wound healing. It provides a barrier to contamination, maintaining the

Case 3. Surgical site infection following a below-knee amputation

- A 75-year-old, unemployed Chinese man, with underlying diabetic mellitus/hypertension, ischaemic heart disease, and a below-knee amputation around early January 2021, followed by postoperative surgical site infection and wound breakdown
- Treatment: Hydrogel was applied as primary dressing after cleansing, then foam and WLAP were used as secondary dressing in this case
- Outcome: Complete re-epithelialisation seen *(Figure 3D)*.

8/2/2021 Wondaleaf applied	8/2/2021 3.2cm x 2cm	8/3/2021 2cm x 1.3cm	17/5/2021 Healed
			

Case 4. Right diabetic foot ulcer

- A 69-year-old, unemployed Malay female, with underlying diabetic mellitus and end-stage renal function
- She had a fever, warmth to touch and pain over the right foot, noted wound over the right heel region, diagnosed with right diabetic foot ulcer
- Treatment: Hydrogel was applied after cleansing, with barrier cream around the wound, then covered with foam and WLAP dressing in this case.
- Outcome: Wound size showed improvement *(Figure 4C)*.

23/3/2021 3cmx4cm	13/4/2021 1.5cmx3.5cm	27/4/2021 0.5cmx2cm
		

Case 5. Right plantar diabetic foot ulcer

- A 42-year-old unemployed Malay lady, with underlying diabetic mellitus, with right plantar diabetic foot ulcer present for 2 months. The patient had a history of right lower leg necrotising fasciitis and wet gangrene of right big toe
- Wound debridement was performed and ray's amputation over the right toe
- Treatment: In this case, Calcium alginate and Silver (Ag) were used as primary dressing, with barrier cream around the wound, then covered with foam and Wondaleaf flat dressing
- Outcome: Wound size became smaller *(Figure 5D)*.

11/3/2021 Wondaleaf applied	11/3/2021 12.5cm x 6cm	5/4/2021 11.5cm x 4.5cm	24/5/2021 7cm x 2.5cm
			

healthy wound condition to promote wound healing. One of the study participants showed an increase in wound size in view of his poor compliance of treatment and dressing; this participant defaulted his follow-up in view of COVID pandemic Movement Control Order.

This suggests that wound healing is affected by multiple variables, such as diabetes control, comorbidities, age, and nutritional status. Thus, a multidisciplinary approach involving endocrinologist, pharmacist, physiotherapy, dietitian and wound care team is also needed to promote diabetic wound healing.

However, this was a single-centre observational study with a small sample size. Thus, further studies are required to confirm these findings.

Conclusion

So far, no adverse effects were observed with the Wondaleaf dressings, except for one case in which the patient defaulted on his follow-up for dressing.

The findings of this study support the use of Wondaleaf Adhesive Pouch (WLAP) and Wondaleaf Flat Dressing on diabetic wounds, showing positive results in healing rates and reduction of wound size. WAS

Declaration of interest

Wondaleaf provided the products for this study. The work was undertaken independently by the authors

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