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Ihab Nabil Amin Hanna
National Institute of Diabetes, doctorihabhanna@gmail.com

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Vacuum-assisted closure therapy modality of treatment for ulcers in lymphedema patients

Ihab Nabil Amin Hanna
Department of Vascular Surgery, National Institute of Diabetes, Cairo, Egypt

Abstract

Background
Lymphedema in the presence of ulcers and lymphorrhea inducing cellulitis hinders the quality of life and mobility of the patients, and might continue inducing severe infection that might result in life-threatening infection, both bacterial and fungal. Since the negative-pressure wound therapy is a recognized modality of wound healings in such a context as lymphedema, it might induce a remarkable withdrawal and decrease in lymphorrhea and lymph fluid, resulting in a decrease of girth and heaviness of the limb, thus improving the quality of life. Also, it helps in promoting wound healing of the ulcers by improving the blood supply of the granulation tissues.

Patients and methods
Patients with lymphedema and lymphorrhea, cellulitis and edema, and ulcers were subjected to negative-pressure wound healing for 1 month after excluding anemic, uncontrolled diabetics, ischemic, or those with a venous disease (reflux or deep venous thrombosis).

Results
In this prospective study, 23 patients were recruited, where 22 patients continued the protocol for four weeks, 14 females and nine males. The mean age was 53 years. No adverse effects were observed as a result of this technique. One patient lost to follow-up and did not continue the protocol; all 22 patients were satisfied regarding the quality of life and social well-being. The negative-pressure wound healing therapy reduced the diameter of the treated limbs by the withdrawal of lymph and complete cessation of lymphorrhea, and thus decreasing the cellulitis induced by the lymphorrhea on the surrounding skin and also markedly reduced the diameters and hence the heaviness of the lower limbs.

Last but not least, all ulcers reduced in diameter and adequate clean granulation tissue developed in the vicinity of the ulcer. Moreover, 5 of 23 patients' ulcers were completely healed.

Conclusion
Vacuum-assisted closure therapy in the presence of lymphedema, ulcers, and lymphorrhea and cellulitis provides a reasonable methodology of treatment by suction of lymphorrhea, thus stopping it with the consequent stopping of high-protein lymphorrhea, resulting in improvement of cellulitis, and a decrease in girth and diameter of the lymphedematous limb. Last but not least, it markedly improves healthy granulation and epithelization, resulting in wound closure. Further studies to confirm the role of vacuum-assisted closure therapy in lymphedema in the presence of ulceration are recommended.

Keywords: Healing, lymphedema, lymphorrhea, negative-pressure wound healing, ulcers

Introduction

Lymphedema is a devastating, severe, and impeding condition characterized by fluid retention and consequent tissue swelling due to a compromised lymphatic system, thus affecting the quality of life and morality of the patient.

Correspondence to: Ihab Nabil Amin Hanna, MD, Vascular Surgery Consultant, National Institute of Diabetes, Cairo, Egypt.
Tel: +01223295085;
E-mail: Doctorihabhanna@gmail.com

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In registries evaluating the prevalence of lymphedema, historical data estimate that 180–250 million people suffer from lymphedema worldwide [1], yet, the prevalence is underestimated due to variations in clinical diagnosis and variability of disease tracking [2]. In the USA, the estimated number of patients suffering from primary lymphedema is 1–2 million, whereas 2–3 million are estimated to suffer from secondary lymphedema [3]. About 300 000 patients are estimated to suffer from lymphedema in Canada.

Ulceration in a lymphedematous leg has a severe consequence due to concomitant lymphorrhea causing severe cellulitis and hindering the ulcer's healing.

This may result in severe infection in the ulcer area and might lead to toxemia and septicemia due to extensive, severe concomitant infection that might lead to amputation as a lifesaving procedure or might endanger the patient's life; moreover, the usual lymphorrhea and poor wound healing after amputation is a familiar scenario in lymphedematous patients.

In the presence of ulcers and lymphorrhea, the traditional conservative therapy of manual lymph drainage, lymphapress, and bandaging is not applicable due to excessive lymphorrhea soaking the bandage and preventing manual lymph drainage due to painful concomitant cellulitis.

Vacuum-assisted closure (VAC) is a noninvasive, active wound management system that applies a subatmospheric pressure within a closed sealed environment. VAC acts via fluid suction, improving circulation in the vicinity of the wound and enhancing proliferation of granulation tissue[4]

Aim

This work aims to assess the role of VAC in management of ulcer healing and alleviation of cellulitis induced by the profuse lymphorrhea, and consequently wound healing and diminution of the lymphedema symptoms, particularly swelling and heaviness.

Figure 1: Plantar surface before vacuum-assisted closure.

Figure 2: Plantar surface after vacuum-assisted closure (VAC). Plantar surface before VAC. Plantar closure after VAC.

Figure 3: Dorsal surface before vac.

Figure 4: Dorsal closure after vac.

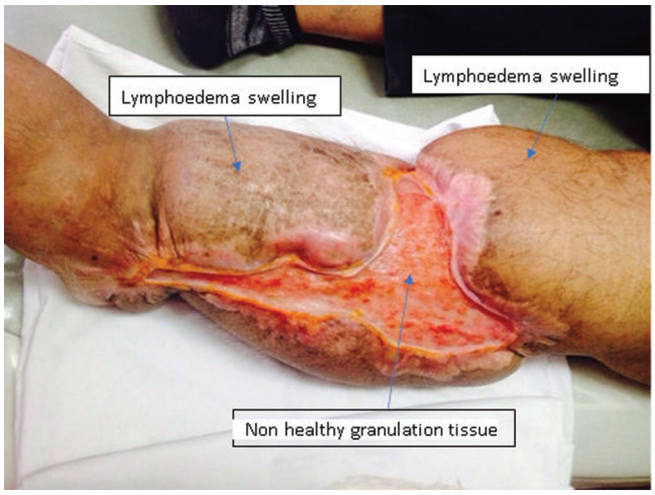

Figure 5: Showing ulcer before vac.

Figure 6: Vac full of lymphoedema.

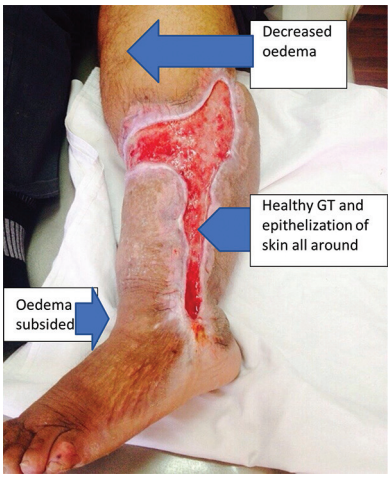

Figure 7: Result of the vac on the ulcer.

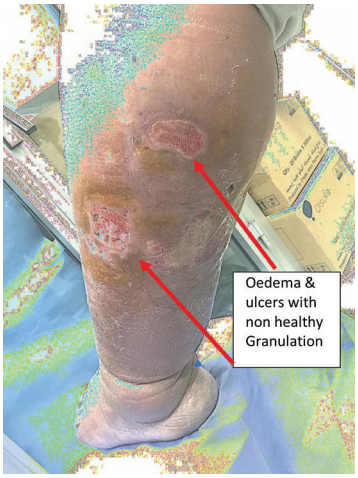

Figure 8: Before withdrawal of vac.

Figure 9: Ulcer After withdrawal of the vac.

Figure 10: Lymph withdrawn on the vac.

Patients and Methods

An exploratory prospective cohort study was conducted on 23 patients (nine males and 14 females with lymphedema and ulcers, resulting in lymphorrhea and cellulitis, were submitted to VAC therapy by Smith and Nephew company for a maximum of 4 weeks), and the results are viewed in terms of improvement of cellulitis ulcer and a decrease in lymphorrhea

and lymphedema in the diameter of the lower limb and in heaviness sensation and the patient's quality of life as regards physical symptoms, social functioning, and well-being.

Patients with anemia, impaired vascularity, or concomitant venous pathology, whether deep venous thrombosis or reflux, or uncontrolled diabetes mellitus, were excluded from the study.

All wounds were debrided and cleansed prior to VAC application.

VAC of Smith and Nephew was applied on continuous mode at a pressure suction of 120 for four successive weeks; the canister was removed when full (800 ml) and the amount was recorded.

Ulcer improvement and granulation were assessed in terms of measurement once weekly during the 4-week interval, as well as the girth reduction in the limb in terms of measurements. Complications in terms of infection, nonhealing and pain, were recorded.

Results

In this prospective study that was conducted at the National Institute of Diabetes from Jan 2018 to Jan 2019, Ethical Committee Approval and informed consent was taken from 23 patients who were recruited. Twenty-two patients continued the protocol for 4 weeks. There were fourteen females and nine males. The mean age was 53 years. No adverse effects were observed as a result of this technique. Apart from one patient who lost to follow-up and did not continue the protocol, all 22 patients were satisfied regarding the quality of life and social well-being.

The VAC therapy reduced the diameter of the treated limbs by the withdrawal of lymph and complete cessation of lymphorrhea, thus decreasing the cellulitis induced by the lymphorrhea on the surrounding skin and also markedly reduced the diameters and hence heaviness of the lower limbs.

Last but not least, all ulcers were reduced in diameter and adequate clean granulation tissue developed in the vicinity of the ulcer. Moreover, 5 of 23 patients' ulcers were completely healed [Figures 1-10, Table 1].

Discussion

Ulcers occurring in lymphedematous patients are a severe, devastating disabling disease. They were aggravated by lymphorrhea, causing inflammation and skin maceration and infection. This lymphorrhea prevents manual lymph drainage and lymphapress and bandaging the initial treatment plan tools for lymphedema that cannot be applied over the ulcers or in the presence of lymphorrhea soaking the bandage, or performance of manual lymph drainage on top of the ulcers; thus, the VAC therapy not only heals ulcers but sucks and reduces lymphorrhea and hence the inflammation and the girth of the limb and consequently the heaviness.

Table 1: Resluts of 23 patients with ulcer managed with VAC

No	age (years)	gender	Size of ulcer (mm)					Size of limb (mm)					Lymphorrea
			Pretreatment	One week	Two weeks	Three weeks	Four weeks	Pretreat	One week	Two weeks	Three weeks	Four weeks	
1	34	F	110×50	100×50	90×40	80×40	60×20	620	600	572	560	500	Stopped
2	40	M	90×30	80×30	70×20	50×10	25×10	760	740	720	690	680	Stopped
3	54	M	30×10	25×10	20×5	10×5	Closed	500	490	470	460	440	Stopped
4	42	F	40×25	35×20	35×15	25×10	20×10	580	560	530	530	530	Stopped
5	44	F	70×40	60×50	50×30	40×10	20×10	670	650	630	610	610	Stopped
6	47	F	150×110 mm	150×100	130×90	110×60	90×40	820	790	780	760	720	Stopped
7	57	M	40×30	30×25	20×15	10×5	Closed	740	700	680	660	640	Stopped
8	60	F	130×30	120×20	80×10	50×10	30×10	680	670	670	660	650	Stopped
10	42	M	80×70	70×50	60×30	60×30	50×25	530	520	510	500	480	Stopped
11	39	F	25×15	20×10	20×5	10×5	closed	270	260	260	250	240	Stopped
12	47	F	25×35	25×25	20×20	20×20	20×15	990	950	910	900	870	Stopped
13	38	F	70×40	60×40	50×30	40×30	20×10	470	460	460	460	430	Stopped
14	57	M	30×20	30×15	25×15	20×15	15×10	280	270	260	260	250	Stopped
15	59	M	40×30	40×20	30×20	20×15	20×15	390	380	360	360	350	Stopped
16	61	F	60×50	50×50	50×30	40×20	20×10	690	650	630	600	510	Stopped
17	43	M	180×100	170×90	150×80	110×60	90×30	760	730	710	690	650	Stopped
18	37	F	20×30	20×30	10×20	10×10	Closed	320	320	310	310	310	Stopped
19	44	F	200×100	180×90	160×70	140×60	120×40	750	720	700	670	650	Stopped
20	40	M	50×30	40×30	30×20	30×10	20×10	690	670	660	640	610	Stopped
21	57	F	30×20	20×10	10×10	Closed	Closed	630	620	620	620	610	Stopped
22	53	F	150×100	140×80	130×70	100×70	90×50	570	530	510	490	480	Stopped
23	62	F	30×10	30×10	Lost to follow-up			660	640	Lost to follow-up			Stopped

F, female; M, male.

Leg ulcers due to chronic lymphedema are a severe, devastating complication, where the main reason for ulceration is due to lymphangiectasia, lymphorrhea or inflammation, skin maceration, and infection [5].

There are several published case studies with the same context[6] as in the case of a decubitus ulcer of an advanced lower-limb lymphedema, yet, in our series, we managed to treat different types of ulcers other than decubitus one with multiple ulcers as a traumatic ulcer.

Some advocate surgical approaches for lymphedema patients as free vascularized lymph node transfer and lymphatic venous anastomosis with widely variable results, mostly of limited few case reports[7] even if there is an aligned nanofibrillar collagen scaffold as two case studies [8]; thus, the paucity of cases undergoing surgery, as well as the inconvenience of the results, wound infection, and lymphorrhea, made us inconveniently resistant to surgical options, thus acting with our technique of VAC utilization, especially in the presence of wounds and lymphorrhea.

In the standardized treatment of lymphedema 'gold standard' approach of complex decongestive therapy consisting of manual lymph drainage and lymphapress, compression bandaging is always hindered in the presence of ulceration and lymphorrhea, thus inducing cellulitis, so our management with VAC helps to stop lymphorrhea and hence improve cellulitis and closing wounds that render the limb ready for complex decongestive therapy [9].

Antibiotic therapy, especially long-acting penicillin, is a necessary adjuvant treatment that prevents recurrence.

Conclusion

VAC therapy in the presence of lymphedema, ulcers, and lymphorrhea and cellulitis provides a reasonable methodology of treatment via suction of lymphorrhea, thus stopping it with the consequent stopping of high-protein lymphorrhea, resulting in improvement of cellulitis, and decrease in girth and diameter of the lymphedematous limb. Last but not least, it markedly improves healthy granulation and epithelization, resulting in wound closure.

Further studies to confirm the role of VAC therapy in lymphedema in the presence of ulceration are recommended.

Conflicts of interest

None.

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