

Four Layer Crepe Bandage in Treatment of Venous Ulcer with Last Layer is Adhesive Elastic Bandage

Ali MMG^{1*}

Vascular Surgery Department, Aswan University Hospital, Egypt

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2. Key words

Venous ulcer; Four layer bandage; Adhesive elastic bandage; Leg ulcer

1. Abstract

1.1. Background: Compression therapy is widely accepted as the corner-stone of venous leg ulceration treatment and often has a dramatic effect on outcome, with patients reporting reduced pain and improved mobility and improved quality of life as a result of ulcer healing. The present study has been done to evaluate the efficacy and safety of four layer compression bandage with last layer is adhesive elastic bandage in treatment of venous ulcer.

1.2. Methods: interventional study was conducted on 50 patients of venous ulcer. 1st layer near to skin is crepe bandage 10 cm, 2nd layer is cotton roll only in the side of ulcer 3rd layer is crepe bandage 10 cm, 4th layer is elastic bandage.

1.3. Results: the results revealed that that outcome at 12th weeks, complete healing was seen in 24(48%) patients. Also 4% of patient had discharge from ulcer, 36 (72%) patients had with healthy skin surrounding the ulcer area and 34% had granulation (50-75%).

1.4. Conclusion: It was observed that healing was better in ulcers with short duration and lesser size in as compared to long standing and large size ulcers.

3. Introduction

Venous disease is responsible for 60-70% of all ulcers in the lower leg. Venous ulcer is the most severe form of venous disease. The estimated life time prevalence for leg ulceration in developed countries is 1% and the point prevalence is 0.1 to 0.2% [1].

In order to assist the flow of blood to the heart, there are valves within the veins that close to prevent the backflow of blood [2]. If the valves are damaged due to trauma or deep vein thrombosis, or are unable to close because the vein is congested due to oedema, they cannot prevent the backflow of blood due to gravity and this increases the pooling of blood in the lower leg [3].

It is this that gives rise to symptoms such as haemosiderin staining the red-purple staining of the skin and irritation, such as varicose eczema and increased oedema. This condition is known as venous hypertension and, if untreated, leads to venous ulceration [4].

Ulceration is also caused by an accumulation of fluid within the tissues, whereby, eventually, the dermal tissue breaks down and an ulcer forms. This may be triggered by an injury to an already oedematous limb [5].

Compression therapy is widely accepted as the corner-stone of venous leg ulceration treatment. Antibiotics do not speed up ulcer healing in the absence of cellulitis and all other specific ulcer heal-

ing drugs are of dubious validity [6].

By applying an adequate level of compression, the diameter of veins may be reduced in both the superficial and deep system, although this does not occur in all the patients [7].

The type of compression bandage used is dependant upon several factors: the size of the patient's legs, how much oedema is present, lifestyle and footwear [8].

Four-layer bandage systems comprising a padding layer, crepe bandage, class 3a elasticated bandage and a class 3b cohesive compression bandage, application of which ensures that compression is gradually applied via the number of layers of bandage [9].

Although no pressure is exerted by the padding layer within compression therapy, it is arguably the most important layer. Its prime function is to protect the skin from the pressure of the bandage, without which the patient would undoubtedly develop pressure damage [10].

The present study is aimed to evaluate the efficacy and safety of four layer compression bandage with last layer is adhesive elastic bandage in treatment of venous ulcer.

4. Subjects and Methods

This interventional study was conducted on 50 patients of venous

*Corresponding Author (s): Ali Mahmoud M. Galal, Vascular Surgery Department, Aswan University Hospital, Egypt, E-mail: eslam606631@gmail.com

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ulcer presenting to Vascular Surgery Department, Aswan University Hospital during the period from May 2017 till May 2019.

Informed written consent was obtained from each patient to be included in this study.

Inclusion criteria

- Patients aged 18 or above.
- Venous ulcer diagnosed clinically with venous insufficiency which confirmed by duplex scan if the cause superficial system or deep system and are able to give informed consent.

Exclusion criteria

- Pregnancy.
- Significant arterial disease (ABPI <0.8).
- Rheumatoid vasculitis.
- Diabetic foot ulceration or malignant ulceration.
- Clinically infected ulcers or excessive exudate.
- Ulcers greater than 10 cm².
- Inability to give informed consent.

Surgical technique

Detailed history was taken with history of predisposing factors for varicose veins.

Patients were examined for venous insufficiency and Ankle Brachial Pressure Index was calculated to assess the arterial supply of the target limb.

Routine laboratory investigations and color Doppler examination was done to assess the status of deep veins and superficial and perforator incompetence in all the patients.

The target ulcer was assessed for quality of ulcer bed tissue, surrounding skin and level of exudates.

The swab for culture sensitivity was sent and antibiotics were given as per culture report. The target ulcer and limb was thoroughly cleansed with normal saline. The wound debridement was done in sloughy and exudative wounds.

4.1. Application of Bandages:

- 1st layer near to skin is crepe bandage 10 cm.
- 2nd layer is cotton roll only in the side of ulcer.
- 3rd layer is crepe bandage 10 cm
- 4th layer is elastic bandage.
- All layers without high pressure only in cross over without tension
- Start from just proximal to toes till below knee.
- Time : every 2 weeks for small sized ulcer and 1 time per week for large sized ulcer (Figure 1).



Figure 1: Crepe bandage

4.2. Statistical Analysis

The collected data were coded, processed and analyzed using the SPSS (Statistical Package for Social Sciences) version 21 for Windows® (SPSS Inc, Chicago, IL, USA). Quantitative data was presented as mean ± SD and range. Qualitative data was presented as number and percent.

5. Results

Table (1) shows that 46.0% of cases were males, 54.0% of cases were females, and mean age was 50.5 ± 6.8 years, with range (19-63) years.

Table (2) shows 20 patients (40%) were housewives and Most of the patients had prolonged standing occupation, regarding site of ulcer, left side was involved in 26 (52%) and right side was involved in 14 (28.0%) also bilateral ulcers were found in 10 (20%) patients. 18 patients (36%) had ulcer of less than 6 months duration, 14 patients (28%) had ulcer duration between 7-12 months and 13 (34%) patients had duration of ulcer more than 12 months.

Table (3) shows that at the time of presentation, 9 (18%) patients had minimal discharge while maximum 23 patients (46%) had medium exudate level and 18 patients (36%) had copious discharge at 12th week, 19 patients (95%) had no discharge and only 2 patient (4%) had minimal discharge. regarding eczema in skin 23 patients (46%) had wet eczema, 187 patients (35%) had dry eczema, 9 (18%) had erythema while no eczema changes were seen in two patients (10%). At 12th week, most of the patients had improvement in skin condition surrounding the ulcer area and there was complete resolution of eczema and erythema. Significant improvement was seen in surrounding skin status after application of bandages over ulcer area.

Table (4) shows that outcome at 12th weeks, complete healing was seen in 24 (48%) patients. Also 2 (4%) of patient had discharge from ulcer, 36 (72%) patients had healthy skin surrounding the ulcer area and 34% had granulation (50-75%).

Table (5) shows that At 12 weeks it was observed that all 10 ulcers which had size less than 5 cm² were completely healed (100%) and 13 out of 20 ulcers (65%) having size between 5 to 10 cm² showed complete healing. None of ulcers which had initial size more than 10 cm² healed (Table 1-5, Figure 2).



Figure 2: Case of thrombophlebitis on both superior saphenous vein & great saphenous vein

Table 1: Demographic data of patients

Variable	N (%)
Gender	
Male	23(46.0%)
Female	27(54.0%)
Age (years)	
(Mean ±SD)	50.5 ±6.8
Range	(19-63)

Table 2: type of occupation, side affection of ulcer and duration of disease in the studied patients

Variable	N (%)
occupation	
house wife	20(40.0%)
prolonged standing occupation	30(60%)
side affection	
right side	14(28%)
left side	26(52.0%)
bilateral side	10(20%)
Duration (months)	
<6months	19 (38%)
7-12 months	14(28%)
more than 12 months	17(34%)

Table 3: Distribution of patients according to type of exudate from ulcer and eczema in skin surrounding the ulcer area

amount of exudate	N (%)
minimal	2(4.0%)
medium	23(46.0%)
copious discharge	18(36.0%)
No discharge	7(14.0%)
eczema in skin	N (%)
wet eczema	23(46.0%)
dry eczema	18(36.0%)
erythema	9(18.0%)
No eczema	0

Table 4: Outcome after 12 weeks Four layer bandage

	before	At 12 weeks
Complete healing	24 (48%)	
Number of patients with discharge from Ulcer	50 (100%)	2 -4%
No. of patients with healthy skin surrounding the ulcer area	5 (10%)	36(72%)
Percentage of granulation	<25	10 (20%)
	25-50	4 (8%)
	50-75	20 (40%)
	>75	0
	Healed	0

Table 5: comparison between studied patient regarding Ulcer size before and after 12 weeks application of Four layer bandage

Ulcer size (cm ²)	No. of ulcers at before bandage	No. of cured ulcer at 12 weeks
0-5	10(20%)	10(20%)
>5-10	20(40%)	13(26%)
>10-15	12(24%)	0
>15-20	8(15%)	0

6. Discussion

Venous disease is responsible for 60-70% of all ulcers in the lower leg. Venous ulcer is the most severe form of venous disease. The estimated life time prevalence for leg ulceration in developed countries is 1% and the point prevalence is 0.1 to 0.2 %. The resultant venous hypertension is associated with skin pigmentation, lipodermato-sclerosis and ulceration[11].

Compression therapy is widely accepted as the corner-stone of venous leg ulceration treatment. Antibiotics do not speed up ulcer healing in the absence of cellulitis and all other specific ulcer healing drugs are of dubious validity[12].

By applying an adequate level of compression, the diameter of veins may be reduced in both the superficial and deep system, although this does not occur in all the patients. The four layer bandage system is the standard method in different countries which comprises of orthopaedic wool, crepe bandage, elastic bandage and a final cohesive retaining layer[13].

This interventional study was conducted on 50 patients of venous ulcer, in which 46.0% of cases were males, 54.0% of cases were females, and mean age was 50.5±6.8 years, with range (19-63) years.

In agreement with our study, the study of **Vashist et al**[11]. reported that mean age of patients was 59.67 years, there were 27 males and 13 females, Other study of **Nelzen et al**[14]. reported a mean age of 64 years old to 77 years, Mean age in our study was less as compared to reported in literature possibly because young patients have to spend lot of time in standing occupation specially in developing countries as most of the patients in the present study had prolonged standing occupation. There is no systematic literature review regarding occupational risk factors for varicose veins.

In the study of **O'Brien et al**[15]. there is female preponderance of venous ulcer. This may be due to geographical variations in the sex incidence of venous ulcer.

On the other hand, the present study revealed that 20 patients (40%) were housewives and Most of the patients had prolonged standing occupation, there is no systematic literature review regarding occupational risk factors for varicose veins. One prospective study of **Brand et al** [16]. has addressed occupational factors and it concluded that women who reported spending >8 hours a day in sedentary activities had a significantly higher incidence of varicose veins than those who spent less than 4 hours a day in such activities.

While as regarding site of ulcer, the present study demonstrated that left side was involved in 26 (52%) and right side was involved in 14 (28.0%) also bilateral ulcers were found in 10 (20%) patients. 18 patients (36%) had ulcer of less than 6 months duration, 14 patients (28%) had ulcer duration between 7-12 months and 13(34%) patients had duration of ulcer more than 12 months.

In line with our study, the study of **Vashist et al**[11]. reported that left side was involved in 20 patients (50%) while right side was involved in 13 patients (32.5%). Bilateral involvement was seen in 7 patients (17.5%).

In harmony with our results, another study of **Gohel et al**[17]. reported that right side is involved in 32% to 41%, left side in 43% to 56% and bilateral involvement in 9% to 21% of patients.

The study of **Vashist et al**[11]. reported that duration of symptoms varied from less than 6 month to 10 years, Maximum 15 patients (37.5%) had ulcer of less than 6 month duration while 12 patients (30%) had duration of 7-12 months and other patients had longer duration of ulcer.

Previous study of **O'Brien et al**[15]. reported varying duration of presentation of ulcers ranging from less than 6 months to more than 5 years. In developing countries patients tend to neglect their symptoms especially in rural areas and may present very late.

Furthermore, the study on the hand revealed that at the time of presentation, 9(18%) patients had minimal discharge while maximum 23 patients (46%) had medium exudate level and 18 patients (36%) had copious discharge at 12th week, 19 patients (95%) had no discharge and only 2 patient (4%) had minimal discharge. regarding eczema in skin 23 patients (46%) had wet eczema, 187 patients (35%) had dry eczema, 9 (18%) had erythema while no eczema changes were seen in two patients (10%). At 12th week, most of the patients had improvement in skin condition surrounding the ulcer area and there was complete resolution of eczema and erythema. Significant improvement was seen in surrounding skin status after application of bandages over ulcer area.

In agreement with our study, the study of **Vashist et al** [11]. reported that maximum 9 patients (45%) had medium exudate level, 7 patients (35%) had copious discharge and four patients had minimal discharge while at 12th week, 19 patients (95%) had no discharge and only 1 patient (5%) had minimal discharge, while as regard surrounding eczema, 9 patients (45%) had wet eczema in skin surrounding the ulcer area, 7 patients (35%) had dry eczema, 2 (10%) had erythema while no eczema changes were seen in two patients (10%).

Compression therapy is the mainstay of treatment of venous leg ulcers (VLU). Good wound care and compression therapy will heal majority of small venous ulcers of short duration. Goals of compression therapy are ulcer healing, reduction of pain and edema, and prevention of recurrence, The successful management of venous leg ulcers represents a significant clinical problem and a major drain on limited financial resources. Bandages vary greatly in their ability to provide sustained compression due to differences in their structure and the content of elastomeric yarns. Other factors, such as limb circumference and shape, will also have an important

influence on the pressure produced beneath a compression bandage[18].

The present study illustrated that outcome at 12th weeks, complete healing was seen in 24(48%) patients. Also 4% of patient had discharge from ulcer, 36 (72%) patients had with healthy skin surrounding the ulcer area and 34% had granulation (50-75%).

In comparison with the study of **Vashist et al.** [11], it was observed that in the four layer bandage group, 9 patients (45%) showed complete healing while 7 patients (35%) showed complete healing in short stretch bandage group at 12 weeks.

Various studies of **Harrison et al.**, [19] and **Franks et al.** [20] on four layer bandaging have shown ulcer healing rates varying from 40 to 61%. Whereas the ulcer healing rates of short stretch bandaging in these studies has varied from 34 to 53.1%.

Finally, in the present study, we found that at 12 weeks it was observed that all 10 ulcers which had size less than 5 cm² were completely healed (100%) and 13 out of 20 ulcers (65%) having size between 5 to 10 cm² showed complete healing. None of ulcers which had initial size more than 10 cm² healed, in agreement with our findings, the study of **Vashist et al.** [11], reported that none of the ulcers healed which had initial size more than 10 cm². **Susan et al.** [20] conducted a meta-analysis comparing the two methods of compression bandaging which included 887 patients from seven trials. They concluded that larger ulcers and ulcers of longer duration took longer time to heal independently of one another and of treatment.

In conclusion, it is concluded that four layer bandaging has better results in healing of venous ulcers. Large size ulcers and chronic ulcers take long time to heal. Four layer bandaging is easy to apply and leads to early healing of ulcers hence should be used in all patients of venous ulcers.

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