

## UNNA BOOT TECHNOLOGY IN THE HEALING OF VARICOSE ULCERS\*

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**ABSTRACT:** This study aimed to analyze the efficiency of Unna Boot technology in the varicose ulcer healing process. This was a retrospective descriptive study conducted in the wound care clinic of a teaching hospital in southern Brazil, using as the data source the medical records of patients with venous ulcers that used the Unna Boot. The study included 49 patients with 80 varicose ulcers, predominantly in the right lower limb, with 56.2% (n = 45), and the medial malleolus region, with 42.5% (n = 34). Regarding the healing of the ulcers, a large volume of exudate (p = 0.0193) and ulcer size (p <0.0001) were statistically significant, while walking without assistance (p = 0.0986) and purulent exudate (p = 0.0629) showed a tendency, as variables that affected the healing. Forty-one patients (51.3%) presented wound healing with the use of the Unna Boot within 12 weeks. The technology is effective in healing varicose ulcers, especially smaller ulcers.

**DESCRIPTORS:** Varicose ulcer; Technology; Healing; Research in clinical nursing; Nursing care.

### TECNOLOGIA BOTA DE UNNA NA CICATRIZAÇÃO DA ÚLCERA VARICOSA

**RESUMO:** Objetivou-se analisar a eficiência da tecnologia Bota de Unna no processo de cicatrização de úlceras varicosas. Trata-se de pesquisa descritiva retrospectiva, realizada no ambulatório de tratamento de feridas de um hospital de ensino da região sul do Brasil, tendo como fonte de dados prontuários de pacientes portadores de úlcera venosa e que utilizaram a Bota de Unna. Incluiu-se 49 pacientes que apresentaram 80 úlceras varicosas, predominantemente em membro inferior direito com 56,2% (n=45) e região de maléolo medial com 42,5% (n=34). Em relação à cicatrização das úlceras, houve significância estatística para volume intenso do exsudato (p-valor=0,0193) e tamanho da úlcera (p-valor<0,0001), tendência para deambulação sem auxílio (p-valor=0,0986) e exsudato purulento (p-valor=0,0629) como variáveis que interferem na cicatrização. Quarenta e um pacientes (51,3%) tiveram cicatrização das lesões mediante o uso da Bota de Unna em até 12 semanas. A tecnologia foi eficiente na cicatrização das úlceras varicosas, em especial nas úlceras de pequeno tamanho.

**DESCRIPTORES:** Úlcera varicosa; Tecnologia; Cicatrização; Pesquisa em enfermagem clínica; Cuidados de enfermagem.

### TECNOLOGÍA BOTA DE UNNA EN LA CICATRIZACIÓN DE ÚLCERA VARICOSA

**RESUMEN:** Estudio cuyo objetivo fue analizar la eficiencia de la tecnología Bota de Unna en el proceso de cicatrización de úlceras varicosas. Fue una investigación descriptiva retrospectiva, realizada en el ambulatorio de tratamiento de heridas de un hospital de enseñanza de la región sur de Brasil, que tuvo como fuente de datos prontuarios de pacientes con úlcera venosa que utilizaron la Bota de Unna. Participaron 49 pacientes que presentaron 80 úlceras varicosas, con predominancia en el miembro inferior derecho con 56,2% (n=45) y región de maléolo medial con 42,5% (n=34). Acerca de la cicatrización de las úlceras, hubo significancia estadística para volumen intenso de exudato (p-valor=0,0193) y tamaño de la úlcera (p-valor<0,0001), tendencia para deambulación sin ayuda (p-valor=0,0986) y exudato purulento (p-valor=0,0629) como variables que interfieren en la cicatrización. Cuarenta y uno pacientes (51,3%) presentaron cicatrización de las lesiones a causa del uso de la Bota de Unna en hasta 12 semanas. La tecnología fue eficiente en la cicatrización de las úlceras varicosas, especialmente en las de pequeño tamaño.

**DESCRIPTORES:** Úlcera varicosa; Tecnología; Cicatrización; Investigación en enfermería clínica; Cuidados de enfermería.

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## ● INTRODUCTION

Varicose Ulcers are defined by lesions that develop in the lower limbs related to venous insufficiency<sup>(1)</sup>. They constitute an important public health problem due to their high incidence, prevalence, chronicity, socioeconomic impact and frequency of relapses. The nurse plays a fundamental role in the treatment of the varicose ulcer considering the responsibility of direct care<sup>(2)</sup>, including the continuous monitoring of the healing process.

The care technologies, part of the nursing process, allow nurses to provide the best medical treatment to patients with varicose ulcers. These technologies include the realization of the dressing, compression therapy, guidance on the importance of rest and the use of compression stockings after healing<sup>(3)</sup>. Compression therapy represents an important alternative treatment for patients with varicose ulcers. This treatment modality is available in two forms: elastic therapy or long-stretch bandages, which consist of a multilayer system, and inelastic therapy or short-stretch bandages, known as the Unna Boot, the object of this study<sup>(4)</sup>.

The Unna boot, developed by a German dermatologist in 1896, is characterized by a compression bandage that includes zinc oxide, gelatin, glycerin and calamine<sup>(5)</sup>. It is possible to use it for up to seven days, associated with another technology, such as non-stick gauze, foams, nanocrystalline silver and silver hydrofiber<sup>(6)</sup>.

The interest in investigating the subject was due to the empirical perception, over a period of 13 years, of the researcher in the treatment of patients with varicose ulcers. During this period, it was observed that patients treated with the Unna Boot presented better clinical outcomes compared to those that underwent other treatments. Considering that the implementation of a health technology, directed towards a particular problem in real conditions of use, can benefit the individuals of a defined population<sup>(7)</sup>, this study aimed to analyze the efficiency of Unna Boot technology in the varicose ulcer healing process.

## ● METHOD

This retrospective descriptive survey was performed in a wound care outpatient clinic of a teaching hospital in Southern Brazil. For its development, the medical records of patients diagnosed with varicose ulcer and treated with the Unna Boot technology, between January 2007 and December 2012, totaling a period of five years, were analyzed.

Two nurses work in this outpatient clinic, in mornings and afternoons, and perform the nursing process through nursing consultations, assessment of injuries, implementation and continuity of care and guidance for patients, family members and/or caregivers according to the institutional protocol. The varicose ulcers were monitored by these two professionals throughout the treatment period.

Data collection occurred in March and April 2014, using pre-tested instruments. In the first stage of the study, an instrument was used to characterize the epidemiological profile of patients with chronic ulcers, with the aim of identifying patients with varicose ulcers. Next, the sociodemographic and clinical variables of the patients and the evaluation of the ulcer were analyzed.

Inclusion criteria covered medical records available of all patients diagnosed with varicose ulcer, treated with Unna Boot technology, who received care in the Wound Care Outpatient Clinic from January 2007 to December 2012. The records unavailable for data collection were excluded.

For this study, the healing of the varicose ulcer was considered as efficiency of the Unna Boot technology. The ulcer was evaluated as healed when it presented total epithelialization, without break in skin continuity. Measures of the varicose ulcers were performed by linear measurement with acetate paper, placed in direct contact with the wound bed and the drawing transcribed by tracing technique, for the patient's record. The surface area, in square centimeters, was estimated by multiplying the two measurements (length x width), noting that the length referred to the vertical extent or cephalo-caudal direction and width referred to the horizontal measurement.

For the analysis of the results, the data were entered into Microsoft Excel® spreadsheets and analyzed through descriptive statistics using the Bioestat® program. In the analysis of factors that could affect the healing outcome, the chi-squared test, Fisher's exact test and William's G-test for categorical variables were used, assuming a 5% level of significance.

The project was approved by the ethics committee of the institution, under authorization number 411.492, and followed the ethical principles of Resolution 466/2012, which establishes the guidelines for research involving human subjects<sup>(8)</sup>.

## ● RESULTS

A total of 142 medical records were analyzed, totaling 252 chronic ulcers, with a prevalence of varicose ulcers,  $n = 112$  (44.4%), followed by those due to leprosy  $n = 32$  (12.6%). A total of 49 patients who were treated with Unna Boot were identified, with 80 injuries as some patients had more than one varicose ulcer. Males were predominant in the sample, 57.1% ( $n = 28$ ), with a mean of 57 years of age, minimum 25 and maximum 84 years. Among the participants, 61.2% ( $n = 30$ ) were married and 81.6% ( $n = 40$ ) Caucasian. Regarding the place of origin, 53.1% ( $n = 26$ ) were from Curitiba and the rest from the metropolitan area and the municipalities of the state of Paraná. In relation to education, 69.3% ( $n = 34$ ) had completed elementary education, 24.2% ( $n = 12$ ) had completed high school education and three (6.1%) were illiterate. Regarding comorbidities, 51% ( $n = 25$ ) had hypertension, 77.6% ( $n = 38$ ) diabetes and 73.47% ( $n = 36$ ) both comorbidities, with 93.9% ( $n = 46$ ) reporting not smoking.

Of the 49 patients studied, 61.2% ( $n = 30$ ) presented one ulcer, nine (18.4%) two ulcers, nine (18.4%) three ulcers and one (2%) five ulcers, totaling 80 varicose ulcers. Regarding the location and region, 56.2% ( $n = 45$ ) of the ulcers were located on the right lower limb, predominantly in the medial malleolus region 42.5% ( $n = 34$ ). The mean time that the patient had been affected by the varicose ulcer was 1,355 days, ranging between 30 days and 10,220 days (28 years), this being due to factors related to the referral of this patient to the service, as many that came to the clinic already had had ulcers for many years with or without treatment in other services.

In the evaluation of the bed of the varicose ulcer, the predominant features in the lesions were the presence of slough in 57.5% ( $n = 46$ ), serous exudate in 78.7% ( $n = 63$ ), moderate volume of exudate in 53.7% ( $n = 43$ ) and discrete odor in 80% ( $n = 64$ ). There was moderate pain recorded in 33.7% ( $n = 27$ ), followed by mild pain in 30% ( $n = 25$ ) and severe pain in 23.7% ( $n = 19$ ). Among the coverings associated with the Unna Boot, the most used were nanocrystalline silver 37.5% ( $n = 30$ ) and activated charcoal dressing with silver 32.5% ( $n = 26$ ). Other coverings used less frequently included hydrocellular in 15% ( $n = 12$ ), hydrofiber with silver in six (7.5%), silicon with silver in four (5%), and collagen/alginate in two (1.2%).

Regarding the size of the ulcers, in this study the following criteria were established for analysis: small varicose ulcer from 0.1 to 10 cm<sup>2</sup>; medium from 10.1 to 100 cm<sup>2</sup>; and large from 100.1 cm<sup>2</sup>. There was a predominance of small lesions 55% ( $n = 44$ ), followed by medium lesions 23.7% ( $n = 19$ ) and large 21.3% ( $n = 17$ ).

Considering the variables related to the patient, only walking showed a tendency to slow the healing of varicose ulcers within 12 weeks, as shown in Table 1.

Regarding the clinical characteristics of the varicose ulcer, the high volume of exudate and absent odor variables presented statistical significance and purulent exudate presented a tendency to interference with healing, as shown in Table 2.

There was no statistical difference between the percentage of ulcers healed within 12 weeks and those healed after 12 weeks. However, when broken down by ulcer size, the Unna Boot technology showed greater efficiency when dealing with small ulcers: 15% ( $n = 12$ ) had healed after 12 weeks compared with 40% ( $n = 32$ ) healed within 12 weeks ( $p < 0.0001$ ). For the medium ulcers, 16.3% ( $n = 13$ ) had healed after 12 weeks and six (7.5%) within 12 weeks, and for large ulcers, 17.5% ( $n = 14$ ) had healed after 12 weeks and only three (3.8%) presented wound healing within 12 weeks, as shown in Figure 1.

Considering all the ulcers analyzed, a positive and significant correlation ( $r = 60.08\%$ ,  $p < 0.0001$ ) was

revealed between the initial wound area and the healing time, indicating that the greater the wound area the longer the healing time, as shown in Figure 2.

It was observed that the area of the varicose ulcers ranged from 0.24cm<sup>2</sup> to 237 cm<sup>2</sup>, with a mean of 38.71 cm<sup>2</sup>. After four weeks of treatment, the mean area of the lesions was 19.76 cm<sup>2</sup> and after 12 weeks the mean area was 5.63 cm<sup>2</sup>. There was a significant reduction in the lesion area at the end of 12 weeks, demonstrating that the Unna Boot technology is efficient in the healing process of varicose ulcers ( $p < 0.0001$ ). Another important finding of this study was that all the patients that used the Unna Boot for 3 to 4 weeks after ulcer healing as a form of prevention, showed no recurrence.

Table 1 - Frequency distribution and percentage of the variables of patients with varicose ulcers according to the healing time. Curitiba, Brazil, 2014

Variables	Healing within 12 weeks (n =49)				Total	P value
	No	%	Yes	%		
Hypertension						
No	15	53.5	9	42.8	24	0.3254*
Yes	13	46.4	12	57.1	25	
Diabetes						
No	23	82.1	15	71.4	38	0.2918*
Yes	5	17.8	6	28.5	11	
Smoking						
No	27	96.4	19	90.4	46	0.3913*
Yes	1	3.5	2	9.5	3	
Mobility						
Walks	27	96.4	17	80.9	44	0.0986*
Walks with help	1	3.5	4	19	5	
Total	28	100	21	100	49	

Legend: \* Fisher's test

Table 2 - Distribution of the frequency and percentage of the varicose ulcers variable according to healing time. Curitiba, Brazil, 2014

Variables	Healing within 12 weeks (n =80)				P value
	Yes	%	No	%	
Exudate					
Purulent	0	0	3	7.5	0.0629**
Serosanguineous	5	12.5	9	22.5	
Serous	35	87.5	28	70	
Volume of Exudate					
High	5	12.5	16	40	0.0193†
Moderate	26	65	17	42.5	
Low	9	22.5	7	17.5	
Pain					
Absent	6	15	3	7.5	0.274**
Intense	6	15	13	32.5	
Light	13	32.5	12	30	
Moderate	15	37.5	12	30	
Odor					
Absent	7	17.5	2	5	0.039**
Discrete	32	80	32	80	
Intense	1	2.5	6	15	

Legend: \*\* William's G-Test; † Chi-squared Test

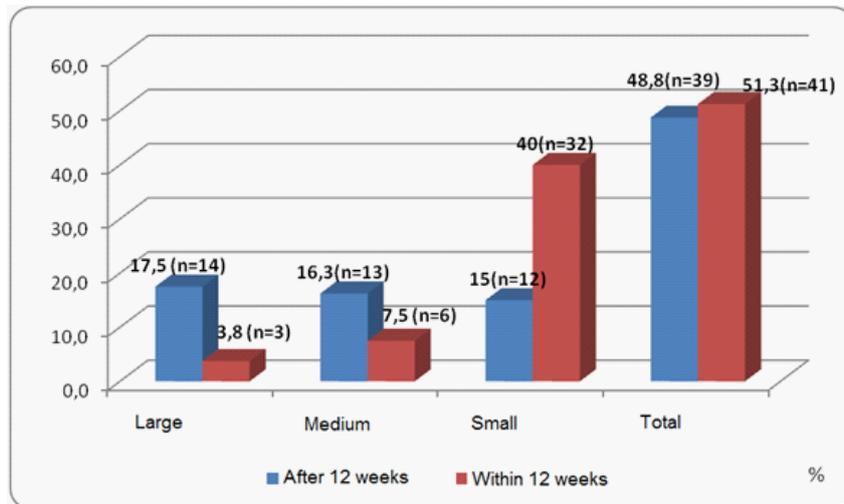


Figure 1 - Percentage and numerical distribution of healing with the use of the Unna Boot according to the size of varicose ulcer. Curitiba, Brazil, 2014

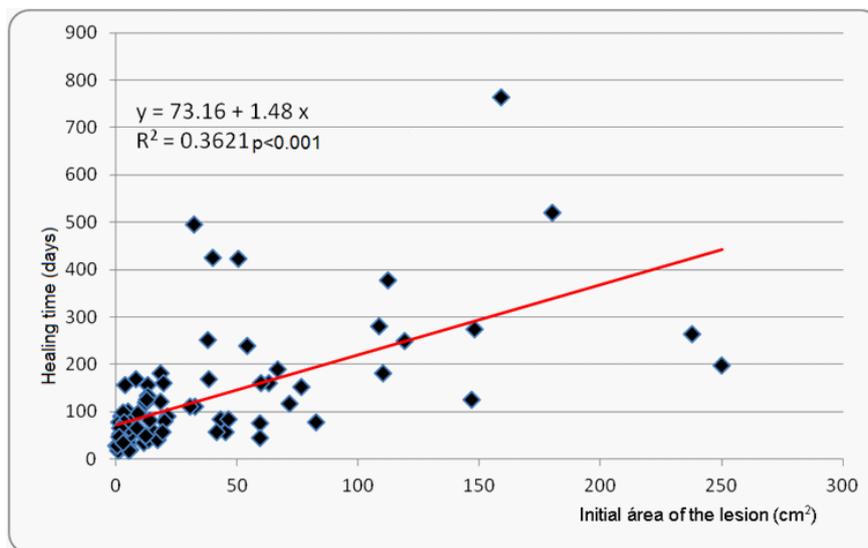


Figure 2 - Relationship between initial area of varicose ulcer and healing time with Unna Boot ( $r = 60.08\%$ ,  $p < 0.0001$ ,  $n = 80$ ). Curitiba, PR, Brazil, 2014

## ● DISCUSSION

Among the patients studied undergoing treatment for varicose ulcers, males prevailed, data similar to that found in an international study that aimed to identify the demographic and clinical characteristics associated with decreased pain and quality of life of patients with active varicose ulcers<sup>(9)</sup> and in another study that evaluated the quality of life in patients with chronic varicose ulcers<sup>(10)</sup>.

Due to advancing age, people become susceptible to chronic wounds, because of changes in the physiological systems and nutritional, metabolic, vascular and immunological alterations that affect the function and appearance of the skin<sup>(11)</sup>. When older adults are affected by varicose ulcers, they experience physiological decreases in the intensity and velocity of almost all stages of healing, resulting in lower inflammatory response, reduced circulation, increased capillary fragility and extended healing time<sup>(12)</sup>. The mean age found in this study was 57 years, similar to the findings of other studies<sup>(13-14)</sup>.

In this study, elementary education prevailed among the patients with varicose ulcers. According to a statement made in a national study<sup>(15)</sup>, this low educational profile, as well as low purchasing power, is expected in patients seeking care at an outpatient clinic of the public health service.

Often, patients suffering from varicose ulcers present other associated diseases, as well as chronic venous insufficiency, which may interfere with tissue repair. Accordingly, as in other studies<sup>(9,14,16)</sup>, a prevalence of hypertension was observed in the patients studied. One study cites 81.5% of patients suffering from varicose ulcer having a history of diabetes<sup>(14)</sup>, data divergent from those found in this study. Other authors<sup>(17)</sup> reported an absence of other chronic diseases in 35% of patients; suggesting the likelihood of tissue repair in less time when compared to patients with various pathologies associated with chronic venous insufficiency. In this study it was noticed that the majority of patients with venous ulcer reported not smoking, similar to other studies, which found only 13.3%<sup>(9)</sup> and 24.6%<sup>(14)</sup> of smokers.

Varicose Ulcers cause profound changes in the daily activities of patients, for example, restriction in mobility<sup>(17)</sup>. In contrast to another study<sup>(17)</sup>, the majority of the patients (89.8%) of the present study were found to be able to walk without assistance, and the analysis of the walking variable showed a statistical tendency in relation to the healing time within 12 weeks ( $p = 0.0986$ ), suggesting that walking without difficulty had a negative impact on healing.

Regarding the evaluation of the bed of the varicose ulcer, the predominant features were the presence of slough, moderate volume of serous exudation, with discrete odor. The presence of devitalized tissue favors infection by providing nutrients for bacterial growth, and inhibiting phagocytosis, slowing tissue repair<sup>(18)</sup>.

The presence of exudate in the wound bed is a common physiological process in the inflammatory phase of healing and the evaluation of the volume, odor and color considers the presence or absence of infection<sup>(19)</sup>. The unpleasant odor of ulcers is uncomfortable for the patient and interferes in personal and work relationships<sup>(20)</sup>. A discrete odor was registered for the majority of varicose ulcers evaluated in this study, similar to data described in a study carried out in a Wound Repair Outpatient Clinic of southeastern Brazil, which showed that 91% of the patients presented mild odor<sup>(21)</sup>.

The results showed a tendency toward purulent exudate ( $p = 0.0629$ ) and statistical significance for a high volume of exudate ( $p = 0.0193$ ), variables that hindered healing within twelve weeks. A wound with excess exudate may represent a prolonged inflammatory phase or presence of infection, interfering with the healing process<sup>(21)</sup>.

The pain and discomfort influence treatment adherence and interfere with the quality of life of patients with varicose ulcers<sup>(17)</sup>. Pain can cause limited mobility, mood swings, changes in family relations and decrease in social life<sup>(15)</sup>. In this study the patients reported moderate to severe pain, data that corroborate the literature. One study registered pain as a characteristic present in the life of patients with varicose ulcers<sup>(17)</sup>.

The guidelines<sup>(22)</sup> for the treatment of varicose ulcers recommend the use of topical covering associated with compression therapy. There are several coverings and the evaluation of the appearance of wound size, type of tissue and exudate must be considered for the choice of the most suitable. There is also the recommendation of coverings with silver in the presence of infection, with regard to critically colonized wounds and delayed healing<sup>(23)</sup>. Approximately 60% of varicose ulcers are colonized by anaerobic bacteria and silver dressings are indicated for reducing the critical colonization and recommended for healing varicose ulcers, always associated with a form of compression therapy<sup>(24)</sup>.

In this study the coverings were used for the reduction of infection in the wound bed, with the most used being: nanocrystalline silver, 37.5% ( $n = 30$ ), and activated charcoal dressing with silver, 32.5% ( $n = 26$ ). Hydrocellular dressing, 15% ( $n = 12$ ), hydrofiber with silver, 7.5% ( $n = 6$ ), soft silicone foam, 5% ( $n = 4$ ), and collagen dressing, 1.2% ( $n = 2$ ), coverings were also used to reduce of the wound.

It should be noted that 51.3% of the patients had healing of injuries through the use of the Unna Boot technology within 12 weeks, while the others presented healing at the end of one year. One study showed that 40% of the healing of varicose ulcers with the Unna Boot occurred over the period of one year or more<sup>(17)</sup>. Other international studies show 40% to 95% healing<sup>(25)</sup> and 74.5% of healing with the Unna Boot<sup>(24)</sup>, however, there was no reference to the healing time.

There was a predominance of small-sized varicose ulcers, after the measurement of all varicose ulcers in the patients studied. An observational study, conducted in southeastern Brazil, which aimed to evaluate the characteristics of varicose ulcers and name the products indicated for their treatment,

found that 22% of the ulcers measured from 0.1 cm<sup>2</sup> to 10cm<sup>2</sup>, 8% more than 100 cm<sup>2</sup>, with these reaching up to 300cm<sup>2</sup>, however, 48% of the ulcers were not measured<sup>(21)</sup>. The impact of the size of the varicose ulcer on the healing was noted, with statistical significance ( $p < 0.0001$ ). The larger the area of the wound, the longer the healing time.

There was a statistically significant ( $p < 0.0001$ ) reduction in the area of the varicose ulcers within 12 weeks, showing that the Unna Boot technology was effective in the treatment. It was noticed that early initiation of the treatment of small varicose ulcers, with Unna Boot technology, increases the chance of healing within 12 weeks.

## ● CONCLUSION

The Unna Boot was effective in healing varicose ulcers within 12 weeks, particularly small ulcers. The size of the ulcer, the presence of purulent exudate, high volume of exudate and walking without assistance were variables that interfered with the healing. The application of the Unna Boot after healing for a period of 3 to 4 weeks was beneficial to prevent relapses.

The nursing process applied with technology allows nurses to improve the care provided and facilitates decision-making regarding the treatment of varicose ulcers, as it is based on scientific evidence, institutional protocols and international guidelines. The limitation of this study was the lack of access to inactive records, i.e., those patients that died or had not had consultations within the previous two years.

It is highlighted that this study is still not conclusive, it is necessary to expand the investigations with other institutions, since there are no similar studies in Brazil for comparison of data with respect to varicose ulcer healing and recurrence.

It is suggested that randomized, clinical trials, with control groups, be carried out to investigate technologies for the prevention and treatment of wounds, as well as their cost-effectiveness.

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