



## Effectiveness of 2% and 4% papain gels in the healing of venous ulcers\*

Efetividade dos géis de papaína a 2% e 4% na cicatrização de úlceras venosas

Efectividad de los geles de papaína al 2% y al 4% en la cicatrización de úlceras venosas

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### ABSTRACT

**Objective:** To analyze the effectiveness of 2% and 4% papain gels in tissue repair of venous ulcers. **Method:** Quasi-experimental study with consecutive sample of 16 patients with 30 venous ulcers treated at the outpatient clinic of a teaching hospital, from April to November in 2011, using a form for clinical assessment of the patient and its lesion. Variables were analyzed by Wilcoxon and McNemar test ( $p < 0.05$ ). **Results:** Most participants were female; aged between 51 and 59 years; obese; with hypertension. Regarding ulcers, there was an average decrease of 7.9 cm<sup>2</sup> (50% of its original size) in 90 days; 20% of the ulcers completely healed within 56.67 days. There was an increase in epithelialization, significant reduction in the slough and edema, improved depth, in the type and amount of exudate ( $p < 0.0001$ ). **Conclusion:** 2% and 4% papain gels were effective in healing venous ulcers.

### DESCRIPTORS

Varicose Ulcer; Leg Ulcer; Papain; Treatment Outcome; Nursing.

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## INTRODUCTION

Venous ulcers are considered a worldwide public health problem due to its high incidence, high cost of treatment and its impact on patient quality of life in physical, emotional and social spheres, and may lead to loss of work capacity and increase early retirement<sup>(1-2)</sup>. The understanding of care for venous ulcers is important for decision making and multidisciplinary intervention and represents a starting point for appropriate public health policies<sup>(3)</sup>.

There are several types of coverage and products used for performing ulcer dressing, including papain, which comes from the latex green papaya fruit (*Carica papaya*), commonly found in Brazil. It is a complex mixture of proteolytic enzymes and peroxidase, which causes proteolysis of the devitalized tissue. It is a chemical debriding agent introduced in Brazil in 1983, used in various wounds etiologies, at all stages of the healing process and in patients of different age groups, showing positive results<sup>(4)</sup>.

In order to enhance the knowledge of its properties, studies with papain as a technology has been advancing. One of these properties is the ability to reduce biofilm on surfaces of medical devices formed by methicillin-resistant *Staphylococcus epidermidis* (MRSE) bacteria, and methicillin-resistant *Staphylococcus haemolyticus* (MRSHA) frequently isolated from the human bacteremia<sup>(5)</sup>.

However, a major challenge to the use of papain is to maintain the stability of its enzymatic action. Most enzymes are not stable at room temperature and lose their biological activity in a short period of time. Its association with other substances is difficult and requires the attention of nurses because papain is inactivated when reacting with oxidizing agents such as iron, oxygen, iodine derivatives, hydrogen peroxide and silver nitrate, light and heat. The papain solution prepared with distilled water or saline solution also showed poor durability<sup>(4)</sup>.

Therefore, researchers and professors from the School of Nursing and the School of Pharmacy from the Universidade Federal Fluminense, developed and tested the papain gels in the concentrations of 2% and 4%, using Carbomer 940 vehicle technology to maintain stability of the enzyme. Carbomers 940 are synthetic high molecular weight polymers formed by repeating acrylic acid units, bioadhesive materials used as gelling agents and stabilizers of emulsions<sup>(6)</sup>. The use of papain gels have become a trend in Brazil, due to its ability to maintain the enzymatic stability of papain in a more satisfying way than in diluted powder<sup>(4)</sup>.

Another important aspect regarding the use of papain is that although it has been established for decades, there is no consensus among nurses in relation to the concentration, method used, the duration of the solution after dilution and the indications for the use of papain<sup>(7)</sup>, demonstrating the need for more research to contribute with evidence of the effect of papain, promoting the basis for decision making regarding its use in venous ulcers.

In addition, the care of venous ulcers requires constant updating, thus, the preparation and application of clinical protocols that promote the improvement of care for venous ulcers and ongoing training of health professionals are

extremely important<sup>(8)</sup> and may be used as a foundation for further research on the subject.

Therefore, this study aimed to analyze the effectiveness of 2% and 4% papain gels in tissue repair of venous ulcers.

## METHOD

This is a quasi-experimental study in which the venous ulcers were treated with 2% and 4% papain gels and evaluated before and after exposure to the intervention, through a research protocol on which the bed ulcers only received treatment with papain gels in the cited concentrations.

The study met the ethical principles of Resolution No. 196/96 of the Brazilian National Health Council and was approved by the Research Ethics Committee of the School of Medicine of the Universidade Federal Fluminense, with the No. 196/08 and CAAE No 0154.0.258.000-08<sup>(9)</sup>. Patients expressed their willingness to participate in the study by signing the Consent Form.

The study was conducted in two stages: the first stage delimited the production of papain gels formulations, by professors and pharmaceutical professionals of the University School of Pharmacy, seeking stability and product quality. Sensory evaluation were carried out by specialist nurses and the production process mapped by international standards of quality control to ensure the perfect reproducibility of the product.

The second stage was developed at a Wound Healing Clinic of a public Teaching Hospital, quaternary level, reference for the treatment of chronic lesions of Niteroi city and surrounding areas.

A consecutive sample was composed of patients seen in the clinic from April to November in 2011, who met the following inclusion criteria: age over 18 years; who presented venous ulcer dimensions greater than 2.0 cm<sup>2</sup>; who was clinically referred to the use of papain gels in concentrations of 2% and 4%, or presented the ulcer bed granulation tissue or the liquefaction necrosis or slough to 100%; who demonstrated understanding of the health team's guidance or who had a legal guardian to ensure continuity of care at home.

Exclusion criteria were: allergy to the product of the research; any type of allergy to latex; circular lesions on the lower limbs; psychiatric diseases; pregnancy and lactation; arterial ulcers; infection at the site of lesion and lack of continuity of home treatment. Circular lesions were excluded due to difficulty of planimetry evaluation to monitor the evolution of injury. The exclusion of pregnant and lactating women occurred because there were no volunteers with these characteristics in this clinical study. Volunteers with infection at the lesion site were excluded by the need to use medication and therapy not included in the study, such as systemic or local antibiotics.

After orientation and signature of the Consent Form by the participants, 21 volunteers were included with 39 ulcers. Five were excluded for reasons such as: disorientation and lack of a guardian; tendons' exposure and pain complaints, whereas the gold standard treatment for this condition is graft tissue and there is no evidence of the use of papain

on the tendon; erysipelas infection, due to the need for systemic antibiotics; death caused by Acute Renal Failure. A total of 16 patients remained with 30 ulcers, with follow-up time of 90 days, for a total of 191 consultations, with an average of 12 visits per patient (SD = ± 1.75).

For data collection, instruments and service protocols were used, containing sociodemographic and clinical data of the patient and lesion. To determine the underlying disease, we used the records of medical diagnosis from charts.

Each subject was evaluated once a week and the measurement of the lesions was performed through an adhesive technique and photographic record every 15 days. The measurement was carried out after cleaning the wound with 0.9% saline solution in the case of granulation tissue, and neutral soap in perilesional region in cases of slough and abundant exudate, according to protocol. The photographic record was made with a digital Camera with 90° focus of the lesion, and a distance of 50 cm.

The following concentrations of papain were used: at home, 2% papain gel wt/wt (percentage weight-weight) once a day or every dressing changes required in the case of excess exudate regardless of the amount of slough. In the clinic, 4% papain gel (wt/wt) once a week, when the amount of slough in the wound bed was higher than 50% of the tissue in the wound bed and 2% papain gel (wt/wt) where the amount of slough in the wound bed was less than 50%. 4% papain is the highest concentration of the study, so it was applied under professional supervision in the clinic, to control adverse reactions<sup>(4)</sup>.

As clinic protocol, at the perilesional region, we advised patients to use lubricants and moisturizers for skin such as creams or oils containing essential fatty acids (EFA); urea cream; liquid vaseline or mineral oil. Care should not be restricted only to the ulcer, but also the perilesional region<sup>(10)</sup>. EFA are widely used in Brazil without contraindications or side effects<sup>(11)</sup>.

The dressings were performed once a week in the clinic by the researcher and changed daily at home by the patient, previously advised and trained. For daily exchange, we provided a dressing kit weekly to each patient with the following materials: tube of 2% papain gel, gauze, bandages and tape to the dressing fixation. For the transport of papain gel, we provided a freezer bag and a reusable artificial ice sheet.

We also provided them a leaflet containing hours of attendance, telephone contact in case of any problem or doubt, with information about the transport and storage of the product (keep the tube of gel in a clean plastic bag, inside the refrigerator, on the second shelf; it should always be transported in a box or freezer bag with ice); care in changing the dressing at home every 24 hours or when the bandage presented signs of saturation, exudate accumulation; extra care not to wet the dressing while taking a shower; application of the product only within the wound and do not use metal objects to spread the product on the gauze.

In addition, the patient or her/his legal guardian was advised about the importance of maintaining the product refrigerated, with removal of the tube from the refrigerator only at the moment of dressing in order to maintain enzy-

matic stability and product use conditions, given that papain is thermolabile and loses its enzymatic activity when exposed to heat<sup>(4)</sup>.

Research data were collected by the researchers themselves after training. The analysis variables of primary outcomes were: evolution of the area of venous ulcers; percentage of healed ulcers and the evolution of the type of tissue in the bed of the lesions. For the secondary outcomes were considered: depth; type and amount of exudate of the lesion; odor; pain; perilesional edema; adverse reactions such as itching and pain after using the product; and characteristics of edges and the adjacent skin.

The inferential analysis consisted of the following methods: the variation of the area of early injury to the end of treatment was analyzed using the Wilcoxon test; the comparison of the absolute delta (cm<sup>2</sup>) and relative (%) of the lesion area was analyzed by Kruskal-Wallis ANOVA and by multiple comparison of the Dunn test; the variation of tissue in the wound bed and lesion characteristics (ordinal variables) from baseline to end of treatment were measured by McNemar test.

Nonparametric methods were used because the areas of values were not normally distributed (Gaussian distribution), due to the wide dispersion of data and rejection of the hypothesis of normality according to the Kolmogorov-Smirnov test. The significance level adopted was 5%. Statistical analysis was performed with the statistical software SAS® System version 6.11 (SAS Institute, Inc., Cary, North Carolina).

## RESULTS

Most participants were female (56.25%), a ratio of 1.2:1; aged between 51 and 59 years (56.25%), and low educational level (62.50%). The average age of the volunteers was 62.31 years, median of 58.50 years and standard deviation of ± 10.15. Only 6.25% were smokers and 12.50% reported occasional use of alcohol.

The Body Mass Index (BMI) shows that 87.50% of the volunteers were considered outside the normal weight standards: 6.25% underweight; 6.25% overweight; 43.75% with obesity class I; 18.75% with obesity class II and 12.50% with obesity class III.

Regarding underlying diseases, 37.50% of the volunteers had systemic arterial hypertension (SAH) and 25% of Chronic Venous Insufficiency (CVI); 37.50% had, in addition to hypertension, other diseases, 18.75% with Diabetes Mellitus; 12.5% with Chronic Venous Insufficiency and 6.25% with both conditions.

## CHARACTERISTICS OF VENOUS ULCERS

The majority, 62.5% of the volunteers, had more than one lesion and 12.5% reported reincidence after other treatments. Regarding occurrence time, 43.75% had venous ulcers for less than three years and 12.5% for over ten years. The average time was five years, with a median of 4 years and a standard deviation of ± 6 years. The minimum time was five months and a maximum of 25 years. According

to the Spearman coefficient, there was no significant correlation between age and the time of lesion ( $r = -0.088$ ;  $p = 0.74$ ) in the 16 study volunteers.

Regarding the site of ulcers, 50% were in the malleolus region, 40% in thirds of the leg (upper, middle and lower) and 10% in the foot dorsum. As for the primary outcome, evolution of the area of venous ulcers, 93.33% had a reduction of which 20% reduced completely. Only 6.67% increased from 16 to 29% of their areas.

Considering the whole sample, there was a significant reduction in the area 7.9 cm<sup>2</sup> on average ( $p = 0.0001$ ), corresponding to an average of 50% ( $p = 0.0001$ ) in the area of ulcers after 90 days of treatment. Due to the large variability observed in the initial lesion area (2 to 120 cm<sup>2</sup>) in this sample, the impact of treatment was also examined separately in three subgroups of initial area: between 2 cm<sup>2</sup> to 3,9 cm<sup>2</sup> ( $n = 10$ ); from 3,9 to 20 cm<sup>2</sup> ( $n = 10$ ) and > 20 cm<sup>2</sup> ( $n = 10$ ).

In the subgroup with initial area of 2 cm<sup>2</sup> to 3.9 cm<sup>2</sup> there was a significant reduction in average of 1.6 cm<sup>2</sup> ( $p = 0.005$ ), which corresponds to 60% ( $p = 0.003$ ) in the area of those ulcers. There was complete healing of four venous ulcers in this subgroup.

In the subgroup with initial area between 3.9 to 20 cm<sup>2</sup> there was a significant reduction in average of 6.5 cm<sup>2</sup> ( $p = 0.005$ ), which corresponds to 66.6% ( $p = 0.005$ ) in the area of those ulcers. Two ulcers were completely healed in this subgroup.

In the subgroup with initial area of > 20 cm<sup>2</sup>, there was a significant reduction in lesion area, on average, 15.7 cm<sup>2</sup> ( $p = 0.002$ ), which corresponds to 23.7% ( $p = 0.002$ ). There was no significant difference at the level of 5%, in the healing of the subgroups < 3.9 cm<sup>2</sup> and 3.9 to 20 cm<sup>2</sup>.

The percentage of healed ulcers was 20%, all initial areas were less than or equal to 4 cm<sup>2</sup>, 66.6% had occurred over twelve months before the study ( $SD = \pm 22$  months). The age of patients whose wounds were healed varied between 51 and 72 years, with an average of 60.25 and a median of 59 years, with a standard deviation of  $\pm 9.98$ . The average healing time was 56.67 days, with a median of 60 days, standard deviation of  $\pm 9.83$ .

Regarding the evolution of tissue in the bed of venous ulcers, the types of tissues that could be found in the bed of the ulcers were divided into four groups: necrotic tissue, slough, granulation tissue and epithelialization. No ulcer had dried necrosis. The variation in bed tissue of the ulcers after treatment with the papain gel was evaluated according to its intensity, semi-quantitatively varying in six levels: 0%; 1-25%; 26-50%; 51-75%; 76-99% and 100%, which represent the amount estimated in the visual assessment of the wound, in each nursing visit (Table 1).

In the total sample, as shown in Table 1, there was significant reduction of slough in the tissue ( $p < 0.001$ ) and a significant increase in epithelialization ( $p < 0.001$ ) from baseline to end of treatment. There were no significant changes in granulation tissue ( $p = 0.25$ ). The use of papain gel demonstrated their activity as debriding slough in the tissue, providing a significant reduction in the quantity of this tissue.

**Table 1** – Intensity of the tissues at the baseline and at the end of treatment – Niteroi, RJ, Brazil, 2011.

Type of tissue	Intensity	Baseline (0 day)		End (90 days)		p value <sup>a</sup>
		N	%	n	%	
Slough	0%	0	0	10	33.3	< 0.001
	1-25%	12	40.0	17	56.7	
	26-50%	9	30.0	3	10.0	
	51-75%	2	6.7	0	0	
	76-99%	7	23.3	0	0	
Granulation	100%	0	0	0	0	0.25
	0%	2	6.7	7	23.3	
	1-25%	7	23.3	2	6.7	
	26-50%	8	26.7	4	13.3	
	51-75%	5	16.7	9	30.0	
Epithelialization	76-99%	8	26.7	8	26.7	< 0.001
	100%	0	0	0	0	
	0%	4	13.3	0	0	
	1-25%	26	86.7	14	46.7	
	26-50%	0	0	7	23.3	
Epithelialization	51-75%	0	0	2	6.7	< 0.001
	76-99%	0	0	1	3.3	
	100%	0	0	6	20.0	

a = McNemar test.

**Table 2** - Lesion characteristics at baseline and end of treatment – Niteroi, RJ, Brazil, 2011.

Characteristics	Category	Baseline (0 day)		End (90 days)		p value <sup>a</sup>
		N	%	n	%	
Depth	Healed	-	-	6	20.0	<b>0.001</b>
	Superficial	8	26.7	14	46.7	
	Partial	22	73.3	10	33.3	
Exudate type	None	-	-	6	20.0	<b>0.0001</b>
	Serous	3	10.0	13	43.3	
	Serosanguineous	25	83.3	11	36.7	
	Purulent	2	6.7	0	0.0	
Exudate amounts	None	-	-	6	20.0	< <b>0.0001</b>
	Small	9	30.0	13	43.3	
	Medium	15	50.0	11	36.7	
Foul odor	Large	6	20.0	0	0.0	0.99
	Yes	1	3.3	0	0.0	
	No	29	96.7	30	100.0	
Pain in the bed of venous ulcers	Yes	13	43.3	8	26.7	0.30
	No	17	56.7	22	73.3	
Pain after using the product	Yes	2	6.7	6	20.0	0.28
	No	28	93.3	24	80.0	
Perilesional edema	Yes	25	83.3	6	20.0	< <b>0.0001</b>
	No	5	16.7	24	80.0	
Ulcer edges	Epithelized	27	90.0	28	93.3	0.99
	Macerated	3	10.0	2	6.7	
Adjacent skin	Hydrated	19	63.3	26	86.7	0.096
	Dried	11	36.7	4	13.3	

a = McNemar test.

Table 2 shows the variables of the secondary outcomes regarding the characteristics of venous ulcers.

As shown in Table 2, a significant improvement after treatment with the papain gel, the depth ( $p = 0.001$ ), the type and amount of exudate ulcers ( $p = 0.0001$ ) and edema ( $p < 0, 0001$ ). There were no significant differences in other characteristics of the ulcers as odor, pain, pain after using the product, edges and adjacent skin to the lesion. It was considered as superficial depth of ulcer one that affects the epidermis and dermis, and partial when it affects the subcutaneous tissue<sup>(12)</sup>. None of the participants had adverse reactions to the product.

## DISCUSSION

Regarding sociodemographic characteristics, most participants of the study were female. Statistics show both nationally and internationally that venous ulcers have a higher prevalence in female population, due to pregnancy and the presence of hormones that predispose the occurrence of Chronic Venous Insufficiency and venous ulcers<sup>(13-15)</sup>. However, some studies have presented a higher incidence in males<sup>(1,16)</sup>.

Most participants observed age in this study was patients between 51 and 59 years. Although the prevalence of venous ulcers is greater in the elderly<sup>(13,15)</sup>, the early occurrence of the ulcer is related to the higher prevalence of comorbidities, the increased risk of complications and poor prognosis<sup>(1,16)</sup>.

Most of the study participants did not smoke or consumed alcohol on a daily basis. This is a positive factor because smoking is considered a risk factor for venous ulcer and unfavorably interferes with the tissue healing process, because it interferes in tissue oxygenation, oxidative stress which affect the function of macrophages and change in the levels of vitamin C and collagen<sup>(17-18)</sup>.

Regarding the Body Mass Index (BMI), most participants had some degree of obesity and had one or more diseases such as systemic hypertension, the Chronic Venous Insufficiency and Diabetes Mellitus. Both obesity and the presented underlying diseases are risk factors for the development of venous ulcers and delayed healing<sup>(19)</sup>.

The venous ulcer is the most serious consequence of chronic venous insufficiency, they are considered a long-term problem and of frequent recurrence, 30% in the first year, rising to 78% after two years<sup>(13,16)</sup>.

The malleolus region was the most affect regarding the location of the studied ulcers. The location varies among studies, with higher occurrence in malleolar region<sup>(17)</sup>; lower third or distal half<sup>(1,14)</sup>.

Lesion characteristics directly influence the quality of life of patients with venous ulcers<sup>(15)</sup>. The primary outcome observed in this study, evolution of the area of venous ulcers, pointed out that the total sample was significantly reduced and ulcers that were between 3.9 cm<sup>2</sup> to 20 cm<sup>2</sup> were the most benefited from the use of papain gel, and smaller than 3.9 cm<sup>2</sup> also demonstrated an excellent average reduction. More than half of study ulcers were reduced by at least 60% of their areas, showing a favorable rate of reduction to the use of papain gel. Ulcers with an area greater than 24 cm<sup>2</sup> are considered poor prognosis due to the poor conditions for healing<sup>(16)</sup>.

The percentage of healed wounds was 20%. Some factors are considered as good prognosis for venous ulcer healing, such as wounds which are smaller than 20 cm<sup>2</sup>, time of occurrence less than 12 months and the presence of epithelialization greater than 10% of the surface in the first 50 days of treatment<sup>(19)</sup>. In this group, the lesions were smaller than 4 cm<sup>2</sup>, favorable factor to healing. However, the lesion time of most of the ulcers was greater than 12 months, a complicating factor for the healing process. The prolonged time of active ulcer proved to be an independent factor associated with poor prognosis for healing, however, the size of the ulcer at baseline showed no significant statistical interference in healing<sup>(3,14)</sup>.

Regarding the type of tissue, all ulcers assessed by the study showed some degree of liquefaction necrosis or slough, which is a thin consistency devitalized tissue, mucoid, soft, yellowish gray color, formed by bacteria, fibrin, elastin, collagen, leucocytes, cell exudate and fragments. The presence of slough is considered a bad condition for healing<sup>(16)</sup>.

The results showed a significant decrease in slough tissue, demonstrating that the papain gel was effective as a debriding. Although not observed by statistical tests in the granulation tissue variation, there was a significant increase in epithelialization of the bed of venous ulcers, indicating that the papain gel used favored the healing process. The presence of granulation tissue is a good prognosis of the wound, since the next stage, epithelialization should initiate its closure, which depends on the completion of this tissue lesion<sup>(14)</sup>.

There was also an improvement in depth of venous ulcers, the type and amount of exudate and edema. The exudate in the wound bed is a physiological process in abundance in the inflammatory phase of chronic ulcers. The serous exudate demonstrates the absence of infection in the wound bed, with a better prognosis<sup>(14)</sup>.

However, excessive exudate may lead to irritative exudation through dermatitis maceration of skin adjacent to the ulcer with increased local inflammation and microbial eczema caused by bacterial colonization, delaying healing. Large amounts of exudate is another bad condition for ulcer healing<sup>(16)</sup>.

Wounds with less exudate and odor contribute to patient rehabilitation in social centers, improving the quality of life for these clients<sup>(15)</sup>. The superficialization of ulcers, reducing the amount and type exudate are improvement factors which indicate the progress of the healing process.

Pain is a common symptom in patients with venous ulcers, which compromises the quality of life, due to the limitations of physical activities and provision for daily life activities, but adequate assistance can contribute to better understanding of pain and its reduction<sup>(15,20-22)</sup>.

Edema interferes with oxygenation and nutrition of tissue in formation, preventing the synthesis of collagen, decreasing cell proliferation and reducing tissue resistance to infection. It is common in venous insufficiency, and its reduction can improve the healing process<sup>(16)</sup>.

Nursing consultations using dressing with papain gel met the main guidelines for the treatment of venous ulcers,

as nurses were able to advise the patient and to prevent venous stasis, stimulating rest and elevation of the lower limbs, using a coverage which maintained an humid conditions, leading to decreased pain and exudate<sup>(15)</sup>. Continuous monitoring of patients with ulcers helps to improve the activities of self-care<sup>(20)</sup>.

None of the products used by patients in the adjacent skin caused any interaction with papain that could be considered harmful or that there was need for suspension and/or notification. The advice provided to patients regarding the care of the skin adjacent to the venous ulcers, through the use of moisturizing and oil, associated with the use of papain gels in the wound bed showed improved adjacent skin hydration.

The characteristics of ulcer edges define the propensity of ulcer healing. In this study, the edges become epithelialized and only one participant showed maceration. The epithelialized tissue edges tend to be thinner, demonstrating that the healing process is progressing. Inflammatory signs such as pain, redness and swelling at the edges and in the perilesional region can indicate infection. The maceration can be caused by prolonged exposure of the skin to fluids<sup>(16)</sup>.

## CONCLUSION

In this study, 30 ulcers of 16 volunteers were assessed throughout 90 days of treatment. Most participants were female with an average age of 62.31 years (SD = ± 10.15), obese with Hypertension and Diabetes Mellitus.

Considering the whole sample, there was a significant reduction in lesion area by the size of 50%. In subgroups analysis, a significant average reduction of 60% in the subgroup <3.9 cm<sup>2</sup> and 66.6% in ulcers with area from 3.9 to 20 cm<sup>2</sup>, ie papain gels were effective in reducing the wounds area of up to 20 cm<sup>2</sup>. However, there was also significant average reduction of 23.7% in wounds larger than 20 cm<sup>2</sup>.

The percentage of healed wounds was 20%, with an average healing time of 56.67 days, ± 9.83. There was significant reduction of slough and increased tissue epithelization, reducing the wound depth, the amount of exudation and edema.

As limitations of the study, we mention the sample size due to the difficulty of recruiting patients who met the clinical study inclusion criteria, including the follow-up time.

It is concluded that 2% and 4% papain gels were effective in healing of venous ulcers and can be safely used in slough and granulation tissue, without reports of adverse events.

## RESUMO

**Objetivo:** Analisar a efetividade dos géis de papaína a 2% e 4% no reparo tecidual das úlceras venosas. **Método:** Estudo quase-experimental, com amostra consecutiva de 16 pacientes com 30 úlceras venosas, atendidos no ambulatório de um hospital universitário, de abril a novembro de 2011, com formulário para avaliação clínica do paciente e da lesão. Variáveis analisadas pelos testes de Wilcoxon e McNemar ( $p < 0,05$ ). **Resultados:** Predomínio do sexo feminino; idade entre 51 e 59 anos; obesas; com Hipertensão Arterial Sistêmica. Quanto às úlceras, houve redução média de 7,9 cm<sup>2</sup> (50% do tamanho) em 90 dias; 20% cicatrizaram completamente em 56,67 dias. Houve aumento da epitelização, redução significativa do esfacelo e do edema, melhora na profundidade, no tipo e na quantidade de exsudato ( $p < 0,0001$ ). **Conclusão:** Os géis de papaína a 2% e 4% foram efetivos na cicatrização de úlceras venosas.

## DESCRIPTORIOS

Úlcera Varicosa; Úlcera da Perna; Papaína; Resultado do Tratamento; Enfermagem.

## RESUMEN

**Objetivo:** Analizar la efectividad de los geles de papaína al 2% y al 4% en la reparación del tejido de las úlceras venosas. **Método:** Estudio cuasi-experimental, con muestra consecutiva de 16 pacientes con 30 úlceras venosas, atendidos en el ambulatorio de un hospital universitario, de abril a noviembre de 2011, con formulario para evaluación clínica del paciente y la lesión. Variables analizadas por las pruebas de Wilcoxon y McNemar ( $p < 0,05$ ). **Resultados:** Predominio del sexo femenino; edad entre 51 y 59 años; obesas; con Hipertensión Arterial Sistémica. En cuanto a las úlceras, hubo reducción media de 7,9 cm<sup>2</sup> (el 50% del tamaño) en 90 días; el 20% cicatrizaron completamente en 56,67 días. Hubo incremento de la epitelización, reducción significativa de la esfacelación y el edema, mejora en la profundidad, la clase y la cantidad de exudado ( $p < 0,0001$ ). **Conclusión:** Los geles de papaína al 2% y al 4% fueron efectivos en la cicatrización de úlceras venosas.

## DESCRIPTORES

Úlcera Varicosa; Úlcera de la Pierna; Papaína; Resultado del Tratamiento; Enfermería.

## REFERENCES

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