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Exploratory cross-sectional study of the use of a green propolis-based ointment in the treatment of skin tears in elderly hospitalized patients

Estudo transversal exploratório do uso de pomada à base de própolis verde no tratamento de skin tears em idosos hospitalizados

Estudio transversal exploratorio del uso de una pomada con propóleo verde en el tratamiento de skin tears en pacientes ancianos hospitalizados

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Abstract
The purpose of this cross-sectional study was to evaluate the use of a green propolis-based ointment for the treatment of skin tears in an elderly hospitalized population. Eleven subjects over 60 years old were selected. They were admitted to a general hospital and received local treatment for skin tears during the hospital stay with a green propolis-containing ointment. Personal data was obtained from the hospital admission to identify the patient's characteristics. Body mass index, alleged allergy to propolis, use of medications, comorbid conditions, degree of dependence (Fugulin scale), and degree of frailty (Rockwood scale) were also obtained. The skin tears were classified using the STAR system. The use of a propolis-containing ointment in skin tears resulted in the improvement of hematomas in the flaps and periflaps of skin tears. In addition, it helped to prevent the colonization and proliferation of bacteria at the injury site, recovering the injured tissue and resulting in viable and quality tissue. No complaints of pain or side-effect events such as signs of tenderness or local or systemic toxicity in the treated patients were reported. The skin tear flaps, darkened by bruises that occurred during the trauma, were gradually absorbed, and the skin improved its surface appearance. The treated tissue presented new and better quality epithelium regardless of treatment time. The ointment containing propolis was effective for the treatment of skin tears. The set of results obtained supported the assumption that propolis-based ointment can be included as an effective option to treat skin tears.
Keywords: Aged; Bedridden persons; Ointments; Propolis; Wounds and injuries.

Resumo
Propôs-se avaliar neste estudo transversal o uso de uma pomada contendo própolis verde no tratamento de *skin tears* em uma população idosa hospitalizada. Foram selecionados 11 sujeitos com mais de 60 anos, internados em um hospital geral, que receberam tratamento local para lesões cutâneas durante a internação com uma pomada contendo própolis verde. Dados pessoais obtidos a partir da admissão hospitalar identificaram as características dos mesmos. Dados como índice de massa corporal, alergia à própolis, uso de medicamentos, comorbidades, grau de dependência (escala de Fugulin) e grau de fragilidade (escala de Rockwood) também foram obtidos. As lesões cutâneas foram classificadas usando o sistema STAR. O uso da pomada melhorou os hematomas nos retalhos e no tecido periférico das *skin tears*. Além disso, ajudou a prevenir a colonização e proliferação de bactérias no local da lesão, recuperando o tecido lesado e resultando em tecido viável e de qualidade. Não foram relatadas queixas de dor ou eventos de efeitos colaterais, como sinais de sensibilidade ou toxicidade local ou sistêmica nos pacientes tratados. Os retalhos de *skin*

*tear*s, escurecidos pelos hematomas ocorridos durante o trauma, foram gradativamente absorvidos, e a pele melhorou o aspecto superficial. O tecido tratado apresentou epitélio novo com melhor qualidade, independentemente do tempo de tratamento. A pomada contendo própolis foi eficaz para o tratamento de *skin tears*. O conjunto de resultados obtidos deu suporte ao pressuposto de que a pomada à base de própolis pode ser incluída como uma opção eficaz no tratamento de *skin tears*.
Palavras-chave: Ferimentos e lesões; Idoso; Pessoas acamadas; Pomadas; Própole.

Resumen
El propósito de este estudio transversal fue evaluar el uso de una pomada a base de propóleo verde en el tratamiento de *skin tears* en una población anciana hospitalizada. Se seleccionaron once sujetos mayores de 60 años en un hospital general, que recibieron tratamiento local de lesiones cutáneas durante su hospitalización con una pomada a base de propóleo verde. Los datos personales obtenidos del ingreso hospitalario identificaron sus características. También se obtuvieron datos como índice de masa corporal, alergia al propóleo, uso de medicamentos, comorbilidades, grado de dependencia (escala de Fugulin) y grado de fragilidad (escala de Rockwood). Las lesiones cutáneas se calificaron utilizando el sistema STAR. El uso de la pomada mejoró los hematomas en los colgajos y en el tejido periférico de *skin tears*. Además, ayudó a prevenir la colonización y proliferación de bacterias, recuperando el tejido lesionado y dando como resultado un tejido viable y de calidad. No se informaron quejas de dolor o efectos secundarios, como signos de sensibilidad o toxicidad local o sistémica, en los pacientes tratados. Los colgajos de desgarro de la piel, oscurecidos por los hematomas producidos durante el traumatismo, fueron absorbidos paulatinamente y la piel mejoró su aspecto superficial. El tejido tratado presentó nuevo epitelio de mejor calidad, independientemente del tiempo de tratamiento. El ungüento que contenía propóleos fue eficaz para tratar *skin tears*. El conjunto de resultados obtenidos apoyó la suposición de que la pomada a base de propóleo puede incluirse como una opción eficaz en el tratamiento de *skin tears*.
Palabras clave: Anciano; Heridas y lesiones; Personas encamadas; Pomadas; Própolis.

1. Introduction

Skin tears are traumatic wounds that occur in the extremities as a result of friction and shearing forces that separate the dermis from the epidermis or both the dermis and epidermis from underlying structures (Strazzieri-Pulido et al., 2017). Clinical practice strongly suggests that skin tears are a clinically relevant and prevalent occurrence, especially among older patients and individuals with chronic or critical illness (Koyano et al., 2017). A number of general and specific risk factors for the development of skin tears have been reported, mostly among the frail and elderly, including general and specific skin factors (Stephen-Haynes, 2020; Van Tiggelen et al., 2020). The skin is more susceptible to damage from mechanical forces such as moisture, friction, and shear due to collagen and elastin losses (Stephen-Haynes, 2012). In addition, arteriosclerotic changes in the small and large vessels cause thinning of vessel walls and a reduction in the blood supply to the extremities (Langemo et al., 2019). This causes the skin to become thinner, more fragile, and more vulnerable to skin tears.

Many elderly people have visual impairment, psychomotor agitation, urinary and/or fecal incontinence, malnutrition, and metabolic and immunological disorders caused by diseases such as diabetes, in addition to frequent infections, which represent greater exposure and chances of breaking the fragile skin (McInulty, 2017). Cognitive impairment can also occur slowly in cases of dementia, and decreased sensitivity is a critical and favorable factor for the occurrence of skin tears. Arms, elbows, backs of hands, and legs are exposed areas claimed to be the most common regions subject to skin tears (Koyano et al., 2016).

Estimates of the prevalence of skin tears vary depending on the elderly's health circumstances. In the community, the prevalence of skin tears varies from 4.5–19.5%, whereas in long-term care populations ranges from 3.9 and 26% (LeBlanc & Baranoski, 2017; Skiveren et al., 2017; Woo & LeBlanc, 2018). Care for the skin of the elderly, especially those in a critical condition and/or with physical immobility and confined to bed, has been highlighted as an important challenge for care teams (Leblanc et al., 2013). Considering the increase in life expectancy, there is a tendency to increase the prevalence of skin tears (Hardie & Wick, 2020). Health professionals have difficulties regarding the identification and diagnosis of skin tears in daily clinical practice, which invariably leads to a delay in interventions and care, making it impeditive for prevention management

of this type of skin wound (Chang et al., 2016). In this manner, the prevalence of skin tears seems to be underestimated (Carville et al., 2014).

Depending on the extension, dressing with different materials is the most common treatment for skin tears in order to promote healing and to avoid additional risks to the skin (Stephen-Haynes, 2012). Dressings can create and maintain a moist environment, providing an optimal condition for wound healing (Jones et al., 2006). Some of the available wound dressings contain active antimicrobial ingredients, such as silver, iodine, honey, among others, aimed at reducing the bacterial damage in the surficial skin (Woo & LeBlanc, 2018). It has also been claimed that dressing is prophylactically used to prevent deeper infection of treated localized wounded areas, minimizing the need for systemic antibiotics (Langemo et al., 2019).

Currently, there is a trend towards the use of biological compounds from natural products in medications or associated with medicinal products (Palombo, 2011). Natural products are the main source of innovative and effective therapeutic agents, offering bioactive molecules with a wide range of molecular structures (Jeon et al., 2011). Of special interest, as an alternative to conventional over-the-counter products, propolis-containing products have been used as an active ingredient in commercial products in varied presentations (Abbasi et al., 2018; Matochek et al., 2020). Due to the abundance of bioactive compounds, propolis presents several biological activities (Marcucci, 1995; Więckiewicz et al., 2013).

The broad application of propolis, a multi-target natural product chemically rich in bioactive agents, has gained the attention of clinicians due to some new and promising areas of use and the development of innovative propolis-containing products that have emerged recently (Bankova et al., 2016). The goal of this clinical trial is to assess the efficacy of a green propolis-based ointment in the treatment of skin tears in a hospitalized elderly population. The research hypothesis was that the propolis-based ointment would have a negative effect on skin tear healing when compared to control, conventionally treated wounded areas.

2. Methodology

2.1 Green propolis-based ointment

The propolis ointment was prepared with dry ethanolic extract (alcohol free) of BRPX propolis containing a high content of phenolic compounds, including Artepillin-C, characteristic of this type of propolis. The base used was petrolatum (81.6%) and the concentration of propolis BRPX was 11.5% (Marcucci et al., 2008).

2.2 Exploratory clinical study

This exploratory, cross-sectional, and analytical clinical study was carried out in a private medium-sized hospital (General Hospital, São Paulo, Brazil). Of these, 110 out of 181 beds are in the Surgical Medical Clinic, with an average occupancy rate of 40% for elderly patients. The present study was performed from July to August 2021, in which all the patients admitted to the hospital during this period were daily examined and monitored. During the evaluations, exclusions and inclusions were performed. At the end of this time, the subjects selected for the study consisted of hospitalized older than 60-year-old patients with open skin tears detected at the time of admission with up to 48 hours of tissue disruption prior to admission. The study was approved by the Research Ethics Committee of Hospital Santa Cruz (CAEE: 12691119.9.0000.8098). In order to participate in the study, in addition to the criteria mentioned, patients or companions had to agree by signing the informed consent form. It is noteworthy that, for the inclusion of patients unable to sign or consent to participating in the study due to their clinical status (chronic, bedridden, with altered consciousness), informed consent was proposed to the accompanying person responsible for the patient after exposing the objectives of the study and accepting the same for patient inclusion.

Data was obtained from the hospital admission in order to identify the patient's characteristics. The extracted data were: patient identification, origin, date of admission, age, sex, body mass index (BMI), report of allergy to propolis, use of medications such as non-steroidal anti-inflammatory drugs, antibiotics, anticoagulants, comorbid conditions (diabetes, hypertension, obesity), degree of dependence (Fugulin Patient Classification System) (Santos et al., 2007), and degree of frailty (Rockwood Frailty Classification Scale) (Theou et al., 2021). The skin tears was classified using the classification system STAR (Skin Tears Audit Research) (Carville et al., 2007; Strazzieri-Pulido et al., 2015). The purpose of using this instrument was to characterize the lesions in the first evaluation in terms of type and appearance in relation to tissue loss and flap conditions.

The skin tears were treated with a green propolis-based ointment (Apis Brasil, Pindamonhangaba, SP, Brazil) by daily applying dressings until the patient's discharge. Every 2 days, measurements of the lesion were performed to check the evolution of the treatment using the instrument called the Pressure Ulcer Scale for Healing (PUSH scale) (Stotts et al., 2001). This scale considers three parameters to assess the wound healing process and intervention results as follows:

1) wound area, related to the greatest length (in the cephalocaudal direction of the lesion) versus the greatest width of the lesion (in a horizontal line from right to left), in square centimeters: 0 (0 cm^2), 1 (< 0.3 cm^2), 2 (0.3 to 0.6 cm^2, 3 (0.7 to 1.0 cm^2), 4 (1.1 to 2.0 cm^2), 5 (2.1-3.0 cm^2), 6 (3.1 to 4.0 cm^2), 7 (4.1 to 8 cm^2), 8 (8.1 to 12.0 cm^2), 9 (12.1 to 24.0 cm^2), and 10 (> 24 .0 cm^2).

2) amount of exudate: 0 (absent), 1 (small), 2 (moderate), 3 (large);

3) tissue type: 0 (closed wound), 1 (epithelial tissue), 3 (granulation tissue), 3 (slough), and 4 (necrotic tissue).

The sum of the scores obtained in these three parameters determines the total score of the PUSH scale.

The treatment of skin tears with the green propolis-based ointment was carried out according to the following steps:

1) Cleaning of the lesion with an aseptic technique using a 0.9% saline solution,
2) Lesion area measurement with a disposable ruler;
3) Analysis of the healing of skin tears using the PUSH scale;
4) Wound cleaning with a 0.9% saline solution;
5) Approximation of the edges of the lesion (rolling the tissue flap to cover the lesion);
6) Application of the green propolis ointment with a sterile spatula at the lesion site, gently gliding in an attempt to bring the injured flap closer;
7) Placement of the first cover (sterile gauze) after application of the product;
8) Fixation of the dressing with a 15 cm crepe strip (3M), making a light bandage and using an adhesive tape for fixation.

When changing the dressings, the direction of the replaced flap was maintained by rolling the flap over the lesion, thus not causing further trauma to the flap.

2.3 Final assessment of the appearance of the skin tears tissue

At the patient's discharge, the repaired tissue was evaluated according to the time (days) of hospitalization. For this analysis, the response to treatment was evaluated by the final appearance achieved in terms of tissue repair, that is, evidence of necrotic tissue (black), fibrinous tissue (yellow), granulation tissue or epithelial tissue (red) by the RYB system (red, yellow, and black) (Krasner, 1995). This injury assessment system was used to reinforce the findings regarding tissue repair obtained by the PUSH scale.

2.4 Statistical analysis

For categorical independent variables, the nonparametric Mann Whitney test (for two categories) and the Kruskall Wallis test (for investigations with three or more categories) were used. The relationship between each of the numerical variables and treatment time was investigated using Spearman's correlation test. Data was processed using Stata 14.0 software (Houston, TX, USA). In all tests, the level of significance was 5%.

3. Results

Table 1 displays the sociodemographic and clinical profiles of cases with skin tears treated with green propolis ointment. The majority of patients treated with the propolis-containing ointment were males, aged over 85 years, and lived in their own homes. As for the median values of the numerical variables, there are 12 days for treatment time, 89 years for age, 17.9 for BMI, and 6 for the number of pre-existing diseases. As for health, 55.5% were underweight (BMI 18.5), 63.6% had more than 6 diseases, 54.5% had diabetes mellitus, and all had systemic arterial hypertension. In terms of medication, 18.2% of the patients regularly use nonsteroidal anti-inflammatory drugs, 90.9% take antibiotics, and 72.7% take anticoagulants.

Table 1 - Characteristics of patients with skin tears treated with green propolis-based ointment.

	Variables	n	%
Gender	Female	3	**27.3**
	Male	8	**72.7**
Treatment time (days)	Median (IQ25-75)	12 (6-14)	
Age	≤85 years old	4	**36.4**
	>85 years old	7	**63.6**
	Median (IQ25-75)	89 (84-96)	
BMI	*****<18.5 Kg/m^2 (low weight)	6	**55.5**
	≥18.5 kg/m^2	5	**45.5**
	Median (IQ25-75)	17.9 (17.4-24.6)	
Propolis allergy	No	6	**54.5**
	Unaware	5	**45.5**
Diabetes Melitus	No	5	**45.5**
	Yes	6	**54.5**
Systemic arterial hypertension	No	0	**0.0**
	Yes	11	**100.0**
Medication use			
Anti-inflammatory	No	9	**81.8**
	Yes	2	**18.2**
Antibiotics	No	1	**9.1**
	Yes	10	**90.9**
Anticoagulant	No	3	**21.3**
	Yes	**8**	**72.7**

*WHO reference for low weight cut-off point in the BMI: <18,5 (World Health Organization. Physical status: the use and interpretation of anthropometry. Geneva: World Health Organization; 1995. (Technical Report Series, 854). Source: authors (2023).

Table 2 displays the analysis of the degree of dependence and fragility of patients with skin tears treated with green propolis-based ointment. When applying the Fugulin scale, it was observed that 100% of the patients were highly dependent for care (score between 21 and 23 points). Using the Rockwood scale, it was possible to identify that 63.6% of the patients had severe frailty, while 36.4% had very severe frailty (Table 2). Table 3 displays the characteristics of skin tears in the patients treated with green propolis-containing ointment in the present study.

Table 2 - Descriptive values for assessing the degree of dependence and fragility of patients with skin tears treated with green propolis-based ointment.

Variable scores	**n**	**%**
Fugulin scale		
21 to 23 (high dependency)	11	**100.0**
Rockwood scale		
7 (severe frailty)	7	**63.6**
8 (very severe frailty)	**4**	**36.4**

Source: Authors (2023).

In the first evaluation of skin tears, 81.8% (n = 9) were classified as 2b (edges cannot be realigned to their normal anatomical position (without excessive stretching); the skin or flap color may be pale, dusky or darkened; and 18.2 (n = 2) were classified as 3 (skin flap is completely absent) (Table 3). At the patient's discharge, the repaired tissue was evaluated according to the time (days) of hospitalization. The response to treatment of skin tears was evaluated by the final appearance achieved in terms of tissue repair; that is, there was evidence of tissue with a "red" appearance, a predominance of living tissue, and new epithelium. As for the origin of the lesion, 54.5% (n = 6) of patients opened their lesions in the hospital during hospitalization. The skin opening happened accidentally, hitting the bed rails, in 45.5% (n = 5) of the patients. The most affected site was the forearm, 90.9% (n = 10) of patients (Table 3).

Table 3 - Characteristics of skin tears in patients treated with green propolis-based ointment.

Variables	n	%
STAR (1st evaluation of skin tears)		
Classification 2b	9	**81.8**
Classification 3	2	**18.2**
RYB (last evaluation of skin tears)		
Red	11	**100**
Origin of wound		
Hospital	6	**54,5**
Residence	4	**36,4**
Long-stay institutions	1	**9,1**
Causes of would		
Hit the grid	5	**45.5**
Adhesive (catheter)	2	**18.2**
Hit the wheelchair	3	**27.3**
Bath chair friction	1	**9.1**
Wound area		
Left upper member (forearm)	10	**90.9**
Right upper member (forearm)	**1**	**9.1**

Source: Authors (2023).

Table 4 displays the Spearman coefficient correlations between the variables and the treatment type. Only the variable "age" was found to be negatively correlated with treatment time, indicating that treatment time increases as the patient's age increases (Table 4).

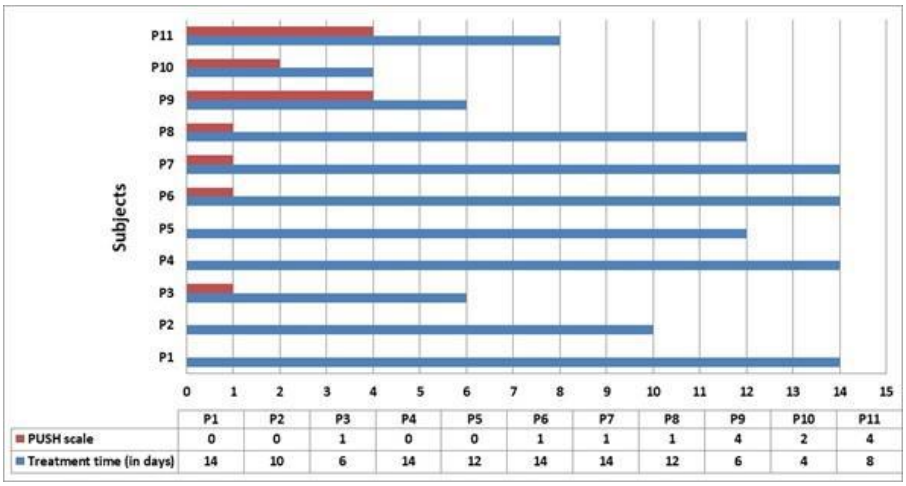
Table 4 - Spearman coefficient correlation between lesion characteristics and indicators and treatment time (days) with green propolis

Variables	Coefficient	P
Age	-0.700	**0.016***
BMI	0.400	**0.222**
Comorbid diseases	-0.339	**0.306**
PUSH score	**-0.578**	**0.062**

*significant ($p < 0.05$). Source: Authors (2023).

Figure 1 displays the distribution of patients according to the treatment time and PUSH scale analysis.

Figure 1 - Distribution of the analysis of the PUSH scale and treatment time of patients with skin tear.



Source: Authors (2023).

The longest treatment time for skin tears with green propolis was 14 days, and the shortest time was 4 days (median 12 days). The analysis of the PUSH scale at the end of the treatment days showed a score of 0 in 4 subjects (36.4%), a score of 1 in 4 subjects (36.4%), a score of 2 in 1 patient (9.1%), and a score of 4 in 2 patients (18.2%).

Table 5 describes the patient history according to the analyzed criteria.

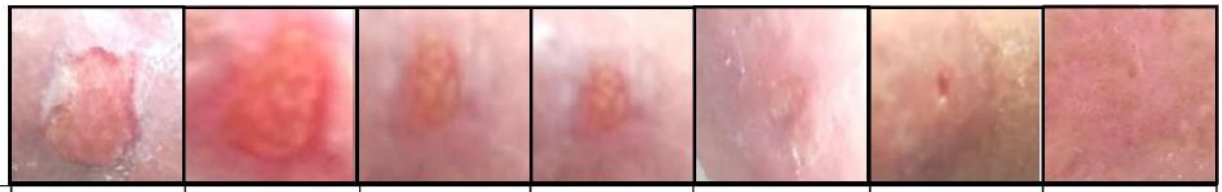
Table 5 - Analyzed criteria and results found according to patient P4.

Analyzed criteria	Data
Gender /age	Female, 88 years old
Fugulin Scale	High dependency for care (Score 22)
Rockwood Scale	high degree of fragility (Score 8)
BMI	18,9 (normal)
Origen of the lesion	Hospitalar
Causa of the lesion	"hit the wheelchair"
Lesion area	upper right member (forearm)
Escale (STAR- 1st avaliation)	3 - no flap and dark peri-lesion skin
Pain scale	0
Treatment time	14 days
Final evaluation (RYB) and PUSH	"*Red"* - Living tissue and new epithelium; PUSH: 0

Source: Authors (2023).

Figure 2 displays the outcomes of one of the subjects selected according to the inclusion criteria.

Figure 2 - Analysis of the evolution and measurements of skin tear of one of the subjects (Subject P4).



Evaluation (days)	Day 1	Day 3	Day 5	Day 7	Day 10	Day 12	Day 14
PUSH/days	2,4 x 1,7 cm	2,3 x 1,4 cm	1,4 x 0,9 cm	1,3 X 0,8 cm	0,9 X 0,2 cm	0,3 X 0, 1 cm	0,0 X 0,0 cm
area/cm²	4,08 cm²	3,22 cm²	1,26 cm²	1,04 cm²	0,18 cm²	0,03 cm²	0 cm²

Source: Authors (2023).

According to the outcomes of subject P4, it can be observed that the outcomes that it took 14 days for the healing of the skin tears. The dressing allowed protection from trauma during healing process and provided a moist wound healing environment. There were no reports of local or systemic adverse events (such as allergies and/or alleged pain), residue, adhesive trauma, or dressing adherence to the wound bed.

4. Discussion

The use of propolis has recently improved because of its multi-target applications and being rich in bioactive agents (Bankova et al., 2016; Carvalho et al., 2019). The therapeutic effects of Brazilian green propolis can be attributed to several phenolic compounds found in the plant *Baccharis dracunculifolia* D.C. (*B. dracunculifolia*). The main phenolic compounds found in green propolis BRPX are phenolic acids such as cinnamic acid derivatives and caffeoylquinnic acids and some flavonoids. The main constituents of green propolis are caffeic and *p*-coumaric acids, kaempferol, kaempferide, and Artepillin C (Marcucci et al., 2008; Szliszka et al., 2013). Together with phenols, one of the main compounds is Artepillin C (3,5-diprenyl-4-hydroxycinnamic acid), only found in propolis in the Southeast region of Brazil (Veiga et al., 2017; Wang et al., 2017). Other phenolic compounds, such as *p*-coumaric acid and 3-prenyl-4-hydroxycinnamic acid, are also found in green propolis extracts (Marcucci et al., 2008). Green propolis also has an wide antiradical spectrum of action against DPPH (1,1-diphenyl-2-picrylhydrazyl) radical, possibly due to a synergic effect of phenolic type compounds found in the extract (Popova et al., 2005). In this manner, green propolis has a broad range of biological properties, including antibacterial activity (Bankova et al., 1996), anti-inflammatory action (Paulino et al., 2006), antihypertensive activity (Maruyama et al., 2009), antihyperlipidemic activity (Koya-Miyata et al., 2009), antioxidant action (Ferreira et al., 2017), antitumor activity (Bhargava et al., 2018), and against coronavirus (Dilokthornsakul et al., 2022). Wound healing implies several biological and molecular events, such as coagulation, inflammation, migration-proliferation, and remodeling (Barchitta et al., 2019). Considering the antimicrobial activities of propolis, inhibiting cell division and growth of bacteria (Santos, 2012), the purpose of using a green propolis-containing ointment was to facilitate wound healing by enhancing collagen synthesis and fibroblast migration/differentiation. In this manner, it is expected to accelerate the healing process due to possibly shortening of the inflammatory phase.

It has been pointed out that frailty encompasses factors which characterize fragile individuals with altered cognition, mood, motivation, motor skills, balance, ability to perform activities of daily living, and those associated with social status and comorbidities (Lacas & Rockwood, 2012). As the elderly get older, capacities gradually lost, becoming more fragile and dependent on care. It is important to highlight the importance and commitment of all health professionals to being focused on the weakened elderly population, which is often affected by skin tears (Souza et al., 2021). It has recently recommended a care bundle, which implies clinical practices and interventions to treat skin tears in elderly people that are collectively performed to

improve patient outcomes (Clarkson, 2013). Among other actions, the use of topical preparations has been claimed to improve the healing of skin tears in older people (McInulty, 2017).

The product used in the present study (green propolis ointment) contains petrolatum, propolis extract, beeswax, and propylparaben. This commercial product is indicated for the treatment of fragile and burned skin. Besides the propolis extract, the formulation of the propolis-based ointment also indicates beeswax as one of the ingredients. Waxes are used as viscosity regulators in the formulation. Petrolatum, also found in the product, is an emollient that represents a mixture of hydrocarbons obtained by the removal of mineral oils. This compound aids in the hydration of damaged skin. As a result, another advantage of using this product is that it keeps the injured site moist while also making it easier to handle and remove the dressing (Carville et al., 2014). The flaps caused by skin tears are delicate and easy to lose during one dressing or another.

It has been pointed out that weight loss and low body mass index are also important indicators for the increased risk of developing tissue damage (Benbow, 2017). The importance of malnutrition identification and appropriate nutrition care practices as frontline measures is important to minimize the impact of skin tears on patients and the health care system (Munro et al., 2018). The impaired nutritional status also favors the breakage of the skin by leaving it unprotected and vulnerable. Although BMI alone is considered a limited nutritional assessment measure and it has not been independently associated with skin tears or multiple skin tears (Munro et al., 2018), the association of different factors to evaluate the susceptibility to skin tears is extremely important. In population surveys, the average internal BMI is used to assess the nutritional status of patients. In geriatric clinical practice, a BMI < 20kg/m^2 represents the cutoff point adopted to classify the elderly as having low weight (Perissinotto et al., 2007). The median BMI value of the elderly observed in the present study was 17.9 kg/m^2, classified as underweight.

In the first clinical evaluation of skin tears 45.5% (n = 5) of the lesions had a darkened clinical aspect due to local hematoma. In addition, 27.3% (n = 3) of the hematomas extended the area of the flap, beyond the edges of the lesion. The darkened flap (hematoma) occurs due to the rupture by breaking of the small vessels existing in the skin. It has been reported that there is a tendency for this clinical aspect to decrease, usually between the 4th and the 7th day of treatment. Conversely, considering the skin of the elderly, this outcome may take longer due to the fragility of the vessels and of the skin tissue. The hematomas regressed according to the days of treatment, and the skin of the flap and peri-flap became gradually clearer. In the present study, 9.0% (n = 1) lost the flap in the 2nd evaluation, 9.0% (n = 1) lost in the 3rd evaluation, 18.2% (n = 2) in the 4th evaluation, and 9.0% (n = 1) in the 5th evaluation. The results also demonstrated that 90.90% (n = 10) of treated skin tears reached "red" tissue (alive and new) by the RYB system, while 9.0% (n = 1) had living tissue in the center of the lesion and the lower edges with discrete tissue, considered "black" (not alive) in the same system. It was noted that 27.3% (n = 3) of cases presented this evolution in the 3rd evaluation, 9.0% (n = 1) in the 4th evaluation, and 9.0% (n = 1) in the 5th evaluation. It has been previously reported that the treatment time for total repair of the injured tissue in skin tears varies as follows (LeBlanc et al., 2016): no tissue loss-up to 10 days; partial loss-up to 19 days; exposed dermis-up to 21 days.

Regardless of the treatment time, it was possible to observe in the treated lesions the development of a new and quality epithelium in all lesions, even with the loss of the flaps during the treatment. In addition, it was possible to identify hydrated skin in the treated area after starting the local treatment of the lesions. As for the complaints of pain, both in the manipulation of the skin and in the removal of the dressings, 100% (n = 11) of the subjects reported no pain complaints during treatment. The absence of pain during the treatment of the elderly with skin tears is considered relevant because it demonstrates evidence that the propolis-containing ointment can be used in this type of lesion even with the exposed epidermis, causing no sensitivity reactions and no harm to the open flap that could be painful for the elderly.

The treatment of skin tears with propolis-containing ointment resulted in no local and systemic allergic reactions in all (n = 11) of the treated patients. Other issues include the need of an appropriate processing and dose regulation, to improving

the drug efficacy and reducing the drug toxicity (Yuan et al., 2016). Another limitation of the present study was to obtain a larger sample of subject according to the inclusion criteria within a predetermined evaluation time. In addition, the selected subjects were classified as having severe frailty (score 7), 63.6% (n = 7) patients and with very severe frailty (score 8), 36.4% (n = 4) patients. Assessments on the dependence and frailty of the elderly using the scales selected in this study collaborated to outline a profile of the limitations of the treated subjects. The impairments of movements of the lower and upper limbs perceived in the patients could suggest greater difficulties beyond their self-care, such as transfers without help from bed to bed, making the elderly vulnerable and susceptible to more cutaneous trauma. Although propolis has the potential to be used as a wound healing agent, particularly when applied topically, more research in wound patients is needed to develop different approaches for wound management. The propolis-based ointment represents an interesting alternative for the treatment of skin tears in hospital and domestic environments, as well as in long-term institutions, considering its easy and simple use, in addition to being affordable.

5. Conclusion

The set of results obtained supported the assumption that propolis-based ointment can be included as an effective option to treat skin tears. The propolis-based ointment represents an interesting alternative for the treatment of skin tears in hospital and domestic environments, as well as in long-term institutions. It can be considered easy and simple to use, in addition to being affordable. Considering that this is an exploratory cross-sectional study, the authors suggest that future studies are necessary to investigate the effectiveness of this propolis-based product in the treatment of skin tears in elderly hospitalized patients. In this manner, a clinical trial would provide more accurate data to demonstrate its clinical effects in this population.

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References

Abbasi, A. J., Mohammadi, F., Bayat, M., Gema, S. M., Ghadirian, H., Seifi, H., Bayat, H., & Bahrami, N. (2018). Applications of propolis in dentistry: a review. *Ethiopian journal of health sciences*, *28*(4), 505-512. https://doi.org/10.4314/ejhs.v28i4.16

Bankova, V., Marcucci, M. C., Simova, S., Nikolova, N., Kujumgiev, A., & Popov, S. (1996). Antibacterial diterpenic acids from Brazilian propolis. *Zeitschrift für Naturforschung C*, *51*(5-6), 277-280.

Bankova, V., Popova, M., & Trusheva, B. (2016). New emerging fields of application of propolis. *Macedonian Journal of Chemistry and Chemical Engineering*, *35*, 1-11. https://doi.org/10.20450/mjcce.2016.864

Barchitta, M., Maugeri, A., Favara, G., Magnano San Lio, R., Evola, G., Agodi, A., & Basile, G. (2019). Nutrition and wound healing: an overview focusing on the beneficial effects of curcumin. *International journal of molecular sciences*, *20*(5), 1119. https://doi.org/10.3390/ijms20051119

Benbow, M. (2017). Assessment, prevention and management of skin tears. Nursing older people, *29*(4), 31-39. https://doi.org/10.7748/nop.2017.e904

Bhargava, P., Grover, A., Nigam, N., Kaul, A., Doi, M., Ishida, Y., Kakuta, H., Kaul, S. C., Terao, K., & Wadhwa, R. (2018). Anticancer activity of the supercritical extract of Brazilian green propolis and its active component, Artepillin C: Bioinformatics and experimental analyses of its mechanisms of action. *International Journal of Oncology*, *52*(3), 925-932. https://doi.org/10.3892/ijo.2018.4249

Carvalho, C., Fernandes, W. H. C., Mouttinho, T. B. F., Souza, D. M., Marcucci, M. C., & D'Alpino, P. H. P. (2019). Evidence-based studies and perspectives of the use of brazilian green and red propolis in dentistry. *European journal of dentistry*, *13*(3), 459-465. https://doi.org/10.1055/s-0039-1700598

Carville, K., G., L., N., N., Haslehurst, P., Michael, R., Santamaria, N., & Roberts, P. (2007). STAR: a consensus for skin tear classification. *Primary Intention*, *15*(1), 18-28.

Carville, K., Leslie, G., Osseiran-Moisson, R., Newall, N., & Lewin, G. (2014). The effectiveness of a twice-daily skin-moisturising regimen for reducing the incidence of skin tears. *International wound journal, 11*(4), 446-453. https://doi.org/10.1111/iwj.12326

Chang, Y. Y., Carville, K., & Tay, A. C. (2016). The prevalence of skin tears in the acute care setting in Singapore. *International wound journal, 13*(5), 977-983. https://doi.org/10.1111/iwj.12572

Clarkson, D. M. (2013). The role of 'care bundles' in healthcare. *British Journal of Healthcare Management, 19*(2), 63-68. https://doi.org/10.12968/bjhc.2013.19.2.63

Dilokthornsakul, W., Kosiyaporn, R., Wuttipongwaragon, R., & Dilokthornsakul, P. (2022). Potential effects of propolis and honey in COVID-19 prevention and treatment: A systematic review of in silico and clinical studies. Journal of Integrative Medicine, *20*(2), 114-125. https://doi.org/10.1016/j.joim.2022.01.008

Ferreira, J. M., Fernandes-Silva, C. C., Salatino, A., Negri, G., & Message, D. (2017). New propolis type from north-east Brazil: chemical composition, antioxidant activity and botanical origin. *Journal of the Science of Food and Agriculture, 97*(11), 3552-3558. https://doi.org/10.1002/jsfa.8210

Hardie, C., & Wick, J. Y. (2020). Skin tears in older people. The Senior care pharmacist, *35*(9), 379-387. https://doi.org/10.4140/TCP.n.2020.379

Jeon, J. G., Rosalen, P. L., Falsetta, M. L., & Koo, H. (2011). Natural products in caries research: current (limited) knowledge, challenges and future perspective. *Caries research, 45*(3), 243-263. https://doi.org/10.1159/000327250

Jones, V., Grey, J. E., & Harding, K. G. (2006). Wound dressings. BMJ, *332*(7544), 777-780. https://doi.org/10.1136/bmj.332.7544.777

Koya-Miyata, S., Arai, N., Mizote, A., Taniguchi, Y., Ushio, S., Iwaki, K., & Fukuda, S. (2009). Propolis prevents diet-induced hyperlipidemia and mitigates weight gain in diet-induced obesity in mice. *Biological and Pharmaceutical Bulletin, 32*(12), 2022-2028. https://doi.org/10.1248/bpb.32.2022

Koyano, Y., Nakagami, G., Iizaka, S., Minematsu, T., Noguchi, H., Tamai, N., Mugita, Y., Kitamura, A., Tabata, K., Abe, M., Murayama, R., Sugama, J., & Sanada, H. (2016). Exploring the prevalence of skin tears and skin properties related to skin tears in elderly patients at a long-term medical facility in Japan. *International wound journal, 13*(2), 189-197. https://doi.org/10.1111/iwj.12251

Koyano, Y., Nakagami, G., Iizaka, S., Sugama, J., & Sanada, H. (2017). Skin property can predict the development of skin tears among elderly patients: a prospective cohort study. *International wound journal, 14*(4), 691-697. https://doi.org/10.1111/iwj.12675

Krasner, D. (1995). Wound care: how to use the red-yellow-black system. *The American journal of nursing, 95*(5), 44-47.

Lacas, A., & Rockwood, K. (2012). Frailty in primary care: a review of its conceptualization and implications for practice. *BMC Medicine, 10*(1), 4. https://doi.org/10.1186/1741-7015-10-4

Langemo, D. K., Williams, A., & Edwards, K. (2019). Skin tears: Prevention and management. Nursing, *49*(4), 66-69. https://doi.org/10.1097/01.NURSE.0000554309.45660.ca7

LeBlanc, K., & Baranoski, S. (2017). Skin tears: finally recognized. *Advances in skin & wound care, 30*(2), 62-63. https://doi.org/10.1097/01.ASW.0000511435.99585.0d

LeBlanc, K., Baranoski, S., Christensen, D., Langemo, D., Edwards, K., Holloway, S., Gloeckner, M., Williams, A., Campbell, K., Alam, T., & Woo, K. Y. (2016). The Art of Dressing Selection: A Consensus Statement on Skin Tears and Best Practice. *Advances in skin & wound care, 29*(1), 32-46. https://doi.org/10.1097/01.ASW.0000475308.06130.df

Leblanc, K., Christensen, D., Cook, J., Culhane, B., & Gutierrez, O. (2013). Prevalence of skin tears in a long-term care facility. *Journal of wound, ostomy, and continence nursing, 40*(6), 580-584. https://doi.org/10.1097/WON.0b013e3182a9c111

Marcucci, M. C. (1995). Propolis: chemical composition, biological properties and therapeutic activity. Apidologie, *26*(2), 83-99.

Marcucci, M. C., Sawaya, A. C. H. F., Custódio, A. R., Paulino, N., & Eberlin, M. N. (2008). HPLC and ESI-MS typification: new approaches for natural therapy with Brazilian propolis. Scientific evidence of the use of propolis in ethnomedicine. In N. Orsolic (Ed.), *Scientific evidence of the use of propolis in ethnomedicine* (pp. 33-54). Kerala, India: Transworld Research Network.

Maruyama, H., Sumitou, Y., Sakamoto, T., Araki, Y., & Hara, H. (2009). Antihypertensive effects of flavonoids isolated from brazilian green propolis in spontaneously hypertensive rats. *Biological and Pharmaceutical Bulletin, 32*(7), 1244-1250. https://doi.org/10.1248/bpb.32.1244

Matochek, M. H. M., Tomaz, P. L. S., Oliveira, T. S., Polassi, M. R., Alonso, R. C. B., Scremin, F. M., Sauro, S., Marcucci, M. C., & D'Alpino, P. H. P. (2020). Influence of a propolis-based irrigant solution on gap formation and bond strength of posts bonded to root canal dentin using different resin cements. *Dent Mater J, 39*(3), 490-499. https://doi.org/10.4012/dmj.2019-111

McInulty, L. (2017). Prevention and management of skin tears in older people. *Emergency nurse, 25*(3), 32-39. https://doi.org/10.7748/en.2017.e1687

Munro, E. L., Hickling, D. F., Williams, D. M., & Bell, J. J. (2018). Malnutrition is independently associated with skin tears in hospital inpatient setting-Findings of a 6-year point prevalence audit. *International wound journal, 15*(4), 527-533. https://doi.org/10.1111/iwj.12893

Palombo, E. A. (2011). Traditional medicinal plant extracts and natural products with activity against oral bacteria: potential application in the prevention and treatment of oral diseases. *Evidence-based complementary and alternative medicine, 2011*, 680354. https://doi.org/10.1093/ecam/nep067

Paulino, N., Teixeira, C., Martins, R., Scremin, A., Dirsch, V. M., Vollmar, A. M., Abreu, S. R., de Castro, S. L., & Marcucci, M. C. (2006). Evaluation of the analgesic and anti-inflammatory effects of a Brazilian green propolis. *Planta Medica, 72*(10), 899-906. https://doi.org/10.1055/s-2006-947185

Perissinotto, E., Pisent, C., Sergi, G., Grigoletto, F., & Enzi, G. (2007). Anthropometric measurements in the elderly: age and gender differences. *British Journal of Nutrition, 87*(2), 177-186. https://doi.org/10.1079/BJN2001487

Popova, M., Silici, S., Kaftanoglu, O., & Bankova, V. (2005). Antibacterial activity of Turkish propolis and its qualitative and quantitative chemical composition. *Phytomedicine, 12*(3), 221-228. https://doi.org/10.1016/j.phymed.2003.09.007

Santos, F., Rogenski, N. M. B., Baptista, C. M. C., & Fugulin, F. M. T. (2007). Patient classification system: a proposal to complement the instrument by Fugulin et al.. *Revista latino-americana de enfermagem, 15*(5), 980-985. https://doi.org/10.1590/S0104-11692007000500015

Santos, V. R. (2012). Propolis: alternative medicine for the treatment of oral microbial diseases. In H. Sakagami (Ed.), *Alternative Medicine* (pp. 133-169): IntechOpen.

Skiveren, J., Wahlers, B., & Bermark, S. (2017). Prevalence of skin tears in the extremities among elderly residents at a nursing home in Denmark. *Journal of wound care, 26*(Sup2), S32-S36. https://doi.org/10.12968/jowc.2017.26.Sup2.S32

Souza, L. M., Teixeira, G. D. S., Silva, D. M. D., Ruiz, L. D. S., Coppola, I. D. S., & Meirelles, L. (2021). Prevalence of skin tears in hospitalized adults and older adults. *Revista da Escola de Enfermagem da USP, 55*, e03683. https://doi.org/10.1590/S1980-220X2019025103683

Stephen-Haynes, J. (2012). Skin tears: achieving positive clinical and financial outcomes. British journal of community nursing, *Suppl*, S6, S8, S10 passim. https://doi.org/10.12968/bjcn.2012.17.sup3.s6

Stephen-Haynes, J. (2020). The what, who, why and how of skin tears in the community and care homes. *British journal of nursing, 29*(20), S14-S17. https://doi.org/10.12968/bjon.2020.29.20.S14

Stotts, N. A., Rodeheaver, G. T., Thomas, D. R., Frantz, R. A., Bartolucci, A. A., Sussman, C., Ferrell, B. A., Cuddigan, J., & Maklebust, J. (2001). An instrument to measure healing in pressure ulcers: development and validation of the pressure ulcer scale for healing (PUSH). *The journals of gerontology. Series A, Biological sciences and medical sciences, 56*(12), M795-799. https://doi.org/10.1093/gerona/56.12.m795

Strazzieri-Pulido, K. C., Peres, G. R., Campanili, T. C., & de Gouveia Santos, V. L. (2017). Incidence of skin tears and risk factors: a systematic literature review. *Journal of wound, ostomy, and continence nursing, 44*(1), 29-33. https://doi.org/10.1097/WON.0000000000000288

Strazzieri-Pulido, K. C., Santos, V. L., & Carville, K. (2015). Cultural adaptation, content validity and inter-rater reliability of the "STAR Skin Tear Classification System". *Revista latino-americana de enfermagem, 23*(1), 155-161. https://doi.org/10.1590/0104-1169.3523.2537

Szliszka, E., Kucharska, A. Z., Sokol-Letowska, A., Mertas, A., Czuba, Z. P., & Krol, W. (2013). Chemical composition and anti-inflammatory effect of ethanolic extract of Brazilian green propolis on activated J774A.1 macrophages. *Evidence-based complementary and alternative medicine, 2013*, 976415. https://doi.org/10.1155/2013/976415

Theou, O., Pérez-Zepeda, M. U., van der Valk, A. M., Searle, S. D., Howlett, S. E., & Rockwood, K. (2021). A classification tree to assist with routine scoring of the Clinical Frailty Scale. *Age and Ageing, 50*(4), 1406-1411. https://doi.org/10.1093/ageing/afab006

Van Tiggelen, H., LeBlanc, K., Campbell, K., Woo, K., Baranoski, S., Chang, Y. Y., Dunk, A. M., Gloeckner, M., Hevia, H., Holloway, S., Idensohn, P., Karadag, A., Koren, E., Kottner, J., Langemo, D., Ousey, K., Pokorna, A., Romanelli, M., Santos, V., Smet, S., Tariq, G., et al. (2020). Standardizing the classification of skin tears: validity and reliability testing of the International Skin Tear Advisory Panel Classification System in 44 countries. *The British journal of dermatology, 183*(1), 146-154. https://doi.org/10.1111/bjd.18604

Veiga, R. S., De Mendonca, S., Mendes, P. B., Paulino, N., Mimica, M. J., Lagareiro Netto, A. A., Lira, I. S., Lopez, B. G., Negrao, V., & Marcucci, M. C. (2017). Artepillin C and phenolic compounds responsible for antimicrobial and antioxidant activity of green propolis and *Baccharis dracunculifolia* DC. *Journal of applied microbiology, 122*(4), 911-920. https://doi.org/10.1111/jam.13400

Wang, C. C., Wang, Y. X., Yu, N. Q., Hu, D., Wang, X. Y., Chen, X. G., Liao, Y. W., Yao, J., Wang, H., He, L., & Wu, L. (2017). Brazilian green propolis extract synergizes with protoporphyrin IX-mediated photodynamic therapy via enhancement of intracellular accumulation of protoporphyrin IX and attenuation of NF-kappaB and COX-2. *Molecules, 22*(5). https://doi.org/10.3390/molecules22050732

Więckiewicz, W., Miernik, M., Więckiewicz, M., & Morawiec, T. (2013). Does propolis help to maintain oral health? *Evidence-based complementary and alternative medicine, 2013*, 351062-351062. https://doi.org/10.1155/2013/351062

Woo, K., & LeBlanc, K. (2018). Prevalence of skin tears among frail older adults living in Canadian long-term care facilities. *International journal of palliative nursing, 24*(6), 288-294. https://doi.org/10.12968/ijpn.2018.24.6.288

Yuan, H., Ma, Q., Ye, L., & Piao, G. (2016). The traditional medicine and modern medicine from natural products. *Molecules, 21*(5), 559.: https://doi.org/10.3390/molecules21050559