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## Use of Natural Products in the Treatment of Chronic Wounds of Vascular Origin

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#### Abstract

This work makes a preliminary announcement about the possibilities for treating chronic wounds with the help of decoctions and ointments from forest medicinal plants obtained in our country. The results obtained are encouraging and are an excellent prerequisite for further research into the healing effect of the available natural resources.

Keywords: Venous Wounds; Arterial Wounds; Treatment; Granulations; Epithelialization; Sumac; Marigold; Resin

#### Introduction

A chronic wound is a wound that does not show a tendency to heal after 8 weeks despite proper and cause-oriented therapy [1]. Chronic wounds are a significant problem not only in specialized health facilities, but also in the daily practice of family doctors. The issue of their occurrence, prevention and treatment does not lose relevance and remains a challenge for medicine and society. With increasing life expectancy, the number of patients with vascular diseases such as atherosclerotic occlusion [2], chronic arterial disease of the extremities, chronic venous insufficiency [3], etc. increases. The causes of such diseases are risk factors such as stress and smoking and diseases such as impaired metabolism, arterial hypertension and diabetes [4]. Accordingly, the number of patients with chronic wounds of vascular origin is increasing. Modern medicine relies on a holistic approach for the treatment of chronic wounds [5]. Since they are usually associated with serious diseases such as diabetes, etc., their treatment remains an interdisciplinary task, in which success is possible only with broadspectrum measures. To prevent complications and side effects, treatment increasingly includes the use of natural products. Natural products are most often secondary metabolites of plant or animal origin. Their application has been known since ancient times, but their full potential still remains a mystery. At the current stage, the biological activity of only 10% of the world's biodiversity has been studied [6]. Recently, doctors have increasingly turned to the use of natural products in their pure form. In many cases, they are an alternative to chemically obtained drugs, which cause more allergic or other adverse reactions. Therefore, natural products are of great medical, social and economic interest. In this regard, the treatment of wounds with natural products is no exception. It is especially widespread in East Asian countries. Although it is considered alternative medicine in the Western world, it is widely used (40% of treated chronic wounds). In our country, over 30 recipes with different herbs are used for wound treatment, but to date there are no published data on their application in conventional medicine. The purpose of this study is to present evidence for the benefit of using natural products for the treatment of chronic wounds and their place and importance in medical practice.

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#### **Subject and Methods**

The subject of the study were patients with chronic wounds. The comparative analysis method was used. The patients were divided into two groups. The patients in each group were treated for chronic wounds. Patients in the first group were treated with a chemically synthesized drug (Vaseline). Patients in the second group were treated with completely natural products (extract).

Conservative therapy included daily wound treatment with medication and dressing. Macroscopic assessment of the wound was performed with the following criteria: area, depth, granulation, secretion and epithelialization.

The age distribution of patients in both groups was the same, as follows.

- Group 1: Vaseline (Ichthammol 0.1 g and excipients lanolin, white petrolatum, cetostearyl alcohol).
- Group 1: Decoction of leaves of sumac *Cotynus cogyggria* Scop. (dried leaves of sumac and water); Decoction of leaves of plantain *Plantago major* L. (dried leaves of plantain and water); Ointment of stems, leaves and flowers of marigold *Calendula officinalis* L. (dried stems, flowers of marigold, lard) Ointment of resin of Scots pine *Pinus sylvestris* L., white fir *Pinus peuce* Griseb. or spruce *Picea abies* H. Karst. (ointment with 10% resin of conifers).

The gender distribution in each group is also identical: 25 men and 15 women.

Age, years	40-50	50-60	60-70	>70
Patients	5	10	15	10



All patients underwent surgical intervention to remove the vascular cause of chronic wounds - venous, arterial and mixed. The surgical procedures included endovascular stenting, dilation, rotarex, bypass surgery of various segments of iliac, femoral and tibial arterial vessels, profundoplasty. Preliminary examinations included: Echo-Doppler diagnostics, Doppler sonography and ABI index of all patients. CT angiography, phlebography at discretion. Complete blood count, biochemistry and microbiology of the wounds were determined.

## Results

During the treatment process, the parameters area such as depth, granulations, epithelialization and microbiology were determined continuously. The final criterion for the efficacy of the treatment was the wound healing time. Table 1 shows the distribution of patients according to this parameter. It is striking that the number of healed wounds in the first month was twice as high in patients treated with herbal extract. The average healing time (1.9 months in group 2 and 2.4 months in group 1) was determined using the STATISTICA software (Figure 1). Figure 2 shows that the difference between the two groups in healing time is statistically significant.

Month of wound healing	1	3	6
1 group – patients treated with Vaseline	4	10	26
2 group – patients treated with herbal extract	8	16	16

Table 1: Distribution of patients according to healing time.





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Table 1 and Figure 1 reflect the working hypothesis that the effectiveness of the studied natural products is the same. In fact, the microbiological clearance of the wound was significantly faster in patients treated with coniferous resin. Of our patients, 10 were treated with resin ointment, and on the 15th day in 9 of the patients the wound was microbiologically clean.

The process of closing an old vascular wound, washed with a decoction of sumac, is documented in Figure 2.



Figure 2: Conservative treatment of a chronic venous wound, washed with decoction of sumac a) first day b) second month c) third month.

The process of closing a wound treated with resin ointment is documented in Figure 3.



Figure 3: Condition of a wound treated with pine resin a) first day b) second month c) third month.

The results we obtained in process of treatment of chronic wounds with natural products showed consistency with the data reported in the literature, both with regard to the use of resin ointments and decoctions of medicinal plants [7-10]. It is still early to judge the relative quality of natural products.

# Characteristics of medicinal plants and analysis of their resources in our country

*Cotynus cogyggria* Scop. is a shrub or low tree with ovate or broadly elliptical leaves and spider-web-like reddish terminal inflorescences. It is found in almost all of Bulgaria in scrubland and oak forests, on dry and stony soils, often on calcareous terrain, in the plains and foothills up to about 800 meters above sea level [11]. The sumac is not a protected species. A potential threat to the species is the overexploitation of its habitats. It is recommended that a single harvest from the population should not exceed 70% of it. Repeated harvesting from the habitats in the presence of larger stocks is recommended after 2-3 years.

The broad-leaved plantain Plantago major L. is a perennial herbaceous plant with broad, ovate or elliptical leaves collected in a rosette and cylindrical spike-shaped inflorescences. It is distributed in moist grassy, sandy and flooded places, along rivers and swamps, along ditches and roads throughout the country, usually in the lower zones. The species is ruderal and has a high presence and bioavailability, which makes the possibilities for its collection unlimited [12].

The marigold *Calendula officinalis* L. is an annual herbaceous plant with large orange baskets. It originates from the Mediterranean and is grown in our country as an ornamental plant. For the needs of pharmaceutical and cosmetic practice, different varieties are used (e.g. "Calendula"), which are grown in experimental fields [13,14].

The coniferous forest tree species Scots pine Pinus sylvestris L., Norway spruce *Pinus peuce* Griseb. and spruce *Picea abies* H. Karst. are widely distributed in our country. Resin is extracted from living trees intended for felling. The annual area of fillings of Scots pine and spruce is about 8400 hectares according to data from 2015 (the White pine is not used). The plantations can be rejuvenated 5 years before felling. In Bulgaria, there are 42,000 hectares of pine and spruce for annual resin production. According to a conservative estimate, the resin yield is 8 l/ha, which makes 336,000 l of resin per year. Resin production was abandoned in Bulgaria back in the 1970s due to a lack of labor. Its partial regrowth for medicinal purposes is not a problem, considering that the quantities needed "for medicine" are incomparably small compared to the numbers given above, and that it will contribute to the diversification of forestry [15,16].

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#### Discussion

In patients with chronic wounds of the lower extremities, it is of paramount importance, to clarify the vascular status of the patient and to discover the causes of the wound - impaired blood supply, venous reflux or both - and the surgical or endovascular correction of the affected segments of the arterial and venous system. Medicinal plants and their products are used at a later stage as a supporting agent for the healing of chronic wounds.

## Conclusions

Natural products from medicinal plants have a place in the treatment of chronic wounds of vascular origin in our medical practice.

The resources of suitable medicinal plants available in the country are practically inexhaustible.

The results obtained in the treatment with resin show that it can be a new contribution to the treatment of chronic wounds in humans.

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