



Research Paper

## The importance of apiphytotherapy in the surgical approach of open arthritis - case report, implications and perspectives

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### ABSTRACT

The work presents the application of a combination of honey and thyme volatile oil in a patient with open suppurating wrist arthritis due to severe electrocution. The previous surgical treatment comprised multiple debridements, skin grafts and regional flap to cover the open joint of the right wrist, with bone exposure. The wound evolution was favorable, with remission of infection and progressive closure of the opened and infected wrist joint.

The combinations of honey and volatile oils could be recommended in severe and infected wounds, due to the multiple actions on wound healing provided by honey bee products, together with the antiseptic action of volatile oils. These actions can be extremely favorable in problematic cases of wounds with bone exposure or open fractures, especially infected with multiresistant germs, with difficult healing, poor local defense and limited loco-regional resources. The combination of honey and thyme volatile oil represents a potent compound with wound healing and antiinfectious effects, and can be applied especially in these difficult cases.

**KEYWORDS:** honey, open arthritis, thyme volatile oil, wound healing

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### I. INTRODUCTION

Acute and chronic wounds are an important public health problem, due to the spread in the population, to the functional impairment, to the social and economic implications. Currently, there are a variety of products, as well as a lot of research and studies that aim to highlight the most appropriate solutions. In general, the therapeutic methods for wounds and burns are examined in the direction of two major lines of action that can be interconnected, the anti-infectious action and the wound healing action. In this regard, given the financial implications, the effectiveness and the availability of product, it is useful to consider honey, a remedy used since ancient times to treat various wounds and whose remarkable properties have recently been proven by scientific research and clinical studies.

Scientific studies have shown multiple properties and effects of honey which are favorable for wound healing, such as anti-infectious, anti-inflammatory, antioxidant, wound debriding, increasing the rate of healing. These actions can be very useful in cases of open arthritis, especially infected with multiresistant germs, when the local defense of the organism is deficient and other resources are limited.

### II. MATERIALS AND METHODS

A 42-year-old male patient was admitted to the Plastic Surgery Department, District Emergency Hospital, Ploiesti, Romania, for the treatment of III-IV grade burn by electrocution at the level of the right hand and forearm and of the left thigh and leg. The lesions were deep, with necrosis of soft tissues and the opening and infection of the right wrist (Fig. 1).

Bacteriological analyzes from infected wounds revealed multidrug-resistant germs, such as *Acinetobacter* and MRSA.

The treatment was prolonged, combined medical and surgical, and included multiple debridements, skin grafts and regional flap harvested from the dorsal face of the right forearm (posterior interosseous flap) to cover the open joint of the right wrist, with bone exposure (Fig. 2).

Combination of organic polyflora honey and 1% thyme volatile oil (v / v) was applied topically pre and especially postoperatively at the level of the right wrist.



**Fig. 1.** Burn wound through electrocution, after surgical serial debridements and initial skin grafting



**Fig. 2.** Burn wound after partial integration of regional flap and skin grafts

### III. RESULTS

The evolution was progressively favorable, with remission of wound infection, integration of skin grafts and gradual closure of the opened and infected wrist joint (Fig. 3).



**Fig. 3.** Progressive wound closure, after serial debridements and applications of honey with thyme volatile oil – final aspect

Due to flexor tendons and median nerve necrosis caused by electrocution, the patient remained with complex sequelae in the right hand, which require further reconstructive surgery.

### IV. DISCUSSIONS

This case report is a difficult case of deep burn through electrocution, with severe and disabling injuries. It highlights the efficacy of the combination between the surgical treatment and the topical applications of honey with thyme volatile oil. This mixture is especially indicated in such cases, with deficient local defense and infection with multi-resistant germs.

Applying medical grade honey can provide a definite favorable action on healing of burns and other wounds, especially when they are infected, sometimes in combination with surgical treatment, being applied in these cases before or after surgery. The anti-infectious activity of honey, without the development of microbial resistance, is particularly useful in the present times, of bacterial multiresistance to antibiotics and of increasingly limited access to antibiotics of last generation.

According to research and trials, the **advantages** of honey based dressings in wounds management are as follows [1-3]:

- **very broad-spectrum antibacterial activity** [4, 5], Gram positive and Gram negative, aerobic and anaerobic, including types of bacteria multiresistant to antibiotics, such as *Pseudomonas*, *Acinetobacter*, methicillin-resistant (MRSA) and coagulase-negative *Staphylococcus aureus*. There was no loss in time of bacterial sensibility to honey and no appear of bacteria resistant mutants [6]. In many cases, honey acted where other antibacterial therapies failed [2], possibly because honey is effective including bacteria aggregated in biofilms [7-9], a situation where antibiotics and silver dressings proved ineffective [10].
- **anti-inflammatory, anti-edematous and anti-exudative activities**, as evidenced by clinical observations [3, 11-14], biochemistry - decreased malondialdehyde and lipid peroxide values [3, 15] and histopathology exams - decrease of inflammatory cells [3]. The anti-inflammatory effect and suppression of reactive oxygen species (ROS), which overstimulate fibroblasts, lead to reduction of fibrosis and hypertrophic scarring [16]. In contrast, synthetic anti-inflammatory drugs do not promote wound healing - non-steroidal anti-inflammatory substances are cytotoxic drugs and corticosteroids inhibit the growth of epithelium [2].

- **antioxidant activity**, by controlling free radicals and reactive oxygen species - ROS [17].
- creation of a **local moist environment**, due to honey viscosity and fluids drawing by osmosis, which promotes wounds healing, because they heal faster if kept moist, than if left to dry and to form a scab. A moist environment ensures epithelial cells growth, fibroblasts contraction to approach the wound edges, as well as non-adherence of dressing to the wound, easy and painless dressings changing, without the risk of breaking newly formed epithelium. Also, a local environment allows the protein-digesting enzymes in the wound tissues to work and loosen any scab and dead tissue [2].
- wound **debriding action**, found in clinical trials [3, 12-14, 16, 18-20]. Honey activates plasminogen and increases plasmin enzyme activity, which lyses fibrin attaching slough, by suppression of the macrophage plasminogen activation inhibitor. Plasmin digests fibrin, which attaches debris on wound surface, but does not digest collagen extracellular matrix which is necessary for tissue repair [2].
- **nutritional action** in the wound, indirectly through osmotic flow of lymph, which brings nutrients needed for healing, but also directly through easily metabolisable carbohydrate intake, amino acids, vitamins and minerals [2].
- **economic benefits** through lower direct cost than conventional treatments [21], reducing the use of antibiotics, the healing and hospitalization time [18, 22, 23].

In order to be considered in the treatment of wounds and to exert without risks the whole range of favorable effects, honey must be organic, harvested and processed properly, and sufficiently free of microorganisms. Strict microbiological criteria that have been proposed for bacteria at a maximal limit of 10 CFU/g honey, and for fungi at a maximal limit of 10 CFU/g honey [24].

Honey suitable for medical application has to satisfy certain requirements, thus being characterized as **medical grade honey** (MGH). Medical grade honey is required to meet the following criteria [24]:

- is organic and free of different contaminants and toxic substances,
- is sterilized, especially through gamma irradiation, under standardized conditions and free of harmful microorganisms,
- can be safely used in medical therapies,
- follows strict production and storage standards, and legal and safety regulations,
- complies to the physicochemical criteria that are important for the use of honey as a wound care product.

The presented case report highlights the effectiveness of the combination of surgical treatment and topical applications of honey bee products and volatile oils, natural potent agents with wound healing and anti-infectious effects. This type of mixtures could be especially indicated in such difficult wounds, with:

- exposure of osteo-articular structures
- poor local defense
- infection with multi-resistant germs
- limited possibilities or failure of reconstructive surgery to close the skin and soft parts defects.

**The volatile (essential) oils** have also been studied for wound management, due to their various chemical constituents, of which 90% are terpenes, that have a wide variety of structural features and exert multiple actions [25], such as:

- antibacterial
- anti-inflammatory
- antioxidant
- wound healing stimulation.

Among the biological properties of volatile oils, scientific research has particularly highlighted the broad spectrum anti-infectious activity: antibacterial (Gram positive and Gram negative, including MRSA), antiviral, antifungal and antiparasitic [26-30].

Experimental studies on *Thymus vulgaris* essential oil have highlighted significant antimicrobial activity, as well as strong antioxidant properties. The thyme volatile oil represents a very promising natural product and can be regarded as a new source of natural antiseptics, with future applications in the pharmaceutical and food industry [31-33].

**Api-phyto combinations** can be recommended in severe and infected wounds, due to the multiple properties and favorable effects for wound healing exerted by honey bee products, along with the antiseptic action of volatile oils. These actions can be extremely useful especially in problematic cases of wounds with bone exposure or open fractures, especially infected with multiresistant germs, with difficult healing, poor local defense and limited loco-regional resources.

## V. CONCLUSIONS

The combination of honey and thyme volatile oil represents a potent compound with wound healing and anti-infectious effects, and can be applied especially in these difficult cases, with exposure of osteo-articular structure, poor local defense, infection with multi-resistant germs and limited surgical possibilities.

Further clinical studies are needed to establish the best indications, methods and forms of administration of medicinal honey, sometimes in combination with other natural products, such as propolis, beeswax and volatile oils.

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