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RESEARCH ARTICLE

IMPACT OF HONEY DRESSING ON CHRONIC ULCER

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Abstract

Purpose: This study aims to highlight the significance of honey in wound treatment by focusing on its healing properties, main compounds responsible for healing capacity, its effectiveness in non-healing wounds, cost-effectiveness, and challenges coming its way.

Background: Honey is an ancient treatment that is increasingly earning its place in modern wound care. Honey has been found to exert antioxidant, anticarcinogenic, anti-inflammatory, and antibacterial effects without antibiotic resistance, promote moist wound healing, and facilitate debridement. Composed of 80% sugar and 17% water, this supersaturated natural substance makes a splendid wound dressing. Its high osmolarity, phytochemicals, and enzymatic production of hydrogen peroxide inhibit bacterial growth, while its acidic pH and autolytic debridement, decrease inflammation and improve blood circulation to enhance epithelialization and healing with minimal scar tissue. Clinical observations suggest that honey holds significant promise as an effective treatment for several medical conditions, particularly in managing non-healing wounds. Large, contaminated wounds are difficult and expensive to treat. Thus, using honey can be an effective and economical approach to managing large wounds.

Methods:A prospective observational study was conducted in the Department of General Surgery at Silchar Medical College and Hospital from August 2022 to April 2023, to evaluate the significance of honey dressing and related complications. This study included 25 cases with an average age of 38.18 (range 17-63) years, of these 19 were males and 6 were females.

Result:In the results of the study, it was reported that honey in acute and chronic wounds provided rapid epithelization and wound contraction in wound healing, had anti-inflammatory and debridement effects, decreased pain, ensured infection control, shortened the time of wound healing, and was cost-effective.

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Introduction:-

Honey has been used to treat wounds for thousands of years in multiple cultures. The usage of honey has been reported in 2100-2000 BC, from a Sumerian tablet writing that mentions honey's use as a drug and an ointment. Aristotle said honey as being "good as a salve for sore eyes and wounds", and "eating honey prolongs life". Hippocrates said, "I eat honey and use it in the treatment of many diseases because honey offers good food and good health".

In advanced world, some clinicians are under the impression that there is little or no evidence to support the use of honey as a wound dressing. To allow sound decisions to be made, a detailed study on the use of honey in wound healing is necessary.

A wound is a disturbance in the normal structure and function of the epidermis. The epidermis is considered the first line of defense and protection against trauma. Various mechanisms can cause wounds, such as acute injury (abrasion, puncture, and/or crushing), surgery, and physiological conditions that compromise the skin (e.g., ischemia and pressure). Wound healing is a complex process with many interdependent immunological and pathophysiological mediators to restore the cellular integrity of the damaged tissue. Wound healing depends on the presence of multiple types of cells, the extracellular matrix, cytokines, and growth factors, in addition to restoring the functionality of the compromised cells. Four distinct and overlapping stages are involved – inflammation, proliferation/regeneration, and tissue fibroplasia.

With the emergence of drug-resistant bacteria, many antimicrobial agents have become ineffective in wound treatment, and many failures in current wound treatment methods have been reported. For this reason, alternative therapies have been sought, one of which is the use of honey as a wound treatment agent. The use of honey has recently gained clinical popularity for possible use in wound treatment and regenerative medicine.

Wound care is an important surgeon-dependent risk factor for infection besides prophylactic antibiotics, operating room environment, and surgical technique. Surgical dressings are classified into three categories. Passive dressings (such as gauze, absorbent pads, and adhesive tapes) act by physical wound protection and control of exudate. Active dressings (such as films, hydrocolloids, hydrofiber, and foam) provide a moist environment that promotes healing and their adherence to the wound is less likely. Interactive dressings (as antimicrobials, e.g. dressings containing silver or iodine, and vacuum dressings) augment the mechanisms of wound healing.

Honey is not only a high sugar-containing solution but also a biological wound dressing having many bioactive components that can enhance wound healing by several mechanisms. Honey accelerates wound healing through actions on its three phases of inflammation, proliferation, and remodeling.

In modern medicine, successful results have been achieved after honey application to many wounds, such as burns, different chronic ulcers, infected surgical wounds, malignant wounds, Fournier's gangrene, and neonatal wounds, along with others.

The purpose of this prospective study was to evaluate the effectiveness and safety of using honey as topical care for different types of wounds with limited resources.

How it works?

Anti-infectious activity:

Honey is a traditional remedy for the treatment of infected wounds. Also confirmed through laboratory research. It has broad-spectrum action against at least 80 species of micro-organisms, including gram-positive and gram-negative bacteria, aerobes and anaerobes, some fungal species of Aspergillus and Penicillium, and all the common dermatophytes. It also acts against types of bacteria multi-resistant to antibiotics, such as Pseudomonas, Acinetobacter, methicillin-resistant(MRSA), and coagulase-negative Staph aureus.

In many cases, honey acted where other antibacterial therapies failed, possibly because honey is effective on aggregated bacteria in biofilms, a situation where antibiotics and silver dressings proved ineffective.

Anti-infectious mechanism:
Due to the osmotic effect of high glucidic concentrations, an agent that was called "inhibin" before its identification was H_2O_2, a well-known antimicrobial agent that is produced by the enzyme glucose oxidase in honey, which may also accelerate the healing process.

Additional non-peroxide antibacterial factors found in honey are- Methylglyoxal (in Manuka honey from New Zealand)

Anti-inflammatory action:
This anti-inflammatory effect of honey diminishes edema and exudate and minimizes or even prevents hypertrophic scar formation. It stimulates collagen synthesis, angiogenesis, and granulation tissue formation, promotes epithelialization, and enhances wound contraction. It reduces pain, deodorizes the wounds, and has a debriding action lifting the debris from the wound.

Anti-oxidant action:
Honey acts as an anti-oxidant by controlling free radicals and reactive oxygen species(ROS).

Antimicrobial Properties:
Topical antimicrobial agents currently used:
Iodine (cadexomer iodine and povidone iodine),
Silver (silver sulfadiazine and ionic silver-impregnated dressings) and
Antiseptic agents such as poly hexamine
Honey is also antimicrobial, acts as a debriding agent, and can help with odor control.

Other properties known are:
Moist local environment:
Due to its high viscosity and to the drawing of fluids by osmosis. Honey promotes wound healing, because wounds heal faster when kept moist as opposed to when they are left to dry out and form a scab. It ensures the growth of epithelial cells, the contraction of fibroblasts to approach the wound edges, as well as non-adherence of dressings to the wound, leading to easy and painless dressing changes, without the risk of breaking newly formed epithelium. It allows the protein-digesting enzymes in the wound tissues to work and loosen any scab and dead tissue.

The debriding action:
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 to the wound surface but does not digest the collagen extracellular matrix, which is necessary for tissue repair.

The nutritional action:
Is indirectly through the osmotic flow of lymph, which brings nutrients needed for healing. And directly through an intake of easily metabolized carbohydrates, amino acids, vitamins, and minerals. Honey provides glucose support for epithelial cells, and leukocytes and the process of glycolysis. The epithelial cells require a reserve of carbohydrates for energy migration over the wound surface to restore the epithelial sheath.

The osmotic flow:
The high osmolarity of honey causes interstitial fluid drainage, thus providing nutritional support for tissue regeneration. This osmotic flow contributes to lifting and removing waste and debris from the wound. Also contributes to the lack of adherence of the dressing to the wound.

The acidity of honey:
Usually pH is less than 4. This may contribute to the antibacterial action of macrophages since an acidic pH inside the vacuole is involved in destroying the ingested bacteria.

Patients And Methods:-

Methodologies
This prospective study was conducted between August 2022 to April 2023 in the Department of General Surgery at Silchar Medical College and Hospital. The inclusion criteria were patients having chronic, infected, or heavily

colonized wounds that did not respond to normal management. Patients were informed about the procedure and consent was taken. Patients who refused honey as a method of wound care, cases with peripheral vascular insufficiency, and cases that were missed during follow-up were excluded from the study. The study included 25 cases with an average age of 38.18 (range 17-63) years, of these 19 were males and 6 were females. There were 11 smokers, and 3 patients were diabetics. Malnutrition, alcoholism, and other causes of immunosuppression were not present in any patient in the study.

The dressing technique

This was done after meticulous debridement, optimizing the patient's general condition, blood sugar control in diabetics, and strict instructions on smoking cessation. Informed consent was obtained from all patients included in the study. As medical-grade honey preparations were not available, patients brought original honey from local beekeepers without irradiation and kept it in dark containers at room temperature. The dressings were handled by the patient or one of the relatives at home after teaching them the steps of dressing during their initial hospitalization where it was done by the resident. The dressing started with thorough wound washing with saline and using gauze to remove any superficial debris. No antiseptic was used in the study. After drying the wound, a ribbon of gauze soaked with honey was applied and folded into at least three layers. We used gauze to function as a mesh keeping honey to prolong its contact with the wound. The gauze length and amount of honey varied according to the wound size for covering the whole wound, filling its depth, and hanging over its edges. A dressing was applied over the gauze and a crepe bandage was applied lightly. The frequency of dressing was variable according to the soaking of the dressing with exudates. This was done twice daily or once daily. With the improvement of the wound condition, dressings were changed every other day. According to the culture results in infected cases, systemic antibiotics were given for four weeks.

Assessment and follow-up

The patients were followed up weekly till sound wound healing. On follow-up in the outpatient clinic, the patient or the relative was asked to perform the dressing in front of one of the doctors to ensure the dressing consistency. The parameters of wound follow-up were wound size and depth, clearance of discharge, progression of granulation tissue formation and epithelialization, the condition of the adjacent skin (dermatitis, maceration, desiccation, edema or excoriation), any adverse events, and time to complete wound healing. Photographs were taken for documentation. It was too difficult to precisely calculate the surface area of the wounds because of the highly variable irregularities of wound shapes. The size follow-up was done by monitoring the changes in the maximum wound length longitudinally and horizontally.

Case 1:- Showing wound before honey dressing and then wound healing after honey dressing.

Case 2:- Showing before and after effects of honey dressing on a wound.

Results:-

Wound sizes were variable. All cases showed improvement in all parameters with complete wound healing. A recurrence of deep infection occurred in 1 case and was treated by debridement. Initial mild itching occurred in 3 patients with spontaneous resolution. A few cases complained of moderate pain that occurred for 10-15 minutes. We have observed that pain is experienced only in very inflamed wounds and disappears once the inflammation has resolved. However, there are many reports of honey relieving pain. The pain experienced does not seem to be associated with damage to the wound. Interestingly, patients have reported a 'peppery' sensation when honey is applied to ulcers. It is possible, therefore, that in some patients the nerve endings are sensitized and thus more responsive to the honey's acidity and/or its organic chemicals.

Also, it was noticed that all early presenting wounds closed within a few weeks while all late presentation wounds took a little longer.

Discussion:-

With honey, we also need to be aware that it is a natural product, and that those characteristics associated with wound healing may be affected by different factors. Hence, the following points are to be taken care of:

1. Do not leave it too late to start using honey on a wound
2. Use only honey that has been selected for use in wound care
3. Use dressings that will hold a sufficient amount of honey in place on the wound to obtain a good therapeutic effect
4. Ensure that honey is in full contact with the wound bed
5. If a non-adherent dressing is used between the honey dressing and the wound bed, it must be sufficiently porous to allow the active components of the honey to diffuse through
6. Ensure that honey dressings extend to cover any area of inflammation surrounding wounds
7. Use a suitable secondary dressing to prevent leakage of honey
8. Change the dressings frequently enough to prevent the honey from being washed away or excessively diluted by wound exudate

Conclusion:-

Honey dressings are a viable treatment option for both early and late-presenting wounds to improve the rate of wound healing the prognosis for healing is partially dependent on time of wound presentation. The study demonstrated that honey was an effective, simple, and affordable method of infected wound care. The antibacterial, anti-inflammatory, antioxidant, as well as nutritional and physical properties of honey, make it a logical and accepted natural agent for wound dressing. The use of honey-impregnated dressings, honey ointments, and honey gel dressings has overcome comments that honey is messy to use and difficult to keep in place.

Hence, the general effects of honey on wound healing

1. Causes greater wound contraction
2. Promotes the formation of granulation tissue
3. Promotes epithelialization of wounds
4. Stimulates tissue growth, synthesis of collagen
5. Stimulates development of new blood vessels in the bed of wounds
6. Reduces postoperative adhesion
7. Reduces edema
8. Reduces inflammation
9. Deodorizes wounds
10. Promotes moist wound healing
11. Facilitates debridement
12. Reduces pain

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