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'REVIEW OF PARA-SURGICAL TECHNIQUES IN AYURVEDA WITH SPECIAL REFERENCE TO MAGGOT DEBRIDEMENT THERAPY

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ABSTRACT

In practice of surgery the recent trends have been inclined towards the minimal invasive methods in concern to the management of various surgical entities owing to one reason or another. A lot has been available in the Ayurveda in concern to established para surgical techniques as Kshar-karma i.e Chemical Cautery, Agni-karma i.e Thermal Cautery, Raktavisravana (Jalouka-avcharana) i.e Hirudotherapy, Maggot Debridement Therapy, methods other than purv-karma & asht-vidh shastra karma in shashti-upkaram. Wound healing in ulcers having chronicity is still a great challenge despite of availability of various measures. Maggot Debridement Therapy could be very rational alternative in relation to this. It involve the intentional introduction of live, disinfected maggots (fly larvae) in the non-healing skin and soft tissue wounds in humans for effective de-sloughing and wound healing promotion in conditions like venous ulcers, diabetic foot lesions, trophic ulcers and other such chronic non healing ulcers. Very enthusiastic results have been reported with its application in above mentioned conditions. The article includes the thorough review about the Maggot Debridement Therapy for chronic non healing ulcers along with the references available in classics.

KEY WORDS: Chronic ulcers, Wound Healing, De-sloughing, Maggots, Maggot Debridement Therapy.

INTRODUCTION

Para surgical method is the technique which is nearly effective as surgical measure, requiring comparatively minimal setup and expertise. It could be executed without the aid of anesthesia requiring minimal or no post-procedure stay & requiring comparatively minimal post-procedure care. Para-surgical measures in Ayurveda are described mainly in concern to the wound management, ano-rectal disorders, conditions like chronic pain management, cutaneous lesions like corns, callosities & papilloma i.e. Kshar-karma (Chemical Cautery).[1] Agni-karma (Thermal Cautery).[2] Raktavisravana (Hirudotherapy).[3] The other measures that can be enlisted under this category are Maggot Debridement Therapy,[4] and methods other than Purv-karma & Asht-vidh shastra karma in Shashti-upkarma.[5] The maggot debridement therapy has been proved to be very much effective in the conditions like venous ulcers, diabetic foot lesions.[6] trophic ulcers and ulcers having delayed healing.[7]

Maggot Debridement Therapy

Maggot Debridement therapy (MDT) is a type of therapy involving the intentional introduction of live, disinfected maggots (fly larvae) in the non-healing skin and soft tissue wound(s) of a humans for the purposes of not only for the selectively cleaning out only the necrotic tissue from the wound but also for disinfection & promotion of wound healing.

Early history of Maggot Debridement Therapy

Written records have documented that maggots have been used since antiquity as a wound treatment as under:

1. Sushrut Samhita treatment of in kaphaja arbuda.[4] particularly in relation to infected growths.
2. Maya Indians and Aboriginal tribes in Australia.[8]
3. Renaissance times-These physicians included Napoleon’s surgeon general, Baron Dominique Larrey, who reported during France's Egyptian campaign in Syria.[9] 1798–1801, that certain species of fly destroyed only dead tissue and had a positive effect on wound healing.

1. Dr. Baer at, Johns Hopkins University in 1929 introduced maggots into 21 patients with intractable chronic osteomyelitis with very effective results within two months. After the publication of Dr. Baer's results in 1931.[10] maggot therapy for wound care became very common, particularly in the United States.

2. The Lederle pharmaceutical company commercially produced "Surgical Maggots", larvae of the green bottle fly, which primarily feed on the necrotic tissue of the living host without attacking living tissue.
3. More than 300 American hospitals employed maggot therapy during the 1940s.
4. The extensive use of maggot therapy prior to World War II was curtailed when the discovery and growing use of penicillin caused it to be deemed outdated.

Reintroduction of MDT

1. With the advent of antibiotic-resistant bacteria, Dr. Ronald Sherman.[11] a physician previously at the University of California, re-introduce maggot therapy into the armamentarium of modern medical care in 1989.
2. The therapeutic maggot used by Sherman.[12] is a strain of the green bottle fly (Phaenicia sericata) and marketed under the brand name medical maggots.
3. In 2007 preliminary trial, maggots were used successfully to treat patients whose wounds were infected with MRSA, a bacterium (Staphylococcus aureus) with resistance to most antibiotics, including methicillin.
4. There are over 800 health care centers in the United States that have utilized maggot therapy.
5. Over 4,000 therapists are using maggot therapy in 20 countries.

MATERIAL AND METHODS

Ayurvedic as well as contemporary literature concerning the MDT is scrutinized for the thorough review of maggot debridement therapy for the management of non-healing concerning the chronic ulcers.

Materials

The flies and maggots used in maggot therapy

The flies used most often for the purpose of maggot therapy are "blow flies" (Calliphoridae); and the species used most commonly is Phaenicia sericata, the green blow fly. Another important species, Protophormia terraenovae, is also notable for its feeding secretions, which combat infection by Streptococcus pyogenes and Streptococcus pneumoniae.

Phaenicia sericata

Scientific classification:

Kingdom : Animalia

Phylum : Arthropoda

Class : Insecta

Order : Diptera

Family : Calliphoridae

Genus : Phaenicia

Species : sericata

Life cycle of Phaenicia sericata:

- Fly lays 150 eggs in a single time.
- Hatches in 24 hours to maggots.
- Turns into cocoons in 5 days.
- Turns in adult form in another 5 days.

Method to culture Biological Maggots

Breeding of flies is done under controlled lab environment. Flies are fed on sugar & water. For reproduction the flies are given protein rich diet say protein mainly of animal origin. Egg are harvested immediately & are washed several times with specific solutions (70% alcohol) & distilled water. Eggs are cultured on red algar (culture medium) at 28 degree centigrade for 24 hours in controlled environment for any type of growth. After hatching maggots are again washed minimal three times with specific solutions (70% alcohol) & distilled water & supplied under the name of biological maggots.

Regulation regarding use of medicinal maggots

In January 2004, the U.S. Food and Drug Administration & in February 2004.[13] the British National Health Service granted permission for maggot debridement therapy in the following conditions:

1. Debridement of non-healing necrotic skin and soft tissue wounds.
2. Diabetic/ Neuropathic foot ulcers.
3. Pressure ulcers.
4. Venous ulcers.
5. Non-healing traumatic or post-surgical wounds.

Application of maggots containing wound dressings

Maggots are contained in a cage-like dressing over the wound for two days. The dressing must be kept air permeable because maggots require oxygen to live. When maggots are satiated, they become substantially larger and seek to leave the site of a wound. Multiple two-day courses of maggot therapy may be administered depending on the severity of the non-healing wound.

Mechanisms of action

The maggot debridement therapy (MDT) has three principal actions as reported in the medical literature:

1. Debride wounds by dissolving only necrotic, infected tissue.[14]
2. Disinfect the wound by killing bacteria.[15]
3. Stimulate wound healing.[15]
4. Biofilm inhibition and eradication.[15]

1. **Debridement**

   Maggots selectively consume only necrotic tissue and can debride a wound in a day or two. These maggots do not damage healthy tissue: they operate with precision at the boundary between healthy and necrotic tissue. They derive nutrients through a process known as "extracorporeal digestion" by secreting a broad spectrum of proteolytic enzymes that liquefy necrotic tissue, and absorb the semi-liquid result within a few days. In an optimum wound environment maggots molt twice, increasing in length from 1–2 mm to 8–10 mm, and in girth, within a period of 3–4 days by ingesting necrotic tissue, leaving a clean wound free of necrotic tissue when they are removed.

2. **Disinfection**

Maggot therapy is effective even against antibiotic-resistant bacteria. Maggot secretions were first experimentally shown in the 1930s to possess potent antimicrobial activity. As early as 1957, a specific antibiotic factor was found in maggot secretions and published in the journal Nature. Secretions believed to have broad-spectrum antimicrobial activity include allantoin, urea, phenylacetic acid, phenylacetaldehyde, calcium carbonate, and proteolytic enzymes. Bacteria not killed by these secretions are subsequently ingested and lysed within the maggots. In vitro studies have shown that maggots inhibit and destroy a wide range of pathogenic bacteria including methicillin-resistant Staphylococcus aureus (MRSA), group A and B streptococci, and Gram-positive aerobic and anaerobic strains.

3. **Wound healing**

Maggot secretions appear to amplify the wound healing by:

1. Effects of host epidermal growth factor and IL-6.
2. Growth of human fibroblasts and slow-growing Chondrocytes.
3. Chondrocyte proliferation, as well as the synthesis of cartilage-specific type II collagen, increases in the maggot secretion environment.
4. Micro massage of the wound by maggot movement is further thought to stimulate the formation of granulation tissue and wound exudates by the host.
5. Maggot secretions also contain a substance called allantoin which has a soothing effect on the skin.

Maggot debridement therapy (MDT) is further compatible with other wound care therapies such as:

1. Antibiotics
2. Negative pressure wound therapy (NPWT)
3. Skin grafting
4. Hyperbaric oxygen therapy

Limitations of MDT

1. Patients and doctors may find maggots unpleasant.
2. Limited availability of medical maggots.
3. Maggots have a short shelf life which prevents long term storage before usage.
4. A moist, exudation wound with sufficient oxygen supply is the ideal wounds for treatment with MDT.

CONCLUSION

Maggots are very effective in de sloughing the wound and making the conditions favorable for the wound healing.

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