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Review / Derleme

Biosurgery: utility in chronic wounds

Biyocerrahi: kronik yara bakımındaki yeri

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ABSTRACT

Biyocerrahi veya maggot debritman tedavisi veya larval terapi faydası özellikle kronik yara bakımında kanıtlanmış bir tamamlayıcı tıp uygulamasıdır. Uygulama neredeyse kronik yara bakımından istenen tüm nitelikleri taşımaktadır. Etki mekanizması temelde dört bölümde incelenebilir; 1) Mekanik debritman, 2) Antimikrobiyal etki, 3) Yara iyileşmesini uyarma, 4) Biyofilm yıkımı. Maggotlardan izole edilen çok sayıda protein yeni ilaçların üretilmesinde ciddi potansiyel taşımaktadır. Şu an için, bu uygulamanın etki mekanizmaları tamamen aydınlatılamamıştır ve uygulama salt bir tedavi yöntemi olarak değerlendirilmemekte; aslen, kronik yara bakımına çok disiplinli bir yaklaşımın parçası olarak sunulmaktadır.

Keywords: *Lucilia sericata*, kronik yara .bakımı, larva terapi, maggot debritman tedavisi

ÖZ

Biosurgery or maggot debridement therapy or larval therapy is a complementary – integrative medicinal method that it has proven utilities especially in chronic wound care. The method nearly provides every activity desired from a wound care. Its modes of action can be divided into four major titles; 1) Mechanic debridement, 2) Antimicrobial action, 3) Directing the tissue to wound healing, 4) Biofilm degradation. Furthermore, many isolated proteins from maggots showing various activities give a potential for future drugs. For now, whole effect mechanisms remain unclear and this therapy is not used as a single treatment method; it is actually a part of multidisciplinary approach to wound care.

Anahtar Kelimeler: *Lucilia sericata*, chronic wound care, larval debridement, maggot debridement therapy

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INTRODUCTION

Biosurgery or maggot debridement therapy or larval therapy is a complementary – integrative medicinal method that is widely studied for a long time (1-3). *Lucilia sericata* larvae are actually important in forensic entomology, but their ability to feed from necrotic tissue and microorganisms makes them perfect candidates to be used in chronic wound care (4,5).

Recently, chronic wounds including diabetic foot are serious problems for healthcare, their financial burden is too high and unfortunately chronic wound prevalence is uprising (6-9). The main problems in these kind of wounds are; 1) Corrupted healing process, 2) Fruitless chronic inflammatory reactions, 3) Continuous producing of necrotic tissue, 4) Infections, v) Biofilm formations (6,10-12). Without breaking this circle, it is actually impossible to make a proper wound treatment. Currently, there are many wound dressings or wound care methods with different specialties, and choosing the appropriate treatment method is debatable and mainly depends on etiology, wound type and existence of infection.

BIOSURGERY

Biosurgery was studied for several types of chronic wounds such as diabetic foot ulcers, venous stasis ulcers, pressure wounds. It acts mainly in four mechanisms; 1) Mechanic debridement, 2) Antimicrobial action, 3) Directing the tissue to wound healing, 4) Biofilm degradation. Maggots do these actions by

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their mechanical movements (i.e. eating) and with secretions/excretions containing several types of proteins, enzymes and chemicals (4,5). Furthermore, recent studies indicated that maggots behave in a specialized way to the wound and the infectious agent, that the proteins show wide variability according to the encountered wound and the infectious agent (13). This seems to be a perfect adaptation mechanism, which might provide physicians a "patient-specialized" treatment.

Mechanic debridement: Feeding from only necrotic tissue is the key point. The larva performs a so-called "search&destroy" activity, that it eats necrotic tissue and also it wanders onto the wound area in search of food. This behavior provides the advantage of debridement in even areas of the wound that are unreachable by surgical debridement (4,5,14). In addition, debridement is not achieved only by feeding, but also enzymatic reactions made by secretions/excretions (15).

Antimicrobial action: Many studies were published indicating antimicrobial effects. Maggots do this action by simply eating the pathogen agent, killing the agent with secretions/excretions and alkalizing the wound area. Till now, bacteriostatic, bactericidal, antifungal and antileishmanial activities were obviously defined (13,14,16-30).

Directing the tissue to wound healing: Although Debridement and antimicrobial actions of biosurgery can already break the chain of choric wound, studies indicated that secretions/excretions of larvae may directly effect in a positive way on wound healing and neoangiogenesis. These reactions are mainly depends on enzymatic reactions. It seems maggot secretions/excretions provokes many immunologic processes in multiple ways that results the wound to get out of chronicity chain (31-34).

Biofilm degradation: Unfortunately, infectious agents of chronic wounds have always a potential to create biofilms, which results with extended treatment durations or even treatment failure. Only a few studies were published on this issue about biosurgery, but preliminary reports seem to be very promising. It was observed that biofilms of *S. aureus, S. epidermidis, K. oxytoca, E. faecalis, E. cloacae* and *P. aeruginosa* can be degraded by this method. Of note, these bacteria are the most encountered species in chronic wound infections (35,36).

The method is applied in two forms; free-range and biobag. These methods have advantages and disadvantages over each other, but the mechanism is totally the same. The choice actually depends on the patient and physician. The studies did not show any significant side effect of biosurgery, only the main problem seems to be patient comfort, which is very subjective and tolerable comparing to the estimated results (4,14,37).

CONCLUSION

Biosurgery is an effective, cheap, easily-applicable method in chronic wound care. Although effect mechanisms remain unclear, several actions were reported in many studies. These activities cannot be separated and should be evaluated as one-chained reaction circle. Besides, this therapy is not a single treatment method; it is actually a part of multidisciplinary approach to wound care.

DECLARATION OF CONFLICTING INTERESTS

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