*L*ibyan *M*edical *J*ournal
https://lmj.ly/index.php/ojs/index

Mini-review article

Maggot Debridement Therapy in the Salvage of Diabetic Foot Ulcers -New Perspectives

Aisha Abdalla*[1], Mohamed Smat[2]

Citation. Abdalla A, Smat M. Maggot Debridement Therapy in the Salvage of Diabetic Foot Ulcers -New Perspectives. Libyan Med J. 2024;16(2):160-163.

Received: 29-07-2024
Accepted: 19-09-2024
Published: 30-09-2024

Funding*: This research received no external funding.*

Conflicts *of Interest: The authors declare no conflict of interest.*

[1]*Faculty of Public Health, Benghazi University and Training Headquarters of the Libyan Medical Board, Laboratory Medicine.*
[2]*Department of Plastic Surgery, AL Wahida Hospital Derna and Department Surgery*
***Correspondence:** A.gadafieplhouse@gmail.com*

Abstract

Infestation of living beings with maggots is called myiasis. Humankind knows this over centuries. Australian aborigines have used maggots to clean wounds for thousands of years. The world war experience of managing infected and necrotic wounds made it obvious that. These wounds which got infected with maggots had a better outcome in terms of debridement, limb salvage, lesser percentage of amputation, lesser degree of septic complication. MDT found place in the medical management of challenging wound with extensive neurosis especially in patients with comorbidities. Where sharp debridement was fraud with serous outcomes. The advent of penicillin was a setback for the modeling of MDT. With the emergence of drug resistance, the prevalence of chronic infection such as osteomyelitis had increased. In the secure for different means of management of such condition, the MDT mode its comeback. Maggots were found to derive their nutation through extracorporeal digestion by secreting protocoled enzymes; the enzymes are metalloproteinase and asperity proteinase. Other enzymes include carboscypepti - dases A and B, Lucien aminopeptidase, collagenase and serine proteases. Broad spectrum antimicrobial activity of the secretion is due to allantois urea, phenyl acetic acid, phenylacetaldehyde calcium carbonate. Bactena not killed by the secretions were ingested by the larvae and degraded in their intestines thus, it has been appreciated that MDT is effective and safe, is better option in certain clinical conditions.

Keywords: *Maggot, Debridement, Therapy.*

Introduction

Historical aspects. Chronic wounds such as sores diabetic or vascular ulcers are associated with high morbidity and to lesser extent mortality (1). Chronic wounds take the form of no healing ulcers with fibrotic tissue, dead and necrotic slough and multiple infections (2). Debridement is the removal of foreign debris and devitalized or contaminated tissues from a wound so that the no surrounding healthy tissues are exposed (3). The main reason for debriding a wound is to avoid for bacterial growth (4, 5). The Utilization of larvae for wound healing has been reported; Australian aborigines have used maggots to clean wounds for thousands of years (6). Ambroise pare 1509-1590 and Dominique jean larrey 1766-1842, have documented the association of maggots with debndement of necrotic tissue during us civil war (7). Battlefield soldiers during world war had their wounds infested with maggots as reported by Williom S.Baer (8). In late 1920s and early 1930 Baer clinically applied maggots in the treatment of complicated wounds and osteomyelitis (8,9). In1929 Baer showed that the treatment was effective in the of chronic osteitis and osteomyctitis (10). The use of maggot debridement therapy (MDT) thrived until the development of penicillin in the 1940s (8).

Biology of flies and maggots

Maggots are they larvae immature flies (11,12). Teeing on necrotic tissue, the larval or maggot stage of fly development is the primary feeding stage (12). The blow fly lags 2000-3000 eggs over a few weeks, in 18-24 hours larvae hatch out. These are 1-2mm in length. They start feeding on necrotic tissue, vigorously teeing larvae increase in size to 8-10mm in about 4-5days molting twice during this time they leave the wound and become pupae further metamorphosis results in development to adult fly. Medical grade larvae are obtained from

infested porcine liver. Eggs are separated and chemically sterilized and kept in aseptic condition before use (13). As a safety precaution the eggs are dis infected using Chlorhexidine, povidone iodine and sodium hypochlorite (14,15,16,17,18).

Mechanism of action

- MDT is based on three mechanisms
- Mechanical removal of necrotic tissue
- Bactericidal and bacteriostatic activity
- Promotion of healing

Four major actions associated with this form of wound therapy are deboned disinfection, stimulation of healing and biofilm elimination by (8,19). Studies by Sherman and pester regarding the elimination of bacterial flora including MRSA by larvae placed in the wound opened new opportunities for researchers and clinicians worldwide (20). Maggot secretion may have an anti-inflammation effect on cutaneous wounds (21).

Mechanical Deben dement is caused by specific muddles or mouth hook, by proteolytic enzymes in the secretions and exertions can dissolve the dead or infected matrix on the wound (22). Maggot secretes and excretes digestive enzymes; dead tissue is lignified and can be easily absorbed by the maggot (23). Proteolytic enzymes produced by the larvae of Lucilia sericata (24). Larval secretion's contain L-histidine 3-gaumidino propionic acid and L-valinol which increase of human on endothelial cells (25,26,27)

Method of application of MDT

Patients undergoing MDT have to be routinely evaluated. A written consent for treatment has to be obtained. MDT is indicated for pen wounds and ulcers that conation gangrenous or necrotic tissues with or without infection (28). In recent years the emergence of antibiotic resistance prompted renegade research for at native approaches to managing chronically infected wounds (29,30). Medical grade maggots have become commercially available since 2004 in us (31). Application of maggots40-50 maggots are carefully inserted into the wound. recessing is opened over this to confine the maggots to the wound bed. Follow up dressing is done after 48 hours, maggots are removed with the help of suction, then of resh batch of maggots are introduced as before. This cycle is repeated as required.

Results previous studies have demonstrated fewer amputation were needed compared to conventional therapy (32,33). Patients who had sufficient exposure, the therapy was successful in halting destruction.

Discussion

Increasing awareness of clinical benefits of MDT lee to more targeted evidence-based use of this modality for diabetic foot ulcers venous ulcers, chronic pressure ulcers. There was a reduction of bacterial load in wounds, osteomyelitis cancer and bruins (29,34,35). Armstrong et., al (2005) demonstrated that the antibacterial activity in excretions and secretions of Lucillia caprine maggot's seer us to act synergistically with concurrent antibiotic therapy for staph, aureus (36). How maggots combat wound infection is that the larvae can ingest wound bacteria and kill them as they pass through the digestive tract (37). It is recommended that early aggressive surgical debridement with intravenous antibiotics in combination with MDT may be more effective that these treatments (38).

Conclusion

MDT is a very effective and safe modality of wound debridement and limb salvage has the benefit of being a means of mechanical removal of necrotic tissue, has the advantage of being bacteriostatic its role in the management of osteomyelitis and MRSA infections is now well established by reach. Mindset of the patient and community associating maggots with the dead, is decaying and nasty total smelling condition is one of the greatest hurdles in employing MDT. Infoline highlighting the medicinal advantages with a better media communication MDT may become acceptable.

Reference

1. Eeasley WD, Hirst G, making a meal of MRSA- the role of bio surgery in hospital acquired infection J Hospital infect 2004:56:6-9.
2. Gupta A. A review of the use of maggots in wound therapy, Ann plastic surg2008:60:224-7.
3. Gray M, Islarval (maggot) debridement effective for removal of necrotic tissue from chronic wounds? J wound ostomy continence Nurs 2008:35:378-84.

4. Sieggreen M, Makelburst J. Debridement choices and challenges of wound care 1997:10:32-7.
5. Nano M, Ricci E, Simone M, lanfranco G. Collagenase Therapy in the Treatment of Decubitus Ulcers in Abatangclo G, Donatil, Vanscheidt W, eds, proteolysis in wound repair,New York, Ny: Springer- Verlag 1994:7-21.
6. Fleischmann W, Grassberger M, Serman R, Maggot Therapy: A Handbook of Maggot-Assisted Wound Healing New yark: Theime;2004.
7. Manring M, Calhoun JH, Biographical sketch; William S. Baer (1879-1931). Clin orthopaed relat res 2011,469:917-9.
8. Sherman RA. Maggot Therapy Takes Us Back to the Future of Wound Care: New and Improved Maggot Therapy for the 21st Century J. Diabetes scitechnd 2009;3:336-44.
9. Baer WS. The classic the treatment of chronic osteomyelitis with the maggot (larva of the blow fly). 1931 clin orthop Relat Res 2011;469:920-44.
10. Baer WS. The treatment of chronic osteomyelitis with the maggot (larva of the blow fly) J Bone Joint Surg. 1931;13:438.
11. Wayman J. Nirojogi V.Walker A. Walker MA. The cost effectiveness of larval therapy in venous ulcers, J .Tissue viability 2000;10:94.
12. Amendt J, Campobass CP, Gaudry E, Reiter C, LeBlanc HN, Hall M J , et.al.. Best practice in forensic entomology--standards and guidelines. Int J Legal Medicinc 2007,121 ;90-104.
13. Nigam Y, Thomas S. Maggot therapy the science and implication for CAM part 1- History and bacterial resistance 2006.
14. Nigam Y, Bexfield A, Thomas S, Ratcliffe N. Maggot therapy, the sciene and implaction for CAM part 1- Hisory and bacterial resistance. Evid based complement: Alternate Ned. 2006;3:223-227.
15. Sun X, Jiang k, Chenj W, Lilu H, Wang J, Wang J. A systemic review of maggot debndement therapy for chronically infected wounds and ulcer Int J Infect Dis. 2014; 25:32-37.
16. Wolff, H. Hansson C. Rearing larvae of Lucilia sericata for chronic ulcer treatment An improved method. Acta derm,Venereol.2005,85,126-131.
17. Mumcuoglu K. Clinical applications for maggots in wound are. J Clin dermatology. 2001;2:219-227.
18. Lasantha K, Khamnoi P, Sukontason KL, Boonyawan D, Chaiwong T. Sukontason K. Sterilization of blow fly eggs, Chrysomya megacephala and Lucilia cuprina, (Diptera: Calliphoridae) for maggot debridement therapy application Parasitol Res. 2017 May;116(5):1581-1589**.**
19. Cazander G, van Veen K, Bouwman L, Bernard A, Jukema G. The influence of maggot excretions on PAO1 biofilm formation on different biomaterials. Clin Orthop Relat Res. 2009 Feb;467(2):536-45**.**
20. Sherman RA, Pechter EA. Maggot therapy Technique and clinical application. J.B One J Surg. 1934,16,572-582**.**
21. Li,X, Liu.N Xia,X, Zhang.S, Bai.B and g Wang.J, .The Effects of Maggot Secretions on the Inflammatory Cytokines in Serum of Traumatic Rats. Afr J Tradit Complement Altern Med. 2013; 10(4): 151–154**.**
22. L Chambers 1, S Woodrow, A P Brown, P D Harris, D Phillips, M Hall, J C T Church, D I Pritchard, Degradation of extracellular matrix components by defined proteinases from the greenbottle larva Lucilia sericata used for the clinical debridement of non-healing wounds. Br J Dermatol. 2003;148(1):14-23**.**
23. Sherman R. Mechanisms of Maggot-Induced Wound Healing: What Do We Know, and Where Do We Go from Here? Evid Based Complement Alternat Med. 2014; 2014:592419
24. Sherman RA, Shimoda KJ. Presurgical maggot debridement of soft tissue wounds are associated with decreased rates of postoperative infection. Clinical Infectious Diseases. 2004;39(7):1067–1070.
25. Horobin AJ, Shakesheff KM, Pritchard DI. Maggots and wound healing: an investigation of the effects of secretions from Lucilia sericata larvae upon the migration of human dermal fibroblasts over a fibronectin-coated surface. Wound Repair and Regeneration. 2005;13(4):422–433.
26. Nigam, Y, Morgan C. Does maggot therapy promote wound healing? The clinical and cellular evidence. J Euro Acad Derma Venereology. 2016;30:776–782
27. Morgan C, Newton R, Ratcliffe N, Dudley E, Nigam Y. Amino acid derivatives from Lucilia sericata excretions/secretions may contribute to the beneficial effects of maggot therapy via increased angiogenesis. BrJ Dermatol. 2010;162:554-562**.**
28. Veen L. Maggot debridement therapy: a case study. 2008;35(4):432-6**.**
29. Steenvoorde P, Buddingh T, Van Engeland A Oskam J. Maggot therapy and the 'yuk' factor: an issue for the patient? Wound Repair and Regeneration. 2005;13:350–352**.**
30. Mumcuoglu KY, Miller J, Mumcuoglu M, Friger M, Tarshis M. Destruction of bacteria in the digestive tract of the maggot of Lucilia sericata (Diptera: Calliphoridae) Journal of Medical Entomology. 2001;38(2):161–166.
31. Sherman RA, Shapiro CE, Yang RM. Maggot therapy for problematic wounds: uncommon and off-label applications. Advances in Skin and Wound Care. 2007;20(11):602–610.

32. Jukema GN, Menon AG, Bernards AT, Steenvoorde P, Rastegar AT, van Dissel JT. Amputation-sparing treatment by nature: "surgical" maggots revisited. Clin Infect Dis. 2002;35(12):1566–1571.
33. Armstrong DG, Salas P, Short B, et al. Maggot therapy in "lower-extremity hospice" wound care: fewer amputations and more antibiotic-free days. Journal of the American Podiatric Medical Association. 2005;95(3):254–257.
34. Sherman RA, Wyle FA. Low-cost, low-maintenance rearing of maggots in hospitals, clinics, and schools. Am J Trop Med Hyg. 1996;54(1):38–41**.**
35. Frank Stadler F , Ramon Z, Shaban, Tatham P, Maggot Debridement Therapy in Disaster Medicine 2016 Feb;31(1):79-84.
36. Shuchi A, Bexfield A. Maggot metabolites and their combinatory effects with antibiotic on Staphylococcus aureus Ann Clin Microbiol Antimicrob. 2011;10: 6**.**
37. Mumcuoglu K, Miller J, Mumcuoglu M, Friger M, Tarshis M. Destruction of bacteria in the digestive tract of the maggot of Lucilia sericata (Diptera: Calliphoridae). Journal of Medical Entomology. 200138, 161–166**.**
38. Dumville J, Worthy G, Soares M. Ven US II: a randomised controlled trial of larval therapy in the management of leg ulcers. Health Technology Assessment, NIHR HTA programme. 2009;13:180–182**.**