PRACTICE

Larva therapy in wound management

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J R Soc Med 2000;**93**:72–74

SUMMARY

The use of maggots for wound debridement has a long history and has lately gained ground in several countries. We collected prospective data to examine the current use of larva therapy (LT) in the UK. Quantitative information was collected on 70 patients treated in nine hospitals.

LT is used primarily to treat leg ulcers and generally involves three applications of larvae at two to three day intervals. This method is judged effective in wound debridement and promotes the growth of granulation tissue. Wound exudate, odour, infection and pain are all reduced by the treatment. Adverse reactions are infrequent but include pain, bleeding, pyrexia and influenza-like symptoms. Prevention of hospital admission and surgery, reduced need for antibiotics and reduced hospital stay are all identified as outcomes of LT.

The nurse practitioners who used LT believed it to have an important role in wound management. A randomized clinical trial, comparing LT with other debriding agents, is required for evaluation of cost effectiveness.

INTRODUCTION

The advantageous effects of maggots in the debridement of wounds have been recognized for four hundred years. However, it was not until the 1920s and 1930s that this method of treatment became popular in America, when Baer[1] and others successfully treated several cases of osteomyelitis[2–6]. Clinical use of the larvae of the green-bottle blowfly (*Lucilia sericata*) became popular in the USA[7–9], but declined with the advent of antibiotics and improvements in aseptic wound care. After a virtual halt, LT has lately been revived and has received much media attention. In America, 2000 larvae applications have now been successfully administered, mainly to war veterans[10–12]. In Germany, one laboratory is producing 70–90 treatments a day. A centre in Sweden has treated 53 patients. A dedicated fly culture laboratory has been developed in the UK[13] and more than 5000 treatments have been distributed to over 370 institutions, including hospitals, specialist clinics and general practices[14]. Some centres in the UK have experience of more than 120 patient episodes. LT has been used to treat various lesions, including burns, and before grafting to lower bacterial populations.

Numerous papers describe the use of this technique, illustrated by case histories and other anecdotal information[13,14–18]. However, there is scant contemporary information on its overall effectiveness in the treatment of wounds. The findings presented in this paper are a preliminary response to this criticism.

PATIENTS AND METHODS

Data were collected by nurse practitioners applying LT in hospitals. A data collection sheet, seeking information on management of the wound before, during and after LT, was based on semi-structured interview data from a previous study[19]. These questions were reviewed by two tissue viability nurses who were frequent users of LT. Additionally, they were scrutinized by research staff at the Bridgend fly culture laboratory, and a clinician experienced in LT helped to validate them further. Data were assembled from nine hospitals frequently using LT in the management of wounds (identified in the previous work[19]). A multi-centre research ethics committee advised that a formal ethical application from each hospital participating in the study was not required. After departmental approval from each hospital, the data collection sheet was piloted in four of the hospitals and formatting of the questions was slightly amended. Users were provided with guidelines on how to apply the larvae. Proximity of lesions to large vessels and the brain is the sole excluding factor so far.

The researcher visited each of the hospitals to show nurse practitioners how to fill in the data collection sheets and to encourage their completion. Data were collected from all patients treated with LT in each of the hospitals over six months. A weekly report from the fly culture

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laboratory, identifying those hospitals using LT, enabled the researcher to make regular contact with practitioners. A database was developed with an Excel spreadsheet. Descriptive statistics were used to describe and summarize the information collected.

RESULTS

Lesions

Most of the wounds were leg ulcers. 16 were arterial, 11 venous, 11 diabetic, and 9 of mixed pathology. The average wound area was 80 cm^2, including 52 cm^2 of slough and necrotic tissue and 8 cm^2 of granulation tissue. Wound exudate was moderate or copious in 52 and 53 were malodorous. 39 patients were in moderate or severe pain, primarily caused by ischaemia, and 49 wounds were infected.

Observations during treatment

Larvae were left on wounds for a mean of 3 days, being changed an average of three times before treatment was complete. In only 2 out of the 70 cases did the larvae not survive in the wound. 23 patients reported pain during LT, severe in 6, moderate in 11, mild in 6. 12 of these patients had arterial ulcers and 8 had venous ulcers. The pain usually developed 48–72 hours from the start of LT. During treatment, bleeding was evident in 24 patients; in none was it serious. Pyrexia during LT was observed in 5 patients, and influenza-like symptoms (pyrexia, malaise, respiratory symptoms) developed in 6. 1 patient proved allergic to the hydrocolloid dressing and in 4 the dressing caused skin maceration; in 3 the dressings were difficult to apply in awkward sites.

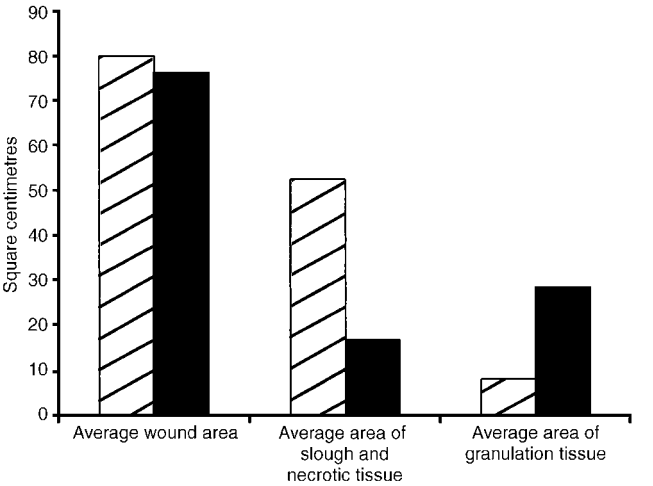

Figure 1 **Dimensions of wound before and after larva therapy.** ▨ Before treatment; ■ after treatment

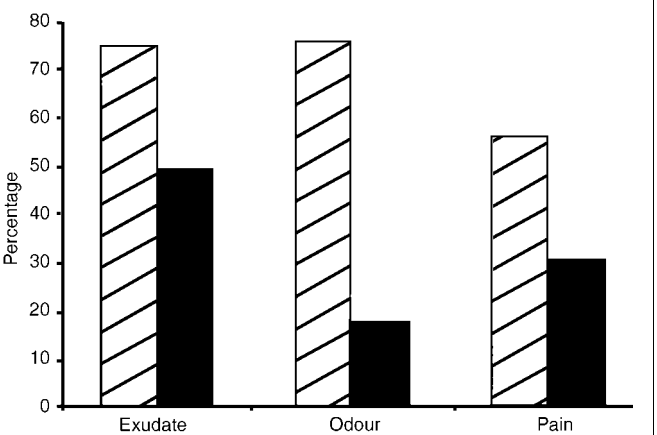

Figure 2 **Description of wound before and after larva therapy.** ▨ Before treatment; ■ after treatment

Observations after treatment

After LT 30 of the wounds were fully debrided, 20 were partially debrided and 8 were unchanged. In 1 case the wound had deteriorated. The average wound size was reduced by nearly 5% and the area of slough and necrotic tissue by 68% (see Figure 1). The area of granulation tissue increased by 21 cm^2 or 26%. The number of wounds with copious or moderate exudate declined from 52 to 32, a reduction of 33%. Wound odour was reduced in 43 wounds (81%) and 27 (69%) patients had less pain. Bacterial growth was recorded in 49 wounds (70%) at the start of the study. After LT only 16 wounds were investigated microbiologically and in 5 of these bacterial growth was absent. There were no cases reported in which antibiotics had to be used after application of the larvae.

In the opinion of nurse practitioners, LT reduced hospital stay in 24 (34%) of the patients, prevented surgery in 19 (27%), avoided hospital admission in 11 (16%) and reduced the need for antibiotics in 18 (26%). They thought that LT had played a major role in management of 63 (90%) of the wounds treated with LT.

DISCUSSION

Adequate wound debridement, by surgical or non-surgical means, is a prerequisite to healing. Non-surgical debridement is generally slower; however, when surgery is not available or not a clinical option, LT can be an effective alternative. It is relatively rapid and very precise; larval scavenging of bacteria reduces infection, including that due to bacterial species resistant to antibiotics; local separation of gangrenous tissue, for instance in a diabetic foot, can postpone or even forestall major ablative surgery to the limb; LT can be undertaken in the community as well as in hospital.

Larval activity in a wound depends on the wound environment. Clinical practitioners can readily acquire the skills necessary to manage the dressings, but further studies are required to elucidate the factors that provide an optimal environment for the larvae.

The apparent stimulation of granulation tissue following successful larval activity in a wound is probably related to specific growth factors in the larval secretions[20], and is the subject of continuing research. Where pain is likely to be troublesome, for instance in patients with arterial disease in the lower limbs, adequate pain relief must be given and the treatment can be foreshortened. No cause was found for the transient pyrexia experienced by some patients, but it could be due to an immunological reaction.

The findings presented in this first prospective study provide some guidance on best practice.

Acknowledgments This research was undertaken with financial support from the Dunhill Medical Trust. Participating hospitals were: Broomfield Hospital, Broomfield, Chelmsford; Joyce Green Hospital, Dartford, Kent; Bradford Royal Infirmary, Bradford; Almagelvin Hospital, Londonderry; Doncaster Royal Infirmary, Doncaster; Derriford Hospital, Plymouth; Royal Hospitals Trust, Belfast; Nevill Hall Hospital, Abergavenny, Gwent; White Abbey Hospital, County Antrim.

REFERENCES

1 Baer WS. The treatment of chronic osteomyelitis with the maggot (larva of the blowfly). *J Bone Joint Surg* 1931;**13**:438–75

2 Buchman J, Blair JE. Maggots and their use in the treatment of chronic osteomyelitis. *Surg Gynecol Obstet* 1932;**55**:177–90

3 Galbraith JH. Treatment of chronic osteomyelitis. *Pennsylvania Med J* 1931;**34**:316–18

4 Goldstein HI. Maggots in the treatment of wound and bone infections. *J Bone Joint Surg* 1931;**13**:476–8

5 Livingston SK. Maggot treatment of osteomyelitis. *JAMA* 1932;**98**:1585

6 Myers J, Czaja LM. The maggot treatment of osteomyelitis. *Illinois Med J* 1931;**60**:124–33

7 Ferguson LK, McLaughlin CW. Maggot therapy—a rapid method of removing necrotic tissue. *Am J Surg* 1935;**29**:72–84

8 Livingston SK. The therapeutic active principle of maggots with a description of its clinical application in 567 cases. *J Bone Joint Surg* 1936;**18**:751–6

9 Horn KL Jr, Cobb AH, Gates GA. Maggot therapy for subacute mastoiditis. *Arch Otolaryngol* 1976;**102**:377–9

10 Sherman RA, Pechter EA. Maggot therapy: a review of the therapeutic applications of fly larvae in human medicine, especially for treating osteomyelitis. *Med Vet Entomol* 1988;**2**:225–30

11 Sherman RA, Wyle F, Vulpe M. Maggot therapy for treating pressure ulcers in spinal cord injury patients. *J Spinal Cord Med* 1995;**18**:71–4

12 Sherman RA, Wyle F, Vulpe M, Levsen L, Castillo L. The utility of maggot therapy for treating chronic wounds. *Am J Trop Med Hyg* 1993;**49**(suppl. 3):266

13 Thomas S, Jones M, Shutler S, Andrews A. All you need to know about maggots. *Nursing Times* 1996;**92**:46,63–70

14 Thomas S, Andrews A, Jones M. The use of larval therapy in wound management. *J Wound Care* 1998;**7**:521–4

15 Evans H. A treatment of last resort. *Nursing Times* 1997;**93**:62–5

16 Morgan D. Myiasis: The rise and fall of maggot therapy. *J Tissue Viabil* 1995;**5**:43–51

17 Boon H, Freeman L, Unsworth J. Larvae help debridement. *Nursing Times* 1996;**92**:46,76–80

18 Walters J. The benefits of larval therapy in wound care. *Nursing Times* 1998;**94**:62–3

19 Courtenay M. The use of larval therapy in wound management in the UK. *J Wound Care* 1999;**8**:177–9

20 Prete PE. Growth effects of *Phaenicia sericata* larval extracts on fibroblasts: mechanism for wound healing by maggot therapy. *Life Sci* 1997;**60**:505–10