Maggot debridement therapy in surgery

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Chapter

6

Adverse Effects and safety issues

6A The YUK-factor

Based on the following article:

Wound repair and Regeneration
P. Steenvoorde, T.J. Buddingh, A. van Engeland, J. Oskam
Department of Surgery Rijnland Hospital, Leiderdorp, The Netherlands.
Maggot therapy and the 'YUK factor'; an issue for the patient? Wound Repair Regen 2005; 13(3); 350-352.

Introduction

Maggots. the very word evokes images of rotting and decay. It's very easy to understand why the mere thought of using these creatures on infected wounds would not be a pleasant thought for many people. It's suggested that many patients are deterred by this therapy, mainly because of the "yuk factor"[163-164],but perhaps health care professionals have a bigger "yuk factor" as compared to patients.[165] Placement of maggots in socalled "biobags" makes them invisible, easier to apply, and may reduce the "yuk factor" in health care professionals and patients.[103;164] Others state that the acceptance of the therapy is high among patients.[166] In a phenomenological study on six patients receiving maggot therapy, the experience was not as scary as imagined.[167] We performed a survey among our patients to inquire whether the "yuk factor" is important for patients undergoing MDT.

Methods

To establish whether or not the "yuk factor" played a role for the patient in agreeing to maggot therapy, we performed a survey among all our maggot-treated patients, treated between september 2002 and december 2003. The maximum time between the questionnaire and maggot therapy was 11 months. The following questions were asked

1. What were your expectations prior to commencing maggot therapy?
2. Did maggots escape during the therapy?
3. Was there any adverse reaction from your surroundings?
4. Would you again agree to maggot therapy?
5. Would you recommend maggot therapy to other patients?

In addition, we asked about the smell of the wound and the itch over the body using a Visual Analog Scale (VAS), in which the patient had to record the smell prior to, during, and after maggot therapy and the itch over the body during maggot therapy.

Results

In the study period, 41 patients were treated with maggot therapy for nonhealing wounds in our hospital. There were 22 men and 19 women with an average age of 67 years (range: 25–93). Thirty-one patients were treated ambulatory, eight patients were treated while admitted, and two were both ambulatory and admitted. There was a variety of underlying comorbidities. Smoking (61%), diabetes mellitus (48%), and arterial insufficiency (34%) played a role in the wound pathology. The average time the wound

existed before maggot therapy was 14 months (range: 0.5–132). All maggot applications were performed in our outpatient department, including those on our admitted patients. There are three nurses and three physicians who performed the treatment. We used two application techniques: the first six patients were treated with biobags, which contained an average of 20 maggots in a fine polyvinylalcohol bag, which was placed on the wound. All other patients where treated with the free-range technique. In the latter technique the maggots are placed freely on the wound, covered only by a net. This net is taped to a skin adhesive, which is applied to the periwound skin. This adhesive together with the covering net acts like a barrier to reduce maggot migration. Over the net, wet gauze and a light bandage is wrapped. Patients were well instructed on how to treat the wound at home. Every 3–4 days new maggots were placed on the wound until thorough debridement was reached. The patients did not have to change their gauze at home. In our patients the average treatment time was 11 days.

All patients who were proposed for maggot therapy, agreed. None of the patients refused. In 19% of the patients an amputation was necessary, despite maggot therapy. We believe, however, that the amputation level was influenced by maggot therapy, leading to lower level amputations. Because three patients had died before the questionnaire was taken, 38 questionnaires were sent. There was a response rate of 37/38 (97%). In their expectations about maggot therapy none of the patients reported adverse feelings regarding maggots. High expectations were reported by 35%, 54% had no expectations, and 11% reported it to be their final hope for cure. Of all patients, 89% would agree again on maggot therapy, 11% would not. Of the four patients (11%) who would not agree again, three did not benefit from the therapy. When asked whether to recommend maggot therapy to others, 94% would and only 6% would not. For the smell of the wound before, during, and after maggot therapy a visual analog scale was used. The average score before maggot therapy was 3.1 (no smell is reported 0.0 and the most offensive smell is 10.0). During maggot therapy, the score was 5.2, and after therapy it returned to 3.0. Twenty-two patients (58%) reported a more offensive smell during maggot therapy. A VAS was also used for the itch over the body. During maggot debridement therapy the average score for itch over the body was 1.0 (0.0–7.3).

In 43% of the patients, at one time or another some maggots escaped. Because patients received several maggot applications, the escape rate was 12% for all free-range technique applications, and 11% for all applications. For all patients in whom maggots escaped, they all agreed on maggot therapy again if necessary. Adverse reactions from social interactions of the patients were reported by 22% of the patients. They consisted mostly of people finding the idea of maggots eerie. However, all of these patients agreed on maggot therapy again, and all recommended the therapy to others.

Discussion

From these results it seems our patients were not deterred by maggot therapy, in contrast to what has been suggested by others.[163-164] Rather, our results support the study by Thomas et al.[166] All patients agreed to maggot therapy when it was suggested by their physician. There were even some patients who presented the idea themselves after hearing it from others. None of the patients reported any adverse feelings toward maggots, and a high percentage was very positive about this therapy. All patients returned the questionnaire, which suggests a close involvement with the therapy or therapist. Most of our patients are positive about maggot therapy and would undergo it again if necessary. An even higher percentage of patients recommend this therapy to others. No difference is seen between patients who were treated with the biobag or with

the free-range technique. There was a high percentage of maggot escapes. Biobags instead of the free-range technique could reduce that percentage to a minimum, although we don't see a difference in acceptance between patients treated with biobags or with the free-range technique. We think this is also due to good instructions before therapy and preparing the patient for the possibility of maggot escapes. A high number of patients reported adverse reactions from their social environment, consisting mostly of people finding the idea of maggots eerie. Although it doesn't seem to influence the maggot therapy, we think acceptance is important to reduce adverse reactions to a minimum. To achieve this goal, one could think about good informative material (for example, in the form of a brochure) in which there is information for relatives— taking relatives to the hospital to attend the application of new maggots and thereby reducing the prejudice for maggot therapy—and about getting media attention, both national and local. When patients appear on radio, television, or in the newspaper telling their story, people might reconsider their ideas about maggots. As for the smell of the wound, we noted the VAS score increased from 3.1 before maggot therapy to 5.2 during therapy. This increase cannot be ignored, but until now we have found no answer for this problem. Pilot studies with active carbon did not show any positive results. Fortunately, the VAS score goes back to its original score after maggot therapy. As for the itch over the body, we conclude that this is not an important side-effect of maggot therapy for our patients. On the basis of this questionnaire, we think it's safe to state that the ''yuk factor'' does not seem to be an important factor for our maggot-treated patients. When patients are well informed and instructed, no one is deterred by the idea of maggots. When a patient with chronic or infected wounds who is not responding to conventional wound debridement therapy is suitable for maggot therapy,[102;163;165-166;168-169] the physician should offer this. Prejudicial thoughts about maggots should be eliminated by the physician in both patient and relative through good information and instructions. Also, health care workers should be well instructed, because they could also be deterred by maggots. In this way, maggot therapy can become a widely accepted, reasonable alternative for patients with chronic or infected wounds.

6B Bleeding complications

Based on the following article:

International Journal of Lower Extremity Wounds
P. Steenvoorde, J. Oskam
From the department of Surgery Rijnland Hospital, Leiderdorp, The Netherlands
Bleeding complications in patients treated with Maggot Debridement Therapy (MDT).
Int J LowExtrem Wounds 2005; 4(1):57-58.

Introduction

In literature maggot debridement therapy (MDT) or biosurgery is advocated as a safe, non-surgical debriding agent.[170] Theoretical contra- indications for MDT are patients with known allergies to eggs, soyabeans, fly larvae or any of the components of the dressing.[169;171] If complications of MDT are mentioned in literature, bleeding is not always reported.[166;170-173] Even in a handbook of maggot-assisted wound healing, bleeding is only mentioned in case maggots are placed near exposed bloodvessels.[174] Information sheets for physicians regarding MDT, report bleeding as a complication. According to reports, bleeding occurs in les than 1% of wounds dressed with maggots, especially if maggots are used in close proximity to major veins of vessels.[175] Maggot therapy in individuals with a natural of pharmocologically induced coaggulopathy should, if done at all, only at close supervision.[176] Church and Courtenay even reporteded mild bleeding to occur in 24 out of 70 patients (34%) treated with MDT. Treatment consisted of maggot removal and simple local measures.[169]

Study

In the period of august 2002 untill 1 january 2004 we treated 41 patients with MDT in our hospital. There was a variety of underlying co-morbidity that maintained the non-healing wounds, as diabetes mellitus, smoking, arterial pathology and corticosteroid use. On the average most treated wounds were leg ulcers. Prior to MDT, the average time the wound existed was 14 months. Average patient age was 67 years. We treated 22 men and 19 women. Most patients were treated ambulatory (31/41). The patients were treated either with biobags (8/41) or with the free-range technique. In total 4/41 patients (10%) experienced mild bleeding, one of the patients needed to be admitted to the hospital for this. In total 11 patients used oral anticoagulation therapy and 7 were on antiplateted therapy during MDT. Of the 4 patients experiencing mild bleeding, 2 were on oral anticoagulation therapy and 1 on antiplateted therapy. None of our patients had significant bloodloss, necessitating bloodtransfusion. In our serie, relative riskfactors for experiencing mild bleeding with MDT are 2.8 and 1.3, for patients on oral anticoagulation therapy and antiplatelet therapy respectively. There was no bleeding in any of the patients treated with the contained form of maggot therapy, in which the maggots are placed in a so-called biobag.[174] In our hospital biobags are used in wounds which are difficult to dress, or in which the chance of escaping maggots has to be almost nil (for example in a patient treated with a wound of her breast). The containment of maggots however reduces its effectiveness[177], therefore in principle, we use the free-range technique. There was no bleeding observed in an earlier study of 16 patients treated with the biobag-technique.[138] In the free-range therapy maggots can crawl around the wound

more freely, compared to the contained technique. Perhaps this freedom leads to a more easily damaged wound, leading to a mild bleeding.

Cathastrophic bleeding in patients treated with MDT has not been reported in literature. Minor bleeding in patients treated with the free-range technique seems to occur in 10% of treated patients. These minor bleedings can be treated simply by local measures and removal of the larvae. In patients on oral anticoagulation therapy mild bleeding seems to occur more frequently (relative risk 2.8). Therefore MDT in patients on oral anticoagulation therapy should be done under close supervision only or the contained form of MDT should be used.

6C Pain

Based on the following article:

Journal of Woundcare
P. Steenvoorde, T. Budding, J. Oskam
Department of Surgery Rijnland Hospital, Leiderdorp, the Netherlands
Determining pain levels in patients treated with maggot debridement therapy.
J Wound Care 2005; 14(10): 485-488.

Introduction

Pain as a complication of maggot debridement therapy (MDT) is controversial.[167] Whether or not there is pain appears to depend on the type of wound treated; for example, pain is not reported in spinal cord injury patients with pressure ulcers due to a lack of or altered sensation.[178] However, some authors suggest that MDT is not painful: mild ischaemia may be experienced in patients with ischaemic wounds;[171] most patients do not feel maggots, or the pain decreases or disappears after the maggots are applied.[174] By contrast, pain has been reported after the maggots have grown (one to three days after application)[179] and in patients who had significant wound pain before maggot therapy despite the use of analgesia.[4] In a study of 74 patients treated with MDT, Wolff et al. found 34% of maggot-treated patients felt increased pain during treatment, 25% less pain and 41% no difference in pain.[180] Courtenay reported severe pain in six of 23 patients, moderate pain in 11 out of 23 and mild pain in six of 23.[179] Approximately 20–25% of patients with painful wounds might complain of increased pain during MDT and should therefore be treated with analgesics.[55] In our experience there can be a significant difference in pain between diabetic patients and non-diabetic patients treated with MDT. This appears to be primarily due to neuropathy. Diabetic polyneuropathy is primarily a symmetrical sensory neuropathy, initially affecting the distal lower extremities.[181] To find out how pain was experienced by patients treated with MDT, a retrospective study was undertaken in which all those treated between September 2002 and 1 January 2004 were interviewed. In accordance with a standard protocol, patients are generally treated in the outpatient department at the Rijnland Hospital, although treatment is undertaken on an inpatient basis if necessary. Indications for MDT included: gangrenous or necrotic tissue, infected diabetic foot ulceration, arterial leg ulceration, traumatic infected ulcers and chronic wounds that would not heal despite treatment by the primary physician. Underlying comorbidities included chronic limb ischaemia,[182] diabetes mellitus, smoking and corticosteroid use.[59] Most of the wounds were worst case scenarios, for which the only other option was amputation or surgical debridement in theatre. Patients were excluded from receiving MDT if the treating surgeon believed an urgent amputation could not be postponed, for example in cases of severe sepsis, or if life expectancy was shorter than a few weeks. All patients gave informed consent. Most black dry necrotic tissue was removed prior to therapy. A diagnosis of infection was made if there was purulent discharge and/or two local signs present, such as warmth, erythema, lymphangitis, lymphadenopathy, oedema or pain.

Method

This was a retrospective study, in which a questionnaire was sent by post to those patients who had been treated with MDT during the study period. The maximum time

interval between the questionnaire and treatment was 11 months. A total of 41 patients were treated in the study period. Unfortunately, three diabetic patients died before the study got under way (one died of pneumonia, one of congestive heart failure and one of bowel ischaemia), so only 38 questionnaires were sent out. The patients were asked to rate and record their pain level before, during and after therapy using a visual analogue scale (VAS). An example of how to fill in the VAS score was attached to the questionnaire. A VAS score below 30mm was interpreted as low pain, 30–54mm as moderate pain and above 54mm as severe pain.[183] The VAS was chosen as it is commonly used for the evaluation of pain severity and relief. It is practical, reproducible, sensitive and easy to analyse.[184] However, it may be unreliable as pain experience is probably blurred by memory and by the end result of the therapy.

Pain management in MDT

Pain management during MDT is standardised in our hospital. Initially, all patients, including those with diabetes, were treated with paracetamol (1g three times daily) and Tramal (licensed as Tramadol in the UK) (50mg three times daily), the latter being changed to Durogesic plaster (25µg every three days and 50µg the day before the maggot change) to avoid the complications of Tramal intake. As previously mentioned, pain is generally experienced after one to three days when the maggots have grown. Therefore, in our protocol the patients received a higher dose of analgesic therapy on the day before the maggot change. If the analgesia was not sufficient or complications due to therapy occurred — for example, the maggots escaped — these were addressed accordingly (the maggots were removed; in one case an epidural anaesthestic was given). Where necessary, the maggots were removed; none of the patients wanted the maggots removed because of the pain; on four occasions, removal was due to mild bleeding.

Results

In the period under discussion, 41 patients (22 men, 19 women) with 46 wounds were treated. The average age was 67 years (range: 25–93 years). Of these, 31 were outpatients, eight were treated while admitted, and two were both ambulatory and admitted. Co-morbidities included: smoking (61%), diabetes mellitus (48%) and chronic limb ischaemia (34%). The average wound duration before starting the maggot therapy was 14 months (range: two weeks to 132 months). Previous treatment modalities included vascular interventions, topical negative pressure, surgical and enzymatic debridement, and other such as wet gauze. Seven wounds were treated using the contained technique, while the remainder were treated using the contained technique, including one patient who received both techniques (maggots escaped the first time with the free-range technique and we wanted to reduce the risk of any other maggots escaping). The mean time after MDT until wound closure was 2.8 months. The follow-up period after MDT ranged from three months to two years and three months, during which time wound improvement was noted in 77% of patients (the wounds were fully debrided and were one-third smaller than their initial wound size, or they were still the same size but had no necrosis or slough and were free of infection; necrosis and slough were measured subjectively). MDT was discontinued if there was a healthy granulating tissue and treatment continued with an alginate dressing (Kaltostat, ConvaTec) some in combination with plaster; some wounds were closed in theatre using a split-skin graft after MDT (in some cases, we removed the maggots in theatre just before applying the split-skin graft). In 65% of the patients the wound closed completely. In 19% of the

patients amputation was necessary despite MDT due to underlying disease, mostly chronic limb ischaemia. There was no effect in the remaining 4%.

In total, 38 questionnaires were sent (17 to patients with diabetes and 21 to non-diabetic patients). The response rate was 37 out of 38 (97%). One non-diabetic patient did not respond. This patient's chart contained no reports of excessive pain during MDT; however, as the patient did not return the questionnaire, there was no VAS score. The pain medication prescribed was recorded in her chart, but there are no available details of when and how often it was taken. Patients with diabetes experienced the same amount of pain before MDT as during it **(Table 1)**. However, eight out of 20 non-diabetic patients experienced more pain during MDT **(Table 2)**. These differences are statistically significant ($p<0.05$). Despite receiving morphine, seven of the 20 nondiabetic patients felt their analgesia was still inadequate (the eighth patient did not receive morphine). This increase in pain cannot be attributed to a negative wound outcome as all eight patients healed. However, it should be noted that the freerange technique was used.

Conclusion

Pain during MDT is a problem in non-diabetic patients. However, this was a retrospective study in which pain measurements were undertaken post and not during treatment. Factors such as memory, time and outcome might have affected how the patients described their pain. Pain is an issue for patients treated with MDT, although this depends on the underlying pathology. A standardised pain management protocol for patients receiving this therapy, which can be individually tailored, is recommended. Based on our experience, use of paracetamol and Durogesic plaster appears to be suitable for the outpatient clinic. Pain can be adequately treated with analgesic therapy in patients with diabetes who are receiving MDT. In non-diabetic patients, however, pain management is more problematic. If pain cannot be adequately treated, the options are admission to hospital, use of the contained technique or, in the worst case scenario, discontinuation of MDT.

Table 1. Pain measured using the VAS in diabetic patients treated with MDT.

No.	Sex	Age	Region	Technique	Pain medication used	Pain before MDT	Pain during MDT
1	M	67	Foot	contained	4	3	3
2	M	82	Foot	free-range	2	1	1
3	F	63	Heel	free-range	2	1	1
4	F	64	Too	free-range	5	3	3
5	M	80	Heel	free-range	4	3	3
6	M	63	Heel	contained	1	1	1
7	F	39	Heel	free-range	5	3	3
8	F	86	Lower leg	free-range	5	3	1
9	F	84	Heel	free-range	5	1	1
10	M	71	Foot	free-range	5	3	3
11	M	53	Foot	free-range	5	1	1
12	F	48	Lower leg	free-range	3	1	1
13	F	79	Lower leg	free-range	4	3	3

14	F	74	BKA	free-range	5	3	3
15	M	86	Heel	free-range	5	3	2
16	M	67	Foot	free-range	2	1	1
17	M	71	BKA	free-range	5	2	1

BKA = below knee amputation
Pain: 1 = mild; 2 = moderate; 3 = severe[11]
Pain medication used: 1 = none; 2 = paracetamol only;
3 = non-steroidal anti-inflammatory
drugs; 4 = morphine (Tramal); 5 = morphine (Durogesic plaster); 6 = morphine (Dipidolor); 7 = epidural

Table 2: Pain measured using the VAS in non-diabetic patients treated with MDT

No.	Sex	Age	Region	Technique	Pain medication used	Pain before MDT	Pain during MDT
1	M	59	BKA	contained	6	1	1
2	M	40	Upper leg	free-range	7	3	1
3	F	76	Lower leg	free-range	4	1	3
4	F	77	Lower leg	contained	2	3	3
5	F	93	Lower leg	free-range	4	3	3
6	F	69	Lower leg	free-range	5	1	3
7	F	80	Lower leg	free-range	5	3	3
8	M	44	Lower leg	free-range	5	1	1
9	M	37	Lower leg	free-range	4	3	3
10	F	77	Lower leg	free-range	5	2	3
11	M	75	Lower leg	free-range	5	1	1
12	M	58	Lower leg	free-range	5	2	3
13	M	84	Heel	free-range	1	1	1
14	F	60	Breast	Both	5	3	3
15	M	48	Lower leg	free-range	5	1	3
16	M	62	Foot	free-range	5	2	3
17	F	88	Heel	free-range	5	3	3
18	M	42	Lower leg	free-range	5	1	1
19	F	64	Lower leg	free-range	3	1	3
20	M	64	Foot	free-range	5	1	2

BKA = below knee amputation
Pain: 1 = mild; 2 = moderate; 3 = severe[11]
Pain medication used: 1 = none; 2 = paracetamol only;
3 = non-steroidal anti-inflammatory
drugs; 4 = morphine (Tramal); 5 = morphine (Durogesic plaster); 6 = morphine (Dipidolor); 7 = epidural