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ORIGINAL ARTICLE

Multicentre prospective observational study on professional wound care using honey (Medihoney™)

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Abstract

In recent years, the treatment of wounds with honey has received an increasing amount of attention from healthcare professionals in Germany and Austria. We conducted a prospective observational multicentre study using Medihoney™ dressings in 10 hospitals – nine in Germany and one in Austria. Wound-associated parameters were monitored systematically at least three times in all patients. Data derived from the treatment of 121 wounds of various aetiologies over a period of 2 years were analysed. Almost half of the patients were younger than 18 years old, and 32% of the study population was oncology patients. Overall, wound size decreased significantly during the study period and many wounds healed after relatively short time periods. Similarly, perceived pain levels decreased significantly, and the wounds showed noticeably less slough/necrosis. In general, our findings show honey to be an effective and feasible treatment option for professional wound care. In addition, our study showed a relationship between pain and slough/necrosis at the time of recruitment and during wound healing. Future comparative trials are still needed to evaluate the extent to which the positive observations made in this and other studies can definitely be attributed to the effects of honey in wound care.

Introduction

Honey has been used to promote wound healing for many centuries all over the world (1,2). Recent in vitro studies demonstrating its broad spectrum of antimicrobial activity (3–7) have revived interest in the use of honey in professional wound care (8), especially its activity against

Key Messages

- honey's antibacterial properties and its ability to accelerate wound healing has been demonstrated in a large number of case studies using specific honey products to treat a wide range of chronic and acute wounds

- despite the availability of honey and ready-to-use honey dressings in the EU (especially those from Australia and New Zealand containing *Leptospermum* honey) there is still substantial reservation regarding their use among physicians
- in an effort to further elucidate the efficacy of this unconventional remedy, we planned a prospective observational multi-centre study with participating centres from Germany and Austria
- the purpose of this multi-centre prospective observational study was to demonstrate the resulting antibacterial activity, pain, size decrease, and wound odor in chronic wounds after treatment with honey
- altogether, 154 wounds of diverse aetiologies were examined in 121 patients; 24 dropped out and 104 patients were included in the data
- the already confirmed antibacterial effects of applied honey could not be analysed under the circumstances of this investigation, because the attending physicians often used antiseptics (locally) and antibiotics (systemically) in parallel with honey
- additional prospective randomised trials including a sufficient number of patients are needed to convince responsible specialists that the use of honey in professional wound care reduces the need for local antiseptics and systemic antibiotics
- active *Leptospermum* honey dressings have recently been added in the NPUAP guidelines (Pressure Ulcer Prevention and Treatment Clinical Practice), which cites evidence for the effectiveness of honey-impregnated dressings as a topical antimicrobial agent in wound bed preparation and treatment
- in our analysis, we have focused on the effects of slough/necrosis on healing as well as possible associations between pain, healing, and the presence of slough/necrosis
- there are three factors that are especially responsible for pain during dressing changes: dressings that adhere to the wound area (35%), directly adhere to the wound (29%), and dried-out dressings (28%)
- in order to minimise pain for the patient and increase the likelihood of compliance, these factors should be taken into account
- the frequency of analgesia required during dressing changes decreased consecutively during the course of our investigation
- our analysis showed that the majority of wounds with no or decreasing pain were either sloughy or clean during the study
- in conclusion, the data of this prospective observational multi-centre study suggest that honey displays promising properties in the management of diverse wound types, when using diverse secondary dressings for patients of different age groups
- the dressings significantly promoted wound healing, reduction in pain and led to an autolytic wound debridement
- our study showed interesting aspects of the relationship between pain and slough/necrosis at the time of recruitment and during wound healing
- future comparative trials are necessary to evaluate the extent to which the observations made in this study can be attributed to the effects of Medihoney™ in wound care

antibiotic-resistant bacteria such as methicillin-resistant *Staphylococcus aureus* (MRSA) (9–11). Honey derived from the floral source *Leptospermum scoparium* (manuka) has therapeutic advantages over other honey because of its notable antibacterial effects (12). In fact, a recent in vitro investigation confirmed that therapeutic honey (Medihoney™) displays bactericidal activity against planktonic bacteria and other bacteria embedded in biofilm (13). The exact antibacterial factors have still not been elucidated, but seem to be related to certain phenolic compounds, methylglyoxal, and most likely other undocumented substances (14–19). It has, however, already been suggested that, these substances do not interfere with the effectiveness of antibiotics (4,5).

Not only honey's antibacterial properties but also its ability to accelerate wound healing has been demonstrated in a large number of case studies using specific honey products to treat a wide range of chronic and acute wounds (1,2,9–11,14,20). In recent years, the benefits of therapeutic honey have been gaining interest in German-speaking countries as the first publications from Europe have appeared in the last few years (15–17). Nevertheless, despite the availability of honey and ready-to-use honey dressings in the EU (especially those from Australia and New Zealand containing *Leptospermum* honey) there is still substantial reservation regarding their use among physicians. Incomplete information about these products, lack of substantiated evidence (1) regarding their effectiveness, and little personal experience may be the source of its mediocre acceptance in medicine.

Therefore, in an effort to further elucidate the efficacy of this unconventional remedy, we planned a prospective observational multicentre study with participating centres from Germany and Austria. Especially motivating in starting this study were the positive experiences in the use of honey in professional wound care for high-risk immune compromised patients (21) at the University Hospital in Bonn.

Because of the varying compositions and ways of producing honey products, their effects are not always the same. For this reason, they should be addressed independently (12). The data presented in this study refers to Medihoney™ products. Similar studies with other medical grade honey may show different outcomes.

Methods and procedures

The study was a 10-centre, prospective, observational and open label study, conducted between March 2007 and March 2009. The purpose of this multicentre prospective observational study was to demonstrate the resulting antibacterial

activity, pain, size decrease, and wound odor in chronic wounds after treatment with honey. It was initiated and coordinated by the Department of Paediatric Hematology and Oncology at the University Hospital in Bonn. Financial support was obtained from the manufacturer of Medihoney™ products, who had no influence on data collection, analysis or publication of this study.

Ethical approval was gained from the Ethics Committee of the Medical Faculty of the University of Bonn; this approval applied to all participating centres. Patients were recruited by the individual participating centres according to the following wound aetiologies: post-operative, pressure ulcers, soft tissue infections, general wounds, burns/scalds and skin lesions. Patients of all ages were assessed and managed in compliance with locally and nationally accepted guidelines. Prior to inclusion in the study, written informed consent for study participation and anonymous data analysis was obtained from the patient or from the patient's legal guardian.

All centres received instructions on how to use the Wound Viewer documentation database, which was specifically developed for online monitoring of all wound parameters specified for this study (A Simon together with M Hamann from Hamann Software Solutions, Nidderau, Germany). Additional support was provided by the wound care group of the Children's Medical Center at the University of Bonn. Because of specific preferences in participating hospitals, we agreed to the combination of honey with diverse dressings for exudate management, i.e. calcium alginate, hydrofiber dressings and sterile gauzes moistened with sterile isotonic sodium chloride solution. The local investigators were advised to change the honey dressings after 1–3 days depending on the individual level of wound exudation; to clean wounds with sterile isotonic sodium chloride solution; to protect wound margins where necessary with 3M™ Cavilon™ (3M Medica, Neuss, Germany); and to avoid additional use of antiseptics after 24 h of treatment with honey. Antibiotics were only used in cases of suspected local or systemic infection, but not as a prophylactic measure to prevent secondary wound infections. Decisions regarding necessary clinical measures or interventions were left to the responsibility of participating physicians.

The patients' age, general and disease-related medical history (comorbidities), wound history, and wound aetiology were monitored prior to the first application of honey dressings. A full wound assessment was conducted at various points in the study. This involved determining the wound surface area (in cm^2), depth (measured by filling the wound up with sterile isotonic sodium chloride solution), and wound cleanliness, i.e. absence of slough/necrotic tissue. In addition, all patients were asked to grade their perceived level of pain on a scale of 0 (no pain) to 10 (excruciating pain), or in the case of children, a visual analogue pain scale was used. Any skin problems such as erythema, maceration of the wound margin, itching and eczema that may have occurred during treatment periods were also documented.

Each wound was assessed at least three times (max. five times). There was at least 7 days between the first and second assessment, and about 4 weeks between the second and third assessment. For the treatment of wounds, two different Medihoney™ products were used: 'antibacterial honey' and 'antibacterial' wound gel. The former consists of a 100% honey mixture, and the latter of an 80% honey mixture supplemented with plant emollients (20%) for higher viscosity. Both products are Certified Experts (CE) and Food and Drug Administration (FDA) certified for wound care.

Statistics

Student's *t*-test was used to analyse general and specific differences to variables within sample groups. These tests evaluated whether changes to specific variables over time were significant, or whether they were influenced significantly by other applied parameters.

Linear regression analysis tested whether or not there was a relationship between two different variables at certain points in the study, e.g. whether variable 'A' could predict variable 'B' at a certain time point.

Analysis of the variance (ANOVA) between data groups, was used to test whether or not different study populations exhibited the same changes in certain variables, i.e. if these changes were influenced by the parameters 'healed' or 'not healed.' The chi-squared distribution tested whether or not a certain parameter was expressed differently between groups, e.g. wound cleanliness in wounds that healed and wounds that did not heal. Pearson's product moment correlation tested whether or not two variables are directly or inversely correlated with one another. This was used to evaluate if treatments that had an influence on one variable would also influence other variables.

Results

Altogether, 154 wounds of diverse aetiologies were examined in 121 patients. Seventeen of the 121 patients dropped out of the study; therefore, results from only 104 patients were included in our data. The duration of the study was approximately 5 weeks. The inclusion and exclusion criteria are given in Table 1. Occasionally, scores for some parameters were not documented. For this reason, some tables show results that do not always correspond to the total number of wounds. For comparative analysis, only complete data sets of the parameters were included.

Patient characteristics are displayed in Table 2. Particularly worth noting is the high number of paediatric patients (almost

Table 1 Inclusion and exclusion criteria

Inclusion criteria	Exclusion criteria
• Wounds of diverse aetiologies • Patients of all ages • Assessed and managed according to locally and nationally accepted guidelines • Compliant with treatment methods • Wounds on different limbs of the same patient • Infected wounds	• Known product intolerance • Healthcare providers are unable to change dressings within allocated assessment times • Inclusion in another clinical trial within 8 weeks prior to the start of the study

Table 2 Patient characteristics and wound aetiology

Age (years)	Median (range)	25 (0·4–85)
	Mean (±SD)	33·2 (±27·5)
Age, only paediatric patients (<19 years)	Mean (±SD)	8·8 (±6·3)
Age, only adult patients	Mean (±SD)	56·1 (±8·4)
Gender (%)	male	56%
	female	44%
Wound history (%)	post-operative	26
	decubitus	20
	soft tissue infections	8
	general wounds	4
	burns/scalds	2
	tumour/skin lesions	2
	unknown	9
	others	27
	Undergoing treatment for cancer	32

Table 3 Patient drop-out rate

Reason	No of patients	% of patients
Discharge or transfer	10	8·3%
Non-compliance	6	5·0%
Pain	1	0·8%

half the patients were younger than 18 years) making the average age of the entire study population lower than usual for wound care studies. Thirty-two percent of the study population was oncology patients with an underlying malignant disease.

At recruitment, 29% of patients exhibited signs of systemic infections, 13% showed fever (T > 38°C in adults and > 38·5°C in children), and 2% displayed secondary bacteraemia. Seventy percent of wounds were treated with antiseptics such as octenidinehydrochloride, polyhexanide or polyvidoneiodine and 37% of wounds were treated at least once with systemic antibiotics. Because of these precautionary measures considered necessary by the participating physicians, conclusive analysis of the antibacterial effects due to honey alone could not be performed.

In 66% of all treatments, antibacterial honey (Medihoney™) was applied, in 22%, antibacterial wound gel (Medihoney™), in 6%, a combination of both, and in 6%, the product was not specified. Although certain secondary dressings for exudate management were suggested by the principal investigator, the different centres usually applied products preferred by the physician involved. The duration of wound treatment averaged 4·88 ± 4·4 weeks.

Drop-out rate

Seventeen of the 121 patients (14·1%) dropped out of the study before completion for reasons displayed in Table 3. Data from these patients were not included in the analysis. One patient dropped out of the study because he was not able to tolerate the Medihoney™ dressings, showing a concomitant increase in pain; 6 patients did not comply with treatment remedies; and 10 patients could not be found for follow-up, because of either discharge from the participating hospital or transfer to another hospital that did not participate in the study.

Tolerance

Overall, tolerance of the honey dressings was very good. In 89% of all assessments the results were positive; in 1·3% there were complaints of poor tolerance such as skin reactions or pain (some of these patients dropped out of the study); and in 9·7% of all assessments tolerance was not monitored.

Wound healing

Of all of the wounds under scrutiny, 31·4% healed completely during the study period, 53·3% improved, 9·2% stagnated (±10% change in wound area), and 6·1% deteriorated (grew in size).

During the course of the honey treatment the average total wound area of all patients decreased significantly from 29·66 ± 57·57 to 11·32 ± 33·3 cm^2 ($P < 0·05$; two-tailed t-test). By segregating the patients into groups of those with wounds that healed (31·4%), so-called 'healed', and those with wounds that did not heal (68·6%), so-called 'not healed,' it was shown that wounds in both groups were treated for a similar average time period, and the degree of healing (wound reduction) achieved in both groups was significant (Table 4).

The wound sizes at recruitment did not vary significantly between the two groups ($P > 0·05$; one-way ANOVA), but the average healing rate as well as the percentage wound reduction attained during the study period was significantly smaller among 'healed' as compared to 'not healed.'

Wound volume was evaluated to a much lower extent than wound areas, possibly because of the fact that the method for doing so was often not feasible or because many wounds simply did not exhibit any deep tissue defects. For cases in which volume was monitored, changes during the course of the study were usually comparable to changes in wound area. For this reason, this parameter was also used to address healing.

Pain

During the honey treatment, 43% of the patients did not suffer from wound pain and 55% experienced a decrease in initial pain levels (Table 5). Overall, the total average pain scores reported by the patients between recruitment and the end of the study decreased significantly from 1·71 ± 1·89 to 0·55 ± 1·22 ($P < 0·05$; paired Student's t-test). The average pain levels at recruitment for patients with decreasing as well as steady pain levels were similar ($P > 0·05$; one-way ANOVA).

At recruitment, before Medihoney™ treatment began, it was necessary to treat 17% of the patients with systemic analgesics during dressing changes. At the last wound assessment, only 4% required analgesia.

Effect of Medihoney™ dressings: pain and healing

Interestingly, the average wound area at recruitment was smallest in the group of patients with steady pain levels, but did not differ significantly from initial wound areas of the

Table 4 Evaluation of wound-healing parameters for healed and not healed

Group	No. of Patients	Study period (weeks)	Wound area at recruitment (cm^2)	Wound area at study end (cm^2)	% wound reduction‡	Healing rate (% wound reduction/week)¶
Healed	32	4·46 ± 3·83	24·17 ± 33·63*	0	100	41·61 ± 38·97
Not healed	69	4·49 ± 4·29	31·97 ± 66·15†	15·8 ± 40·86	39·41 ± 47·14	13·44 ± 21·88

*Differences in wound area between recruitment and study end are significant ($P < 0·05$; paired Student *t*-test).
†Differences in wound area between recruitment and study end are significant ($P < 0·05$; paired Student *t*-test).
‡Difference in % wound reduction between 'healed and not healed' is significant ($P < 0·05$; unpaired Student *t*-test).
¶Difference in healing rate between 'healed' and 'not healed' is significant ($P < 0·05$; unpaired Student *t*-test).

Table 5 Observed correlation between pain scores, percent of wound reduction, and rate of wound reduction

Pain group	*n*	Pain score recruitment	Pain score study end	Wound size recruitment (cm^2)§	Wound size study end (cm^2)	% wound reduction§	% wound reduction/week (healing rate)§
No pain	42	0	0	25·05 ± 31·57‡	5·02 ± 11·59	66·24 ± 38·4	26·55 ± 31·58
Pain decreased	54	3·02 ± 1·77*	0·51 ± 1,25	36·23 ± 74·66¶	16·77 ± 46·14	52·28 ± 54·35	18·85 ± 30·97
Pain remained the same	6	2·5 ± 0·84	2·5 ± 0·84†	3·5 ± 4,23	1·17 ± 1·17	41·67 ± 49·16	16·24 ± 21·54

*Difference in pain score between recruitment and study end is significant ($P < 0·05$; paired Student *t*-test).
†Difference in pain score at study end between patients with the same pain and patients with decreasing pain is significant ($P < 0·05$; unpaired Student *t*-test).
‡Difference in wound size between recruitment and study end is significant ($P < 0·05$; paired Student *t*-test).
¶Difference in wound size between recruitment and study end is significant ($P < 0·05$; paired Student *t*-test).
§Values between the groups did not vary significantly ($P > 0·05$; one-way ANOVA).

other two pain groups (Table 5). However, in contrast to the other two groups, the average wound size at the end of the study period in this group was not significantly different from the corresponding values at recruitment ($P > 0·05$; paired Student's *t*-test; Table 5). In addition, the healing rates as well as percentage wound reductions of all three groups were similar ($P > 0·05$; one-way ANOVA). All groups were involved in the study for a similar length of time.

The majority of the wounds within the groups with no or decreasing pain displayed a tendency towards healing. This is in contrast to the group with no change in pain levels throughout the study period, which showed a tendency towards not healing. Overall, individual pain scores appeared to be related to wound area at the time of recruitment ($P < 0·05$; linear regression, Table 5), but not at the individual study end-points. Further analysis showed that pain and healing did not correlate at recruitment or at the study's end ($P > 0·05$; Pearson's correlation).

Effect of Medihoney™ on wound cleanliness

It was difficult to establish a scale for evaluating different degrees of slough/necrosis in wounds, which would have necessitated a statistical differentiation between these two parameters. Furthermore, such a scale may have been viewed very differently among the individual study centres (observation bias). Hence, the wounds were either described as 'clean' (grade 1, no slough/necrosis) or 'not clean' (grade 0, presence of slough/necrosis). Based on this scale, wounds cleaned up significantly during the Medihoney™ treatment ($P < 0·05$; paired Student's *t*-test), from an average grade of 0·16 ± 0·37 to a value of 0·74 ± 0·44. The same trend was observed among non-healing wounds (from 0·13 ± 0·34 to 0·61 ± 0·49).

Discussion

This prospective observational study was designed to collect data on honey (Medihoney™) as a potential wound-healing agent in 10 medical centres located throughout Germany and Austria. Because of the different clinical specialties of the participating centres, wounds of diverse aetiologies and patients of diverse age groups were included in the study. This study is one of the first in which the patient pool was on average very young as many paediatric patients were included (17). In addition, one-third of all patients suffered from an underlying malignant disease (18). This represents a group of patients for which complete wound healing is not always achievable and for which there is an increased risk of bacterial super-infection (8,17,18).

The use of diverse secondary wound dressings for exudate management in our study is in accordance with other recent studies on the use of honey in wound care (22,23). This demonstrates that Medihoney™ is compatible with many modern wound-dressing materials in terms of wound healing and cleanliness as well as pain reduction (19).

The potent abilities of honey to eliminate topical wound infections including those due to MRSA (4,24) are of outstanding interest from a clinical perspective. Unfortunately, the already confirmed antibacterial effects of applied honey (7,15,22,25) could not be analysed under the circumstances of this investigation, because the attending physicians often used antiseptics (locally) and antibiotics (systemically) in parallel with honey. This is probably due to the high proportion of patients with malignancies and chemotherapy in this trial. Additional prospective randomised trials (24,26) including a sufficient number of patients are needed to convince responsible specialists that the use of honey in professional wound care reduces the need for local antiseptics and systemic antibiotics

(1,2,17). Active *Leptospermum* honey dressings have recently been added in the NPUAP guidelines (National Pressure Ulcer Advisory Panel) (27), which cites evidence for the effectiveness of honey-impregnated dressings as a topical antimicrobial agent in wound bed preparation and treatment (28).

Diverse parameters associated with wound healing such as pain and status of wound necrosis/slough were taken into account in this study, as they profoundly impact healing and the quality of life of the patient. Outcome parameters such as wound healing and pain reduction were especially of paramount interest to the patient. In general, the dressings supplemented with the Medihoney™ products were well tolerated by patients, reflecting the results of prior studies. Among the few complaints we heard, the most prevalent one was of a burning sensation immediately after Medihoney™ application; this pain was, however, transient in nature and has been attributed to the acidity of the honey (26,29). Furthermore, rare local periwound skin irritations (local eczema) occurred, which should not be mistaken for atopic reactions. In future studies, more efforts should be undertaken to ensure that the reaction was due to honey rather than to the secondary wound dressing; for example, by retesting honey on intact skin areas. Prophylactic periwound skin protection with a protective skin barrier should be used routinely to minimise the potential of maceration, especially in heavily exudating wounds requiring frequent dressing changes.

Generally wounds healed well after application of honey products, reflecting the results of many surveys (1) as well as other studies that have been published. Approximately 85% of the wounds healed or improved during the relatively short period of investigation. Thus, the presence of an active healing component in the honey products used is strongly suggested as also indicated in a recent randomised clinical trial (10). The total average wound area of all patients decreased significantly in size, reflecting the results of another recent study (30). Patients with wounds that healed displayed a faster reduction of wound surface areas as observed in another recent study (30). The rate of healing may present an interesting parameter for comparing wound healing in future studies not only concerning the reduction of wound size, but also the time frame within which this is achieved. This should be of particular interest for studies focusing on total cumulative costs of treatment when comparing different therapeutic approaches.

The results also demonstrated that wound size is not a reliable predictor for healing tendency. Other factors have a much more significant influence on healing such as age, medications, underlying diseases, immune status and nutritional parameters (1,31,32). These factors support the complex humoral and cellular immune response (33–35) involved in local inflammation and the mobilisation of keratinocytes from the wound margins (36). In our analysis, we have focused on the effects of slough/necrosis on healing as well as possible associations between pain, healing, and the presence of slough/necrosis.

The majority of sloughy/necrotic wounds in our study were cleaned effectively with honey dressings, reflecting observations from previous studies (10,24,26). Because the majority of the wounds that healed were sloughy/necrotic at the time of recruitment, the debriding activity of the honey dressings may have been the deciding factor in the underlying improvement. The honey dressing aides the body's process of autolysis; the high sugar content promotes movement of extracellular fluid as well as wound tissue oedema to the surface of the wound. This results in a moist environment on the wound surface (28). Medical *Leptospermum* honey has been described as a complete wound bed preparation product (37–39).

Pain relief is a central therapeutic goal in professional wound care (40), in particular in paediatric patients, where the presence of an anaesthesiologist has to be requested during dressing changes (14,17). Pain related to the use of a specific dressings or the procedure of dressing changes is of critical importance concerning compliance in patients. Pain may be responsible for premature cessation of otherwise beneficial treatment approaches (10,30). The importance of regular pain assessment and strategies to minimise trauma during wound care of chronic wounds have been highlighted by others (19). According to a study, investigating nursing and medical practitioners' evaluation of pain and trauma at dressing changes in Austria, Germany and Switzerland, there are three factors that are especially responsible for pain during dressing changes: dressings that adhere to the wound area (35%), directly adhere to the wound (29%), and dried-out dressings (28%) (41). In order to minimise pain for the patient and increase the likelihood of compliance, these factors should be taken into account.

As described in an earlier study (30), the frequency of analgesia required during dressing changes decreased consecutively during the course of our investigation. Nevertheless, a negative correlation between pain and healing was neither found at the time of recruitment nor at the end of the study. Pain may represent a surrogate parameter for acute or chronic inflammation of the wound (2,42), which interferes negatively with wound healing. Although wound pain measured at specific points in the study did not predict healing (43), only half of the wounds with persisting high pain levels got smaller and the other half stagnated. The extent of pain reduction that can be attributed to honey is difficult to evaluate from a non-controlled observational study. A comparative trial with other dressings or remedies would be more conclusive in this regard.

Our analysis showed that the majority of wounds with no or decreasing pain were either sloughy or clean during the study

Table 6 Pain groups relative to healing and wound cleanliness

Pain group	% Wounds ameliorating (% healers)	% Wounds unresponsive	% Wounds deteriorating	Wounds clean (%)	Wounds cleaning up (%)	Wounds staying/ becoming sloughy (%)
No pain	90 (40)	5	5	11.6	62.8	25.6
Pain decreased	86.5 (25)	5.8	7.7	18.2	56.4	25.4
Pain remained the same	50 (0)	50	0	0	50	50

(Table 6). Regarding all wounds at the time of recruitment, the clean ones showed significantly higher pain values than the sloughy ones. Debridement achieved with the Medihoney™ dressings overtime was not associated with an increase in pain; however, usually with an advance in wound healing.

Conclusions

In conclusion, the data of this prospective observational multicentre study suggest that honey displays promising properties in the management of diverse wound types, when using secondary dressings for patients of different age groups. The dressings significantly promoted wound healing, reduction in pain and led to an autolytic wound debridement. In addition, our study showed interesting aspects of the relationship between pain and slough/necrosis at the time of recruitment and during wound healing. Future comparative trials are necessary to evaluate the extent to which the observations made in this study can be attributed to the effects of Medihoney™ in wound care.

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