

ORIGINAL ARTICLE

Clinical application of traditional Chinese medicine powder in the treatment of acute and chronic wounds

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Abstract

This study aimed to explore the clinical application and efficacy of traditional Chinese medicine (TCM) powder in the treatment of acute and chronic wounds. Eighty patients with a wound infection were randomly and equally divided into a control group and an observation group. Gauze padding containing furacilin was used to dress the infected wounds of the control group. TCM powder was used to treat the wounds of the observation group. The total response rate of the observation group was significantly higher than the control group ($P = .017$). The colour and exudate volume scores in the observation group were lower than the control group, and the differences between the two groups were statistically significant ($P < .05$). The time to the appearance of new epithelium and time to the wound healing of the burns in the observation group were shorter than the control group, and the differences were statistically significant ($P < .05$). The TCM powder absorbed a large amount of necrotic tissue and exudate from the wound surface, cleared heat and toxins, and activated blood circulation. It also resolved blood stasis, eliminated pus, and allowed for new skin growth, as well as regenerating muscle.

KEYWORDS

burn depth, burns, scalds, traditional Chinese medicine powder, wound surface

Key Messages

- the use of traditional Chinese medicine powder has certain advantages over the conventional Western medicine treatment of wounds as it is non-invasive and relatively cheap
- it has been shown to heal all types of burns, including third-degree burns, and is effective for treating ulcers, such as those found in diabetic foot
- it has also been successful in healing wounds that conventional treatment could not

1 | INTRODUCTION

In recent years, with the development in people's living standards as well the implementation of health and safety

guidelines in the workplace, the number of patients presenting with traumatic burns has been gradually decreasing. However, small-scale traumatic burns, causing severe damage to the skin and subcutaneous soft tissues,

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do still occur, and they can easily lead to local soft tissue microcirculation disorders, local soft tissue infections, and necrosis.¹ Relatively large and severe burns can sometimes threaten the patient's life. The conventional treatment of infected wounds after burns includes debridement, the application of topical medication (1% silver sulfadiazine cream), bandaging, dressing changes, and even surgery. However, such conventional treatment as well as the frequency of drug changes and the inability of patients to tolerate them for a long time can often lead to unsatisfactory results and higher associated costs, which impose a burden on patients physically and mentally.^{2,3} In recent years, with the continuous development of the world's medical level, traditional Chinese medicine (TCM) has been widely used in clinical practice.^{4,5} TCM not only has made great contributions to human health, but also enrich the development of modern medicine.⁶ It is known that topical TCM powder has its advantages in the treatment of infected burn wounds.⁷ This study observed the clinical efficacy of using TCM powder and conventional surgical wet dressing therapy to treat such injuries.

2 | PATIENTS AND METHODS

2.1 | General patient information

A total of 80 patients were included in this study and randomly divided into a control group and an observation group. There were 18 male and 22 female patients in the control group, ranging in age from 18 to 65 years old. These patients included five cases of burns from fire, 15 cases of burns from motorcycle exhaust, and 20 cases of burns from boiling water; and the size of wound area ranged from 10 cm × 11 cm to 18 cm × 35 cm. The number of male and female patients in the observation group was 14 and 26, respectively, and they ranged in age from 17 to 66 years old. They included three cases of burns from fires, eight cases of burns from motorcycle exhaust, 24 cases of burns from boiling water, and five cases of chronic diabetic foot. The wound area ranged from 4 cm × 5 cm to 56 cm × 110 cm in size. The colour of the infected wounds, the amount of exudate, time to the appearance of new epithelium, and time to the wound healing were observed before and after treatment in both groups.

This study was conducted in accordance with the declaration of the 1964 Helsinki and approved by the ethics committee of Heping Hospital Affiliated to Changzhi Medical College (Approval No: RT2021100). Written informed consent was obtained from all participants.

2.2 | Inclusion and exclusion criteria

The inclusion criteria were as follows: (a) patients with post-burn wounds that exhibited varying degrees of infection and skin necrosis, with positive (+) bacterial culture results and symptoms that were in accordance with the diagnosis of sores in *Chinese traditional surgery*; (b) patients aged 1 to 70 years; and (c) patients who signed an informed consent form. The exclusion criteria were as follows: (a) patients with exposed vascular nerves, exposed bone, or exposed internal fixation; (b) patients with severe dysfunction of the heart, brain, liver, kidneys, or other organs or severe primary diseases; (c) patients with underlying diseases that affect wound healing, such as hematologic, immune system, and connective tissue diseases; (d) patients participating in other clinical studies; and (e) patients with poor compliance.

2.3 | Treatment

The patients in both groups underwent thorough debridement treatment and bacterial culture and drug sensitivity tests, and they were given antibiotics in line with the drug sensitivity test results. Gauze padding containing furacilin (a wet dressing) was used to dress the infected wounds of the patients in the control group, and the dressing was changed daily, unless the actual condition of the infected wound required otherwise. On the other hand, TCM powder was used to treat the wounds of the patients in the observation group. The powder included the following: 50 g each of Cortex Phellodendron, honeysuckle, Lithospermum, Borneol, and Dragon's blood, 30 g each of Angelica sinensis, Radix Paeoniae Rubra, Angelica dahuricae, and Hydrargrum oxydatum crudum, and 20 g each of frankincense, myrrh, and Salvia miltiorrhiza in powder form. The powder was evenly sprinkled over the whole of the wound surface, and the wound was bandaged with sterilised gauze to provide anti-inflammation and pain relief and avoid any potential infection caused by exposing the wound surface. The course of treatment for both groups was 2 weeks. There was no statistically significant difference between the two groups in terms of gender and age ($P > .05$) (Table 1).

2.4 | Efficacy criteria

The efficacy criteria were formulated with reference to clinical practice and the literature, which included *Diagnostic Efficacy Criteria of Chinese Medicine*. The degrees of efficacy of the healing were as follows: a complete response meant that the infected wounds healed and all the clinical symptoms completely disappeared; a

TABLE 1 Comparison between two groups in terms of general data

Group	n	Gender		Age (yr, $\bar{x} \pm s$)
		Male	Female	
Control Group	40	18	22	40.73 + 12.82
Observation group	40	15	25	36.92 + 12.34
χ^2 value		0.464		—
<i>t</i> value		—		1.350
<i>P</i> value		0.496		0.181

Note: “—” indicates no value for this statistic.

moderate response implied that the infected wound area was significantly reduced and the clinical symptoms improved to some extent; and no response indicated that the infected wound area was not significantly reduced, and the clinical symptoms did not improve.

2.5 | Observation indexes

The following observation indexes were used; (a) colour: the wound was scored as 1, 2, and 3 for bright red, light red, and dark purple, respectively, before and after treatment; (b) wound exudate volume: a score of 0 was assigned to both groups before and after treatment for a bright red wound with no obvious surface secretions; if the amount of secretion was small and did not soak one piece of gauze, the score was 1; if the amount of secretion was large and soaked one piece of gauze, it was scored as 2; and if the amount of secretion was very large and soaked two or more pieces of gauze, the score was 3; and (c) times to the appearance of new epithelium and to wound healing.

2.6 | Statistical analysis

The software package SPSS 23.0 was used for the statistical analysis. A *t*-test was performed with the measurement data, and a χ^2 test was used for the count data. The significance level was set as $\alpha = .05$.

3 | RESULTS

3.1 | General results

In the observation group (treated with TCM powder), 35 patients achieved a complete response, 4 had a moderate response, and 1 had no response, which was an

overall response rate of 97.5%. In the control group (treated with general conventional surgical therapy), 26 patients achieved a complete response, 5 had a moderate response, and 9 had no response, which was an overall response rate of 77.5%. The total response rate of the observation group was significantly higher than that of the control group ($P = .017$; Table 2).

The colour and exudate volume scores in both groups were significantly reduced after treatment compared with those before treatment ($P < .05$), and both methods were effective in treating the infected wounds. However, the colour and exudate volume scores in the observation group were lower than those in the control group, and the differences between the two groups were statistically significant ($P < .05$; Table 3).

The time to the appearance of new epithelium and time to the wound healing of the burns in the observation group were shorter than those in the control group, and the differences were statistically significant ($P < .05$; Table 4).

3.2 | Medical history and treatment course of five patients

Patient 1 was a 45-year-old male, who was burned when a liquid propane gas tank exploded while he was cooking at home. He was treated at the burns orthopaedic department of a local grade A tertiary hospital. Due to the large burn area and the fact that he had multiple deep third-degree burns, it was recommended that he should go to go to a higher-level hospital for further consultation and treatment. The patient's family then transferred him to a military tertiary hospital, and after consultation with a burn surgeon, surgery was performed, which cost about 100 000 Chinese Yuan. The patient was from a rural area and was covered by agricultural insurance, but it had a low reimbursement value for accidental injury. Introduced by relatives of the family, he came to our clinic, and was given prompt treatment. The patient's burns were described as follows: superficial second-degree burns on the right thoracic rib and waist covering about 6% of the body, and third-degree burns on the right thigh and buttocks covering about 10% of the body. After the wound was cleaned and disinfected, TCM powder was applied, and the burn was dressed as usual. After an interval of about 30 minutes, the patient's pain was considerably relieved, his vital signs were normal, and he was able to sleep. Since the burn was in the acute stage, and there was a large amount of exudate, a daily dressing change was recommended to help the wound heal and prevent infection. After a total of seven dressing changes, the wound was basically healed. Figure 1 shows images of the burn before and after treatment.

TABLE 2 Comparison between two groups in terms of clinical efficacy (n [%])

Group	n	Complete response	Recovering	Uncured	Overall response rate	χ^2	P
Control Group	40	26 (65)	5 (12.5)	9 (22.5)	31 (77.5)	7.972	.017 ^a
Observation group	40	35 (87.5)	4 (10.0)	1 (2.5)	39 (97.5)		

Note: Compared with the control group, ^a $P < .05$, there is a statistically significant difference.

TABLE 3 Comparison between two groups in terms of infected wound colour and exudate volume scores before and after treatment ($\bar{x} \pm s$ scores)

Group	n	Colour			Amount of exudates		
		Before treatment	After treatment	P	Before treatment	After treatment	P
Control Group	40	2.42 ± 0.55	1.70 ± 0.68	<.05 ^a	2.35 ± 0.53	1.63 ± 0.54	<.05 ^a
Observation group	40	2.20 ± 0.46	1.02 ± 0.16	<.001 ^a	2.30 ± 0.61	0.35 ± 0.48	<.001 ^a
t value		1.979	6.057		0.391	11.129	
P value		.052	<.05 ^b		.697	<.05 ^b	

Note: Compared with pre-treatment, ^a $P < .05$; Compared with the control group, ^b $P < .05$, there is a statistically significant difference.

TABLE 4 Comparison of the time to the appearance of new epithelium and time to the wound healing in the two groups ($\bar{x} \pm s$, d)

Group	n	Time to the appearance of new epithelium	Time to the wound healing
Control Group	40	11.63 ± 2.75	21.36 ± 3.87
Observation group	40	7.00 ± 0.82	13.80 ± 1.79
t value		8.38	11.76
P value		<.05 ^a	<.05 ^a

Note: Compared with the control group, ^a $P < .05$, there is a statistically significant difference.

Patient 2 was a 30-year-old female, who was scalded by soup while working in a restaurant in Nanjing. She was treated at a grade A tertiary hospital in Nanjing. After the patient's condition was stabilised, she came to the Burns Therapy Clinic in Mingguang for further treatment. The patient had multiple burns on her back, with first-degree burns covering about 4% of the body, and shallow and deep second-degree burns about 6%. The wound was routinely treated with the TCM powder. At first, the powder was changed once every 2 days, and when the condition improved, it was changed once every 3 days. After the dressing had been changed five times, the scald wounds of the patient were basically healed, the pigmentation was good, and there was no fibrous scar remaining, Figure 2 shows the patient before and after treatment.

**FIGURE 1** Comparison of patient 1 before and after treatment. (A) Before treatment. (B) After treatment

Patient 3 was a 50-year-old male, who was repairing a gas pipe when the gas leaked and caught fire. He was taken to a grade A tertiary hospital in Shanghai for treatment. After consultation and treatment from a burn specialist, the patient and his family were informed that the wounds required skin grafting surgery, which would cost about 40 000 Yuan. The patient was reluctant to have the surgery because of the high cost. On the recommendation of a friend, after the patient's vital signs stabilised, the family drove him to the clinic overnight for treatment. The patient had first-degree burns covering about 4% of the entire face, a flesh-coloured slightly wet wound visible on the right forearm and the back of the right hand, and deep second-degree burns, which were red and white, covering about 6% of the body. At the beginning, the herbal powder was changed once every 2 days, and



FIGURE 2 Comparison of patient 2 before and after treatment. (A) Before treatment. (B) After treatment



FIGURE 3 Comparison of patient 3 before and after treatment. (A) Before treatment. (B) After treatment

when the patient's condition improved, it was changed once every 3 days. After six dressing changes, the scald wounds were basically healed, with good pigmentation but no fibrous scar remaining. Figure 3 presents the burn areas before and after treatment.

Patient 4 was a 92-year-old male, who had been suffering from diabetes mellitus for a long time. When he was diagnosed with diabetic foot, the patient was treated in the burns orthopaedic department of the local grade A tertiary hospital, but the results were unsatisfactory. For more than 3 years, his family continued to take him to various specialist hospitals in Beijing and Shanghai, but there was no change. The clinic was finally recommended to the

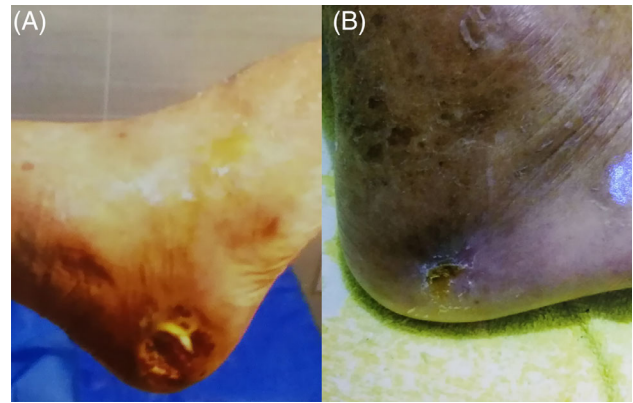


FIGURE 4 Comparison of patient 4 before and after treatment. (A) Before treatment. (B) After treatment

patient by a friend, and he was treated with the traditional powder. The dressing was changed once every 5 days because the patient's wound was a chronic non-healing wound, and required a longer interval between changes. After a total of seven dressing changes, the wound was healed. Figure 4 has images of the patient before and after treatment.

The patient, a 65-year-old male, had a car accident, and sulfuric acid liquid leaked from the car battery, burning his right lateral calf. He was also sent to the burns orthopaedic department of a local grade A tertiary hospital for treatment, but he and his family were not happy with it, so he was transferred to the burns department of Jiangsu Provincial People's Hospital for further treatment. After consultation and treatment from the burn specialist, the patient and the family were informed that the burn needed a skin graft. However, skin grafting may not guarantee survival, and the cost of the operation was high, costing about 60 000 Chinese Yuan. The clinic was recommended to him by a relative, and he received treatment there with the TCM powder. He had a deep second-degree burn covering about 6% of the right lateral calf, and the dressing had to be replaced eight times. Figure 5 compares the burn wound before and after treatment.

From the perspective of TCM, when the skin undergoes a trauma, the meridians of the injured area become blocked, and there is qi stagnation and blood stasis, which can lead to a painful wound, the abnormal transmission of qi, blood, and fluid, and fluid accumulation or non-circulation overflow outside the veins and meridians. This can result in the development of swelling, blisters, and secretions around the wound. The stagnation of qi and blood is accompanied by the stagnation of water, dampness, and heat, which generates sores and pus. A wound that takes a long time to heal is considered to be a surgical disease of sores and ulcers.



FIGURE 5 Comparison of patient 5 before and after treatment. (A) Before treatment. (B) After treatment

TCM holds that the pathogenesis of surgical diseases is mainly due to the stagnation of qi and blood, the stagnation of ying–qi, the obstruction of the meridians, and the dysfunction of the internal organs. The main cause of sores and ulcers is heat and toxicity, and the interaction between toxicity, decay, stasis, and deficiency contributes to the formation and development of the trauma response. The development of sores can be divided into three stages: the initial stage, pus formation and post-ulceration. External treatment is aimed at removing the toxins and swelling, eliminating pus and decay, regenerating muscle and suturing the wound. Therefore, the mechanism of action of topical herbal medicine in treating sores can be summarised as follows: (a) clearing heat and detoxifying toxins; (b) activating blood circulation and resolving blood stasis; (c) eliminating pus and encouraging the growth of new skin and (d) dispelling decay and regenerating muscle.

4 | DISCUSSION

Despite advances in treatment, the efficacy of skin wound healing remains a topic of concern in the medical community today. From a modern Western medical perspective, a cutaneous wound refers to damage to the structure or integrity of the function of the skin barrier, which can have a variety of causes and result in a series of local and even systemic physiological and pathological changes.⁸ Wound repair involves multiple cells and inflammatory mediators and is precisely regulated by multiple signalling pathways, resulting in a very complex pathophysiological

process. Abnormalities in any component or link may affect the wound repair process, delaying the repair and affecting the quality of healing in minor cases or preventing the healing of the wound in severe cases.^{9,10} The microenvironment of wound repair, the functional cells involved in repair, and the extracellular matrix (ECM) are considered to be the three most critical local factors affecting the healing of skin wounds. Only when these three factors are synergistic with each other can the wound be effectively repaired, otherwise the wound may not heal, which in turn can affect the patient's quality of life and even threaten their life.^{9,10} The local microenvironment, inflammatory response, necrotic tissue, foreign bodies, infection, an insufficient number or dysfunction of functional cells, malnutrition, and abnormal ECM synthesis and decomposition are all considered to be the most important causes of non-healing wounds.^{9,10} To encourage wound healing, it is necessary to improve blood circulation to the wound, promote wound revascularization, maintain a stable microenvironment, eliminate the inflammatory response, remove necrotic material, and gather stem cells to form ECM.

Skin wounds are one of the most common clinical conditions and can be the result of a burn, surgery, or various medical diseases. They include the following: (a) multi-site skin pressure sores in elderly patients; (b) diabetic foot sores; (c) arteriovenous ulcers of the lower extremities and (d) scar ulcers and granulation wounds. With the development of the biomedical and materials science, new materials have been developed, providing more options, tools and means of wound repair.^{11–13} Although they can be effective, they are also costly and not easily accepted by conventional patients. Some materials are still in the clinical trial stages and need further improvement and exploration.

In TCM, skin wounds belong to the category of sores and ulcers.¹⁴ The aetiology and evolution of sores and ulcers are well understood and documented in the literature, and there is a 5000-year history of treating them. For example, the ulcer doctors of the Zhou dynasty were surgeons whose duties involved treating swellings, ulcers, and open incised wounds.¹⁵ There are relevant medical records dating back to the pre-Qin era of China, and the *Yellow Emperor's Classic of Internal Medicine* makes reference to the efficacy of TCM powder applied externally to wounds.¹⁶ With the development of medicine, practitioners have gained a deeper understanding of wounds and have made continuous progress in their treatment. TCM powder is a surgical preparation of various drugs with positive clinical efficacy. The powder has different effects such as decongesting, dispersing poison, eliminating pus, dispelling rot, eroding and flattening pterygium, engendering the growth of flesh, closing wounds, fixing

pain, and stopping bleeding.¹⁷ In the early stage of a wound, the powder is used for its dissipative effect, and in the middle stage, the powder promotes pus and removes decay. If an abscess has formed but has not broken, or a ruptured opening is too small and rigid with pterygium protruding, the powder will heal the abnormal flesh. In the later stage, a powder for muscle growth is used to close the wounds. In addition, there are also hemostatic powders with an astringent effect.

There are some limitations in the present study. The sample size of this study is limited, and the results will need to be fully validated with a larger sample size in the future.

In conclusion, the use of TCM powder has certain advantages over the conventional Western medicine treatment of wounds as it is non-invasive and relatively cheap. It has been shown to heal all types of burns, including third-degree burns, and is effective for treating ulcers, such as those found in diabetic foot. It has also been successful in healing wounds that conventional treatment could not.

CONFLICT OF INTEREST

The authors declare no potential conflict of interest.

DATA AVAILABILITY STATEMENT

The datasets used and/or analysed during the current study available from the corresponding author on reasonable request.

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