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Ji Desheng Snake Pills Combined with Hypertonic Glucose External Application in the Treatment of Stage III and IV Pressure Injuries

Rongting Liu[1], Cong Zhang[2], Jing Zeng[3], Xue Wu[1], Shihong Deng[1], Jing Chen[1*]

[1]Department of Gastrointestinal Surgery, The First Affiliated Hospital of Yangtze University, Jingzhou, China
[2]Department of Cardio-Thoracic Surgery, The First Affiliated Hospital of Yangtze University, Jingzhou, China
[3]Department of Orthopaedic Surgery, The First Affiliated Hospital of Yangtze University, Jingzhou, China
Email: *754882715@qq.com

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Abstract

Background: As a common surgical disease, pressure injury has become a long-standing problem in clinical treatment and nursing process. This research was conducted to explore the feasibility of Ji Desheng Snake Pills combined with hypertonic glucose external application in the treatment of stage III and IV pressure injuries. **Methods:** Patients with stage III and IV pressure injuries, who received treatment in our hospital between December 2018 and December 2019 were selected and divided into experimental group, conventional treatment group, and control group, 30 cases for each. The three groups received Ji Desheng Snake Pills combined with hypertonic glucose external application, moist dressing external application and surgical dressing change, respectively. The safety, therapeutic effect and cost benefit of the three treatment methods were compared. **Results:** There were no adverse reactions in the three groups of patients. The PUSH scores of the experimental group and the conventional treatment group were significantly lower than that of the control group on the 14th, 21th, and 28th days, and the result was statistically significant ($p < 0.05$), while there was no significant difference between the experimental group and the conventional treatment group ($p > 0.05$). The wound healing rates of the experimental group (70.14 ± 8.27%) and the conventional treatment group (73.99 ± 7.15%) were significantly higher than that of the control group (43.25 ± 8.53%) on the 28th day, with statistical significance ($p < 0.05$); there was no significant difference between the experimental group and the conventional treatment group ($p > 0.05$). The total treatment costs of the three groups were 569.73 ± 78.12 yuan, 1043.40 ± 135.31 yuan, and 186.47 ± 30.29 yuan. The cost of the conventional treatment group was the highest, followed by the experimental group, and the control

group was the lowest. The result was statistically significant ($p < 0.05$). **Conclusion:** In the treatment of stage III and IV pressure injuries, there was no significant difference in the safety and therapeutic effect between the experimental group (Ji Desheng Snake Pills combined with hypertonic glucose external application) and the conventional treatment group (moist dressing external application), but the experimental group had better cost benefit.

Keywords

Ji Desheng Snake Pills, Hypertonic Glucose, Pressure Ulcer, Pressure Ulcer Scale for Healing Tool

1. Introduction

Pressure Injury (PI), commonly known as Pressure Ulcer (PU), or bed sore or decubitus ulcer, is a localized injury of skin and deep soft tissues caused by persistent ischemia and hypoxia originated from the pressure on local tissues of the body due to long-term maintenance of a fixed posture [1]. It often occurs at the bone carina, which is characterized by a long course of disease, slow healing, and high treatment costs, affecting the life quality of patients, even resulting in the death of patients due to the serious secondary infections [2]. Stage III and IV pressure ulcers will have full-thickness skin loss, accompanied by exposure of bones, tendons or muscles, and even the ulcers reach muscle and supporting systems (e.g. fascia, tendons, joint capsules), causing osteomyelitis [3], and the condition is often more serious. Ji Desheng snake pills, as a special antidote with more than 300 years of application history, consist of dozens of animal and plant medicinal materials. It is easy to use, both internally and externally, with the effects of anti-inflammation and anti-bacteria, detoxification and detumescence, relieving pain and promoting granulation, and strengthening the body's immunity [4] [5]. In clinic, its external application is commonly used in the treatment of mosquito bites, herpes zoster, phlebitis, and drug leakage at the injection site [6]. In this study, patients with stage III and stage IV pressure injuries, who received treatment in the First Affiliated Hospital of Yangtze University between December 2018 and December 2019 were selected and given Ji Desheng Snake Pills combined with hypertonic glucose external application, moist dressing external application and surgical dressing change, respectively. The safety, therapeutic effect and cost benefit of the three treatment methods were compared to explore the feasibility of Ji Desheng snake pills combined with hypertonic glucose external application in the treatment of stage III and IV pressure injuries. The report was as follows.

2. Method Part

2.1. Research Subject

The study population were selected by convenience sampling method and con-

sisted of 90 patients meeting the inclusion criteria in the First Affiliated Hospital of Yangtze University between December 2018 and December 2019, then the participants were randomly divided into experimental group, conventional treatment group, and control group, 30 cases for each. Patients in the experimental group, the conventional treatment group and the control group were treated with Ji Desheng snake pills combined with hypertonic glucose external application, moist dressing external application and surgical dressing change, respectively. During the treatment, the pressure ulcer area, wound tissue type, would effusion, pain degree, adverse actions and pressure ulcer treatment costs were observed and recorded on the 1st, 7th, 14th, and 28th days. This study was approved by the hospital ethics committee.

2.2. Inclusion Criteria and Exclusion Criteria

1) Inclusion criteria: a) age ≥ 18 years; b) first pressure ulcer treatment; c) stable control of primary disease or complications; d) compliant with the National Pressure Ulcer Advisory Panel (NPUAP) diagnostic criteria for stage III and IV pressure ulcers [3]; e) patients and their families voluntarily participated in the clinical efficacy observation study and signed informed consent.

2) Exclusion criteria: a) patients with abnormal blood glucose levels during treatment; b) patients with active wound bleeding or coagulation dysfunction; c) patients with drug allergy; d) serious heart, liver, and kidney insufficiency; e) sepsis; f) immunosuppressant or hormone therapy; g) refusal to continue the research.

2.3. Treatment Plan

In the control group, the skin around the wound was disinfected with 0.5% iodophor, and the wound was lightly moistened with a cotton ball of normal saline. If there was obvious necrotic tissue, it needed to be debrided and applied with vaseline gauze and sterile gauze. As to the experimental group, after treating the wound with the above method, 20 Ji Desheng snake pills were crushed and stirred into a paste after adding 50% glucose solution, and then evenly smeared on the wound which was then covered with sterile gauze. For the conventional treatment group, the common moist dressing was used. The choice of dressings was based on the treatment principles of stage III and IV pressure ulcers [7]. Alginate dressings were used as inner dressings to cover the pressure ulcer wounds. The size and shape of the dressings were tailored according to the size of the wound, 1 - 2 cm beyond the edge of the wound. The outer layer was adhered and fixed with a hydrocolloid dressing. If the wound was infected, silver ion dressing was then used as the inner dressing, and the outer layer was covered with gauze or cotton pad after being fixed with a hydrocolloid dressing. The dressing was changed daily in the early stage of the treatment, and the frequency of dressing changes was gradually reduced according to whether the wound had effusion, peculiar smell, and whether the dressing was clean and dry. The air bed

was usually used and the patients were turned over every 2 hours. The treatment cycle was 28 days.

2.4. Evaluation Indices

The observation record table of pressure ulcer therapeutic effect was set up with the 1st, 7th, 14th, 21st, and 28th days as the observation points. The patient's pressure ulcer area, wound tissue type, would effusion, and pain degree were recorded to calculate PUSH score, VAS pain score and wound healing rate on the 28th day as evaluation indices of therapeutic effect. Meanwhile, the adverse actions during the treatment were recorded as safety evaluation indices and pressure ulcer treatment costs were counted as evaluation indices of cost benefit. The calculation method of pressure ulcer area (cm^2) was to multiply the length of the wound (cm, take the patient's head to toe as the vertical axis) by the width of the wound (cm, the horizontal axis was perpendicular to the vertical axis). The formula for calculating the wound healing rate on the 28th day was: healing rate = (original wound area before treatment − wound area on the 28th day)/original wound area before treatment × 100%.

2.5. Statistical Methods

SPSS26.0 software was utilized for statistical analysis. The measurement data was expressed as $\bar{x} \pm s$, using the single-factor ANOVA test. The count data was expressed by the number of cases and percentage (%). The comparison between groups used $\chi 2$ test, considering $p < 0.05$ as statistically significant.

3. Results

3.1. Patient Baseline Data

In this study, the experimental group included 18 male patients and 12 female patients, with the average age of 73.80 ± 3.41 years; the conventional treatment group 16 males and 14 females, with the average age of 72.47 ± 7.55 years; the control group included 13 males and 17 females, with the average age of 74.73 ± 5.48 years. There were no statistically significant differences between the three groups in sex, age, BMI index, hemoglobin, albumin, mean arterial pressure, pressure ulcer location distribution, and Braden score ($p > 0.05$) (**Table 1**), indicating that the three groups of patients were comparable.

3.2. Safety, Therapeutic Effect and Cost Benefit

During the treatment, no adverse reactions occurred in the three groups of patients. On the 14th, 21th, and 28th day, the PUSH scores of the experimental group and the conventional treatment group were significantly lower than that of the control group, and the result was statistically significant ($p < 0.05$), while there was no significant difference between the experimental group and the conventional treatment group ($p > 0.05$) (**Table 2**). Comparing the control group, the experimental group and the conventional treatment group, the wound healing

Table 1. Comparison of baseline data of the three groups of patients.

	The control group	The experimental group	The conventional treatment group	p
Sex n (%)				0.468
Male	13 (43.3)	18 (60)	16 (53.3)	
Female	17 (56.7)	12 (40)	14 (46.7)	
Age (years)	74.73 ± 5.48	73.80 ± 3.41	72.47 ± 7.55	0.311
BMI (kg/m^2)	21.06 ± 1.93	20.47 ± 1.44	20.83 ± 1.52	0.383
Hemoglobin (g/L)	135.40 ± 16.98	134.63 ± 15.47	136.87 ± 15.48	0.860
Albumin (g/L)	47.47 ± 8.78	43.10 ± 9.60	45.40 ± 9.67	0.201
MAP (mmHg)	89.50 ± 8.34	87.60 ± 9.93	88.60 ± 10.35	0.745
Location of pressure ulcer n (%)				
Sacrococcygeal region	13 (20.6)	17 (29.3)	17 (29.8)	0.447
Heel	7 (11.1)	6 (10.3)	5 (8.8)	0.952
Spinous process	8 (12.7)	10 (17.2)	11 (19.3)	0.647
Scapular region	10 (15.9)	7 (12.1)	6 (10.5)	0.668
Elbow	8 (12.7)	5 (8.6)	5 (8.8)	0.707
Hip	8 (12.7)	3 (5.2)	6 (10.5)	0.331
Ankle	9 (14.3)	10 (17.2)	7 (12.3)	0.776
Braden tool	13.57 ± 1.59	13.67 ± 1.35	13.47 ± 1.22	0.858

BMI: Body mass index, MAP: Mean arterial pressure.

Table 2. Comparison of PUSH scores of the three groups of patients.

	The control group	The experimental group	The conventional treatment group	F value	p[a]
1 d	13.93 ± 1.46	13.60 ± 1.69	13.63 ± 1.54	0.411	0.664
7 d	12.67 ± 1.12	12.10 ± 1.16	12.13 ± 1.20	2.259	0.111
14 d	12.10 ± 1.09	11.07 ± 1.48‡	11.17 ± 1.26‡	5.857	0.004
21 d	11.50 ± 1.08	9.60 ± 1.83‡	9.93 ± 1.17‡	15.750	0.000
28 d	10.07 ± 1.60	7.30 ± 1.62‡	7.20 ± 1.75‡	28.911	0.000
F value	36.909	70.435	90.160		
p[b]	0.000	0.000	0.000		

‡: compared with the control group ($p < 0.05$).

rates of the three groups on the 28th day were 43.25% ± 8.53%, 70.14% ± 8.27%, and 73.99% ± 7.15%, respectively. The results showed that the experimental group and the conventional treatment group were significantly higher than the control group, with statistical significance ($p < 0.05$); there was no significant difference between the experimental group and the conventional treatment group ($p > 0.05$) (Table 3). On the 7th, 14th, 21th, and 28th day, the VAS pain scores of the experimental group and the conventional treatment group were significantly lower than that of the control group, and the result was statistically significant ($p < 0.05$), while there was no significant difference between the experimental group and the conventional treatment group ($p > 0.05$) (Table 4).

Table 3. Comparison of wound healing rates and treatment costs of the three group of patients.

Variables	The control group	The experimental group	The conventional treatment group	Statistical value	p
Healing rate (%)	43.25 ± 8.53	70.14 ± 8.27‡	73.99 ± 7.15‡	131.233	0.000
Treatment cost (RMB¥)	186.47 ± 30.29	569.73 ± 78.12‡*	1043.40 ± 135.31‡	654.730	0.000

‡: compared with the control group ($p < 0.05$); *: compared with the conventional treatment group ($p < 0.05$).

Table 4. Comparison of VAS pain scores of the three groups of patients.

	The control group	The experimental group	The conventional treatment group	F value	p[a]
1 d	6.17 ± 1.21	6.17 ± 1.09	6.20 ± 0.85	0.010	0.990
7 d	4.53 ± 1.17	3.00 ± 0.95‡	3.03 ± 0.77‡	24.286	0.000
14 d	3.50 ± 1.20	1.77 ± 0.63‡	1.93 ± 0.74‡	34.724	0.000
21 d	2.53 ± 1.04	1.10 ± 0.66‡	1.20 ± 0.66‡	29.339	0.000
28 d	1.70 ± 0.84	0.43 ± 0.50‡	0.40 ± 0.50‡	41.116	0.000
F value	75.728	242.944	305.545		
p^b	0.000	0.000	0.000		

‡: compared with the control group ($p < 0.05$).

The total treatment costs of the three groups were 186.47 ± 30.29 yuan, 569.73 ± 78.12 yuan, and 1043.40 ± 135.31 yuan. The conventional treatment group was the highest, followed by the experimental group, and the control group was the lowest. The result was statistically significant ($p < 0.05$) (**Table 3**).

4. Discussion

As a common surgical disease, pressure injury has become a long-standing problem in clinical treatment and nursing process due to the fact that patients are bedridden for a long time and may be combined with unfavorable factors such as hypotension, low protein and edema, plus fixed position, improper care, etc., which makes the wound easily infected and difficult to heal [8] [9]. In modern medicine, moist dressings are used in the treatment of pressure injuries. Studies have shown that its effective rate reaches 92.11%, which can significantly improve the therapeutic effect. However, the new type of moist dressing is expensive, which imposes an unbearable burden of medical expense on patients with difficult family conditions [10] [11] [12].

Many Chinese medicine scholars have conducted substantial basic research and clinical experiments, and opine that the method of external application of Chinese medicine preparations can effectively treat pressure ulcers, with obvious curative effects, small side effects and other advantages [13]. Our research team previously used Ji Desheng snake pills combined with 50% glucose solution external application to treat superficial phlebitis and achieved favorable results

[14]. However, due to no finding that Ji Desheng snake pills have been used in the treatment of pressure ulcers at home and abroad, there is currently a lack of comparison in efficacy and cost-effectiveness.

In this study, we also took advantage of the above-mentioned characteristics of Ji Desheng snake pills, combined with the hypertonic characteristics of 50% glucose solution that can reduce tissue inflammation and exudation, to achieve the effect of promoting wound healing. No adverse reactions were observed in this research. The results showed that after one week of treatment, there was no significant difference in the PUSH score, wound healing rate, VAS pain score between the cases treated with Ji Desheng snake pills combined with hypertonic glucose external application and those treated with moist dressing external application, both of which were significantly better than the surgical dressing in the aforementioned indices. On the other hand, the treatment cost of Ji Desheng snake pills combined with hypertonic glucose external application was significantly lower than that of moist dressing external application. The reason is that almost all the moist dressings used in domestic hospitals are imported products, so it is difficult to reduce the use cost. This makes Ji Desheng snake pills show obvious advantages in cost-effectiveness. The above results indicate that Ji Desheng snake pills combined with hypertonic glucose external application, as a new type of treatment with characteristics such as simple operation, significant therapeutic effect and low price, has potential cost benefit advantage especially for pressure ulcer patients with poor economic conditions.

5. Conclusion

This research explored the feasibility of Ji Desheng snake pills combined with hypertonic glucose external application in the treatment of stage III and IV pressure injuries. The results showed that for the treatment of stage III and IV pressure injuries, Ji Desheng snake pills combined with hypertonic glucose external application were not significantly different from moist dressing external application in the therapeutic effect and safety, while the former method had significantly better cost benefit. However, this study is exploratory and there are still certain limitations in terms of research time, research methods, patient compliance, sample size, pharmacological mechanism research, and TCM syndrome differentiation treatment. Therefore, the follow-up research still needs to be improved and deepened in the above regards so as to make the research results more convincing.

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Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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