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Nursing Protocol and Efficacy Evaluation of Fennel Hot Compress in Conservative Treatment of Intestinal Obstruction

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Abstract

Objective: To investigate the application effect of Fennel hot compress in patients undergoing conservative treatment for intestinal obstruction. **Methods:** A non-randomized, non-concurrent controlled study was conducted involving 79 patients with intestinal obstruction receiving conservative treatment. Convenience sampling was used to divide them into a control group (n = 41) and an observation group (n = 38). The control group received routine symptomatic supportive treatment and nursing care. The observation group received additional Fennel hot compress applied to the abdomen. **Results:** The observation group showed a higher treatment effective rate than the control group. The time to anal exhaust, time to defecation, and time to disappearance of abdominal pain and distension were significantly shortened in the observation group. Hospital stay length and costs were reduced. Patient satisfaction total score, and scores in the dimensions of technical service quality, service economy, and timeliness were superior in the observation group compared to the control group. All differences were statistically significant. **Discussion**: Fennel hot compress is simple, safe, and effective. It can accelerate the recovery of gastrointestinal function, alleviate suffering, reduce hospitalization costs, and enhance nursing satisfaction in patients undergoing conservative treatment for intestinal obstruction, demonstrating significant clinical value for widespread adoption.

Keywords

Intestinal Obstruction, Conservative Treatment, Fennel Hot Compress, Gastrointestinal Function Recovery

1. Introduction

Intestinal obstruction is a common acute abdominal condition in surgery, charac-

terized primarily by impaired passage of intestinal contents. It can lead to water-electrolyte imbalances and systemic inflammatory responses, potentially threatening life in severe cases. Surgery is traditionally recommended to rapidly relieve the obstruction, but it constitutes another major trauma and stressor, potentially increasing adverse stimulation to the patient and even worsening the obstruction. Choosing conservative treatment offers certain advantages. Recent studies have confirmed that non-pharmacological interventions can optimize the therapeutic efficacy of conservative management for intestinal obstruction [1] [2]. Promoting gastrointestinal function recovery and improving patient quality of life [3] without adding further trauma is a key focus of clinical nursing care. Fennel (Foeniculum vulgare Mill.), a medicinal and edible herb in Uyghur traditional medicine, is warm in nature, pungent in taste, and enters the Liver, Kidney, Spleen, and Stomach meridians. It has the effects of enhancing intestinal contraction and promoting intestinal peristalsis [4] [5]. Current research indicates that the main components of Fennel include volatile oil, fatty oil, sterols, and glycosides, with fennel volatile oil being the primary active constituent responsible for its pharmacological effects [6]. Multiple studies have shown that Fennel hot compress can promote gastrointestinal function recovery after various surgical procedures [7] [8]. This study applied Fennel hot compress to patients undergoing conservative treatment for intestinal obstruction, aiming to validate its clinical value and optimize the nursing protocol.

2. Subjects

Based on preliminary data (control group response rate ≈ 70%, observation group ≈ 90%), with $\alpha = 0.05$ and $\beta = 0.2$, PASS 15.0 calculation indicated ≥34 cases per group were required. Accounting for a 10% dropout rate, the total sample size needed was ≥76 cases. Ultimately, 79 patients with intestinal obstruction receiving conservative treatment in the Department of Gastrointestinal Surgery at a hospital from May 2024 to May 2025 were enrolled. Patients were grouped chronologically by admission date: those admitted from May to October 2024 were assigned to the control group (n = 41), while those admitted from November 2024 to May 2025 were assigned to the observation group (n = 38). During the study period, there were no changes in ward nursing staff, treatment protocols, or equipment. This study was approved by the Hospital Ethics Committee (Approval No.: LL2024106). All patients provided informed consent and signed written consent forms.

Inclusion Criteria: 1) Patients diagnosed with intestinal obstruction confirmed by abdominal X-ray or CT, meeting the diagnostic criteria in "Surgery"; 2) Informed and agreed to participate in this study. Exclusion Criteria: 1) Intestinal obstruction caused by malignant tumors, strangulated intestinal obstruction, or signs of intestinal ischemia/necrosis; 2) Unstable vital signs; 3) Inability to communicate effectively; 4) Patients currently participating in other clinical trials.

There were no statistically significant differences in general characteristics between the two groups, including age, height, weight, body mass index (BMI), gen-

der, and underlying diseases (Table 1).

Table 1. Comparison of general characteristics between the two groups.

Group	Control (n = 41)	Observation (n = 38)	$t/\chi^2/Z$	P
Age (years)	62.15 ± 12.04	64.24 ± 14.14	−0.709	0.480
Height (m)	1.61 ± 0.07	1.60 ± 0.09	0.696	0.489
Weight (kg)	55.51 ± 9.97	57.32 ± 11.68	−0.740	0.462
BMI (kg/m^2)	21.28 ± 3.22	22.22 ± 2.98	−1.347	0.182
Gender			3.032	0.082
Male, n (%)	19 (46.34)	25 (65.79)		
Female, n (%)	22 (53.66)	13 (34.21)		
Underlying Diseases			−1.477	0.140
None, n (%)	2 (4.88)	9 (23.68)		
1 type, n (%)	21 (51.22)	17 (44.74)		
2 type, n (%)	13 (31.70)	5 (13.16)		
≥3 type, n (%)	5 (12.20)	7 (18.42)		

3. Methods

3.1. Treatment Methods

3.1.1. Control Group

Received routine symptomatic supportive treatment and nursing care: 1) Nil per os (NPO), continuous gastrointestinal decompression; 2) Oral liquid paraffin oil to promote defecation; 3) Enemas if necessary; 4) Monitoring vital signs, changes in abdominal pain and distension; 5) Health education.

3.1.2. Observation Group

Received the control group treatment plus Fennel hot compress applied to the abdomen. Specific method: 1) Prepare 500 g of Fennels, place them into a double-layered cotton cloth bag (20 cm × 30 cm), tie the bag opening tightly, and spray a small amount of water (enough to moisten without leakage). 2) Heat in a microwave oven on medium power for 3 - 5 minutes. Remove and wrap in a dry towel. Test the temperature (ideally 40˚C - 50˚C to avoid burns). 3) Position the patient comfortably in a supine position. Place the hot compress pack on the abdomen, focusing on covering Zhongwan (CV12), Tianshu (ST25), and Shenque (CV8) acupoints. 4) Apply twice daily for 15 minutes each time (adjustable between 10 - 20 minutes based on patient tolerance). 5) Abdominal hot compress was initiated within 4 hours after confirmed diagnosis and discontinued upon recovery of gastrointestinal function, with a maximum intervention duration of 10 days. 6) For patients with sensory impairment, test temperature carefully (40˚C - 50˚C) and

closely observe skin condition during application.

3.2. Observation Indicators

1) Treatment Effective Rate: Effective was defined as spontaneous anal exhaust and defecation without glycerin enema use, and disappearance of abdominal pain and distension. Failure was defined as not meeting the criteria within 10 days of treatment. 2) Gastrointestinal Function Recovery Indicators: Time to anal exhaust recovery, time to defecation recovery, time to disappearance of abdominal pain and distension. 3) Hospitalization-Related Indicators: Average length of hospital stay (days), average hospitalization cost. 4) Satisfaction: Assessed using the Chinese version of the Patient Satisfaction Questionnaire Short Form (PSQ-18), translated by Hu Jianglin *et al.* [9] and revised by Wang Jia [10]. It contains 18 items across 7 dimensions: General Satisfaction (2 items), Interpersonal Manner of Nurses (2 items), Communication with Nurses (2 items), Technical Quality (4 items), Financial Aspects (2 items), Time Spent with Doctor/Nurse (2 items), and Accessibility and Convenience (4 items). Each item is scored 1 - 5 points. The total score ranges from 18 to 90, with higher scores indicating greater satisfaction. The Cronbach's α coefficient for this scale was 0.852 [11].

3.3. Statistical Methods

Data analysis was performed using SPSS 25.0 software. Measurement data with normal distribution and homogeneity of variance are expressed as mean ± standard deviation ($\bar{x}$ ± s), and compared between groups using the independent samples *t*-test. Data with normal distribution but heterogeneity of variance were compared using Welch's corrected *t*-test (*t'* test). Non-normally distributed data or ordinal categorical variables are expressed as Median (P25, P75) and compared using the Mann-Whitney U test. Count data are expressed as number (percentage) and compared using the Chi-square test (χ^2 test). $P < 0.05$ was considered statistically significant.

4. Results

4.1. Comparison of Treatment Effective Rate

In the observation group, the mean duration of hot compress application was 3.8 ± 1.5 days, with no reported adverse events. The treatment response rate was significantly superior to that of the control group, and the difference was statistically significant ($P < 0.05$); details are shown in **Table 2**. Further confirmation by both univariate and multivariate logistic regression analysis demonstrated that the probability of achieving treatment response was significantly higher in the observation group than in the control group; the results are presented in **Table 3**.

The effective rate was significantly higher in the observation group than in the control group, with a statistically significant difference ($P < 0.05$). Details are shown in **Table 2**.

Table 2. Comparison of treatment effective rate between the two groups.

Item	Control (n = 41)	Observation (n = 38)	Effective Rate (%)	χ^2	P
Effective	28	34	68.29	5.239	0.022
Ineffective	13	4	89.47		

Table 3. Univariate and multivariate analysis of risk factors for treatment response rate.

Variables		Univariate Analysis		Multivariate Analysis	
		OR (95% CI)	P	OR (95% CI)	P
Group	Control/Observation	3.95 (1.16 - 13.46)	0.028	4.51 (1.20 - 16.94)	0.026
Gender	Female/Male	0.87 (0.30 - 2.55)	0.796	1.14 (0.36 - 3.66)	0.825
Age		0.99 (0.95 - 1.03)	0.622	0.98 (0.93 - 1.03)	0.425
BMI		1.03 (0.86 - 1.23)	0.749	0.98 (0.81 - 1.18)	0.841
Underlying Diseases	<2/≥2	0.84 (0.28 - 2.52)	0.759	1.22 (0.35 - 4.22)	0.755

4.2. Comparison of Obstruction Symptom Recovery Time

The time to anal exhaust recovery, time to defecation recovery, and time to disappearance of abdominal pain and distension were significantly shorter in the observation group compared to the control group, with statistically significant differences ($P < 0.05$). Details are shown in Table 4.

Table 4. Comparison of obstruction symptom recovery time between the two groups (Days, $\bar{x} \pm s$).

Item	Control (n = 41)	Observation (n = 38)	t	P
Time to Anal Exhaust Recovery	6.68 ± 3.75	4.74 ± 2.94	2.553	0.013
Time to Defecation Recovery	7.12 ± 3.91	4.92 ± 3.04	2.778	0.007
Time to Disappearance of Abdominal Pain/Distension	7.44 ± 3.88	5.29 ± 3.07	2.718	0.008

4.3. Comparison of Hospitalization Indicators

The length of hospital stay and hospitalization costs were significantly lower in the observation group compared to the control group, with statistically significant differences ($P < 0.05$). Details are shown in Table 5.

Table 5. Comparison of hospitalization indicators between the two groups (Median (P25, P75)).

Item	Control (n = 41)	Observation (n = 38)	Z	P
Hospital Stay (days)	7 (5, 11)	6 (4, 9)	−4.845	0.000
Hospital Costs (10,000 CNY)	0.70 (0.61, 1.19)	0.61 (0.46, 0.94)	−1.982	0.047

Notes: After adjusting for gender and number of underlying diseases, hospitalization costs were significantly lower ($\beta = -0.09$, $P = 0.027$).

4.4. Comparison of Satisfaction Scores

The Cronbach's alpha coefficient of the PSQ-18 scale in this study was 0.841, which is close to the reported 0.852 in reference [11], confirming its reliability in this population. The observation group showed significantly higher satisfaction scores than the control group in the total score and the dimensions of Technical Quality, Financial Aspects, and Time Spent with Doctor/Nurse ($P < 0.05$). Details are shown in Table 6.

Table 6. Comparison of satisfaction scores between the two groups ($\bar{x} \pm s$).

Dimension	Control (n = 41)	Observation (n = 38)	t/t'	P
Total Score	69.39 ± 7.06	80.50 ± 5.61	−7.707	0.000
General Satisfaction	4.05 ± 0.55	4.21 ± 0.53	−1.337	0.185
Interpersonal Manner of Nurses	4.02 ± 0.72	4.23 ± 0.59	−1.423	0.159
Communication with Nurses	4.17 ± 0.80	4.32 ± 0.66	−0.872	0.386
Technical Quality	3.83 ± 0.77	4.52 ± 0.51	−4.709	0.000
Financial Aspects	3.63 ± 0.94	4.03 ± 0.72	−2.092	0.040
Time Spent with Doctor/Nurse	3.17 ± 0.62	4.28 ± 0.57	−8.295	0.000
Accessibility and Convenience	4.09 ± 0.44	4.21 ± 0.41	−1.180	0.242

Notes: The satisfaction total score, as the primary endpoint, remained statistically significant after Bonferroni correction ($P < 0.001$). No adjustment was applied to secondary endpoints due to their exploratory nature.

5. Discussion

5.1. Fennel Hot Compress Significantly Improves Treatment Efficacy and Symptom Relief

The results of this study show that the effective rate in the observation group reached 89.47%, significantly higher than the 68.29% in the control group, and key symptom recovery times were shortened. This therapeutic advantage can be explained by the synergistic mechanism of pharmacological action and meridian stimulation. The volatile oil components in Fennels can specifically activate inhibited gastrointestinal smooth muscle, enhancing smooth muscle tension by increasing intracellular Ca^{2+} concentration, thereby increasing contraction amplitude and frequency, restoring intestinal propulsive movement and reducing gas accumulation [9]. Simultaneously, active components like anethole possess broad-spectrum antibacterial, anti-inflammatory, and antispasmodic effects, alleviating intestinal wall edema by inhibiting inflammatory mediator release (e.g., TNF-α, IL-6) and reducing the intensity of pain caused by intestinal spasm [10]. The selection of Zhongwan (CV12, Stomach Front-Mu point), Tianshu (ST25, Large Intestine Front-Mu point), and Shenque (CV8) acupoints forms a triangular treatment zone. Warm stimulation promotes transdermal absorption of active components through the

skin, utilizing meridian conduction to achieve bidirectional regulation of gastrointestinal motility—improving paralytic ileus while suppressing abnormal hypermotility [12]. This triple synergistic effect of "pharmacological action—warmth—meridian stimulation" aligns closely with the conclusion "acupoint hot compress accelerates intestinal motility reconstruction" observed by Ma Yan *et al.* [4] in studies on gastrointestinal function recovery after abdominal surgery, confirming the universal mechanism of this therapy in regulating gastrointestinal motility.

5.2. Significant Health Economic Benefits

This study demonstrates that Fennel hot compress technology generates significant savings in medical resources by accelerating clinical symptom relief. The hospital stay was shortened by 1 day compared to the control group (a relative reduction of 14.3%), increasing daily bed turnover rate and effectively releasing medical bed resources. Cost accounting data showed that the average total hospitalization cost per patient in the observation group was 12.9% lower than in the control group, with drug costs decreasing by 18.3% and examination costs decreasing by 9.7%. This trend aligns highly with the observation in Deng Yanhua's study [7] that "non-pharmacological interventions can reduce medical costs by 15% - 20%". Further analysis revealed that the incremental cost-effectiveness ratio (ICER) of this technology was savings of 1860 CNY per day of reduced hospital stay, far below the benchmark daily hospitalization cost in domestic tertiary hospitals (2500 - 3000 CNY), demonstrating significant health economic advantages.

From a health system perspective, the promotion of this technology can generate multiple benefits: For medical institutions, it can improve bed utilization rates and medical service efficiency; for medical insurance funds, it reduces per capita payment amounts, enhancing fund sustainability; for patient families, it directly reduces medical expenses and income loss due to caregiving. This "win-win-win" cost control model provides an important reference for primary medical institutions to implement low-cost, high-benefit rehabilitation technologies within the hierarchical diagnosis and treatment system.

5.3. Fennel Hot Compress Multi-Dimensionally Enhances Patient Satisfaction

Patient satisfaction scores showed the most significant difference in the Time Spent dimension, which directly correlates with the shortened hospital stay and reduced symptom relief time, confirming the theory that "the timeliness of efficacy is a core dimension of patient perception" [11]. The improvement in the Technical Quality dimension score reflects that the standardized hot compress operating procedure (including temperature control, acupoint location, and duration standardization) enhanced the predictability of nursing actions. By establishing a positive cycle of "professional operation—efficacy confirmation—trust reinforcement", it increased patient recognition of nursing professionalism, consistent with the "standardized operation improves doctor-patient perception" phenomenon ob-

served by Cai Lin [8] in post-gynecological surgery care across different disease types. This transmission effect from improvement in physiological indicators to enhancement of psychological experience provides empirical evidence for constructing a nursing quality evaluation system under the "biopsychosocial" medical model.

6. Conclusion

Fennel hot compress demonstrates significant application effects in patients undergoing conservative treatment for intestinal obstruction. It promotes gastrointestinal function recovery, alleviates patient suffering, reduces hospitalization costs, and is simple, safe, and effective to operate, making it worthy of widespread clinical promotion. However, this study is a non-randomized, non-concurrent controlled trial, potentially subject to selection bias. The sample size is relatively small, and long-term follow-up observations were not conducted. Future research should adopt randomized, double-blind, controlled designs, expand sample sizes, and include long-term follow-up to further validate the application effect of Fennel hot compress in patients undergoing conservative treatment for intestinal obstruction.

Conflicts of Interest

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

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