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Improvement of Clinical Symptoms and Gut Microbiome After Fecal Microbiota Transplantation: A Case Study of a 106-Year-Old Man with MODS

Jingyun Fang[1], Jiayu Yin[2], Qinghong Liu[1], Xiangyi Yang[1], Xuesong He[2], Shengzhou Wang[3], Min Fan[3], Mohammed Alnaggar[3], Jingsu Wang[3], Zhaoqun Deng[4*], Yuanfei Liu[1*]

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Abstract: Fecal microbiota transplantation (FMT) has been used in a wide variety of diseases. Many researchers hypothesize that the dysbiosis of intestinal microbiota plays an important role in the development of gut-derived infections; thus, FMT is a potential therapeutic target against multiple organ dysfunction syndrome (MODS). A 106-year-old male patient was initially diagnosed with cerebral infarction and pulmonary infection. During the course of hospitalization, the patient developed MODS. The patient received a single nasogastric infusion of sterile-filtered, pathogen-free feces from a healthy donor. Fecal samples were collected every two days post-infusion to monitor changes in the microbiota composition in response to treatment. After FMT, MODS and severe diarrhea were alleviated; the patient's fecal microbiome diversity resembled that of the healthy donor's fecal microbiome; moreover, his clinical symptoms improved remarkably with the changes in fecal microbiome. Additionally, no observable side effects were noted during FMT treatment. These findings warrant further investigation of FMT as a putative new therapy for treating microbiota-related diseases, such as MODS.

Keywords: MODS; Fecal microbiota transplantation; Therapeutic efficacy

Online publication: January 19, 2022

1. Introduction

Fecal microbiota transplantation (FMT) is a way to directly change the recipient's gut microbiota to normalize the composition, with the goal of curing diseases [1,2]. A growing body of evidence clearly showed that microbiota-host interactions have relationships with various disorders, such as Clostridium difficile infection (CDI), diabetes mellitus, inflammatory bowel disease, cancer, gut-brain disease, and so on [3,5]. It has been approved as a standard therapy for recurrent CDI by official guidelines [6]. Research has shown that gut microbiota may serve as a physical barrier that maintains mucosal integrity by preventing the penetration of the epithelial barrier by pathogens and by modulating immunological activity [7].

Multiple organ dysfunction syndrome (MODS) is defined as the development of potentially reversible physiologic derangement involving two or more organ systems that are not involved in the disorder, resulting in intensive care unit (ICU) admission, and arising in the wake of a potentially life-threatening physiologic insult [8]. MODS mostly occurs secondary to severe sepsis or septic shock, trauma, neoplastic diseases, and other causes of systemic inflammatory response syndrome (SIRS) [8,9]. The pathophysiology of MODS is still unclear. A growing number of evidence shows that translocation of microbes or components of microbes from the gastrointestinal tract have connection with immune system dysregulation [10]. We hypothesize that FMT might play a therapeutic role in the management of MODS following severe sepsis. Herein, we present a case of a 106-year-old patient who developed MODS and severe diarrhea following severe sepsis. 16S rRNA sequence analysis was performed to evaluate the microbiome diversity before and after FMT.

2. Case study

This is a case of a 106-year-old man, with a history of venous thrombosis, atrial fibrillation, osteoporosis, coronary heart disease, chronic obstructive pulmonary disease, and hypertension. In view of his advanced age, the patient was a chronic occupant in the Department of Geriatrics. Before he was transferred to ICU, he developed fever and had sudden loss of consciousness; computed tomography (CT) confirmed the presence of cerebral infarction near the right lateral ventricle and pulmonary infection. Consequently, the patient's fever persisted, and he progressed to MODS. Due to respiratory failure, the patient underwent tracheotomy and was supported by a ventilator. The patient was given a variety of antibiotics to control the infection. Thereafter, he developed progressive diarrhea on average six to eight times a day, with a total volume of 1,000 to 2,000 mL per day and stools of jam-like consistency. Then, the patient's fecal bacteria population was analyzed, and the results indicated severely perturbed intestinal microflora. Based on the above findings, it was agreed on that this patient was a good candidate for treatment with FMT.

3. Methods

3.1. Assessment of gut microbiome by 16S sequencing

Fecal samples were collected before and one week after FMT. A detailed description of donor stool sampling, 16S sequencing, and data processing were summarized. Sampling packages were distributed to the participant, and the fecal samples were collected and stored in sealed containers, which were then transported with frozen gel packs to provide a low temperature environment until delivered to the laboratory. The fecal samples were pre-treated, and 16S sequencing was used to characterize the gut microbiome. The variable V3V4 regions of the 16S rRNA genes were amplified by polymerase chain reaction (PCR) using universal primers (5′-GTACTCCTACGGGAGGCAGCA-3′ and 5′-GTGGACTACHVGGGTWTCTAAT-3′). The original sequencing analysis was performed using QIIME2 for classification assignment [11,12].

3.2. FMT procedure

The infusion of donor feces was carried out on day 0, and the patient underwent a total of four times of FMT, at a frequency of once every five days. An 11-year-old male, who was willing to participate in this study, was chosen to donate fecal microbiota. Before the study, he tested negative for both blood-borne diseases and common stool pathogens, including but not limited to hepatitis A (HAV-IgM), hepatitis B (HBsAg), hepatitis C (HCV-IgG), hepatitis D (HDV-Ab), hepatitis E (HEV-IgM), human immunodeficiency virus (HIV), cytomegalovirus (CMV), syphilis, roundworm, pinworm, hookworm, amoeba, and duovirus, among others in his fecal samples.

3.3. Statistical analysis

The correlation between two variables was tested by linear regression analysis using Pearson test. The relative intensity of each band was calculated and expressed as a percentage of the sum of all fragments in the same lane of the gel. A P value < 0.05 was considered statistically significant.

4. Results

4.1. Changes in intestinal microflora following FMT

The abundance of nonpathogenic microbiota in the healthy donor's fecal samples was higher than that of pathogenic microbiota. Notably, the gut microbiota composition of the patient exhibited a trend toward the microbiota composition of the healthy donor's feces. After the patient was treated with FMT, it was found that the diversity of his intestinal flora improved, the proportion of beneficial bacteria increased, while the proportion of harmful bacteria decreased, the overall intestinal flora balance greatly improved, with intestinal metabolism and absorption ameliorating. The abundance of nonpathogenic microbiota (Bacteroides fragilis, Bifidobacterium, and so on) increased greatly; however, the abundance of harmful bacteria (Escherichia coli, Shigella, and so on) decreased significantly (**Figure 1**).

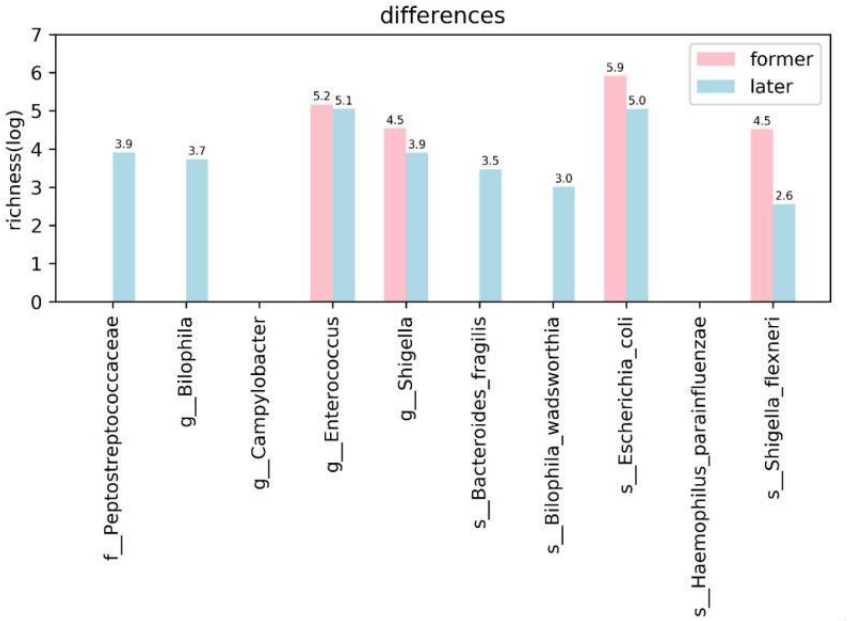

Figure 1. The differences between the former and later of FMT.

4.2. Clinical outcomes

Based on the evidence of disturbed microbiota, FMT was used to treat MODS and severe diarrhea. As expected, the response to FMT was satisfactory in the patient. On day 1 post-FMT, the patient's body temperature decreased from 39.6°C prior to infusion to 37.1°C after infusion, with heart rate and frequency of diarrhea reducing. After the fourth FMT, the patient's brain natriuretic peptide (BNP) declined dramatically; in addition, the patient was able to breathe spontaneously without ventilator. Unfortunately, due to his advanced age, the patient eventually died after five months of treatment with FMT.

5. Discussion

Inside the human intestine, there are approximately 40 trillion bacteria residing, indicating that there are at least as many cells of microbial origin as those of human origin [13]. A large body of evidence now suggests

that microbiome plays a critical role in maintaining host homeostasis. Microbiome can be altered in many disease states, such as cancer, inflammatory bowel disease, heart disease, and so on [14-16].

MODS is a life-threatening and complex condition with multiple etiological factors. It has long been hypothesized that the gut is "the motor" of multiple organ dysfunction syndrome (MODS). In recent years, many studies have reported that the application of FMT has shown to be e106ffective in patients with MODS. In this research, the patient is a 106-year-old man, who is considered to be of advanced age. With FMT, there was disease remission, and the patient could even breathe without ventilator, which was really a miracle. Unfortunately, due to his advanced age, the patient eventually died after five months of treatment with FMT.

In this study, the intestinal microbiota before and after FMT were compared. The significant alterations in the intestinal microbiota post-FMT were identified via 16S rRNA analysis. It was found that the proportion of dominant bacteria in the intestine increased significantly. The study on the involved mechanisms of gut microbiota will be further pursued.

6. Conclusion

In summary, FMT can effectively maintain microecological homeostasis and antagonize pathogenic microorganisms, so this therapy seems to be a promising treatment for intestinal failure regardless of the causative factors.

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Disclosure statement

The authors declare that there is no conflict of interest.

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Systematic Evaluation and Meta-Analysis of the Efficacy and Safety of Shenfu Injection in the Treatment of Septic Cardiomyopathy

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Abstract: ***Objective:*** To evaluate the efficacy and safety of Shenfu injection in the treatment of septic cardiomyopathy. ***Methods:*** Literatures on Shenfu injection for the treatment of sepsis published from the establishment of each database to December 31, 2020, were searched by computer; Cochrane risk-of-bias tool was used for evaluating the quality of literatures, and Review Manager 5.4 software was used for meta-analysis. ***Results:*** Twenty random controlled trials (RCTs) were included, with a total of 1,179 patients; the meta-analysis showed that the routine treatment of Western medicine combined with Shenfu injection can reduce the 28-day mortality, the length of hospital stay, cardiac troponin I (cTnI), and N-terminal pro-brain natriuretic peptide (NT-proBNP) as well as improve the left ventricular ejection fraction (LVEF) with low incidence of adverse reactions. ***Conclusion:*** Western medicine combined with Shenfu injection can further reduce myocardial injury in patients with sepsis and improve cardiac function as well as the prognosis of patients with septic cardiomyopathy.

Keywords: Shenfu injection; Septic cardiomyopathy; Effectiveness; Safety; Meta-analysis

Online publication: January 19, 2022

1. Introduction

Septic cardiomyopathy is one of the important reasons for the rapid progress and deterioration of patients with sepsis [1]. Nearly half of the patients with sepsis have cardiomyopathy, and its mortality is as high as 70% [2]. Septic cardiomyopathy is a short-term reversible cardiac dysfunction [3]. Therefore, it is extremely important to take effective measures to reverse the myocardial injury and restore the cardiac function in time in septic patients.

Septic cardiomyopathy is a common complication in the mid and late stages of sepsis. Its main pathogenesis is the deficiency and decline of Yang Qi, and its main treatment includes strengthening and supplementing Qi as well as warming Yang. Shenfu injection can protect the myocardium, improve myocardial contractility, and regulate peripheral circulation. At present, it is mainly used in the treatment of various heart diseases, such as shock and heart failure [4]. Although studies have shown that Shenfu injection combined with conventional western medicine can reduce myocardial injury and improve cardiac function, prognosis, as well as the curative effect [5,6], there is a lack of large sample evidence support. Therefore, a meta-analysis on the efficacy and safety of Western medicine combined with Shenfu injection in the treatment of septic cardiomyopathy is carried out, so as to provide evidence-based basis for clinical treatment.

2. Materials and methods

2.1. Inclusion and exclusion criteria

2.1.1. Inclusion criteria

(1) Research type: RCTs published at home and abroad as of December 31, 2020.

(2) Subjects: Patients with sepsis, regardless of gender, aged ≥ 18 years, without any significant difference in baseline data before treatment.

(3) Interventions: The experimental group received the conventional treatment of Western medicine combined with Shenfu injection, while the control group only received the conventional treatment of Western medicine, without restrictions in the usage, dosage, and treatment time.

(4) Outcome indicators: At least one of the following – 28-day mortality rate, length of stay in ICU, cTnI, NT-ProBNP, and LVEF.

2.1.2. Exclusion criteria

Literatures of the same group of patients; unclear treatment time; inconsistent outcome indicators; animal experiments; cases, reviews, and literatures in which the full text cannot be obtained.

2.2. Literature retrieval strategy

PubMed, Embase, CNKI, Wanfang, and other databases were searched by computer from the establishment date of each database to December 31, 2020, without language restriction. The English keywords used to search were "ShenFu injection," "sepsis," "septic shock," and "RCT." The Chinese keywords used were "参附注射液," "脓毒症," "脓毒性休克," and "感染性休克." Each keyword was searched by collocation.

2.3. Data extraction

The articles were imported into Endnote; they were duplicated and deleted according to the inclusion and exclusion criteria. Upon reading the title, literatures such as reviews, animal experiments, and those with drug nonconformity were excluded. The researchers browsed the full text carefully and eliminated some literatures, such as those with non-randomized controlled trials and outcome index nonconformity. Two researchers screened the literatures independently and checked each other. When there were differences, the third researcher ruled. Data including basic information, sample size, intervention methods, treatment time, outcome indicators, etc. were extracted.

2.4. Quality evaluation

Cochrane risk-of-bias tool was used to evaluate the quality of the studies one by one [7], and whether the outcome indicators were affected was the only criterion. The results of the assessment were represented by Cochrane risk-of-bias bar chart with red, yellow, and green dots.

2.5. Statistical analysis

RevMan 5.4, which is a statistical analysis software, was used, and the results were represented by forest plots. In this study, the continuous variables were analyzed by mean difference (MD) and the binary variables by relative risk (RR). The confidence interval (CI) was 95%. Chi-square test was used to evaluate the heterogeneity between studies; when $P > 0.1$, $I^2 < 50\%$, and there is no heterogeneity, the fixed effect model is selected for meta-analysis; when $P < 0.1$, $I^2 \geq 50\%$, and there is heterogeneity, the random effect

model is used for meta-analysis. When the heterogeneity is too large, only descriptive analysis is carried out. The stability of the results was evaluated by eliminating the literatures one by one for sensitivity analysis. Funnel plot was used to evaluate the publication bias of the literatures with outcome index ≥ 10.

3. Results

3.1. Literature search results and basic characteristics

A total of 984 literatures were retrieved. Taking into consideration of the exclusion criteria, 20 literatures were included in the statistical analysis [5,6, 8-25], all of which were Chinese literatures. The retrieval process is shown in **Figure 1**. In total, 1,179 patients were included. There were 13 literatures with the outcome of 28-day mortality rate [5, 8-13, 17, 19-21, 24,25], and 8 literatures with the outcome of ICU stay [5,10,12,17,19, 21-22, 24]; there were 5 literatures with cTnI outcome index [5,6,14,16,23], 6 literatures with NT-ProBNP outcome index [5,11, 14-15, 18,23], and 4 literatures with LVEF outcome index [6, 15-16, 18]. The basic characteristics of the included literatures are listed in **Table 1**.

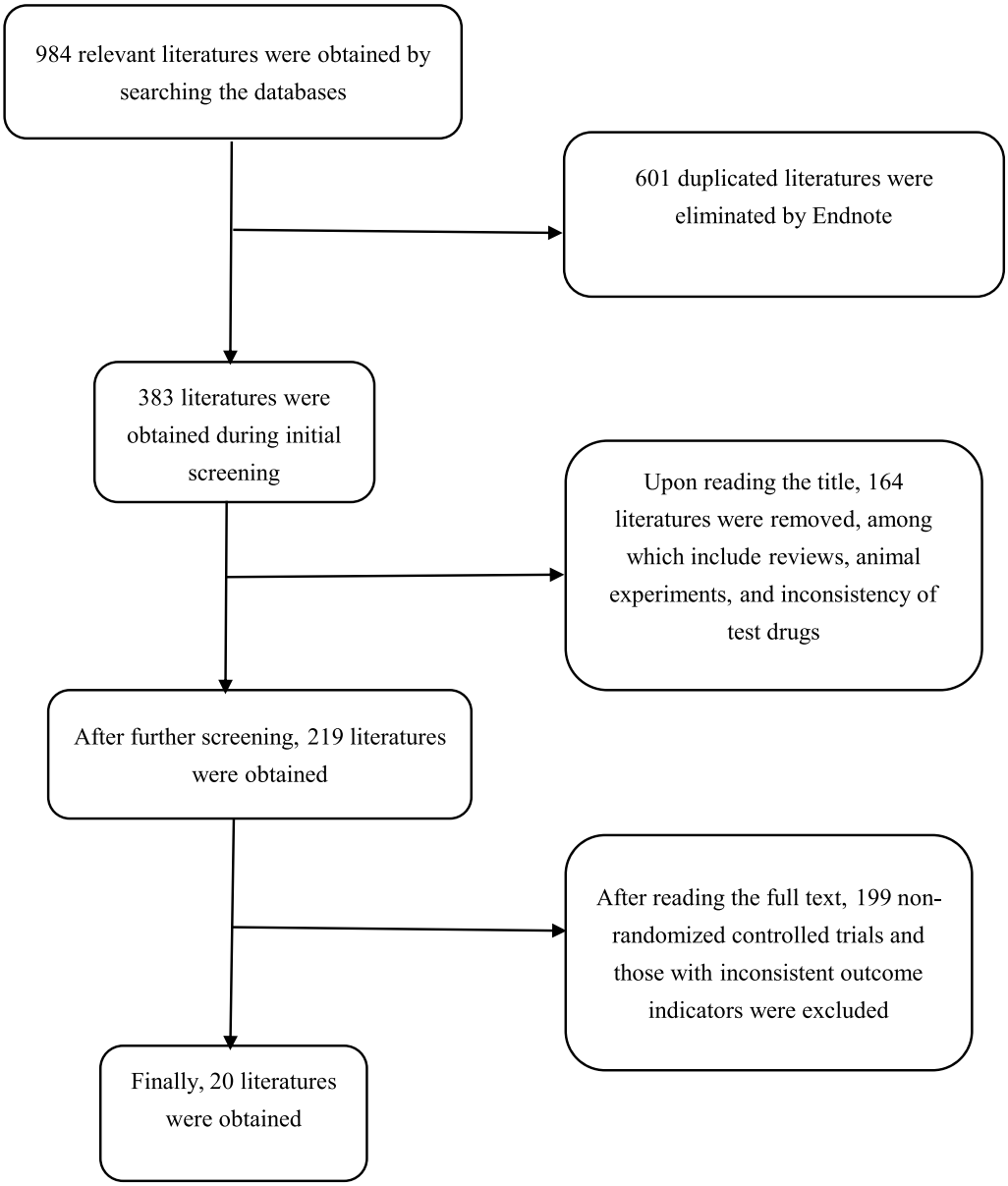

Figure 1. Flow chart of the literature retrieval process

Table 1. Basic characteristics of the included literatures

Author and year	Average age		Sample size / case		Interventions		Treatment time / day	Outcome indicators
	Experimental group	Control group	Experimental group	Control group	Experimental group	Control group		
Huiyuan Feng 2014	48 ± 12	49 ± 12	30	30	Shenfu + conventional therapy	Conventional therapy	72 hours	③④
Handong Zou 2012	42.6 ± 16.8	42.6 ± 16.8	30	18	Shenfu + conventional therapy	Conventional therapy	72 hours	①②③④
Yuanyuan Luo 2018	43.35 ± 4.31	41.20 ± 4.34	30	30	Shenfu + conventional therapy	Conventional therapy	7 days	③⑤
Xi Song 2015	48 ± 12	49 ± 11	30	30	Shenfu + conventional therapy	Conventional therapy	3 days	③④
Xiping Wu 2012	59.64 ± 11.85	59.64 ± 11.85	25	25	Shenfu + conventional therapy	Conventional therapy	7 days	①④
Min Liu 2015	53.7 ± 7.62	52.9 ± 8.95	25	20	Shenfu + conventional therapy	Conventional therapy	7 days	③⑤
Maoen Lin 2014	58.4 ± 12.8	56.8 ± 11.7	30	30	Shenfu + conventional therapy	Conventional therapy	14 days	④⑤
Tao Liu 2014	58.3 ± 15. 9	58.3 ± 15.9	45	27	Shenfu + conventional therapy	Conventional therapy	7 days	④⑤
Qiqi She 2017	51.5	54.5	30	30	Shenfu + conventional therapy	Conventional therapy	14 days	①
Feng Geng 2019	48.2 ± 7. 5	44.8 ± 8.7	34	34	Shenfu + conventional therapy	Conventional therapy	7 days	②
Yangchun Xiao 2017	65.72 ± 12.24	66.42 ± 13.75	36	35	Shenfu + conventional therapy	Conventional therapy	5 days	①②
Xiaoxun Huang 2016	55 ± 6	57 ± 8	20	20	Shenfu + conventional therapy	Conventional therapy	7 days	①②
Jiayin Li 2012	64.38 ± 6.05	70.25 ± 4.27	8	8	Shenfu + conventional therapy	Conventional therapy	6 days	①②
Lanting Tao 2019	68 ± 20.3	65 ± 18.4	24	25	Shenfu + conventional therapy	Conventional therapy	7 days	①
Sheng Yao 2015	63.3 ± 11.4	63.2 ± 6.6	20	20	Shenfu + conventional therapy	Conventional therapy	15 days	①

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Author and year	Average age		Sample size / case		Interventions		Treatment time / day	Outcome indicators
	Experimental group	Control group	Experimental group	Control group	Experimental group	Control group		
Manli Liu 2017	60.47 ± 12.78	62.56 ± 10.79	42	40	Shenfu + conventional therapy	Conventional therapy	7 days	①②
Ying Cui 2018	58.2 ± 12.0	59.1 ± 10.4	40	40	Shenfu + conventional therapy	Conventional therapy	7 days	①②
Lei Wang 2018	53.16 ± 12.08	52.63 ± 12.75	51	51	Shenfu + conventional therapy	Conventional therapy	14 days	①②
Ronglin Jiang 2009	65.4 ± 12.1	68.8 ± 12.9	27	25	Shenfu + conventional therapy	Conventional therapy	5 days	①
Xianglian Zou 2015	53.96 ± 10.55	50.32 ± 13.74	32	32	Shenfu + conventional therapy	Conventional therapy	7 days	①

Note: ① 28-day mortality rate; ② length of stay in ICU; ③ cTnI; ④ NT-ProBNP; ⑤ LVEF

3.2. Quality evaluation

Among the 20 literatures, 8 adopted the random number table method [6,9,14, 16-18, 20,23], while only 1 adopted the envelope lottery method [10]. All 20 literatures did not adopt the blind method, but since the outcome indicators are laboratory examination results and objective indicators, which do not affect the judgment of the results, it can be considered that the blind method adopted by the analyst is of low risk, it is impossible to report the results selectively with 20 articles, and there is no bias from other sources in the literatures. Only two literatures reported adverse reactions [16,19]; there were uncertainties in other studies. Only ten literatures mentioned about signing an informed consent or obtaining the consent of patients or family members [6,8,10, 12-14, 20, 22-24]. The risk of bias of each study is shown in **Figure 2**.

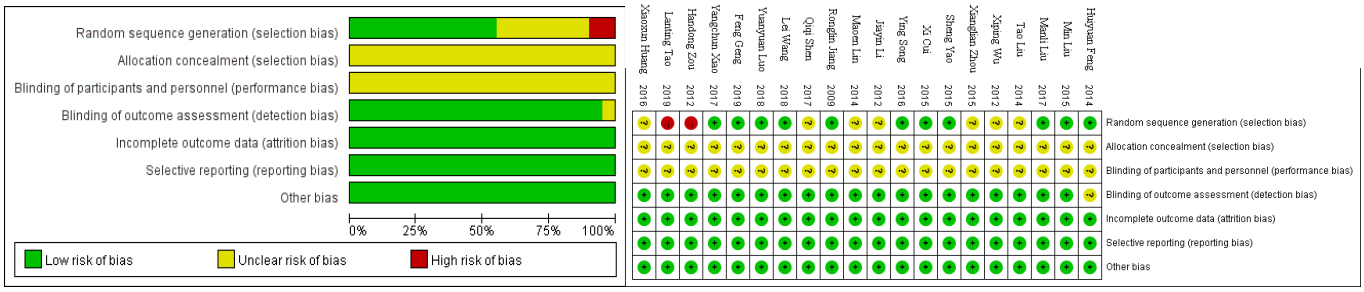

Figure 2. Risk-of-bias

3.3. 28-day mortality rate

There were 13 literatures with the outcome of 28-day mortality rate. The results showed that there was no heterogeneity among the studies (P = 0.37, I^2 = 7%); thus, the fixed effect model was used. The results showed that Shenfu injection can reduce the 28-day mortality rate of patients with sepsis (RR = 0.65, 95% CI [0.53,0.80], P < 0.0001], as shown in **Figure 3**.

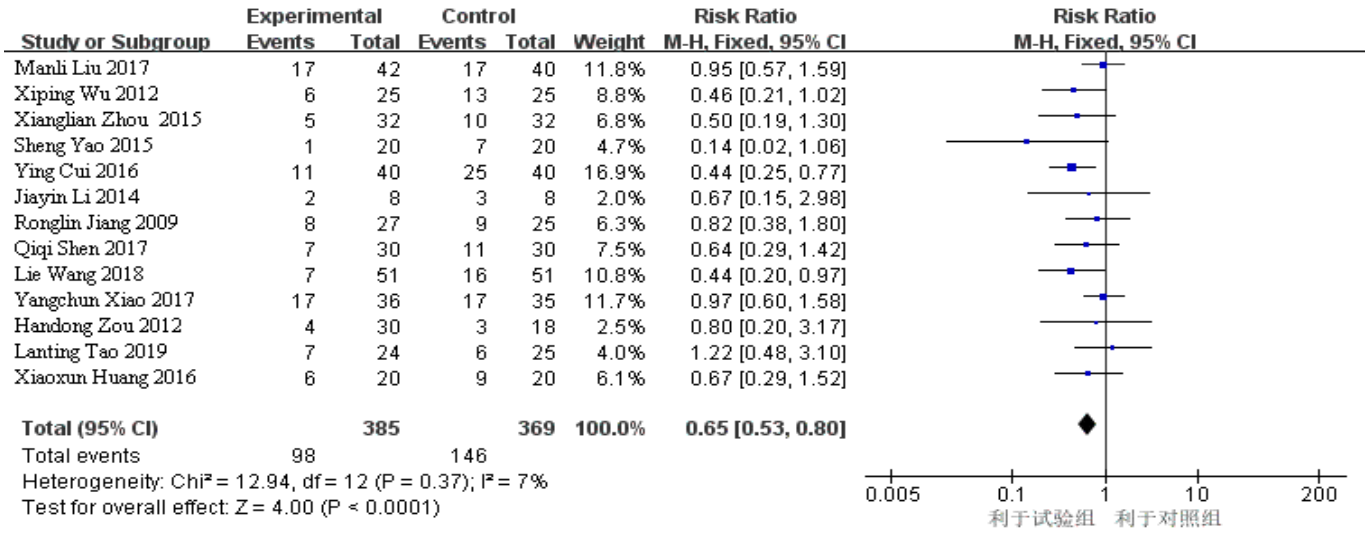

Figure 3. Forest plot of 28-day mortality rate

3.4. Length of stay in ICU

There were 8 literatures with the outcome of the length of stay in ICU. The results showed no significant heterogeneity (P = 0.11, I^2 = 40%); thus, the fixed effect model was used. The results showed that Shenfu injection can shorten the length of stay in ICU for patients with sepsis (MD = -2.04, 95% CI [- 2.91, - 1.17], P < 0.00001), as shown in **Figure 4**.

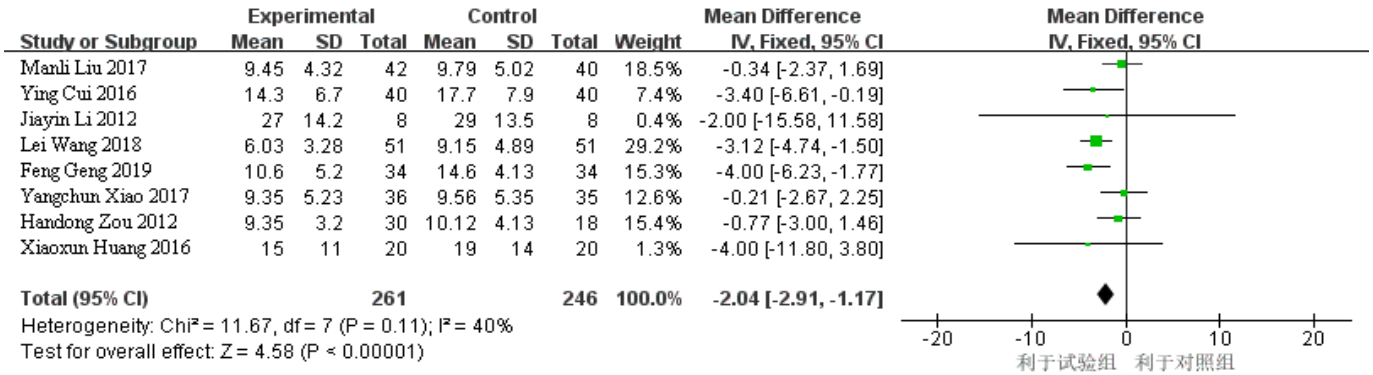

Figure 4. Forest plot of the length of stay in ICU

3.5. cTnI

In total, there were 5 literatures with the outcome of cTnI levels. Due to high heterogeneity, only systematic evaluation was carried out. The results showed that Shenfu injection can reduce the cTnI levels in patients with sepsis, and the difference was statistically significant.

3.6. NT-proBNP

There were 6 literatures with the outcome of NT-proBNP. Due to high heterogeneity, only systematic evaluation was carried out. The results showed that Shenfu injection can reduce the NT-proBNP levels in patients with sepsis, and the difference was statistically significant.

3.7. LVEF

There were 4 articles with the outcome of LVEF. The results showed that the heterogeneity was slightly higher (P = 0.06, I^2 = 59%); thus, the random effect model was used. The results showed that Shenfu injection can reduce LVEF in patients with sepsis (MD = 6.03, 95% CI [2.40, 9.66], P = 0.001), as shown in **Figure 5**.

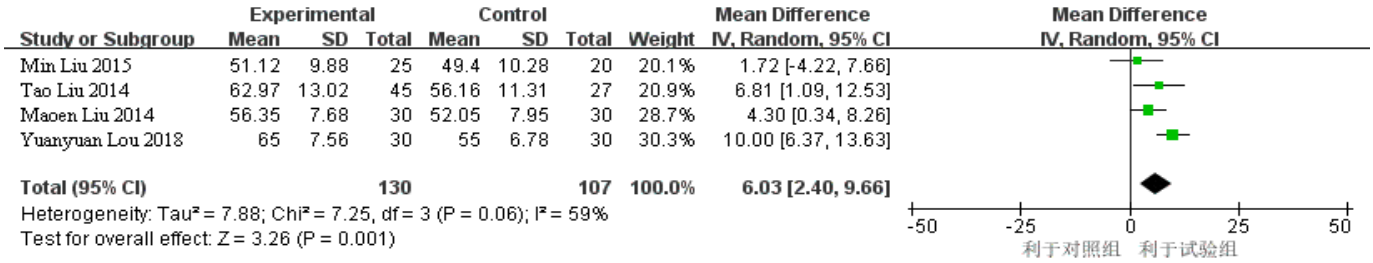

Figure 5. Forest plot of LVEF

3.8. Adverse reactions

There were 2 literatures that reported on the adverse reactions of Shenfu injection, both of which indicated no adverse reactions. Other literatures had no information regarding this matter. Therefore, it can be inferred that the incidence of adverse reactions from Shenfu injection may be low. Researchers should pay more attention to the adverse reactions of this drug in the future.

3.9. Sensitivity analysis

By eliminating the literatures one by one, the observation was on whether the outcome indexes had changed significantly. The combined results did not change significantly, indicating that the results are robust and reliable.

3.10. Publication bias

The publication bias of the 28-day mortality rate was evaluated with ≥ 10 references included. It can be seen from **Figure 6** that the studies on both the left- and right-hand side of the funnel plot are evenly distributed, indicating that there is no publication bias.

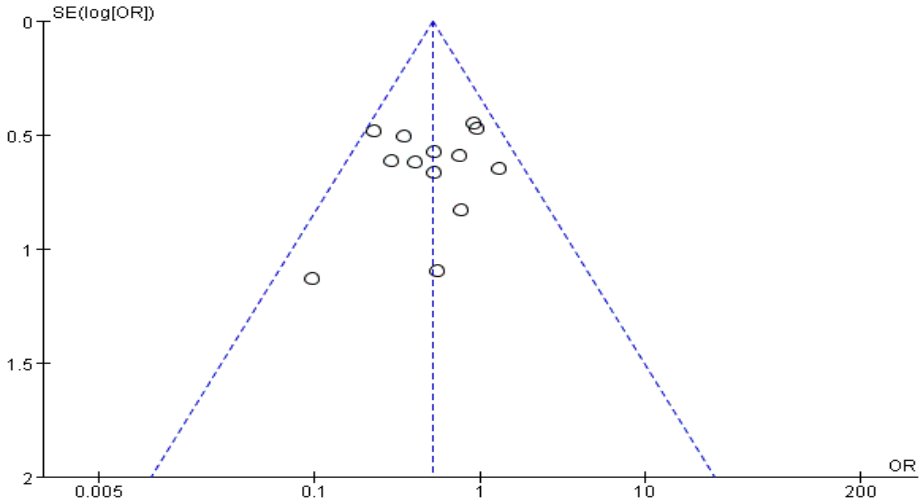

Figure 6. Funnel plot of 28-day mortality rate

4. Discussion

Septic cardiomyopathy has always been the focus of scholars, but there is no consensus on its diagnosis or treatment. Currently, it is generally believed that the downregulation of myocardial inhibitory factors and β adrenergic receptors, abnormal calcium ion transport in cardiomyocytes, and mitochondrial dysfunction may be related to the pathogenesis of septic cardiomyopathy. Cardiomyocyte injury, decreased cardiac output, and ventricular dilation are the main clinical manifestations of septic cardiomyopathy [26,27]. CTnI, NT-ProBNP, and LVEF are common clinical indicators for the evaluation of septic cardiomyopathy [28]. The rapid increase of cTnI levels in the initial stage of septic cardiomyopathy is a highly sensitive and specific clinical index for the diagnosis of myocardial injury. When there is damage to cardiomyocytes, myocardial contractility weakens, stroke output decreases, and the synthesis of pro-BNP increases. Enzyme-cleaved NT-proBNP reflects the state of cardiac function more accurately. The increase of NT-proBNP is positively correlated with the severity of cardiac dysfunction; LVEF is used as the evaluation index of systolic heart failure [29,30]. Generally, LVEF in patients with cardiac insufficiency is less than 50%. At present, the treatment of septic cardiomyopathy still focuses on symptomatic support, such as rehydration, cardiac strengthening, and blood pressure stabilization [26], without any specific treatment.

The basic pathogenesis of sepsis is based on deficiency, marked by excess, and mixed with deficiency and excess. Positive deficiency is not only the basis of onset but also a prominent manifestation after the progress of the disease. Septic cardiomyopathy mostly occurs in the mid and late stages of sepsis. It is closely related to the lack of healthy Qi in the body. Shenfu injection is made from a classic prescription of "warming Yang and supplementing Qi." In the prescription, Radix Aconiti Lateralis Preparata is hot and goes through various meridians to recover the scattered Yin-Yang; Radix Ginseng Rubra helps to regulate various deficiencies. The two drugs are compatible in restoring healthy Qi to the body. Modern research of traditional Chinese medicine reports that aconitine contained in Shenfu injection has positive inotropic effect on the heart, while ginsenoside has obvious effects in scavenging free radicals, strengthening the heart, and stabilizing blood pressure [31,32]. Animal experiments have shown that the Chinese patent medicine can reduce myocardial inhibitory factors, improve Na^+/K^+-ATPase activity in cardiomyocytes, and improve mitochondrial function [33-36]. This meta-analysis also shows that the use of Shenfu injection with conventional treatment can further reduce cTnI and NT-proBNP levels, increase LVEF, and improve the prognosis of patients with septic cardiomyopathy.

The limitations in this meta-analysis are as follows: the included literatures are of low quality, the diagnostic criteria are inconsistent among different studies due to time differences; there are differences in the usage, dosage, and treatment time of Shenfu injection; there are also differences in the methods and the course of conventional western treatment, which may be the source of heterogeneity in the results of this meta-analysis. It is hoped that the future clinical trial design would be more standardized.

Disclosure statement

The authors declare that there is no conflict of interest.

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Factors Inducing Drainage Tube Complications After Hepatobiliary Surgery

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Abstract: ***Objective:*** To explore the main factors of drainage tube complications after hepatobiliary surgery. ***Methods:*** From November 2019 to October 2021, 103 patients with drainage tube complications after hepatobiliary surgery in Changshu No. 2 People's Hospital were selected as subjects for this study; the factors of postoperative drainage tube complications were analyzed by retrospective analysis. ***Results:*** The complications of drainage tubes include cavity organ damage, sliding of drainage tube into the abdominal cavity, broken drainage tube, blocked drainage tube, bleeding in drainage tube, bleeding from the mouth of drainage tube, abdominal cavity infection caused by drainage tube, and intestinal obstruction caused by drainage tube compression; the number of cases were 9, 8, 12, 21, 18, 17, 8, and 10, accounting for 8.74%, 7.77%, 11.65%, 20.39%, 17.48%, 16.50%, 7.77%, and 9.70%, respectively; the causes of these complications include early and late removal of drainage tube, improper positioning, color of drainage fluid, drainage tube falling out or self-removal, and so on. ***Conclusion:*** After hepatobiliary surgery, although the complications caused by drainage tubes have certain relationship with the indwelling time and surgery, the most critical is related to postoperative nursing care; therefore, it is necessary to observe the condition of the drainage tube and draining fluid after surgery, including the color of the fluid, its flow rate, and whether the drainage tube leaks or falls out; after surgery, patients should be encouraged to cooperate with the medical staffs, and family members should be reminded to pay attention to the observation of patients and informed about matters needing attention, so as to reduce the incidence of drainage tube complications after hepatobiliary surgery.

Keywords: Hepatobiliary surgery; Drainage tube complications; Postoperative care

Online publication: January 19, 2022

1. Introduction

As the largest internal organ of the human body, the liver participates in a number of vital functions necessary for human survival, such as the synthesis and secretion of bile [1], the basic metabolic needs of the body, excretion and detoxification, phagocytosis, hematopoiesis, regeneration, etc. [2]. It is one of the important organs of the human body. The structure of the liver is complex, and the incidence of disease is also high. The types of diseases that require hepatobiliary surgery have brought many treatment issues. At present, common benign hepatobiliary diseases in China include gallstones, hepatobiliary stones, etc.; however, recurrent stone obstruction would result in cholangitis. Long-term recurrent cholangitis can cause liver fibrosis, imbalance liver morphology, portal hypertension, and even bile duct cancerization, which has become an important cause of death of benign biliary diseases in China [3-5].

Hepatobiliary surgery began in 1888. Langenbuch, a German doctor, was the first to successfully carry out hepatectomy (left lobe hepatectomy). In 1978, Philipe Mouret, a gynecologist and obstetrician, carried out the world's first laparoscopic cholecystectomy, which marked the birth and development of minimally

invasive (laparoscopic) surgery and promoted the development of hepatobiliary surgery. However, the development of hepatobiliary surgery technology has not prevented surgical complications from occurring. Due to its own anatomical structure and physiological characteristics in addition to the difficulty of some procedures, hepatobiliary surgery does not only have the universality of various complications of general surgery, but also its own uniqueness. The incidence of surgical complications is high. Most of the complications are related to the condition of the hepatobiliary system, improper surgical methods, surgical techniques, and poor perioperative management [6]. Research has found that in addition to bleeding, bile duct injury, and liver failure, bile leakage is also one of the most common complications of hepatobiliary surgery [7], of which among all the complications, bile leakage is one of the most common causes of death [8].

2. Materials and methods

2.1. General information

From November 2019 to October 2021, 103 patients with drainage tube complications after hepatobiliary surgery were treated in Changshu No. 2 People's Hospital. The had an average age of 46 years; 53 were male patients and 50 were female patients; 46 patients had a smoking history and their weight ranged from 41kg to 98kg. The clinical data of all the patients were complete, and drainage tubes were placed after hepatobiliary surgery. The patients signed the informed consent form prior to the study.

2.2. Method

Through retrospective analysis, the number of patients with drainage tube complications, such as infection, bile leakage, biliary bleeding, and other complications, after hepatobiliary surgery in Changshu No. 2 People's Hospital was determined. The number, causes, types, and probability of complications were statistically sorted out along with the measures that could be taken for different complications.

3. Results

3.1. Statistics of complications

Upon regression analysis, it can be appreciated that from the 103 patients admitted, the complications of drainage tube include cavity organ damage, sliding of drainage tube into the abdominal cavity, broken drainage tube, blocked drainage tube, bleeding in drainage tube, bleeding from the mouth of drainage tube, abdominal cavity infection caused by drainage tube, as well as intestinal obstruction caused by drainage tube compression. The number of cases were 9, 8, 12, 21, 18, 17, 8, and 10 accounting for 8.74%, 7.77%, 11.65%, 20.39%, 17.48%, 16.50%, 7.77%, and 9.70 %, respectively, as shown in **Table 1**.

Table 1. Statistics of complications

Types of complications	Number of cases	Proportion of complications (%)
Cavity organ damage	9	8.74%
Sliding of drainage tube into the abdominal cavity	8	7.77%
Broken drainage tube	12	11.65%
Blocked drainage tube	21	20.39%
Bleeding in drainage tube	18	17.48%
Bleeding from the mouth of drainage tube	17	16.50%
Abdominal infection caused by drainage tube	8	7.77%
Intestinal obstruction caused by drainage tube compression	10	9.70%

3.2. Multiple factor analysis

Taking specific complications as dependent variables, regression analysis was carried out. There were five main causes for these complications: early removal, late removal, improper positioning, color of drainage fluid, as well as the falling out and self-removal of drainage tube. The 95% confidence intervals were 0.55-1.94, 0.46-8.52, 1.22-7.95, 0.48-2.26, and 3.34-13.81, respectively. Among them, drainage tube failing out or self-removal and improper positioning of drainage tube are independent risk factors.

4. Discussion

Postoperative short-term indwelling drainage tube is commonly seen in hepatobiliary surgery, but it also carries risk of complications. Research has shown that cavity organ injury, bleeding, sliding of drainage tube into the abdominal cavity, abdominal infection, and drainage port infection caused by drainage tube account for high proportions [2]. Therefore, analyzing the causes of drainage tube complications is of great significance to prevent complications during the retention period of drainage tubes. The results of this study showed that the main causes are drainage tube indwelling time, drainage tube falling out or self-removal shortly after surgery, positioning of drainage tube, and drainage fluid color. Multivariate logistic regression analysis showed that drainage tube falling out or self-removal shortly after surgery and improper positioning of drainage tube are independent risk factors of postoperative drainage tube complications [3].

Several studies have shown that during the indwelling of drainage tube, if the drainage period is insufficient or if the drainage tube is removed in advance, the drainage of bile from the gallbladder would be inadequate, thus leading to biliary leakage or recurrent symptoms. According to a study by Yingqin Zhang and other researchers, some patients still experience inflammation one week after hepatobiliary surgery, and some even have severe hydrocholecystis and adhesion. Therefore, the falling out or self-removal of drainage tube shortly after surgery would result in poor drainage of inflammatory secretion from the gallbladder [4]. In this study, 58.8% of the patients had complications involving the abdomen. According to analysis, the reason may be due to the diffusion of cholecystitis secretion along the gallbladder fistula [5]. Therefore, in clinical diagnosis and treatment, the nursing care for drainage tubes should be strengthened, the patients should be encouraged to strictly abide by the doctor's advice, and they should not remove the tube on their own. At the same time, when placing the drainage tube, the tube should be reasonably positioned as far as possible to prevent the drainage tube from falling out by itself. The results of this study showed that improper positioning is another independent risk factor of drainage tube complications. Previous studies have shown that improper positioning would lead to infection, biliary bleeding, obstruction, and other problems. If it is not handled in time or in an incorrect manner, there may be serious consequences; this is not conducive to the postoperative recovery of general surgery patients. Therefore, it is necessary to reinforce the observation of postoperative drainage tubes, deal with drainage tube abnormalities as soon as possible, change the dressing frequently, and disinfect the site well [6].

Prior to hepatobiliary surgery, patients need to evaluate their own risk factors. For patients with poor physique or diseases, nutritional support should be provided before the procedure. Preoperative intensive training and multichannel training should be carried out, and the indications of various hepatobiliary surgery methods should be well understood before surgery. Intraoperative cholangiography should be performed routinely during the initial stage of laparoscopic cholecystectomy (LC) in primary hospitals and in the first 100 to 200 cases taken up by the operator to avoid iatrogenic bile duct injury and choledocholithiasis residue. After being proficient in the technique, intraoperative cholangiography can be performed selectively. Perioperative nursing and hepatobiliary surgery education should be emphasized [5,8]. In conclusion, after hepatobiliary surgery, although the complications caused by drainage tube have a certain relationship with the indwelling time and surgery, the most critical is related to postoperative nursing care. It is necessary to observe the condition of the drainage tube after surgery: whether the drainage tube

leaks or falls out. In addition, it is necessary to observe the fluid from the drainage tube, including its color and flow rate. After surgery, patients should be encouraged to cooperate with the medical staffs, and family members should be reminded to pay attention to the observation of patients and informed about matters that need attention, so as to reduce the incidence of drainage tube complications after hepatobiliary surgery.

Disclosure statement

The author declares that there is no conflict of interest.

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Meta-Analysis of the Clinical Effect of Acupuncture on Postherpetic Neuralgia

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Abstract: ***Objective:*** To systematically evaluate the safety and efficacy of acupuncture on patients with postherpetic neuralgia . ***Methods:*** Based on the heyword retrieval method, China National Knowledge Infrastructure (CNKI, 1978-2020), China Biomedical Literature database (CBM, 1979-2020), VIP database (WEIPU, 1989-2020), Wanfang database (1989-2020), Cochrane Library, PubMed, and Embase were searched; randomized controlled trials of the use of acupuncture in the treatment of postherpetic neuralgia were screened out; the quality of the included literatures was evaluated based on the evaluation criteria in the Cochrane Handbook, and meta-analysis was performed using RevMan 5.3. ***Results:*** Twenty-six literatures that met the criteria, involving 2,174 patients, were included; the meta-analysis showed that compared with western medicine, the use of acupuncture can improve the overall effective rate (RR = 1.24, 95% CI [1.17, 1.32], P < 0.00001) and reduce the VAS score (MD = -1.43, 95% CI [-1.97, -0.89], P < 0.00001). ***Conclusion:*** The use of acupuncture can further improve the clinical effect of patients with postherpetic neuralgia.

Keywords: Acupuncture; Postherpetic neuralgia; Meta-analysis; Clinical effect; VAS score

Online publication: January 19, 2022

1. Introduction

Herpes zoster is a common skin disease seen in clinical practice. It is an acute infectious skin disease caused by varicella-zoster virus. Herpes zoster usually occurs on one side of the patient's body and generally does not exceed the median line, with pain as the main manifestation. Postherpetic neuralgia is one of the most common complications of herpes zoster. It is a pathologic neuropathic pain that persists after the onset of herpes zoster or remains after the resolution of the herpes zoster. This long-term sequela of herpes zoster has a serious impact on the physical, psychological, daily life, and activity of patients. With age, the incidence of postherpetic neuralgia increases. The incidence of postherpetic neuralgia is about 65% in patients 60 years of age and older and up to 75% in those 70 years of age and older [1]. For the treatment of postherpetic neuralgia, on the basis of inhibiting virus and nourishing nerves, traditional Chinese medicine (TCM) has put forward the therapeutic methods of relieving collaterals and pain, replenishing qi and nourishing yin, as well as comprehensive repairing. Among them, acupuncture has good therapeutic effect in the treatment of postherpetic neuralgia. Acupuncture can reduce the vascular permeability around inflammatory lesions, inhibit the exudation of inflammatory substances, promote the excretion of inflammatory substances, and at the same time, it has the effect of analgesia and relieving collaterals. It has significant clinical efficacy in improving pain [2]. A meta-analysis and systematic review of the clinical

trials of acupuncture in the treatment of patients with postherpetic neuralgia have been conducted, in order to systematically analyze the therapeutic effect of acupuncture on postherpetic neuralgia, thus providing more evidence-based data for clinical acupuncture treatment in postherpetic neuralgia.

2. Data and methods

2.1. Literature retrieval strategy

Based on the keyword retrieval method, China National Knowledge Infrastructure (CNKI, 1978-2020), Chinese Biomedical Literature database (CBM, 1979-2020), Chongqing VIP Full-Text Journal Database (WeiPu, 1989-2020), Wanfang Data Knowledge Service Platform (WanFang, 1989-2020), Cochrane Library, PubMed, and Embase were searched. All searches were performed as of December 31, 2020. In order to avoid missing out literatures, "acupuncture," "fire needle," "electroacupuncture," "filiform needle," "herpes zoster," "postherpetic neuralgia," "herpes zoster sequelae," "PHN," and other keywords were used in the search.

2.2. Inclusion criteria

The inclusion criteria were as follows: (1) clinical randomized controlled trials; (2) the clinical manifestations, characteristics of the pain, diagnostic criteria, as well as the definitions of cure rate and total effective rate meet the description in the Chinese Expert Consensus on the Diagnosis and Treatment of Postherpetic Neuralgia [1]; (3) electroacupuncture, fire acupuncture, and filiform needle are assumed under the category of acupuncture therapy.

2.3. Exclusion criteria

The exclusion criteria were as follows: (1) repeatedly published or detected literature data; (2) in the study group or the control group, the treatment regimen adopted multiple combined interventions; although acupuncture therapy is used, it cannot be judged whether acupuncture therapy plays a role in the clinical treatment; (3) trials involving common interventions, such as moxibustion, qigong, massage, and cupping; (4) patients with other serious diseases, such as severe hypertension, severe diabetes, coronary heart disease, and other serious diseases.

2.4. Outcome indicators

The primary outcome indicators were the overall response rate of clinical efficacy and visual analogue scale (VAS) score. The secondary outcome indicators were cure rate, recurrence rate, and adverse reaction rate.

2.5. Literature screening and data extraction

Uniform inclusion criteria were used. Two investigators independently read the title and abstract of the literatures, excluded those that did not meet the inclusion criteria, and further read the full text to determine whether the inclusion criteria were met. The third person was responsible for the re-evaluation and the inclusion of literatures upon consultation if any inconsistencies occurred. The extraction of data included the first author's name, publication year, sample size of included patients, interventions, outcome measures, etc.

2.6. Assessment of methodological quality

The included literatures were assessed according to the risk of bias assessment tool, found in the Cochrane

Handbook 5.1.0, in terms of the methods (random sequence generation and allocation concealment), whether the blinding of investigators, subjects, and outcome assessors was implemented, the completeness of the outcome data, the occurrence of selective reporting of the results, the methodological quality of each study in 7 areas, as well as the presence or absence of other biases.

2.7. Statistical analysis

Meta-analysis was performed on all data using RevMan 5.3. The risk ratio (RR) was used for dichotomous variables and the mean difference (MD) was used as an effect indicator for continuous variables; 95% confidence interval (CI) was calculated for both. When $P > 0.10$ and $I^2 < 50\%$, the heterogeneity between studies was considered small, and the fixed effects model was used; otherwise, the random effects model was used, and sensitivity analysis was performed to find the source of heterogeneity; when necessitated, subgroup analysis was performed to clarify whether clinical and methodological heterogeneity existed.

3. Results

3.1. Literature retrieval and screening process

A total of 681 literatures were obtained through the literature search. According to the inclusion and exclusion criteria, duplicated literatures without raw data were excluded, and 26 literatures [3-28] were finally included. The literature screening process and results are shown in **Figure 1**.

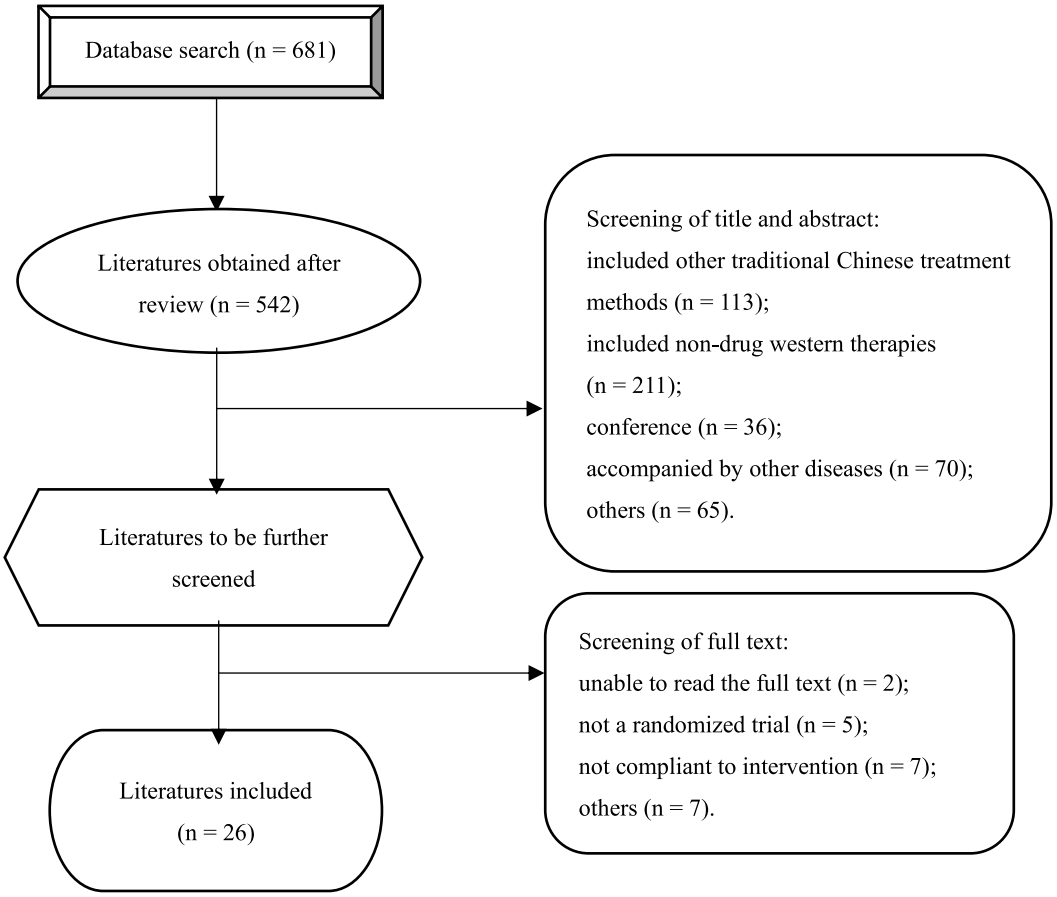

Figure 1. Literature screening process

3.2. Basic characteristics of the included literatures

The total sample size of the 26 trials included was 2,174, including 1,090 in the observation group and 1,082 in the control group. Acupuncture interventions were noted in all 26 trials with clear outcome measures, as shown in **Table 1**. For the observation group, acupuncture alone was used in 14 trials, acupuncture combined with western medicine was used in 10 trials, and acupuncture combined with traditional Chinese medicine was used in 2 trials. For the control group, western medicine alone was used in 24 trials and traditional Chinese medicine was used in 2 trials. All 26 trials reported the therapeutic effect of acupuncture on postherpetic neuralgia. In terms of outcome measures, 20 trials [3-20, 27-28] described using the overall response rate of clinical efficacy, while 17 trials [5-7, 10,11,13,14,16,18, 20-26, 28] described using VAS scores; the recurrence rate was reflected in 4 trials [5,7,14,26], cure rate in 8 trials [6,9,11,13,16,19,20,27], and adverse reaction rate in 4 trials [17,19,22,23].

Table 1. Basic characteristics of the included literatures

Literatures	Year	Sample size (O/C)	Study type	Intervention		Outcome measures
				Observation group	Control group	
Zeng F [3]	2016	50/50	Randomized controlled	Acupuncture	Western medicine	Overall response rate
Duan C [4]	2018	31/31	Randomized controlled	Acupuncture	Western medicine	Overall response rate
Li W [5]	2018	42/42	Randomized controlled	Acupuncture	Western medicine	Overall response rate; VAS score; recurrence rate
Liang X [6]	2017	60/60	Randomized controlled	Acupuncture	Western medicine	Overall response rate; VAS score; cure rate
Lin S [7]	2020	39/39	Randomized controlled	Acupuncture	Western medicine	Overall response rate; VAS score; recurrence rate
Lu L [8]	2020	70/70	Randomized controlled	Acupuncture	Western medicine	Overall response rate
Shi A [9]	2018	51/51	Randomized controlled	Acupuncture	Western medicine	Cure rate; overall response rate
Zhang S [10]	2020	50/50	Randomized controlled	Acupuncture	Western medicine	Overall response rate; VAS score
Zheng Y [11]	2019	34/34	Randomized controlled	Acupuncture	Western medicine	Cure rate; overall response rate;VAS score
Cui W [12]	2019	30/30	Randomized controlled	Acupuncture + western medicine	Western medicine	Overall response rate
Huang Y [13]	2019	35/35	Randomized controlled	Acupuncture + western medicine	Western medicine	Cure rate; VAS score; overall response rate
Li J [14]	2019	35/35	Randomized controlled	Western medicine	Western medicine	Overall response rate; VAS score; recurrence rate
Wang J [15]	2019	43/43	Randomized controlled	Acupuncture + western medicine	Western medicine	Overall response rate
Wang J [16]	2020	45/44	Randomized controlled	Acupuncture + western medicine	Western medicine	Overall response rate; cure rate; VAS score
Wang L [17]	2018	30/30	Randomized controlled	Acupuncture + western medicine	Western medicine	Overall response rate; adverse reaction rate
Zhao W [18]	2018	29/29	Randomized controlled	Acupuncture + western medicine	Western medicine	Overall response rate; VAS score

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Literatures	Year	Sample size (O/C)	Study type	Intervention		Outcome measures
				Observation group	Control group	
Li Z [19]	2018	30/30	Randomized controlled	Acupuncture + TCM	TCM	Cure rate; overall response rate; adverse reaction rate
Wang C [20]	2020	30/30	Randomized controlled	Acupuncture + TCM	TCM	Cure rate; overall response rate; VAS score
Gong Y [21]	2018	32/32	Randomized controlled	Acupuncture	Western medicine	VAS score
Huo X [22]	2020	35/35	Randomized controlled	Acupuncture	Western medicine	VAS score; adverse reaction rate
Wu C [23]	2018	26/26	Randomized controlled	Acupuncture	Western medicine	VAS score; adverse reaction rate
Zhang Y [24]	2018	40/40	Randomized controlled	Acupuncture	Western medicine	VAS score
Luo Y [25]	2019	49/49	Randomized controlled	Acupuncture + western medicine	Western medicine	VAS score
Wang Y [26]	2016	39/39	Randomized controlled	Acupuncture + western medicine	Western medicine	VAS score; recurrence rate
Fang X [27]	2013	107/104	Randomized controlled	Acupuncture	Western medicine	Overall response rate; cure rate
Zhang M [28]	2014	28/26	Randomized controlled	Acupuncture + western medicine	Western medicine	Overall response rate; VAS score

3.3. Quality assessment of the included literatures

The quality assessment of the included literatures was evaluated with reference to Cochrane's Bias Risk Assessment Tool, which includes 7 items. In terms of random sequence generation, 7 literatures [4,5,7, 19-20, 24,25] used the random number table method, 1 trial [18] used the digital parity grouping method, and the remaining 18 literatures did not specify any specific randomization method. There was no statistically significant difference ($P > 0.05$) in the evaluation results of the general data (age, disease duration, onset time, and severity) between the observation groups and the control groups ($P > 0.05$). According to the risk of bias assessment, only 1 article [18] was high risk, while the rest were low risk. In terms of the hidden aspects of random assignment, none of the 26 literatures were unclear. In terms of implementer and subject blinding, only 1 article [4] was double-blinded, while the remaining 25 literatures [3-5, 7-28] did not mention anything related to it, which were low risk. In terms of blinding of outcome assessment, none of the 26 literatures mentioned it as unclear, while in terms of data integrity and selectivity, with reference to the study protocol designed in the literatures, the data and results reported in the literatures were complete and low risk. Other biases were not mentioned in any of the included literatures and were considered low risk. The evaluation results are shown in **Figure 2**.

Figure 2. Risk of bias assessment of the included literatures

3.4. Meta-analysis

3.4.1. Overall effective rate

(1) In the subgroup analysis of acupuncture versus western medicine, 10 trials were included [3-11, 27], with a total of 1,065 subjects. There was no heterogeneity (P = 0.30, I^2 = 16%) among the studies, and the fixedeffects model was used. The results showed that the overall effective rate of the observation group was higher than that of the control group, with a significant statistical difference (RR = 1.24, 95% CI [1.17, 1.32], P < 0.00001), as shown in **Figure 3**. It is suggested that acupuncture can further improve the overall effective rate of patients with postherpetic neuralgia.

(2) In the subgroup analysis of acupuncture combined with western medicine compared with western medicine, 8 trials were included [12-18, 28], with a total of 547 subjects. There was no heterogeneity (P = 0.47, I^2 = 0%) among the studies, and the fixed effects model was used. The results showed that the overall effective rate of the observation group was higher than that of the control group, with a significant statistical difference (RR = 1.20, 95% CI [1.12, 1.29], P < 0.00001), as shown in **Figure 3**. It is suggested that acupuncture can effectively increase the overall effective rate of patients with postherpetic neuralgia on the basis of using western medicine.

(3) In the subgroup analysis of acupuncture combined with traditional Chinese medicine compared with traditional Chinese medicine only, a total of 120 subjects were included in 2 trials [19,20]. There was no heterogeneity (P = 1.00, I^2 = 0%) between the studies, and the fixed effects model was used. The results showed that the overall effective rate of the observation group was higher than that of the

control group, with a significant statistical difference (RR = 1.32, 95% CI [1.12, 1.55], P = 0.0007), as shown in **Figure 3**. It is suggested that acupuncture can significantly improve the overall effective rate of patients with postherpetic neuralgia on the basis of using traditional Chinese medicine.

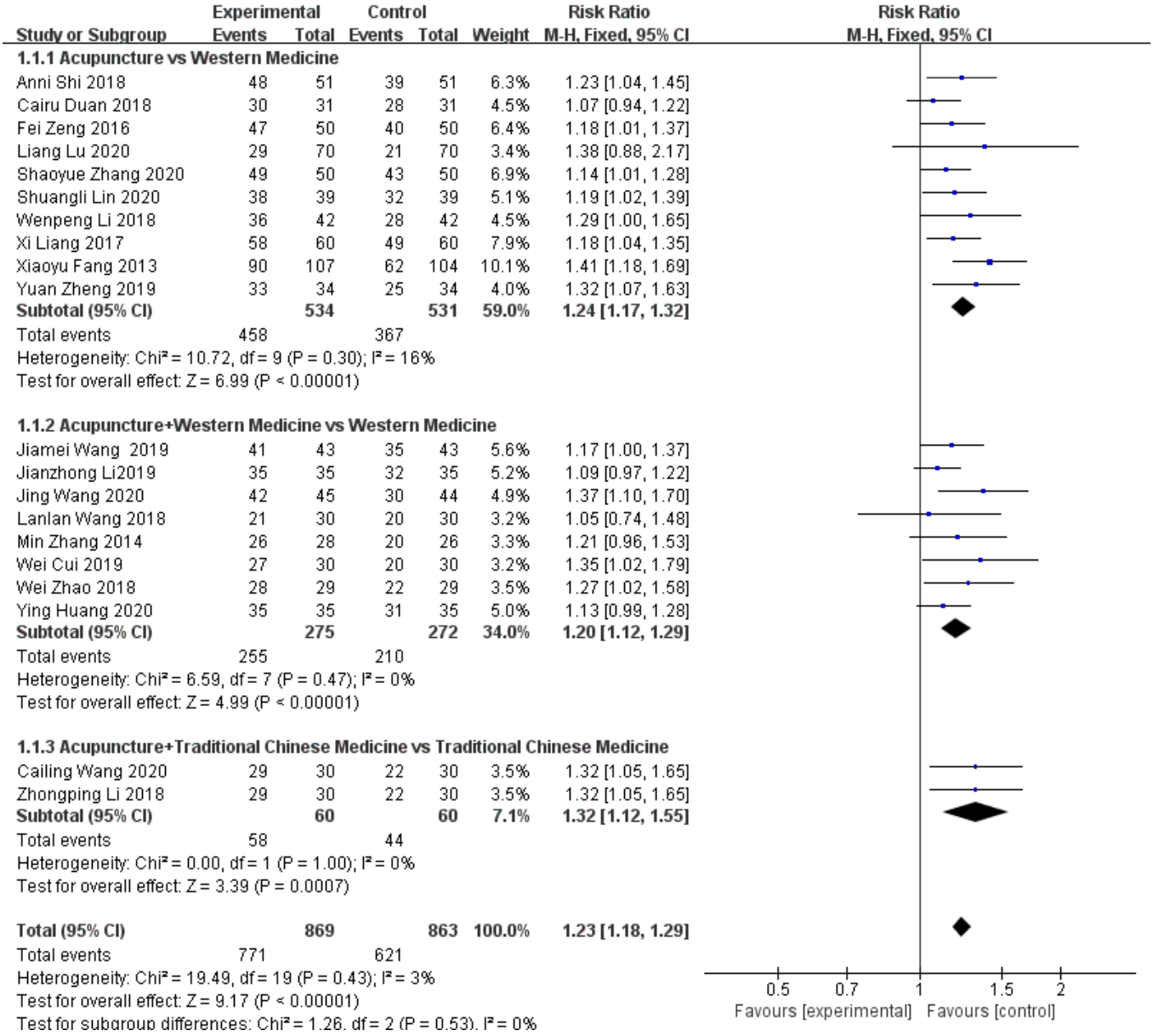

Figure 3. Forest plot for overall response rate

3.4.2. VAS score

(1) In the subgroup analysis of acupuncture versus western medicine, 9 trials were included [5-7, 10,11, 21-24], with a total of 690 subjects. There was heterogeneity among the studies (P < 0.00001, I^2 = 99%), and the random effects model was used. The results showed that the VAS score of the observation group was lower than that of the control group, with a significant statistical difference (MD = -1.43, 95% CI [-1.97, -0.89], P < 0.00001), as shown in **Figure 4**. It is suggested that acupuncture can further reduce the VAS score of patients with postherpetic neuralgia.

(2) In the subgroup analysis of acupuncture combined with western medicine compared with western medicine alone, 7 trials were included [13,14,16,18,25,26,28], with a total of 517 subjects. There was heterogeneity among the studies ($P < 0.00001$, $I^2 = 89\%$), and the random effects model was used. The results showed that the VAS score of the observation group was lower than that of the control group, with a significant statistical difference (MD = -1.87, 95% CI [-2.35, -1.40], $P < 0.00001$), as shown in **Figure 4**. It is suggested that acupuncture can effectively reduce the VAS score of patients with postherpetic neuralgia on the basis of western medicine.

(3) In the subgroup analysis of acupuncture combined with traditional Chinese medicine compared with traditional Chinese medicine alone, only 1 trial was included [20], with a total of 60 subjects. There is insufficient evidence that acupuncture combined with traditional Chinese medicine can effectively reduce the VAS score of patients with postherpetic neuralgia.

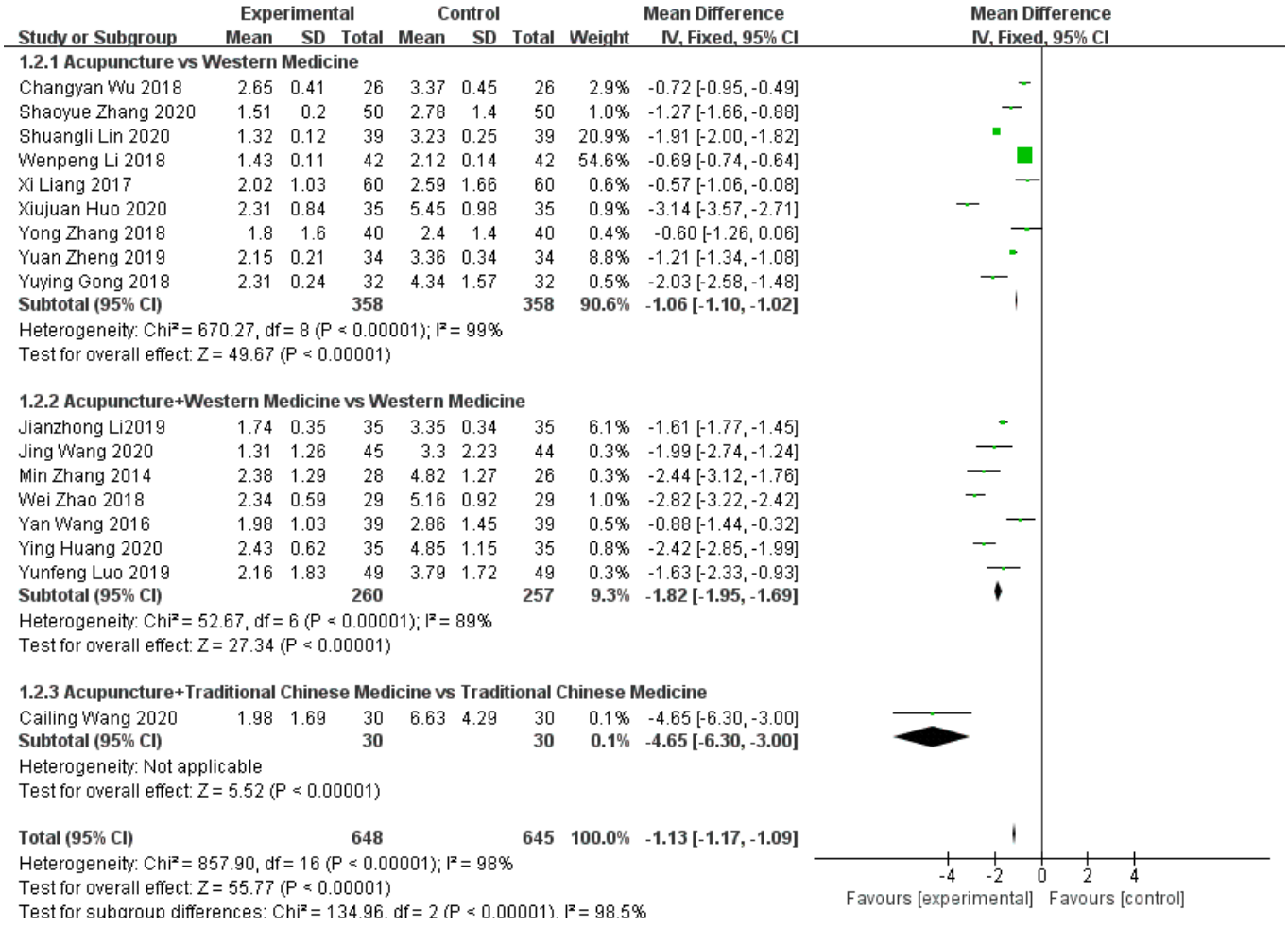

Figure 4. Forest plot for VAS score

3.4.3. Cure rate

(1) In the subgroup analysis of acupuncture compared with western medicine, 4 trials reported on cure rate [6,9,11,27], with a total of 501 subjects. There was no heterogeneity ($P = 0.30$, $I^2 = 18\%$) among the studies, and the fixed effects model was used. The results showed that the cure rate of the observation group was higher than that of the control group, with a significant statistical difference (RR = 2.17, 95% CI [1.59, 2.98], $P < 0.00001$), as shown in **Figure 5**. It is suggested that acupuncture can further improve the cure rate of patients with postherpetic neuralgia.

(2) In the subgroup analysis of acupuncture combined with western medicine compared with western medicine alone, 2 trials were included [13,15], with a total of 159 subjects. There was no heterogeneity (P = 0.92, I2 = 0%) between the studies, and the fixed effects model was used. The results showed that the cure rate of the observation group was higher than that of the control group, with a significant statistical difference (RR = 1.73, 95% CI [1.19, 2.51], P = 0.004), as shown in **Figure 5**. It is suggested that acupuncture can effectively improve the cure rate of patients with postherpetic neuralgia on the basis of western medicine.

(3) In the subgroup analysis of acupuncture combined with traditional Chinese medicine compared with traditional Chinese medicine alone, 2 trials reported on cure rate [19,20], with a total of 120 subjects. There was no heterogeneity (P = 0.89, I^2 = 0%) between the studies, and the fixed effects model was used. The results showed that the cure rate of the observation group was higher than that of the control group, with a significant statistical difference (RR = 2.60, 95% CI [1.38, 4.89], P = 0.003), as shown in **Figure 5**. It is suggested that acupuncture can significantly improve the cure rate of patients with postherpetic neuralgia on the basis of traditional Chinese medicine.

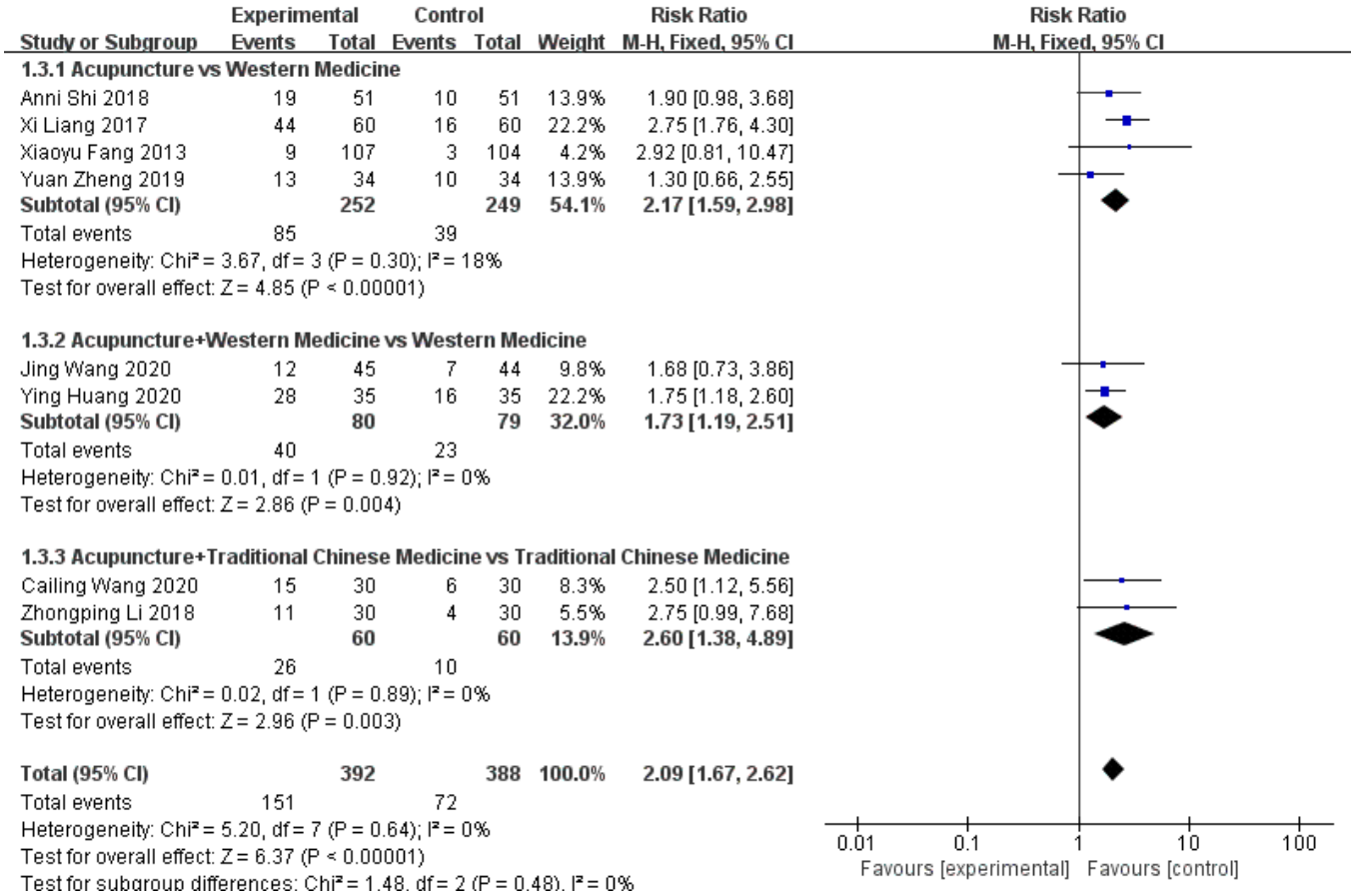

Figure 5. Forest plot for cure rate

3.4.4. Recurrence rate

(1) In the subgroup analysis of acupuncture versus western medicine, a total of 162 subjects were included in 2 trials [5,7]. There was no heterogeneity (P = 0.31, I^2 = 3%) between the studies, and the fixed effects model was used. The results showed that the recurrence rate of the observation group was lower than that of the control group, with a significant statistical difference (RR = 0.43, 95% CI

[0.17, 1.06], P = 0.07), as shown in **Figure 6**. It is suggested that acupuncture can reduce the recurrence rate of patients with postherpetic neuralgia.

(2) In the subgroup analysis of acupuncture combined with western medicine compared with western medicine alone, 2 trials reported on recurrence rate [14,26], with a total of 148 subjects. There was no heterogeneity (P = 0.12, I^2 = 60%) between the studies, and the fixed effects model was used. The results showed that the recurrence rate of the observation group was lower than that of the control group, with a significant statistical difference (RR = 0.33, 95% CI [0.05, 1.97], P = 0.22), as shown in **Figure 6**. It is suggested that acupuncture can effectively reduce the recurrence rate of patients with postherpetic neuralgia on the basis of western medicine.

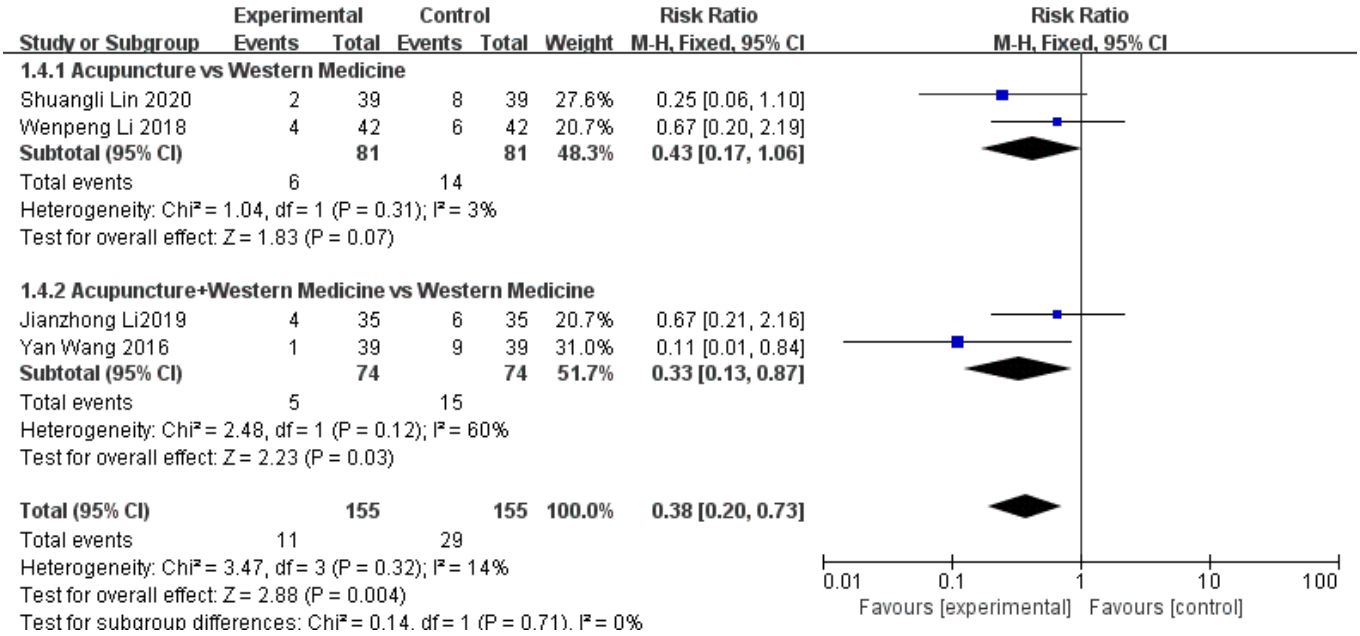

Figure 6. Forest plot for recurrence rate

3.4.5. Adverse reaction rate

(1) In the subgroup analysis of acupuncture compared with western medicine, a total of 124 subjects were included in 2 trials [22,23]. There was no heterogeneity (P = 0.54, I^2 = 0%) between the studies, and the fixed effects model was used. The results showed that the adverse reaction rate of the observation group was lower than that of the control group, with a significant statistical difference (RR = 0.20, 95% CI [0.04, 1.11], P = 0.07), as shown in **Figure 7**. It is suggested that acupuncture can further reduce the adverse reactions of patients with postherpetic neuralgia.

(2) In the subgroup analysis of acupuncture combined with traditional Chinese medicine compared with traditional Chinese medicine alone, only 1 trial was included [19], and a total of 60 subjects. Therefore, there is insufficient evidence that acupuncture combined with traditional Chinese medicine can reduce the rate of adverse reaction in patients with postherpetic neuralgia.

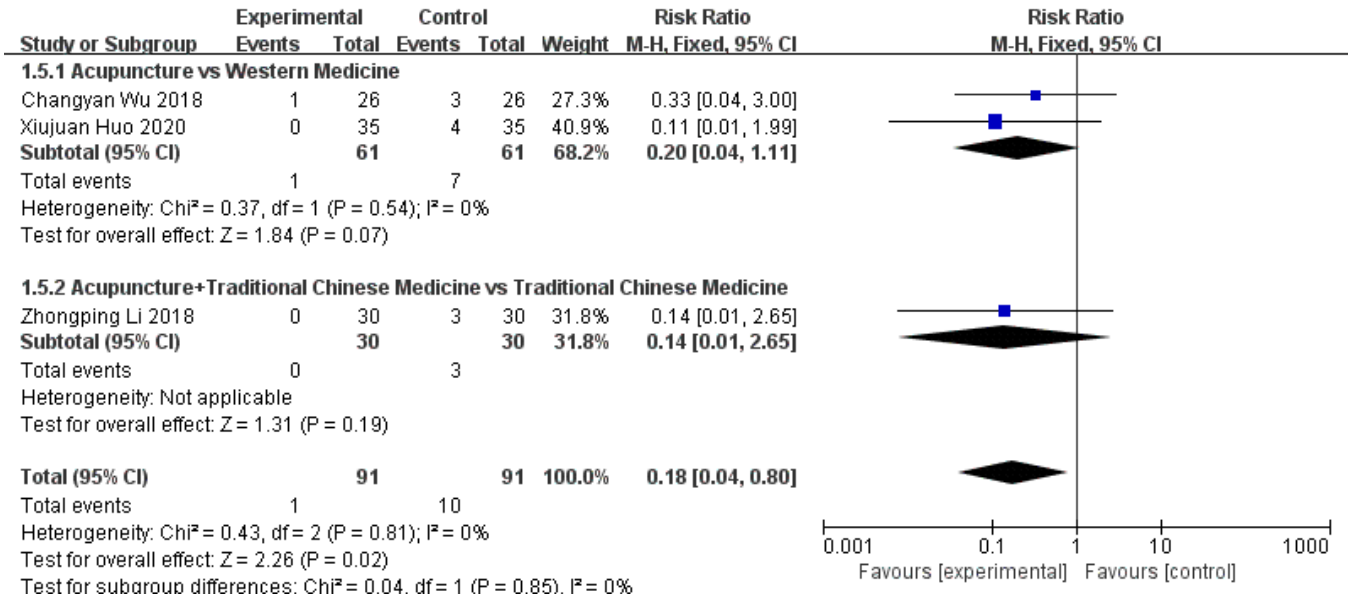

Figure 7. Forest plot for adverse reaction rate

4. Discussion

Herpes zoster is mainly caused by varicella-zoster virus infection. Postherpetic neuralgia is one of the main complications of herpes zoster. The pain experienced by patients affected by postherpetic neuralgia can seriously affect their life and activity. Therefore, timely and effective treatment is necessary. The disease is mainly restricted by advanced age, late treatment, short course of treatment, other primary diseases, and other factors. Pharmacological studies have shown that in the routine symptomatic supportive treatment, the combination of multiple drugs, leading to various adverse reactions, such as amenorrhea, impotence, delayed dyskinesia, dry mouth, constipation, liver function derangement, granulocytopenia, etc., would bring more pain to the patients and affect their compliance to treatment.

In traditional Chinese medicine, it is believed that postherpetic neuralgia is related to a deficiency of vital energy, disturbance of Ying and defense, as well as incompatibility of meridians and collaterals. Acupoint selection based on syndrome differentiation and acupuncture at meridian points can gradually relieve the pain of patients. The results from this meta-analysis showed that in the treatment of postherpetic neuralgia, comparing acupuncture with western medicine, the use of acupuncture can further improve the overall effective rate (RR = 1.24,95% CI [1.17,1.32], $P < 0.00001$) and reduce the VAS score of patients (MD = -1.43,95% CI [-1.97, -0.89], $P < 0.00001$). The method is simple and can effectively improve the pain as well as the quality of life of patients suffering from postherpetic neuralgia.

However, there are some limitations in this study. Through literature collocation, it was noted that the sample size of the literatures reporting about the use of acupuncture in the treatment of postherpetic neuralgia is relatively small, double-blinded clinical trials are insufficient, the records of loss to follow-up, withdrawal, and adverse events occurring in the clinical trials were not detailed enough, and the late follow-up records were incomplete. As a result, partial data were not included in the analysis, which may affect the reliability of the results. It is hoped that there will be more high-quality literatures in future studies to clarify the clinical effect of acupuncture in comparison with other therapeutic methods, provide more valuable references for future scientific research and clinical practice, as well as add to the development of the TCM cause.

Disclosure statement

The authors declare that there is no conflict of interest.

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Observation on the Therapeutic Effect and Complication Rate of Totally Laparoscopic Total Gastrectomy and Laparoscopic-Assisted Total Gastrectomy in the Treatment of Gastric Cancer

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Abstract: ***Objective:*** To investigate the effect and complication rate of totally laparoscopic and laparoscopic-assisted total gastrectomy in the treatment of gastric cancer. ***Methods:*** From March 2019 to July 2021, 60 patients with gastric cancer were selected as the subjects in this study; the patients in group A underwent laparoscopic-assisted total gastrectomy, whereas those in group B underwent totally laparoscopic total gastrectomy; the treatment effect and complication rate were compared between the two groups. ***Results:*** The postoperative recovery of group B was significantly better than that of group A, and the postoperative complications (10.00%) of group B were significantly lower than that of group A (33.33%) ($P < 0.05$). ***Conclusion:*** For patients with gastric cancer, totally laparoscopic total gastrectomy has better therapeutic effect and lower postoperative complications, which is worthy of popularization.

Keywords: Totally laparoscopic total gastrectomy; Laparoscopic-assisted total gastrectomy; Gastric cancer; Therapeutic effect; Incidence of complications

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1. Introduction

Gastric cancer is a common malignant tumor of the digestive system. The mortality rate ranks second among malignant tumors, and the death toll in China is about 20 per 100,000 people. With the change of dietary pattern and increase in stress, the incidence rate and mortality rate of gastric cancer are gradually increasing, showing a younger trend, and the five-year survival rate is less than 30%. In clinical treatment, radical gastrectomy is the first choice. With the introduction of minimally invasive technology, there is a new trend for total gastrectomy, which does not only reduce the amount of intraoperative bleeding and the stress trauma caused by laparotomy, but also promote postoperative recovery [1]. Sixty patients with gastric cancer were selected in this study to determine the effect of totally laparoscopic and laparoscopic-assisted total gastrectomy.

2. Materials and methods

2.1. Basic information

From March 2019 to July 2021, 60 patients with gastric cancer were divided into two groups, group A and group B, by the red and blue ball method, with 30 cases in each group. In total, there were 33 male patients

and 27 female patients; the mean age was 59.73 ± 3.26 years old; TNM stages included stage I (22 cases), stage II (19 cases), and stage III (19 cases). The data comparison was not significant ($P > 0.05$).

The indications of gastric cancer were met by imaging or fiber endoscopy; no surgical or chemotherapy contraindications, and no lesions were found in the heart, liver, and kidney.

2.2. Method

Patients in group A underwent laparoscopic-assisted total gastrectomy, and the procedure for each patient was as follows: laparoscopic-guided tissue dissociation and lymph node dissection; a 10 cm incision was made in the upper abdomen, and the specimens were taken out for gastrointestinal reconstruction and esophagojejunostomy; a drainage tube was placed in, and the incision was sutured.

Patients in group B underwent totally laparoscopic total gastrectomy, and the procedure for each patient was as follows: the patient was adjusted to supine position and intubated under general anesthesia; an incision was made at 1 cm below the umbilicus to create an artificial pneumoperitoneum, and a laparoscope was then placed to accurately explore and locate the lesion; the left and right anterior axillary edges were defined as traction holes and 5 mm trocars were placed in; the main operating hole was defined as the outer edge of the right rectus abdominis horizontal line and the junction at 2 cm above the navel. A 12 mm casing needle was inserted, and a 5 mm casing needle was then inserted into the left symmetrical position (traction hole) to form a V-shape. The greater omentum was freed and combined with ultrasonic knife resection, the clearing of lymph nodes were carried out according to the following sequence: from the right greater omentum, to the duodenal bulb, and the lower pole of the spleen; the pancreatic capsule and the anterior mesenteric lobe of colon were pulled; the common hepatic artery, left gastric artery, and proximal splenic artery were peeled back, and the left and right gastroepiploic vessels were removed; a 4.5 cm incision was made in the upper abdomen, and the specimens were taken out and sent for examination; the incision was closed and artificial pneumoperitoneum was established; with the help of linear cutting stapler, the suspensory ligament of the duodenum was transected, which was 7 cm (length 1 cm) from the distal jejunum stump; jejunum anastomosis and reconstruction of the digestive tract were carried out; a drainage tube was placed, and the incision was sutured [2,3].

2.3. Observation indicators

2.3.1. Perioperative indicators

The perioperative indicators included operation time, intraoperative bleeding, and the number of lymph nodes dissected.

2.3.2. Postoperative recovery indicators

The indicators for postoperative recovery included the time to postoperative flatulence, time taken to resume normal diet, time to postoperative ambulation, and hospitalization period.

2.3.3. Coagulation function indicators

A total of 2 ml fasting venous blood was taken from each patient before the procedure and 24 hours after that. The supernatant was taken by centrifugation. APTT (activated partial thromboplastin time), Fg (fibrinogen), and D-D (D-dimer) were measured by enzyme-linked immunosorbent assay [4].

2.3.4. Postoperative complications

Postoperative complications included anastomotic leakage, intestinal obstruction, infection, and fat

liquefaction.

2.4. Statistical analysis

Statistical Package for the Social Sciences (SPSS) 24.0 was used in this study. The measurement data were expressed in $\bar{x} \pm s$ and inspected by t, while the count data were expressed in percentage (%) and inspected by x^2; $P < 0.05$ indicates a statistically significant difference.

3. Results

3.1. Perioperative indicators

The perioperative indicators were compared, and the values of each group were similar, with no significant difference ($P > 0.05$), as shown in **Table 1**.

Table 1. Perioperative indicators [$\bar{x} \pm s$]

Group	Operation time (min)	Intraoperative bleeding (ml)	Number of lymph nodes dissected
Group A (n = 30)	238.70 ± 13.69	155.57 ± 21.48	31.43 ± 3.51
Group B (n = 30)	235.06 ± 12.36	151.45 ± 20.44	31.59 ± 3.63
t value	1.0809	0.7611	0.1736
P	0.2842	0.4497	0.8628

3.2. Postoperative recovery

The postoperative recovery indicators were compared; the values of group A were significantly worse than those of group B ($P < 0.05$), as shown in **Table 2**.

Table 2. Postoperative recovery [$\bar{x} \pm s$, d]

Group	Time to first flatulence	Time taken to resume to normal diet	Time to postoperative ambulation	Hospitalization period
Group A (n = 30)	3.70 ± 1.23	5.23 ± 1.24	4.26 ± 1.23	21.03 ± 3.53
Group B (n = 30)	2.12 ± 0.85	3.99 ± 1.09	2.77 ± 1.29	14.37 ± 3.45
t value	5.7882	4.1138	4.5787	7.3904
P	0.0000	0.0001	0.0000	0.0000

3.3. Coagulation function

The coagulation profile of the patients in both groups were compared. The values of each group were similar, with no significant difference ($P > 0.05$), as shown in **Table 3**.

Table 3. Coagulation function indicators [$\bar{x} \pm s$]

Group	APTT (s)		Fg (g/L)		D-D (mg/L)	
	Preoperative	Postoperative	Preoperative	Postoperative	Preoperative	Postoperative
Group A (n = 30)	28.49 ± 5.74	29.87 ± 6.45	2.89 ± 0.60	3.59 ± 0.72	0.11 ± 0.01	0.30 ± 0.07
Group B (n = 30)	28.53 ± 5.71	30.14 ± 6.56	2.88 ± 0.62	3.66 ± 0.70	0.10 ± 0.03	0.32 ± 0.08
t value	0.0271	0.1607	0.0635	0.3818	1.7321	1.0305
P	0.9785	0.8729	0.9496	0.7040	0.0886	0.3070

3.4. Postoperative complications

The postoperative complications of the patients in both groups were compared. The values of group A (33.33%) were more than those of group B (10.00%), with significant difference ($P < 0.05$), as shown in **Table 4**.

Table 4. Postoperative complications [n, %]

Group	Anastomotic fistula	Intestinal obstruction	Infection	Fat liquefaction	Total incidence rate
Group A (n = 30)	4 (13.33)	3 (10.00)	2 (6.67)	1 (3.33)	10 (33.33)
Group B (n = 30)	1 (3.33)	1 (3.33)	1 (3.33)	0 (0.00)	3 (10.00)
x^2					4.8118
P					0.0282

4. Discussion

Gastric cancer is a common type of gastrointestinal cancer, with high incidence rate and high mortality. Surgery is the first choice for patients with gastric cancer, in which the curative effect is better. Especially for patients with early gastric cancer, lesions can be removed, and the survival rate can be improved through surgery. Under the previous mode of treatment, open resection was common. Although cancer cells can be completely removed in this way, it has several disadvantages, such as large trauma and slow postoperative recovery. At the same time, surgical stress trauma will also increase the body's inflammatory response, block its immune regulatory function, and cause immune dysfunction, thus leading to the loss of resistance to cancer cells, which in turn accelerates metastasis and diffusion, resulting in a high rate of postoperative metastasis and life-threatening event [5].

Laparoscopy is a new type of minimally invasive surgery in recent years, and it is also the inevitable trend of surgical development in the future. With the vigorous development of industrial manufacturing technology, laparoscopy can be integrated with other disciplines combined with professional and skilled technical means and gradually acquire the status of traditional laparotomy. Especially in patients with gastric cancer, studies have shown that laparoscopic-assisted total gastrectomy can improve the effect of lymph node dissection and reduce postoperative complications, with a high safety profile [6].

In laparoscopic-assisted total gastrectomy, lymph nodes at the targeted area can be cleared under the guidance of laparoscopic technology and the incision made under the xiphoid process is convenient for gastric transection and gastrointestinal reconstruction. However, this procedure has its limitations, especially for the obese group. If the upper abdominal incision is small, it increases the difficulty of exposure, reduces the clarity of the surgical field, and induces postoperative complications due to excessive traction of the anastomosis. Totally laparoscopic total gastrectomy is also a kind of laparoscopic surgery for gastric cancer. It can be used to observe the tissue status of the lesion through laparoscopy, and then treatment such as lymph node dissection, tissue dissociation, and digestive tract reconstruction can be done.

The procedure will not lead to cell rupture and tissue damage while maneuvering the lesion. It has certain advantages, which include clear surgical field as well as less trauma and bleeding [7]. However, in the medical field, there are disputes about the efficacy of the two. This study showed that there is no significant difference in perioperative indicators and coagulation function indicators ($P > 0.05$), but the postoperative recovery and postoperative complications with totally laparoscopic total gastrectomy are significantly better than those of laparoscopic-assisted total gastrectomy ($P < 0.05$). The results showed that the former is more conducive to physical recovery, which is related to less trauma and less surgical stress response.

In short, in the treatment of patients with gastric cancer, totally laparoscopic and laparoscopic-assisted total gastrectomy both belong to the category of minimally invasive surgery. Compared with traditional laparotomy, they have the advantages of small incision and less trauma as well as bleeding. However, comparing the two in terms of curative effect, it can be appreciated that totally laparoscopic total gastrectomy has better postoperative recovery and lower incidence of postoperative complications; hence, this surgical method should be promoted.

Disclosure statement

The author declares that there is no conflict of interest.

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Clinical Value of Musculoskeletal Ultrasound in Rehabilitation After Flexor Tendon Rupture Repair of the Hand

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Abstract: ***Objective:*** To explore the application effect and clinical value of musculoskeletal ultrasound in the rehabilitation of hand function after flexor tendon rupture repair. ***Methods:*** In this study, 72 patients were selected from among patients who underwent flexor tendon rupture repair of the hand in Yancheng Third People's Hospital from May 2018 to May 2020; the patients were randomly divided into the control group (routine hand rehabilitation training) and the experimental group (musculoskeletal ultrasound and targeted hand rehabilitation training based on examination results) by die roll, with 34 cases in each group; the hand rehabilitation of the two groups were compared. ***Results:*** The excellent and good rate of the total active motion (TAM) of the experimental group (94.44%) was significantly higher than that of the control group (69.44%) ($P < 0.05$); before treatment, there was no significant difference in the diameter and degree of stenosis of the artery in the finger between the two groups ($P > 0.05$); after treatment, the degree of stenosis and the diameter of the artery of the experimental group were significantly better than those of the control group ($P < 0.05$). ***Conclusion:*** For patients treated with flexor tendon rupture repair of the hand, the use of musculoskeletal ultrasound in the rehabilitation process can significantly improve the functional recovery of the hand; therefore, it is worthy of in-depth research, promotion, and application in clinical rehabilitation.

Keywords: Musculoskeletal ultrasound; Hand; Flexor tendon rupture; Repair; Hand rehabilitation; Clinical value

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1. Introduction

The rupture of flexor tendon in the hand is mainly caused by strong external forces. Timely and effective treatment is required upon rupture. The general treatment for this condition is by repair. Rehabilitation training is needed after surgery; otherwise, the patient may have serious dysfunction to his or her daily life in the future. In postoperative rehabilitation training, patients need to aim for good tendon healing. In routine rehabilitation training, rehabilitation personnel only train based on prior clinical experience, without any targeted rehabilitation in consideration of the patients' actual situation; therefore, the effect has not significantly improved [1]. With the continuous development of science and technology, the diagnostic process has improved. Among them, diagnostic ultrasound can effectively diagnose tendon rupture by using high-frequency ultrasound as well as evaluate the state and healing of tendons. Therefore, 72 patients, who underwent flexor tendon rupture repair of the hand, were selected from Yancheng Third People's Hospital to explore the application effect of musculoskeletal ultrasound in postoperative rehabilitation.

2. Data and methods

2.1. General information

Seventy-two patients with flexor tendon rupture of the hand treated in Yancheng Third People's Hospital from May 2018 to May 2020 were selected as the subjects in this study. The patients were divided by die roll into two groups, the control group and the experimental group, with 34 cases in each group. In the control group, there were 21 male patients and 13 female patients, age ranging from 22 to 53 years old, with an average age of 33.25 ± 8.76 years old. In the experimental group, there were 23 male patients and 11 female patients, age ranging from 20 to 51 years old, with an average age of 33.65 ± 7.89 years old. There was no significant difference in age, sex, and other general data between the two groups ($P > 0.05$).

The inclusion criteria were as follows: (1) patients with flexor tendon rupture of the hand; (2) those without obvious symptoms of hand infection and combined injury; (3) those who signed the informed consent form of this study; (4) those who received rehabilitation within one month after the repair [2].

The exclusion criteria were as follows: (1) patients with combined injury of other parts; (2) those with severe mental dysfunction or mental illness; (3) those with low compliance and unable to cooperate with rehabilitation training.

2.2. Method

The patients in the control group received routine rehabilitation training of the hand, and the results of the hand function evaluation scale were used as the basis of rehabilitation training. Three days after the repair, the external fixation plaster was removed in consideration of the actual situation of the patients, and the patients were guided to carry out mild active flexion and extension training. One month after the repair, they were trained in non-resistance active flexion and extension. Anti-resistance active flexion and extension exercise was performed 6 weeks after the repair [3].

For the experimental group, musculoskeletal ultrasound was used before the initiation of rehabilitation training. Upon obtaining the examination results, a scientific, reasonable, and targeted hand rehabilitation training plan was constructed based on the results. At 2 weeks, 4 weeks, 6 weeks, 8 weeks, 12 weeks, and 16 weeks after the repair, the patients were regularly examined by musculoskeletal ultrasound. According to the inspection of the structures each time, the training is adjusted accordingly. The instrument used was a digital color doppler ultrasonic diagnostic instrument, and the probe frequency was set to 4-13 MHz. For each patient, the inspection process was as follows: (1) the tendon was continuously scanned with the probe; (2) the tendon was scanned longitudinally. During scanning, the tissue size, marginal tissue, specific structure, and the internal echo of the lesion were determined. The specific ultrasonographic changes to the injured flexor tendon suture site and active scar connection were observed. In case of tendon adhesion, it is necessary to determine the moving parts and formulate a targeted hand rehabilitation training plan based on the inspection results [4].

2.3. Observation indicators

(1) Overall efficacy of total active motion (TAM)

It is divided into four grades: excellent, good, medium, and poor. If the range of motion is normal, it is deemed as excellent; compared with the healthy side, TAM ≥ 75% is considered good, 50% ≤ TAM < 75% is considered as medium, and TAM < 50% is deemed as poor [5].

(2) Inner diameter of artery and degree of artery stenosis

2.4. Statistical analysis

The data in this study were processed and calculated by SPSS 24.0. The counting data were expressed in n/% and tested by X^2; the measurement data were expressed in $\bar{x} \pm s$ and tested by t. $P < 0.05$ indicates a statistically significant difference.

3. Results

3.1. TAM effect

The TAM effect of the experimental group was significantly better than that of the control group ($P < 0.05$), as shown in **Table 1**.

Table 1. Comparison of the TAM effect between the two groups [n (%)]

Group	Excellent	Good	Medium	Poor	Excellent and good rate
Experimental group (n = 36)	20 (55.56)	14 (38.89)	2 (5.56)	0 (0.00)	34 (94.44)
Control group (n = 36)	13 (36.11)	12 (33.33)	6 (16.17)	5 (13.89)	25 (69.44)
X^2 value					7.6037
P value					0.0058

3.2. Diameter of the artery in the finger

Before treatment, there was no significant difference in the diameter of the artery between the two groups ($P > 0.05$). After treatment, the arterial diameter of the two groups significantly improved, but the arterial diameter of the experimental group was significantly better than that in the control group ($P < 0.05$), as shown in **Table 2**.

Table 2. Comparison of arterial diameter of the finger between the two groups before and after treatment ($\bar{x} \pm s$)

Group	Diameter of artery (mm)	
	Before treatment	After treatment
Experimental group (n = 36)	0.87 ± 0.01	1.18 ± 0.04
Control group (n = 36)	0.87 ± 0.02	1.01 ± 0.06
X^2 value	0.0000	14.1449
P value	1.0000	0.0000

3.3. Degree of stenosis of the artery in the finger

Before treatment, there was no significant difference in the degree of stenosis between the two groups ($P > 0.05$). After treatment, the degree of stenosis of the two groups significantly improved, but the degree of stenosis of the experimental group was significantly better than that of the control group ($P < 0.05$), as shown in **Table 3**.

Table 3. Comparison of the degree of stenosis of the artery in the finger between the two groups before and after treatment ($\bar{x} \pm s$)

Group	Degree of stenosis (%)	
	Before treatment	After treatment
Experimental group (n = 36)	69.98 ± 9.06	42.39 ± 5.77
Control group (n = 36)	67.39 ± 9.23	52.74 ± 6.82
X^2 value	1.2015	6.9515
P value	0.2336	0.0000

4. Discussion

The flexor tendon of the hand is a very important tissue structure in the human hand. As tendons are important for joint activity, they play important roles in people's daily life and activity. If the flexor tendon of the hand is damaged, it will lead to the loss of normal activity and function of the hand. At present, with the continuous development of urbanization, the probability of injury is gradually increasing due to various factors, such as high-intensity work. Combined with relevant statistical data, tendon injury accounts for more than 30% of hand injuries, and patients receiving flexor tendon repair account for more than 90% of patients with tendon injuries [6]. Flexor tendon rupture of the hand is a trauma caused by external forces, which is commonly seen in clinical practice. Upon rupture, the finger is presented in a flexion grip form. If the finger joint is straightened, the distal tendon will move with it. As a result, it is difficult to repair the broken end in the actual process of flexor tendon repair, and even if the repair is successful, the tendon may rupture again after suturing. Therefore, it is necessary to understand the state of the ruptured tendon in advance. At present, diagnostic ultrasound is widely used in clinics and is gradually maturing in China. Musculoskeletal ultrasound is one of the diagnostic ultrasound techniques, which has the characteristics of high probe frequency and clear image display [7]. In postoperative rehabilitation, patients can fully understand the tendon connection in the hand and determine the specific state of tendon healing through musculoskeletal ultrasound before formulating a rehabilitation training plan.

For patients after flexor tendon rupture repair of the hand, it is necessary to first carry out musculoskeletal ultrasound examination, and then formulate a postoperative rehabilitation training plan in consideration of the examination results. Compared with routine postoperative rehabilitation training, it can significantly improve the total active motion. For example, the results of this study showed that the excellent and good rate of TAM of the experimental group was 94.44%, while that of the experimental group was 69.44%, with statistically significant difference ($P < 0.05$). This shows that the application value of musculoskeletal ultrasonography is justified. The diameter and degree of stenosis of the artery in the finger of the experimental group were significantly better than those of the control group ($P < 0.05$). It also shows the recovery of the tendon after repair and before rehabilitation training. By carrying out musculoskeletal ultrasound examination first, and then formulating a rehabilitation training plan, there would be improvement in the quality of rehabilitation training and the recovery level of the tendon after repair.

In conclusion, for patients with flexor tendon rupture of the hand, formulating a targeted rehabilitation training plan based on the musculoskeletal ultrasound examination results after surgery can improve the speed of functional recovery. It has certain application value in clinical rehabilitation.

Disclosure statement

The author declares that there is no conflict of interest.

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Value of Emergency Nursing Procedures in Improving the First Aid Efficiency and Outcomes of Comatose Patients with Cerebral Hemorrhage

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Abstract: ***Objective:*** To determine the application value of emergency nursing in improving the efficiency and outcomes of first aid for comatose patients with cerebral hemorrhage. ***Methods:*** Forty comatose patients with cerebral hemorrhage treated in Suzhou Hospital of Traditional Chinese Medicine from August 2018 to June 2019 were selected as the research subjects in this study; the patients were divided into two groups, a control group and a study group, by lot; the patients in the control group received nursing by conventional means, while emergency nursing procedures were provided to the patients in the study group; the efficiency of first aid and the outcomes of the two groups were compared; the application value of emergency nursing procedures was analyzed. ***Results:*** The first aid efficiency of the study group was significantly higher than that of the control group; the condition evaluation, reception time, triage time, and rescue time of the study group were significantly lower than those of the control group; the treatment outcomes of the study group were significantly better than those of the control group ($P < 0.05$). ***Conclusion:*** Based on the results, compared with conventional nursing methods, the implementation of emergency nursing procedures for comatose patients with cerebral hemorrhage helps to improve the efficiency of first aid and the outcomes of the treatment; it has high clinical application value and is worthy of popularization as well as application in clinical practice.

Keywords: Emergency nursing procedures; Cerebral hemorrhage with coma; Efficiency of first aid; Outcomes of first aid

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1. Introduction

Cerebral hemorrhage is a cerebrovascular disease caused by cerebral ischemia which results in nerve dysfunction. It is relatively common in clinical practice and has a high incidence, mainly occurring among the elderly. With the rapid development of society, the accelerated pace of the city, and the increasing stress, the incidence among middle-aged groups has shown a substantial rise in trend [1]. In cerebral hemorrhage, the thrombus in the cerebral nerve tissue may fall off and travel through the systemic circulation to cerebral vessels, resulting in the blockage of main cerebral vessels and inducing acute cerebral infarction [2]. Many clinical studies have proven that in cerebral hemorrhage, the blood glucose levels are significantly raised, the anaerobic glycolysis of glycogen is promoted, there is continuous accumulation of acidic metabolites, the activity of protease is inhibited, and many peroxy free radicals are generated, causing damage to the neurons in the brain and inducing various complications [3]. When the blood vessels in the cranial cavity are blocked, it will lead to the failure of cerebral blood circulation, interrupt the blood and oxygen supply

to cerebral nerves, cause hypoxia and swelling of cerebral neurons, compress the small blood vessels around the nerve, as well as increase the probability of cerebral hemorrhage transformation, which will not only affect limb coordination and motor function, but also threaten the patient's life in serious cases, causing damage to the patient's physical and mental health [4]. Patients with cerebral hemorrhage have a sudden onset, and their condition changes in a short time. Secondary cerebral hemorrhage may occur. A large amount of bleeding may endanger the patient's life. Coma is one of the common complications of patients with intracerebral hemorrhage. If a patient with cerebral hemorrhage does not wake up in time, the patient may be in a vegetative state. The routine first aid process does not only have a slow diagnosis time, but also a low inspection efficiency, thus missing the best rescue opportunity for comatose patients with cerebral hemorrhage. After treatment, most patients would still have a series of sequelae, which cannot meet the growing nursing needs of patients [5]. Therefore, timely diagnosis and treatment can help reduce the probability of cerebral infarction caused by cerebral hemorrhage. According to clinical research, timely and efficient implementation of emergency nursing procedures for comatose patients with cerebral hemorrhage can shorten the diagnosis, transportation time, and rescue time, change the treatment outcomes, reduce the probability of disability and death, effectively improve the rescue efficiency, establish a good foundation for follow-up treatment, and promote the patient's brain and nervous system to return to normal along with their prognosis.

Emergency nursing is a comprehensive, professional, and scientific new nursing model, which makes the nursing process standardized, efficient, and scientific. It can improve the efficiency of first aid as well as the level and quality of nursing, provide basic guarantee for follow-up treatment, and satisfy the patients. In this study, 40 comatose patients with intracerebral hemorrhage were taken as the research subjects, sand the clinical effects of emergency nursing procedures were analyzed and sorted out.

2. Materials and methods

2.1. General information

Forty comatose patients with cerebral hemorrhage, treated in Suzhou Hospital of Traditional Chinese Medicine from August 2018 to June 2019, were selected as the research subjects. The patients were randomly divided into two groups, the control group and the study group, with 20 patients in each group. Conventional nursing methods were used for the patients in the control group. There were 11 male patients and 9 female patients, age ranging from 43 to 76 years old, with an average age of 59.52 ± 7.37 years old, and the time from onset to admission was 2.12 ± 0.14 hours. In the study group, there were 12 male patients and 8 female patients, age ranging from 45 to 78 years old, with an average age of 60.76 ± 8.12 years old, and the time from onset to admission was 2.31 ± 0.16 hours. There was no significant difference between the two groups ($P > 0.05$).

2.2. Inclusion and exclusion criteria

The inclusion criteria were as follows: (1) patients who were clinically diagnosed with cerebral hemorrhage coma; (2) the time from onset to admission was < 24 hours; (3) patients and their family members volunteered to participate in this study.

The exclusion criteria were as follows: (1) patients with severe heart, liver, lung, or kidney diseases; (2) patients whose vital signs had no rescue significance at admission; (3) patients and their families who disagreed with the implementation of emergency nursing procedures.

2.3. Methods

The control group received routine nursing. Upon diagnosis, the condition of each patient was preliminarily

evaluated, ECG monitoring was performed, oxygen was given according to situation, the patient's vital signs were monitored, and the rescue process was assisted.

Emergency nursing was carried out for the patients in the study group. Several measures were taken based on the steps below.

(1) Establish an emergency nursing procedure team, improve various emergency nursing procedures, select experienced emergency medical staffs, strengthen the training of nursing knowledge prior to actual work, improve the first-aid professional skills and adaptability of medical staffs, place medical devices and drugs at fixed points, and keep them with special personnel, clarify the division of responsibilities among team members, and carry out emergency nursing procedures in an orderly manner.

(2) Upon receiving an emergency call, do a quick visit within 5 minutes. After arriving at the site, provide first aid; during transportation, keep the patient lying on his or her back, supply conventional oxygen therapy, and always pay attention to the changes of vital signs. Then, contact the hospital triage desk to inform the patient's condition, so as to guide their preparations based on the patient's condition (e.g., antihypertensive drugs, thrombolytic drugs, and other relevant rescue items).

(3) Upon admission, the nursing staffs at the pre-examination desk shall assess the severity of the patient's condition, open a green channel for the patient, transfer the patient to the emergency room within three minutes, and hand over the patient to the emergency personnel in the hospital.

(4) After being transferred to the emergency room, the emergency nursing staffs shall assist the attending doctor to establish venous channels, collect blood samples, conduct brain computed tomography (CT) examination, evaluate the condition of the patient, and then initiate thrombolytic therapy. Thrombolytic therapy is a common treatment for intracerebral hemorrhage, as it can effectively open up the blocked blood vessels and restore the normal blood and oxygen supply to brain tissues. However, this therapy has a certain risk of cerebral infarction. After anoxic death, the neurons in the infarct focus promotes the generation of a large number of oxygen free radicals, resulting in oxidative stress injury to local tissues. The secondary injury after thrombolytic therapy will aggravate the compression on neurons and increase the risk of rebleeding. Therefore, it is necessary to use thrombolytic therapy carefully especially for comatose patients with cerebral hemorrhage, grasp the applicability of thrombolytic drugs for patients, and reduce the risk of cerebral infarction.

(5) Ask the family members whether the patient has severe drug allergy, hypertension, diabetes, or other comorbidities, and provide psychological counseling to help relieve their anxiety and promote their cooperation with emergency nursing procedures.

(6) During thrombolytic therapy, pay close attention to the changes of the patient's vital signs, such as heart rate, blood pressure, and body temperature, observe whether the patient's pupils and pulse are abnormal, as well as prevent secondary damage to the brain as a result of cerebral ischemia.

2.4. Observation indicators

The emergency outcomes and efficiency of the two groups were compared.

2.5. Statistical analysis

The data in this study were calculated and analyzed by SPSS 23.0. $P < 0.05$ indicates that there is statistical

significance. The measurement data were tested by t-test and expressed in mean ± standard deviation ($\bar{x} \pm s$), while the counting data were expressed in n (%), with X^2 as the main parameter.

3. Results

3.1. Outcomes of first aid

The outcomes of first aid of the two groups are shown in **Table 1**.

Table 1. Outcomes of the two groups [n (%)]

Group	Rescue success rate	Disability rate	Mortality rate
Study group (n = 20)	19 (95.00%)	1 (5.00%)	1 (5.00%)
Control group (n = 20)	14 (70.00%)	7 (35.00%)	6 (30.00%)
X^2 value	4.329	5.625	4.329
P value	0.037	0.018	0.037

3.2. Efficiency of first aid

The comparison of the efficiency of first aid between the two groups is shown in **Table 2**.

Table 2. Comparison of the efficiency of first aid between the two groups ($\bar{x} \pm s$, min)

Group	Evaluation of condition	Reception time	Triage time	Rescue time
Study group (n = 20)	0.81 ± 0.23	4.21 ± 0.83	3.15 ± 0.37	35.46 ± 2.62
Control group (n = 20)	1.24 ± 0.68	5.34 ± 1.32	4.72 ± 1.34	40.17 ± 3.15
t value	2.679	3.241	5.051	5.141
P value	0.011	0.002	0.000	0.000

4. Discussion

Cerebral hemorrhage is a common brain disease in neurosurgery. The pathological basis of this disease is a disorder in cerebral blood supply and internal circulation, resulting in nerve damage. If the patient is not treated in time, it may endanger the patient's life. The development and change in the condition of a comatose patient with cerebral hemorrhage is complex, and the rescue is difficult, so there is not much time for the emergency nursing staffs. The conventional nursing method has low rescue efficiency and high disability rate as well as mortality rate, which is not conducive to grasping the golden opportunity of rescue, thus resulting in unsatisfactory treatment effect. Clinical research shows that the implementation of scientific and effective first-aid nursing procedures can reduce the damage to patients' neuronal tissues, improve the first aid effect, shorten the rescue time, reduce the disability rate and mortality rate, as well as change the treatment outcomes.

Emergency nursing is a professional first aid mode. The team members have clear responsibilities, carry out their responsibilities in an orderly manner, and assume targeted treatment measures according to the changes in the patient's condition, thus shortening the rescue time, improving the first aid efficiency, changing the treatment outcomes, and promoting the smooth development of first aid. In this study, 40 comatose patients with cerebral hemorrhage were selected as the research subjects, in which 20 patients received routine nursing and the remaining received emergency nursing. The first aid efficiency and outcomes of the two groups were analyzed and compared. The research results showed that the first aid efficiency of the study group was significantly higher than that of the control group, in which the condition

evaluation, reception time, triage time, and rescue time of the study group were lower than those of the control group; the emergency outcomes of the study group were also significantly better than those of the control group, indicating that emergency nursing procedures can significantly improve the first aid efficiency, clarify the understanding of patients and their family members about cerebral hemorrhage coma, and improve the overall satisfaction of patients with the nursing work. Emergency nursing is a scientific and effective nursing method to improve nursing efficiency and patient rescue efficiency. It is suitable for the rescue and nursing of comatose patients with cerebral hemorrhage. It strives for the best treatment opportunity for patients, improves the treatment outcomes, provides a good foundation for follow-up treatment, and has high clinical value. Therefore, it is worthy of further promotion in clinical practice.

In conclusion, the application of emergency nursing procedures to the nursing of comatose patients with cerebral hemorrhage helps to improve the first aid efficiency and the treatment outcomes. Good clinical results have been observed through emergency nursing; thus, it is worthy of popularization and application in clinical practice.

Disclosure statement

The author declares that there is no conflict of interest.

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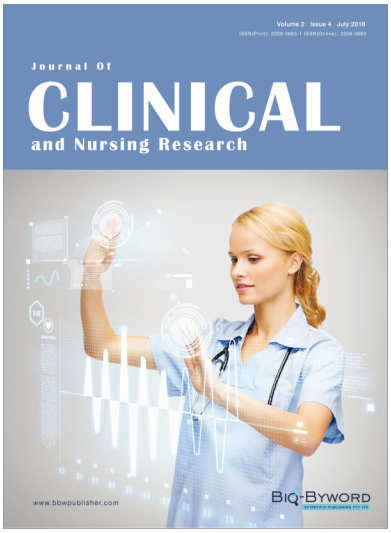

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