

Observation on the Combined Use of Liver-Soothing and Blood-Activating Formula with Western Medication After PCI for Acute Myocardial Infarction in the Elderly

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Abstract: **Objective:** To evaluate the combined application of a self-formulated liver-soothing and blood-activating formula with Western medicine in elderly patients after PCI for acute myocardial infarction. **Methods:** Ninety patients with acute myocardial infarction treated at our hospital between January 2022 and October 2023 underwent percutaneous coronary intervention (PCI) and conventional Western medication. They were randomly assigned to a control group and an observation group (n=45 each) using the random number table method. The control group received conventional Western medication alone, while the observation group received Western medication combined with the self-formulated liver-soothing and blood-activating formula. Serum inflammatory factor levels, myocardial injury markers, vascular endothelial function indicators, cardiac ultrasound parameters, quality of life scores, and clinical efficacy were compared between groups. **Results:** Pre-treatment inflammatory markers showed no statistically significant difference between groups ($P>0.05$). Post-treatment, the observation group exhibited significantly lower levels than the control group ($P<0.05$). Myocardial injury markers showed no pre- or post-treatment differences between groups ($P>0.05$). Pre-treatment vascular endothelial function indicators showed no significant difference ($P>0.05$). After treatment, compared with the control group, patients in the observation group showed a statistically significant increase in nitric oxide (NO) levels and a decrease in endothelin-1 (ET-1) levels ($P<0.05$). Regarding cardiac ultrasound indicators, there were no statistically significant differences between the two groups before treatment ($P>0.05$). Compared with the control group, patients in the observation group showed an increase in left ventricular ejection fraction after treatment, while there were no statistically significant differences in left ventricular end-diastolic diameter and left ventricular end-systolic diameter ($P>0.05$). Regarding quality of life scores, there were no statistically significant differences between the two groups before treatment ($P>0.05$). Compared with the control group, post-treatment quality of life scores decreased significantly in all domains except medication side effects and medication concerns in the observation group ($P<0.05$). Regarding clinical efficacy, the treatment response rate was 95.56% in the observation group and 82.22% in the control group, with a statistically significant difference ($P<0.05$). **Conclusion:** For elderly patients with acute myocardial infarction undergoing PCI, the combination of a proprietary liver-soothing and blood-activating formula with Western medication not only enhances overall therapeutic efficacy but also effectively reduces inflammatory factor levels, improves vascular endothelial function, promotes cardiac function recovery, and elevates clinical efficacy and quality of life. This approach holds significant value for clinical promotion and application.

Keywords: Self-formulated Liver-soothing and Blood-activating Formula; Western Medicine; Elderly Acute Myocardial Infarction; PCI.

1. Introduction

Acute myocardial infarction is a common and frequently occurring cardiovascular disease characterized by acute occlusion of the coronary artery due to various causes, leading to ischemia and necrosis in the corresponding myocardial region and resulting in impaired cardiac function. This condition is characterized by sudden onset, severe symptoms, and high mortality rates. Clinical manifestations primarily include chest pain, myocardial ischemic injury, myocardial necrosis, and acute circulatory dysfunction, posing a serious threat to the patient's life. Currently, percutaneous coronary intervention (PCI) is the primary treatment for acute myocardial infarction. While recanalizing occluded vessels can promptly restore myocardial perfusion, factors such as myocardial ischemia-reperfusion injury and ventricular remodeling continue to impact long-term outcomes and may even endanger patients' lives. Regulating the sympathetic nervous system, renin-angiotensin-aldosterone system, oxidative stress, and inflammatory injury remains crucial for improving outcomes [1]. Therefore, actively enhancing

myocardial perfusion and mitigating myocardial injury after PCI is vital for promoting recovery [2]. Increasingly, research focuses on identifying effective approaches within traditional Chinese medicine to enhance long-term outcomes for this condition. This retrospective analysis examines elderly patients with acute myocardial infarction treated at our hospital between January 2022 and October 2023. It investigates the efficacy of combining liver-soothing and blood-activating formulas with Western medications following PCI in elderly myocardial infarction patients. Findings are reported below.

2. Materials and Methods

2.1. Clinical Data

A total of 90 patients with acute myocardial infarction treated at our hospital between January 2022 and October 2023 underwent percutaneous coronary intervention (PCI) and conventional therapy. They were randomly assigned using the random number table method to a control group and an observation group, each comprising 45 patients. The

control group included 31 males and 14 females, aged 68–89 years with a mean age of (76.15 ± 3.27) years. The observation group comprised 17 males and 28 females aged 70–91 years with a mean age of (78.66 ± 5.34) years. Comparison of baseline characteristics between groups revealed no statistically significant differences ($P > 0.05$), ensuring comparability. Inclusion Criteria: All patients met WHO diagnostic criteria; Approval from the hospital ethics committee; TCM pattern diagnosis of true heart pain with qi stagnation and blood stasis syndrome; First episode with time from onset to emergency PCI ≤ 12 hours; Informed consent signed by both patient and family. Exclusion Criteria: Patients with PCI contraindications; severe dysfunction of vital organs (heart, liver, lungs, kidneys, etc.); coagulation disorders, immune diseases, malignancies, or infections; allergies to any herbal medicine components; pregnant or lactating women.

2.2. Methods

The control group received conventional Western medical treatment, while the observation group received combined treatment with Western medicine and the Liver-Soothing and Blood-Activating Formula, as detailed below.

All patients underwent PCI. Postoperatively, consistent requirements were applied regarding dietary adjustments, nutritional support, and cessation of smoking and alcohol consumption.

Control group: Enteric-coated aspirin tablets, 100 mg once daily; Ticagrelor tablets [3], 90mg per dose, twice daily; Rosuvastatin calcium tablets 10mg per dose, once daily; Metoprolol succinate sustained-release tablets 23.75mg per dose, once daily, administered orally with dosage adjusted based on heart rate and blood pressure; Sacubitril/Valsartan Sodium Tablets 50mg per dose, twice daily, orally (use if no contraindications). Management of underlying conditions such as hypertension and diabetes should follow the "Expert Consensus on Integrated Chinese and Western Medicine Diagnosis and Treatment of Acute Myocardial Infarction."

Observation Group: In addition to the control group treatment, the following proprietary formula for soothing the liver and promoting blood circulation was administered: Bupleurum root 12g, Cyperus rhizome 10g, Curcuma rhizome 30g, Ligusticum root 15g, Aquilaria wood 12g, Pentaglottis seed 12g, Corydalis tuber 15g, Salvia root 15g, Angelica root 15g, Fried Licorice 6g. Modifications based on syndrome differentiation [4]: For concomitant qi deficiency, add Astragalus 15g and Codonopsis 12g; for phlegm-dampness, add Poria 12g and Tangerine Peel 10g; for yin deficiency, add Ophiopogon 12g and Rehmannia 10g. One dose daily, 200ml each time, taken warm in two divided doses morning and evening, for 2 consecutive weeks.

2.3. Observation Indicators

Compare serum inflammatory factor levels, myocardial injury markers, vascular endothelial function indicators,

cardiac ultrasound parameters, quality of life scores, and clinical efficacy between groups before and after treatment. Collect 5ml of morning peripheral venous blood on PCI Day 1 and PCI Day 14. Perform cardiac color Doppler ultrasound, complete the Multidimensional Myocardial Infarction Assessment Scale, and evaluate clinical efficacy using the Clinical Efficacy Evaluation Scale. Serum markers included: high-sensitivity C-reactive protein, interleukin-6, matrix metalloproteinase-9, creatine phosphokinase isoenzymes, troponin, nitric oxide (NO), endothelin-1 (ET-1). Echocardiographic parameters: left ventricular ejection fraction, left ventricular end-diastolic diameter, left ventricular end-systolic diameter. The Chinese version of the Multidimensional Myocardial Infarction Assessment Scale, translated from Professor David Thompson's original, was used to evaluate patient quality of life. Lower scores indicate better quality of life. Clinical efficacy was categorized as marked improvement, improvement, or no improvement according to the Chinese Herbal Medicine Clinical Efficacy Evaluation Criteria for Angina Pectoris. Criteria: 1. Marked improvement: After treatment, symptoms such as severe precordial pain substantially or completely resolved, with recovery exceeding 90%. Electrocardiogram (ECG) showed at least 50% of inverted T waves flattened and ST segment depression of 0.1-0.3 mV. 2. Effective: After treatment, improvement in symptoms such as severe precordial pain exceeds 50%, and ECG shows more than 30% T-wave inversion with flattening and ST-segment depression of 0.05-0.10 mV. 3. Ineffective: No improvement or relief of symptoms post-treatment, with ECG showing neither ST segment nor T wave changes meeting the above criteria. Overall incidence rate = (Marked improvement + Effective) / Total cases $\times 100\%$.

2.4. Statistical Analysis

Data were analyzed using SPSS 27.0 software. Quantitative data are expressed as mean $\pm$ SD ($\bar{X} \pm S$), analyzed by t-test. Categorical data are presented as percentages and analyzed by chi-square χ^2 test. Differences were considered statistically significant at $P < 0.05$.

3. Results

3.1. Comparison of Serum Inflammatory Cytokine Levels Before and After Treatment in Both Groups

There was no statistically significant difference in pre-treatment levels of high-sensitivity C-reactive protein (hs-CRP), interleukin-6 (IL-6), and matrix metalloproteinase-9 (MMP-9) between the two groups ($P > 0.05$). Post-treatment levels of hs-CRP, IL-6, and MMP-9 were significantly lower in the observation group compared to the control group ($P < 0.05$), as detailed in Table 1.

Table 1. Comparison of serum inflammatory factor levels before and after treatment in both groups ($\bar{X} \pm S$)

Group	Number of Cases	Time	High-Sensitivity C-Reactive Protein (mg/L)	Interleukin-6 (ng/L)	Matrix Metalloproteinase-9 (μ g/L)
Observation Group	45	Before treatment	6.85 $\pm$ 1.13	46.13 $\pm$ 13.84	246.24 $\pm$ 66.05
		After treatment	5.11 $\pm$ 0.94	30.06 $\pm$ 9.04	161.15 $\pm$ 51.35
Control group	45	Before treatment	6.79 $\pm$ 1.34	45.49 $\pm$ 15.11	240.06 $\pm$ 64.22
		After treatment	5.82 $\pm$ 1.03	35.83 $\pm$ 10.24	209.81 $\pm$ 70.69

3.2. Comparison of Myocardial Injury Indicators Before and After Treatment Between the Two Groups

There were no statistically significant differences in

myocardial injury indicators between the two groups before and after treatment ($P>0.05$); see Table 2 for details.

Table 2. Comparison of myocardial injury indicators before and after treatment in both groups ($\bar{x} \pm S$)

Group	Number of Cases	Creatine Phosphokinase-Isozyme (U/L)		Troponin I (ng/ml)	
		Before Treatment	After Treatment	Before treatment	After treatment
Observation group	45	284.06 $\pm$ 6.15	20.02 $\pm$ 3.51	4.85 $\pm$ 0.63	0.02 $\pm$ 0.003
Control group	45	282.98 $\pm$ 6.03	21.93 $\pm$ 4.01	4.72 $\pm$ 0.57	0.03 $\pm$ 0.005

3.3. Comparison of Vascular Endothelial Function Indicators Before and After Treatment in Both Groups

There was no statistically significant difference in NO and

ET-1 levels between the two groups before treatment ($P>0.05$). Compared with the control group, the observation group showed a statistically significant increase in NO levels and a decrease in ET-1 levels after treatment ($P<0.05$).

Table 3. Comparison of vascular endothelial function indicators before and after treatment in both groups ($\bar{x} \pm S$)

Group	Number of Cases	Nitric Oxide (μ mol/L)		Endothelin-1 (μ g/L)	
		Before Treatment	After Treatment	Before Treatment	After treatment
Observation group	45	64.08 $\pm$ 6.03	76.93 $\pm$ 9.01	85.72 $\pm$ 11.57	63.53 $\pm$ 11.25
Control group	45	63.26 $\pm$ 6.15	69.12 $\pm$ 8.51	84.85 $\pm$ 10.63	74.32 $\pm$ 10.13

3.4. Comparison of Cardiac Ultrasound Parameters Before and After Treatment in Both Groups

There were no statistically significant differences in echocardiographic parameters between the two groups before

treatment ($P>0.05$). After treatment, the left ventricular ejection fraction in the observation group increased compared to the control group, while there were no statistically significant differences in left ventricular end-diastolic diameter and left ventricular end-systolic diameter ($P>0.05$). See Table 4 for details.

Table 4. Comparison of Cardiac Ultrasound Parameters Before and After Treatment in Both Groups ($\bar{x} \pm S$)

Group	Number of Cases	Time	Left Ventricular Ejection Fraction (%)	Left Ventricular End-Diastolic Diameter (mm)	Left Ventricular End-Systolic Diameter (mm)
Observation Group	45	Before treatment	45.69 $\pm$ 3.58	52.94 $\pm$ 5.38	38.06 $\pm$ 3.82
		After treatment	57.06 $\pm$ 6.42	48.71 $\pm$ 2.79	34.37 $\pm$ 3.02
Control group	45	Before treatment	46.38 $\pm$ 3.66	52.86 $\pm$ 5.11	37.81 $\pm$ 3.75
		After treatment	54.22 $\pm$ 6.12	50.06 $\pm$ 3.03	34.99 $\pm$ 3.11

3.5. Comparison of Quality of Life Scores Before and After Treatment in Both Groups

There was no statistically significant difference in quality

of life scores between the two groups before treatment ($P>0.05$). Compared with the control group, patients in the observation group showed statistically significant reductions in all quality of life scores after treatment except for medication side effects and concerns about medication use ($P<0.05$). See Table 5 for details.

Table 5. Comparison of Quality of Life Scores Before and After Treatment in Both Groups ($\bar{x} \pm S$)

Group	Number of Cases	Time	Physical Activity	Emotional Reaction	Dependency	Safety	Diet	Drug Side Effects	Concerns about medication
Observation group	45	Before Treatment	29.11 $\pm$ 6.34	9.21 $\pm$ 2.24	8.27 $\pm$ 1.85	16.99 $\pm$ 4.42	5.44 $\pm$ 1.56	0.99 $\pm$ 0.13	5.11 $\pm$ 1.34
		After treatment	13.58 $\pm$ 4.03	3.45 $\pm$ 0.94	2.24 $\pm$ 1.67	7.12 $\pm$ 1.91	2.08 $\pm$ 0.34	0.77 $\pm$ 0.11	1.44 $\pm$ 0.07
Control group	45	Before treatment	28.84 $\pm$ 6.05	9.06 $\pm$ 2.05	8.12 $\pm$ 1.69	16.54 $\pm$ 4.03	5.21 $\pm$ 1.37	0.92 $\pm$ 0.12	5.06 $\pm$ 1.13
		After treatment	15.34 $\pm$ 4.12	4.52 $\pm$ 2.05	3.11 $\pm$ 1.75	8.53 $\pm$ 2.05	2.64 $\pm$ 0.41	0.80 $\pm$ 0.12	1.53 $\pm$ 0.08

3.6. Comparison of Clinical Efficacy Between the Two Groups

The treatment efficacy rate in the observation group was

95.56%, while that in the control group was 82.22%. Compared with the control group, the observation group demonstrated significantly higher clinical efficacy with statistically significant differences ($P<0.05$). See Table 6 for

details.

Table 6. Comparison of Clinical Efficacy Between Groups [n (%)]

Group	Number of Cases	Marked improvement	Effective	No Effect	Overall Efficacy Rate
Observation Group	45	28 (62.22)	15 (33.33)	2 (4.44)	43 (95.56)
Control group	45	17 (37.78)	20 (44.44)	8 (17.78)	37 (82.22)

4. Discussion

Currently, the incidence of acute myocardial infarction continues to rise, with elderly patients accounting for a significant proportion. With the development of chest pain centers, percutaneous coronary intervention (PCI) has become the most effective treatment for acute myocardial infarction. PCI recanalization of the culprit vessel promptly restores myocardial blood supply, simultaneously causing reperfusion injury, vascular endothelial cell damage, and stimulating platelet aggregation, inflammation, and oxidative stress reactions. Combined with the presence of post-myocardial infarction complications, patients who have undergone myocardial infarction procedures face increased probabilities of recurrent myocardial infarction and angina pectoris, leading to a significant decline in quality of life ([5]). Therefore, exploring effective integrated Chinese and Western medicine treatment protocols holds significant importance for disease recovery.

Traditional Chinese medicine classifies acute myocardial infarction as falling under the category of "true heart pain," with the disease location centered in the heart and involving the liver, kidneys, and other organs. Its pathological characteristics primarily involve qi stagnation and blood stasis, leading to obstruction of the heart meridians [6]. Coronary artery intervention can promptly reopen occluded vessels and restore myocardial perfusion, but it cannot resolve the underlying TCM pathomechanisms of qi stagnation and blood stasis, or obstruction of the heart meridians. Since the chest is the seat of qi, where qi and blood converge, and also the boundary of the liver meridian's course, impaired qi and blood circulation leads to qi stagnation and blood stasis in the chest. Compounded by the fact that such patients often experience dual-heart issues like anxiety, they are prone to emotional distress, impairing liver function and causing liver qi stagnation. Blood is the mother of qi, and qi is the commander of blood; stagnant qi leads to blood stasis, resulting in symptoms like chest tightness, chest pain, restlessness, insomnia, irritability, and anger. Therefore, treatment should focus on regulating liver qi and promoting qi circulation with herbs [7], combined with Chinese herbs that promote blood circulation, resolve blood stasis, and unblock meridians to improve the syndrome of qi stagnation and blood stasis.

The liver-soothing and blood-activating formula used in this study contains: Bupleurum root (12g), Cyperus rhizome (10g), Curcuma rhizome (30g), Ligusticum root (15g), Aquilaria wood (12g), Pentaglottis seed (12g), Corydalis tuber (15g), Salvia root (15g), Danggui 15g, and Fried Gancao 6g. Among these: - Chaihu disperses heat and soothes the liver to relieve depression; - Xiangfu soothes the liver to relieve depression and regulates qi to ease the middle; - Chuanxiong promotes blood circulation and qi flow; - Yujin promotes blood circulation to relieve pain, regulates qi to relieve depression, and clears the heart to cool the blood; Danggui invigorates and nourishes blood; Aquilaria, Wu Ling Zhi, and Corydalis promote blood circulation, regulate qi, and

relieve pain; Danshen activates blood circulation, removes stasis, unblocks menstruation, alleviates pain, and clears the heart to relieve restlessness; Fried Licorice harmonizes the actions of all herbs and helps reduce action potential instability [8]. The combination of these herbs synergistically promotes blood circulation, removes blood stasis, regulates qi, and relieves depression. This formula addresses both liver qi stagnation and blood stasis, aligning with the pathological characteristics of this condition [9]. Modern pharmacological studies indicate that multiple herbs in this formula, including Bupleurum, Ligusticum, and Curcuma, can alleviate myocardial ischemia and hypoxia damage, improve vascular endothelial function, promote cardiac function recovery, protect myocardial tissue, and optimize overall therapeutic efficacy and prognosis.

This study demonstrated that post-treatment levels of C-reactive protein, interleukin-6, and matrix metalloproteinase-9 were significantly lower in the observation group compared to the control group. This indicates the formula's efficacy in mitigating vascular oxidative stress and inflammatory damage following myocardial infarction. When combined with Western medications, blood-activating Chinese herbs exert synergistic effects through multi-target mechanisms to inhibit oxidative stress and inflammatory responses. This mechanism aligns with the effects of blood-activating formulas like Astragalus and Cinnamon Twig Decoction in mitigating reperfusion injury after PCI [10]. Post-treatment, patients in the observation group exhibited elevated NO levels and reduced ET-1 levels, indicating that this formula promotes anti-platelet aggregation, coronary artery dilation, improved vascular endothelial function, and inhibition of vascular endothelial cell proliferation [11]. This suggests the combined regimen effectively suppresses inflammatory responses and enhances vascular endothelial function, consistent with current domestic research findings on integrated Chinese and Western medicine reducing vascular endothelial injury [12]. The observation group exhibited a higher left ventricular ejection fraction post-treatment compared to the control group, indicating that this formula aids in restoring cardiac function after myocardial infarction. Post-treatment, the observation group demonstrated lower quality-of-life scores across all domains except for medication side effects and concerns about drug use compared to the control group. The treatment efficacy rate was 95.56% in the observation group versus 82.22% in the control group. The higher treatment efficacy rate in the observation group suggests that combining the Liver-Soothing and Blood-Activating Formula with Western medicine for elderly patients after PCI for acute myocardial infarction enhances clinical outcomes, effectively alleviating symptoms and improving quality of life post-infarction [13]. Limitations of this study include a small sample size and poor patient compliance with long-term oral Chinese herbal medication. Further large-scale, long-term clinical studies are needed to refine these findings.

In summary, the combination of liver-soothing and blood-activating formula with Western medicine demonstrates significant efficacy in elderly patients after PCI for acute

myocardial infarction. It reduces inflammatory responses, inhibits platelet aggregation, improves vascular endothelial function, suppresses endothelial cell proliferation, enhances cardiac function and quality of life, alleviates postoperative symptoms, promotes recovery, and improves long-term prognosis. This approach warrants widespread clinical promotion and application.

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