Efficacy of Sanqi Powder Combined with Finger Exercises for Upper Limb Hematoma after Percutaneous Coronary Intervention

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Abstract

Objective To investigate the clinical effect of external application of Panax notoginseng powder combined with six-step finger exercises on upper limb hematoma following percutaneous coronary intervention (PCI). Methods One hundred patients with upper limb hematoma complicating PCI were divided into control and observation groups according to admission time; the control group received 50% magnesium sulfate wet compress combined with topical Hirudoid, while the observation group received external application of Panax notoginseng powder combined with six-step finger exercises intervention; hematoma resolution time, arm circumference, pain scores (VAS), comfort level (GCQ), and incidence of complications were compared between the two groups. Results The observation group demonstrated significantly superior outcomes compared to the control group in hematoma resolution time, arm circumference, pain scores (VAS), comfort level (GCQ), and complications (all $P<0.05$). Conclusion For patients with upper limb hematoma following PCI, intervention with external application of Panax notoginseng powder combined with six-step finger exercises can accelerate hematoma absorption in the affected limb, relieve pain, improve comfort level, and reduce the risk of complications.

Full Text

Efficacy of Sanqi Powder Combined with Finger Exercises on Upper Limb Hematoma After Coronary Intervention

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Abstract

Objective: To investigate the clinical effect of external application of Sanqi powder combined with six-step finger exercises on upper limb hematoma following coronary intervention.

Methods: A total of 100 patients who developed upper limb hematoma after coronary intervention were divided into control and observation groups based on admission sequence. The control group received 50% magnesium sulfate wet compress combined with hirudoid external application, while the observation group received Sanqi powder external application combined with six-step finger exercise intervention. Hematoma regression time, arm circumference, pain scores (VAS), comfort levels (GCQ), and complication rates were compared between the two groups.

Results: The observation group showed significantly better outcomes than the control group in hematoma regression time, arm circumference, pain scores (VAS), comfort levels (GCQ), and complications (all $P<0.05$).

Conclusion: For patients with upper limb hematoma after coronary intervention, Sanqi powder external application combined with six-step finger exercise intervention can accelerate hematoma absorption, alleviate pain, improve comfort, and reduce complication risk.

Keywords: Sanqi powder; six-step finger exercise; coronary intervention; upper limb hematoma; nursing intervention

Introduction

Coronary heart disease represents a major cardiovascular threat to human health. In 2022, the number of coronary heart disease patients in China reached approximately 11.39 million, with elderly patients aged 60 and above accounting for nearly 30% of cases [1]. As population aging and urbanization accelerate, the incidence of coronary heart disease continues to rise annually [2]. Coronary angiography (CAG) and percutaneous coronary intervention (PCI) are currently the most effective methods for early diagnosis and treatment [3]. In recent years, transradial coronary intervention (TRI) has been recommended as the preferred approach for coronary heart disease patients due to its superior safety and comfort [4].

The most common complication of this procedure is forearm hematoma [5], which often results from operator inexperience, patient-specific factors, excessive anticoagulant use, inadequate nursing observation, and improper compression at the puncture site [6]. Studies have reported hematoma incidence rates of 0%-12% after radial artery puncture [7]. If large hematomas are not treated promptly, they can cause severe pain, local tissue ischemia and necrosis, thrombosis formation, and even skin breakdown, potentially leading to compartment syndrome in severe cases [8]. These complications reduce patient compliance,

increase suffering, and prolong hospitalization and costs. Therefore, early detection and treatment with strengthened nursing intervention for limb hematoma are critically important.

Current standard care typically employs 50% magnesium sulfate wet compress combined with hirudoid external application, but hematoma resolution is slow and effects on established hematomas are limited. In recent years, traditional Chinese medicine has demonstrated unique advantages in postoperative rehabilitation. Sanqi (*Panax notoginseng*), a prestigious traditional Chinese medicinal herb, possesses bidirectional regulatory characteristics of hemostasis without stasis and stasis dispersion without harming vital energy. Its active component, Panax notoginseng saponins (PNS), can significantly reduce blood viscosity and promote tissue edema absorption [9]. Based on evidence-based nursing concepts, this study is the first to explore the combined application of Sanqi powder and rehabilitation exercise, applying Sanqi powder external application combined with six-step finger exercises to treat limb hematoma and pain in patients after transradial coronary intervention, achieving satisfactory results.

Methods

1.1 Study Subjects From January 2022 to December 2024, 100 patients who developed upper limb hematoma after transradial coronary intervention at our hospital were enrolled. **Inclusion criteria:** (1) Upper limb hematoma occurring within 24 hours after transradial coronary intervention with diameter $ 2*cm*; (2)$Normalpreoperativeplateletcount$(100−300×10^{9}$/L) and normal coagulation parameters (PT, APTT, TT, FIB within institutional reference ranges); (3) Clear consciousness, normal communication ability, and signed informed consent; (4) Affected limb muscle strength ≥grade 4 (Lovett scale). **Exclusion criteria:** (1) Severe dysfunction of heart, liver, kidney, or lung (e.g., NYHA class IV heart failure, chronic kidney disease stage 5); (2) Preoperative limb trauma, deformity, or mobility limitation; (3) History of mental illness (e.g., depression, schizophrenia); (4) Postoperative hemodynamic instability (systolic blood pressure <90 mmHg or requiring vasoactive drugs); (5) Postoperative high-dose anticoagulation (heparin >50 IU/kg/h).

A non-randomized concurrent controlled design was used: the first 50 admitted patients were assigned to the control group and the subsequent 50 to the observation group. The control group comprised 26 males and 24 females, aged 37-79 years (mean 56.20$±7.39*years*).$Theobservationgroupcomprised25malesand25females, aged34−76years(mean55.14±$6.89 years). Baseline characteristics including gender and age showed no significant differences between groups (P>0.05). This study protocol was approved by our institutional medical ethics committee.

1.2.1 Intervention Methods A research team was established, led by one deputy chief nurse ($ $15 years of experience, including $ $5 years in cardiovascular medicine$)$and$comprising$five years in cardiovascular medicine). All team members completed standardized training including: Sanqi powder external application procedures, six-step

finger exercise instruction, and data collection protocols (unified VAS scoring language, standardized circumference measurement techniques). Training evaluation included theoretical examination (closed-book, $ $90 points required) and practical assessment (scored by team leader, $ $95 points required). Team members qualified for study participation only after passing three consecutive practical assessments and signing operation commitment letters. To ensure rigor, all operations and data collection were performed by two designated team members (one for procedure execution, one for data recording).

Control Group: After returning to the ward following transradial coronary intervention, patients received routine limb observation by responsible nurses. Upon hematoma detection, the research team marked the hematoma border (with marker pen) and measured circumference at the most swollen area of both the affected and healthy limbs to determine hematoma extent. Treatment involved magnesium sulfate wet compress: based on swelling extent and avoiding the puncture site, 50% magnesium sulfate injection (10ml:5g, Tianjin Pharmaceutical Peace Co., Ltd.) was used to saturate 4 layers of sterile gauze (5$×$5cm) to the point of no dripping, covering the hematoma area (extending $ $2cm beyond edges) while avoiding the puncture site; outer plastic film (extending 1cm beyond gauze edges) secured the compress. After 30 minutes, the compress was removed, skin was cleaned and dried, and 1.5-2 hours later, hirudoid was applied to an area 2-3cm larger than the hematoma, 3-4 times daily until hematoma resolution.

Observation Group: Received Sanqi powder external application combined with six-step finger exercise intervention. **Specific methods:** After elastic bandage removal at 24 hours, appropriate amount of Sanqi powder was mixed with warm water to form a paste. Two layers of sterile gauze were fully soaked in the Sanqi paste and applied to the affected area, covering 2-3cm beyond the hematoma extent while avoiding the needle puncture site, then wrapped with plastic film. Application was performed once daily until complete hematoma resolution. This was combined with six-step finger exercises initiated once the patient' s condition stabilized (generally 30 minutes post-procedure), performed once hourly during non-sleep periods until elastic bandage removal, then every 2 hours after bandage removal. Exercises were performed gently to avoid loosening the elastic bandage and causing bleeding. Patients were closely monitored, and exercises were suspended if vital signs were unstable, limb numbness occurred, or pain was intolerable, resuming after symptom relief; exercises were discontinued if wound bleeding, local blisters, or radial artery spasm occurred.

The six-step finger exercise comprises six active hand movements summarized as "grasp, touch, count, press, extend, and flick." **Grasp:** Extend all five fingers with palm upward, then make a fist. **Touch:** Touch the thumb sequentially to the index, middle, ring, and little fingers. **Count:** Extend all five fingers, then bend them sequentially from thumb to little finger for counting exercise. **Press:** Extend all five fingers, then use the thumb to press sequentially on the index, middle, ring, and little fingers. **Extend:** Keep all five fingers together

with palm upward, then forcefully extend all fingers. **Flick:** Use the thumb to hold down fingertips of the index, middle, ring, and little fingers sequentially, then flick them open. Each movement cycle was repeated 10-15 times.

1.2.2 Evaluation Methods Data collection was performed simultaneously by the team leader and one team member. **Outcome measures included:** (1) Hematoma regression time: time from intervention initiation to complete hematoma absorption; (2) Arm circumference: measured using a flexible tape at the most swollen area of the affected limb and the corresponding area of the healthy limb (in cm), assessed before intervention and on days 1-6; (3) Pain score (VAS): assessed using the Visual Analogue Scale (VAS, 0-10 points) [10] before intervention and on days 1-6; (4) Comfort score (GCQ): assessed using the General Comfort Questionnaire (GCQ) comprising physiological, psychological, sociocultural, and environmental dimensions, with total scores ranging from 28-112 points (28-56=poor comfort, 57-84=moderate comfort, 85-112=good comfort); (5) Complication rate: including local skin allergy, tension blisters, and compartment syndrome.

1.2.3 Statistical Methods Data were analyzed using SPSS 26.0 statistical software. Measurement data were expressed as mean±standard deviation. After Shapiro-Wilk testing, normally distributed data were compared between groups using independent samples t-test; non-normally distributed data were expressed as median (quartiles) [M(Q1,Q2)] and compared using Mann-Whitney U test. Count data were expressed as number (percentage) [n(%)] and compared using ^{2} test. $P<0.05$ was considered statistically significant.

Results

2.1 Comparison of Hematoma Regression Time The observation group showed significantly shorter complete hematoma regression time compared with the control group ($P<0.05$). See Table 1 .

2.2 Comparison of Arm Circumference No significant difference in arm circumference was observed between groups before intervention ($P>0.05$). After intervention, the observation group showed significantly reduced arm circumference and more pronounced swelling reduction compared with the control group ($P<0.05$). See Table 2 .

2.3 Comparison of Pain Scores No significant difference in pain scores was observed between groups before intervention ($P>0.05$). After intervention, both groups showed pain reduction, with significantly lower pain scores in the observation group compared with the control group ($P<0.05$). See Table 3 .

2.4 Comparison of Comfort Scores No significant difference in comfort scores was observed between groups before intervention ($P>0.05$). After inter-

vention, both groups showed increased comfort scores, with significantly higher scores in the observation group compared with the control group ($P<0.05$). See Table 4 .

2.5 Comparison of Complication Rates The observation group showed significantly lower complication rates compared with the control group ($P<0.05$). The observation group had only 2 cases of mild skin redness that resolved spontaneously without special treatment, while the control group had 3 cases of local blisters and 4 cases of allergic reactions; no serious complications such as compartment syndrome occurred in either group. See Table 5 .

Discussion

Transradial coronary intervention is gradually becoming the preferred approach for interventional treatment due to its advantages of easy nursing care, minimal trauma, and rapid recovery, representing one of the recognized effective treatments for coronary heart disease [11]. However, the radial artery wall is relatively thin with a small diameter and is prone to spasm, making it susceptible to injury during TRI [12]. Additionally, patients require long-term oral anticoagulants that prolong coagulation time. Under these conditions, factors such as vascular injury, inaccurate puncture site compression, insufficient compression time, inadequate compression pressure, or postoperative antiplatelet drug use may dissolve newly formed blood clots on the arterial wall, increasing the risk of local hematoma and upper limb swelling [13]. When subcutaneous hematoma forms, the puncture site exhibits local swelling and pain with varying degrees of ecchymosis [14], which can lead to tissue ischemia, necrosis, and thrombosis, potentially causing upper limb dysfunction in severe cases. Therefore, early nursing intervention for limb subcutaneous hematoma is extremely important.

Magnesium sulfate wet compress combined with hirudoid external application is currently the conventional treatment for limb swelling after coronary intervention. The hyperosmotic property of magnesium sulfate promotes gradual hematoma resolution, while magnesium ions dilate blood vessels, improve microcirculation, and exert anti-inflammatory effects to achieve swelling reduction and pain relief [15]. Hirudoid ointment' s main component is mucopolysaccharide polysulfate, which research shows can rapidly penetrate skin and accelerate edema and hematoma dispersion by improving local circulation without interfering with normal blood system function [16]. However, magnesium sulfate compress causes local skin dehydration and wrinkling, requires frequent gauze changes, and drug crystals can irritate and damage skin, affecting patient compliance [17]. Moreover, its onset is slow with delayed symptom relief, which is not conducive to postoperative recovery, necessitating more efficient treatment methods.

Traditional Chinese medicine holds that subcutaneous hematoma at puncture sites results from impaired local blood vessel circulation causing blood to ex-

travasate beyond vessels and accumulate subcutaneously. Treatment principles therefore focus on clearing heat and detoxifying, activating blood to remove stasis, and unblocking collaterals to relieve pain [15]. Sanqi possesses dual hemostatic and blood-activating effects, can improve vascular endothelial function, inhibit platelet aggregation, reduce blood viscosity, improve local circulation, and reduce limb swelling while providing analgesia. Its ginsenoside Rg1 component can inhibit TRPV1-mediated responses in skin keratinocytes, thereby alleviating pain [18-19]. The six-step finger exercise employs "grasp, touch, count, press, extend, and flick" movements to mobilize joints on the operative side, accelerating local blood circulation and metabolism, reducing inflammatory nerve stimulation, eliminating edema, and promoting early repair of damaged nerves and vessels, effectively improving postoperative limb pain and swelling symptoms while reducing local vascular complications and enhancing patient comfort [20-21]. Therefore, Sanqi powder external application combined with six-step finger exercises can fully exert both pharmacological effects and early rehabilitation benefits, effectively reducing swelling and pain, activating blood to remove stasis, and shortening symptom improvement and pain resolution time.

This study applied Sanqi powder external application combined with six-step finger exercises in clinical nursing care for patients with upper limb hematoma after coronary intervention. Results showed that the observation group exhibited significantly reduced operative limb circumference on days 2-6 post-intervention, more pronounced swelling reduction, and significantly superior outcomes in hematoma regression time, pain scores (VAS), and comfort scores (GCQ) compared with the control group (all $P<0.05$), demonstrating that this combined intervention effectively alleviates limb swelling, reduces pain severity, and improves therapeutic efficacy.

In summary, applying Sanqi powder external application combined with six-step finger exercises for patients with upper limb hematoma after coronary intervention can effectively promote hematoma absorption, alleviate pain symptoms, improve patient comfort, and reduce complication risk. However, due to limited sample size, future large-sample studies are needed to provide scientific evidence for improving clinical intervention outcomes in patients with upper limb hematoma following coronary intervention.

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Note: Figure translations are in progress. See original paper for figures.