Original Article
Effects of comprehensive nursing interventions on stress in patients undergoing percutaneous coronary intervention

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Abstract: Objective: To discuss the effects of comprehensive nursing interventions on stress in patients undergoing percutaneous coronary intervention (PCI). Methods: A total of 110 coronary heart disease (CAD) patients who received PCI in the Second Affiliated Hospital of Nanchang University between January 2017 and July 2017 were enrolled in the study. Their baseline characteristics were retrospectively reviewed and they were randomized into the observation group (n = 55) and the control group (n = 55). The control group received conventional nursing interventions, while the observation group received comprehensive nursing interventions. Patients' stress levels were compared between the two groups through the serum levels of malondialdehyde (MDA) and lipid peroxidase (LPO); the quality of life was compared between the two groups through the scores of The MOS 36-Item Short-Form Health Survey (SF-36); the mental state was compared between the two groups through the scores of Self-Rating Anxiety Scale (SAS) and Self-Rating Depression Scale (SDS); and the self-care agency was compared between the two groups through the scores of Exercise of Self-Care Agency (ESCA). Any complication occurred during the surgery was recorded in two groups. Results: After nursing interventions, the serum levels of MDA and LPO in two groups were significantly reduced (all P < 0.001), and were significantly lower in the observation group than in the control group (all P < 0.01); the scores of SF-36 in two groups were significantly increased, while the scores of SAS and SDS in two groups were significantly decreased (all P < 0.001). Statistical differences were also found between the two groups in the scores of SF-36, SAS and SDS after nursing interventions (all P < 0.01). After nursing interventions, scores on four factors of ESCA, namely motivation, knowledge base, active vs. passive response to situations and sense of self-worth, were significantly increased in two groups (all P < 0.001), and were significantly higher in the observation group than in the control group (all P < 0.01); the observation group was significantly higher than the control group in patient satisfaction (P = 0.031). The incidence of postoperative complications was significantly lower in the observation group than in the control group (P = 0.023). Conclusion: Comprehensive nursing interventions could considerably relieve stress and negative emotions for patients undergoing PCI, such as anxiety and irritability. It could lower the incidence of complications and significantly improve patients' self-care agency and their quality of life.

Keywords: Comprehensive nursing, percutaneous coronary intervention, stress, quality of life

Introduction

Coronary heart disease (CHD) is a common cardiovascular disease. The growing prevalence of CHD in recent years is the result of accelerated population aging, irregular work-rest schedule, and unhealthy eating habits. Percutaneous coronary intervention (PCI) is an effective means for the treatment of CHD as it is curative and minimally traumatic, thus becoming a favorable option for a growing number of patients and doctors [1-3]. Nevertheless,

being traumatic in nature, PCI still has potential risks that cannot be ignored. In addition, the growing demands for effective nursing care and high-quality treatment increase the difficulty of nursing care [4-6].

Conventional nursing care was usually adopted for patients undergoing PCI. But some patients still suffer mental burden and physical problems, resulting in unsatisfactory treatment outcomes. Compared with conventional nursing care, comprehensive nursing care is developed

as a multi-faceted model based on primary nursing and basic nursing. It puts patients first, and strives to provide overall services during the perioperative period, so as to improve patient satisfaction as much as possible [7-9]. A previous study showed that the comprehensive nursing interventions for patients undergoing coronary artery bypass surgery could effectively relieve their negative emotions, such as worry and fear, thus playing a positive role in the following treatment [10]. Currently, there are only few reports over the effects of comprehensive nursing interventions on patients undergoing PCI, especially over its effects on patients' stress.

In this study, we recruited 110 CAD patients who received PCI in the Second Affiliated Hospital of Nanchang University between January 2017 and July 2017, so as to observe the effects of comprehensive nursing interventions on patients' stress, quality of life and mental state.

Materials and methods

Subjects

A total of 110 CAD patients who received PCI in the Second Affiliated Hospital of Nanchang University between January 2017 and July 2017 were enrolled in the study. Their baseline characteristics were retrospectively reviewed and they were randomized into the observation group (n = 55) and the control group (n = 55). The study was approved by the Ethics Committee of the Second Affiliated Hospital of Nanchang University. All participants and their relatives signed informed consent before entry into the study.

Inclusion criteria: Patients who had never underwent PCI before the study; patients who were sound in mental state; patients with no malignant tumor; patients without abnormalities of blood coagulation; patients with complete baseline characteristics; and patients who suffered cognitive impairment preoperatively.

Exclusion criteria: Patients who were complicated by severe organic diseases in heart, liver, and kidney; patients who suffered severe heart failure; patients who suffered severe arrhythmia; patients who dropped out of the study; patients with low treatment compliance; patients who could not engage in the follow-up on time; patients who were complicated by congenital heart disease.

Methods

The control group received conventional nursing care. First, the medical staff gave detailed introduction to patients about the ward, explained to them the importance of regular work-rest schedule and good eating habits and assisted them to undergo necessary medical tests. Second, before the surgery, the medical staff explained to the patients the benefits of the surgery and the surgical procedures. Third, after the surgery, the medical staff advised patients to drink more water to facilitate the metabolism of contrast agent and to rest more in bed before the recovery of physical condition. Successful cases of the surgery were told to the patients to reduce their negative emotions, such as worry and fear. The importance of treatment compliance was explained to the patients. Also explained to the patients were the necessities of light diet, smoking cessation, alcohol withdrawal and a right amount of exercises.

The observation group received comprehensive nursing interventions, which included several parts, namely interventions upon admission, interventions related to drug use and medical tests, interventions related to diet pattern and mental state, preoperative and intra-operative interventions, postoperative intervention. First, upon admission to hospital, the medical staff introduced to the patients the facilities of the ward and relevant regulations of the hospital, instructed them how to use the pager, and made timely assessments upon the existing and potential adverse factors of patients and took relevant safety precautions. Moreover, the medical staff explained to the patients the pathogenesis of CHD, informed them of risk factors of the disease, and instructed them about physical self-inspection. In case of hemorrhagic symptoms such as gum bleeding or hematuria, patients needed to immediately inform the relevant medical staff [11, 12]. Second, in terms of medication, the medical staff informed patients and their relatives of drug names, doses, times of taking medicine, and methods of drug administration,

Table 1. Comparison of baseline characteristics between the two groups

Group	Gender		Age range (year)	Average course of disease (year)	Types of CHD (n)		
	Male	Female			Angina pectoris	Acute myocardial infarction	Other diseases
The observation group (n = 55)	30	25	61.55±2.88	6.47±2.03	26	19	10
The control group (n = 55)	32	23	61.28±2.83	6.40±2.09	24	21	10
t/χ²	0.148		0.596	0.178	0.180		
P	0.700		0.621	0.859	0.914		

Table 2. Comparison of patients' stress in two groups before and after interventions ($\bar{x} \pm sd$)

Group	Time	MDA (µmol/L)	LPO (µmol/L)
The control group (n = 55)	Before interventions	4.13±1.60	3.80±1.01
	After interventions	3.39±1.02###	3.01±0.96###
The observation group (n = 55)	Before interventions	4.11±1.58	3.81±1.04
	After interventions	2.59±1.43**,###	2.42±1.15**,###

Note: Compared with the control group, **$P < 0.01$. Compared within the group before interventions, ###$P < 0.001$. MDA, malondialdehyde; LPO, lipoperoxide.

emphasized the importance of taking medications as prescribed by doctors, and asked them to never stop drug use or change dosage without permission. The medical staff also explained to the patients the effects, times, and precautions of relevant auxiliary examinations, so as to achieve good compliance. Third, when it comes to dietary pattern and psychological interventions, the medical staff instructed patients to increase intake of high-fiber food, which could facilitate gastrointestinal motility and help defecation, and advised them not to eat high-cholesterol food such as cream and fat meat. The medical staff communicated with patients to dispel their doubts by explaining the objective and methods of PCI, and helped them to relieve negative emotions in a reasonable way. Fourth, before the surgery, the medical staff instructed patients of how to urinate and defecate in bed, asked patients to wear hospital wristbands for accurate infusion through remaining needle. The medical staff also communicated with patients one-on-one to help patients understand the basic procedures of surgery. During the surgery, the medical staff actively assisted surgeons and paid close attention to the patient's vital signs, including state of consciousness and oxygen saturation. Fifth, after the surgery, the medical staff asked patients to rest more in bed, informed them that urination and defecation could only be done in bed, and immobilized patients' right lower limb by medical restraint strap. The medical staff

also explained to patients that drinking more water was to speed up the metabolism of contrast agent. Finally, the medical staff monitored the puncture site of patients in case of bleeding, observed the pulse of radial artery. Any abnormality was promptly reported to doctors.

Measurements

Primary indicators: Stress: All patients had been collected 5 mL of fasting venous blood in the morning before and after interventions respectively. The blood sample was centrifuged at the speed of 3,500 r/min for 5 min to separate the blood serum, which was kept for laboratory tests. The enzyme-linked immunosorbent assay (ELISA) was used to measure and compare the levels of malondialdehyde (MDA) and lipid peroxidase (LPO) of patients in the two groups. Quality of life: The MOS 36-Item Short-Form Health Survey (SF-36) was used to assess the quality of life of patients in two groups before interventions and three months after interventions respectively. This questionnaire is constructed on a hundred-mark system. A higher total score indicates higher quality of life. Mental state: Self-Rating Anxiety Scale (SAS) and Self-Rating Depression Scale (SDS) were used to assess the mental state of patients in two groups before interventions and three months after interventions respectively, the higher the total score, the more serious the state of anxiety/depression.
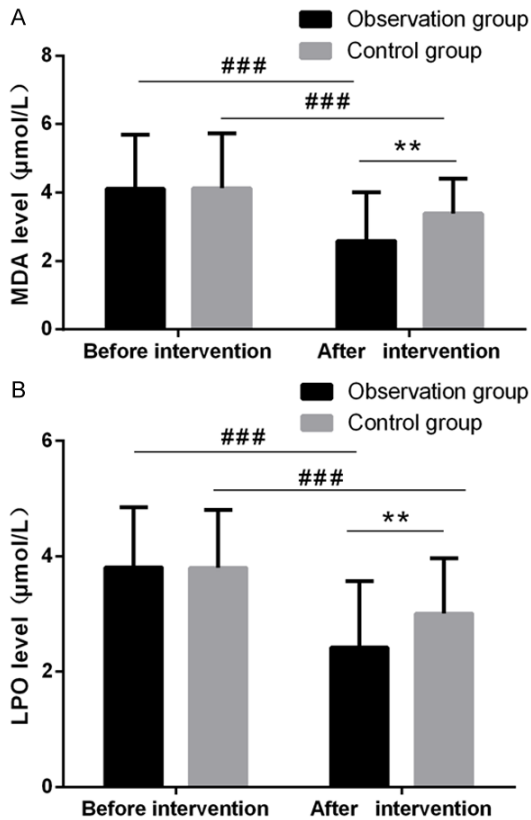
Figure 1. Comparison of patients' stress in two groups before and after interventions. A. Comparison of the MDA level between two groups; B. Comparison of the LPO level between two groups. MDA, malondialdehyde; LPO, lipoperoxide. $^{**}P < 0.010$, $^{###}P < 0.001$.

Secondary indicators: Self-care agency: Exercise of Self-Care Agency (ESCA) was adopted to assess the self-care agency of patients in two groups before interventions and three months after interventions respectively. ESCA includes four factors, namely motivation, knowledge base, active vs. passive response to situations and sense of self-worth. The total score of ESCA ranges from 0 to 172, the higher the score is, the stronger the self-care agency would be. Patient satisfaction: Our hospital had designed a scale of patient satisfaction to evaluate the patient satisfaction of the nursing care. The scale included evaluations of nursing staff, nursing measures, psychological nursing, and the entire nursing process. The scale was constructed on the hundred-mark system. A score of higher than 85 was defined as satisfactory, a score of 70 to 84 as basically satisfactory, and a score of less than 70 as unsatisfactory. Patient satisfaction = (cases of

satisfactory + cases of basically satisfactory)/ total number of cases * 100%. Complications: The incidence of postoperative complications was recorded in two groups.

Statistical analysis

All the data were statistically processed using SPSS 20.0 software package. The measurement data were expressed as mean ± standard deviation ($\overline{x}$ ± sd). Comparison within the group before and after interventions was based on paired t-test and between two groups on independent-sample t-test. The enumeration data were expressed as percentage (%), and were compared based on chi-square test. *P* value of < 0.05 is considered significant.

Results

Comparison of baseline characteristics between two groups

No significant differences were found in baseline characteristics including gender, age, the average course of disease and types of CHD between two groups (all P > 0.05). Comparative analyses between two groups could proceed. See **Table 1**.

Comparison of patients' stress in two groups before and after interventions

Before interventions, no significant differences were found in the serum levels of MDA and LPO between two groups (P > 0.05). After interventions, the serum levels of MDA and LPO in two groups were significantly reduced (all P < 0.001), and were significantly lower in the observation group than in the control group (all P < 0.01). See **Table 2** and **Figure 1**.

Comparison of quality of life and mental state between two groups before and after interventions

Before interventions, no significant differences were found in the quality of life and mental state between two groups (P > 0.05). After interventions, the scores of SF-36 were significantly increased in two groups, while the scores of SAS and SDS were significantly decreased in two groups (all P < 0.001). Statistical differences were also found between two groups in the scores of SF-36, SAS and

Table 3. Comparison of quality of life and mental state between two groups before and after interventions ($\bar{x} \pm$ sd)

Group	Time	SF-36	SAS	SDS
The control group (n = 55)	Before interventions	68.54±10.30	52.53±9.11	52.76±9.11
	After interventions	73.47±10.65###	45.67±8.43###	46.96±8.51###
The observation group (n = 55)	Before interventions	68.55±10.26	52.56±9.04	52.77±9.12
	After interventions	84.25±11.79**,###	32.89±8.21**,###	35.60±8.19**,###

Note: Compared with the control group, **P < 0.01; compared within the group before interventions, ###P < 0.001. SF-36, The MOS 36-Item Short-Form Health Survey; SAS, self-rating anxiety scale; SDS, self-rating depression scale.

Table 4. Comparison of patients' self-care agency in two groups before and after interventions ($\bar{x} \pm$ sd)

Group	Time	Motivation	Sense of self-worth	Knowledge base	Active vs. passive response to situations
The control group (n = 55)	Before interventions	18.43±5.96	21.11±3.83	33.34±5.47	27.40±4.11
	After interventions	24.87±5.22###	26.51±4.56###	38.55±6.73###	35.98±3.70###
The observation group (n = 55)	Before interventions	18.44±5.97	21.07±3.88	33.35±5.36	27.37±4.03
	After interventions	30.02±6.03**,###	31.44±5.89**,###	47.03±6.72**,###	41.21±3.65**,###

Note: Compared with the control group, **P < 0.01; compared within the group before interventions, ###P < 0.001.

Table 5. Comparison of patient satisfaction between two groups (n, %)

Group	Satisfactory	Basically satisfactory	Dissatisfactory	Patient satisfaction
The observation group (n = 55)	40	11	4	51 (94.44)
The control group (n = 55)	33	10	12	43 (78.18)
X^2				4.681
P				0.031

SDS after nursing interventions (all P < 0.01). See **Table 3**.

Comparison of self-care agency between two groups before and after interventions

No significant difference was found in patients' self-care agency between two groups before interventions (P > 0.05). After interventions, the scores of four factors of ESCA, namely motivation, namely knowledge base, active vs. passive response to situations and sense of self-worth, were improved in patients of two groups after nursing interventions (P < 0.001), and were significantly higher in the observation group than in the control group (P < 0.01). See **Table 4**.

Comparison of patient satisfaction between two groups

The observation group was significantly higher than the control group in patient satisfaction (P < 0.05). See **Table 5**.

Comparison of the incidence of postoperative complications between two groups

After surgery, there were 1 case of impaired renal function, 2 cases of vasovagal reflex, 1 case of urinary retention, and 1 case of deep venous thrombosis in the observation group; there were 3 cases of impaired renal function, 4 cases of vasovagal reflex, 4 cases of urinary retention and 3 cases of deep venous thrombosis in the control group. The incidence of postoperative complications was 9.09% in the observation group and was 25.45% in the control group. The incidence of postoperative complications in the observation group was significantly lower than in the control group (P < 0.05). After effective treatment, the postoperative complications were alleviated in patients of two groups. See **Table 6**.

Discussion

Most clinical studies have found that some procedures in the course of PCI, including punctur-

Table 6. Comparison of the incidence of postoperative complications between two groups (n, %)

Group	Impaired renal function	Vasovagal reflex	Urinary retention	Deep venous thrombosis	Incidence
The observation group (n = 55)	1	2	1	1	5 (9.09)
The control group (n = 55)	3	4	4	3	14 (25.45)
X^2					5.153
P					0.023

ing, placing cannula, might result in discomfort in patients, or even patients' rejection, leading to the body stress [13-15]. Stress levels were closely related to the treatment outcomes. And the serum levels of MDA and LPO could reflect the stress levels of the body. However, there is currently no report over the effects of comprehensive nursing interventions on the levels of MDA and LPO. In this study, the serum levels of MDA and LPO in two groups were significantly reduced after nursing interventions, and were significantly lower in the observation group than in the control group. Since most patients have no knowledge about the surgery, they usually suffer negative emotions, such as irritability, anxiety, and worry. These emotional changes can have an impact on surgical outcomes, thus affecting patients' quality of life to varying degrees after surgery. In this study, the scores of SF-36 in two groups were significantly increased after nursing interventions, while the scores of SAS and SDS in two groups were significantly decreased. Statistical differences were also found between the two groups in the scores of SF-36, SAS and SDS after nursing interventions. The results showed that comprehensive nursing care on the basis of conventional nursing care could effectively reduce patients' stress, relieve their negative emotions including worry and fear, and improve their quality of life. This might be the results of comprehensive nursing interventions in the perioperative period for patients undergoing PCI, which significantly eased patients' fear and anxiety over the surgery by helping them fully understand the pathogenesis of the disease and the surgical procedures. The relieve of negative emotions could suppress the body stress by effectively diminishing the stimulation to hypothalamus and maintaining the stability of the nervous and endocrine systems, thus leading to faster rehabilitation and contributing to a higher quality of life after surgery [16].

Though PCI could considerably improve CHD patients' physical conditions, there were still a variety of high-risk factors that would have an impact on treatment outcomes, or even lead to patients' re-admission to hospital, if not treated in a timely manner [17]. According to a previous study, developing an active lifestyle and good habits and improving patients' self-care agency and self-management ability guaranteed the early recovery of patients undergoing PCI [18]. In this study, scores on four factors of ESCA, namely motivation, namely knowledge base, active vs. passive response to situations and sense of self-worth, were significantly declined in patients of two groups after nursing interventions, and were significantly higher in the observation group than in the control group. The incidence of postoperative complications was also significantly lower in the observation group than in the control group. The results showed that comprehensive nursing interventions for patients undergoing PCI could significantly improve their self-care agency, lower the incidence of postoperative complications, and improve patient satisfaction. This was consistent with the results of the relevant study [19, 20]. There were several possible reasons. First, comprehensive nursing interventions throughout the perioperative period allowed patients and their relatives to have a better understanding of the pathogenesis and development of CHD, and ensured that the patients were monitored by their relatives in the postoperative period. Second, it was useful in bringing patients' enthusiasm into play, increasing their confidence in the treatment and ensuring their treatment compliance in the postoperative period. Therefore, comprehensive nursing interventions played a significant role in patients' recovery [21, 22].

This study still has some limitations. First, the study population was enrolled from a single center and was therefore small. A multicenter analysis with a large population is needed.

Second, the time span of the study was short. Therefore, prospective in-depth analyses with larger study population and longer time span are warranted.

In conclusion, comprehensive nursing interventions for patients undergoing PCI could considerably relieve stress and negative emotions. It could lower the incidence of complications and significantly improve patients' self-care agency, their quality of life as well as patient satisfaction. It is useful and is therefore worthy of clinical application.

Disclosure of conflict of interest

None.

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