Psychiatria Danubina, 2015; Vol. 27, No. 1, pp 44-49 *Original paper*

EFFECTS OF MASSAGE ON THE ANXIETY OF PATIENTS RECEIVING PERCUTANEOUS CORONARY INTERVENTION

Sanying Peng[1], Bie Ying[2], Yi Chen[2] & Xiamei Sun[1]

[1]*Department of Physical Education, Changzhou Campus of Hohai University, Changzhou City, China*
[2]*Lishui University of Public Health, Guangjing, China*

received: 5.10.2014; revised: 4.12.2014; accepted: 17.12.2014

SUMMARY

Background: *This study aimed to explore the effects of massage on the state anxiety of patients receiving percutaneous coronary intervention (PCI).*

Subjects and methods: *In accordance with the principle of the minimum allocation of imbalance index for comparability, a total of 117 cases that were ready to receive PCI were divided into two groups (59 in the intervention group and 58 in the control group). The patients in the control group received routine care, whereas the patients in the observation group were given massage intervention. The state anxiety, heart rate, and blood pressure of the two groups were observed and compared.*

Results: *Massage treatments reduced the emergency response and level of anxiety of cardiovascular patients before PCI. The post-intervention blood pressure, heart rate, and pain score of the intervention group were significantly better than those of the control group (P<0.05).*

Conclusions: *Health professionals should pay attention to and strengthen the exploration of the effects of reasonable care intervention mode under PCI to promote the physical and mental health of patients, as well as improve their medical care satisfaction.*

Key words: *anxiety – massage - percutaneous coronary intervention - PCI*

* * * * *

INTRODUCTION

Cardiovascular and cerebrovascular disorders are among the major diseases that currently pose a significant threat to human health (Caplan 1981). These diseases present a high mortality rate, and approximately 17 million deaths are caused by cardiovascular disorders each year worldwide. In China, the incidence and mortality of cardiovascular disease are exponentially rising with the rapidly aging population (Li 2009). Percutaneous coronary intervention (PCI) is a series of treatments involving catheter technology; through the effects of sacculus pressure expansion, mechanical cutting, laser vaporization, and ultrasound hole, metal stents are placed in the coronary to expand its narrow inner diameter for improving myocardial blood supply and alleviating clinical symptoms (Kim et al. 2001). PCI is an important means to treat cardiovascular disease; this technology is becoming increasingly mature, and the treatment effect is being recognized by the public (Fekrat et al. 2006). However, PCI can also increase a variety of serious cardiovascular events, which can cause a series of psychological and physiological disturbances in patients (Dunn et al. 1995).

The most typical preoperative psychological stress response is the acute anxiety reaction (Richards & Gibson 2000). Anxiety is a complicated and combined emotion with nervousness, anxiety, worries, and fear that people subjectively show under an environment where disaster, danger, and situations that require large efforts will occur (Zhou & Li 2012, Ferreira-Vorkapic et al. 2013, Mella et al. 2014). Carr et al. (2006) proposed that preoperative anxiety levels of patients show a steadily increasing trend, and sharply rise to the highest point before anesthesia. Piotrowski (Piotrowski et al. 2003) proposed that massage can relieve pain because the powerful stimulus, such as pressure of massage, is faster than pain along nerve pathways to block pain transmission to the brain. This study aimed to determine whether massage therapy is effective in reducing anxiety levels, and establish its potential safety and lack of side effects (McRee et al. 2003). Therefore, we aimed to ascertain the necessity of preoperative stress management in the form of massage therapy, which can improve the overall physical and mental health of a patient.

SUBJECTS AND METHODS

Subjects

According to the stipulated inclusion and exclusion criteria, 117 cases of surgical patients who were ready to receive PCI between March 2010 and December 2012 were selected. All the subjects were of Han nationality. The subjects investigated were selected from the orthopedic patients of three general hospitals of Zhejiang Province, with the approval of the medical ethics committees. Informed consent was obtained from the study participants. The privacy of patients was respected, and all information was kept confidential. The inclusion criteria were as follows: (1) admission

diagnosis was coronary artery disease, with the intention to carry out PCI surgical treatment; (2) older than 18 years of age, having certain language communication and reading skills; (3) first PCI surgical patients; and (4) without serious heart, brain, liver complications, or psychiatric disorders. The exclusion criteria were as follows: (1) patients who refused to participate in the study; (2) patients with acute myocardial infarction and acute coronary syndrome; (3) patients with neuropathy or delirium; and (4) patients who used preoperative sedation, antihypertensive drugs, or preoperative pain medications.

This study was conducted in according with the Helsinki Declaration and was approved by the institution's ethics committee. With the informed consent of the subjects in the survey, we respect the patient's right to privacy, and the patient's confidential information is not compromised.

Methods

In this study, a randomized clinical trial design was used with three factors, namely, gender, age, and illness control. In accordance with the principle of the minimum allocation of imbalance index, the 117 subjects were divided into the intervention group (59 subjects) and control group (58 subjects). The control group was not involved in the massage, and other intervention procedures were the same as in the clinical group. All patients were in a relatively quiet, interference-free environment during nursing intervention. The massage time was 20 min before surgery, and the main massaged body parts were the head, neck, shoulder, and back. The patients in the control group were treated with routine care. The patients were advised to take sitting positions, with their back toward the masseur. The masseur stood on the left side of the patients. The massage was conducted as follows. First, taking up and rubbing on neck, i.e., the masseur placed one hand on the head of the patient; for the other hand, the thumb pulp was on the opposite position of the forefinger and middle finger pulps or the remaining four fingers. The masseur rubbed the neck muscle of the patient top-down with force for 2 min. This procedure is appropriate when the patient has a sense of soreness. Second, taking up and rubbing on shoulders, i.e., the masseur placed both thumbs on both sides of scapular fossa. The remaining four fingers were placed in front of the shoulders. The thumb, four fingers, and first web space were used for taking up and rubbing on the shoulder muscle with force rhythmically for 1 min. Third, push along back waist, i.e., the masseur placed both palms on the back waist of the patient and pushed top-down along the first and second lines of the bladder meridian until lumbosacral portion for three to five times. Fourth, pressing the spine on both sides, i.e., the masseur set the thumb fingers or palm roots on the bladder meridian of the back of the patient top-down, pressed vertically downward, opened the remaining four fingers to collaboratively press the muscle repeatedly for three to five times. Fifth, taking up and rubbing on the back waist, i.e., the masseur rubbed with palms overlapped from top to bottom on both sides of the spine muscles of the patient for three to five times. This step should be conducted with smooth, consistent, and appropriate force. Finally, rolling back with side palm, i.e., the masseur attached the palm back of the near little finger side on the back of the patient, slightly flexed the metacarpophalangeal joints, performed flexion and extension activities of the active connection by wrist, induced forearm supination and pronation, and rolled the back of the palm to and fro continually on the back of the patient.

Measures

Physiological Stress Response Indicators

The heart rate was measured by a stethoscope. Blood pressure was measured by a cuff sphygmomanometer. These two indicators were measured at the second day after admission, day before surgery, and 1 h before surgery by the same nurse three times each. The average value was obtained.

Measurement of Anxiety Levels

The State-Trait Anxiety Inventory (STAI), which was designed by Spielberger in 1977, was used for measuring anxiety levels (Spielberger 1983). In the present study, we used two inventories, namely, state anxiety and trait anxiety. The former mainly measured subjective experience of fear, nervousness, and anxiety of current or recent time or scenes, and also measured stress-state anxiety. The latter measured normal anxiety level. Each inventory comprised four levels. From the first level to the fourth level, the level standards of S-AI were as follows: 1, absolutely not; 2, slightly; 3, middle level; and 4, very obvious. The level standards of T-AI were as follows: 1, almost not; 2, some; 3, often; and 4, almost always. By adding each item, we could obtain a total score. A high score indicates a high anxiety level of the patient. STAI has been proven with good reliability and effects (Spielberger 1983).

Measurement of Pain Levels

Pain severity was rated using a four-point verbal rating scale (Blenkharn et al. 2002). On the basis of the complaint of the patient of pain degree, the pain was rated into four grades, i.e., none, mild, medium, and heavy (0 is no significant pain; 1 is mild pain (i.e., patient can feel tolerable pain, has a normal life, and pain does not interfere sleep); 2 is moderate pain (i.e., patient feels obvious unbearable pain that requires painkillers, and the sleep of the patient is disturbed); 3 is severe pain (i.e., the patient cannot tolerate the pain, needs analgesics, has seriously disturbed sleep, and pain may be associated with autonomic dysfunction or passive posture)). Each level has one score. This scale has adequate reliability and validity (Blenkharn et al. 2002).

Statistical Analysis

Data were analyzed using SPSS 17.0 statistical software. Quantitative data were presented as the mean ± standard deviation ($\chi \pm s$). Comparisons between groups on the two sets of quantitative data were conducted using the t-test for independent samples. Comparisons within groups were performed using paired t-test, and comparisons between groups on the two sets of ordinal categorical data were conducted using the Wilcoxon rank test. Comparisons between groups and within the group in terms of the three indicators of physiological stress reactions were performed using repeated measurement data ANOVA (P=0.05).

RESULTS

General Information

The two groups showed insignificant differences in terms of gender, age, and required number of stents of patients (P>0.05), as shown in Table 1.

Physiological Stress Response

ANOVA showed that the groups and time factors of the three indicators, such as systolic blood pressure, diastolic blood pressure, and heart rate, exhibited a significant interaction (P<0.05). Comparisons between the groups indicated that the baseline differences among the three indicators were not statistically significant (P>0.05). One day before surgery, the systolic and diastolic blood pressure differences of the two sets were not significant (P>0.05), whereas the heart rate of the control group was significantly higher than that of the intervention group (P=0.017). One hour before surgery, the three indicators (i.e., systolic blood pressure, diastolic blood pressure, and heart rate) of the intervention group were significantly lower than those of the control group (P<0.05). Comparisons within the groups indicated that the systolic blood pressure, diastolic blood pressure, and heart rate indicators in the intervention and control groups gradually increased up until the surgery time, but this increase was less pronounced in the intervention group than that in the control group. The difference in the heart rate at 1 h before surgery was statistically significant in comparison with the baseline. The difference between systolic and diastolic blood pressures was not statistically significant (P>0.05). The three indicators of the control group at 1 h before surgery were significantly (P<0.05) higher than the baseline index values. The differences in heart rate at the day before surgery in comparison with the baseline were also statistically significant (P=0.025), as shown in Table 2.

Anxiety Level

Differences in trait anxiety between the two groups at each time point were not statistically significant (P>0.05). However, state anxiety scores of the intervention and control groups were both high. The difference within the control group was statistically significant (P=0.022), whereas the difference in the intervention group was not significant (P=0.332). One day before

Table 1. Comparison of general information of the intervention and control groups

		Intervention group (n=59)	Control group (n=58)	P
Gender	Male	40	40	0.892
	Female	19	18	
Age		59±6	60±7	0.409
Required number of stents	1	19	18	0.847
	2	19	18	
	3	9	10	
	4	12	12	

Table 2. Comparison of physiological stress response of the intervention and control groups

Indicator	Time	Intervention group	Control group
Systolic blood pressure	Baseline	122.3±14.3	123.4±13.3
	1 d before surgery	123.5±12.9	127.6±13.2
	1 h before surgery	125.1±14.6*	131.8±13.8#
Diastolic blood pressure	Baseline	74.6±11.7	74.2±9.8
	1 d before surgery	75.1±10.2	77.16±8.3
	1 h before surgery	76.5±11.2*	82.12±12.2#
Heart rate	Baseline	73±5	74±5
	1 d before surgery	74±8*	77±5#
	1 h before surgery	76±8*#	84±9#

Note: Fsystolic blood pressure (interaction) =4.354, P=0.012; Fsystolic blood pressure (interaction) =3.997, P=0.044; Fsystolic blood pressure (interaction) =5.125, P=0.009; * indicates that the control group has P<0.05 in the same time point; # represents the baseline of the same group, P<0.05

Table 3. Comparison of anxiety level of the intervention and control groups

Indicator	Time	Intervention group (n=59)	Control group (n=58)
State anxiety	Baseline	40.86±7.24	41.03±8.24
	1 d before surgery	42.97±10.66	45.15±7.34#
	D (difference)	2.11±2.79*	4.12±3.20
Trait anxiety	Baseline	39.31±10.52	40.29±6.29
	1 d before surgery	40.81±9.67	41.60±8.44
	D (difference)	1.50±2.84	1.31±3.05

Note: * indicates that the control group has P<0.05 in the same time point; # represents the baseline of the same group, P<0.05

Table 4. Comparison of postoperative pain levels of the two groups

		Intervention group (n=59)	Control group (n=58)	P
Average score		1.15±0.71	1.52±0.78	0.009
Pain ratings	0	9 (15.3%)	4 (6.9%)	0.010
	I	34 (57.6%)	26 (44.8%)	
	II	14 (23.7%)	22 (37.9%)	
	III	2 (3.4%)	6 (10.3%)	

surgery, state anxiety in the control group was significantly higher than that in the intervention group, and the change in the value of inter-group difference was statistically significant (t=3.62, P<0.001) (Table 3).

Postoperative Pain Level

Table 4 shows that the pain of patients in the interference group was obviously less than that of patients in the control group, and the difference was statistically significant (t=2.64, P=0.009). Pain levels were processed with Wilcoxon, inspected, and presented. The differences between groups were also statistically significant (Z=2.57, P=0.010). The control group occupied a larger percentage than the interference group in high pain levels (Table 4).

DISCUSSION

With the development of medical standards and changes in medical models, the requirements of holistic nursing of patients are increasing. For cardiovascular PCI surgery, preoperative preparation and postoperative rehabilitation of patients are performed outside the hospital; communication with health care workers is limited, and the time is short, which may affect the access of patients to relevant knowledge and mental preparation (Delaney et al. 2002). Many domestic and foreign studies have confirmed that nursing preoperative intervention can effectively alleviate the preoperative levels of psychological stress response in cardiovascular PCI patients (Tiidus 2000). Preoperative intervention can be conducted in various forms, mainly psychological intervention, music therapy, aromatherapy, and massage therapy (Hernandez-Reif et al. 2001). Such interventions help patients form correct knowledge and information, as well as prepare well before surgery (Wentworth et al. 2009). For the psychological state and health needs of PCI patients at early stage, an effective channel of communication and a trust relationship between nurses and patients should be established. The establishment of the preoperative operation system should be constantly improved, and patient-centered care measures throughout the entire surgical process should be implemented.

When animals encounter a variety of emergency situations, such as strenuous exercise, blood loss, or bitter cold, their bodies experience a series of widely strengthened sympathetic-adrenal system activity (Field 1998). This phenomenon is the stress response. Psychologist Walter Cannon proposed stress theory. Reactions include accelerated heart beat, a wide range contraction of skin and splanchnic vascular, bronchiectasis, and glycogenolysis acceleration. The physiological significance lies in the mobilization of the potential power of the body to adapt to drastic changes in the environment. The activities of the cardiovascular system and stress hormones can be increased, thereby resulting in a tense mood. By contrast, when the parasympathetic division is active, the body is at rest, rather than facing threats and dangers, which can reduce cardiovascular activity, reduce stress hormones, and recover mood. Research has proven that massage can reduce stress hormones and physiological reactions, and stimulate the parasympathetic activity of the autonomic nervous system (Ferrell-Torry & Glick 1993, Hulme et al. 1999, Schachner et al. 1998).

Massage not only reduces nervous emotions, but also maintains a nice balance of vagus nerve and sympathetic activities; it is good for preventing stress by reducing the anxiety (Zhou et al. 2013) and nervous status of patients before surgery. McCaffrey and other researchers (McCaffrey & Taylor 2005) suggested that the reduction in preoperative anxiety and tensions of patients who are ready for PCI is highly important in improving patient comfort and relieving stress risk factors that may affect the demand for myocardial blood supply. The results of this study showed that the anxiety

levels of patients in the intervention group were lower than those in the control group after implementation of the massage care program. Moreover, the massage care intervention program could help enhance the adaptive response of patients and effectively improve preoperative anxiety and nervousness, thereby making vital signs stable. Bauer et al. (Bauer et al. 2010) reported that massage therapy can reduce pain, anxiety, and nervousness of cardiac surgery patients, which was consistent with the conclusions of the current study. This study also showed that the anxiety level of patients became increasingly serious with the arrival of the day of surgery. This finding was consistent with the study of Carr et al. (2006) on preoperative anxiety, which presented a temperature rise trend. The results of this study showed that the anxiety scores in the two groups showed insignificant differences before intervention ($P>0.05$). Furthermore, early nursing intervention could help improve the adaptive response of a patient to reduce preoperative state anxiety levels. These results were consistent with the findings of domestic research on preoperative anxiety nursing interventions by Yang Youqun (Yang 2010).

Comparison of the values of three different times (baseline, the day before surgery, and 1 h before surgery) showed that the heart rate gradually increased as the time changed, and S-AI varied with time. Blood pressure also gradually increased with time. Therefore, surgical physiological stress and psychological stress exist at the same time and interact with each other, affecting the immune function of the body. Moderate preoperative stress is favorable toward survival, enhancement of resistance of the body, maintenance of a stable internal environment, and promotion of wound healing. If the stimulus is too strong, an overreaction may weaken physiological reserves, leading to myocardial oxygen supply/oxygen consumption disorders, increased blood coagulation, stress ulcer, decreased insulin sensitivity, hyperglycemia, and ketonuria (Chen et al. 2010). In this study, heart rate demonstrated an overall downward trend with the surgical process over time. When sending patients into the operating room, patients in the intervention group had lower heart rates than those in the control group ($P<0.05$). This study showed that massage care intervention played a significant role in reducing preoperative heart rate changes. This point was consistent with the conclusion of heart rate reduction by Kshettry et al. (2010).

This study had several limitations. It was not a double-blind study. Nurses measured physiological indices and questionnaires of research subjects with awareness. The presence of tolerance in the measured results should be considered. We failed to determine whether the massage by nurses in this research is suitable for other invasive surgeries, and if massages can improve ubiquitous pain, anxiety, and impression of patients. A large sample size is necessary as a foundation for further research to obtain practical conclusions.

CONCLUSIONS

This study indicated that massage treatments could reduce the preoperative anxiety level of cardiovascular PCI patients. After intervention, the blood pressure, heart rate, anxiety, and pain of the patients in the observation group were significantly better than those of patients in the control group. Therefore, health professionals should pay close attention to and strengthen the exploration of an effective and reasonable care intervention mode under PCI to promote the physical and mental health of patients, and improve the life quality of the patients. However, can massage be applied to other invasive surgery? Can pain, anxiety, and depression, which widely exist in invasive surgery, be improved? We need a large sample size as a basis to conduct further studies to draw practical conclusions in laying the foundation for clinical applications.

Acknowledgements: None.

Conflict of interest: None to declare.

References

1. *Bauer BA, Cutshall SM, Wentworth LJ, Engen D, Messner PK, Wood CM, et al.: Effect of massage therapy on pain, anxiety, and tension after cardiac surgery: a randomized study. Complement Ther Clin Pract 2010; 16:70-75.*
2. *Blenkharn A, Faughnan S, Morgan A: Developing a pain assessment tool for use by nurses in an adult intensive care unit. Intensive Crit Care Nurs 2002; 18:332–41.*
3. *Caplan G: Mastery of stress: Psychosocial aspects. Am J Psychiatry 1981; 138:413-420.*
4. *Carr E, Broekbank K, Allen S: Patents and frequency of anxiety in women and ongoing gynaecological surgery. Clin Nurs 2006; 15:41-52.*
5. *Chen L, Yang M, Wang L: Research Progress of Measures for Surgical Stress Response. Nursing Journal of Chinese People's Liberation Army 2012; 20:40-43.*
6. *Delaney JP, Leong KS, Watkins A, Brodie D: The short-term effects of myofascial trigger point massage therapy on cardiac autonomic tone in healthy subjects. Journal of Advanced Nursing 2002; 37:364–371.*
7. *Dunn C, Sleep J, Collett D: Sensing an improvement: an experimental study to evaluate the use of aromatherapy, massage and periods of rest in an intensive care unit. J Adv Nurs 1995; 21:34-40.*
8. *Fekrat F, Sahin A, Yazici KM: Anaesthetists' and surgeons' estimation of preoperative anxiety by patients submitted for elective surgery in a university hospital. Eur J Anaesthesiol 2006; 2:22-233.*
9. *Ferrell-Torry AT & Glick OJ: The use of therapeutic massage as a nursing intervention to modify anxiety and the perception of cancer pain. Cancer Nursing 1993; 16:93–101.*
10. *Ferreira-Vorkapic C, Range B, Nardi AE, Rafael JN: Taming the Mind: Discussion of the Results of Research on Meditation and Anxiety Disorders. Revista Argentina de Clinica Psicologica 2013; 22:101-110.*

11. *Field TM: Massage therapy effects. American Psychologist 1998; 53:1270–1281.*
12. *Kim MS, Cho KS, Woo H, Kim JH: Effects of hand massage on anxiety in cataract surgery using local anesthesia. J Cataract Refract Surg 2001; 27:884-890.*
13. *Hernandez-Reif M, Field T, Krasnegor J, Theakston H: Lower back pain is reduced and range of motion increased after massage therapy. International Journal of Neuroscience 2001; 106:131–145.*
14. *Hulme J, Waterman H, Hillier VF: The effect of foot massage on patients' perception of care following laparoscopic sterilization as day case patients. Journal of Advanced Nursing 1999; 30:460–468.*
15. *Kshettry VR, Carole LF, Henly SJ, Sendelbach S, Kummer B: Complementary alternative medical therapies for heart surgery patients: feasibility, safety, and impact. Ann Thorac Surg 2006; 81:201-205.*
16. *Li C: The Preventive and Therapeutic Effect of Change Harmful Lifestyle to Cardio-vascular Disease. Guide of China Medicine 2009; 7:33-34.*
17. *McCaffrey R & Taylor N: Effective anxiety treatment prior to diagnostic cardiac catheterization. Holist Nurs Pract 2005; 19:70–73.*
18. *McRee LD, Noble S, Pasvogel A: Using massage and music therapy to improve postoperative outcomes. AORN J 2003; 78:433-442.*
19. *Mella FR, Vinet EV, Munoz AMA: Scales of Depression, Anxiety and Stress (Dass-21): Adaptation and Psychometric Properties of Secondary School Students of Temuco. Revista Argentina de Clinica Psicologica 2014; 23:179-190.*
20. *Piotrowski MM, Paterson C, Mitchinson A, Kim HM, Kirsh M, Hinshaw DB: Massage as adjuvant therapy in the management of acute postoperative pain: a preliminary study in men. J Am Coll Surg 2003; 197:1037–1046.*
21. *Richards KC, Gibson R, Overton-McCoy AL: Effects of massage in acute and critical care. AACN Clin Issues 2000; 11:77-96.*
22. *Schachner L, Field T, Hernandez-Reif M, Duarte AM, & Krasnegor J: Atopic dermatitis symptoms decreased in children following massage therapy. Pediatric Dermatology 1998; 15:390-395.*
23. *Spielberger CD: Manual for the state-trait anxiety inventory. CA: Consulting Psychologists, Palo Alto, 1983.*
24. *Tiidus PM: Massage and ultrasound as therapeutic modalities in exercise-induced muscle damage. Canadian Journal of Applied Physiology 2000; 24:267–278.*
25. *Wentworth LJ, Briese LJ, Timimi FK, Sanvick CL, Bartel DC, Cutshall SM, et al.: Massage therapy reduces tension, anxiety, and pain in patients awaiting invasive cardiovascular procedures. Prog Cardiovasc Nurs 2009; 24:155-161.*
26. *Yang Y: Effect of Point Massage on Anxiety, Vital Signs and Postoperative Recovery of Patients Undergoing Elective Operation on Abdominal Region. Journal of Nursing 2010; 17:56.*
27. *Zhou X, Zhang S, Li X: Application of Relaxation Training and its Enlightenment for Nursing. Chinese Journal of Nursing 2013; 39:129-130.*
28. *Zhou Y & Li X: Progress in Domestic Surgery Anxiety. Chinese Journal of Behavioral Medical Science 2012; 12:119-120.*

Correspondence:
Sanying Peng
Department of Physical Education, Changzhou Campus of Hohai University
Changzhou City, Jiangsu Province, China
E-mail: pengsy2012@yeah.net