

Original Article

Alleviation of pain after spinal surgery and morphine-related side effects using comprehensive care interventions: a randomized controlled trial

Yiyan Xu

Department of Operation Room, Linyi Central Hospital, Linyi City, Shandong Province, China

Received August 20, 2017; Accepted September 24, 2017; Epub November 15, 2017; Published November 30, 2017

Abstract: Objective: To investigate the clinical effects of comprehensive care interventions on alleviation of pain and morphine-related side effects after spinal surgery. Methods: Ninety-eight patients who underwent spinal surgeries in department of orthopaedics of our hospital from January 2016 to December 2016 were included as subjects in this study. Patients were randomly divided into two groups: the conventional care group and the comprehensive care group. The conventional care group adopted routine care while the comprehensive care group adopted comprehensive care interventions. The visual analogue scale (VAS) was used to evaluate the degree of pain perception of patients and the incidence of side effects such as nausea, vomiting, vertigo and others were compared between the two groups. Results: There was no statistical difference in pain scores 3 h after spinal surgery between two groups ($P=0.559$). However, the pain scores of comprehensive care group were lower than those of conventional care group 6 h, 12 h, 24 h and 48 h after spinal surgery (all $P<0.05$). The incidence of pruritus in comprehensive care group (4.08%) was lower than that of conventional care group (16.33%, $P=0.045$). The incidence of nausea and vomiting in comprehensive care group (0.40%) was similar to that in conventional care group (14.28%, $P=0.980$). And the incidence of urinary retention in comprehensive care group (4.08%) was lower than that in conventional care group (16.33%, $P=0.025$). Conclusion: The comprehensive care interventions are suitable for postoperative care of spinal surgery because they were quite helpful in reducing the degree of postoperative pain and the incidence of morphine-related side effects in patients with spinal surgery.

Keywords: Comprehensive care interventions, spinal surgery, morphine

Introduction

Postoperative pain is very common, which has adverse effects on the patients and affect their postoperative recoveries, so it is quite necessary to further improve the management of postoperative pain [1, 2]. The nerves and blood vessels are rich in the spine, and as postoperative pain is a prominent problem, so it is also necessary to choose a better way of analgesia for spinal surgery [3, 4]. Morphine is a common postoperative analgesic in clinic, but it can easily lead to skin pruritus, nausea, vomiting, even urinary retention and other adverse effects, therefore, the pros and cons of using morphine for analgesia needs to be weighed [5]. With the improvement of people's living standards, people are demanding a higher quality of medical services, which can not only achieve better analgesic and therapeutic effects, but also

minimize the incidence of complications [6]. Comprehensive care interventions are involved in exercises, diets, psychology and other aspects [7]. The author hypothesized that the use of morphine combined with comprehensive care interventions synchronously after spinal surgery could improve the effects of morphine and effectively reduce the morphine-related side effects, so that the clinical study was accordingly conducted.

Materials and methods

General information

Ninety-eight patients who underwent spinal surgeries in our hospital from January 2016 to December 2016 were subjects of this study. All the patients were randomly divided into two groups according to random number table:

Alleviation of pain after spinal surgery and morphine-related side effects

comprehensive care group and conventional care group (with 49 cases in each group).

Inclusion criteria: All the patients aged from 18 to 65 years old who were treated with general anesthesia for spinal surgeries; patients whose postoperative analgesia were achieved using intravenous injection of morphine; patients who were in ASA degree I or II; patients who were informed and volunteered to participate in this study.

Exclusion criteria: Patients who synchronously had other complications in cardiopulmonary system, urinary system, etc.; patients who were allergic to morphine; patients who had taken analgesics for a long time; patients with obtundation or reading and language barriers.

Research methods

All the patients underwent spinal surgeries in the condition of general anesthesia and were treated with intravenous injection of morphine to achieve analgesia with a dose of 10 mg at a time after being operated and returned to the ward. When the patients felt the pain was unbearable, they would be reinjected, but the intervals between two injections should not be shorter than 4 h. And all the injection dose within one day should not exceed 40 mg.

Patients in the conventional care group were treated with routine care which included postoperative wound care, assisted rehabilitation and other routine care methods. Patients in the comprehensive care group adopted comprehensive care interventions, the specific measures were as follows.

Firstly, patients applied rehabilitation interventions. Individualized rehabilitation programs of patients were established according to patients' conditions, including rehabilitation methods, time schemes, and the patients were assisted to adhere to their rehabilitation exercises [8]. Secondly, patients applied the diet care. Diet plans were made, in which the intake of high protein and high calorie was paid attention to, and the selected food was digestible. Patients took fresher vegetables and fruits but less sugar and starch in the food [9]. Thirdly, patients received a better recovery environment, and the bedding and room had been kept clean and comfortable. Patients were guided to have self-massage and activities when they

had a rest in order to improve their overall comfort level [10]. Fourthly, patients applied psychological care. By communicating with patients every day, their existent negative emotions and mentalities can be detected in time which was beneficial to resolve in a timely manner. If patients had serious anxiety, depression or other emotions, they would get some professional guidance from a professional psychological doctor to obtain emotional ease, so that patients can maintain a positive attitude [11].

Follow-up and observed indicators

Firstly, the baseline information such as patients' age, ratio of sex, operation time, anesthesia time, operative blood loss volume etc., was collected. Secondly, the visual analogue scale (VAS) scoring method was used to evaluate the pain situations 3 h, 6 h, 12 h, 24 h and 48 h after spinal surgery respectively [12]. In VAS, there was a total of 11 levels represented by scores of zero to ten. Zero represented painless and ten symbolized the most painful. The scores were counted according to patients' self-perception. Thirdly, the incidences of four relevant adverse reactions (nausea and vomiting, skin pruritus, and urinary retention) during postoperative analgesia were recorded. The conditions of patients were examined and recorded during daily rounds of the wards, and patients' everyday adverse reactions were recorded at any time.

Statistical methods

SPSS17.0 software was used to analyze statistical significance of data of this study. The enumeration data were expressed as number of cases and percentage, and the test method between two groups was chi-square test. The measurement data were expressed as mean \pm standard deviation and the between-group comparisons were performed by t test. The repeated measurements of variance analysis combined with post Bonferroni test were used for VAS scores comparison. The difference was statistically significant when $P < 0.05$.

Results

Comparison of general information between two groups

The research which included 98 patients was completed successfully without any loss in follow-up. There was no statistical difference in

Alleviation of pain after spinal surgery and morphine-related side effects

Table 1. Comparison of general information between two groups

Group	Conventional care group (n=49)	Comprehensive care group (n=49)	X ² /t	P value
Age (year old)	49.58±8.39	50.19±7.84	0.481	0.712
Sex ratio (male/female)	28/21	26/23	0.165	0.685
Operation time (minute)	132.94±34.58	134.39±32.94	1.934	0.689
Anesthesia time (minute)	213.29±45.69	209.58±39.51	2.014	0.824
Operative blood loss volume (ml)	498.94±45.33	503.49±51.49	2.038	0.863

Table 2. Comparison of postoperative pain scores at different time points between two groups

Group	Conventional care group (n=49)	Comprehensive care group (n=49)	F value	P value
Postoperative 3 h	2.83±0.38	2.85±0.42	0.482	0.559
Postoperative 6 h	2.67±0.31	2.34±0.39	4.293	0.016
Postoperative 12 h	2.49±0.43	2.01±0.19	8.492	0.015
Postoperative 24 h	1.93±0.39	1.69±0.31	9.392	0.008
Postoperative 48 h	1.79±0.34	1.61±0.39	13.925	0.003

the age, sex ratio, operation time, anesthesia time and operative blood loss volume between two groups (all $P > 0.05$), as shown in **Table 1**.

Comparison of pain scores at different time points after operation between two groups

There was no statistical difference in pain scores 3 h after spinal surgery between two groups ($P = 0.559$). The pain scores of comprehensive care group 6 h, 12 h, 24 h and 48 h after spinal surgery were all lower than those of conventional care group (all $P < 0.05$), as shown in **Table 2**.

Comparison of incidence and severity of skin pruritus between two groups

The incidence of skin pruritus in comprehensive care group (4.08%) was lower than that in conventional care group (16.33%), as shown in **Table 3**.

Comparison of incidence and severity of nausea and vomiting between two groups

The incidence of nausea and vomiting in comprehensive care group (0.40%) was similar to that in conventional care group (14.28%, $P = 0.980$), as shown in **Table 4**.

Comparison of incidence of urinary retention between two groups

The incidence of urinary retention in comprehensive care group (4.08%) was lower than that

of conventional care group (18.37%, $P = 0.025$), as shown in **Table 5**.

Discussion

The effects of comprehensive care interventions are all-sided [13]. This study found that the pain degrees and the side effects related to skin pruritus and urination of patients treated with comprehensive care decreased significantly [14]. Therefore, the comprehensive care could not only improve the analgesia efficacy, but also achieve security [15]. The possible reasons were as follows. First, a special care group was set up in comprehensive care interventions. Under the constraint of the designated examination system, every member in the special care group was ensured to care for the patient with due diligence, which was the precondition for patients' getting a good care experience [16]. Second, comprehensive care interventions focused more on postoperative rehabilitation activities of patients, so the patients could acquire a small quantity of activity ability in early times. Ability of activity could bring a lot of benefits to the recovery of patients, and it could help patients to use their own abilities to ease pain which could accelerate the recovery rate of patients [17]. Third, comprehensive care interventions made adjustments to patients' recovery environment, and a good recuperation environment was an effective guarantee for rehabilitation. Fourth, comprehensive care interventions provided specific rules on diets of patients. Every patient had his or her own individualized diet programs, in which the adverse intake of patients to recovery was reduced, and the intake that were beneficial to emotions and surgical operation recovery of patients was improved [18]. So, the supply of nutrition and energy requirement of patients could be well

Alleviation of pain after spinal surgery and morphine-related side effects

Table 3. Comparison of incidence and severity of skin pruritus between two groups (n, %)

Group	No scratch	Light scratch	Unbearable pruritus	Total
Conventional care group (n=49)	2 (4.08)	2 (4.08)	4 (8.16)	8 (16.33)
Comprehensive care group (n=49)	1 (2.04)	0	1 (2.04)	2 (4.08)
X ² value	0	0.510	0.843	4.009
P value	1	0.475	0.359	0.045

Table 4. Comparison of incidence and severity of nausea and vomiting between two groups (n, %)

Group	Nausea	Nausea and occasional vomiting	Vomiting	Total
Conventional care group (n=49)	4 (8.16)	1 (2.04)	2 (4.08)	7 (14.28)
Comprehensive care group (n=49)	1 (2.04)	0	1 (2.04)	2 (4.08)
X ² value	0.843	0	0	1.598
P value	0.359	1	1	0.980

Table 5. Comparison of incidence of urinary retention between two groups (n, %)

Group	Urinary retention
Conventional care group (n=49)	9 (18.37)
Comprehensive care group (n=49)	2 (4.08)
X ² value	5.018
P value	0.025

met. Fifth, the psychological care was added into comprehensive care interventions with the development of psychological medicine. Patients were unwilling to cooperate with medical workers due to the bad moods or emotions, which might result in patients' uninsured sleep and diet, thus could be harmful to the recovery of patients. While positive attitudes could not only make patients cooperate more actively with treatment, but also make their emotions ease, which would ensure that a variety of hormone secretions in body could be stable and be helpful for recovery of patients.

The results of this study showed that conscious pain of patients in comprehensive care group had decreased since 6 h after spinal surgery, which actually was the effect of comprehensive care. Although patients did not get any exercise or diet care at this time, the environmental care and psychological care endowed patients with more positive emotions. Meanwhile, there were special care workers working to ease the postoperative psychological pressure of patients, which had positive psychological implications on patients. So, the per-

ception of conscious pain of patients was decreased.

Some scholars have done similar researches. Chen et al. applied comprehensive care interventions on patients with spinal

trauma and found that the subjective pain perception began to decrease within postoperative 12 h, at the same time the incidence of various adverse reactions related to morphine was low, which was consistent with the results of this study [19]. Akeda et al. did a research on 209 patients and revealed that the pain degrees of patients decreased obviously at the third day after comprehensive care interventions, which was possibly caused by the absence of designated, immediate, specific, postoperative counseling for adverse emotions in their research [20]. However, this study did not count the effects of morphine dose on the results of this study, which needed multi-level and in-depth study in subsequent researches.

In summary, comprehensive care interventions can effectively improve the analgesic effects of morphine and reduce the morphine-related side effects, which is worth promoting in clinic.

Disclosure of conflict of interest

None.

Address correspondence to: Yiyang Xu, Department of Operation Room, Linyi Central Hospital, No.17 Jiankang Road, Yishui County, Linyi City 276400, Shandong Province, China. Tel: +86-15106691680; E-mail: yiyangxu369@163.com

References

- [1] Wang Y, Zang XY, Bai J, Liu SY, Zhao Y and Zhang Q. Effect of a Health Belief Model-based

Alleviation of pain after spinal surgery and morphine-related side effects

- nursing intervention on Chinese patients with moderate to severe chronic obstructive pulmonary disease: a randomised controlled trial. *J Clin Nurs* 2014; 23: 1342-1353.
- [2] Yu L, Mo L, Tang Y, Huang X and Tan J. Effects of nursing intervention models on social adaptation capability development in preschool children with malignant tumors: a randomized control trial. *Psychooncology* 2014; 23: 708-712.
- [3] He HG, Zhu L, Li HC, Wang W, Vehvilainen-Julkunen K and Chan SW. A randomized controlled trial of the effectiveness of a therapeutic play intervention on outcomes of children undergoing inpatient elective surgery: study protocol. *J Adv Nurs* 2014; 70: 431-442.
- [4] Gozalo P, Prakash S, Qato DM, Sloane PD and Mor V. Effect of the bathing without a battle training intervention on bathing-associated physical and verbal outcomes in nursing home residents with dementia: a randomized cross-over diffusion study. *J Am Geriatr Soc* 2014; 62: 797-804.
- [5] Chen HT, Tseng MH, Lu L, Sie JY, Chen YJ, Chung Y and Lai F. Cloud Computing-Based Smart Home-Based Rehabilitation Nursing System for Early Intervention. *Journal of Computational & Theoretical Nanoscience* 2014; 20: 218-221.
- [6] Coolbrandt A, Wildiers H, Aertgeerts B, Van der Elst E, Laenen A, Dierckx de Casterle B, van Achterberg T and Milisen K. Characteristics and effectiveness of complex nursing interventions aimed at reducing symptom burden in adult patients treated with chemotherapy: a systematic review of randomized controlled trials. *Int J Nurs Stud* 2014; 51: 495-510.
- [7] Lovell K, Wearden A, Bradshaw T, Tomenson B, Pedley R, Davies LM, Husain N, Woodham A, Escott D, Swarbrick CM, Femi-Ajao O, Warburton J and Marshall M. An exploratory randomized controlled study of a healthy living intervention in early intervention services for psychosis: the INTERvention to encourage Activity, improve diet, and reduce weight gain (INTERACT) study. *J Clin Psychiatry* 2014; 75: 498-505.
- [8] Villegas N, Santisteban D, Cianelli R, Ferrer L, Ambrosia T, Peragallo N and Lara L. The development, feasibility and acceptability of an Internet-based STI-HIV prevention intervention for young Chilean women. *Int Nurs Rev* 2014; 61: 55-63.
- [9] Lee BO, Chien CS, Hung CC and Chou PL. Effects of an in-hospital nursing intervention on changing illness perceptions in patients with injury. *J Adv Nurs* 2015; 71: 2540-2550.
- [10] Jung H, Yoo H, Lee Y and Chung KY. Interactive pain nursing intervention system for smart health service. *Multimedia Tools & Applications* 2015; 74: 2449-2466.
- [11] Van Haitsma KS, Curyto K, Abbott KM, Towsley GL, Spector A and Kleban M. A randomized controlled trial for an individualized positive psychosocial intervention for the affective and behavioral symptoms of dementia in nursing home residents. *J Gerontol B Psychol Sci Soc Sci* 2015; 70: 35-45.
- [12] Kemp J, Despres O, and Dufour A. Unreliability of the visual analog scale in experimental pain assessment: a sensitivity and evoked potentials study. *Pain Physician* 2012; 15: 693-699.
- [13] Wu JR, Wang ML, Liu KC, Hu MH and Lee PY. Real-time advanced spinal surgery via visible patient model and augmented reality system. *Comput Methods Programs Biomed* 2014; 113: 869-881.
- [14] Losby JL, Hyatt JD, Kanter MH, Baldwin G, and Matsuoka D. Safer and more appropriate opioid prescribing: a large healthcare system's comprehensive approach. *J Eval Clin Pract* 2017.
- [15] Sim J, Crookes P, Walsh K, and Halcomb E. Measuring the outcomes of nursing practice: a Delphi study. *J Clin Nurs* 2017.
- [16] Bergs J, Lambrechts F, Mulleneers I, Lenaerts K, Hauquier C, Proesmans G, Creemers S, and Vandijck D. A tailored intervention to improving the quality of intrahospital nursing handover. *Int Emerg Nurs* 2017.
- [17] Flikweert ER, Izaks GJ, Knobben BA, Stevens M, and Wendt K. The development of a comprehensive multidisciplinary care pathway for patients with a hip fracture: design and results of a clinical trial. *BMC Musculoskelet Disord* 2014; 15:188.
- [18] Thompson J. Improving clinical care for patients with irritable bowel syndrome. *Br J Nurs* 2017; 26: 76-80.
- [19] Chen RK, Than KD, Park P and Shih AJ. Thermoelectrical modeling of bipolar coagulation on posterior spinal artery in a porcine spinal surgery model. *IEEE Trans Biomed Eng* 2014; 61: 182-188.
- [20] Akeda K, Matsunaga H, Imanishi T, Hasegawa M, Sakakibara T, Kasai Y and Sudo A. Prevalence and countermeasures for venous thromboembolic diseases associated with spinal surgery: a follow-up study of an institutional protocol in 209 patients. *Spine (Phila Pa 1976)* 2014; 39: 791-797.