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Original Article

Effect of nursing management for pain in orthopedic trauma

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Abstract: Objective: To investigate the effect of nursing management for pain in trauma orthopedics. Methods: A total of 68 patients in the Trauma Orthopedics Department of Zhucheng People's Hospital were enrolled as the research subjects and randomly assigned in a control group and an observation group. The control group was given routine care, and the observation group was given nursing management for pain. The anxiety and depression as well as the pain levels were compared between the two groups. Results: The time needed for pain relief, out of-bed activity and wound healing were shorter in the observation group than in the control group (all $P<0.05$), but there was no difference in the time of using remedial analgesics between the two groups ($P>0.05$). After intervention, the scores of anxiety, depression, pain and sleep disorders in the observation group were lower than those in the control group (all $P<0.05$). The Barthel score in the observation group was higher than that in control group ($P<0.05$). The incidence of adverse reactions was lower, and the satisfaction rate was higher in the observation group than in the control group (both $P<0.05$). Conclusion: Nursing management of pain can improve unhealthy mental conditions, reduce pain level, and increase the satisfaction rate in patients.

Keywords: Nursing management of pain, trauma orthopedics, pain, satisfaction

Introduction

The incidence of traumatic fractures caused by external forces such as accidents is increasing year by year [1-3]. Those patients are often accompanied by severe bone and/or muscle damage [4-6]. Pain is the first symptom of traumatic fracture and is felt by patients during the entire healing process; besides, it causes stress reactions in the body, which leads to various risks, and is also not conducive to treatment and prognosis [7-9]. Furthermore, intense pain causing unhealthy emotions is a major cause of medical disputes in trauma orthopedics [10, 11]. Pain is closely related to decreased quality of life and depression [12]. Therefore, effective measures are needed to relieve patient's pain level, so as to mitigate their stress reactions and adverse emotions, as well as improve treatment effects and rehabilitation [13]. A pain management model started late in China and relevant cognition about its benefits is insufficient. At present, pain management is still regulated by anesthesiologists and ward physicians, while nurses passively follow medical orders, resulting in a low quality of care and low patient satisfaction rates [14]. Nursing management for pain is an improved continuous high-quality care, based on traditional pain management. Brandow et al. have confirmed that pain management can significantly reduce the hospitalization frequency in patients with sickle cell diseases suffering from pain [15]. However, there is no report on nursing management for pain in trauma orthopedics. The purpose of this study was to investigate whether nursing management specifically for pain could reduce postoperative pain, improve psychological state, increase satisfaction rate, and promote recovery in patients with fractures.

Materials and methods

Baseline data

This study was conducted with the approval of the Ethics Committee of Zhucheng People's Hospital. A total of 68 patients admitted to the Trauma Orthopedics Department in Zhucheng People's Hospital from January 2018 to January 2019 were enrolled as the research subjects and randomly assigned into a control group and an observation group, with 34 cases in each group. Signed informed consent was obtained from all the patients and their families.

Patients were eligible if they were aged between 18 and 60 years old, suffered from traumatic fractures of the sacrum, radius, tibia, or fibula caused by traffic accidents, falling accidents etc.; had varying degrees of incomplete fracture, dislocation, as well as damage to the epidermis and muscle; had no damage to organs and nerves around the affected area; had an educational level of junior high or above; and had favorable compliance. Patients were excluded if they had malignant tumors or coagulopathy; had degraded or impaired hearing or visual function; had mental or conscious disorders; or had incomplete clinical data.

Methods

After the surgery when patients were completely awake and had a conscious response, they were given intravenous analgesia (50 mL: 5 mg/5 mL of morphine or 1mg of fentanyl + 9 mL of 0.75% bupivacaine + 36 mL of 0.9% sodium chloride injection) to relieve the pain. In this study, the reference values of analgesic pump were set as: 4-6 mL of load, 1 mL each dose, injection rate of 1 mL/min. The patients could press the analgesic pump by themselves to use the analgesic drugs according to their own pain level.

The intervention period in both groups was from patients' postoperative awake time to the 7th day after surgery. In the control group, routine nursing intervention included assisting the patients to be in the correct position, elevating the affected area to reduce local stasis and pain, examining and disinfecting the wound regularly, guiding or assisting the patients to use the analgesic pump, recording the pain level of the affected area, timely reporting any deteriorated conditions to the attending physician, measuring daily body temperature, enquiring about the symptoms, and encouraging the patients to actively face the treatment.

In the observation group, intensive pain care was adopted and included the following specific methods. First, ward rounds were performed with a theme of pain management be aware in a timely manner of patients' pain and discomfort symptoms. For patients with aggravated pain, the causes of the aggravation were analyzed in real time. For stasis and swelling pain induced by insufficient blood flow, the patients position was adjusted along with the degree of the tightness of the bandage. For patients with normal physiological indicators but still suffering from sudden pain caused by non-specific inducement, the analgesic dose was increased based on medical orders. Second, the patients were introduced to basic knowledge of pain in order to better understand pain and to correct in a timely manner any false awareness of pain of patients and their families. Third, the patient's sense of security was improved by means of encouragement, so as to alleviate their physical pain sensitivity due to psychological factors. Four, psychotherapy was given to patients with stress or anxiety. Nurses communicated in a timely manner with patients, played relaxing and soft music for patients to positively adjust their physical and mental state as well as to improve their sleep quality. Five, the nursing staff instructed the patient to perform reasonable initial activities after surgery in order to effectively relief pain and promote rehabilitation. The swollen limb of patients was elevated to improve local blood circulation and to relief the swelling and pain. Six, nurses gave ice compresses to reduce local congestion, edema and bleeding; gave hot compresses to reduce muscle spasm and increase local blood supply. Last, a ladder analgesic treatment was performed according to the patient's pain complaints. If the analgesia was appropriate, patients were instructed to start corresponding rehabilitation exercise as soon as possible.

Outcome measures

Main outcome measures were the changes of anxiety, depression, and pain, as well as the sleep quality in the two groups of patients before nursing and on the 4th day of nursing intervention. The anxiety was evaluated by self-rating anxiety scale (SAS) and Hamilton anxiety scale (HAMA). Scores of SAS ranged from 25 to

Table 1. Baseline data ($\bar{x}$ ± sd), n/%

Group	Control group	Observation group	t/χ^2	P
n	34	34		
Age (year)	45.8±8.1	47.6±6.2	1.483	0.143
Sex (male/female)	20/14	24/10	0.580	0.447
Albumin (g/L)	39.59±4.13	37.88±6.98	1.227	0.224
Site of fracture			0.376	0.829
Tibia and fibula	12 (35.29)	14 (41.18)		
Patella	12 (35.29)	12 (35.29)		
Radius	10 (29.41)	8 (23.53)		
Intraoperative anesthesia method			0.076	0.783
General anesthesia	8 (23.53)	10 (29.41)		
Epidural anesthesia	26 (76.47)	24 (70.59)		
Operation time (h)	1.18±0.22	1.23±0.23	0.866	0.390
Comorbidities				
Hypertension	6 (17.65)	4 (11.77)	0.117	0.732
Hyperglycemia	5 (14.71)	3 (8.82)	0.142	0.707
Cardiovascular diseases	4 (11.77)	1 (2.94)	0.864	0.353

100 points. A score higher than 50 points indicated an anxious state, and the greater the score, the more serious the anxiety [16]. Score of HAMA ranged from 0 to 64 points. A score higher than 14 points indicated an anxious state, and the greater the score, the more serious the anxiety [17]. The depression was evaluated by self-rating depression scale (SDS) and Hamilton depression scale (HAMD). Score of SDS ranged from 25 to 100 points. A score higher than 50 points indicated a mild depression, and the greater the score, the more serious the depression [18]. Score of HAMD ranged from 0 to 54 points. A score higher than 20 points indicated a depression state, and the greater the score, the more serious the depression [19]. The pain level in patients was evaluated with the use of visual analogue scale (VAS, ranged 0-10 points, the higher the score, the more sever the pain) and the numeric rating scales (NRS, ranged 0-10 points, the higher the score, the more sever the pain) before nursing and after 24 h, 48 h, and 72 h of nursing intervention [20, 21]. The sleep quality was evaluated using Pittsburgh sleep quality index (PSQI) before and 4 days after nursing. The score of PSQI ranged 0 to 21 points. A score higher than 16 points indicated poor sleep quality, and the greater the score, the worse the sleep quality [22]. Functional evaluation was performed before nursing and before discharge using Barthel index, with a total score of 100 points. Higher score indicated better independence [23].

The secondary outcome measures were as follows. First, the time needed for pain relief, out of-bed, and wound healing, as well as the number of painkillers used in the two groups. Second, the pre-discharge adverse reactions (muscle atrophy, infection, joint stiffness, and lower extremity venous thrombosis). Third, the satisfaction evaluation was conducted at discharge by a self-made questionnaire, with results of great satisfaction, satisfaction and dissatisfaction. The satisfaction rate = (number of great satisfaction + number of satisfaction)/total number of cases * 100%. Lastly, the number of doctor-patient disputes and complaints was counted according to the records from the medical administration department and our department.

Statistical analyses

SPSS 21.0 software was used for statistical processing. Measurement data were expressed as mean ± standard deviation ($\bar{x}$ ± sd), compared between groups using independent sample t-test, and compared within groups using paired t-test. Pain scores were compared at multiple time points using repeated measures analysis of variance combined with post hoc Bonferroni test. Count data were expressed as cases or percentage (n/%), and tested using corrected χ^2 test. $P<0.05$ was considered statistically significant.

Results

Comparison of baseline data

There was no statistically significant difference in age, sex, albumin, site of fracture, intraoperative anesthesia method, operation time and comorbidities between the two groups (all $P>0.05$). See **Table 1**.

Comparison of postoperative conditions

Patients in the observation group had significantly shorter time in terms of pain relief, out

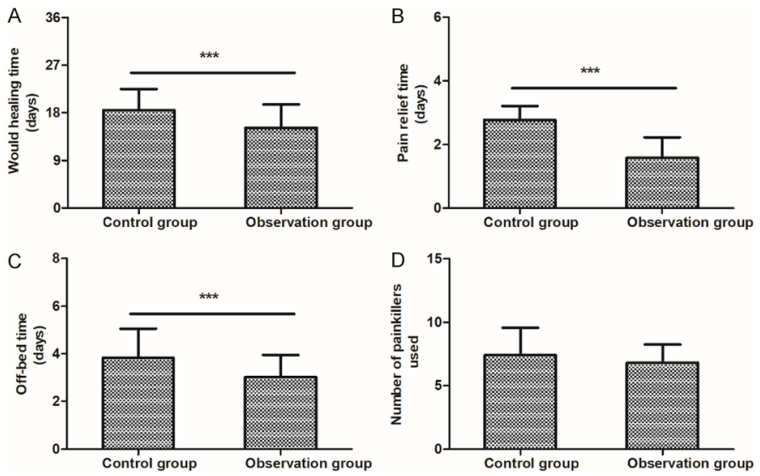

Figure 1. Comparison of postoperative conditions ($\bar{x}$ ± sd). A: Wound healing time; B: Pain relief time; C: Out of-bed time; D: Times of using analgesics. Compared with the control group, ***P<0.001.

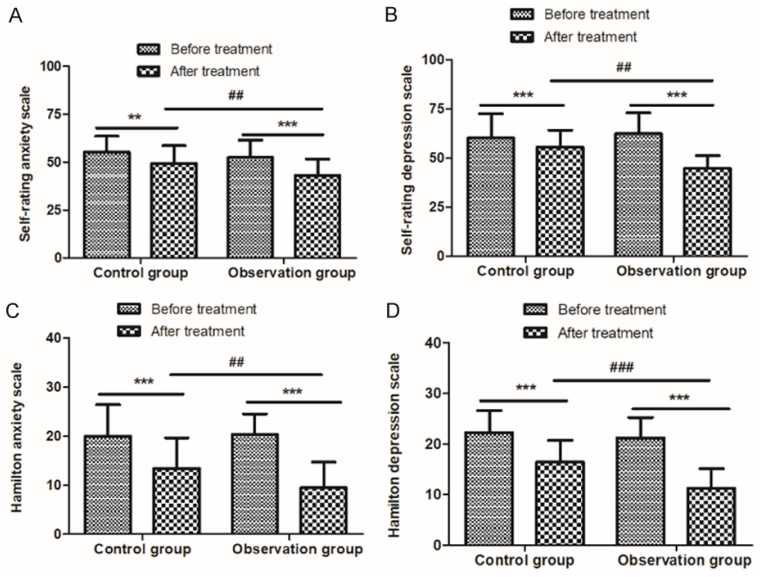

Figure 2. Scores of psychological status between the two groups ($\bar{x}$ ± sd). A: Self-rating anxiety scale, the higher the score, the more sever the anxiety; B: Self-rating depression scale, the higher the score, the more sever the depression; C: Hamilton anxiety scale, the higher the score, the more sever the anxiety; D: Hamilton depression scale, the higher the score, the more sever the depression. Compared with before nursing, **P<0.01, ***P<0.001; compared with control group, ##P<0.01, ###P<0.001.

of-bed, and wound healing than the control group. There was no difference in the number of painkillers used between the two groups (P> 0.05). See **Figure 1**.

Psychological status of two groups

There were no differences in the scores of SAS, SDS, HAMA, and HAMD between the two groups before nursing (all P>0.05). After nursing intervention, the scores of SAS, SDS, HAMA and HAMD in the observation group were lower than those in the control group, with statistically significant differences (all P<0.05). See **Figure 2**.

Comparison of pain level, sleep quality and limb function

There were no differences in scores of VAS, NRS, PSQI, and Barthel index between the two groups before nursing (all P> 0.05). After nursing intervention, the comparison of VAS, NRS, and PSQI at the same time point showed significantly lower scores in the observation group than in the control group, and significantly higher Barthel index in the observation group than in the control group (all P<0.05). See **Figure 3**.

Comparison of complications

The number of patients with muscle atrophy, infection, joint stiffness, and lower limb venous thrombosis and other discomfort in the observation group was fewer than those in the control group, with statistically significant difference (all P<0.05). See **Table 2**.

Comparison of patient satisfaction

The satisfaction rate of patients in the observation group was higher than that in the control group, with significant difference (P<0.05). While there were no statistical differences between the two groups in the number of doctor-patient disputes and complaints (both P>0.05). See **Table 3**.

Discussion

Pain control has evolved to pain management [23]. Before applying standardized nursing of

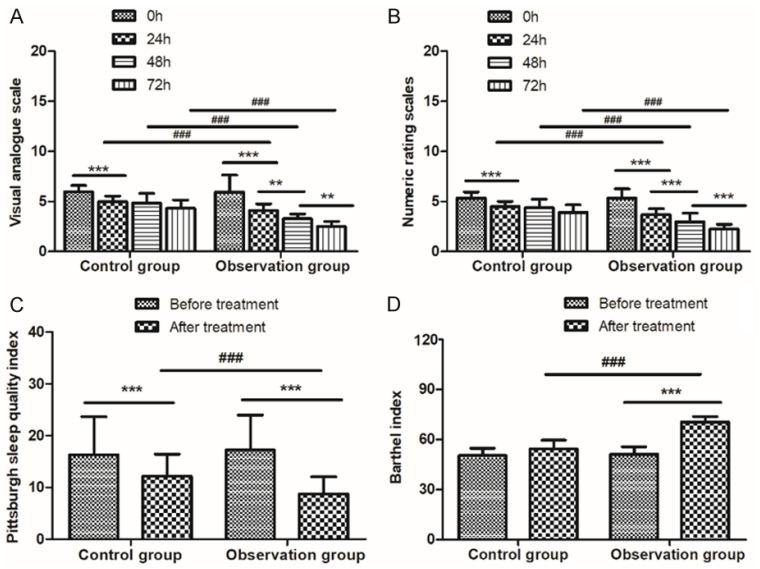

Figure 3. Comparison of pain level, sleep quality and limb function ($\bar{x} \pm sd$). A: Visual analogue scale, the higher the score, the more sever the pain; B: Numeric rating scale, the higher the score, the more sever the pain; C: Pittsburgh sleep quality index, the higher the value, the poorer the sleep quality; D: Barthel index, the higher the score, the better the recovery. Compared with before nursing, $^{**}P<0.01$, $^{***}P<0.001$; compared with control group, $^{###}P<0.001$.

pain management, training of the nursing staff to enrich their professional knowledge and skills can result in effective improvement of the quality of care and greatly reduce patients' adverse emotions such as worries about adverse reactions caused by drugs through improved nursing [24]. In this study, we required nursing staff to strictly implement a standardized pain management model to pass on scientific information to patients, to better enable patients to have a correct understanding of postoperative analgesia, and to change the inaccurate concepts of analgesic addiction. This model was implemented throughout the pain management process, such as reducing local soft tissue damage through scientific and reasonable care, as well as raising the swollen limb of the patient and maintaining an abduction neutral position. In the early stage of the fracture, ice compress with reasonable and timely analgesics was used to relieve pain. Therefore, patients in the observation group needed less pain relief, had shorter out of-bed time, and faster wound healing, as well as less use of painkillers than the control group.

Due to the sudden psychological stress after a fracture trauma, severe postoperative pain can bring about great suffering to the patients, interfere with the patient's normal life and work, and easily cause anxiety and depression [25]. Jiang et al. confirmed that emotions such as depression and anxiety can make the treatment of traumatic fractures more difficult [26]. This difficulty is related to the fact that depression and anxiety can cause chronic pain, and the threshold of pain is reduced. Our results confirmed that the scores of SAS, SDS, HAMA, and HAMD of patients in observation group were significantly lower than those in the control group. We explained the mechanism of pain to patients and diverted the patient's attention by intimate conversation and relaxing music. To work on the aggravation of pain during the initial stage of fracture, we guided patients to make reasonable movements hoping to reduce their pain, and we helped patients to lift the swollen limb to help local blood circulation and to relieve swelling and pain. Therefore, the scores of VAS and NRS of patients in the observation group were significantly lower than those in the control group. The lower pain scores were also conducive to performing rehabilitation exercises, so the Barthel index of the observation group was significantly higher than that of the control group. Pu et al. confirmed that the plasma dimer level was higher and, the VAS score and the overall satisfaction rate were better in the experimental group than in the control group at 6 hours and 4 days after surgery [27]. Li et al. found that patients often refuse functional exercise when they were in pain, and the lack of exercise can lead to poor blood circulation in the injured limb, and then muscle atrophy, joint stiffness, and lower limb venous thrombosis, which increases the hospital stay and wound healing time [28]. In this study, the patients in the observation group were instructed by the nursing staff to perform rehabilitation exercises as soon as possible (if the pain was tolerable). Therefore, the incidences of muscle atrophy, joint stiffness and lower limb venous thrombosis in the observation group were sig-

Table 2. Comparison of complications (n, %)

Group	Control group	Observation group	t/χ^2	P
n	34	34		
Muscle atrophy	12 (35.30)	4 (11.77)	4.005	0.045
Infection	11 (32.35)	3 (8.82)	4.407	0.036
Joint stiffness	14 (41.18)	4 (11.77)	6.120	0.013
Lower extremity venous thrombosis	17 (50.00)	5 (14.71)	8.130	0.004
Other discomforts	16 (47.06)	8 (23.53)	4.205	0.040

Table 3. Comparison of patient satisfaction (n, %)

Group	Control group	Observation group	t/χ^2	P
n	34	34		
Great satisfaction	5 (14.71)	15 (44.12)	10.444	0.005
Satisfaction	19 (55.88)	17 (50.00)		
Dissatisfaction	10 (29.41)	2 (5.88)		
Doctor-patient dispute	2 (5.88)	0	0.515	0.473
Complaint	2 (5.88)	0	0.515	0.473

nificantly lower than those in the control group, and the satisfaction rate was significantly higher in the observation group than in the control group.

However, the small sample size in this study may lead to certain deviations in the results. Therefore, we will expand the sample size to further confirm the impact of nursing management of pain in orthopedic patients. Patients' pain and unhealthy emotions were improved after pain management, but the results are susceptible to and may be affected by the moods of their relatives and friends. Therefore, we considered patient compliance before enrollment. In this study, we did not observe patients' pain-related side effects such as nausea, vomiting, and delirium. In the future study, we will focus on the discomfort caused by analgesics, and strive to find the optimal dosage of analgesics so as to minimize the patients' pain with safe use of analgesics.

In summary, pain is part of a comprehensive psychological and physiological feedback system, and is common after traumatic fractures. Nursing management of pain can relieve postoperative pain and unhealthy emotions, reduce postoperative complications, and promote patient recovery, so it is worthy of further promotion and application.

Disclosure of conflict of interest

None.

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