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Original Article

Effect of high-quality nursing on orthopedic trauma based on a fast-track surgery model

Weihong Wang[1*], Ping Liu[2*], Qin Zhang[3], Ge Jiang[4], Hanjing Zheng[5], Weiwei Zhang[6]

[1]Operating Room, Chun'an Hospital of Traditional Chinese Medicine, Hangzhou 311700, Zhejiang, China; [2]Department of Orthopedics, The Eighth People's Hospital of Hengshui, Hengshui 253800, Hebei, China; [3]Department of Pediatric Surgery, Maternity and Child Health Care of Zaozhuang, Zaozhuang 277000, Shandong, China; [4]Department of Emergency, Penglai Traditional Chinese Medicine Hospital, Yantai 265600, Shandong, China; [5]Department of Emergency, Shijiazhuang Fourth Hospital Affiliated to Hebei Medical University, Shijiazhuang 050000, Hebei, China; [6]Department of Critical Care Medicine, Haiyang People's Hospital, Yantai 265100, Shandong, China. [*]Equal contributors and co-first authors.

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Abstract: Objective: To explore the effect of fast-track surgery (FTS) based high quality nursing on orthopedic trauma. Methods: In this retrospective study, 94 patients who received orthopedic trauma surgery in our hospital from December 2018 to November 2020 were included. The patients were assigned to a research group (n=47) or a control group (n=47) according to which nursing method they received. The control group received routine nursing, while the research group also received FTS-based high-quality nursing. Perioperative situation, quality of life score (SF-36) before and after operation, incidence of complications, pain score (VAS) at different time periods after operation, and nursing satisfaction were compared between the two groups. Results: There was no significant difference in operation time or blood loss between groups (P>0.05). The time to getting out of bed for the first time, time to drainage tube removal, and length of hospital stay in the research group were shorter than those in the control group (P<0.001). Repeated measurement analysis of variance revealed that the VAS score of the research group was lower than that of the control group at 1 h, 3 h, 6 h, 24 h and 48 h after operation (P<0.05). Intra-group comparison manifested that the VAS scores of both groups decreased at 1 h, 3 h, 6 h, 24 h and 48 h after operation (P<0.05). Comparison at different time points revealed that the difference was statistically significant (P<0.05). The incidence of complications in the research group (4.26%) was lower than that in the control group (17.02%; P<0.05). The satisfaction rate of nursing in the research group (93.62%) was higher than that in the control group (78.72%; P<0.05). After intervention, the level of superoxide dismutase (SOD) and glutathione (GSH) in both groups decreased with a lesser decrease in the research group. The contents of reactive oxygen species (ROS) and malondialdehyde (MDA) in groups after intervention were higher than those before intervention with a milder increase in the research group. Conclusion: FTS mode can shorten the recovery time, reduce the degree of pain and the reduce the time of analgesia. It also promotes the recovery and shortens the hospital stay of patients, and improves their quality of life, with high satisfaction. This may be related to an expeditedd surgical process and reduced oxidative stress response of patients undergoing surgery under the rapid recovery surgical model.

Keywords: Orthopedic trauma, FTS mode, high quality nursing, quality of life

Introduction

Patients with orthopedic trauma often have a sudden onset, and their daily activities and work are obviously affected after a fracture, which imposes psychological, physiological, and economic burdens [1]. Therefore, how to ensure early recovery and minimize complications of patients with orthopedic trauma has become a research hotspot. At present, most clinical nursing programs used in orthopedic trauma are based on the common diseases, which is not efficient enough, and patients have poor outcomes [2, 3]. Fast-track surgery (FTS) is an important clinical management mode, which adopts a series of optimized measures based on evidence-based medicine, such as preoperative education, gastrointestinal technology, and postoperative analgesia, and encourages nursing staff, patients, and their fami-

lies to participate in nursing intervention. In this way, it can minimize the risk of complications and reduce the degree of trauma stress, thus shortening the rehabilitation process [4, 5]. Kang et al. found that a nursing scheme based on FTS could accelerate the rehabilitation process, relieve postoperative pain, reduce postoperative complications, and harmonize the doctor-patient relationship [6]. The same effect has been achieved in orthopedic trauma, but there are few studies on the impact on patients' quality of life [7, 8]. Therefore, in this retrospective study, we analyzed the clinical data of 94 orthopedic trauma cases in our hospital, and comprehensively discussed the application value of a nursing scheme based on FTS through perioperative indicators and long-term quality of life.

Materials and methods

General data

In this retrospective study, 94 patients who received orthopedic trauma surgery in our hospital from December 2018 to November 2020 were included. The patients were divided into a research group (n=47, high-quality nursing based on FTS) and a control group (n=47, routine high-quality nursing in traumatic orthopedics) according to which nursing method they received. This study was approved by the Ethics Committee of Chun'an Hospital of Traditional Chinese Medicine (No. 20200043).

Inclusion and exclusion criteria

Inclusion criteria: (1) Patients diagnosed with femoral fractures by CT and other examinations, and treated with plate screw internal fixation; (2) Patients knew about this study and signed an informed consent form.

Exclusion criteria: (1) Those with cardiovascular and cerebrovascular diseases; (2) Those with organic diseases in kidney or liver; (3) Those with communication disorders and nervous system diseases; (4) Women during lactation and pregnancy; (5) Those with multiple fractures; (6) Those with severe malnutrition; (7) Those complicated with other fractures or multiple injury; (8) Those who had acute conditions such as hemorrhagic shock and infection; or (9) Those with bone diseases such as bone joint deformity or bone tumor.

Methods

Control group

Routine high-quality nursing was given to orthopedic trauma patients [9]. (1) When patients were admitted to the hospital, health education and psychological intervention were performed; An orthopedic health knowledge manual was distributed to patients, and the nursing staff routinely carried out daily nursing, explained the contents of the health knowledge manual patiently and in detail, answered patients' questions, deepened their understanding of their own condition and surgical treatment, and urged them to actively cooperate with surgical treatment and nursing; (2) The responsibility system for holistic nursing was implemented. Relevant staff were required to arrive at the post about 10 min in advance to routinely patrol the room, check patients' trauma status, and give timely feedback after finding relevant problems; (3) Skin test of antibiotics was performed before operation. Patients were guided in carrying out respiratory function training. Psychological intervention was performed before the operation to guide patients to relax and evaluate pain, and analgesia Was given if necessary; (4) The operating room was reasonably divided into several zones. Special passages were set up for medical staff and patients, and for transporting medical wastes to closely cooperate with surgery-related operations; (5) Patient-controlled analgesia was given after operation: Analgesia was stopped 48 h after operation. Sufentanil (Shandong Qilu Pharmaceutical Co., Ltd., China; 2 ng/kg) and droperidol (Shandong Qilu Pharmaceutical Co., Ltd., China; 0.10 mg/kg) were dissolved in 100 mL normal saline, and a PCIA pump was connected for continuous administration.

Research group

In addition to the nursing in the control group, high-quality nursing based on FTS was performed in the research group [10]. (1) The disease severity assessment was performed, covering the assessment of mental and psychological state. The disease diagnosis and treatment were explained carefully and patiently, and the surgical treatment effect and postoperative complications were introduced to patients to ensure that patients were fully prepared

psychologically; (2) According to the pain score, the postoperative analgesia scheme (touching, distraction and intravenous patient-controlled analgesia) was adopted to minimize the frequency and dose of opioid drugs, and the swelling degree, color, degree of pain and temperature of the affected limb were closely observed to avoid the occurrence of osteofascial compartment syndrome. According to the deep vein thrombosis risk factor assessment scale, patients with high risk of deep vein thrombosis (DVT) were screened, and anticoagulants or active and passive functional training were given; (3) The preparative work before the operation was the same as that of the control group. In addition, appropriate anesthesia was chosen after communication with the operating room and anesthesiologists in advance. It is generally believed that epidural or subarachnoid anesthesia and local anesthesia are more effective in blocking nerve stimulation and reducing stress response than general anesthesia, which is beneficial to patients' later recovery. Patients were asked to not have water or food 6 h before operation, and infusion was strictly restricted. (4) According to the fracture type of the patient, they were assisted to maintain an appropriate position to ensure comfort, and various modes such as physical and medical means were used to relieve pain to the greatest extent; (5) The nursing staff visited the patient within 1 h after their return to the ward, explain in detail the precautions after operation, and guide then to turn over in bed and move the joints of the limbs. 6 h after operation, the patient was instructed to carry out exercise training. The first step was to take the muscle static contraction movement of the affected limb and the distal joint movement, and then the exercise time and intensity were increased; (6) Patients were given liquid or semi-liquid food 4 h after operation, and then given a normal diet 1 day after operation to prevent vomiting and nausea caused by intestinal emptying for a long time. Eating early is beneficial to promote visceral blood circulation, stimulate intestinal peristalsis and improve gastrointestinal function. Then, according to the patient's condition, they were given normal food under the premise of ensuring a reasonable diet. After operation, the staff should contact the rehabilitation department as soon as possible to specify the rehabilitation plan and guidance for patients in the later stage. (7) In case of a postoperative pulmonary infection, patients should be given expectoration, help in turning over and buckling on their backs, and antibiotics should be given in time. In the case of constipation, abdominal massage was given to patients to promote intestinal peristalsis. Severe cases were given an enema. In the case of pressure sores after operation, family members should be instructed to use balloons, and required to scrub the whole body of patients every day. In the case of local pressure sores, disinfection should be given in time, and bedsore stickers were applied.

Outcome measures

Main outcome measures: (1) The perioperative conditions of both groups were counted, including operation time, blood loss during operation, time to get out of bed for the first time, time to remove drainage tube, and length of hospital stay. (2) Pain scores were taken at 1 h, 3 h, 6 h, 24 h and 48 h after operation. As to VAS scale, the scores ranged from 0-10 points, and a higher score indicated more severe pain [11].

Secondary outcome measures: (1) The quality of life scores of both groups before and 3 months after intervention were counted and evaluated according to the SF-36 scale, which covered mental health, social function, general health, and physiologic function. The score ranges from 0-100 points, and a higher score indicates better quality of life [12]. (2) The incidence of complications between groups was compared. (3) The nursing satisfaction was assessed. The nursing attitude and quality were evaluated through a self-made nursing satisfaction questionnaire. To ensure the validity and reliability of the questionnaire, Cronbach's α coefficient was used to examine the internal consistency reliability, and content-related validity index (CVI) was applied to the content validity. Cronbach's α coefficient and CVI of this questionnaire reached 0.96 and 0.79, respectively, with good reliability and validity. With a total score of 100 points, the questionnaire was divided into very satisfied (≥90 points), satisfied (70-89 points) and dissatisfied (<70 points). Nursing satisfaction = (very satisfied + satisfied)/total number of cases *100%. (4) Fasting circumferential venous blood was collected from patients in the morning after surgery and 48 h after surgery, respec-

Table 1. General data ($\bar{x}$ ± sd)

Group	Research group (n=47)	Control group (n=47)	t/χ^2	P
Gender (male/female)	25/22	29/18	0.696	0.404
Age (years)	64.1±12.7	62.9±13.3	0.444	0.658
Education level				
Junior high school (n)	13	16	0.449	0.503
Senior high school (n)	21	20	0.043	0.835
Junior college and above (n)	13	11	0.224	0.636
BMI (kg/m^2)	20.69±3.11	21.14±3.07	0.706	0.482
Comorbidity				
Hypertension (n)	13	16	0.449	0.503
Diabetes (n)	6	3	1.106	0.293
Others (n)	3	4	0.154	0.694
Cause of injury				
Fall from height (n)	3	5	0.547	0.460
Traffic accident (n)	11	7	1.099	0.294
Accidental fall (n)	33	35	0.213	0.645

Note: BMI: body mass index.

tively, and serum was centrifuged to detect the changes of oxidative stress indicators, including superoxide dismutase (SOD), glutathione (GSH), malondialdehyde (MDA) and reactive oxygen radicals (ROS), before and after intervention. SOD kits (batch No. 070611), GSH kits (batch No. 081209), MDA kits (batch No. 050213) and ROS kits (batch No. 060913) were from Shanghai Beyotime Biotechnology, China.

Statistical methods

The data were processed by SPSS 22.0, and the figures were drawn using GraphPadPrism 6.0. Bartlett variance homogeneity test and Kolmogorov-Smirnov normality test were conducted to test the measured data, both of which confirmed the homogeneity of variance and approximately obeyed the normal distribution, and were expressed as mean ± standard deviation ($\bar{x}$ ± sd). Comparison between groups was conducted by the independent sample t-test, and that within groups was conducted by the paired t-test. Repeated measurement data at multiple time points were analyzed by the repeated measurement variance analysis and post-Bonferroni pairwise comparison. The counted data were expressed by case (%). When the number of cases was less than 40 or the theoretical frequency $T \leq 1$, the exact probability method was adopted, and when the number of cases ≥40 and the theoretical frequency $t > 5$ or $1 < t < 5$, χ^2 test was used. $P < 0.05$ indicated statistical significance.

Results

General data

The clinical data of gender, age, education level, body mass index (BMI), combined diseases, and cause of injury were comparable ($P > 0.05$; **Table 1**).

Perioperative situation

There was no significant difference in operation time and blood loss between groups ($P > 0.05$). The time to get out of bed for the first time, time to remove drainage tube and length of hospital stay in the research group were all shorter than those in the control group ($P < 0.001$; **Table 2**).

VAS scores

Repeated measurement analysis of variance manifested that the VAS score of the research group was lower than that of the control group at 1 h, 3 h, 6 h, 24 h, and 48 h after operation ($P < 0.05$). Intra-group comparison showed that the VAS scores of both groups decreased at 1 h, 3 h, 6 h, 24 h, and 48 h after operation ($P < 0.05$). Comparison at different time points revealed that the difference was statistically significant ($P < 0.05$; **Table 3**).

Table 2. Comparison of perioperative conditions between groups ($\bar{x}$ ± sd)

Group	Research group (n=47)	Control group (n=47)	t	P
Operation time (min)	141.39±18.56	136.22±16.98	1.409	0.162
Intraoperative blood loss (mL)	256.51±46.32	263.33±51.64	0.674	0.502
Time of getting out of bed for the first time (d)	1.69±0.64	3.11±0.90	8.815	<0.001
Drainage tube removal time (d)	1.56±0.53	3.07±0.82	10.603	<0.001
Hospitalization time (d)	5.69±1.23	10.22±2.96	9.689	<0.001

Table 3. Comparison of VAS scores between groups ($\bar{x}$ ± sd, score)

Group	1 h after operation	3 h after operation	6 h after operation	24 h after operation	48 h after operation
Research group (n=47)	5.67±1.29	4.69±1.05	3.78±0.82	3.23±0.69	2.56±0.60
Control group (n=47)	6.51±1.35	5.50±0.98	4.50±0.77	4.04±0.79	3.11±0.71
$F_{The\ group}$ (P)	34.150 (<0.001)				
F_{Time} (P)	17.831 (<0.001)				
$F_{Interactive}$ (P)	14.228 (<0.001)				

Note: VAS: pain score.

Table 4. Comparison of SF-36 scores between groups ($\bar{x}$ ± sd, score)

Index	Mental health	Social function	General health	Physiologic function
Before intervention				
Study group (n=47)	55.91±6.44	60.24±5.66	58.59±7.71	52.29±6.53
Control group (n=47)	53.89±7.11	61.39±6.07	60.04±6.95	54.07±7.00
After intervention				
Research group (n=47)	89.21±8.09*	90.01±7.82*	88.39±6.44*	86.96±7.98*
Control group (n=47)	81.03±7.67$^{*,\#\#\#}$	83.95±8.19$^{*,\#\#\#}$	82.56±5.93$^{*,\#\#\#}$	81.23±9.05$^{*,\#\#}$

Note: Compared with before intervention, *P<0.05; compared with Study group, $^{\#\#}$P<0.01, $^{\#\#\#}$P<0.001.

SF-36 scores

There was no significant difference in mental health, social function, general health or physiologic function scores between groups before intervention (P>0.05), but the scores after intervention were higher than those before, and those of the research group were higher than those of the control group (P<0.05; **Table 4**; **Figure 1**).

Incidence of complications

The total incidence of complications in the research group (4.26%) was lower than that in the control group (17.02%; P<0.05; **Table 5**).

Nursing satisfaction

The satisfaction with nursing in the research group (93.62%) was higher than that in the control group (78.72%; P<0.05; **Table 6**).

Comparison of oxidative stress levels of patients before and after intervention

There was no significant difference between the MDA, ROS, GSH and SOD contents of both groups before intervention (P>0.05), and the SOD and GSH contents decreased after intervention compared with those before intervention, but the decrease in the research group was milder than that of the control group (P<0.05) (**Table 7**).

Discussion

Orthopedic trauma patients suffer from severe pain, and some patients with lower limb fractures also get osteofascial compartment syndrome, which has a great impact on rehabilitation of body function. Surgery is an essential treatment measure for those patients, but long-term bed rest is needed after surgery,

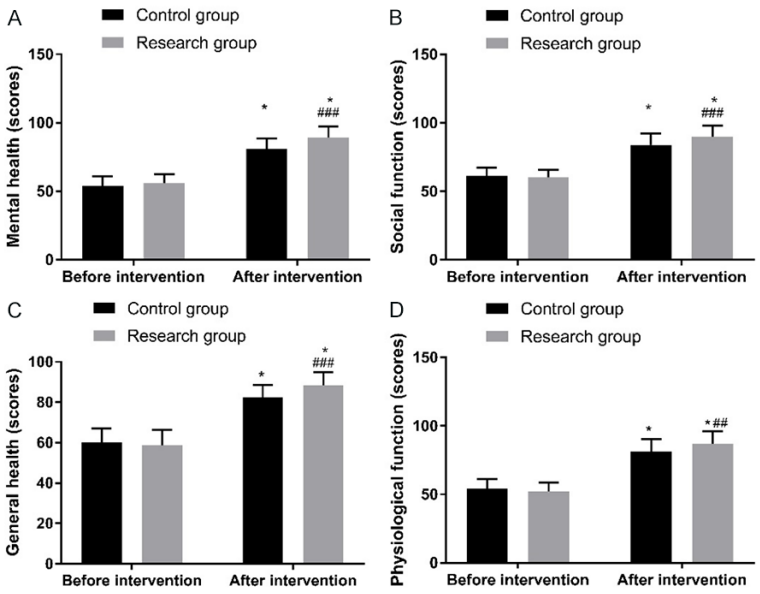

Figure 1. Comparison of surgical conditions between groups. A: Mental health; B: Social function; C: General health status; D: Physiological function. Compared with before intervention, *P<0.05; Compared with research group, ##P<0.01, ###P<0.001.

Table 5. Comparison of complication rates between groups (n, %)

Group	Research group (n=47)	Control group (n=47)	χ^2	P
Infection	1 (2.13)	2 (4.26)	0.344	0.557
DVT	0 (0.00)	1 (2.13)	1.011	0.315
Constipation	1 (2.13)	4 (8.51)	1.901	0.168
Pressure ulcer	0 (0.00)	1 (2.13)	1.011	0.315
Total incidence	2 (4.26)	8 (17.02)	4.029	0.045

Table 6. Comparison of satisfaction rates between groups (n, %)

Group	Research group (n=47)	Control group (n=47)	χ^2	P
Very satisfied	29 (61.70)	19 (40.43)		
Satisfied	15 (31.91)	18 (38.30)		
Dissatisfied	3 (6.38)	10 (21.28)		
Nursing satisfaction	44 (93.62)	37 (78.72)	4.374	0.036

which easily leads to complications such as pressure sores, constipation, and DVT. These are not conducive to the rehabilitation of body function and improvement of quality of life [13, 14]. Therefore, the type of nursing intervention for patients is still of interest forresearch.

Routine nursing for orthopedic trauma is strictly based on the common orthopedic diseases, which can achieve certain results, but the recovery of body function is slow and the incidence of complications is still high [15]. FTS is based on a holistic concept, which effectively combines multidisciplinary nursing techniques such as preoperative education, pain intervention, and postoperative rehabilitation, and can reduce the occurrence of postoperative complications and shorten the process of body function rehabilitation [16]. Zhang et al. verified that FTS can effectively shorten the time of wound healing and getting out of bed, improve the patients' rehabilitation compliance, reduce the risk of complications to 5.71%, and promote recovery and discharge as soon as possible. They used psychological counseling before operation, health education, and temperature and humidity adjustment in the operating room during operation, assisting patients to take comfortable posture after operation, and massage for limbs [17]. Wang et al. found that compared with patients in the control group who were given the traditional pain management scheme, those in the research group with FTS-based management scheme (including preoperative health education, preemptive analgesia, postoperative analgesia, guidance of the patients to eat and get out of bed early) had lower VAS scores in each time period after operation, showed a lower incidence of complications, without DVT, and experienced shorter hospitalization time [18]. In this study, the routine high-quality nursing and FTS-based high-quality nursing were adopted respectively in the two groups. It was found that the time to get out of bed for the first time, time to remove the drainage tube, and length of hospital stay in the

Table 7. Comparison of oxidative stress levels between groups before and after intervention ($\bar{x}$ ± sd)

Indexes	Group	Case	MDA (nmol/mL)	ROS	GSH (μg/mL)	SOD (U/mL)
Before intervention	Research Group	47	15.43±3.35	6.17±1.33	61.29±10.55	79.57±14.09
	Control group	47	14.93±2.79	6.25±1.27	62.51±9.24	78.53±16.34
After intervention	Research Group	47	20.73±8.57*	10.26±2.66*	48.57±5.15*	70.39±12.65*
	Control group	47	26.03±9.65*,###	13.54±3.09*,###	32.35±5.79*,###	49.04±9.43*,##

Compared with pre-intervention, *P<0.05; Compared with study group, ##P<0.01, ###P<0.001. MDA, malondialdehyde; ROS, reactive oxygen radical.

research group were all shorter than those in the control group, the VAS score in each time period after operation and the incidence of complications were lower (4.26%), which was consistent with the above studies. This showed that the high-quality nursing based on FTS concept had a higher application value in orthopedic trauma, which was beneficial to relieve postoperative pain, shorten rehabilitation time, and reduce the risk of complications. The main reasons are as follows: In the FTS concept combined with a high-quality nursing program, preoperative psychological intervention and health education can alleviate patients' negative emotions, deepen their cognition of the role of surgical treatment, and promote them to actively cooperate with treatment and nursing. This approach also enhances the trust between nurses and patients, which is conducive to the further development of nursing intervention. In addition, postoperative rehabilitation guidance, body position nursing, and diet guidance can ensure that patients receive limb function rehabilitation training as early as possible after operation, and obtain nutrients needed for body function rehabilitation, thus shortening the postoperative rehabilitation process [19, 20]. Moreover, postoperative pain is a vital factor affecting postoperative vital signs. If postoperative pain is not controlled, it may reduce gastrointestinal peristalsis, increase oxygen consumption, and increase heart load. Therefore, postoperative analgesia should be performed through various modes in order to minimize pain and avoid pain affecting postoperative rehabilitation training.

In addition, this clinical research on the nursing scheme based on the FTS concept focused on short-term rehabilitation after operation. Based on this, this study explored and analyzed the long-term quality of life of patients. It revealed that the scores of SF-36 in the research group were higher than those in the control group, and the nursing satisfaction was higher. Wu et al. discovered that the application of FTS in perioperative nursing for modified radical mastectomy could effectively promote patients' rehabilitation and improve nursing satisfaction [21], which is consistent with this study. This suggests that high-quality nursing based on FTS is more conducive to improving the quality of life of patients with orthopedic trauma and deepening their recognition of nursing. The reason might be that this nursing scheme can reduce postoperative pain and shorten the time to functional rehabilitation, so the quality of life is improved effectively and the satisfaction of nursing is higher.

SOD, GSH, MDA, and ROS are important indicators of oxidative stress. Under the conditions of trauma or surgery, the body is in a state of stress, and oxidation reactions are increased [22]. This study noted that the levels of SOD and GSH in groups after intervention were lower than those before intervention, but the decrease in the research group was milder than that in the control group. The contents of ROS and MDA after intervention were higher than those before intervention, but the increase in the research group was also milder than that in the control group. This suggests that high-quality orthopaedic trauma care based on the rapid rehabilitation surgery model can suppress oxidative stress in postoperative orthopaedic trauma patients.

Nevertheless, there are some limitations. First, the number of cases was small, and the study time was short; Second, we did not analyze the specific mechanism or related factors of fast-track surgery, and long-term follow up of the prognosis of patients was absent. These will be optimized in our future research.

In summary, the FTS mode can shorten the recovery time, reduce the degree of pain, pro-

mote recovery and discharge of patients, and improve their quality of life.

Disclosure of conflict of interest

None.

Address correspondence to: Weiwei Zhang, Department of Critical Care Medicine, Haiyang People's Hospital, No. 73 Haiyang Road, Haiyang City, Yantai 265100, Shandong, China. Tel: +86-18106383133; E-mail: zhangweiwei3692581@163.com

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