

Original Article

Damage control procedures guiding emergency nursing for patients with pelvic fracture

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Abstract: Objective: This study aimed to explore the changes in the negative emotions and prognosis of patients with pelvic fractures after damage control procedure (DCP) guided emergency nursing. Method: A total of 98 patients with pelvic fracture that were admitted to our hospital were divided into the study group (SG, n=49) for DCP guided emergency nursing, and the control group (CG, n=49) for routine emergency nursing, in order of precedence. General indicators, changes in negative emotions before and after nursing, complications and fatality rate were compared between the two groups. All patients were followed up for 1 year, and changes in SF-36 scores during this period were analyzed. Results: Compared to the CG, the SG had shorter length of hospital stay, out-of-bed activity time and fracture healing time, lower Self Anxiety Scale (SAS) and Self Depression Scale (SDS) scores, incidence of complications and fatality rate, and higher SF-36 scores at 3, 6 and 12 months after nursing ($P<0.05$). Conclusion: DCP guided emergency nursing can significantly ameliorate disease development, improve negative emotions and quality of life, and reduce the incidences of complications and fatality rate in patients with pelvic fractures, which deserves to be popularized, clinically.

Keywords: Damage control procedures, emergency nursing, pelvic fracture, negative emotions, prognosis

Introduction

With the modern development of society and the economy in recent years, the incidence of traffic and industrial accidents is increasing annually. Pelvic fracture is a common but severe orthopedic disease [1, 2], accounting for about 3% of all fracture types. It is mostly caused by high-energy injuries and complicated with organ injury, reduced resistance and haemorrhage, in the majority of patients. According to data, the fatality and the disability rates of pelvic fracture are around 20% and 55% respectively, and the mortality could be as high as 30% in the case of open pelvic fractures. Therefore, early treatment and improved nursing are important to control the degree of injury and improve the prognosis [3-5].

Originating from the US Marine Corps, damage control procedures (DCP) are applied to maintain the integrity of the severely damaged vessels, so as to minimize the damage. After that, DCP is used to rescue severely injured patients. In 1983, Rotondo first proposed the concept of "Damage Control Operation" and clearly specified that when rescuing patients with severe

injuries or with high blood loss, stage wise definitive surgical treatment needs to be implemented based on the patients' physiological tolerance. This concept has proven to be effective in clinical application, greatly improving the survival rate of patients with multiple injuries. At present, DCP has been extensively used to treat patients with severe thoracic, head and abdominal injuries as well as multiple fractures [6-8]. Some studies have shown that DCP can significantly reduce the incidence of respiratory insufficiency and multiple organ failure in patients with multiple fractures, reduce inflammation and improve both the survival rate and quality of life (QOL) [9, 10]. This study aimed to explore the feasibility of DCP in patients with pelvic fracture and analyze the effects of nursing intervention on patients' negative emotions and their prognosis, so as to accelerate the postoperative healing and improve QOL.

Materials and methods

General materials

A total of 98 patients with pelvic fracture admitted to our hospital from January to Decem-

Effects of damage control procedures guiding emergency nursing

ber 2019 were divided into the study group (SG, n=49) and control group (CG, n=49) in the order of precedence. The SG had 30 males and 19 females, with the average age of (40.28 ±4.55) years and the average weight of (63.44 ±4.78) kg, while the CG had 29 males and 20 females, with the average age of (40.31±4.33) years and the average weight of (64.01±4.31) kg.

Inclusion criteria: patients who (1) were diagnosed with pelvic fracture by imaging; (2) had complete medical records. This study has obtained the approval from the Ethics Committee of the East Hospital of Sixth People's Hospital, Shanghai, China. Informed consent was provided by patients' family members.

Exclusion criteria: patients complicated with mental disorders or dysgnosia, severe liver and kidney failure or mental diseases, coagulation disorders, malignant tumors and congenital limb dysfunction and women with pregnancy or lactating were excluded.

Methods

For patients in the CG, routine emergency nursing was provided, during which, nurses cooperated with the physicians for emergency operations and prevention of complications.

For patients in SG, DCP guided emergency nursing was provided with the following specific measures: (1) Stage 1: nursing (time control). At this stage, emergency nurses arrived at the scene of the accident and built a venous channel first. After blood collection, infusion balance was performed, during which the real-time infusion speed was adjusted according to the patients' conditions. Meanwhile, a catheter was placed and urination was observed. It may be a urethral injury in case of difficulty in urination or liquid overflow or bladder injury in case of hematuria. Timely intervention was provided in any case. (2) Stage 2: nursing (fontal injury control). A: psychological injury control. In most cases, patients with pelvic fracture may be panicked and nervous, and less cooperatively consequently. Nurses closely communicated with patients, told them the truth, comforted and encouraged them to accept treatment, so as to minimize negative emotions B: hemorrhagic shock control. Patients with hypothermia, reduced urinary production and blood circulation were immediately given intervention to

prevent shock; for patients with hypoxemia, attention was paid to maintain the respiratory tract in an open state by timely oxygen supply; at the same time, the vital signs, *i.e.*, blood pressure and heart rate were recorded. C. Fixation and traction. An elastic pelvic belt was used to appropriately wrap the area from the crista iliaca to the point about 15 cm above the peak of the femoral trochanter to maintain the normal transverse pelvic diameter. Simultaneously, two sand bags with a diameter of 15 cm and a length of 25 cm around were placed at the left and right rears of the pelvis. Finally, skeletal traction through supracondyle of the femur was performed at the affected side by bending the hip joint and the knee joint at 45° and placing them on a Braun frame. Sliding traction was maintained at the middle position. The restoring weight was about 10 kg and the maintaining weight was about 6 kg. (3) Stage 3: nursing (control of complications). This stage focused on monitoring the patients' vital signs. By referring to literature and previous experience, it was found that patients were prone to urethral injury in the event of pubic rami fractures and Diastasis Symphysis Pubis. Henceforth, urination was closely observed and a catheter was placed. Anal bleeding suggested rectal injury. Elevated blood pressure and dilated pupils indicated intracranial injury. Lower limbs dysfunction corresponded to spinal nerve injury. Considering the traction of lower limbs during the transfer of patients, sand bags are placed under the affected limb in case of repeated internal rotation and extroversion which may lead to stress.

Observation indicators and evaluation criteria

Intergroup comparison of general clinical indicators: The length of hospital stay, out-of-bed activity time, fracture healing time, transfusion volume, operation time and intraoperative blood loss were recorded and compared between the two groups.

Intergroup comparison of changes in Self Depression Scale (SDS) and Self Anxiety Scale (SAS) scores before and after nursing: All patients were evaluated by SAS and SDS before and at 7 d after intervention. The SAS is a 20-item scale designed to reflect patients' anxiety level. A total of 15 questions are worded positively and 5 negatively. Each question is scored with 1-4 points. According to the Chinese normal standards, patients are not anxious in

Effects of damage control procedures guiding emergency nursing

the case of 0 to 49 points, mildly anxious in the case of 50 to 59 points, moderately anxious in the case of 60 to 69 points, and severely anxious in the case of 70 points or above. The SDS is a 20-item scale consisting of 10 questions positively worded and 10 negatively. Each question is scored with 1-4 points. According to the Chinese normal standards, patients are not depressed in the case of 0 to 52 points, mildly depressed in the case of 53 to 62 points, moderately depressed in the case of 63 to 72 points, and severely depressed in the case of 73 points or above [11, 12].

Intergroup comparison of incidence of complications and fatality rate during the 1-year follow-up: All patients were followed up for 12 months. The incidence of complications, including soft tissue infection, acute respiratory distress syndrome, sciatic nerve traction injury, venous thrombus, and fatality rate were recorded and compared between the two groups.

Dynamic changes in the QOL after intervention: The SF-36 scale was used to evaluate both groups' QOL before, at 3, 6 and 12 months after intervention. SF-36 is a widely used and accepted quality-of-life measure that covers 8 dimensions, i.e., physical function, social function, physical role, body pain, mental health, emotional function, vitality and overall health. It can be used to evaluate physical health and mental health. The total score of each item is 100 points, which is positively correlated with the QOL [13].

Statistical analysis

Statistical analysis was performed with SPSS 22.0. In the case of numerical data it was expressed as mean \pm standard deviation (mean \pm SD), comparison studies were carried out through Student's t test; in the case of nominal data it was expressed as [n (%)], comparison studies were carried out through chi-squared test for intergroup comparison. Continuous variables were measured by Student's t test. For all statistical comparisons, significance was defined as $P < 0.05$ [14].

Results

Intergroup comparison of general clinical materials

The two groups were not statistically different in terms of general clinical materials, including

gender, age, weight, marital status, educational background, visit time, cause of injury and complications ($P > 0.05$) (Table 1).

Intergroup comparison of general clinical indicators

The length of hospital stay, out-of-bed activity time and fracture healing time were significantly shorter in the SG than in the CG ($P < 0.05$). No significant difference was found between the two groups in terms of transfusion volume, operation time and intraoperative blood loss ($P > 0.05$) (Figure 1).

Changes in SAS and SDS scores before and after nursing

The two groups had no significant difference in SAS and SDS scores before nursing ($P > 0.05$). After nursing, the scores reduced in both groups ($P < 0.05$) and were far lower in the SG at 7 d after nursing ($P < 0.05$) (Figure 2).

Incidence of complications and fatality rate during the 1-year follow-up

Throughout the 1-year follow-up, the number of complications such as soft tissue infection, acute respiratory distress syndrome, sciatic nerve traction injury and venous thrombus were 1, 3, 3 and 3 respectively in the CG (26.53%), and 1, 0, 1 and 1 in the SG (6.12%), respectively ($P < 0.05$). The 1-year fatality rate was 20.41% in the CG and 2.04% in the SG ($P < 0.05$) (Table 2 and Figure 3).

Analysis of dynamic changes in the QOL after intervention

The scores of mental health and physical health in the SF-36 assessment were not statistically different between the two groups before intervention ($P > 0.05$), but changed significantly at the 12 months of follow-up ($P < 0.05$). After intervention, the SF-36 scores were all increased. Intergroup comparison showed that, at 3, 6 and 12 months of follow-up, the scores of mental health and physical health were higher in the SG ($P < 0.05$) (Figure 4).

Discussion

With the rapid development of social communications, industry and agriculture, the occurrence of traffic and construction accidents is increasingly rising. Pelvic fracture is a common

Effects of damage control procedures guiding emergency nursing

Table 1. Intergroup comparison of general clinical materials (mean \pm SD)/[n (%)]

General clinical materials		SG (n=49)	CG (n=49)	t/X ²	P
Gender	Male	30	29	0.043	0.836
	Female	19	20		
Average age (year)		40.28 \pm 4.55	40.31 \pm 4.33	0.033	0.974
Average weight (kg)		63.44 \pm 4.78	64.01 \pm 4.31	0.62	0.537
Average BMI (kg/m ²)		23.38 \pm 3.22	23.41 \pm 3.12	0.047	0.963
Average visit time (h)		1.23 \pm 0.32	1.22 \pm 0.31	0.157	0.876
Job	Farmer	9	9	0.055	0.811
	Worker	27	26		
	Others	13	14		
Educational background	Illiterate	4	5	0.071	0.781
	Elementary school	10	11		
	Junior middle school	15	14		
	Senior high school, college and university	20	19		
Marital status	Married	43	44	0.102	0.749
	Unmarried	6	5		
Cause of injury	Traffic accident	23	24	0.114	0.718
	Crimping	12	11		
	Fall from height	10	9		
	Hit by a heavy object	4	5		
Complication	Intraperitoneal organ damage	9	8	0.233	0.689
	Supracondylar femoral fracture	4	6		
	Hemorrhagic shock	3	3		
	Bladder injury	3	4		

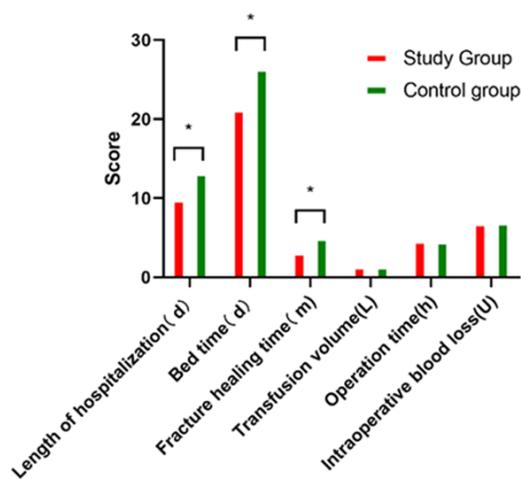


Figure 1. Intergroup comparison of differences in general indicators. The length of hospital stay, out-of-bed activity time and fracture healing time in the SG were significantly shorter than those in the CG ($P < 0.05$), while no significant difference was found between the two groups in terms of transfusion volume, operation time and intraoperative blood loss ($P > 0.05$). * $P < 0.05$ vs CG.

orthopedic disease, accounting for about 3% of all fracture types. About 25% of the pelvic frac-

ture cases are complicated with multiple injuries [15]. Most of them are caused by high-energy injuries, which are generally complex and severe, and complicated with injuries of head, chest, abdomen and the long bones. Patients with multiple injuries have a higher mortality [16].

Clinical advice on pelvic fracture intervention is symptomatic first aid and surgical treatment. The main purpose of symptomatic first aid is to stabilize the patients' vital signs and facilitate the follow-up treatment. This method is not controversial in the clinic. However, there is a clear clinical dispute about whether to perform surgical treatment immediately after pelvic fracture. From the traditional perspective, early surgery can quickly stop bleeding and help recover body function [17]. However, many practices in recent years have found that inappropriate early surgery after injury may disrupt patients again or even aggravate their conditions. Therefore, it is recommended that patients with pelvic fracture should be treated simply by means of countershock, pelvic fixation and other treatment methods, followed by

Effects of damage control procedures guiding emergency nursing

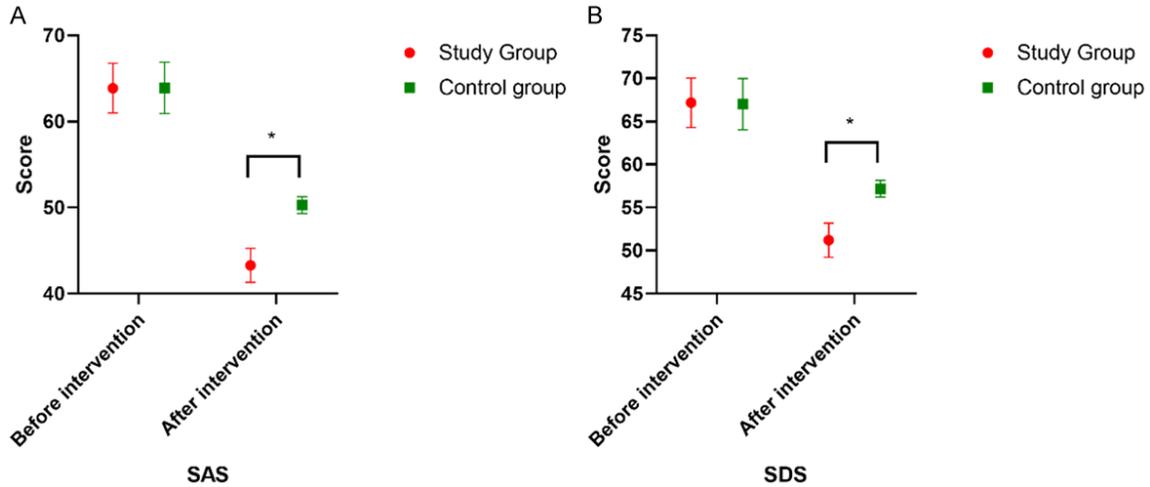


Figure 2. Changes in SAS and SDS scores before and after intervention. Before intervention, the two groups were not significantly different in SAS and SDS scores ($P>0.05$). After intervention, the SAS (A) and SDS scores (B) in the SG were lower than those in the CG ($P<0.05$). & $P<0.05$ vs CG.

Table 2. Incidence of complications and fatality rate during the 1-year follow-up [n (%)]

Group	N	Soft tissue infection	Acute respiratory distress syndrome	Sciatic nerve traction injury	Venous thrombosis	Overall incidence of complications	Fatality rate
CG	49	4 (8.16)	3 (6.12)	3 (6.12)	3 (6.12)	13 (26.53)	10 (20.41)
SG	49	1 (2.04)	0 (0.00)	1 (2.04)	1 (2.04)	3 (6.12)	1 (2.04)
X^2	-	-	-	-	-	7.47	6.322
P	-	-	-	-	-	0.006	0.012

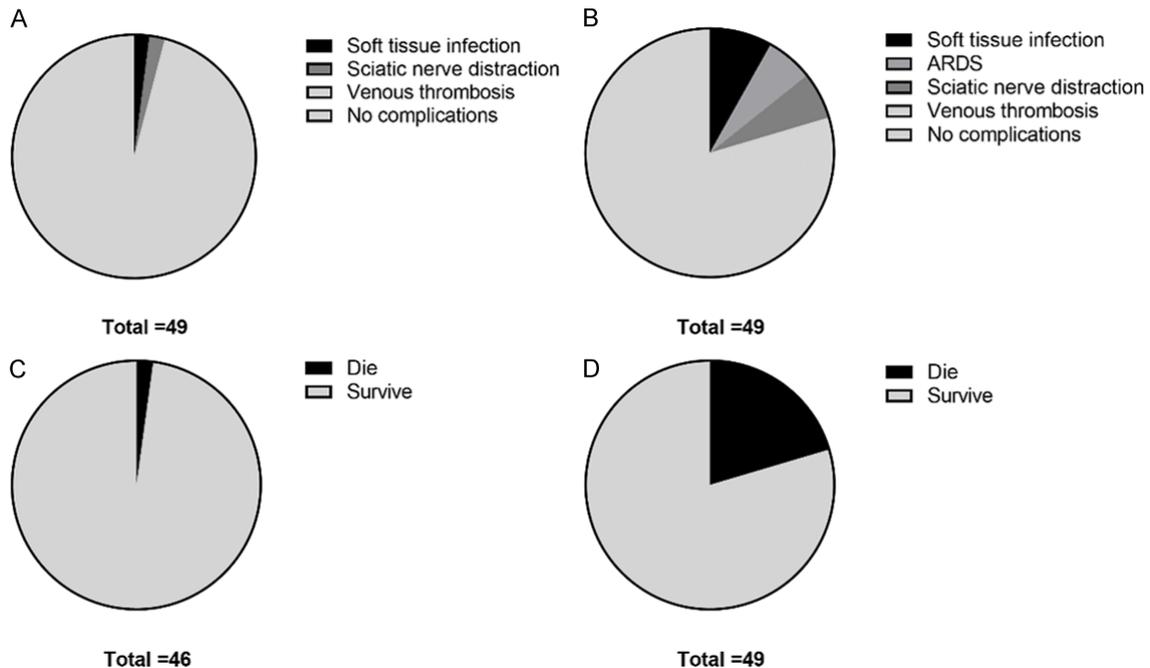


Figure 3. Intergroup comparison of incidence of complications and fatality rate during the 1-year follow-up. During the 1-year follow-up, the number of cases such as soft tissue infection, acute respiratory distress syndrome, sciatic nerve traction injury and venous thrombosis were 1, 0, 1 and 1 respectively in the SG (6.12%) (A), and 1, 3, 3 and 3 respectively in the CG (26.53%) (B). The 1-year fatality rate was 2.04% in the SG (C) and 20.41% in the CG (D).

Effects of damage control procedures guiding emergency nursing

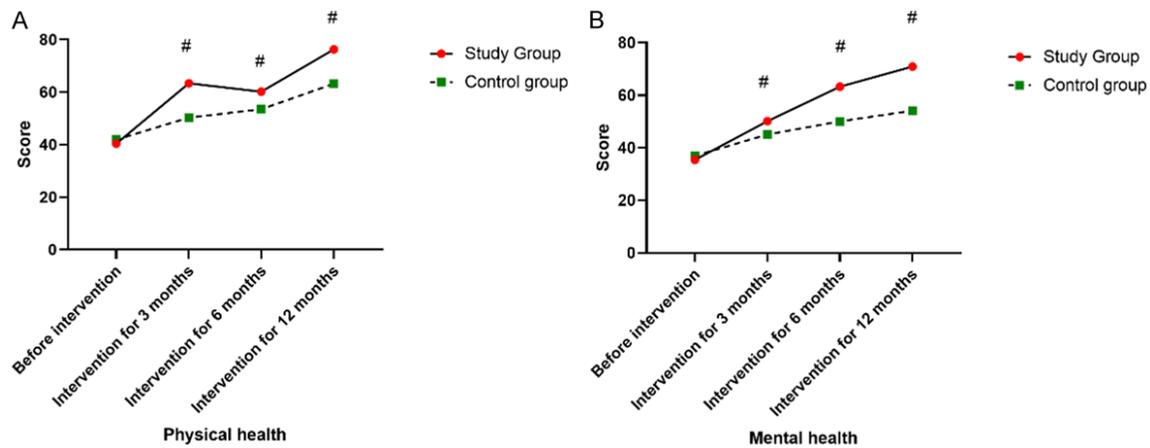


Figure 4. Analysis of dynamic changes in QOL after intervention. The scores of physical health and mental health were not significantly different between the two groups before intervention ($P>0.05$), but were higher in the SG (A and B) than in the CG at 3, 6 and 12 months of intervention ($P<0.05$). # $P<0.05$ vs CG.

pelvic or celiac packing and hemostasis. When the conditions are stable, definitive surgery is performed as the case may be. This process is called DCP [18, 19].

As a novel nursing theory, DCP emphasizes rapid, transient and preliminary intervention in the early stage to first eliminate symptoms that endanger patients, and then treat them according to their conditions. The theory was first applied in clinic in 1980s and achieved remarkable results, and has been extensively used in surgeries recently. Studies have proved that by applying DCP in patients with liver rupture, the effective rate was significantly increased, and the length of hospital stay and medical expenses were reduced. Further studies demonstrated that DCP could significantly reduce the incidence of complications and fatality rate in patients with multiple severe injuries. These finding support the good application foundation of DCS in clinic [20, 21].

By dividing pelvic fracture patients into different groups, the feasibility of DCP was analyzed, and its effects on their negative emotions and prognosis were studied. According to the results, the length of hospital stay, out-of-bed activity time and fracture healing time in the SG were shorter than those in the in CG, suggesting that DCP accelerated the postoperative recovery. A clinical study regarding the pelvis has shown that pelvic fracture is a relatively serious type of fracture, especially pelvic fracture complicated with multiple injuries, which has a high fatality rate. In such a case, pinning

hope on early surgical treatment is no longer feasible. Instead, measures should be taken to correct and regulate the internal environment first [22]. DCP is a good example of this concept. Through scientific and reasonable assessment of the patients' conditions and providing effective emergency nursing, the first aid quality was improved. In this study, patients in the SG were intervened with by time control and fontal damage control to maximally recover their physiological status and facilitate the treatment in later stages. These measures have accelerated the postoperative recovery according to the study findings [23]. A comparative study of 80 patients with pelvic fractures showed that early psychological intervention is helpful to the recovery process of the patients and is effective in improving their depressed emotions [24]. It is possible that the development of primary injury is one of the key factors affecting patients' emotions. After preliminary intervention, patients in the SG achieved improvements in clinical symptoms and therefore a significant upturn of negative emotions. As a result, their SAS and SDS scores reduced sharply and were better than those of the CG.

The incidence of complications and fatality rate after intervention were also analyzed. According to the results, the overall incidence of complications was 6.12% in the SG and 26.53% in the CG. A clinical long-term follow-up of pelvic fracture patients showed that the high incidence of complications was one of the important causes of death in elderly patients with pelvic fracture, and good postoperative reha-

bilitation intervention was helpful to prolong the survival time of elderly patients with pelvic fracture [25]. It is believed that complications are important reference indicators to predict the postoperative survival rate of pelvic fracture patients. Nurses implemented scientific and effective damage control for the SG patients to shorten the first aid time and slow down the development of the disease. Meanwhile, predictable liquid transfusion can control the patients' conditions and reduce the incidence of postoperative complications accordingly. Finally, the comparison of QOL between the two groups suggests that DCP can also help improve postoperative QOL of patients with pelvic fractures, which is similar to the research results of other scholars. A study has shown that good damage control can significantly improve patients' SF-36 score from (70.98 ±4.99) to (88.28±4.51) [26]. To analyze the possible reason, it may be because fontal damage control accelerated the postoperative recovery of patients' conditions, shortened the postoperative length of hospital stay and improved patients' negative emotions by psychological and physical intervention. As a result, patients' postoperative QOL was enhanced.

In conclusion, DCP guided emergency nursing can significantly accelerate the development of pelvic fracture, improve patients' negative emotions, reduce the incidence of complications and fatality rate, and improve patients' QOL, which deserves to be popularized in the clinic. However, this study is defective in the following aspects: (1) Limited number of samples may result in biased results; (2) The follow-up was too short to obtain long-term findings. In view of these shortages, further interventions will be based on more samples and extended for a longer period of time, so as to provide detailed theoretical basis for the improvement of pelvic fracture patients' prognosis.

Disclosure of conflict of interest

None.

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Effects of damage control procedures guiding emergency nursing

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