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Influence of an ERAS-Based Nursing Approach on Postoperative Recovery and Deep Vein Thrombosis Incidence after Femoral Fracture Repair

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Abstract: This study aimed to evaluate the effects of Enhanced Recovery After Surgery (ERAS)-based nursing on postoperative recovery, deep vein thrombosis (DVT) incidence, pain levels, anxiety, and patient satisfaction in patients undergoing femoral fracture surgery. A total of 68 patients with femoral fractures were equally assigned to either a control group receiving conventional care or an observation group undergoing ERAS-based nursing interventions. Key outcome measures included time to first ambulation, wound healing time, length of hospital stay, incidence of DVT, Functional Independence Measure (FIM) score, Harris Hip Score, Visual Analogue Scale (VAS) for pain, Hamilton Anxiety Scale (HAMA), and overall nursing satisfaction. All patients were followed up for six months after discharge. Compared with the control group, patients in the observation group showed significantly shorter ambulation and wound-healing times, as well as reduced length of hospital stay ($p<0.05$). They also had higher FIM and Harris Hip Scores, lower VAS and HAMA scores, and a markedly lower incidence of DVT ($p<0.05$). In addition, overall nursing satisfaction was notably higher in the observation group ($p<0.05$). ERAS-based nursing interventions effectively enhance functional recovery in patients undergoing femoral fracture surgery, shorten hospital stays, reduce DVT incidence, alleviate postoperative pain, and improve psychological status. These benefits collectively result in higher patient satisfaction, supporting wider clinical application of ERAS-based nursing strategies in orthopedic care.

1. Introduction

Femoral fractures are a relatively common type of orthopedic trauma, often triggered by direct or indirect forces leading to disruption of the femoral structure. Patients typically present with localized swelling, severe pain, and limited mobility, all of which can markedly diminish their quality of life [1]

Surgical treatment remains the primary option for most femoral fractures, as exposing the fracture site and achieving anatomical reduction can help restore limb function. However, the invasive nature of surgery can result in significant postoperative pain, which in turn decreases patients' motivation to

participate in rehabilitation and adversely affects recovery [2]

Moreover, extended bed rest post-surgery contributes to venous stasis in the lower limbs, substantially increasing the risk of thrombotic events—particularly deep vein thrombosis (DVT)—that may potentially progress to life-threatening pulmonary or cerebral embolisms [3-4]

In recent years, the concept of Enhanced Recovery After Surgery (ERAS) has gained prominence in the perioperative management of orthopedic patients. Grounded in evidence-based medicine and individualized care, ERAS-based nursing employs targeted strategies designed to accelerate recovery. By addressing both physical and psychological factors—such as providing tailored exercise regimens, delivering effective pain management, and reducing preoperative anxiety—ERAS protocols can shorten hospital stays and improve clinical outcomes [5]

Therefore, this study aimed to explore the impact of ERAS-based nursing interventions on postoperative rehabilitation and the incidence of DVT in patients undergoing surgical treatment for femoral fractures.

2. Materials and Methods

2.1 General Information

Between December 2021and December 2023, a total of 68 patients who underwent femoral fracture surgery in the Department of Orthopedics of our hospital were recruited. Using a random number table, patients were equally assigned to an observation group or a control group, with 34 patients in each.

(1) Control group (n=34): 17 males and 17 females; age range, 50–81years; mean age (65.48±6.23) years. Causes of fracture included traffic accidents (17 cases), high falls (9 cases), and other causes (8 cases).

(2) Observation group (n=34): 19 males and 15 females; age range, 49–83 years; mean age (65.52±6.24) years. Causes of fracture included traffic accidents (19 cases), high falls (11 cases), and other causes (4 cases).

No statistically significant differences in baseline characteristics were noted between groups ($p>0.05$). This study was approved by the hospital's institutional ethics committee and was conducted in strict accordance with the latest revision of the Declaration of Helsinki.

2.2 Inclusion and Exclusion Criteria

2.2.1 Inclusion criteria

①Diagnosis of femoral fracture confirmed by CT or X-ray.

②No contraindications to anesthesia or surgery.③Good treatment adherence, with complete clinical data.④Patients and their families were fully informed and provided written consent.

2.2.2 Exclusion criteria

①Severe hepatic or renal dysfunction. ②Comminuted femoral fractures. ③Previous total hip replacement. ④Coagulopathies. ⑤Comorbid mental illness or significant communication barriers.

2.3 Nursing Interventions

2.3.1 Control Group

Routine nursing was provided. Preoperatively, brochures were distributed, and patients' questions

regarding the surgical procedure were addressed. Patients were advised to avoid spicy or irritating foods during the perioperative period. Postoperatively, anti-inflammatory and analgesic medications were administered as prescribed. Basic functional training guidance was offered, and patients were advised to attend regular follow-up visits upon discharge.

2.3.2 Observation Group

An Enhanced Recovery After Surgery (ERAS)–based nursing protocol was implemented.

(1) Preoperative Care

Nursing staff provided patient education on the nature of femoral fractures, helped patients and families reduce unnecessary visit frequency, and created a calm rest environment. Relaxing music was played to promote better sleep quality. A dietitian developed individualized nutritional plans to optimize patients' preoperative nutrient intake. Nursing staff maintained open communication with patients and families via visual aids or videos to explain surgical procedures, disease-related knowledge, and key preoperative precautions.

(2) Intraoperative Care

Nurses closely monitored patient hemodynamics and temperature, ensuring that infused fluids were maintained at room temperature. They also coordinated with the surgeon to uphold aseptic practices, promptly offering reminders as needed. Following the procedure, prophylactic antibiotics were administered in accordance with medical orders to prevent infection.

(3) Postoperative Care

On the first postoperative day, analgesics were tailored to each patient's pain level. Nurses provided psychological support, encouraged patients to adopt a positive mindset, and motivated them to initiate rehabilitation activities. Patients were guided to perform in-bed exercises such as arm raises and ankle pump exercises for approximately 35 minutes per session. Gradual out-of-bed activities were introduced using caregiver support or assistive devices (e.g., crutches), twice a day for about 30 minutes each time. Families were instructed to perform gentle muscle massages afterward to help relieve soreness. Starting around postoperative days 5–6, patients progressed to knee flexion and extension exercises, standing, and walking (with reduced reliance on assistive devices), for 30 minutes per session, twice daily.

Both groups continued receiving their respective nursing interventions until hospital discharge. Post-discharge, regular follow-up was carried out by telephone or other means for up to six months.

2.4 Evaluation Criteria

In this study, multiple parameters were employed to compare outcomes between the two groups, encompassing clinical indicators, rehabilitation status, hip joint function, incidence of deep vein thrombosis (DVT), postoperative pain, psychological well-being, and nursing satisfaction.

2.4.1 Clinical Indicators

The time to first ambulation, wound healing time, and overall length of hospital stay were recorded for both groups.

2.4.2 Rehabilitation Status

The Functional Independence Measure (FIM) was utilized to assess rehabilitation outcomes pre- and post-nursing intervention. FIM comprises two main dimensions with a total of six components:

①Motor function: self-care, sphincter control, transfers, and locomotion (total score range: 0–91).

②Cognitive function: communication and social cognition (total score range: 0–35).

The maximum cumulative score is 126, with higher scores indicating better functional independence [6].

③Hip Joint Function

The Harris Hip Score (HHS) was used to evaluate hip function before and after the nursing interventions. This scale addresses five primary domains: pain, gait, activity level, functional ability, and deformity, for a total of 100 points. Scores are categorized as follows:

- <70 points: Poor functional capacity
- 70–79 points: Fair functional capacity
- 80–89 points: Good functional capacity
- 90–100 points: Excellent functional capacity

Higher scores suggest better hip joint recovery [7].

2.4.3 Incidence of Deep Vein Thrombosis

A fully digital color Doppler ultrasound system (latest generation device, registered under local regulatory guidelines) was employed to detect and confirm DVT in both groups.

2.4.4 Postoperative Pain

The Visual Analogue Scale (VAS) was administered pre- and post-nursing intervention to gauge pain intensity. The scale is depicted by a 10-cm line, subdivided into 10 equal units (1 point each). Patients indicate their perceived pain level along the line:

- 0 points: No pain
- 1–3 points: Mild pain
- 4–6 points: Moderate pain
- 7–10 points: Severe pain

Lower scores reflect lower pain levels [8].

2.4.5 Psychological Status

The Hamilton Anxiety Scale (HAMA) was used to assess anxiety before and after nursing care. This scale includes 14 items, each scored on a 5-point scale. Total scores are interpreted as follows:

- ≤7 points: Normal
- 8–14 points: Mild anxiety
- 15–21 points: Moderate anxiety
- 22–29 points: Severe anxiety

Lower scores indicate better psychological status [9].

2.4.6 Nursing Satisfaction

Upon completion of the intervention, patients were asked to fill out a hospital-designed satisfaction questionnaire (Cronbach's α=0.873; test–retest reliability=0.869). This survey evaluates quality of care, nursing attitude, patient experience, and disease-related knowledge. Total scores range from 0 to 100, and satisfaction levels were classified as follows:

- 95–100 points: Very satisfied
- 85–94 points: Satisfied
- 0–84 points: Not satisfied

The overall satisfaction rate was calculated by combining the percentages of "very satisfied" and "satisfied."

2.5 Statistical Methods

All data were processed using SPSS 26.0. Continuous variables are presented as the mean±standard deviation ($\bar{x}$±s) and analyzed by the t-test. Categorical variables are expressed as percentages (%) and compared using the chi-square (x^2) test. A difference was considered statistically significant at $p<0.05$.

3. Results

3.1 Comparison of Clinical Indicators between the Two Groups

Patients in the observation group had shorter times to first ambulation, wound healing, and overall hospital stays compared with those in the control group ($p<0.05$). Table 1.

Table 1: Comparison of Clinical Indicators between the Two Groups (n=68:$\bar{x}$±s)

Group	n	Time to Ambulation(days)	Wound Healing Time (days)	Length of Hospital Stay(days)
Control Group	34	11.25±2.14	8.32±1.30	18.73±4.72
Observation Group	34	7.16±1.79	5.41±1.09	14.09±3.79
t		8.62	10.30	4.52
p		0*	0*	0*

Note:*p<0.001

3.2 Comparison of FIM Scores and Harris Scores between the Two Groups

Before nursing intervention, there were no statistically significant differences in either FIM or Harris scores between the two groups ($p>0.05$). Following the intervention, the observation group demonstrated significantly higher FIM and Harris scores than the control group ($p<0.05$). Table 2.

Table 2: Comparison of FIM and Harris Scores between the Two Groups Before and After Nursing (n=68:$\bar{x}$±s)

Indicator	Group	n	Score ($\bar{x}$±s)	t	p
FIM (Pre)	Control Group	34	33.80±4.21	0.31	0.759
	Observation Group	34	34.10±4.13		
FIM (Post)	Control Group	34	67.57±6.19	4.73	0*
	Observation Group	34	74.91±6.55		
Harris (Pre)	Control Group	34	65.35±10.39	0.03	0.978
	Observation Group	34	65.20±10.42		
Harris (Post)	Control Group	34	83.30±4.47	8.14	0*
	Observation Group	34	92.08 4.42		

Note: FIM = Functional Independence Measure; Harris = Harris Hip Score. *p<0.001

3.3 Comparison of Deep Vein Thrombosis (DVT) Incidence between the Two Groups

In the control group, the incidence of DVT was 23.53% (8/34), whereas in the observation group, it was 2.94% (1/34). The observation group exhibited a significantly lower incidence of DVT compared to the control group ($x2=4.610$, $p=0.032$). Table 3.

Table 3: Incidence of Deep Vein Thrombosis in the Two Groups (n=68:n[%])

Group	n	DVT Cases	Incidence	x^2	p
Control Group	34	8	23.53	4.61	0.032
Observation Group	34	1	2.94		

3.4 Comparison of VAS and HAMA Scores between the Two Groups

After nursing intervention, both the VAS and HAMA scores in the observation group were significantly lower than those in the control group ($p<0.05$). Table 4.

Table 4: Comparison of VAS and HAMA Scores in the Two Groups Before and After Nursing (n=68:$\bar{x}\pm s$)

Indicator	Group	n	Pre-Nursing	Post-Nursing	t1	p1	t2	p2
VAS	Control Group	34	6.33±1.16	4.61±1.31	0.41	0.684	9.47	0
	Observation Group	34	6.22±1.09	2.42±0.27				
HAMA	Control Group	34	15.62±3.79	12.72±3.43	0.37	0.712	10.35	0
	Observation Group	34	15.34±3.82	6.20±1.42				

3.5 Comparison of Nursing Satisfaction between the Two Groups

The overall satisfaction rate in the observation group was significantly higher than that in the control group ($p<0.05$). Table 5.

Table 5: Comparison of Nursing Satisfaction Rates Between the Two Groups (n=68: n[%])

Group	n	Satisfied	Relatively Satisfied	Dissatisfied	Total Satisfied	x^2	p
Control Group	34	12 (35.29)	13 (38.24)	9 (26.47)	25 (73.53)	5.31	0.021
Observation Group	34	17 (50.00)	15 (44.12)	2 (5.88)	32 (94.12)		

4. Conclusions

The femur is the longest and most weight-bearing bone in the human body. Fractures of the femur typically result from direct, high-energy trauma, such as motor vehicle accidents, falls from heights, or blunt force injuries. Patients often present with severe pain and restricted mobility in the fracture site, and in severe cases, displacement or angular deformities may occur. Without prompt intervention, massive hemorrhage can ensue[10]. Although surgical management remains the primary approach for femoral fractures, prolonged postoperative bed rest and limited physical activity elevate the risks of muscle atrophy and poor venous return, thereby increasing the incidence of deep vein thrombosis (DVT) in the lower extremities [11]. Thus, delivering effective perioperative nursing interventions is of paramount importance to reduce postoperative DVT and enhance the outcomes of surgical treatment.

Conventional nursing often focuses on the surgical outcome itself, paying insufficient attention to postoperative rehabilitation exercises. Consequently, the incidence of DVT remains relatively high, and the overall nursing effect is suboptimal[12]. By contrast, Enhanced Recovery After Surgery

(ERAS)–based nursing, grounded in evidence-based medical principles, provides a holistic perioperative management strategy for patients with femoral fractures. It optimizes nursing measures, mitigates surgical stress responses, and ultimately facilitates faster postoperative recovery [13].

In this study, patients in the observation group, who received ERAS-based nursing, exhibited significantly shorter times to ambulation, wound healing, and hospital discharge compared with the control group. Furthermore, they demonstrated higher Functional Independence Measure (FIM) and Harris Hip scores, as well as improved overall nursing satisfaction. Their DVT incidence, Visual Analogue Scale (VAS) pain scores, and Hamilton Anxiety Scale (HAMA) scores were notably lower than those of the control group ($p<0.05$). These findings suggest that ERAS-based nursing can effectively shorten hospital stays, expedite postoperative recovery, reduce the risk of DVT, alleviate postoperative pain, improve psychological well-being, and enhance patient satisfaction following surgical treatment for femoral fractures.

Several factors may account for these positive outcomes. First, ERAS-based nursing strengthens patient education prior to surgery. By providing comprehensive information on the nature of femoral fractures, the surgical procedure, and perioperative precautions, patients and their families gain a clearer understanding of the treatment plan. This process helps alleviate preoperative concerns, enhances disease awareness, and bolsters confidence in the therapeutic regimen, thereby improving adherence [14]. Additionally, individualized dietary programs are devised to optimize immune function and minimize surgical risk, facilitating a smoother and faster recovery [15].

Second, the psychological status of patients is closely monitored, and targeted interventions are implemented to mitigate negative emotions. This approach helps improve patient cooperation and overall satisfaction. During surgery, meticulous intraoperative nursing—such as maintaining normothermia and supervising infusion rates—ensures a warmer, more comfortable operating environment. This practice reduces the incidence of shivering and limb numbness, helps maintain hemodynamic stability, and prevents unnecessary surgical trauma, thereby supporting better surgical outcomes [16,17].

Postoperatively, pain management is tailored to each patient's needs to minimize stress responses and encourage earlier ambulation, which not only shortens wound healing time but also prevents complications such as infection that may arise from prolonged wound exposure [18]. Guided rehabilitation exercises further aid in restoring hip joint function, while targeted massage techniques promote venous return and help prevent lower extremity DVT. Telephone follow-up and other convenient communication methods enable timely monitoring of patient progress, providing opportunities for early identification and management of any complications, thereby enhancing the overall rehabilitation process.

In conclusion, implementing ERAS-based nursing interventions for patients undergoing femoral fracture surgery can significantly improve postoperative functional recovery, shorten hospital stays, accelerate the rehabilitation process, reduce DVT incidence, alleviate postoperative pain, and mitigate anxiety. Patients also report higher satisfaction levels, indicating that such an approach is both clinically beneficial and worthy of broader adoption.

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