Am J Transl Res 2024;16(7):3231-3239
www.ajtr.org /ISSN:1943-8141/AJTR0156111

*Original Article*

# Enhanced recovery after surgery speeds up healing for hip fracture patients

Xia Long, Wen Li, Dan Hou, Xiaoyue Li, Dongyue Cheng

*Department of Orthopaedics, The Affiliated Hospital of Southwest Medical University, Luzhou 646000, Sichuan, China*

Received February 25, 2024; Accepted May 14, 2024; Epub July 15, 2024; Published July 30, 2024

**Abstract:** Objective: To investigate the effects of enhanced recovery after surgery (ERAS) on the perioperative healing and stress response in patients with hip fractures. Methods: A retrospective analysis was conducted on the medical records of 86 patients with hip fractures admitted to the Affiliated Hospital of Southwest Medical University between January 2022 and August 2023. Among them, 48 patients in the research group received ERAS, while 38 patients in the control group received conventional nursing. Hip joint function, pain levels, stress response, fracture healing time, incidence of complications, and nursing satisfaction were compared between the two groups. Results: After nursing, the Harris scores notably increased in both groups, with the research group showing notably higher scores compared to the control group ($P<0.05$). The levels of cortisol and epinephrine, as well as the visual analog scale scores significantly decreased in both groups, with the research group showing significantly lower levels ($P<0.05$). In addition, the research group experienced significantly shorter fracture healing time ($P<0.05$), higher nursing satisfaction ($P=0.014$), and lower incidence of complications ($P=0.028$). Logistic regression analysis revealed that age, underlying diseases, nursing method, emotional disorders, and timing of surgery were independent factors influencing the post-nursing outcomes. Conclusion: The ERAS mode can effectively alleviate pain, improve hip joint function, reduce fracture healing time and complications, mitigate stress response, and accelerate postoperative recovery in patients with hip fractures. It is worthy of application and promotion in clinical practice.

**Keywords:** Enhanced recovery after surgery, hip fractures, stress response, fracture healing

## Introduction

Hip fractures, occurring in the proximal end of the femur or acetabulum, typically result from external forces or factors like osteoporosis [1]. Primarily afflicting the elderly individuals, particularly those with osteoporosis or weakened bones [2], these fractures pose significant health challenges due to age-related bone issues, making the elderly more susceptible to hip injuries [3]. According to statistics, approximately 16.9 million cases of hip fractures occur worldwide each year, predominantly among individuals aged 65 and above [4]. With the ongoing global trend of population aging, the incidence of hip fractures is projected to escalate, bearing substantial consequences. Approximately 30% of elderly hip fracture patients die within a year. Among survivors, 70% face long-term mobility constraints and functional impairment [5]. These data highlight the importance of preventive measures and early intervention to reduce the incidence of hip fractures and improve patient rehabilitation outcomes.

Surgical treatment is one of the crucial methods for managing hip fractures. It allows for fracture reduction, stabilization, and early initiation of rehabilitation and physical therapy. This promotes the recovery of hip function and mobility, providing patients with better rehabilitation prospects and reducing the risk of long-term disability [6]. However, surgical procedures entail inherent risks, including anesthesia complications, bleeding, infection, and wound healing issues, potentially compromising patient outcomes. Therefore, postoperative nursing interventions is particularly important [7]. During the perioperative period, nurses can

https://doi.org/10.62347/AEVL7890

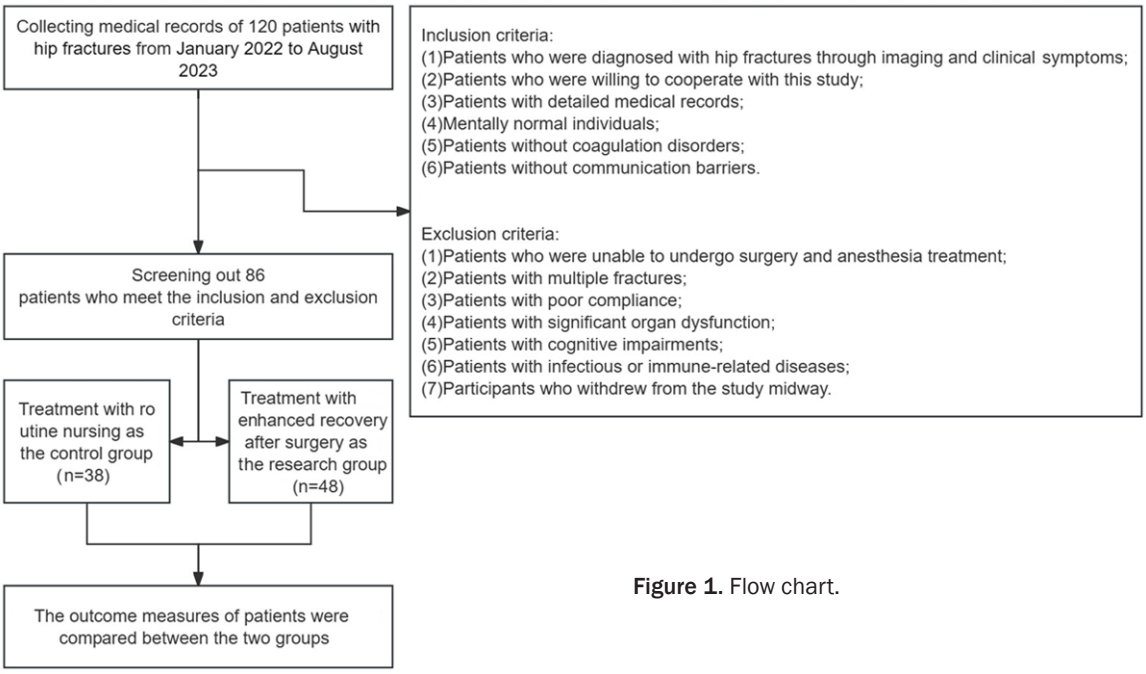


**Figure 1.** Flow chart.

provide comprehensive care support to minimize surgical risks and promote recovery [8]. Enhanced recovery after surgery (ERAS) is a comprehensive nursing intervention mode that provides both preoperative and postoperative care, alongside psychological support, tailored to meet individualized nursing needs [9]. This nursing mode is characterized by its comprehensiveness and patient-centeredness, aiming to promote rapid patient recovery. Relevant studies have shown that ERAS is a beneficial approach for perioperative rehabilitation in cardiac surgery patients [10]. Compared to traditional standard nursing, ERAS is better accepted by patients and has the potential to reduce complications and improve quality of life. This suggests the feasibility of implementing this nursing model in surgical patients.

In this context, ERAS was employed in our study for patients with hip fractures to investigate its efficacy, as well as impact on stress response and fracture healing, thereby providing reliable references for the clinical management of hip fractures.

## Method and materials

### *Case collection*

A retrospective analysis was conducted on the medical records of 120 patients with hip fractures admitted to the Affiliated Hospital of Southwest Medical University from January 2022 to August 2023. This study was conducted with the approval of the Medical Ethics Committee of the Affiliated Hospital of Southwest Medical University. From the initial pool, 86 cases meeting the study's criteria were included and categorized into two groups: the research group, comprising 48 patients who received ERAS, and the control group, consisting of 38 patients receiving conventional nursing care. See **Figure 1**.

### *Inclusion and exclusion criteria*

Inclusion criteria: Patients diagnosed with hip fractures based on imaging and clinical symptoms; patients with good compliance; patients with complete medical records available; mentally stable individuals; patients without coagulation disorders and communication barriers.

Exclusion criteria: Patients who were unable to undergo surgical or anesthesia treatment; patients with multiple fractures; patients with significant organ dysfunction; patients with cognitive impairment; patients with infectious or immune-related diseases.

### *Nursing intervention*

In the control group, all patients received routine nursing interventions. Upon admission,

health education was provided, and a surgical plan, including the date, procedure, precautions, etc., was developed based on individual conditions and delivered to the patients and their families. Postoperatively, vital signs of the patients were monitored promptly, and wound inspections were performed regularly. Measures were taken for prevention and management of infection and other complications such as deep vein thrombosis. Any abnormal conditions during the nursing process were promptly reported to the physician for appropriate management.

In the research group, all patients received ERAS nursing. The specific protocol was as follows. (1) Preoperative health education: Detailed information about the surgical process, including the type of surgery, anesthesia methods, and postoperative rehabilitation plan, were provided to the patients and their families. The risks and expected outcomes of the surgery were explained to help them make informed decisions. The patients were educated about the protection and precautions related to the fracture fixation device, including avoiding excessive activity, proper use of walking aids or crutches, and avoiding falls and collisions. (2) Preoperative preparation: Nurses assessed patients' overall health status and nursing needs, including necessary laboratory tests, electrocardiograms, and chest X-rays, to ensure surgical safety. Additionally, guidance on preoperative preparation, such as fasting for 6 hours and abstaining from water intake for 2 hours, was provided to ensure a smooth surgical procedure. (3) Intraoperative nursing: During the operation, the nurses paid attention to maintain the temperature of the operating room and keep the infusion, washing liquid, and surgical instruments at about 37°C, so as to prevent patient discomfort from cold. Nurses provided emotional support and assisted treatment throughout the procedure. (4) Postoperative nursing: Two hours after the surgery, vital signs and postoperative condition were observed. Oral intake readiness was assessed based on their individual situation, and progressive nutritional support was provided. Measures like attention diversion, music, or appropriate analgesic treatment were administered to relieve the discomfort. Fixation device stability was regularly checked. (5) Rehabilitation training. A personalized rehabilitation plan was developed based on individual conditions, including early rehabilitation exercises, active and passive joint movements, muscle strengthening, and flexibility training. These exercises aimed to promote blood circulation and reduce the incidence of complications. The patients were educated on proper use of walking aids or crutches to avoid additional pressure on the injured hip and facilitate their recovery of walking ability. Additionally, the nurses encouraged the patient to gradually increase the intensity and range of their activities to improve muscle strength, balance, and coordination. Necessary support and supervision were provided to ensure the safety and adaptability of the patient during rehabilitation training. Finally, the nurses regularly assessed the patients' rehabilitation progress, and adjusted the rehabilitation plan accordingly, aiming to maximize the restoration of the patient's function and daily life abilities. Any abnormal conditions during nursing were promptly reported to the physician for appropriate management.

*Collection of clinical data*

Clinical data of the patients were obtained from electronic medical records and outpatient follow-up records, including age, sex, body mass index (BMI), underlying diseases, education level, place of residence, ethnicity, cortisol (Cor), epinephrine (E), fracture healing time, Harris score [11], Visual Analog Scale (VAS) score [12], nursing satisfaction, and complications.

*Outcome measures*

Primary outcome measures: The hip joint function in both groups was evaluated before and after nursing using the Harris Hip Score scale. This scoring scale ranges from 0 to 100, with higher scores indicating better hip joint function. The levels of stress response indicators, including Cor and E, were compared before and after nursing between the two groups. The fracture healing time was compared between the two groups.

Secondary outcome measures: The pain levels were compared before and after nursing between the two groups using the VAS. The scale has a total score of 10 points, with a higher score suggesting more serious pain. A self-made Nursing Satisfaction Questionnaire was

**Table 1.** Comparison of clinical data

| Factors | Research group (n=48) | Control group (n=38) | $\chi^2$ | *P* value |
|---|---|---|---|---|
| Age (years) | | | 0.112 | 0.738 |
| ≤60 | 21 | 18 | | |
| >60 | 27 | 20 | | |
| Sex | | | 0.392 | 0.531 |
| Male | 26 | 18 | | |
| Female | 22 | 20 | | |
| Body mass index (kg/m$^2$) | | | 0.458 | 0.499 |
| ≤23 | 23 | 21 | | |
| >23 | 25 | 17 | | |
| Underlying diseases | | | 1.208 | 0.272 |
| Yes | 30 | 28 | | |
| No | 18 | 10 | | |
| Education level | | | 0.037 | 0.849 |
| Below junior college | 35 | 27 | | |
| Junior college or above | 13 | 11 | | |
| Place of residence | | | 0.231 | 0.631 |
| Urban area | 29 | 21 | | |
| Rural area | 19 | 17 | | |
| Ethnicity | | | 0.325 | 0.568 |
| Han | 34 | 29 | | |
| Ethnic minorities | 14 | 9 | | |

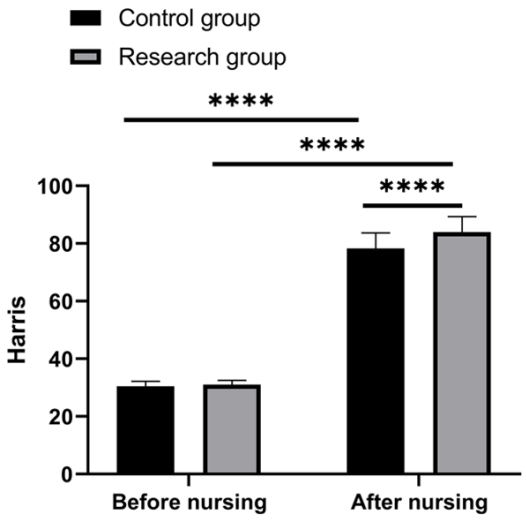


**Figure 2.** Comparison of Harris scores. Note: **** indicates P<0.0001.

adopted to evaluate nursing satisfaction. The questionnaire has a total score of 100, with a score <60 points for dissatisfaction, a score between 60-89 for basic satisfaction, and a score ≥90 points for satisfaction. Satisfaction rate = (the number of cases satisfied with nursing + that of cases basically satisfied with nursing)/total number of cases × 100%. The complications of the two groups were also compared.

*Statistical analyses*

This study adopted SPSS20.0 (SPSS Co., Ltd., Chicago, USA) for statistical analyses and used GraphPad Prism 7 (Graphpad software, inc., San Diego, CA) for data visualization. Counting data were presented as cases (%), and analyzed via the chi-square test. Measurement data were presented as means ± standard deviations (Means ± SD). For statistical analysis between the two groups, an independent samples t-test was used. For comparisons within the same group before and after nursing, a paired t-test was employed. P<0.05 suggests a significant difference. Logistic regression was utilized to analyze the risk factors affecting patient prognosis.

## Results

*Comparison of baseline data*

No notable differences were observed in basic clinical data between the two groups, including age, gender, BMI, underlying diseases, education level, place of residence, and ethnicity (P>0.05, **Table 1**).

*Comparison of hip joint function*

Before nursing, both groups exhibited comparable Harris scores (P>0.05). However, after nursing, a significant increase was found in Harris scores in both groups, with the research group showing significantly higher scores than the control group (P<0.05, **Figure 2**).

*Comparison of stress response*

No notable differences were found in the levels of Cor and E before nursing (P>0.05). However, after nursing, significant decreases

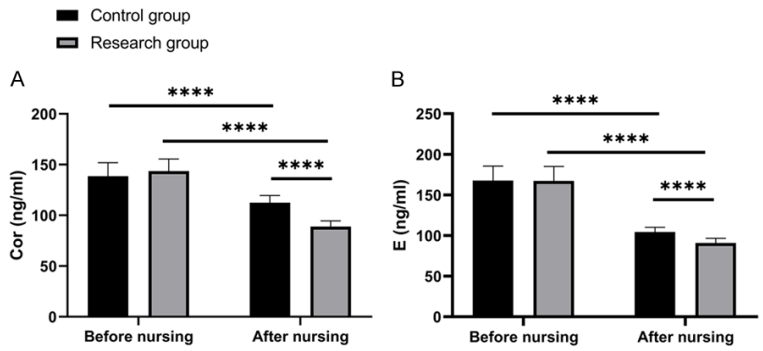


**Figure 3.** Comparison of stress response. A. Changes in Cor levels before and after nursing. B. Changes of E levels before and after nursing. Note: **** indicates P<0.0001. Cor: cortisol; E: epinephrine.

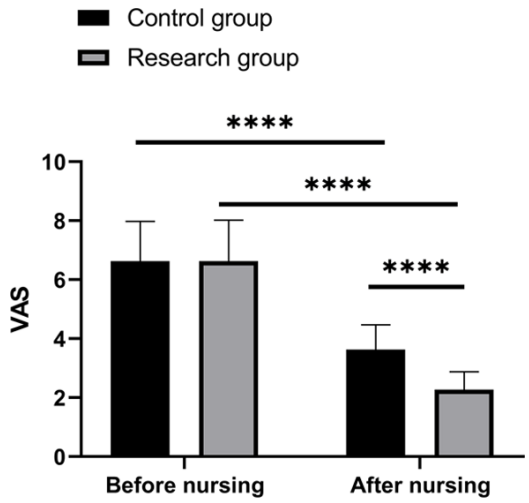


**Figure 4.** Comparison of VAS scores. Note: **** indicates P<0.0001. VAS: Visual Analog Scale.

were observed in both levels in the two groups, with the research group showing significantly lower levels than the control group (P<0.05, **Figure 3**).

*Comparison of pain scores*

Pre-nursing VAS scores did not differ significantly between the two groups (P>0.05). However, post-nursing, a notable decrease in VAS scores was observed in both groups, with the research group exhibiting significantly lower scores (P<0.05, **Figure 4**).

*Comparison of fracture healing time*

The research group experienced a significantly shorter fracture healing time compared to the control group (P<0.05, **Figure 5**).

*Comparison of nursing satisfaction*

The comparison of nursing satisfaction between the two groups revealed a notably lower nursing satisfaction in the control group than in the research group (P=0.014, **Table 2**).

*Comparison of complications*

A notably higher incidence of complications was revealed in the control group compared to that in the research group (P=0.028, **Table 3**).

*Analysis of factors affecting patient prognosis*

According to the post-nursing Harris score, the patients were reclassified into two different groups. The good prognosis group included patients with scores ranging from 80 to 100 (good or excellent prognosis, 60 cases). The poor prognosis group included patients with scores 79 or lower (fair or poor prognosis, 26 cases). Univariate analysis revealed that age, underlying diseases, nursing method, emotional disorders, and timing of surgery were significant factors influencing the treatment outcomes (**Table 4**).

Subsequently, these significant indicators were assigned values for further analysis. Prognosis was assigned a value of 0 for good and 1 for poor. Age was assigned 0 for ≤60 years and 1 for >60 years. Underlying diseases were assigned 1 for presence and 0 for absence. Nursing method was assigned 1 for routine nursing and 0 for ERAS nursing. Emotional disorders were assigned 1 for presence and 0 for absence. Timing of surgery was assigned 0 for ≤24 hours and 1 for >24 hours. A multivariant regression analysis was then conducted.

Logistic regression analysis revealed that age, underlying diseases, nursing method, emotional disorders, and timing of surgery were independent factors influencing the treatment outcomes (**Table 5**).

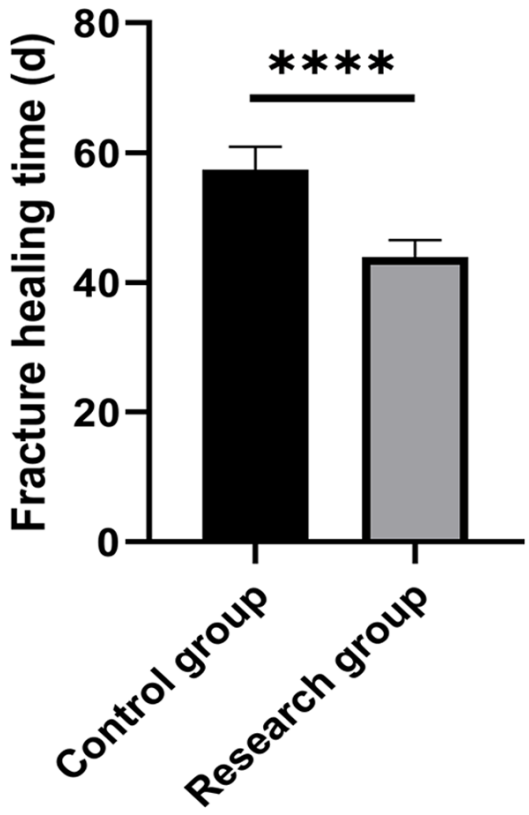


**Figure 5.** Comparison of fracture healing time. Note: **** indicates P<0.0001.

## Discussion

Hip fractures are typically caused by severe external force on the hip joint area, such as falls, accidents, or high-energy sports injuries [13]. Elderly individuals, especially those with osteoporosis, are at high risk for hip fractures [14]. Affected patients often experience severe pain, swelling, inability to bear weight and walk, leg deformity, limited range of motion [15], as well as risk of nonunion and complications [16]. Therefore, timely diagnosis, treatment, and rehabilitation are crucial to alleviate symptoms, restore function, and prevent complications.

Treatment of hip fractures typically requires surgical intervention, but the specific approach depends on the type of fracture, patient age, and overall health condition [17]. Surgical treatment is commonly used for hip fractures, especially for patients with poor stability or complex fractures. The goal of surgery is to restore stability to the hip, promote healing, and restore hip joint function [18]. However, surgical treatment also carries certain risks. Therefore, effective nursing care is essential to minimize surgical risks and promote patient recovery and rehabilitation [19]. Currently, clinical nursing mostly focuses on disease management, making it difficult to meet the multifaceted needs of patients. ERAS is a nursing model that optimizes various measures for preoperative, intraoperative, and postoperative care. Its goal is to minimize the trauma and stress response of the body to surgery and speed up patient recovery after surgery [20].

In this study, we observed the pain scores of the patients, and found notably decreased VAS scores in both groups after nursing, with the research group showing even lower scores compared to the control group. The data indicate that patients experienced significant pain relief after receiving ERAS, which potentially accelerated the recovery time, reduced the length of hospital stay, and improved the patients' quality of life. Similar to the results of this study, Wei et al. [21] found that ERAS significantly alleviated postoperative pain in patients undergoing total knee arthroplasty via vastus medialis approach, reduced recovery time, and enabled patients to regain mobility faster. Furthermore, the recovery of hip joint function after nursing was observed. The results showed that the Harris scores significantly increased in both groups after treatment, and the research group had significantly higher scores compared to the control group, indicating that patients experienced significant improvement in hip joint function after receiving ERAS. Similar to this study, Frassanito et al. [22] found that implementing ERAS in hip and knee replacement surgeries enhanced muscle strength and stability, exerting a significant positive impact on early discharge, improving joint function, and restoring independence in daily activities.

Cortisol is an important stress hormone in the body that helps protect against damage of excessive stress [23]. Epinepherine is a hormone secreted by the adrenal glands, regulating the cardiovascular system, respiratory system, and metabolic processes [24]. They are widely used in research and clinical practice to assess stress levels, stress responses, and coping abilities, aiding in understanding an individual's physiological and psychological

**Table 2.** Comparison of nursing satisfaction

| Group | Satisfied | Basically satisfied | Dissatisfied | Satisfaction rate |
|---|---|---|---|---|
| Control group (n=38) | 10 (26.32) | 16 (42.11) | 12 (31.58) | 26 (68.42) |
| Research group (n=48) | 21 (43.75) | 22 (45.83) | 5 (10.42) | 43 (89.58) |
| $\chi^2$ | | | | 5.989 |
| P | | | | 0.014 |

**Table 3.** Comparison of complications

| Group | Nausea and vomiting | Urinary tract infection | Deep vein thrombosis | Incision infection | Pulmonary infection | Incidence of complications |
|---|---|---|---|---|---|---|
| Control group (n=38) | 4 (10.53) | 1 (2.63) | 1 (2.63) | 3 (7.89) | 2 (5.26) | 11 (28.95) |
| Research group (n=48) | 1 (2.08) | 1 (2.08) | 0 | 2 (4.17) | 1 (2.08) | 5 (10.42) |
| $\chi^2$ | | | | | | 4.809 |
| P | | | | | | 0.028 |

**Table 4.** Univariate analysis

| Factors | Good prognosis group (n=60) | Poor prognosis group (n=26) | $\chi^2$ | P |
|---|---|---|---|---|
| Age (years) | | | 5.105 | 0.024 |
| ≤60 | 32 | 7 | | |
| >60 | 28 | 19 | | |
| Sex | | | 3.017 | 0.082 |
| Male | 27 | 17 | | |
| Female | 33 | 9 | | |
| Body mass index (kg/m$^2$) | | | 2.406 | 0.121 |
| ≤23 | 34 | 10 | | |
| >23 | 26 | 16 | | |
| Underlying diseases | | | 5.006 | 0.025 |
| Yes | 36 | 22 | | |
| No | 24 | 4 | | |
| Nursing method | | | 9.478 | 0.002 |
| Routine nursing | 20 | 18 | | |
| ERAS | 40 | 8 | | |
| Emotional disorders | | | 8.606 | 0.003 |
| Yes | 28 | 21 | | |
| No | 32 | 5 | | |
| Fracture type | | | 0.001 | 0.979 |
| Femoral neck fracture | 46 | 20 | | |
| Intertrochanteric fracture | 14 | 6 | | |
| Timing of surgery | | | 4.435 | 0.035 |
| ≤24 h | 23 | 4 | | |
| >24 h | 37 | 22 | | |

states. In this study, the levels of Cortisol and Epinepherine were significantly decreased in both groups after treatment, and the research group exhibited significantly lower levels compared to the control group. The results indicate that after hip fracture surgery, the stress levels in the body significantly increased. However, after receiving ERAS, the stress response was notably alleviated, which is beneficial for the patients' subsequent recovery. ERAS can help reduce the stress response caused by external factors and surgical procedures, triggering a

**Table 5.** Multivariate analysis

| | B | S.E. | Wald | Sig. | Exp (B) | 95% C.I. of the EXP (B) | |
|---|---|---|---|---|---|---|---|
| | | | | | | Lower limit | Upper limit |
| Age | 1.399 | 0.651 | 4.618 | 0.032 | 4.05 | 1.131 | 14.506 |
| Underlying diseases | 1.552 | 0.737 | 4.437 | 0.035 | 4.721 | 1.114 | 20.006 |
| Nursing method | 2.552 | 0.752 | 11.531 | 0.001 | 12.832 | 2.942 | 55.973 |
| Emotional disorders | 1.762 | 0.742 | 5.646 | 0.017 | 5.824 | 1.362 | 24.913 |
| Timing of surgery | 2.504 | 0.856 | 8.55 | 0.003 | 12.226 | 2.283 | 65.481 |

decrease in the magnitude of elevation in stress indicators such as Cortisol and Epinepherine. This significantly reduces the impact of stress response on patient recovery. Additionally, our results revealed significantly shorter fracture healing time in the research group than in the control group. This indicates that after receiving ERAS, patients experienced a significant reduction in fracture healing time. ERAS achieves these outcomes through personalized rehabilitation plans, early rehabilitation training, pain management, reduced bed rest time, and collaborative care from a multidisciplinary team, which accelerates the recovery process in hip fracture patients [25]. Moreover, Logistic regression analysis revealed that age, underlying diseases, nursing method, emotional disorders, and timing of surgery were independent factors influencing the treatment outcomes.

The study also conducted a comparison of complications after nursing and found a notably lower incidence of compilations in the research group, indicating that the incidence of complications among patients was decreased after ERAS. Similarly, Huang et al. [26] revealed that ERAS significantly reduced adverse reactions following laparoscopic radical resection of primary liver cancer, which is consistent with the findings of this study. Furthermore, a comparison of nursing satisfaction revealed notably higher satisfaction in the research group than in the control group. This indicates that compared to conventional nursing, ERAS is better accepted by patients.

Although this study demonstrated the efficacy of ERAS in patients with hip fractures, there are still some limitations. For example, the sample size of this study is small, which may introduce bias in the experimental results. Additionally, there may be differences in the level of experience among the nursing staff, which could influence the quality of care provided to the two groups. Therefore, we hope to conduct further experiments in the future to refine our study findings.

In conclusion, the ERAS mode can effectively alleviate pain, improve hip joint function, reduce fracture healing time and complications, mitigate stress response, and speed up postoperative recovery in patients with hip fractures. It is worthy of application and promotion in clinical practice.

## Acknowledgements

This work was supported by the Department of Orthopaedics, Sichuan Medical Association (Shang Antong) Special Research Project (No. 2021SAT09).

## Disclosure of conflict of interest

None.

## Abbreviations

ERAS, enhanced recovery after surgery; Cor, Cortisol; E, Epinephrine; VAS, visual analogue scale; BMI, body mass index.

**Address correspondence to:** Dongyue Cheng, Department of Orthopaedics, The Affiliated Hospital of Southwest Medical University, Luzhou 646000, Sichuan, China. E-mail: 18113578899@163.com

## References

[1] LeBlanc KE, Muncie HL Jr and LeBlanc LL. Hip fracture: diagnosis, treatment, and secondary prevention. Am Fam Physician 2014; 89: 945-951.

[2] Parker M and Johansen A. Hip fracture. BMJ 2006; 333: 27-30.

[3] Matsumoto T, Sone T, Soen S, Tanaka S, Yamashita A and Inoue T. Abaloparatide increases lumbar spine and hip BMD in Japanese patients with osteoporosis: the phase 3 ACTIVE-J

study. J Clin Endocrinol Metab 2022; 107: e4222-e4231.
[4] Veronese N and Maggi S. Epidemiology and social costs of hip fracture. Injury 2018; 49: 1458-1460.
[5] Griffiths R, Babu S, Dixon P, Freeman N, Hurford D, Kelleher E, Moppett I, Ray D, Sahota O, Shields M and White S. Guideline for the management of hip fractures 2020: guideline by the Association of Anaesthetists. Anaesthesia 2021; 76: 225-237.
[6] Bhandari M and Swiontkowski M. Management of acute hip fracture. N Engl J Med 2017; 377: 2053-2062.
[7] Sheehan KJ, Williamson L, Alexander J, Filliter C, Sobolev B, Guy P, Bearne LM and Sackley C. Prognostic factors of functional outcome after hip fracture surgery: a systematic review. Age Ageing 2018; 47: 661-670.
[8] Beaupre LA, Magaziner JS, Jones CA, Jhangri GS, Johnston DWC, Wilson DM and Majumdar SR. Rehabilitation after hip fracture for nursing home residents: a controlled feasibility trial. J Gerontol A Biol Sci Med Sci 2019; 74: 1518-1525.
[9] Engelman DT, Ben Ali W, Williams JB, Perrault LP, Reddy VS, Arora RC, Roselli EE, Khoynezhad A, Gerdisch M, Levy JH, Lobdell K, Fletcher N, Kirsch M, Nelson G, Engelman RM, Gregory AJ and Boyle EM. Guidelines for perioperative care in cardiac surgery: enhanced recovery after surgery society recommendations. JAMA Surg 2019; 154: 755-766.
[10] Feng W, Zhou J, Lei Y, Chen W, Miao Y, Fu X, Pi J, Zhang M, Na Z and Lou W. Impact of rapid rehabilitation surgery on perioperative nursing in patients undergoing cardiac surgery: a meta-analysis. J Card Surg 2022; 37: 5326-5335.
[11] Li F, Zhu L, Geng Y and Wang G. Effect of hip replacement surgery on clinical efficacy, VAS score and Harris hip score in patients with femoral head necrosis. Am J Transl Res 2021; 13: 3851-3855.
[12] Sung YT and Wu JS. The visual analogue scale for rating, ranking and paired-comparison (VAS-RRP): a new technique for psychological measurement. Behav Res Methods 2018; 50: 1694-1715.
[13] Xu BY, Yan S, Low LL, Vasanwala FF and Low SG. Predictors of poor functional outcomes and mortality in patients with hip fracture: a systematic review. BMC Musculoskelet Disord 2019; 20: 568.
[14] Zhang X, Yang M, Zhang J, Ye P, Wong RMY, Cheung WH, Armstrong E, Johansen A, Ivers R, Wu X and Tian M. Establishing a Chinese older hip fracture registry for older patients: a Delphi study to define the focus and key variables for this registry. Osteoporos Int 2023; 34: 1763-1770.
[15] Berggren M, Karlsson A, Lindelof N, Englund U, Olofsson B, Nordstrom P, Gustafson Y and Stenvall M. Effects of geriatric interdisciplinary home rehabilitation on complications and readmissions after hip fracture: a randomized controlled trial. Clin Rehabil 2019; 33: 64-73.
[16] Cheung ZB, Xiao R and Forsh DA. Time to surgery and complications in hip fracture patients on novel oral anticoagulants: a systematic review. Arch Orthop Trauma Surg 2022; 142: 633-640.
[17] Li L, Bennett-Brown K, Morgan C and Dattani R. Hip fractures. Br J Hosp Med (Lond) 2020; 81: 1-10.
[18] Peeters CM, Visser E, Van de Ree CL, Gosens T, Den Oudsten BL and De Vries J. Quality of life after hip fracture in the elderly: a systematic literature review. Injury 2016; 47: 1369-1382.
[19] Chen YR, Chen YL, Chen WY, Lin YC and Jane SW. Evidence-based nursing care of older adult patient with postoperative delirium and hip fracture. Hu Li Za Zhi 2021; 68: 90-96.
[20] Stenberg E, Dos Reis Falcao LF, O'Kane M, Liem R, Pournaras DJ, Salminen P, Urman RD, Wadhwa A, Gustafsson UO and Thorell A. Guidelines for perioperative care in bariatric surgery: enhanced recovery after surgery (ERAS) society recommendations: a 2021 update. World J Surg 2022; 46: 729-751.
[21] Wei B, Tang C, Li X, Lin R, Han L, Zheng S, Xu Y, Yao Q and Wang L. Enhanced recovery after surgery protocols in total knee arthroplasty via midvastus approach: a randomized controlled trial. BMC Musculoskelet Disord 2021; 22: 856.
[22] Frassanito L, Vergari A, Nestorini R, Cerulli G, Placella G, Pace V and Rossi M. Enhanced recovery after surgery (ERAS) in hip and knee replacement surgery: description of a multidisciplinary program to improve management of the patients undergoing major orthopedic surgery. Musculoskelet Surg 2020; 104: 87-92.
[23] Larsson SC, Lee WH, Kar S, Burgess S and Allara E. Assessing the role of cortisol in cancer: a wide-ranged Mendelian randomisation study. Br J Cancer 2021; 125: 1025-1029.
[24] Gough CJR and Nolan JP. The role of adrenaline in cardiopulmonary resuscitation. Crit Care 2018; 22: 139.
[25] Zhu S, Qian W, Jiang C, Ye C and Chen X. Enhanced recovery after surgery for hip and knee arthroplasty: a systematic review and meta-analysis. Postgrad Med J 2017; 93: 736-742.
[26] Huang Y, Chen F and Li H. Effect of rapid rehabilitation nursing on inflammation and liver function after laparoscopic radical resection of primary liver cancer. Am J Transl Res 2022; 14: 8156-8165.