ENHANCED RECOVERY AFTER SURGERY (ERAS) FOR TOTAL HIP REPLACEMENT AT CAN THO CENTRAL GENERAL HOSPITAL

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ABSTRACT

Objectives: The Enhanced Recovery After Surgery (ERAS) program has demonstrated significant benefits for patients undergoing total hip arthroplasty (THA). This study aims to evaluate the effectiveness of early recovery measures following total hip replacement surgery at the Center for Trauma and Orthopedics, Can Tho Central General Hospital. **Subjects and Methods:** A retrospective and prospective descriptive study was conducted on 70 patients in 2021 and 71 patients in 2024, all of whom underwent total hip replacement surgery at the Orthopedic Trauma Center of Can Tho Central General Hospital. **Results:** The combined sample included 141 patients with an average age of 56.65 ± 12.02 years. The most common cause for surgery was femoral head necrosis (48.9%). A majority of patients received local infiltration analgesia (79.4%) and epidural analgesia (68.8%). Postoperative complications occurred in 6.3% of patients. Statistically significant differences were observed in several key areas, including mean Harris Hip Score three months post-surgery ($p<0.001$), rehabilitation exercises, hospital costs, postoperative hospital stay, patient satisfaction, and postoperative pain ($p<0.05$). **Conclusions:** Implementing the ERAS program for total hip replacement procedures helps lower hospital costs, improve patient satisfaction, reduce postoperative pain, enhance hip function, and shorten hospital stays in Can Tho and throughout Vietnam.

Keywords: *Enhanced recovery after surgery (ERAS); total hip replacement; hip arthroplasty; local infiltration analgesia (LIA)*

I. INTRODUCTION

The Enhanced Recovery After Surgery (ERAS) program is a multidisciplinary approach designed to help patients undergoing major surgery achieve early recovery and minimize complications. This program provides comprehensive care during the preoperative, intraoperative, and postoperative phases.[1].

ERAS was first introduced in colon surgery by Danish surgeon Kehlet in 1997 and has since been adopted by other surgical specialties, demonstrating significant improvements in clinical outcomes and treatment costs[2]. The ERAS® Society was established in Amsterdam in 2010 , and the first ERAS guideline for total hip arthroplasty (THA) was published in 2019, based on a systematic evaluation of 17 key components[3].

Currently, in Vietnam, there are very few studies evaluating the results of the ERAS program in the treatment of THA[4]. Therefore, we conducted the study "Evaluation of the effectiveness of measures to enhance recovery after total hip arthroplasty" with 2 objectives: general characteristics of the research subjects and evaluation of ERAS treatment results in total hip replacement patients at the Orthopedic

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Date of receipt: 25/08/2025
Date of scientific judgment: 29/08/2025
Reviewed date: 29/09/2025

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II. MATERIALS AND METHODS

2.1. Study Subjects

The study included patients undergoing total hip replacement surgery at the Center for Trauma and Orthopedics, Can Tho Central General Hospital.

Inclusion Criteria:

- Patients aged 18 years or older.
- Patients undergoing total hip replacement surgery.
- Patients with complete medical records, pre- and post-operative X-rays, periodic re-examinations, and consent to participate.

Exclusion Criteria:

- Patients with pathological fractures.
- Patients with multiple traumas.
- Patients with ipsilateral lower limb fractures.
- Patients with bilateral hip replacements during the same hospitalization.

2.2. Research Methods

Research design: This was a retrospective and prospective descriptive study with pre- and post-treatment controls.

Study time and sample size: The study included a retrospective group of 70 patients from 2021 and a prospective group of 71 patients from 2024. The total sample size was 141 patients.

Study content: We recorded the general characteristics of the 141 patients, including gender, location, cause of femoral issue, age, and length of hospital stay both post-surgery and overall.

ERAS Treatment Components: The study included an evaluation of several ERAS components:

- Local infiltration analgesia (LIA).
- Anesthesia methods (spinal anesthesia or endotracheal anesthesia).
- Epidural analgesia.
- Prophylactic antibiotics (3rd generation cephalosporin) administered within 1 hour before surgery.
- Intravenous Tranexamic Acid administered before and after surgery.
- Antithrombotic prophylaxis (Lovenox, Pradaxa).
- Prophylactic anti-nausea and vomiting drugs (Dexamethasone) administered before and after surgery.
- Preoperative examination (by cardiology, respiratory, and anesthesia departments).
- Bladder catheter placement and time to removal.
- Time to discontinuation of intravenous (IV) fluids after surgery.

Evaluation of Surgical Outcomes: Surgical outcomes were evaluated based on:

- Patient satisfaction upon discharge.
- Surgical complications and adverse events.
- Visual Analog Scale (VAS) pain scores before and after surgery.
- Harris Hip Score (HHS) before and three months after surgery (for the 71 patients in the 2024 group). The Harris Hip Score was categorized as excellent (91-100 points), good (80-90 points), fair (70-79 points), fair (60-69 points), or poor (<60 points) [5].

Relationship between Outcomes and Risk Factors: The study also examined the relationships between treatment outcomes and risk factors, including:

- Hospital costs and rehabilitation.
- Postoperative hospital stay and LIA use.
- Postoperative VAS scores and patient satisfaction at discharge.

Data Analysis: Data was processed using SPSS 20.0. Quantitative variables with a significance level equal to or greater than 0.05 were considered to have a normal distribution. A One-sample T-test was used to test the average with a single value, with a p-value < 0.05 indicating a statistically significant difference at a 95% confidence interval. The Independent Sample T-Test was used for the average of two independent groups with normal distribution variables, and the Paired Samples T-Test was used for the average of two time points within one group.

Figure 1. ***Warming the patient before and during total hip replacement surgery***

2.3. Medical ethics

The study was approved by the Science and Technology Council of Can Tho Central General Hospital (Decision No. 42/QD-KHCN 2024). All research information was kept confidential.

III. RESULTS

3.1. General characteristics

The study included 141 patients with an average age of 56.65 ± 12.02 years (range: 23–83). There was a higher proportion of male patients (61.7%) compared to females (38.3%). The most common causes were femoral head necrosis (48.9%) and femoral neck fracture (46.1%). The average postoperative hospital stay was 4.52 ± 1.54 days.

Table 1. ***General characteristics of study subjects (n = 141)***

General characteristics		Results
Age	Mean ± SD (minimum – maximum)	56.65 ± 12.02 (23-83)
Gender	Male	87 (61.7%)
	Female	54 (38.3%)
Location	Right	74 (52.5%)
	Left	67 (47.5%)
Causes in the femur	Femoral neck fracture	65 (46.1%)
	Femoral head necrosis	69 (48.9%)
	Hip osteoarthritis	7 (5%)
Postoperative length of hospital stay (days)	Mean ± SD (minimum – maximum)	4.52 ± 1.54 (2-14)
Total length of hospital stay (days)	Mean ± SD (minimum – maximum)	8.94 ± 3.08 (3-24)

Regarding ERAS components, 79.4% of patients received local infiltration analgesia (LIA), and 68.8% received epidural analgesia. Prophylactic antibiotics, Tranexamic acid, antithrombotic prophylaxis, and anti-nausea/vomiting drugs were administered to 100% of patients. Bladder catheter placement was lower in 2024 (81.43%) than in 2021 (91.43%).

Table 2. ***ERAS content supporting treatment (n = 141)***

ERAS content		Number (n)	Rate (%)
Local invasive analgesia (LIA)	Yes	29	20.6
	No	112	79.4
Anesthesia method	Spinal anesthesia without morphine	103	73.1
	Spinal anesthesia with morphine	26	18.4
	Endotracheal anesthesia	12	8.5
Epidural analgesia	Yes	97	68.8
	No	44	31.2
Prophylactic antibiotics		141	100
Tranexamic acid		141	100
Antithrombotic prophylaxis		141	100
Prophylaxis of postoperative nausea and vomiting		141	100
Preoperative examination		141	100
Bladder catheter placement	Year 2021 (70 patients)	64	91.4
	Year 2024 (71 patients)	57	81.4
Removal of bladder catheter on postoperative day		101	100
Discontinuation of IV on postoperative day		141	100
No surgical wound drainage		141	100

3.2. Treatment results

Overall, 95.7% of patients were satisfied at discharge, while 4.3% were dissatisfied. Postoperative pain, as measured by the VAS scale, significantly decreased each day after surgery (p<0.001). The total complication rate was 6.3%. Specific complications included: Urinary retention after catheter removal (1.4%), Nausea and vomiting (2.1%), Itching (0.7%), Artificial hip dislocation (1.4%), and Late hip infection (0.7%).

Table 3. ***Length of hospital stay, and total hospital stay after surgery in 2021 and 2024***

Characteristics	Year	Mean ± SD	p (Independent samples test)
Postoperative length of hospital stay (days)	2021	4.54 ± 1.68	0.849
	2024	4.49 ± 1.40	
Total length of hospital stay (days)	2021	8.99 ± 3.38	0.850
	2024	8.89 ± 2.79	

The postoperative and total lengths of hospital stay in 2024 were shorter than in 2021, however the differences were not statistically significant (p > 0,05).

Table 4. ***Assessment of pain level according to VAS scale before and after surgery (n = 141)***

Visual Analogue Scale (VAS)	Mean ± SD (minimum - maximum)	p (Paired samples test)
Preoperative day 0 (0)	5.99 ± 1.56 (3-9)	< 0.001 [(1) and (0)]
Postoperative day 1 (1)	1.90 ± 0.84 (1-4)	< 0.001 [(2) and (0)]
Postoperative day 2 (2)	1.29 ± 0.52 (1-3)	< 0.001 [(2) and (1)]

Pain level according to VAS scale decreased gradually each day after surgery, the difference was statistically significant (p < 0.001).

Table 5. ***Harris Hip Score (HHS) before and 3 months after surgery in 2024 (n = 71)***

Harris Hip Score	Mean ± SD (minimum – maximum)	p (Paired samples test)
Before surgery	42.36 ± 4.36 (23-76)	< 0.001
Three months after surgery	95.48 ± 4.79 (74-100)	

After 3 months of follow-up of 71 patients (2024) after total hip replacement surgery: the average HARRIS score increased compared to before surgery, the difference was statistically significant (p < 0.001). 95.77% (68 cases) had a particularly good HARRIS group (91-100 points), 2.82% (2 cases) had a good level (80-90 points) and 1.41% (1 case) had a fair level (70-79 points).

Table 6. ***Association between treatment outcomes and risk factors (n = 141)***

Treatment outcomes			p (Independent samples test)
Hospitalization costs	Without rehabilitation	38111849 VND	0.015
	With rehabilitation	32032139 VND	
Hospitalization days after surgery	Without LIA	5.00 days	0.049
	With LIA	4.39 days	
VAS after surgery 24 hours	Satisfied	1.86 points	0.005
	Unsatisfied	2.83 points	
VAS after surgery 48 hours	Satisfied	1.26 points	< 0.001
	Unsatisfied	2.00 points	

Statistically significant differences between rehabilitation exercises and hospitalization costs, LIA and number of days in hospital after surgery, patient satisfaction and postoperative pain (p < 0.05).

IV. DISCUSSION

4.1. General characteristics

Our study recorded an average patient age of 56.65 ± 12.02 years, with the youngest being 23 years old and the oldest 83 years old. Similar results were reported by Ta Tuan Anh, with an average age of 56.22 ± 10.91 years (range: 34-79) ($p = 0.67$, and Huynh Van The, who recorded an average of 59.31 ± 9.44 years (range: 32-78) ($p = 0.31$)[7]. In contrast, younger patient populations were reported by Doan Anh Tuan (42.6 ± 10.7 years, $p < 0.001$)[8] and Dam Quang Kha (45.3 ± 2.1 years, $p < 0.001$)[10]. Conversely, an older patient group was observed in the study by Nguyen Thi Phuong Tuyen, with an average age of 68.3 ± 16.6 years ($p < 0.001$)[9]. These differences can be attributed to variations in study populations. The similarity between our study and Huynh Van The's is due to both being conducted at the same research site.

Our study also recorded a higher proportion of male patients (61.7%) compared to females (38.3%). Similar findings were noted in studies by Dam Quang Kha (92.1% male)[10] and Doan Anh Tuan (82.9% male)[8]. However, Huynh Van The reported a predominance of female patients (59.4%, $p < 0.001$), likely because the study focused on femoral neck fractures in elderly patients, where 71.9% of cases were due to low-energy trauma (domestic accidents). The higher prevalence of women in that study can be attributed to decreased estrogen levels after menopause, increasing susceptibility to fractures[7, 11].

The average postoperative hospital stay in our study was 4.52 ± 1.54 days, with a range of 2 to 14 days. Patients who underwent rehabilitation training had an average postoperative stay of 4.49 ± 1.40 days (Table 3). Longer hospital stays were reported in other studies: Nguyen Thi Phuong Tuyen recorded an average stay of 7.14 ± 2.88 days ($p < 0.001$)[9], while Huynh Van The reported 5.14 ± 1.23 days (range: 3-8) ($p < 0.001$)[7]. The shorter hospital stays in our study can be attributed to preoperative rehabilitation for high-risk patients and those with femoral fractures requiring prolonged immobilization, preoperative assessments, and multimodal pain management. Specifically, we implemented local infiltration analgesia (LIA) and epidural pain relief, removed bladder catheters, discontinued intravenous fluids on the first postoperative day, and initiated rehabilitation exercises immediately after surgery.

Our study observed a decrease in both postoperative hospital stays and total hospitalization days in 2024 compared to 2021, although the difference was not statistically significant ($p > 0.05$) (Table 3). The improvement in 2024 can be attributed to the more comprehensive application of Enhanced Recovery After Surgery (ERAS) protocols. In 2021, some ERAS components, such as preoperative rehabilitation, LIA pain relief, and supportive epidural analgesia, were not fully implemented. Additionally, in 2021, 91.43% of patients had a bladder catheter placed during surgery, whereas in 2024, this rate decreased to 81.43%. Our study did not record any cases requiring surgical drainage tubes.

The bladder catheter placement rate in our study was higher than that reported by Nguyen Thi Phuong Tuyen (70.3%), but our catheter removal time was shorter (3.16 ± 2.1 days vs. 5.52 ± 2.71 days). Additionally, Nguyen Thi Phuong Tuyen reported an average surgical drainage tube removal time of 2.02 ± 0.36 days and a high postoperative blood transfusion rate of 26.8%[9]. According to ERAS guidelines, limiting intravenous fluids, encouraging early oral intake postoperatively, avoiding routine bladder catheterization, early catheter removal, and omitting surgical drainage

tubes can reduce infection risks and lower the need for postoperative blood transfusions[4].

4.2. Treatment outcomes

A total of 95.7% of patients reported satisfaction at discharge, while 4.3% were dissatisfied. Patient satisfaction correlated with postoperative VAS pain levels, showing statistically significant differences on day 1 ($p = 0.005$) and day 2 ($p < 0.001$) (Table 5). Similar findings were reported by Huynh Van The, who recorded 45.3% very satisfied, 50% satisfied, and 4.7% less satisfied patients. The similarity may be attributed to the same research location and lead surgeon, though conducted at different times (April 2018 to August 2020)[7].

Complications occurred in 6.3% of patients during or after surgery, including 1.4% urinary retention post-catheter removal, 2.1% nausea and vomiting perioperatively, 0.7% itching immediately post-surgery, 1.4% (2 cases) artificial hip dislocation, 0.7% (1 case) late hip infection.

The routine early removal of catheters (100% on postoperative day 1) may have contributed to the 1.4% urinary retention rate. The use of morphine in spinal anesthesia or continuous epidural analgesia for 48-72 hours postoperatively posed risks of nausea, vomiting, urinary retention, and itching. In two cases, artificial hip dislocations occurred before discharge and were immediately reduced under anesthesia in the operating room. One late joint infection case (0.7%) involved a patient with hypertension, type 2 diabetes, and chronic renal failure, who had a hospital stay of 16 days, a BMI of 18.36 kg/m², and received a 1050 mL blood transfusion (3 units of 350 mL). The patient's hemoglobin level at discharge was 9.8 g/dL.

Nguyen Thi Phuong Tuyen, who also applied the ERAS program in TKH, reported an early postoperative complication rate of 3.3%, including urinary tract infections (1.65%), pneumonia (0.55%), surgical site infections (0.55%), and grade 2 pressure injuries (0.55%)[9]. Compared to studies that did not routinely apply ERAS, our study and that of Nguyen Thi Phuong Tuyen demonstrated lower complication rates. For instance, Huynh Van The recorded early complications of surgical site bleeding in 3.1% of cases, managed with pressure bandages, and hip dislocation in 3.1%, successfully reduced with no late complications[7]. Dam Quang Kha reported 9.1% prolonged limb swelling, 3.6% superficial surgical site infections, 2.4% surgical hip dislocations, and 1.2% deep vein thrombosis[10]. Doan Anh Tuan observed 3.66% bone fractures, 2.44% dislocations and subluxations, and 2.44% superficial surgical site infections[8]. Among these studies, only our study documented anesthesia-related adverse events and complications from pain management methods.

At three months post-treatment, our study recorded an average HARRIS score of 95.48 ± 4.79, with very good and good outcomes in 98.59% of patients. Fair outcomes accounted for 1.41%, while no cases fell into the average or poor categories. Our results surpassed those of Huynh Van The (96.8%)[7], Doan Anh Tuan (89.02%, with 4.88% poor outcomes)[8]. All referenced studies showed significant increases in average HARRIS scores post-treatment ($p < 0.05$).

Rehabilitation exercises significantly reduced hospital costs ($p = 0.015$). The use of LIA pain relief reduced postoperative hospital stay with statistical significance ($p = 0.049$). The application of ERAS has been shown to improve outcomes in multiple studies. Li Y reported significant reductions in hospital stay, postoperative complications, blood transfusion rates, and pain levels ($p < 0.05$)[12]. Niu and others observed lower

surgical site infection rates (1.6%, p < 0.001), fewer postoperative complications (5.12%, p < 0.001), and shorter hospital stays (p < 0.001) compared to controls[13]. Zhu S found significantly reduced hospital stays in the ERAS group (p < 0.01) and fewer complications (p = 0.03) compared to the non-ERAS group[14].

The findings from this study, along with a meta-analysis and systematic reviews of ERAS programs, confirm that ERAS helps to reduce hospital stays, lower complication rates, and alleviate postoperative pain.

V. CONCLUSION

The Early Recovery After Surgery (ERAS) program, which integrates seventeen key components, effectively lowers hospital costs, enhances patient satisfaction, minimizes postoperative pain, improves hip function, and shortens hospital stays for total hip replacement patients in Can Tho and throughout Vietnam.

ACKNOWLEDGEMENTS

We would like to thank Can Tho Central General Hospital for their support in conducting this study.

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