Outcome of the Enhanced Recovery After Surgery protocol in vaginal surgery for pelvic organ prolapse

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Abstract

The Enhanced Recovery After Surgery (ERAS) protocol is an innovative approach to perioperative care that aims to reduce morbidity and postoperative length of stay (LOS) by accelerating the postoperative recovery process while minimizing postoperative complications. This study aimed to assess the impact of ERAS implementation on outcomes in urogynecology, specifically in vaginal surgery for pelvic organ prolapse (POP). A quasi-experimental study was conducted on 44 patients diagnosed with POP and undergoing vaginal surgery in a tertiary urogynecology unit from December 2023 to July 2024. Data were analyzed using SPSS version 20. The outcomes evaluated were postoperative LOS, urinary retention, postoperative pain, and the 30-day hospital readmission rates. The 44 subjects were analyzed and divided into 2 groups, namely the study group (ERAS group) with 22 patients and the control group (pre-ERAS group) with 22 patients. The mean postoperative LOS in the ERAS group was significantly shorter than in the pre-ERAS group (1.2 and 2.2 days, respectively, $p<0.001$). The incidence of urinary retention in the ERAS group was higher than in the pre-ERAS group, but was not statistically significant (4 and 2 subjects, respectively, $p=0.664$). The postoperative pain intensity of all subjects in both groups was categorized as mild. There were no 30-day readmissions in either group. ERAS protocol can reduce postoperative LOS. Patients who underwent ERAS intervention had postoperative pain intensity, but the incidence of urinary retention and 30-day readmissions was not significantly different compared to patients who did not undergo ERAS intervention.

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Introduction

The Enhanced Recovery After Surgery (ERAS) protocol is an innovative approach in perioperative care that involves multidisciplinary collaboration and aims to reduce morbidity and length of patient care by speeding up the postoperative recovery process and reducing the possibility of postoperative complications.[1] The ERAS protocol includes three main components, namely preoperative, intraoperative, and postoperative care. This protocol plays a role in optimizing the patient's health condition through providing preoperative information, education, and counseling, intraoperative management, involving standardized anesthesia and fluid balance regulation, as well as postoperative management, which includes early mobilization, oral fluid and solid food intake as early as possible, and approaches to multimodal treatment to treat pain, nausea, and vomiting.[2,3]

The ERAS protocol was first introduced by Henrik Kehlet in 2001, with an initial focus on perioperative care for colorectal surgery, and this approach has been expanded to cover various types of surgery, including gynecological surgery.[4] Research by Kalogera *et al*. in 2013 regarding the application of ERAS in patients undergoing gynecological surgery showed that the implementation of this protocol resulted in a reduction in the length of hospital stay, a decrease in morbidity and readmission rates, and an increase in patient satisfaction levels.[5] In 2016, the ERAS Society

published recommendations for the implementation of ERAS in gynecologic surgery and oncology, which were updated in 2019. However, because the gynecologic ERAS protocol initially focused more on intra-abdominal surgery and did not cover vaginal surgery, the ERAS Society developed new recommendations that include pre-, intra-abdominal care components, and postoperative care specifically for vaginal surgery. One of the conditions treated through vaginal surgery is pelvic organ prolapse (POP).[2,3,6]

POP is a decrease or protrusion of parts of the vagina (anterior wall, posterior wall, and top of the vagina), which can affect the patient's quality of life. One method of treating POP is vaginal surgery.[7,8] Based on data from a tertiary urogynecology unit, the length of postoperative care for POP patients is 2 to 3 days.[9]

The aim of this study, therefore, was to evaluate whether the implementation of ERAS would affect outcomes in the vaginal surgery for POP. The primary outcome was postoperative length of stay. Secondary outcomes included the following: urine retention, postoperative pain, and 30-day readmission. We also collected information, including age, maternal pre-pregnancy body mass index (BMI), history of lifting weights, number of vaginal deliveries, Malnutrition Screening Tool (MST) score, medical comorbidity, cystocele grade, POP procedures, operative duration, and estimated blood loss. The authors hypothesized that patients who underwent ERAS intervention have shorter postoperative length of stay than patients who did not undergo ERAS intervention.

Materials and Methods

This study was a quasi-experimental design conducted at a tertiary urogynecology unit from December 2023 to July 2024. In this study, a comparison was made between the control group and the intervention group. The control group was recruited first (December 2023 to February 2024) and received standard protocol. The intervention group was recruited second (March 2024 to July 2024) and received the ERAS protocol.

Participants in this study consisted of female patients diagnosed with POP and who had undergone vaginal surgery in the period December 2023 to July 2024. Participants in the study met the following exclusion criteria: i) had a history of urinary retention; ii) had been treated in the high care unit (HCU) or intensive care unit (ICU) postoperatively; iii) there were intraoperative complications such as bladder injuries, and incomplete data.

The core components of our ERAS protocol are listed in Figure 1. The urogynecology team at the urogynecology polyclinic provides information, education, and preoperative counseling, which includes an explanation of the surgery to be performed, stopping smoking and alcohol consumption (if any) 4-6 weeks before surgery, walking 30 minutes every day, and consuming foods rich in protein and carbohydrates for 1 week before surgery. The subject also underwent preoperative nutritional screening using the MST. If the subject had a score of ≥2, they were consulted with a nutritionist. Upon entering the treatment room, the subject was informed by the nurse that the subject could eat a maximum of 6 hours before surgery. Then the subject was given maltodextrin 12.5%, at 4 hours before surgery: 1×200 mL (containing 30 g maltodextrin) and 2 hours before surgery: 1×200 mL (containing 30 g maltodextrin). The subject was given prophylactic antibiotics, namely cefazolin 2 g intravenously 60 minutes before surgery. The patient was given two types of drugs, namely dexamethasone 5 mg and ondansetron 4 mg as prophylactic antiemetics. While in the operating room, the anesthesia team provided standard anesthesia to the subject who would undergo surgery, namely, using regional anesthesia. In addition, the anesthesia team regulated the administration of fluids.

Subjects were given postoperative analgesics with non-opioid analgesics, namely non-steroidal anti-inflammatory drugs (NSAIDs) analgesics and began gradual mobilization. Removal of the urinary catheter at 05.00 the next day, then measuring the residual urine at 11 am. After 24 hours of surgery, the intensity of pain in the subject was measured by the Visual Analog Score (VAS). We asked the patient to mark a point on a 10 cm line, with cutoffs for mild (1-3 cm), moderate (4-6 cm), and severe (7-10 cm). When the patient was able to go home, the postoperative length of stay was calculated. After the patient was discharged from the hospital, it was evaluated within 30 days whether the patient was re-admitted with indications related to the surgery or not. Furthermore, data was collected for analysis.

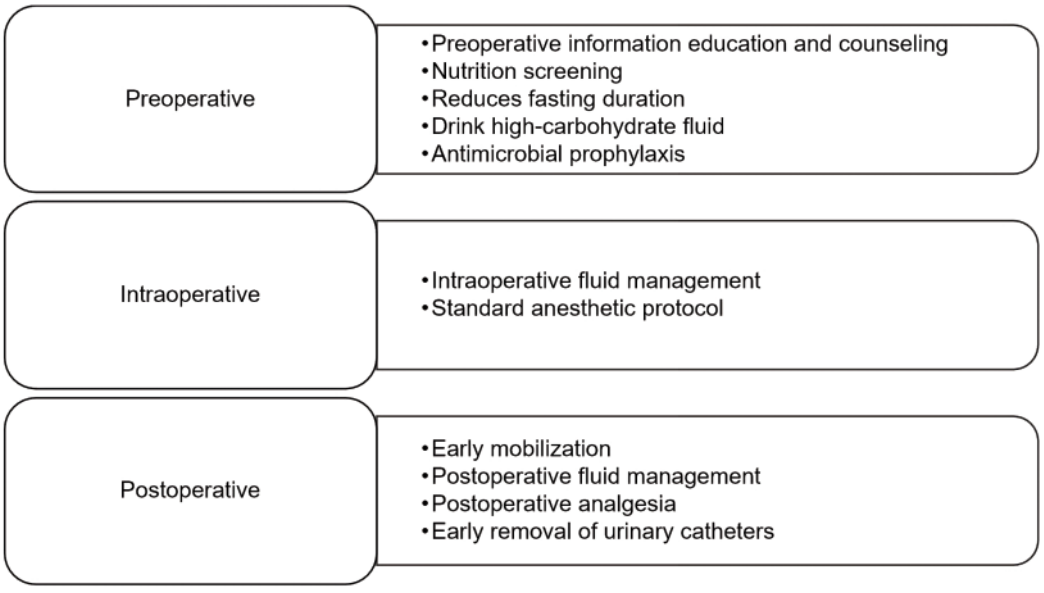

Figure 1. The protocol of Enhanced Recovery After Surgery for vaginal surgery.

Control group and intervention group data were collected from medical records. Intervention group data were collected after subjects underwent vaginal surgery and received the ERAS protocol. The data were analyzed using the Statistical Package for the Social Sciences (SPSS) version 20 (IBM, Armonk, NY, USA). The assessment of the distribution of numerical data was used to determine the type of hypothesis test, whether it was a parametric or non-parametric test. In this study, the type of test conducted was a two-group unpaired test. If the data distribution is normal, then the statistical test conducted is the unpaired *t*-test. However, if the data distribution is not normal, then the statistical test conducted is the Mann-Whitney test. Categorical data were tested using the Chi-square. If the Chi-square test requirements are not met, then the Fisher test is carried out to determine the significance value. The significance level used is α of 5% or 0.05. This study was approved by the local human research ethics committee (KET-635/UN2.F1/ETIK/PPM. 00.02/2023).

Results

There was a total of 48 patients who underwent POP surgery at a tertiary urogynecology unit in the period December 2023 to July 2024. After selecting based on inclusion and exclusion criteria, research subjects of 44 patients were studied and divided into 2 groups, namely the intervention group (ERAS group) with 22 patients and the control group (pre-ERAS) with 22 patients. In this study, 4 patients were excluded. Causes of patient exclusion included: 2 patients were treated in the HCU and ICU postoperatively, 1 patient experienced postoperative haematuria, and 1 patient had intraoperative findings of endometrial carcinoma, so the procedure was continued with laparotomy (Figure 2).

Several characteristics were studied from the ERAS and pre-ERAS groups. Based on age, there were 32 subjects aged ≥60 years (72.7%). The mean BMI of POP patients was 24.4 in the ERAS group and 24.8 in the pre-ERAS group. Overall, most of the subjects were included in the obesity category (BMI>25 kg/m^2), which was 17 subjects (38.6%). The number of subjects who had a history of lifting heavy objects was the same in both groups. Based on parity, most of the study subjects were multiparous (16 subjects in the ERAS group and 14 subjects in the pre-ERAS group). All subjects had an MST score of <2. The subjects who underwent POP surgery had medical comorbidities, with the most common comorbidities being hypertension and type II diabetes mellitus. This study also analyzed the type of POP procedure in which a total of 33 (75%) subjects underwent transvaginal hysterectomy. The shortest duration of surgery in the ERAS group was 95 minutes or 1 hour 35 minutes, and the longest duration was 285 minutes (4 hours 45 minutes), while in the pre-ERAS group, the shortest duration of surgery was 75 minutes (1 hour 15 minutes), and the longest duration was 285 minutes (4 hours 45 minutes). In the ERAS group, the lowest bleeding volume was 20 mL, and the highest was 400 mL, while in the pre-ERAS group, the lowest volume was 30 mL, and the highest was 500 mL. Complete subject characteristics are shown in Table 1. Bivariate analysis was conducted to determine the effect of the ERAS implementation on the postoperative length of stay (Table 2). The p-value was 0.00 (p<0.05), which indicated that ERAS implementation significantly decreased postoperative length of stay.

The results of the bivariate analysis for urinary retention event (Table 3) showed p=0.664, which indicated that there was no significant difference between the standard group (pre-ERAS) and the ERAS group. The postoperative pain intensity (VAS) in the ERAS group was found to be the same as the non-ERAS group (p>0.999), where in both groups the intensity of all subjects was categorized as mild pain with VAS 1-3. These results indicate that there is no significant difference between the implementation of the ERAS protocol regarding the degree of postoperative pain.

In this study, there were no 30-day readmission events in either the ERAS or pre-ERAS groups. In addition, there were no complications of postoperative nausea and vomiting (PONV), urinary tract infections (UTI), or surgical wound infection in all subjects.

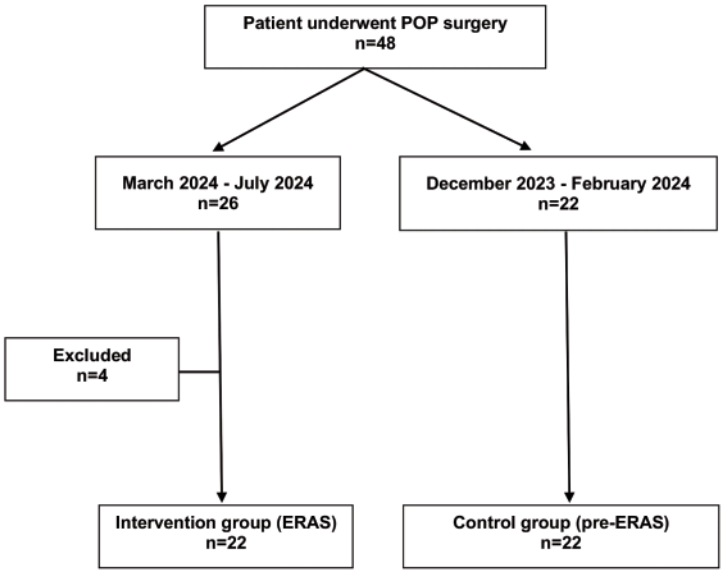

Figure 2. Flow-chart outlining study recruitment, intervention, and data collection. POP, pelvic organ prolapse; ERAS, Enhanced Recovery After Surgery.

Table 1. Subject's characteristics.

Variables	Group		p
	ERAS (n=22)	Pre-ERAS (n=22)	
Age			
Mean±SD	61.8±9.2	64.0±7.3	0.399
<60 years old, n (%)	7 (31.8)	5 (22.7)	
≥60 years old, n (%)	15 (68.2)	17 (77.3)	
Body mass index			
Mean±SD	24.4±3.7	24.8±3.7	0.678
Underweight, n (%)	1 (4.5)	0 (0.0)	
Normal, n (%)	5 (22.7)	8 (36.4)	
Overweight, n (%)	8 (36.4)	5 (22.7)	
Obese, n (%)	8 (36.4)	9 (40.9)	
History of lifting weights	15 (68.2)	15 (68.2)	>0.999
Vaginal parity, n (%)			0.567
Primiparous	1 (4.5)	3 (13.6)	
Multiparous	16 (72.7)	14 (63.6)	
Grand multiparous	5 (22.7)	5 (22.7)	
MST score, n (%)			>0.999
0-1	22 (100.0)	22 (100.0)	
≥2	0 (0.0)	0 (0.0)	
Medical co-morbidity, n (%)	12 (54.5)	15 (68.2)	0.353
Cystocele grade, n (%)			
Grade 2	4	0	0.039
Grade 3	11	18	
Grade 4	7	4	
Pelvic organ prolapseprocedures, n (%)			
TVH	14 (63.6)	19 (86.4)	0.082
Non-TVH	8 (36.4)	3 (13.6)	
Obliterative	12 (54.5)	16 (72.7)	0.210
Reconstruction	10 (45.5)	6 (27.3)	
Operative duration (minutes)			
Median (min-max)	142.5 (95-285)	170.0 (75-285)	0.452#
Estimated blood loss (mL)			
Median (min-max)	150.0 (20-400)	100.0 (30-500)	0.018#

ERAS, Enhanced Recovery After Surgery; SD, standard deviation; MST, Malnutrition Screening Tool; TVH, transvaginal hysterectomy. #Mann-Whitney rank test.

Table 2. Postoperative length of stay outcome after the Enhanced Recovery After Surgery protocol implementation.

Variable	Group		p
	ERAS (n=22)	Pre-ERAS (n=22)	
Post-operative length of stay (days) Mean±SD	1.2±0.5	2.2±0.4	0.000

ERAS, Enhanced Recovery After Surgery; SD, standard deviation.

Table 3. Urinary retention and postoperative pain outcome after the Enhanced Recovery After Surgery protocol.

Variable	Group		p
	ERAS (n=22), n (%)	Pre-ERAS (n=22) n (%)	
Urinary retention			0.664*
Yes	4 (18.2)	2 (9.1)	
No	18 (81.8)	20 (90.9)	
Post-operative pain (VAS)			>0.999
Mild (VAS 1-3)	22 (100.0)	22 (100.0)	
Moderate (VAS 4-6)	0 (0.0)	0 (0.0)	
Severe (VAS 7-10)	0 (0.0)	0 (0.0)	

ERAS, Enhanced Recovery After Surgery; VAS, Visual Analog Score; *Fisher's exact test; #Mann-Whitney rank test.

Discussion

Effect of the Enhanced Recovery After Surgery protocol implementation on postoperative length of stay

The postoperative length of stay needs to be considered because it is related to the risk of nosocomial infections such as UTI, surgical wound infections, or pneumonia. The postoperative length of stay is also an outcome that is often considered to be the most important factor in influencing treatment costs.[9] In the National Health Insurance system, payment patterns for advanced health facilities have been regulated using the Indonesian Case Base Groups (INA-CBGs) system with predetermined rates.[10] Problems arise when the hospital rates exceed the INA-CBG rates, resulting in a deficit that will become a burden on hospital financing. Implementing the ERAS protocol is expected to shorten postoperative length of stay, ultimately reducing treatment costs.[9] When implementing ERAS, it is also necessary to pay attention to postoperative patient outcomes such as urinary retention, postoperative pain, and patient readmissions.[11] In this study, the postoperative length of stay in the ERAS group was significantly lower compared to patients in the pre-ERAS group (1.2±0.5 *vs.* 2.2±0.4 days; p=0.00). Meanwhile, the results of a study by Carter-Brooks *et al*. found that the length of stay in the ERAS group was significantly lower (25.9±13.5 *vs.* 12.1±11.2 hours, p<0.001). Carter-Brooks *et al.* found that the implementation of ERAS reduced the length of stay by 13.8 hours.[11] Another study by Gong *et al*. also found a significant difference in the length of stay in the ERAS and non-ERAS groups (70.25 *vs.* 121.35 hours, p<0.001). Furthermore, Gong *et al.* also found that the ERAS group had significantly lower hospital costs (46,838.65±2584.08 *vs.* 42,793.57±2560.3-yuan, p<0.001).[12]

Carter-Brooks *et al.* attributed significant reductions in length of stay to universal implementation of all ERAS components by nurses, anesthesiologists, pharmacists, surgeons, and other support staff, as well as to improvements in the quality of departmental initiatives involved. During the implementation of ERAS protocols, gynecologic surgeons were able to more easily identify nausea and urinary retention during recovery, or other conditions that may prevent early discharge from the hospital. Additionally, ERAS programs that include preoperative education, patient optimization, fluid management, and opioid avoidance through multimodal pain interventions are potential solutions.[1,11]

Effect of the Enhanced Recovery After Surgery protocol implementation on urinary retention complications

In this study, the urinary retention cases in the ERAS group were higher than in the pre-ERAS group, but without a significant difference (4 *vs.* 2, p=0.664). Different results were reported by Gong *et al*., who found the number of urinary retention cases in the ERAS group was lower, without a significant difference (5 *vs.* 7, p=0.459).[12] On the other hand, the results by Carter-Brooks *et al.* found urinary retention events after discharge from the hospital in the ERAS group were significantly higher than in the pre-ERAS group (42.1% *vs.* 23.6%, p=0.005).[11] The inconsistency of the three study results may be due to differences in the number of subjects involved and differences in patient characteristics. The incidence of postoperative urinary retention varies between institutions. The main causes of postoperative urinary retention are anesthesia and anatomic injuries related to POP reconstruction. Tissue edema, inflammation, and peripheral nerve-ending damage due to surgical procedures and the effects of anesthesia used perioperatively can decrease detrusor muscle activity and result in bladder emptying dysfunction and increased postoperative residual bladder volume.[13] In our study, 4 patients in the ERAS group experienced urinary retention. Of the 4 patients, 3 had a preoperative diagnosis of grade 4 cystocele, and 1 had grade 3 cystocele, with a mean duration of surgery of 182.5 minutes. While in the pre-ERAS group, the 2 patients who experienced urinary retention had a preoperative diagnosis of grade 3 cystocele with a mean duration of surgery of 190 minutes. From the research of Elisia and Priyatini in 2016 regarding the incidence of urinary retention after POP reconstruction, it was found that there was no relationship between age, BMI, degree of prolapse, degree of cystocele, or post-reconstruction UTI with postoperative urinary retention. Vaginal hysterectomy + anterior colporrhaphy + colpoperineorrhaphy + sacrospinous fixation procedures were associated with postoperative urinary retention [relative risk 3.66; 95% confidence interval (CI) 2.91 to 4.60 (p<0.001)]. In addition, the duration of surgery >130 minutes was also associated with the occurrence of urinary retention [odds ratio (OR) 2.05; 95% CI 1.10 to 3.82, p<0.409].[14] These results are similar to the study of Lamonerie *et al*., which explained that the duration of surgery by more than 120 minutes increased the risk of urinary retention with an OR 3.03, and a 95% CI 1.39-6.61.[15]

Effect of the Enhanced Recovery After Surgery protocol implementation on postoperative pain intensity

Based on the analysis results, the level of pain intensity in the ERAS group was the same as the pre-ERAS group (p>0.999), where in both groups the intensity of all subjects was categorized as mild pain with VAS 1-3. In this study, there were no subjects who had moderate and severe pain intensity. From the results of a survey by Trowbridge *et al*., there was no significant difference in the mean highest pain score between the ERAS and pre-ERAS groups. The results of another study conducted by Yoong *et al*. found that the VAS pain score (on the day of discharge from the hospital) in the ERAS group was lower than the non-ERAS group, with no significant difference (2.3 *vs.* 2.7; p>0.05).[16]

One component of ERAS is multimodal analgesia. Multimodal analgesia is defined as the use of more than one modality of pain control to achieve an effective level while reducing opioid-related side effects. Multimodal analgesia includes systemic medication administration as well as regional and neuraxial techniques. Multimodal analgesia also incorporates the idea of pre-emptive analgesia, which is the administration of medication to reduce pain before surgery or painful stimuli occur. The use of pre-emptive analgesics has been shown to reduce pain intensity, inflammation, and PONV, compared to reactive administration (administration after painful stimuli arise). In this study, multimodal analgesia was not given because, before the implementation of ERAS, postoperative POP patients already had mild pain intensity. The type of analgesic used in both groups was the NSAIDs (nonsteroidal anti-inflammatory drugs) group.[3,17,18]

Effect of the Enhanced Recovery After Surgery protocol implementation on 30-day readmission

In this study, there was no 30-day readmission in either the ERAS or pre-ERAS groups. With the reduction in the length of stay of the study subjects in the ERAS group, there was no effect on the 30-day readmission. Different results were obtained from a study by Carter-Brooks *et al*., who found a significant increase in the incidence of readmission (within a maximum of 30 days after discharge from the hospital) in the ERAS group compared to pre-ERAS (8 *vs.* 2, p=0.030). Indications for readmission included myocardial infarction, chest pain/arrhythmia, weakness, hyponatremia, wound complications, nausea/ileus, and ureteral obstruction. Despite the reduction in length of stay, readmission cases increased from 1.5% to 6.7% after the implementation of the

ERAS protocol. Different results were seen in another study by Giri *et al*., who found that the incidence of readmission in the ERAS group was higher than in the pre-ERAS group, but without a significant difference (4 *vs.* 3, p=0.84), with indications for readmission between the two groups being different.[11,18,19]

The limitations that can be improved in further research, namely, no analysis of risk factors related to the incidence of urinary retention was carried out. In further research, it would also have been interesting to evaluate the level of patient satisfaction. Another limitation is that this study did not evaluate the cost-effectiveness of ERAS protocol implementation for vaginal surgery.

Conclusions

The outcomes of postoperative POP vaginal patients who underwent ERAS intervention had a shorter postoperative length of stay; the incidence of urinary retention was not significantly different, and they had postoperative pain and the incidence of 30-day readmissions that were not different compared to patients who did not undergo ERAS intervention.

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