Original Article

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Enhanced recovery after surgery for hysterectomy for pelvic organ prolapse

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Objectives: To investigate whether enhanced recovery after surgery (ERAS) for major urogynaecological surgery could reduce length of stay (LOS) and accelerate recovery, as measured by time to full mobilisation and resumption of oral intake.
Methods: An ERAS programme was implemented in our hospital in March 2022. We retrospectively reviewed medical records of women who underwent vaginal hysterectomy with or without laparoscopic assistance or concomitant procedures (pelvic floor repair, sacrospinous fixation, and continence surgery) performed or supervised by at least one urogynaecology subspecialist between July 2020 and May 2023.
Results: In total, 73 patients who underwent vaginal hysterectomy before (n=32) or after (n=41) ERAS implementation were included. The ERAS group had shorter LOS (3.2 vs 4.9 days, p<0.001) and faster recovery, as measured by times to full mobilisation (1 vs 1 day, p<0.001), oral intake resumption (0 vs 0 day, p<0.001), and successful urethral catheter removal (1 vs 2 days, p<0.001). In the ERAS group, the mean self-reported pain scores were 0.56 at rest and 2.73 during movement. Seven (17.1%) patients experienced postoperative nausea and vomiting. The predictor of LOS was the time required for successful urethral catheter removal (β=0.052, p<0.001). One patient in each group was readmitted to hospital within 30 days for vaginal bleeding. Two patients without ERAS developed vault infection, which resolved with antibiotic treatment.
Conclusion: The ERAS programme can shorten LOS among patients undergoing vaginal hysterectomy. The duration of urethral catheter use was the main predictor of LOS.

Keywords: Enhanced recovery after surgery; Length of stay; Pelvic organ prolapse

Introduction

Enhanced recovery after surgery (ERAS) aims to promote recovery using evidence-based practices throughout the pre-, intra-, and post-operative periods to reduce surgical stress and optimise patient outcomes, involving multidisciplinary professionals, including surgeons, anaesthetists, physiotherapists, and dietitians[1,2]. It was first adopted in colorectal surgery and was later extended to gynaecological oncology cases[3]. It can decrease length of stay (LOS), complications, and costs associated with surgical interventions[4,5].

Various ERAS measures are applied across the entire surgical journey[6-10]. Preoperatively, patients are advised to reduce smoking and alcohol consumption, and to meet doctors and anaesthetists for informed consent. They may be given an oral carbohydrate drink prior to anaesthesia to maintain hydration, improve preoperative well-being, and reduce postoperative insulin resistance. Fasting duration is kept as short as possible, and bowel preparation is not recommended. Additionally, anaesthetists adopt a multimodal approach to control postoperative pain, as well as postoperative nausea and vomiting (PONV), using a combination of analgesics perioperatively. Postoperatively, patients are encouraged to eat and mobilise early; intravenous fluids should be discontinued when patients resume oral intake. Drain insertion is avoided, and the Foley catheter is removed as early as feasible.

Most patients undergoing urogynaecological surgery are older adults with multiple comorbidities. Older age is a risk factor for developing postoperative morbidity and mortality[11], and almost 40% of older patients develop postoperative complications[12]. A meta-analysis showed that older colorectal patients managed via ERAS experienced fewer complications and shorter LOS, without any increase in readmission rates[13]. Nonetheless, the benefits of ERAS for urogynaecological surgery remain unclear. Some studies have shown that ERAS reduces LOS by <1 day[14,15]; others have shown that ERAS results in a higher percentage of same-day discharge[16]. The present study aimed to investigate whether ERAS for major urogynaecological surgery could reduce LOS and accelerate recovery, as

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measured by time to full mobilisation and resumption of oral intake.

Methods

An ERAS programme was implemented in our hospital in March 2022. We retrospectively reviewed medical records of women who underwent vaginal hysterectomy with or without laparoscopic assistance or concomitant procedures (pelvic floor repair, sacrospinous fixation, and continence surgery) performed or supervised by at least one urogynaecology subspecialist between July 2020 and May 2023.

Before ERAS implementation, patients were discharged when they could ambulate, eat, and void as they did preoperatively. Intra- or post-operative analgesics were not routinely used. Fasting durations varied according to anaesthetists' preferences, and most patients fasted after midnight; no carbohydrate loading was provided. Prophylactic antibiotics were administered at induction of anaesthesia. Postoperative care was based on the preferences of attending physicians and patients. After ERAS implementation, standardised instructions were followed (Table 1) unless modified by attending physicians.

Table 1. Details of the enhanced recovery after surgery (ERAS) programme.

Pre-operation	Patients are assessed by a urogynaecologist, ERAS manager, anaesthetist, and physiotherapist 2 months before surgery.
	An ERAS manager and a designated nurse provide general advice to patients and their family members on smoking, alcohol consumption, and diet.
	The ERAS manager explains details of the entire surgical journey and addresses patient concerns regarding mood, finances, and postoperative care. Patients are referred to medical social workers if needed.
	Nutritional status is assessed using metabolic equivalents of task, and patients are referred to a dietitian for preoperative carbohydrate loading if not contraindicated.
	The physiotherapist provides preoperative assessment, including exercise tolerance, venous thromboembolism risk, prescription of home exercises, and referral to a prehabilitation programme, if indicated.
Intra-operation	Standardised multimodal analgesics are administered as pre-anaesthetic medications, including paracetamol, non-steroidal anti-inflammatory drugs, and pregabalin, if no contraindications are present.
	Carbohydrate loading is provided if patients do not have diabetes mellitus or impaired fasting glucose.
	Venous thromboembolism preventive measures, including graduated elastic compression stockings, sequential compression devices, and low-molecular-weight heparin, are administered according to stratified risk.
	Bowel preparation is performed for sacrocolpopexy or cases with anticipated dense adhesions.
	Patients maintain a short fasting period (ie, solids up to 6 hours and clear fluids up to 2 hours).
	A standardised anaesthetic protocol is implemented to maintain normovolaemia and normothermia.
Post-operation	Regular administration of standardised multimodal analgesics, including paracetamol, non-steroidal anti-inflammatory drugs, and tramadol, as well as antiemetics, including ondansetron or metoclopramide, is provided to reduce postoperative pain, nausea, and vomiting. Pain scores at rest and during movement are assessed daily by an ERAS nurse.
	Sips of water are allowed in the post-anaesthesia care unit, and patients are encouraged to resume oral intake as early as feasible after returning to the general ward.
	All tubes and drains are removed as early as feasible, balancing the risk of urinary retention. The urethral catheter is usually removed on postoperative day 1.
	Restrictive intravenous fluid infusion is adopted to maintain normovolaemia.
	Patients are followed up by a physiotherapist for chest physiotherapy, lower limb circulatory exercises, and mobilisation exercises to achieve early mobilisation and recovery to preoperative ambulatory status.
	The ERAS manager reviews recovery progress throughout the perioperative period and liaises with the gynaecologist, anaesthetist, physiotherapist, and family members.

Data collected included patient age, body mass index, type of operation, estimated intraoperative blood loss, pre- and post-operative haemoglobin levels, days required to regain preoperative mobility, days required to resume oral intake, days required for successful urethral catheter removal without urinary retention, intra- and post-operative complications (based on the Clavien-Dindo classification system[17]), unexpected readmissions within 30 days, and LOS.

Statistical analysis was performed using SPSS (Windows version 26.0; IBM Corp, Armonk [NY], US). The two groups were compared using the *t* test, Fisher's exact test, or Mann-Whitney *U* test, as appropriate. Significant variables were analysed using logistic regression to identify predictors of LOS. A p value of <0.05 was considered statistically significant.

Results

In total, 73 patients who underwent vaginal hysterectomy before (n=32) or after (n=41) ERAS implementation were included (Table 2). The two groups were comparable in terms of baseline characteristics, except that patients in the ERAS group tended to be younger (67.1 vs 70.2 years, p=0.054), had longer surgical duration (151.0 vs 116.8 minutes, p=0.001), and had greater blood loss (100 vs 50 mL, p=0.049).

Compared with patients without ERAS, a larger proportion of patients with ERAS received multimodal analgesia on induction (75.6% vs 21.9%, p<0.001), used graduated elastic compression stockings and sequential compression devices (95.1% vs 18.8%, p<0.001), received carbohydrate loading (56.1% vs 0%, p<0.001), received antiemetics (61.0% vs 28.1%, p<0.001), and received postoperative multimodal analgesia (95.1% vs 37.5%, p<0.001).

The ERAS group had shorter LOS (3.2 vs 4.9 days, p<0.001) and faster recovery, as measured by times to full mobilisation (1 vs 1 day, p<0.001), oral intake resumption (0 vs 0 day, p<0.001), and successful urethral catheter removal (1 vs 2 days, p<0.001). In the ERAS group, the mean self-reported pain scores were 0.56 at rest and 2.73 during movement. Seven (17.1%) patients experienced PONV despite intravenous ondansetron use. The predictor of LOS was the time required for successful urethral catheter removal (β=0.052, p<0.001).

The two groups were comparable in terms of intra- and post-operative complications and unplanned readmission. One patient in each group was readmitted to hospital within 30 days for vaginal bleeding; vault haematoma was found in the patient without ERAS. Two patients without ERAS developed vault infection, which resolved with antibiotic treatment.

The ERAS programme received high satisfaction ratings both at discharge and at the 6-week follow-up. Patients were satisfied with preoperative counselling provided by the gynaecologist, anaesthetist, and physiotherapist, as well as with perioperative follow-up by a designated ERAS nurse. Postoperative pain control was considered satisfactory by 97% of patients. Antiemetics were administered to 61% of patients, who reported effectiveness in managing PONV. Although only 45% of patients received consultation from a medical social worker, 86.5% of these patients were satisfied with the support provided. Two patients reported a preference for earlier removal of the urethral catheter, whereas one patient expressed a desire to delay mobilisation due to postoperative fatigue.

Discussion

Among patients who underwent vaginal hysterectomy, LOS shortened after ERAS implementation from 4.9 to 3.2 days. One study demonstrated discharge at 13.8 hours after surgery in 91.7% of cases following major prolapse surgery[16]. However, this results required more intensive patient education and support from clinical staff and caregivers. Same-day discharge programmes usually require daily telephone contact by nurses, early outpatient follow-up visits, and close monitoring for complications.

The duration of urethral catheter use was the main predictor of LOS. In our unit, the urethral catheter was generally kept until the morning after hysterectomy, given that the risk of postoperative voiding dysfunction can be as high as 60%[18]. Although urethral catheterisation may be omitted for simple vaginal hysterectomy, and a trial of retrograde bladder filling for voiding should be considered[19], 6.3% of urogynaecology patients who underwent day surgery failed a voiding trial and were discharged with an indwelling catheter[19].

Compliance with ERAS is particularly important for older patients[20], given their increased morbidity, frailty, and need for more intensive care. Older patients may be less able to comply with early ambulation or early oral intake. The compliance rate among geriatric colorectal patients reportedly ranged from 42.3% to 77.2%; it was higher in those undergoing laparoscopic surgery[13,21]. In patients undergoing open gynaecological

Table 2. Characteristics and outcomes of patients who underwent vaginal hysterectomy with or without enhanced recovery after surgery (ERAS).

Variable	No ERAS (n=32)*	ERAS (n=41)*	p Value
Age, y	70.2±1.1	67.1±1.1	0.054
Body mass index, kg/m^2	24.2±3.3	24.3±2.9	0.866
Hypertension	22 (68.8)	19 (46.3)	0.063
Diabetes mellitus	11 (34.4)	11 (26.8)	0.608
Use of anticoagulants	3 (9.4)	0	0.080
Respiratory disease	4 (12.5)	1 (2.4)	0.091
Smoker	0	1 (2.4)	0.374
American Society of Anesthesiologists physical status III	9 (28.1)	5 (12.2)	0.244
Preoperative haemoglobin, g/dL	12.8±1.3	12.7±1.2	0.614
History of abdominal surgery (except bilateral tubal ligation)	7 (21.9)	4 (9.8)	0.194
Advanced stage of prolapse	13 (40.6)	12 (29.3)	0.754
Weight of uterus, g	58 (38.5-69.5)	66 (46.0-103.0)	0.099
Surgical duration, min	116.8±33.7	151.0±42.3	0.001
Duration in recovery room, min	39 (36.0-44.0)	40 (32.8-48.3)	0.951
Blood loss, mL	50 (30.0-137.5)	100 (50.0-150.0)	0.049
Vaginal hysterectomy			0.497
Without laparoscopic assistance	29 (90.6)	34 (82.9)	
With laparoscopic assistance	3 (9.4)	7 (17.1)	
Concomitant continence surgery	2 (6.3)	5 (12.2)	0.456
Concomitant sacrospinous fixation	10 (31.3)	8 (19.5)	0.283
Anaesthesia type			1.000
General	19 (59.4)	25 (61.0)	
Spinal	13 (40.6)	16 (39.0)	
Antibiotics on induction	32 (100)	41 (100)	1.000
Vaginal packing	10 (31.3)	9 (22.0)	0.427
Analgesia on induction	25 (78.1)	37 (90.2)	0.114
Unimodal	18 (56.3)	6 (14.6)	<0.001
Multimodal	7 (21.9)	31 (75.6)	-
Bowel preparation	1 (3.1)	0	0.438
Use of graduated elastic compression stockings and sequential compression devices	6 (18.8)	39 (95.1)	<0.001
Carbohydrate loading	0	23 (56.1)	<0.001
Use of antiemetics	9 (28.1)	25 (61.0)	<0.001
Postoperative use of analgesics	20 (62.5)	41 (100)	<0.001
Unimodal	8 (25.0)	2 (4.9)	<0.001
Multimodal	12 (37.5)	39 (95.1)	-
Oral intake, d	0 (0-1)	0	<0.001
Full mobilisation, d	1 (1-2)	1 (1-1)	<0.001
Successful urethral catheter removal, d	2 (2-2)	1 (1-1)	<0.001
Postoperative haemoglobin change, g/dL	-1.3 (-1.7 to -0.5)	-1.2 (-2.0 to -0.8)	0.399
Intraoperative complications	3 (9.4)	0	0.080
Postoperative pain, nausea, and vomiting	-	7 (17.1)	-
Postoperative complications	5 (15.6)	6 (14.6)	0.907
Postoperative severe complications (Clavien-Dindo classification ≥3a)	2 (6.3)	0	0.189
Readmission	1 (3.1)	1 (2.4)	0.859
Postoperative length of hospital stay, d	4.9±0.7	3.2±0.3	<0.001

* Data are presented as mean ± standard deviation, No. (%) of participants, or median (interquartile range).

surgery, compliance rates exceeding 80% are associated with improved outcomes[22]. Customised ERAS protocols for geriatric patients may further improve outcomes[13]. In our unit, a designated ERAS manager is responsible for monitoring postoperative progress and fostering rapport and trust between patients and the medical team. Medications for pain relief and PONV are reviewed daily by the gynaecologist, anaesthetist, and ERAS manager. The ERAS manager also provides instructions to patients and their families to facilitate early ambulation and early feeding. Compliance rates for most components reached 80% to 90%; the lowest rate (70%) was observed for tolerance of sips of water in the post-anaesthesia care unit; most patients declined to try, whereas others were sleepy and fatigued after surgery.

The present study had several limitations. The sample size was relatively small and derived from a single unit, which may introduce selection bias. Patients in the ERAS group tended to be younger; this may have contributed to the shorter LOS. Additionally, documentation was more comprehensive in the ERAS group because a designated ERAS nurse was responsible for patient follow-up. Patient satisfaction and clinical symptoms were not systematically assessed before ERAS implementation. Complications were rare; therefore, differences between patients with and without ERAS may not have been detectable. Most patients underwent vaginal hysterectomy for pelvic organ prolapse, which may limit the generalisability of the findings.

Conclusion

The ERAS programme can shorten LOS among patients undergoing vaginal hysterectomy. The duration of urethral catheter use was the main predictor of LOS. Further studies to evaluate same-day removal of the urethral catheter to further shorten LOS and enhance patient recovery and satisfaction are warranted.

Contributors

Both authors designed the study, acquired the data, analysed the data, drafted the manuscript, and critically revised the manuscript for important intellectual content. Both authors had full access to the data, contributed to the study, approved the final version for publication, and take responsibility for its accuracy and integrity.

Conflicts of interest

Both authors have disclosed no conflicts of interest.

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Data availability

All data generated or analysed during the present study are available from the corresponding author on reasonable request.

Ethics approval

This study was approved by the Kowloon Central / Kowloon East Cluster Research Ethics Committee (reference: KC/KE-23-0161/ER-3). The patients were treated in accordance with the tenets of the Declaration of Helsinki.

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