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Impact of Enhanced Recovery after Surgery (ERAS) on Length of Hospital Stay and Post Operative Outcomes Following Pancreatic Surgeries

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Abstract: ***Enhanced Recovery After Surgery (ERAS) is a multidisciplinary, evidence-based approach designed to reduce surgical stress and promote faster postoperative recovery. This observational study, conducted between April 2022 and April 2024, evaluated the feasibility and safety of an institutional-based ERAS protocol for patients undergoing pancreatic surgeries for benign conditions in India. The study compared outcomes between 35 patients in the ERAS group and 61 in the conventional care group, focusing on hospital stay, postoperative complications, and mortality. The results showed a significantly shorter hospital stay in the ERAS group (8.84 ± 3.35 days vs. 10.1 ± 4.2 days, P=0.04) without an increase in complications or readmission rates. ERAS patients also experienced earlier ambulation, reduced opioid use, and quicker removal of nasogastric tubes, Foley's catheters, and drains. Although the benefits were more evident in open surgeries, further studies are needed to establish the impact of ERAS in laparoscopic pancreatic surgeries. The findings suggest that ERAS is a safe and feasible approach in the Indian healthcare setting, improving recovery while reducing hospital resource utilization.***

Keywords: ERAS, pancreatic surgery, postoperative recovery, hospital stay, perioperative care

1. Introduction

- Enhanced recovery after surgery (ERAS) is a multidisciplinary evidence - based perioperative intervention delivered to patients with the aim of maintaining normal physiology and thus facilitating postoperative recovery
- The higher rates of serious postoperative complications is associated with an excessive response to surgical stress.
- C - reactive protein (CRP), interleukin (IL) - 6, tumour necrosis factor - α (TNF - α) acts as markers of the severity of the surgical stress response.
- ERAS is based on the reduction of this surgical stress by various perioperative measures and thereby facilitating early recovery and hence early discharge with less hospital cost.

2. Objective

- Enhanced recovery after surgery (ERAS) are evidence based perioperative practices with beneficial outcomes mainly in the form of shorter length of hospital stay.
- This study was conducted to evaluate the feasibility and safety of institutional based ERAS protocol in the Indian population undergoing pancreatic surgeries for benign pancreatic conditions.

3. Materials and Methods

- This is an Observational study conducted between April 2022 to April 2024.
- From April 2022 to March 2023, 61 patients underwent conventional perioperative care.
- From April 2023 to March 2024, 35 patients underwent ERAS perioperative care. Both the groups were followed up for one month for any readmissions.
- The outcomes of ERAS group (n=35) were compared to the conventional group (n=61).
- All patients were informed about the aims and details of ERAS protocol and an informed consent was obtained.
- All patients were followed till 1 month of discharge.
- In our study as per the feasibility and availability of resources in our institution we framed an institutional based ERAS protocol which was implemented from April 2023 (35 patients) while the rest received conventional perioperative care.

4. Statistical Analysis

- The analysis included profiling of patients on different demographic and anthropometric characteristics, comorbidities as well as clinical and laboratory findings.
- Estimation of ERAS parameters during perioperative was undertaken.
- The detailed analysis was related to duration of hospital stay and post - operative outcomes such as complications and mortality.
- Descriptive analysis of quantitative parameters was expressed as means and standard deviation. Categorical data was expressed as absolute number and percentage.
- P - value < 0.05 is considered statistically significant.
- SPSS software, version 24.0 was used for analysis.

5. Data Collection

- Patient data including demographic features, comorbidities, operative procedures, American Society of Anaesthesiologists Physical Status (ASAPS), nasogastric tube removal, drain removal, foley's removal, oral diet, complications, postoperative hospital stay, morbidity and mortality was prospectively collected of the ERAS group and the conventional group.
- Morbidity and mortality was defined as any complications or death that occurred during hospital stay or within postoperative 30 days.

Discharge Criteria

- Patients were considered dischargeable postoperatively if they met the following criteria (Table 3).
- After discharge, patients were followed up through telephone within the first 24 hours and once per week for 4 weeks. The patients also contacted us if they had any complaints.

- The outcomes of patients who underwent ERAS protocol (35 patients) were compared with the data of those who underwent conventional perioperative (61 patients).
- The primary endpoint was the duration of postoperative hospital stay and the secondary end point was the incidence of postoperative complications and mortality within 30 days after discharge.

6. Results

- This observational study was conducted from April 2022 to April 2024 in the department of Surgical Gastroenterology, KLEs Dr Prabhakar Kore Hospital And MRC, Belagavi, Karnataka.
- A total of 96 patients with benign pancreatic conditions underwent laparoscopic/open pancreatic surgeries were included in our study.
- ERAS group had a shorter length of hospital stay (10.1 ± 4.2 vs 8.84 ± 3.35 days, P=0.04) than the conventional group.
- In the ERAS group there was no increase in postoperative complications and had a similar readmission and mortality rate compared to the conventional group.
- The preoperative baseline characteristics of the two groups are compared.
- There were no significant differences between the two groups in terms of age, BMI (body mass index) and ASA (American society of anaesthesiologist score).
- Most commonly the patients presented with abdominal pain in both the ERAS group comprising 28 (80%) followed by gastric outlet obstruction with 6 (17.14%) and in Conventional group also abdominal pain with
- 48 (78.69%) followed by gastric outlet obstruction with 11 (18.3%)
- Most common type of surgery in both the Conventional group and ERAS group was Lateral Pancreaticojejunostomy followed by Cysto - jejunostomy.
- Mean duration of surgery was 185.95 ±55.0 minutes in the conventional group and in ERAS group it was 231.57±55.21 which was statistically significant with a p value of <0.001 possibly due to improved surgical techniques overtime by the same operating surgeon.
- Average volume of blood loss was more in the Conventional group of 125.4 ±58.84ml than in the ERAS group 71.85±41.04 with a statistically significant p value of <0.001.
- Post - operative pain was assessed with VAS (visual analogue score) on POD 2 which was statistically significant in ERAS group where non opioids analgesics with local blocks/epidural were more commonly used than in conventional group where opioids and NSAIDs (non steroidal anti inflammatory drugs) were used.
- Though oral feed was started on POD1 but most of the ERAS patients 16 (47.14%) tolerated oral diet on POD2 as compared to Conventional group 59 (96.72%) in which diet was started most commonly after POD2.
- The Nasogastric tube and Foley's catheter was removed early most commonly on POD 1 in ERAS group 23 (65.71%) and 23 (65.71%) respectively than in the conventional group, 1 (1.64%) and 7 (11.47%) which was statistically significant, p value <0.001.
- The drain if inserted was removed earlier within 5 days in most of the patients in ERAS group 13 (31.4%) than in the conventional group 6 (10.6%) with statistically significant p value of <0.001.
- Most of the patients, 30 (85.71%) in ERAS group were ambulated on postoperative day 1 however in the Conventional group only 14 (23.7%) were ambulatory on POD 1 which was also statistically significant (p value <0.001).
- There was a statistically significant difference in the duration of hospital stay with shorter duration of stay in ERAS group than in the conventional group (8.84 ± 3.35 days v/s 10.1 ± 4.2 days) with p value of <0.04.
- However, in subgroup analysis, the comparison between laparoscopic procedures in both the groups did not reach the statistical significant difference with 7 ± 1.94 in non - ERAS v/s 6.40 ± 0.55 in ERAS group with p value of 0.52 unlike in open procedures where the p value was statistically significant (<0.03).
- The overall mortality was 1 (2.4%) in non - ERAS patients and 1 (4.2%) in the ERAS group. Statistically, the difference was not significant with p value of 0.908.

Comparison of baseline characteristics of ERAS and Conventional group

Characteristics	Conventional	ERAS	P value					
Age in years	47.4±12.09	43.6±15.34	0.76	ASAe	I	20 (32.7%)	12 (34.3%)	
Male/Female	46 (75.45%) / 15 (25.4%)	32 (90%) /3 (10%)	0.01		II	40 (65.6%)	18 (51.4%)	
BMI[a]	24.15±4.63	22.88±5.31	0.84		III	1 (1.6%)	5 (14.3%)	
Diabetes Mellitus	9 (14.75%)	6 (17.14%)		ECOG f	1	21 (34.4%)	11 (31.4%)	0.796
Hypertension	12 (19.67%)	5 (14.21%)						
					2	6 (9.8%)	4 (11.4%)	
Most common presentation								
Pain Abdomen	48 (78.69%)	28 (80%)			0	34 (55.7%)	20 (57.14%)	
Gastric Outlet Obstruction	11 (18.3%)	6 (17.14%)						
Obstructive Juandice	6 (9.8%)	1 (2.85%)						

Type of Surgery Conventional Eras

Lateral Pancreatico - jejunostomy	20 (32.7%)	10 (28.6%)	
Frey's Procedure	10 (16.3%)	7 (20%)	
Cysto - jejunostomy	12 (19.7%)	8 (22.8%)	
Cysto - gastrostomy	3 (4.9%)	5 (14.2%)	
LPJ with Choledocho - jejunostomy	5 (8.2%)	3 (8.6%)	
LPJ with Gastro - jejunostomy	11 (18.2%)	2 (5.7%)	
Open pancreatic surgeries	36 (59%)	20 (57%)	
Laparoscopic pancreatic surgeries	25 (41%)	15 (43%)	
Duration of surgery	185.95 ±55.0	231.57±55.21	<0.001
Blood loss	125.4 ±58.84	71.85±41.04	<0.001

Comparison of post - operative outcomes

Variables		Conventional group	ERAS group	P value
VAS[a] (POD2)		5 (5, 5)	5 (4, 5)	<0.001
Ambulation	POD1	14 (23.7%)	30 (85.71%)	<0.001
	>POD1	46 (76.23%)	5 (14.28%)	
Oral intake	POD2	2 (3.27%)	16 (47.14%)	<0.001
	>POD2	59 (96.72%)	19 (52.85%)	
Foley's removal	POD1	7 (11.47%)	23 (65.71%)	<0.001
	>POD1	54 (88.52%)	12 (34.28 %)	
Drain removal	< POD5	6 (10.6%)	13 (31.4%)	<0.001
	≥POD5	26 (42.6%)	11 (30%)	
PONV[b]		29 (32.8%)	11 (30%)	0.69
Postoperative complications	Yes	20 (32.8%)	10 (28.6%)	0.54
	No	41 (67.2%)	25 (71.4%)	
Clavien Dindo grade	1	11 (17.8%)	5 (15%)	
	2	30 (48.9%)	23 (65%)	
	3a	1 (2.2%)	0 (0%)	
	3b	3 (4.4%)	2 (5%)	
	4a	13 (22.2%)	0 (0%)	
	5	3 (4.4%)	5 (15%)	

Subgroup analysis of hospital stay in open and laparoscopic surgery in both groups

Surgery	Group	Hospital stay Mean +/ - SD	Mean difference	P value
Open (N=56)	Group 1	10.39±4.24	1.35	0.03
	Group 2	9.03 ± 3.40		
Laparoscopy (N=40)	Group 1	7 ± 1.94	0.6	0.52
	Group 2	6.40 ± 0.55		

7. Discussion

- Our study findings showed that the ERAS program was safe and feasible with similar rates of complications, readmissions and mortality and with a shorter duration of hospital stay as compared to conventional perioperative care.
- It is difficult to strictly adhere to the ERAS protocol making full compliance difficult to achieve, hence we followed an institutional based ERAS protocol.
- In our study though there was a low compliance in ERAS group to oral diet with 16 (47.14%) on POD2, there was high compliance rates with early ambulation 30 (85.71%), Foleys removal on POD1 23 (65.71%) and carboload intake 30 (85.71%) with overall aggregate compliance of 71.06%.
- In conventional care prolonged preoperative fasting of 12 to 24 hours was routinely followed but in ERAS, only 2 hours of fasting before the operation was sufficient with a Carboload drink up to 2 hours before surgery and was followed in our study.
- Most of the ERAS protocols exclude diabetes patients due to concerns of impaired preoperative blood glucose control and hence the evidence supporting preoperative Carboload intake by diabetic patients is lacking.
- In our study 6 (17.14%) patients in the ERAS group presented with gastric outlet obstruction and all preoperatively received gastric lavage through nasogastric tube. Out of these 6 patients, 2 patients could not tolerate Carboload possibly due to complete obstruction.
- In the ERAS group 6 (17.14%) patients were diabetic and none had either preoperative or postoperative deranged sugar levels after receiving Carboload solution.
- In our study, we started the patients on oral feeding from POD1 and gradually progressed to normal diet as per patient tolerance over 3 - 4 days and there were no increased rates of postoperative complications.
- This suggests that early oral feeding is safe and feasible and does not increase the risk of postoperative anastomotic leakage or pneumonia.
- Opioids were routinely used in conventional care and are known to cause nausea and vomiting that hampers and delays the recovery.
- In our study, we used non opioid multimodal analgesia in the form of epidural analgesia, patient - controlled non opioid analgesia pumps, transversus abdominis blocks and local infiltration of surgical wounds with ropivacaine.
- Postoperatively intravenous analgesics were used till POD 2 and later on non opioid oral analgesics with on demand intravenous analgesics. Pain intensity was evaluated from POD 1 onwards using the VAS (Visual analogue scale).
- Though there was no decrease in rates of PONV (postoperative nausea vomiting), results showed that in the ERAS group VAS score was significantly lower than that of the conventional care group with p value of <0.001.
- Non opioid multimodal analgesia helps reduce stress and patient discomfort with early and prolonged mobility.
- In our study, we performed both laparoscopic and open surgeries and there was statistically significant shorter hospital stay in the ERAS group with a p value of 0.04.
- But in the subgroup analysis comparing only the laparoscopic procedures in the ERAS and conventional group, there was no statistically significant difference in hospital stay.
- Postoperative complications are the key to a successful ERAS program and decides the length of hospital stay of the patient. In our study there were similar complication rates.
- In the Conventional group the complications were seen in 29 (32.8%) while in ERAS group 10 (28.6%) with p value of 0.54. Most of the complication was of Clavien Dindo grade II with ileus as the most common complication in both the groups followed by surgical site infection.
- All the patients in both the groups were followed up for 1 month and there were similar mortality with 2.4% (1) mortality in the Conventional group whereas 4.2% (1) mortality in the ERAS group which was statistically not significant.

8. Conclusion

- Our study results demonstrated that implementing an ERAS protocol in patients undergoing pancreatic surgeries is safe and feasible in the Indian population with a shorter hospital stay and with no increase in rates of complications and readmissions; however, establishing the role of ERAS in laparoscopic pancreatic surgeries needs further large prospective studies.
- ERAS improves the hospital bed utilization rate and reduces the financial burden for the patient's family.