The Effect of introducing a nurse guided enhanced recovery after surgery program on patients undergoing hepatectomy

Yisu-Liu, Jia-Li

Abstract

Background: enhanced recovery after surgery (ERAS) could shorten hospital stay and decrease postoperative complications for patients undergoing colorectal surgery. Whether ERAS have the same effect in patients undergoing hepatectomy is not clear, researches led by nurse are especially rare. The study aimed at investigating the safety, feasibility and efficiency of nurse guided ERAS program on patients undergoing hepatectomy.

Method: patients undergoing liver resection treated with nurse guided ERAS program were taken for ERAS group. ERAS program included: perioperative respiratory function training, perioperative diet guidance, early postoperative activity and postoperative pain management. Primary outcome measures we postoperative length of stay and postoperative complications. Secondary outcome measures were the first time to flatus and defecation, NRS on first and second postoperative day (POD), mortality and readmission rate.

Result: The study included totally 100 patients, the patients in each group were 50.The length of stay of patients in ERAS group was shorter than control group (5 days vs 7 days, P=0.001). The overall complications rate and general complications rate of patients in ERAS group were obviously lower than control group (12% vs 30%, P=0.027; 8% vs 24%, P=0.029). The first time to flatus and defecation of ERAS group were both earlier than control group (3 days vs 4 days, P=0.000; 5 days vs 6 days, P=0.010). The NRS score on POD 1 and POD 2 of the ERAS groups were both lower than control group (6 vs 4, P=0.006; 5 vs 3, P=0.000). The surgery-related complications rate of two groups had no significant difference. There were no perioperative mortality or readmission of two groups in the study (0, P=1.000).

Conclusion: The application of nurse guided ERAS program safe, effective and feasible for patients undergoing liver resection. It shortened postoperative length of stay and decreased postoperative complication. At the same time, it reduced postoperative pain and improved patient comfort.

Key Words: enhanced recovery after surgery, nurse, hepatectomy

Introduction

ERAS runs through all aspects of perioperative period. The success implement of ERAS needs multidisciplinary teamwork of surgeons, anesthetists, nurses and rehabilitation therapists. ERAS can reduce operation related stress to promote patients recovery, shorten hospital stay and decrease postoperative complications[1]. The ERAS program was first used in cardiac surgery and has been applied in other surgeries, such as colorectal, orthopedics, urology, gynecology, cardiothoracic surgery, vascular surgery and plastic surgery in later 20 years[2-5]. ERAS program was the standard therapy of colorectal surgery. ERAS clinical practice guidance of colorectal surgery and gastrectomy were released in 2013 and 2014. Because of the particularity of hepatectomy, ERAS study of hepatectomy was few. Different studies were distinctly different from each other in ERAS strategy.

Hepatectomy is the first choice therapy for primary and secondary liver tumor. The mortality of hepatectomy is relatively low (1%~3%), but the postoperative complications rate is up to 30%[5]. Thus, we need corresponding measures to improve clinical outcome of patients undergoing liver resection. Study showed that ERAS could shorten length of stay, decrease postoperative complications and

DOI: 10.5176/2345-7198_5.1.46
ISSN 2345-7198

accelerate postoperative recovery in hepatectomy. The studies were mostly guided by surgeons and anesthetists, the studies guided by nurses were rarely. The study was to investigate the safety, feasibility and efficiency of nurse guided ERAS program on patients undergoing hepatectomy.

Methods

Patients having hepatectomy from January 2015 to May 2015 were as historical control group, while patients having hepatectomy from June 2015 to December 2015 were treated with nurse guided ERAS program. All patients of two groups were operated in standard operation method and standard anesthesia by the same liver surgery team, and nursed by the same nurse team. Nurses had been trained and examined before study.

Inclusion and Exclusion Criteria

Inclusion Criteria: From 25 to 70 years old; selected hepatectomy; Child pugh score was A or B; ASA classification was I or II.

Exclusion Criteria: with distant metastasis including matogenous spread and lymphatic metastasis; with biliary obstruction and hyperbilirubinemia preoperative; with severe dysfunction of heart, lung or kidney; needing a second concomitant operation; refusing to join in or dropping out study.

Perioperative respiratory function training

The cardiopulmonary function of patients was assessed. The purposes, meanings and methods of respiratory training were explained to patients and their families, including abdominal breathing, contracted lips breathing, cough training. A respiratory function training plan was made on the first day of hospitalization. After operation to patients with stable vital signs, raised the bed 15 °~3 0 °,guided patients to

training for 5 times per day and 5~10 minutes every time. Patients were guided to sit on bed with foot on floor and hands on bed for 10~20 minutes every time, and stand beside bed for 5~10 minutes every time and 2 times per day

breath by pursed lips breathing and abdominal breathing, encouraged patients to cough effectively. At the same time, helped patients turn over and knocking back per 2 hours. POD1 to discharge, guided patients to pursed lips breathing and abdominal breathing 5~10min/ times, 3~4times a day; patients were instructed to blow the balloon 5~10min/ times, 3~4 times a day; encouraged patients to cough effectively and knock back 5~10min after oxygen inhalation, which was 3 times a day. According to the patient's tolerance to adjust and increase the amount of training and training time. **Perioperative diet guidance**

The patients were informed to eat easy digest, no gas, no greasy food 2 to 3 days before operation. Patients could have normal diets at the night before operation and no solid food 6 hours before operation and no liquid food 2 hours before operation. 500~1000ml 10% glucose was taken at the night before operation and 2 hour before operation. A small amount of warm water was given in 6h after anesthesia, patients could take a little liquid food (such as soup or rice porridge) if patients were not choked and take normal diet on POD1.

Early postoperative activity

The patients were informed of the importance and necessity of early postoperative activity on the day before operation. Nurses would give papers of early postoperative activity and introduce detailed method to patients and their families. Patients were helped to do passive activities once they went back to the ward and active activities were encouraged after patients were awake. On POD1, patients would be helped and guided lift body up with hands to sit and turn over, then do general movement on bed. Nurse would guide patients to do function

when they felt comfortable. On POD2, patients were encouraged to walk in word for 5~10 minutes every time and 5 times per day, and do daily activities including washing face, brushing teeth, wearing clothes, moving chairs and beds.

On POD3, patients would walk with walking aid in ward corridor for 10~20 minutes every time and 2~3 times per day.
Patients could add activities according to their physical conditions and do daily activities as eating and defecation with the help of family.

Postoperative pain management

Postoperative pain management was conducted in the way of multimodal analgesia and postoperative pain was regularly assessed by using the NRS. In 0~48 hours after operation, epidural analgesia was adopted. Afterwards, regular oral taking non-opioid analgesic like NSAID would be adopted to control pain[6, 7]. If needed, intramuscular injection of 50mg pethidine hydrochloride can be given for severe pain.

Statistical analysis

Patients related data and outcome measures of two groups were analyzed by SPSS13.0. Continuous variables were described as averages ± standard deviations ($\bar{x}\pm s$) and categorical variables as numbers and rate. T test was used to compare continuous variables of two groups. χ^2 test was performed to compare categorical variables of two groups, and the correction formula was used while theoretical frequency below 5. $P<0.05$ was considered to be statistical significant.

Result

100 patients were included in the study. The demographics dates for patients were shown as table 1, operative and outcome dates were shown as table 2 and table 3. There were no significant differences in the demographic data and operative details between the two groups, such as gender, age, Child classification, ASA classification, operative time, intraoperative blood loss, blood transfusion requirements and type of hepatectomy. The length of stay in ERAS group was shorter than control group (5 days vs 7 days, P=0.001). About 64% patients discharged on POD 6 or earlier and there were no statistical difference between types of hepatectomy. There were no perioperative mortality or readmission of two groups in the study (0, P=1.000).

The recovery time of bowel sound of patients in ERAS was shorter than control group (2 days vs 3 days, P=0.000). The first time to flatus and defecation of ERAS group were both earlier than control group (3 days vs 4 days, P=0.000; 5 days vs 6 days, P=0.010). The NRS score on POD 1 and POD 2 of the ERAS groups were both lower than control group (6 vs 4, P=0.006; 5 vs 3, P=0.000).

5 of 50 patients were associated of postoperative complications in the ERAS group, including nausea and vomiting (n=2), abdominal distension and abdominal pain (n=1), pulmonary infection (n=1), biliary fistula (n=1). 15 of 50 patients occurred postoperative complications in the control group, including nausea and vomiting (n=6), abdominal distension and abdominal pain (n=4), pulmonary infection (n=1), incision infection (n=1), biliary fistula (n=1) and ascites (n=2). The overall complications rate and general complications rate of patients in ERAS group were obviously lower than control group (12% vs 30%, P=0.027; 8% vs 24%, P=0.029). The surgery-related complications rate of two groups had no significant difference.

Table 1 Demographics dates for patients

Items	ERAS Group	Control Group	*P*
Gender(Male/Female, case)	37/13	33/17	0.383
Age（year， $\bar{x}\pm s$ ）	53.91±3.36	57.53±2.76	0.421
Child classification（A/B，case）	42/8	42/8	1.000
ASA classification（ *I* / *II*，case	2/48	0/50	0.475
Liver resection type（case）			0.190
Segmentectomy	11	8	
Left Lateral Segmentectomy	10	11	
Left hepatectomy	7	11	
Right hepatectomy	15	13	
Extended left hepatectomy	2	4	
Extended Right hepatectomy	5	3	

Table 2 Operative and outcome dates for patients

Outcome Measures	ERAS Group	Control Group	*P* Value
Operative time（h， $\bar{x}\pm s$ ）	5.25±0.39	5.18±0.43	0.896
Intraoperative blood loss（ml， $\bar{x}\pm s$ ）	186.32±30.89	215.22±36.55	0.562
Patients for blood transfusion（case）	2	4	0.674
Recovery of bowel sound（h， $\bar{x}\pm s$ ）	55.26±2.63	75.21±3.27	0.000
Duration to first flatus（h， $\bar{x}\pm s$ ）	73.78±3.10	98.89±3.70	0.000
Duration to first defecation（h， $\bar{x}\pm s$ ）	123.43±6.46	152.89±9.76	0.010
Time to get out of bed（h， $\bar{x}\pm s$ ）	78.58±2.74	64.43±3.37	0.000
Length of stay（d， $\bar{x}\pm s$ ）	5.46±1.68	7.22±1.87	0.000
NRS score on POD1($\bar{x}\pm s$ ）	4.45±1.51	6.29±1.86	0.006
NRS score on POD2($\bar{x}\pm s$ ）	3.48±1.16	5.10±1.61	0.000
Perioperative death（case）	0	0	1.000
Readmission in 30 days（case）	0	0	1.000

Table 3 Postoperative complications of patients

Postoperative Complications	ERAS Group	Control Group	*P* Valuve
Overall Complications	5	15	0.022
General Complications	4	12	0.029
nausea and vomiting	2	6	
abdominal distension and abdominal pain	1	4	
pulmonary infection	1	1	
incision infection	0	1	

surgery-related complications	1	3	0.610
biliary fistula	1	1	
ascites	0	2	

Discussion

The study showed that nurse guided ERAS program could shorten the length of stay and reduce postoperative complications of patients undergoing hepatectomy without increasing perioperative mortality or readmission rate in 30 days. Perioperative respiratory function training, perioperative diet guide, early postoperative activity and postoperative pain management are important measures to promote postoperative recovery for hepatectomy patients.

Influenced by anesthetics and postoperative pain, patients would decrease cough or dare not to cough after liver resection, thus increase the rate of respiratory complications such as pneumonia and atelectasis, even result in anoxia, dyspnea and respiratory failure. Perioperative respiratory function training can help patients to improve pulmonary function and clean the secretions of respiratory thus reduce postoperative complications and promote postoperative recovery.

Preoperative fasting was to avoid complications resulted by stomach contents regurgitation or aspiration during anesthesia. Preoperative fasting would result in hypoglycemia and insulin resistance and insulin resistance was bad for liver regeneration[8]. A meta-analysis showed carbohydrate loading could decrease insulin resistance and discomfort such as hunger, thirst, nausea or anxiety, and could shorten length of stay without increasing postoperative complications[9]. Preoperative fasting no more than 6h for solid food and 2h for liquid food was recommended[10, 11].

Long-term rest on bed could result in occurrence of complications such as deep vein thrombosis, hypostatic pneumonia and was adverse to recovery of patients. Early postoperative activity could reduce pulmonary complications, prevent muscle atrophy and deep vein thrombosis and promote recovery of bladder function. At the same time, it could promote recovery of gastrointestinal function[7, 12, 13]. Early postoperative activity was an important measure of ERAS and promotion for recovery of patients. Therefore, patients were encouraged to mobilize early after operation in the premise of good analgesia.

Moderate and severe pain was common in hepatectomy. Due to pain or being afraid of wound dehiscence, patients dare not to mobilize early after operation. So, improving pain management is a crucial factor for promoting of postoperative recovery. The purpose of postoperative analgesia management is to reduce pain stress and make patients can tolerate early mobilization without increasing postoperative complications risk[14]. The study used NSADS multimodal analgesia to implement pain management of patients, assessed pain and used analgesic regularly, tried to reduce the use of opioids, thus promote recovery of gastrointestinal function[15, 16].

The innovation of the study was the ERAS program was guided by nurses and they can part in the clinical decision-making along with other medical staff for the rehabilitation of patients, which was different with studies led by surgeons or anesthetists. At the same time, there were some limitations. The study was historical control and the lack of random. A larger sample of randomized controlled trials will be taken in the future.

Conclusion

The application of nurses guided ERAS program was safe, effective and feasible for patients undergoing liver resection. It shortened postoperative length of stay and decreased postoperative complications.

References

[1] PageA J, EjazA, SpolveratoG, et al. Enhanced recovery after surgery protocols for open hepatectomy--physiology,immunomodulation, and implementation[J]. J Gastrointest Surg, 2015, 19(2): 387-399.

[2] Ansari D, Gianotti L, Schroder J, et al. Fast-track surgery: procedure-specific aspects and future direction[J]. Langenbecks Arch Surg, 2013, 398(1): 29-37.

[3] Zhuang C L, Ye X Z, Zhang X D, et al. Enhanced recovery after surgery programs versus traditional care for colorectal surgery: a meta-analysis of randomized controlled trials[J]. Dis Colon Rectum, 2013, 56(5): 667-678.

[4] Cerantola Y, Valerio M, Persson B, et al. Guidelines for perioperative care after radical cystectomy for bladder cancer: Enhanced Recovery After Surgery (ERAS((R))) society recommendations[J]. Clin Nutr, 2013, 32(6): 879-887.

[5] Dasari B V, Rahman R, Khan S, et al. Safety and feasibility of an enhanced recovery pathway after a liver resection: prospective cohort study[J]. HPB (Oxford), 2015, 17(8): 700-706.

[6] Schultz N A, Larsen P N, Klarskov B, et al. Evaluation of a fast-track programme for patients undergoing liver resection[J]. Br J Surg, 2013, 100(1): 138-143.

[7] Savikko J, Ilmakunnas M, M Kisalo H, et al. Enhanced recovery protocol after liver resection[J]. 2015, 102(12): 1526-1532.

[8] Vibert E, Boleslawski E, Cosse C, et al. Arterial Lactate Concentration at the End of an Elective Hepatectomy Is an Early Predictor of the Postoperative Course and a Potential Surrogate of Intraoperative Events[J]. Ann Surg, 2015, 262(5): 787-792, 792-793.

[9] Bilku D K, Dennison A R, Hall T C, et al. Role of preoperative carbohydrate loading: a systematic review[J]. Ann R Coll Surg Engl, 2014, 96(1): 15-22.

[10] Melloul E, Hubner M, Scott M, et al. Guidelines for Perioperative Care for Liver Surgery: Enhanced Recovery After Surgery (ERAS) Society Recommendations[J]. World J Surg, 2016, 40(10): 2425-2440.

[11] A C A S O. Practice guidelines for preoperative fasting and the use of pharmacologic agents to reduce the risk of pulmonary aspiration: application to healthy patients undergoing elective procedures: an updated report by the American Society of Anesthesiologists Committee on Standards and Practice Parameters[J]. Anesthesiology, 2011, 114(3): 495-511.

[12] Vlug M S, Wind J, Hollmann M W, et al. Laparoscopy in combination with fast track multimodal management is the best perioperative strategy in patients undergoing colonic surgery: a randomized clinical trial (LAFA-study)[J]. Ann Surg, 2011, 254(6): 868-875.

[13] Lassen K, Soop M, Nygren J, et al. Consensus review of optimal perioperative care in colorectal surgery: Enhanced Recovery After Surgery (ERAS) Group recommendations[J]. Arch Surg, 2009, 144(10): 961-969.

[14] Kambakamba P, Slankamenac K, Tschuor C, et al. Epidural analgesia and perioperative kidney function after major liver resection[J]. Br J Surg, 2015, 102(7): 805-812.

[15] Bell R, Pandanaboyana S, Prasad K R. Epidural versus local anaesthetic infiltration via wound catheters in open liver resection: a meta-analysis[J]. ANZ J Surg, 2015, 85(1-2): 16-21.

[16] Kapritsou M, Korkolis D P, Giannakopoulou M, et al. Fast-track recovery after major liver and pancreatic resection from the nursing point of view[J]. Gastroenterol Nurs, 2014, 37(3): 228-233.