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Original Article

Fast track surgery nursing models accelerate physical rehabilitation in perioperative patients undergoing hepatobiliary surgery

Ting Zhang[1], Jianhong Xu[1], Qianjuan Wang[1], Jiayun Li[2]

[1]*Department of Hepatobiliary Pancreatic Surgery, Jiaxing First Hospital, Jiaxing 314000, Zhejiang, China;* [2]*Intensive Care Unit, Jiaxing First Hospital, Jiaxing 314000, Zhejiang, China*

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Abstract: Objective: To compare the effects between primary hepatic carcinoma (PHC) patients undergoing laparoscopic partial hepatectomy receiving Fast track surgery (FTS) nursing and traditional nursing, aiming to select an effective nursing intervention plan for such patients. Methods: This study included 84 patients with PHC who underwent laparoscopic partial hepatectomy, randomly divided into an observation group (n42) and a control group (n=42). The observation group received FTS nursing, while the control group received traditional nursing care. Intraoperative and postoperative conditions, serological indicators, and complication rates were compared between the groups. Results: The observation group showed significantly reduced postoperative drainage tube removal time, anal exhaust time, hospitalization expenses, and length of stay (LOS) compared to the control group (all P<0.05). C-reactive protein (CRP), total bilirubin (Tbil), alanine aminotransferase (ALT), and cholinesterase (ChE) levels in the observation group were notably lower than those in the control group on postoperative days 1, 3, and 5 (all P<0.05). No significant difference was found in postoperative complication rates between the observation (14.29%) and control groups (16.67%) (*P*>0.05). Conclusions: Compared with traditional nursing, FTS nursing effectively reduces inflammation and liver function injury in patients undergoing PHC surgery, shortens LOS, lowers hospitalization expenses, and accelerates physical rehabilitation without increasing postoperative complications.

Keywords: Fast track surgery nursing model, patients with primary hepatic carcinoma undergoing surgery, intraoperative conditions, serological indicators, C-reactive protein, alanine aminotransferase

Introduction

Primary hepatic carcinoma (PHC) is a prevalent malignancy in China, especially in the southeastern coastal regions, suggesting that environmental factors may play a role [1, 2]. Treatment options for PHC generally include pharmacological therapy, surgical intervention, and postoperative management [3]. Symptoms of PHC vary widely, and treatment selection is typically based on these clinical manifestations. Systemic symptoms include fatigue, weight loss, anorexia, abdominal distension, and may be accompanied by nausea, vomiting, fever, diarrhea, and occasionally, anemia, lower limb edema, subcutaneous bleeding, and irregular menstruation, among others. Treatment is tailored to specific patient symptoms, with comprehensive approaches - encompassing surgery, hepatic artery ligation, chemotherapy, cryotherapy, laser, microwave, and radiotherapy - proving most effective [4-6]. Surgical treatment remains the primary and most effective option for PHC and is often adapted to the characteristics of the lesions [7, 8]. Chemotherapy, although an adjunctive option, requires high patient resilience and is only recommended for those able to tolerate it physically [9].

Surgery is critical for managing hepatobiliary diseases but can induce adverse effects, underscoring the importance of perioperative nursing interventions alongside precise surgical techniques [10]. The perioperative period encompasses preoperative, intraoperative, and postoperative phases, where scientifically grounded nursing measures are crucial [11-13]. The Fast track surgery (FTS) model is a recent

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nursing approach encompassing intraoperative, postoperative recovery, and comprehensive nursing pathways aimed at enhancing physical and mental recovery [14]. FTS has been successfully implemented across clinical departments, such as thyroid, anorectal, trauma, and vascular surgery, demonstrating effective interventions for various conditions [15].

Given the above context, the impact of FTS nursing interventions in hepatobiliary surgery remains to be fully elucidated. Therefore, this study compares intraoperative and postoperative conditions, serological indicators, and complication rates between these two groups to evaluate the effects of FTS nursing in patients undergoing PHC surgery.

Materials and methods

Research subjects

Eighty-four patients with PHC who underwent laparoscopic partial hepatectomy at Jiaxing First Hospital from January 2022 to December 2023 were enrolled in this study, including 52 males and 32 females, aged 32-70 years, with a mean age of 51.75±7.55 years. All surgeries were performed by senior physicians. Patients were divided into two groups based on their perioperative nursing plan, with 42 cases each in the observation and control groups. The observation group received FTS nursing intervention, while the control group received traditional nursing care. The observation group included 24 males and 18 females, with a mean age of 50.48±6.35 years; 36 patients had left-lobe lesions, and 6 had right-lobe lesions. In the control group, 26 males and 16 females had a mean age of 52.17±7.06 years; 34 patients had left-lobe lesions, and 8 had right-lobe lesions. No significant differences were observed in sex distribution, mean age, or lesion location between the two groups, indicating comparability for subsequent analysis. This study was approved by the institutional review board of Jiaxing First Hospital.

Inclusion criteria: (1) Patients diagnosed with PHC [17] and receiving surgical treatment for the first time; (2) Single-tumor presentation; (3) Age over 20 years; (4) Complete baseline data.

Exclusion criteria: (1) Patients with severe liver dysfunction; (2) Patients with severe renal insufficiency; (3) Presence of systemic infection; (4) Patients with thrombocytopenia or coagulation disorders; (5) Patients with distant metastasis; (6) Pregnant or lactating women.

Nursing methods

FTS nursing: Preoperative education on FTS nursing was provided to patients and their families, with informed consent obtained. Patients fasted for 8 hours before surgery, with 150 mL of a 10% glucose solution administered orally 2 hours prior to surgery. No indwelling catheter was required during surgery; if used, it was removed within 24 hours postoperatively. Intraoperatively, fluid volume and body temperature were carefully managed. Postoperatively, patients received an intravenous infusion of 2,500 mL/day, and parecoxib was administered for analgesia. Patients began ambulation 1-2 days post-surgery, targeting a minimum of four sessions on the first day, with gradual increases in activity. Dietary progression included a full liquid diet on postoperative day 1, followed by semi-liquid and regular diets.

Traditional nursing: Patients and their families were briefed on hepatectomy-related information and risks one day prior to surgery. Fasting was required for 12 hours preoperatively, and drinking was restricted for 6 hours before surgery. Bowel preparation included gastrointestinal decompression with tube placement, which removed post-anal exhaust. An indwelling urinary catheter was placed preoperatively and removed after ambulation. An abdominal drainage tube was placed during surgery and removed once no bleeding was observed. Postoperative analgesia was managed with a routine analgesia pump, and dietary progression mirrored that of the FTS group following anal exhaust.

Observation indicators

Observation indicators were obtained from the hospital's medical record system and departmental statistics, with postoperative complications recorded on the 1st, 3rd, and 5th days post-surgery. Key metrics included operating time, intraoperative blood loss, postoperative anal exhaust time, length of hospital (LOS), hospitalization expenses, and the removal time of the abdominal drainage tube. Surgical methods, such as laparoscopic left hemi-hepatecto-

Table 1. Comparison of demographic data and intraoperative conditions between the two groups

	Observation group (n=42)	Control group (n=42)	t/χ^2	*P*
Age (years)	50.48±6.35	52.17±7.06	0.317	0.752
Sex			-0.062	0.951
Male (n%)	24 (57.1%)	26 (61.9%)		
Female (n%)	18 (42.9%)	16 (38.1%)		
Lesion location			-0.264	0.792
Right lobe	6 (14.3%)	8 (19.0%)		
Left lobe	36 (85.7%)	34 (81.0%)		
Operating time (min)	214.75±27.01	229.84±25.96	1.005	0.317
Intraoperative blood loss (mL)	270.68±33.55	307.55±52.23	0.392	0.696
Surgical methods			0.867	0.443
Laparoscopic left hemi-hepatectomy	11 (26.2%)	12 (28.6%)		
Laparoscopic left lateral lobectomy	21 (50%)	19 (45.2%)		
Laparoscopic right hemi-hepatectomy	6 (14.3%)	7 (16.7%)		
Laparoscopic partial hepatectomy	4 (9.5%)	4 (9.5%)		

my, laparoscopic left lateral lobectomy, laparoscopic right hemi-hepatectomy, and laparoscopic partial hepatectomy (lobectomy or segmental hepatectomy), were also documented.

Serological indicators - including C-reactive protein (CRP), total bilirubin (Tbil), alanine aminotransferase (ALT), and cholinesterase (ChE) - were measured on postoperative days 1, 3, and 5 by collecting fasting venous blood samples from both groups. Nursing satisfaction was assessed using a self-developed scale based on The Newcastle Nursing Satisfaction Scale (NSNS) [16], calculated as (number of very satisfied cases + number of satisfied cases)/total cases × 100%.

Postoperative complications included pleural effusion, incisional wound infection, abdominal effusion, operative area abscess, pulmonary infection, and hemorrhage. These complications were recorded for both groups during follow-up, and the incidence rate.

Statistical analysis

Data were analyzed using SPSS 19.0. Measurement data were presented as mean ± standard deviation ($\overline{x}$ ± *sd*) and categorical data were expressed as percentages (%). Inter-group comparisons used an independent samples t-test, intra-group comparisons used paired t-tests, and categorical data were compared using the χ^2 test. Statistical significance was defined as P<0.05.

Results

Comparison of intraoperative conditions between groups

The mean operating time in the observation group was 214.75±27.01 minutes, with an intraoperative blood loss of 270.68±33.55 mL. The surgical procedures included laparoscopic left hemi-hepatectomy (11 cases), laparoscopic left lateral lobectomy (21 cases), laparoscopic right hemi-hepatectomy (6 cases), and laparoscopic partial hepatectomy (4 cases). In the control group, the operating time was 229.84±25.96 minutes, with an intraoperative blood loss of 307.55±52.23 mL. Surgical procedures included laparoscopic left hemi-hepatectomy (12 cases), laparoscopic left lateral lobectomy (19 cases), laparoscopic right hemi-hepatectomy (7 cases), and laparoscopic partial hepatectomy (4 cases). Comparative analysis revealed no significant differences between groups in operating time, intraoperative blood loss, or surgical methods (all P>0.05) (**Table 1**).

Comparison of postoperative conditions between groups

The mean removal time for the postoperative drainage tube was 2.63±0.85 days in the observation group, while the anal exhaust time was 1.57±0.36 days. Hospitalization expenses averaged 39.5±10.5 thousand yuan, and the LOS was 9.12±1.36 days. In the control group, the drainage tube removal time averaged

Table 2. Comparison of postoperative conditions between the two groups

	Observation group (n=42)	Control group (n=42)	t/χ^2	*P*
Removal time of postoperative drainage tube (Days)	2.63±0.85	4.77±0.68	7.807	<0.001
Postoperative anal exhaust time (Days)	1.57±0.36	2.85±0.52	22.2	<0.001
Hospitalization expenses (thousand yuan)	39.5±10.5	56.5±12.8	12.182	<0.001
LOS (Days)	9.12±1.36	12.08±2.42	14.362	<0.001

Note: LOS: length of hospital stay.

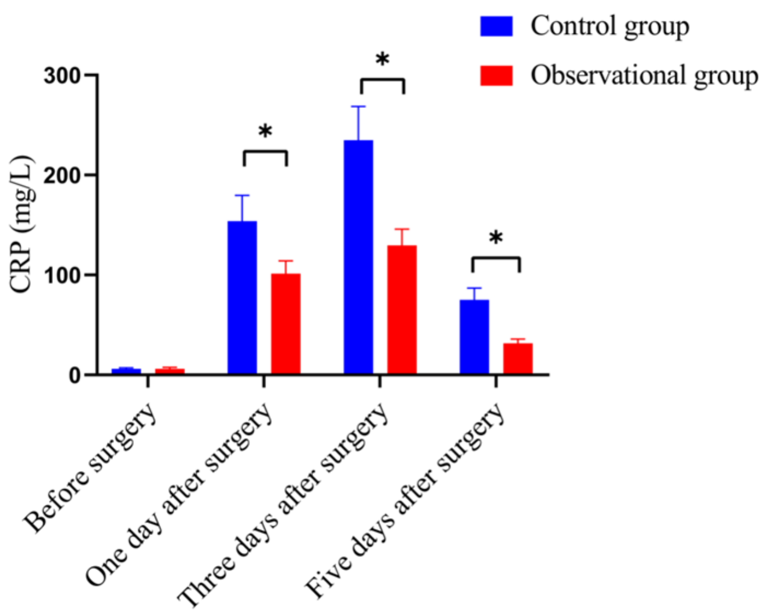

Figure 1. Comparison of CRP between the two groups. CRP: C-reactive protein. *P<0.05 as compared with the control group.

4.77±0.68 days, anal exhaust time was 2.85±0.52 days, hospitalization expenses reached 56.5±12.8 thousand yuan, and the LOS was 12.08±2.42 days. Comparative analysis indicated significantly shorter drainage tube removal time, anal exhaust time, reduced hospitalization expenses, and shorter LOS in the observation group compared to the control group (all P<0.05) (**Table 2**).

Comparison of CRP between the two groups

In the observation group, CRP levels were recorded as 101.44±12.58 mg/L on postoperative day 1, 129.73±16.05 mg/L on day 3, and 31.55±4.28 mg/L on day 5. In the control group, CRP levels were 153.89±25.67 mg/L, 234.95±33.71 mg/L, and 75.13±11.82 mg/L on days 1, 3, and 5, respectively. Comparative analysis indicated significantly lower CRP levels in the observation group across all time points (P<0.05) (**Figure 1**).

Comparison of liver function between groups

The TBil levels in the observation group were 32.91±8.14 μmg/L, 25.35±6.48 μmg/L, and 19.60±5.88 μmg/L on postoperative days 1, 3, and 5, respectively. In the control group, TBil levels were 45.03±10.66 μmg/L, 39.25±10.15 μmg/L, and 30.48±7.43 μmg/L on the same days. The TBil levels in the observation group were significantly lower at all time points (all P<0.05) (**Figure 2A**). The ALT levels in the observation group were 435.22±41.65 U/L, 167.36±22.75 U/L, and 55.28±6.03 U/L on days 1, 3, and 5, respectively. In the control group, ALT levels were 630.13±60.85 U/L, 295.78±33.25 U/L, and 214.93±13.58 U/L on the respective days, with significantly lower levels in the observation group (P<0.05) (**Figure 2B**). ChE levels in the observation group were 6,287.15±163.09, 3,085.44±155.72, and 2,015.65±230.17 on days 1, 3, and 5, respectively. In the control group, ChE levels were 7,618.44±127.85, 5,119.26±148.55, and 3,865.38±194.75 on the same days. The observation group consistently showed significantly lower ChE levels (P<0.05) (**Figure 2C**).

Comparison of postoperative complications between groups

In the observation group, postoperative pleural effusion occurred in 2 cases, abdominal effu-

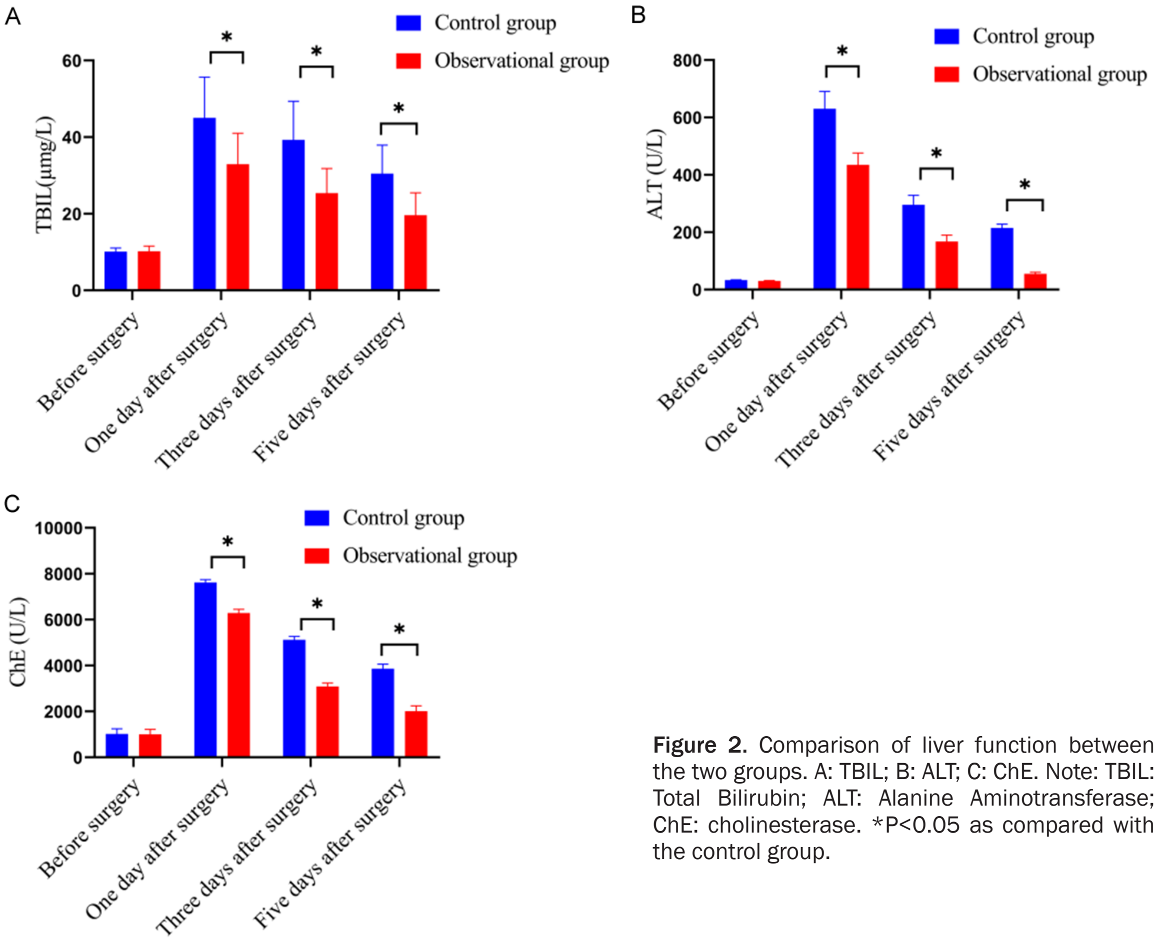

Figure 2. Comparison of liver function between the two groups. A: TBIL; B: ALT; C: ChE. Note: TBIL: Total Bilirubin; ALT: Alanine Aminotransferase; ChE: cholinesterase. *P<0.05 as compared with the control group.

Table 3. Comparison of postoperative complications between groups

Indicators	Observation group (n=42)	Control group (n=42)	χ^2/t	P
Postoperative pleural effusion	2	3		
Abdominal effusion	1	1		
Pulmonary infection	1	1		
Abscess of the operative area	0	1		
Hemorrhage	1	0		
Infection of incisional wound	1	1		
Total incidence (%)	6 (14.29%)	7 (16.67%)	0.686	0.494

sion in 1 case, pulmonary infection in 1 case, hemorrhage in 1 case, and incisional wound infection in 1 case, with no cases of abscess formation. In the control group, there were 3 cases of pleural effusion, 1 case of abdominal effusion, 1 case of pulmonary infection, 1 case of abscess formation, no cases of hemorrhage, and 1 case of incisional wound infection. No significant differences were observed in the overall incidence of complications between the observation group (14.29%) and the control group (16.67%) (P>0.05) (**Table 3**).

Comparison of nursing satisfaction between groups

In the observation group, 12 cases reported basic satisfaction with nursing, compared to 7 cases in the control group, indicating a significant difference between the groups (P<0.05). The overall satisfaction rate in the observation group was 88.10%, higher than the 76.19% in the control group (P<0.05) (**Table 4**).

Discussion

Postoperative findings indicated that the removal time of the drainage tube, anal exhaust

Table 4. Comparison of nursing satisfaction between the two groups [cases (%)]

	Basically Satisfaction	Satisfaction	Very Satisfaction	Satisfaction Rate
Observation group (n=42)	12 (28.47%)	22 (52.38%)	3 (7.1%)	37 (88.10%)
Control group (n=42)	7 (16.67%)	23 (54.76%)	2 (4.76%)	32 (76.19%)
t	6.42	2.93	3.39	5.17
P	0.041	0.74	0.33	0.02

time, hospitalization costs, and LOS were significantly lower in the observation group. Abdominal drainage helps remove blood, gas, purulent fluid, and stomach contents, and observing its quantity, color, and characteristics is critical for detecting massive postoperative bleeding and monitoring patient recovery [18-21]. Effective postoperative care, particularly for patients with drainage or decompression tubes, is essential. Early ambulation post-surgery, ideally within 6 hours, facilitates same-day anal exhaust, while delayed ambulation (over 12 hours) extends the time to first exhaust [22-26]. These results underscore the benefits of FTS nursing in expediting drainage tube removal, reducing hospitalization costs, and promoting faster discharge, facilitating quicker patient recovery and return to daily life.

CRP is a strong predictor of cardiovascular events, such as myocardial infarction and stroke. In this study, CRP levels in the observation group were significantly lower than those in the control group on days 1, 3, and 5 post-surgery, aligning with findings by Mehrabi et al. (2019) on the impact of FTS nursing in PHC surgery [27]. These results suggest that FTS nursing effectively reduces postoperative inflammatory markers and alleviates the stress response in perioperative patients.

TBil levels were also consistently lower in the observation group across all postoperative time points. Since TBil is commonly used to diagnose liver or biliary diseases, this finding suggests that FTS nursing may improve liver and biliary function in PHC surgical patients. ALT, another crucial indicator in clinical assessments of liver function, further supports these findings [28]. When liver inflammation occurs, ALT levels are typically elevated, and the degree of elevation is positively correlated with the severity of inflammation. Serum ChE activity is also a valuable marker for assessing liver parenchymal cell damage [29]. In this study, ALT and ChE levels were significantly lower in the observation group compared to the control group on postoperative days 1, 3, and 5. This indicates that FTS nursing can effectively reduce inflammation and mitigate liver function impairment in patients undergoing PHC surgery. Regarding postoperative complications, there was no significant difference in incidence between the observation group (14.29%) and the control group (16.67%) (P>0.05), suggesting that FTS and traditional nursing yielded similar outcomes in terms of complications in PHC surgery patients.

In conclusion, FTS nursing effectively reduces inflammation and liver function injury in patients undergoing PHC surgery. It also shortens LOS, reduces hospitalization expenses, accelerates physical rehabilitation, and does not increase postoperative complications.

Disclosure of conflict of interest

None.

Abbreviations

FTS, Fast track surgery; PHC, Primary hepatic carcinoma; LOS, Length of stay; CRP, C-reactive protein; TBil, Total bilirubin; ALT, Alanine aminotransferase; ChE, Cholinesterase.

Address correspondence to: Jiayun Li, Intensive Care Unit, Jiaxing First Hospital, No. 1882 Central South Road, Jiaxing 314000, Zhejiang, China. Tel: +86-15868376547; E-mail: LJY15868376547@outlook.com

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