

## Original Article

# Effect of enhanced recovery after surgery on patients with malignant obstructive jaundice complicated with diabetes mellitus

Huijun Yan<sup>1</sup>, Shuangyu Qi<sup>1</sup>, Linlin Cui<sup>3</sup>, Binghui Xu<sup>1</sup>, Guimei Du<sup>2</sup>

Departments of <sup>1</sup>Hepatobiliary and Pancreatic Surgery, <sup>2</sup>Neonatology, Hengshui People's Hospital, Hengshui, Hebei Province, China; <sup>3</sup>Electroencephalogram Room, The No.4 People's Hospital of Hengshui, Orthopedics Department Hospital, Hengshui, Hebei Province, China

Received April 11, 2020; Accepted May 22, 2020; Epub March 15, 2021; Published March 30, 2021

**Abstract:** Objective: To explore the effect of enhanced recovery after surgery on patients with malignant obstructive jaundice complicated with diabetes mellitus. Methods: Patients with malignant obstructive jaundice complicated with diabetes mellitus received surgery in Hengshui People's Hospital were divided into two groups: patients in one group received routine care (routine care group, RC group), and patients in another group received enhanced recovery after surgery on the basis of routine care (accelerated care group, AC group). The differences in patients' satisfaction with care and nursing effects between the two groups were compared. Results: The scores of nursing effects such as nursing records and surgical safety in the RC group were significantly lower than those in the AC group ( $P < 0.001$ ). The psychological state of patients in the AC group was better than that in the RC group after care ( $P < 0.001$ ). The nursing-sensitive quality indicators, the quality of life scores and the patients' nursing satisfaction in the AC group were all higher than those in the RC group ( $P < 0.001$ ). The incidence of adverse events in the AC group was significantly lower than that in the RC group ( $P = 0.01$ ). Conclusion: Compared with routine care, the effect of enhanced recovery after surgery is better on patients with malignant obstructive jaundice complicated with diabetes mellitus.

**Keywords:** Malignant obstructive jaundice, enhanced recovery after surgery, diabetes mellitus, quality of life

## Introduction

Malignant obstructive jaundice (MOJ) is due to the blockage of bile ducts caused by compression or obstruction of malignant tissue [1]. MOJ caused by malignant tumor has few symptoms in the early stage and it is easy to be misdiagnosed, resulting a low early detection rate. When the patients show the jaundice, the tumor has progressed to malignancy and their prognosis is poor [2]. Meanwhile, the bile cannot be normally discharged into the digestive tract, leading to cholestasis, thus inducing hyperbilirubinemia, which then contributes to the related pathophysiological changes such as liver function decline, malnutrition and so on. Among them, diabetes mellitus (DM) is a common complication in MOJ patients. Patients with MOJ complicated with DM tend to have impaired glucose tolerance and postoperative

hyperglycemia, but the etiology is not completely clear [3]. Clinical experience shows that the tumors causing MOJ generally have a high malignancy. And the patients are in poor condition and have poor surgical tolerance. Therefore, it is important to select safe and effective surgical methods and care measures to treat the disease thoroughly [4]. The idea of enhanced recovery after surgery (ERAS) was proposed in 2001 by Danish surgeons Kehlet and Wilmore [5]. ERAS can improve the prognosis of surgical patients and accelerate the process of postoperative rehabilitation to shorten the hospital stay, increase the patients' satisfaction and accelerate postoperative rehabilitation [6].

With the advancement of ERAS, it has achieved good results in abdominal and joint surgery. However, there are few studies about ERAS applied on MOJ and other related intestinal dis-

eases. Therefore, this article aims to explore the effect of ERAS on patients with MOJ complicated with DM by analyzing the differences in adverse events, quality of life, nursing-sensitive quality indicators, nursing effects, psychological state and patients' nursing satisfaction between the patients received routine care only and those received ERAS.

### Materials and methods

#### *General materials*

Seventy-eight patients with MOJ complicated with DM who received surgery in Hengshui People's Hospital (Jan 2018-Aug 2019) were randomly divided into two groups: patients in one group received routine care (routine care group, RC group), and patients in another group received the ERAS on the basis of routine care (accelerated care group, AC group). There were 39 patients in each group. This prospective study has been approved by the Ethics Committee of Hengshui People's Hospital and all patients signed the informed consent.

#### *Criteria for inclusion and exclusion*

Inclusion criteria were: Patients who had significant clinical manifestations of MOJ complicated with DM [6]; patients who received percutaneous transhepatic cholangial drainage; patients who had normal consciousness and were able to coordinate the treatment.

Exclusion criteria were: Patients who had other malignancies; patients with type 2 DM or even complicated with other diseases; patients who had incomplete data.

#### *Care methods*

*Routine care:* The care process was from post-operation to discharge. First, preparation: The personalized patient files were established and the basic information of patients such as personal information, other diseases, clinical symptoms related to the disease, drug allergy history were indicated. Second, propaganda: The health education manuals of MOJ were distributed to the patients and their families and the causes, risk factors and precautions of the disease were introduced. Third, implementation: Timely feedback of patients' questions and suggestions were provided and adverse

events were reported and addressed in time and actively. The patients' families were told to strengthen nutrition for patients and food intakes were adjusted according to the patients' condition and other relevant conditions. Forth, consolidation: The nursing staffs paid more attention to the patients' mental health and care. Fifth, conclusion: The opinions and suggestions of the patients and their families were widely solicited to find problems and solve them in time.

*ERAS: Routine instruction of preoperative care:* The surgery process and care methods were introduced to the patients and their families in detail before the surgery and they were informed about the positive effect of postoperative diet and activity on postoperative rehabilitation and the possible postoperative complications to eliminate their worries and encourage them to actively cooperate with the surgery.

*Postoperative care instruction:* First, analgesia administration: If patients did not receive postoperative analgesia with an analgesic pump, postoperative analgesia was administered according to the doctors' orders; in principle, the analgesic should be consistent with that used in preoperative or intraoperative; the liquid intake and output volumes were calculated every day after surgery and liquid intake volume was restricted or reduced. Second, early postoperative food intake: after patients were awake from anesthesia, they should take 50~100 mL of energy drinks (Mizone or Pocari) every 4 hours; they should keep full liquid diet 1-3 days after surgery and semi-liquid diet 3-5 days after surgery, and during the 5-7 days after surgery, solid food could be taken. Third, accelerating recovery of gastrointestinal function: The patients were suggested to chew gum and received abdominal ultrasound infrared physiotherapy. Fourth, antibiotic management: The antibiotics were stopped from 3 to 5 days after surgery. Fifth, early activity: Patients were encouraged to have early exercise by combining on bed activities (limb movement and bicycle exercise) with off-bed activities (walking).

After the surgery, the nerve signs of patients were detected by telemetric ECG monitor. The patients with stable life sign could stop using ECG monitor 24~48 hours after surgery.

## Effect of enhanced recovery after surgery

Clipping the urinary catheter 24~48 hours after surgery was advised. The urinary catheter and drainage tube were removed 3~5 days after surgery. Other care measures were consistent with routine care and patients were asked to return to the hospital regularly for review.

### *Surgical nursing effect*

Surgical nursing effect was evaluated by scoring surgical preparation, surgical safety and so on via a 10-point scale. A high score indicates the high level of nursing quality.

### *Nursing-sensitive quality indicators*

The evaluation of nursing quality was performed according to the "Evaluation scale of nursing quality" made by Hengshui People's Hospital. The contents include qualification for drugs utilization and safety management, implementation of grading nursing, accurate identification for patients, professional skills of nurses and ability in risk management. Each indicator scores 0-10 points. A low score indicates the poor nursing quality.

### *Psychological state scores*

After care, patients' negative emotion was evaluated by self-rating anxiety scale (SAS) and self-rating depression scale (SDS) [7]. SAS adopted a cutoff score of greater than 50 for anxiety, and a high score indicates the severe anxiety status. SDS was used to evaluate the mental, physical and psychological disorders, which adopted a cutoff score of greater than 53 for depression. A high score indicates the serious depression.

### *Quality of life*

After care, patients were evaluated by Rating Scale of Quality of Life (SF-36) [8], which includes physiological function, social function, daily activities and so on. The total score was 100 points. A higher score indicates the better quality of life.

### *Nursing satisfaction*

After care, the patients' nursing satisfaction was evaluated by Inpatient Satisfaction Questionnaire including 6 factors and a total of 6 scores. The total score of 4-6 points is classified as "satisfaction", 3 points as "basic satis-

faction", 0-2 points as "dissatisfaction". Satisfaction probability (%) = (number of satisfactory patients + number of basic satisfactory patients)/total number of patients × 100.

### *Adverse events*

During and after the care, the incidence of adverse events was observed and recorded including nursing disputes, infection, complications, and readmission due to surgical problems.

### *Statistical analysis*

SPSS23.0 was adopted for statistical analysis. The enumeration data including adverse events and nursing satisfaction were expressed by n (%), and chi-square test or Fisher exact probability test was adopted for the comparisons between two groups. The measurement data including psychological state scores, nursing-sensitive quality indicators, quality of life and surgical nursing effect were expressed as mean ± sd, and the paired-sample t test was adopted for the comparison between two groups. P<0.05 was considered statistically significant.

## Results

### *Comparison of general materials*

The difference was not statistically significant in general materials between the RC group and AC group (P>0.05). See **Table 1**.

### *Comparison of surgical nursing effect*

The results showed that the scores of indicators for nursing effect in the RC group were all significantly lower than those in the AC group (P<0.001). See **Table 2**.

### *Comparison of nursing-sensitive quality indicators*

As shown in **Table 3**, the nursing-sensitive quality indicators scores in the AC group were significantly higher than those in the RC group (P<0.001).

### *Comparison of psychological state*

Before care, the differences in SAS score and SDS score between the two groups were insig-

## Effect of enhanced recovery after surgery

**Table 1.** General materials (n,  $\bar{x} \pm sd$ )

Group (n=39)	RC group	AC group	$\chi^2/t$	P
Gender			0.095	0.757
Male	20	22		
Female	19	17		
Age (year)			0.105	0.745
45-59	18	20		
60-75	21	19		
Site of obstruction			0.118	0.731
Low	16	18		
High	23	21		
History of treatment			0.121	0.752
Yes	21	19		
No	18	20		
Primary disease			0.048	0.826
Hypertension	11	10		
Heart disease	12	11		
Others	16	18		
Time of surgery (min)	112.43±15.34	113.45±16.76	0.280	0.779
BMI (kg/m <sup>2</sup> )	17.34±4.22	17.93±3.87	0.643	0.521
Bleeding volume (mL)	435.21±46.19	432.97±51.03	0.197	0.844

Note: RC: routine care; AC: accelerated care; BMI: body mass index.

**Table 2.** Comparison of indicators for nursing effect ( $\bar{x} \pm sd$ )

Group (n=39)	RC group	AC group	t	P
Surgery preparation	9.12±0.34	9.65±0.67	4.405	<0.001
Care cooperation	9.05±0.40	9.81±0.78	4.616	<0.001
Care records	8.98±0.87	9.56±0.45	3.698	<0.001
Device management	9.03±0.16	9.64±0.35	7.976	<0.001
Surgical safety	9.39±0.43	9.97±0.94	3.799	<0.001
Surgical quality	9.34±0.73	9.87±0.59	3.526	<0.001

Note: RC: routine care; AC: accelerated care.

nificant ( $P>0.05$ ). After care, the psychological states in the RC group and AC group were significantly changed, but the scores of SAS and SDS in the AC group were significantly lower than those in the RC group ( $P<0.001$ , **Table 4**).

### *Comparison of quality of life*

The scores of indicators for life quality in the AC group were significantly higher than those in the RC group ( $P<0.001$ , **Table 5**).

### *Comparison of nursing satisfaction*

Compared with the AC group, there was a higher number of patients satisfied with the nursing in the AC group, but lower number of patients

basically satisfied with the nursing and dissatisfied with the nursing ( $\chi^2=2.944$ ,  $P=0.015$ ). The satisfaction rate in the AC group and RC group was 94.87% and 82.05% respectively. The differences in number of patients who basically satisfied with the nursing and dissatisfied with the nursing and the satisfaction rate between the two groups were insignificant ( $\chi^2=1.126$ ,  $P=0.253$ ; **Figure 1**).

### *Comparison of adverse events of patients*

There were 10 patients with adverse events in the RC group and 4 patients in AC group. The incidence of adverse events in the AC group was significantly lower than that in the RC group ( $P=0.010$ , **Table 6**).

## **Discussion**

MOJ is one of the serious complications caused by malignant tumor. In severe cases, MOJ can cause cholestasis and further lead to other symptoms. For patients who can tolerate surgery, surgical treatment is one of the best methods to relieve obstruction and treat MOJ [9]. However, MOJ is often

accompanied with DM which is a risk factor for surgery. Patients with MOJ complicated with DM are in high risk of acute myocardial infarction and postoperative complications. Stress factors such as surgery and anesthesia can aggravate DM and even lead to ketoacidosis. Postoperative complications such as impaired glucose tolerance and postoperative hyperglycemia are common in MOJ patients complicated with DM. Therefore, it is a hot spot to search for a safe, rapid, effective and more beneficial surgical option for patients with MOJ complicated with DM [10].

In our study, compared with patients received routine care, patients received ERAS showed

## Effect of enhanced recovery after surgery

**Table 3.** Comparison of scores of sensitive indicators of nursing quality of patients ( $\bar{x} \pm sd$ )

Group (n=39)	RC group	AC group	t	P
Qualification for drugs utilization and safety management	8.12±1.25	9.74±1.41	5.369	<0.001
Implementation of grading nursing	8.56±0.68	9.59±0.74	6.400	<0.001
Accurate identification for patients	7.72±0.89	9.10±1.12	6.024	<0.001
Professional skills of nurses	8.02±1.11	9.62±1.32	5.535	<0.001
Ability in risk management	8.13±0.75	9.32±1.43	4.602	<0.001

Note: RC: routine care; AC: accelerated care.

**Table 4.** Comparison of psychological state of patients ( $\bar{x} \pm sd$ )

Group (n=39)	Score of SAS	Score of SDS
Before care		
RC group	57.56±5.74	62.84±6.19
AC group	58.48±5.69	61.57±6.24
t	0.711	0.902
P	0.479	0.369
After care		
RC group	51.79±6.10 <sup>#</sup>	51.49±4.07 <sup>#</sup>
AC group	43.69±3.81 <sup>#</sup>	42.21±3.34 <sup>#</sup>
t	7.033	11.010
P	<0.001	<0.001

Note: RC: routine care; AC: accelerated care; SAS: self-rating anxiety scale; SDS: self-rating depression scale. Compared with the same group before nursing, <sup>#</sup>P<0.001.

**Table 5.** Comparison of life quality of patients ( $\bar{x} \pm sd$ )

Group (n=39)	RC group	AC group	t	P
Energy	76.75±5.39	88.58±6.69	8.599	<0.001
Body pain	75.96±6.11	85.24±7.86	5.821	<0.001
Emotion and professional title	74.33±7.15	82.46±8.77	4.487	<0.001
Social function	71.25±5.19	79.52±7.38	5.724	<0.001
Daily activity	76.45±6.01	82.37±6.65	4.125	<0.001
Mental health	75.61±5.43	82.95±7.99	4.745	<0.001
General health	74.74±7.32	82.47±7.56	4.587	<0.001
Role physical	77.19±5.17	85.22±6.55	6.010	<0.001

Note: RC: routine care; AC: accelerated care.

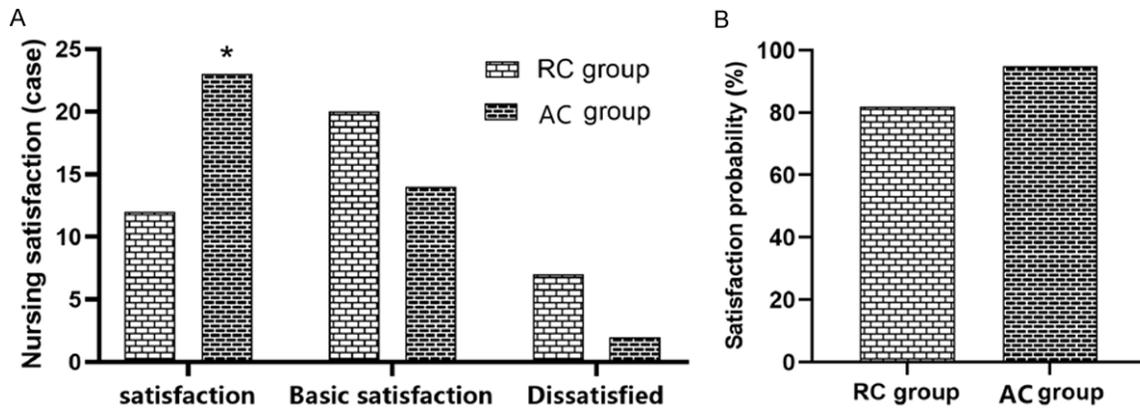
better nursing effects, higher nursing quality, better psychological state, higher life quality and higher nursing satisfaction rate, but lower incidence of adverse events, indicating that the application of the ERAS model in the patients with MOJ complicated with DM can significantly reduce the incidence of unexpected events and improve the postoperative psychological mood and satisfaction of patients [11, 12]. Previous study reported that the ERAS has a good effect in relieving clinical symptoms, preventing and controlling operative complications and improv-

ing psychological state of patients [12, 13]. In addition, a large number of clinical experiments have proved that ERAS pays more attention to the services before and after surgery and communication in the operating room to avoid the adverse events due to inadequate preparation. Meanwhile, ERAS provides the patients with psychological nursing to alleviate their mental stress and focuses on the training and cultivating nursing staffs to improve the professional accomplishment and nursing cooperation ability of nurses, which is beneficial to ensure the surgical safety and improve the operation quality.

Also, ERAS provides consultation platform for patients and focuses on communication with patients so as to improve patients' pre-hospital guidance satisfaction, professional skills and attitude towards service of nurses and ensure the quality and safety of surgery [14-17]. A report shows that quality of life is a globally accepted concept of health, indicating that nursing for patients is not only about physical health but also about their mental well-being [18]. Related studies show that compared with routine care, the application of ERAS in the patients with MOJ has achieved remarkable nursing effect. ERAS not only effectively improves the effect and quality of surgery and nursing-sensitive quality indicators, but also improves the quality

tude towards service of nurses and ensure the quality and safety of surgery [14-17]. A report shows that quality of life is a globally accepted concept of health, indicating that nursing for patients is not only about physical health but also about their mental well-being [18]. Related studies show that compared with routine care, the application of ERAS in the patients with MOJ has achieved remarkable nursing effect. ERAS not only effectively improves the effect and quality of surgery and nursing-sensitive quality indicators, but also improves the quality

## Effect of enhanced recovery after surgery



**Figure 1.** Comparison of nursing satisfaction of patients. A: Comparison of number of nursing satisfaction of patients; B: Comparison of satisfaction probability of patients. RC: routine care; AC: accelerated care. Compared with the RC group, \* $P < 0.05$ .

**Table 6.** Comparison of adverse events of patients (n)

Group (n=39)	Infection	Complications	Nursing disputes	Readmission	Incidence
RC group	1	2	4	3	25.640
AC group	0	1	2	1	10.250
$\chi^2$	1.000	0.333	0.667	1.000	6.599
P	0.317	0.563	0.414	0.317	0.010

Note: RC: routine care; AC: accelerated care.

quality, reduce the incidence of adverse events and medical dispute of such patients.

### Disclosure of conflict of interest

None.

of life and nursing satisfaction of patients and significantly reduces the incidence of adverse events after surgery, which is absolutely important for improving prognosis [19-21]. The results of our study are similar to those of the above researches.

However, our study also has certain limitations. Because of the cost and other problems, we had not carried out a comprehensive physical examination of all subjects, so we couldn't exclude the influence of other factors. Additionally, due to the shortage of time and insufficient sample size, the results may have some deviations. In particular, the care methods adopted in this experiment were few and had limitations. Therefore, in the future, a study with more care methods should be performed to provide more effective information for the treatment and care of patients with MOJ complicated with DM.

In conclusion, ERAS has better nursing effects, nursing quality, and higher satisfaction rate in the care of patients with MOJ complicated with DM. Meanwhile, ERAS can improve the life

**Address correspondence to:** Shuangyu Qi, Department of Hepatobiliary and Pancreatic Surgery, Hengshui People's Hospital, No.180 Renmin East Road, Taocheng District, Hengshui 053000, Hebei Province, China. Tel: +86-15610836325; E-mail: qishuangyuu76c@163.com

### References

- [1] Liu CL, Zhang H, Wang C, Kong YL, Zhao G, Xiao M and He XJ. Effect of immune nutrients on the incidence of infection after biliary stent implantation in patients with malignant biliary obstruction. *Prog Mod Biomed* 2017; 17: 882-885.
- [2] Jiang SL, Huang Q and Zhai DS. Comparison of clinical curative effect between ERCP and PTCD in treatment of malignant obstructive jaundice. *Chin J Endosc* 2018; 77: 75-79.
- [3] Liu R, Chen WW, Huang K, Han SS and Liu CL. Application of MNA-SF and NRS 2002 in the evaluation of nutritional status and affecting factors in patients with malignant obstructive jaundice. *Parenter Enteral Nutr* 2019; 54: 74-78.
- [4] Liu H, Li ZL, Shang HT, Zhang XB, Bao JH, Wang HB, Hao CF and Liu JJ. Effect of percutaneous

## Effect of enhanced recovery after surgery

- gallbladder puncture and percutaneous hepatobiliary channel drainage on preoperative yellow reduction in patients with low malignant obstructive jaundice. *Chin J Hepatobiliary Surg* 2017; 23: 851-852.
- [5] Zhu Y, Feng D, Wang B, Wang WX and Liu LH. Research of quality and safety management standards on ambulatory surgery service. *Chin J Hosp Adm* 2018; 34: 989-901.
- [6] Yuan HD, Zhang XL, Ma G and Lu YZ. Construction of day surgery management system based on patient safety. *Chin J Hosp Adm* 2017; 33: 352-354.
- [7] Duan QQ and Shen L. Clinical validity of the self-rating anxiety and depression scale. *Chin Ment Health J* 2012; 26: 676-679.
- [8] Huang K, Yuan FF, Wang H, Lv TT, Wang B, Ye DQ and Huang K. Reliability and validity of SF-36 scale for quality of life assessment of Chinese college students. *Anhui Med Pharm J* 2017; 21: 2002-2004.
- [9] Huang P, Zhang XF, Lv W, Fan Z, Jiang N, Wang X and Liang SH. EUS-guided biliary drainage using a fully covered self-expandable metal stent for malignant obstructive jaundice. *Chin J Hepatobiliary Surg* 2019; 25: 189-193.
- [10] Wang L, Lin NP, Ke Q, Liu ZQ, Zeng YY and Liu JF. The impact and the risk factors of different preoperative biliary drainage procedures for patients with malignant obstruction jaundice on overall survival: a Meta-analysis. *Chin J Hepatobiliary Surg* 2018; 24: 823-828.
- [11] Yang JE, Wang WH, Jiang WJ, Zhou DJ and Xie HF. Effects of link management model in day-care operation ward of urology department. *Chin J Mod Nurs* 2018; 24: 1744-1747.
- [12] Wang XF and Tian YJ. Effect of predictive nursing on recovery and complications after ERCP for malignant obstructive jaundice. *Hainan Med J* 2019; 30: 25-28.
- [13] Ma J, Luo J, Gu J, Liu Q, Liu L, Zhang W, Zhang Z and Yan Z. Malignant obstructive jaundice treated with intraluminal placement of Iodine-125 seed strands and metal stents: an analysis of long-term outcomes and prognostic features. *Brachytherapy* 2018; 17: 689-695.
- [14] He JH, Yang XL, Gu Q, Chen L and Yao QY. Application of transitional care in postoperative patients with carpal tunnel syndrome. *Nur J Chin Peop Libera Army* 2019; 42: 62-64.
- [15] Jin H, Pang Q, Liu H, Li Z, Wang Y, Lu Y, Zhou L, Pan H and Huang W. Prognostic value of inflammation-based markers in patients with recurrent malignant obstructive jaundice treated by reimplantation of biliary metal stents: a retrospective observational study. *Medicine* 2017; 96: e5895.
- [16] Yuan L, Li L, Qian ZX, Chen XY, Pan LL and Wang QH. Intermittent time series analysis of the effect of day surgery on average hospital days. *Chin J Hosp Adm* 2018; 34: 805-809.
- [17] Professional Committee on Accelerated Rehabilitation Surgery, China Research Hospital Society and China Ambulatory Surgery Association. Expert consensus on standardized processes of ambulatory biliary surgery (2018 edition). *Chin J Surg* 2018; 56: 321-327.
- [18] Duan F, Cui L, Bai Y, Li X, Yan J and Liu X. Comparison of efficacy and complications of endoscopic and percutaneous biliary drainage in malignant obstructive jaundice: a systematic review and meta-analysis. *Cancer Imaging* 2017; 17: 27.
- [19] Gu XM, Wang J, Zhu JY and Gu MY. Clinical application of laparoscopic inguinal hernia repair for adults in daytime operation mode. *Chin Pract Med* 2017; 12: 61-62.
- [20] Shi B, Li L, Yang G, Wang QX, Ping Y and Li ZG. Diagnosis of malignant obstructive jaundice by percutaneous transhepatic cholangial biopsy. *Chin J Intervent Imaging Ther* 2017; 35: 104-112.
- [21] Caiazzo R, Baud G, Clément G, Lenne X, Torres F, Dezfoulian G, Lebuffe G, Kipnis E, Dervaux B and Pattou F. Impact of centralized management of bariatric surgery complications on 90-day mortality. *Ann Surg* 2018; 268: 831-837.