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Original Article

Effect of fast-track surgery model on postoperative pain and hospital stay of patients undergoing thyroid surgery

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Abstract: Objective: To investigate the effect of fast-track surgery on emotions, pain, and length of hospital stay during the preoperative period for thyroid disease. Study design and methods: From June 2020 to September 2020, 43 patients who received routine perioperative nursing for thyroid disease in Ganzhou People's Hospital were retrospectively included as a control group, and 51 patients who received nursing care on the basis of fast-track surgery strategy from June 2020 to September 2020 in Ganzhou People's Hospital were retrospectively included as an experimental group. Time spent out of bed, length of hospital stay, medical expenses, and time of indwelling catheter use were compared between the two groups. Visual analogue scale (VAS) was used to evaluate the variations in intensity of pain postoperatively. The incidence of adverse reactions was recorded and compared. The risk factors affecting complications in patients undergoing surgery for thyroid disease were evaluated. Results: Patients in the experimental group had shorter time spent out of bed, shorter length of hospital stay, less medical expenses, and shorter time of indwelling catheter use than those in the control group (all $P < 0.05$). The experimental group exhibited lower VAS scores than control group at 3 to 5 days after surgery (both $P < 0.05$). The total incidence of adverse reactions in the experimental group was lower than that in the control group ($P < 0.05$). Univariate analysis showed that gender, reoperation, intraoperative blood loss, and the use of recurrent laryngeal nerve detector were single factors affecting perioperative complications, while Logistic regression analysis showed that reoperation, intraoperative blood loss and the use of recurrent laryngeal nerve detector were highly correlated with perioperative complications (all $P < 0.05$). Conclusion: Fast-track surgery can significantly accelerate the rehabilitation of patients, alleviate postoperative pain and adverse emotions, and reduce the incidence of adverse reactions in patients with thyroid disease, which has positive significance to improve the prognosis of patients, and thus it is recommended for clinical promotion.

Keywords: Thyroid disease, perioperative period, fast-track surgery

Introduction

The thyroid gland is the largest endocrine gland in the human body, which is generally located below the thyroid cartilage of mammals, beside the trachea [1]. The thyroid gland plays a crucial role in controlling energy expenditure, regulating the body's sensitivity to various hormones, and producing proteins [2]. The thyroid gland is also a very important endocrine organ that regulates body metabolism, growth rate, and calcium balance [3]. Thyroid disease is a group of diseases caused by a variety of factors, which is a common and frequently-occurring disease. Data have shown that there are about 300 million patients with thyroid disease worldwide, which is the second largest endocrine disease after diabetes; other studies have reported that there are at least 40 million patients with hypothyroidism and 10 million patients with hyperthyroidism in China, and the number is increasing annually [4-6]. The causes of thyroid disease are complex, such as genetics, immunity, and changes in food consumption patterns. It has been found in clinical practice that a small number of patients with benign thyroid disease have no obvious clinical symptoms, which have little effect on the daily life of individuals, but most patients with thyroid disease have a tendency of compression or malignant change [7]. Thus, it is clinically recommended to seek medical treatment early and take active treatment [8].

Surgery is a common means to treat thyroid disease, which is of positive significance to allevi-

ate the condition and improve the prognosis of patients. Good nursing is the basis to reduce the incidence of postoperative complications and accelerate the recovery of patients. However, current perioperative nursing for thyroid disease is passive and less targeted, and a more effective and reasonable nursing strategy is needed [9, 10]. Fast-track surgery (FTS) refers to the comprehensive perioperative nursing measures adopted through multiple modes and multi-departmental cooperation to accelerate the postoperative rehabilitation process and reduce the incidence of postoperative complications and mortality. This model has a long history of application in clinical practice and has been widely used in many surgical diseases, which has brought about great changes in clinical treatment and nursing models, and proper perioperative nursing is important to achieve rapid rehabilitation [11]. Many studies have pointed out that FTS can significantly accelerate the postoperative rehabilitation of patients. Wu et al. conducted FTS interventions for lung cancer patients and found that the FTS model could significantly expedite the first time to get out of bed after surgery, shorten the time of drainage tube removal and the length of postoperative hospital stay, as well as help reduce the pain intensity of patients at 48 h and 72 h postoperatively and reduce the total incidence of postoperative complications [12]. At present, there are few studies on the application of FTS to patients undergoing thyroid surgery. The innovation of this study is to explore the feasibility of applying the FTS model to patients undergoing thyroid surgery by using grouping and comparison methods, which provides some data support for the follow-up study, and also provides novel nursing measures for the postoperative rehabilitation of thyroid patients.

Materials and methods

Baseline data

From June 2020 to September 2020, 43 patients with thyroid diseases who had not undergone perioperative FTS in Ganzhou People's Hospital were retrospectively included as the control group (CG), and 51 patients with perioperative FTS from June 2020 to September 2020 in Ganzhou People's Hospital were retrospectively included as the experimental group (EG). The study was approved by the ethics committee of Ganzhou People's Hospital.

Inclusion criteria: (1) The enrolled patients were diagnosed with thyroid diseases (including hyperthyroidism, hypothyroidism, thyroid nodules, and thyroid cancer I-II) and received surgical treatment at the time of admission [13]; (2) The enrolled patients had complete clinical data as indicated by information system.

Exclusion criteria: (1) Patients with previous history of mental illness; (2) Patients complicated with severe liver and kidney dysfunction; (3) Those with other serious organic diseases such as coronary heart disease and renal failure.

Intervention methods

Patients in the CG received routine perioperative nursing for thyroid diseases, including preoperative health education, dietary care, close monitoring, and rehabilitation exercises.

In addition to routine nursing, patients in the EG received FTS, as shown in **Table 1**.

Outcome measurements

Primary outcome measurement: (1) Surgical indicator. Time spent out of bed (TSOB), length of hospital stay (LOS), medical expenses, time of indwelling catheter use (TICU), amount of intraoperative bleeding, operation time, and number of lymph node clearances were compared between the two groups [14]. (2) Pain assessment. The visual analogue scale (VAS) was used to continuously evaluate the postoperative pain, which is a 10-cm line anchored with text at the end that defines the bounds of various pain dimensions. The patient was asked to make a vertical mark on the scale to indicate the intensity of his or her pain. A score of 0 at one end of the line indicates no pain, and a score of 10 at the other end indicates severe pain. The evaluation time-points were 1 d, 2 d, 3 d, 4 d, and 5 d after surgery, respectively [15]. (3) Incidence of adverse reactions after surgery. The incidence of hoarseness, hypocalcemic convulsions, skin ecchymosis and other events from the end of surgery to dis-

Table 1. Perioperative FTS measures

Nursing stages	Nursing methods	Specific measures
Preoperative nursing	Psychological care	Preoperative psychological evaluation of patients was carried out to understand their questions and concerns about the surgery and to answer them from a professional perspective to improve their understanding of surgery, as well as to improve their compliance and confidence in the treatment.
	Position guidance	Patients were assisted in practicing correct posture, with a soft pillow under the patient's shoulders to keep the patient's head in a low level and make the neck relax, which is convenient for operation.
	Other preparations	Medication should be prescribed for patients with basic diseases. The hair in the operated area should be shaved and preoperative dietary care was ensured.
Intraoperative nursing	Liquid limitation	The amount of fluid input should be minimized during the operation to avoid prolonged recovery of gastrointestinal function and paralysis time.
	Position care	During the operation, the patient head was kept slightly lower to fully expose the visual field of the operation. Patient positioning should be restored in time, against the risks and discomfort related to the patient position.
	Intraoperative warming	Body temperature was monitored. A constant ambient temperature and humidity environment was maintained. If the body temperature was below 36°C, rewarming therapy with blankets, inflatable insulation, hot compress and other measures should be provided.
Postoperative nursing	General care	Patients returned to a comfortable position. Drainage tube care was performed, and data were recorded. The vital signs of patients were closely monitored. If patient showed swallowing abnormalities and difficulty breathing, hematoma should be screened to avoid suffocation.
	Daily life care	Appropriate dietary care was implemented for patients. When the patient is awake after anesthesia, he/she should drink a moderate amount of water. If do not feel bad, patients should take a small amount of liquid food, and semi-liquid and soft foods diet will be offered gradually.
	First aid preparation	For some patients with thyroid tumors, the risk of tracheal softening due to long-term tumor compression should be considered. Therefore, the tracheotomy package should be prepared. If the patient showed signs of asphyxia, they should be rescued in time.
	Pain intervention	Postoperative pain is common complication. Analgesic options, such as injection of analgesics, diversion of attention, etc., should be provide to alleviate pain.

charge in the two groups were recorded, and the difference was compared [16].

Secondary outcome measurements: The risk factors for perioperative complications were analyzed [17].

The collection of outcome information in the study was carried out by in-hospital nursing staff, and the data sources were from the scale and the in-hospital patient admission registration system. The data collection staff received relevant trainings in advance and had certain judgment ability on the application and accuracy of the scale. After data collection, two persons input the data to ensure that the data were correct.

Statistical methods

The Statistical Package for Social Sciences (SPSS) 24.0 statistical software was used to analyze the data. The Kolmogorov-Smimov test was used to examine the normality of quantitative data. The independent sample t test was used for the indicators in accordance with normal distribution. For comparison of pain intensity, sphericity test was used to analyze whether there was correlation between repeated measures; if $P > 0.05$, one-way analysis of variance (ANOVA) was used, and if $P < 0.05$, multivariate analysis of variance (MANOVA) was used; the results were expressed as mean ± standard deviation. Indicators not conforming to a normal distribution were tested using the

Table 2. Clinical data (mean ± SD)/[n/(%)]

Baseline		EG (n=51)	CG (n=43)	t/χ^2	*P*
Gender	Male	22	20	0.107	0.743
	Female	29	23		
Mean age (year)		39.78±3.18	40.18±3.01	0.623	0.535
Educational level	Illiteracy	5	5	0.671	0.128
	Primary school	14	11		
	Middle school	26	23		
	High school and above	6	4		
Marital status	Married	40	34	0.060	0.94
	Single	11	9		
Type of disease	Hyperthyroidism	15	13	0.728	0.132
	Hypothyroidism	19	16		
	Thyroid nodules	11	9		
	Thyroid cancer	6	5		
History of hypertension	Yes	32	27	0.000	0.996
	No	19	16		
History of diabetes	Yes	30	27	0.154	0.695
	No	21	16		

EG: experimental group; CG: control group.

Kruskal Wallis rank sum test, and results were expressed as medians and quartiles. The chi-square test was used for inter-group comparisons of qualitative data. The risk factors of perioperative complications were analyzed by Logistic regression. $P < 0.05$ was deemed as statistically significant. GraphPad Prism 8.3 was used for plotting.

Results

Baseline data comparison

There were no statistically significant differences in the clinical data of patients between the two groups, such as gender, average age, history of disease, type of disease, marital status, education level (all $P > 0.05$; **Table 2**).

Comparison of surgical indicators

In the EG, the TSOB was (2.17±0.21) d, LOS was (5.28±0.87) d, medical expense was (5.3±1.9) thousand China Yuan (CNY), TICU was (1.28±0.32) d, amount of intraoperative bleeding was (35.26±5.11) mL, operation time was (3.05±0.21) h, and number of lymph node clearances was (10.26±2.11). In the CG, the TSOB was (2.76±0.18) d, LOS was (5.91±0.44) d, medical expense was (6.5±2.1) thousand CNY, TICU was (1.51±0.12) d, amount of intraoperative bleeding was (43.56±5.68) mL, operation time was (3.26±0.19) h, and number of lymph node clearances was (11.01±1.98). The TSOB, LOS, medical expense, TICU, amount of intraoperative bleeding, and operation time of the EG were lower than those of the CG (all $P < 0.05$) (**Figure 1**).

Postoperative pain changes in the two groups

The difference in VAS scores between the two groups was not statistically significant on the 1st day after surgery (7.28±0.31 in the EG vs. 7.27±0.28 in the CG) ($P > 0.05$). The VAS scores of the EG were significantly lower than those in the CG on 2 d (5.18±0.21 in the EG vs. 6.22±0.19 in the CG), 3 d (4.19±0.14 in the EG vs. 5.22±0.22 in the CG), 4 d (3.61±0.32 in the EG vs. 4.19±0.31 in the CG), and 5 d (2.10±0.14 in the EG vs. 3.01±0.17 in the CG) after surgery (all $P < 0.05$) (**Figure 2**).

Adverse reactions after surgery in the two groups

In the CG, there were 3 (6.98%) cases of hoarseness, 1 (2.33%) case of hypocalcemic convulsions, and 5 (11.63%) cases of skin ecchymosis, and in the EG, there were 1 (1.96%) case of hoarseness, 0 (0.00%) case of hypocalcemic convulsions, and 2 (3.92%) cases of skin

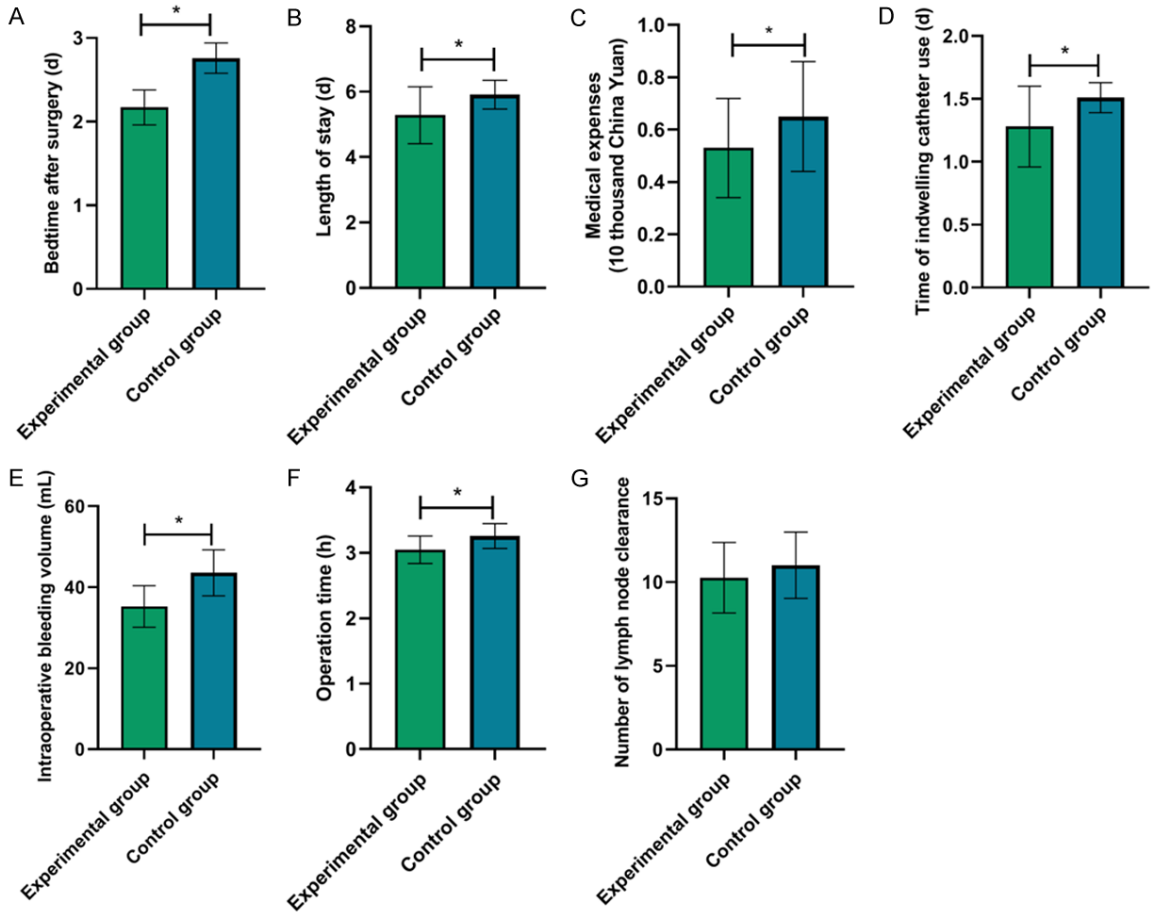

Figure 1. Comparison of surgical indicators between the two groups of patients. The experimental group has lower or less time spent out of bed (A), length of hospital stay (B), medical expenses (C), time of indwelling catheter use (D), amount of intraoperative bleeding (E), and operation time (F) than the control group ($P < 0.05$), but there is no difference in number of lymph node clearance (G) between the two groups. $^{*}P < 0.05$.

ecchymosis. The incidence of adverse reactions in the EG (5.88%) was significantly lower than that in the CG (20.93%) ($P < 0.05$) (**Table 3**).

Analysis of risk factors of perioperative complications

Univariate analysis showed that gender, reoperation, intraoperative blood loss, and the use of recurrent laryngeal nerve detector were single factors affecting perioperative complications, while Logistic regression analysis showed that reoperation, intraoperative blood loss and the use of recurrent laryngeal nerve detector were highly correlated with perioperative complications ($P < 0.05$) (**Tables 4** and **5**).

Discussion

The thyroid gland plays an important role in regulating energy metabolism, protein synthesis, and body growth [18]. Thyroid diseases include a variety of diseases, such as hyperthyroidism, hypothyroidism, thyroid nodules, and thyroid cancer [19]. The high incidence of thyroid diseases is attributed to changes in residents' dietary habits and lifestyle, elevated level of exposure to risk factors, and the continuous improvement in diagnostic techniques. Thyroid diseases have a great impact on the normal life of residents, and early and effective intervention is of great significance to improve the quality of life of patients with thyroid diseases [20].

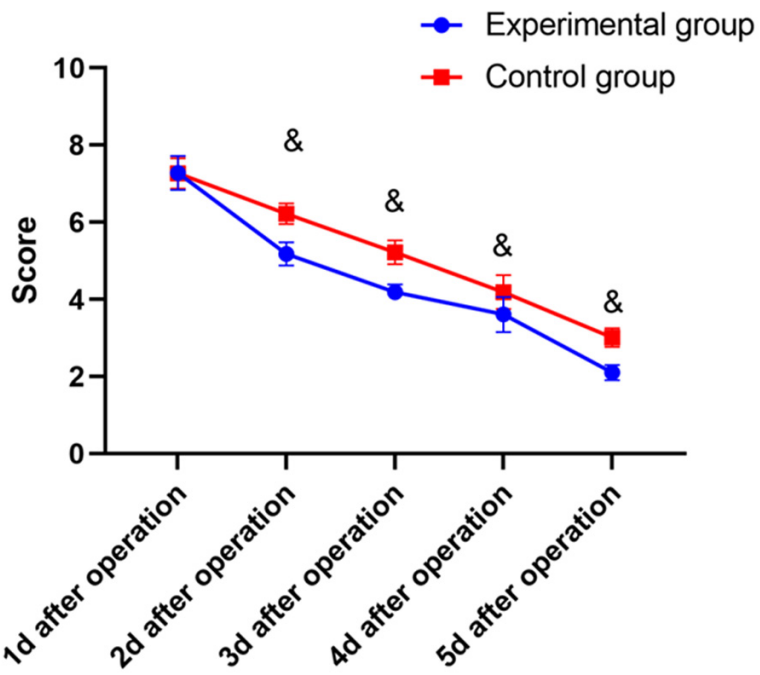

Figure 2. Comparison of pain intensity between two groups from 1 d to 5 d after surgery. There was no significant difference in pain intensity between the two groups of patients from 1 d to 5 d after surgery ($P > 0.05$). From 2 d to 5 d after surgery, the pain scores of the experimental group were lower compared those of the control group ($P < 0.05$). $^{\&}P < 0.05$.

Table 3. Comparison of the incidence of adverse reactions [n (%)]

Grouping	Cases	Hoarseness	Hypocalcemic convulsions	Skin ecchymosis	Incidence
EG	51	1 (1.96)	0 (0.00)	2 (3.92)	3 (5.88)
CG	43	3 (6.98)	1 (2.33)	5 (11.63)	9 (20.93)
χ^2	-	-	-	-	4.744
P	-	-	-	-	0.029

EG: experimental group; CG: control group.

Surgical treatment of thyroid diseases is the one of the most common methods. Clinical practice has found that drug treatment is characterized by long treatment course and obvious side effects. Therefore, surgical treatment is still recommended for some cases. Surgery can significantly relieve the clinical symptoms and prolong survival [21]. However, it has been found that due to the traumatic treatment of surgery, patients in the perioperative period will experience obvious psychological and physiological stress such as preoperative anxiety and depression, postoperative pain, ecchymosis and other complications. All these have adverse effects on patient's physical rehabilitation and quality of life during the perioperative period. Some patients even suffer from asphyxia after surgery, endangering their lives. Therefore, the disadvantages of the traditional nursing model should be realized and improved.

FTS is a new clinical nursing model. It uses a series of optimization measures with evidence-based evidence to alleviate stress response and accelerate rehabilitation after surgery [22]. At present, FTS has achieved good effects in clinical application. Some studies have found that FTS can shorten the LOS, reduce the rate of rehospitalization, and has high safety. A study of patients undergoing total hip replacement pointed out that FTS significantly shortened the LOS, and patients in the study group with FTS had significantly lower blood transfusion volumes and shorter intensive care unit LOS compared to patients with routine nursing, suggesting that FTS helps accelerate postoperative rehabilitation [23], which are similar to the results of this study. In this study, it was found that compared with the CG who received traditional nursing, the EG showed a noticeable decrease in medical expenses, TSOB, LOS and TICU, indicating that FTS had positive effects with respect to the prognosis of these patients. A survey of patients with thyroid cancer showed that FTS could not only reduce the LOS of patients, but also shorten the time of the wake-up following anesthesia and increase solid food tolerance, suggesting that FTS has the effects of stabilizing the perioperative body function of patients with thyroid cancer [24]. A study of patients undergoing laparoscopic radical gastrectomy also found that FTS could significantly shorten the anal exhaust time and reduce the C-reactive protein level at 4 d postoperatively, as well as help reduce the hospitalization cost of

Table 4. Univariate analysis of perioperative complications

Clinical data		With complications (n=12)	Without complications (n=82)	t/χ^2	*P*
Gender	Male	8	24	6.521	0.011
	Female	4	58		
Reoperation	Yes	9	32	5.509	0.019
	No	3	50		
Time of operation	≥ 120 min	5	42	0.382	0.536
	< 120 min	7	40		
Intraoperative blood loss	≥ 100 mL	10	12	27.559	< 0.001
	< 100 mL	2	70		
Use of recurrent laryngeal nerve detector	Yes	9	20	12.568	< 0.001
	No	3	62		

Table 5. Logistic regression analysis results

Risk factor	β	S.E	Wald	P	OR	95% CI
Reoperation	1.885	0.856	4.871	0.026	6.401	1.212-30.265
Intraoperative blood loss	1.359	0.6659	4.265	0.035	3.985	1.065-14.215
Use of recurrent laryngeal nerve detector	3.562	0.715	13.265	0.000	17.514	3.265-11.698

β: standardized coefficient, SE: standard error, Wald: Wald statistic, P: probability level, OR: odd ratio, 95% CI: 95% confidence interval.

patients, suggesting that FTS can accelerate the rehabilitation of patients and reduce their treatment cost at the same time, which has positive significance to optimize the utilization of medical resources [25].

The results of this study also showed that the patients in the EG undergoing FTS had significantly lower severity of pain than the CG during the 2 d to 5 d postoperatively. The reason may be that pain management is a crucial part of FTS, while the traditional nursing mode often pays more attention to the efficacy of surgery and ignores the subjective feelings of patients. FTS focuses on reducing the perioperative stress response of patients and adopts various measurements such as oral analgesics and analgesic pumps to effectively reduce the pain intensity as well as relieve the patient's stress response after surgery. A study of 90 patients undergoing surgical treatment has pointed out that postoperative pain is one of the more obvious discomforts experienced by surgical patients during the perioperative period, and obvious pain is not conducive to the rehabilitation process of patients after surgery, and even severe pain can cause stress reaction of patients, increasing the incidence of postoperative adverse events, so good nursing is of great significance [26].

Finally, this study suggested that FTS could also help reduce the incidence of postoperative complications in patients with thyroid diseases. The incidence of postoperative complications in the EG was 5.88%, significantly lower than the 20.93% in the CG. The authors believe that FTS can reduce the stress response in the perioperative period with a series of nursing interventions, such as provision of nutrition care, regulation of anabolic metabolism, prevention of hypothermia, alleviation of inflammatory response, minimization of surgical incision, and early postoperative activities; and the data showed that the effect was obvious. The reason is related to the fact that FTS optimizes the preoperative physical condition of patients and promotes their postoperative function recovery. Unlike traditional nursing models, FTS advocates patients to get out of bed early after surgery to better maintain muscle function and accelerate gastrointestinal motility. At the same time, it requires active nutritional intake after surgery to reduce the damage to the posterior lung function as well as the incidence of complications. A controlled

study conducted for patients with thyroid cancer showed that rapid rehabilitation surgical nursing significantly shortened the postoperative hospitalization time of patients, and also reduced the postoperative pain of patients [27], which were similar to the results of this study, providing some basic support. Finally, the risk factors of perioperative complications in patients with thyroid disease were analyzed, and the results showed that reoperation, intraoperative blood loss and the use of recurrent laryngeal nerve detector were highly correlated with perioperative complications. The results indicated the key direction for perioperative nursing of patients with thyroid surgery to a certain extent and suggested that the key intervention should be carried out in the patients from the above aspects.

Conclusion

In summary, FTS can provide better patient outcomes, alleviate postoperative pain and adverse emotions, and reduce the incidence of adverse reactions, which has positive significance to improve the prognosis of patients and is recommended for clinical promotion. However, this study is a retrospective study and has the following deficiencies: (1) the sample size and population size are too small, and the sample source is relatively simple, which may have some impacts on the comprehensiveness of the results; (2) it lacks in-depth research on a single type of thyroid diseases. The above-mentioned deficiencies will be improved by including a larger sample and a wider range of diseases.

Disclosure of conflict of interest

None.

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