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Impacts of the perioperative fast track surgery concept on the physical and psychological rehabilitation of total hip arthroplasty

A prospective cohort study of 348 patients

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Abstract

Studies have shown that rapid rehabilitation surgery has a positive effect on recovery after major orthopedic surgery. However, very few studies have examined the impact of fast track surgery on physical and psychological rehabilitation in patients who have undergone total hip replacement.

This study aimed to investigate the value of the rapid rehabilitation surgical model for patients undergoing total hip arthroplasty during the perioperative period.

We conducted a prospective cohort study that included patients who underwent total hip arthroplasty at our hospital from January 2015 to December 2018. We divided the patients into 2 groups – the rapid rehabilitation group and the conventional rehabilitation group – and compared their length of hospital stay, time to off-bed activity, pain score, Self-Rating Anxiety Scale scores, Self-Rating Depression Scale scores, complication rate, and rate of satisfaction during hospitalization.

A total of 348 patients were included in the study. Of these, 180 received rapid rehabilitation nursing and 168 patients received conventional nursing. Compared with the patients in the conventional rehabilitation group, those in the rapid rehabilitation group had shorter hospital stays (11.5 ± 1.2 day vs 15.5 ± 2.3 day, $P = .021$), resumed off-bed activities sooner (20.5 ± 3.4 hours vs 61.8 ± 4.7 hours, $P = .001$, had less postoperative pain (4.0 ± 1.2 vs 6.5 ± 1.1, $P < .001$), and lower anxiety and depression scores (anxiety score: 24.4 ± 2.1 vs 47.9 ± 2.9; depression score: 25.8 ± 1.8 vs 43.7 ± 1.7, $P < .001$).

The application of rapid rehabilitation surgery in total hip arthroplasty can accelerate patients' postoperative recovery, relieve anxiety and depression, and increase the patient's satisfaction with the treatment.

Abbreviations: FTS = fast track surgery, THA = total hip arthroplasty.

Keywords: nursing, psychological rehabilitation, rapid rehabilitation surgery, total hip arthroplasty

1. Introduction

Approximately 160,000 patients in the United States undergo total hip arthroplasty (THA)[1] every year. The causes are mostly osteonecrosis of the femoral head, Garden III and Garden IV femoral neck fractures, and ankylosing spondylitis. Tang et al[2] reported that the treatment of comminuted femoral neck fractures among people aged 65 years and older is extremely challenging and the mortality rate for this procedure is 30%. Patients who undergo traditional THA are inadequately prepared before surgery and have severe intraoperative stress responses, frequent postoperative complications, unsatisfactory pain control, poorly timed rehabilitation exercises, and frequent dislocation of joints after discharge.

The fast track surgery (FTS) concept was first proposed by Kehlet[3] in 2011 and was applied in gastrointestinal surgery. Since then, articles describing the application of this concept on orthopedic surgery have emerged. Rapid rehabilitation surgery is based on the patient's condition and optimizes traditional rehabilitation methods by adopting evidence-based practices. Additionally, it combines medical treatment with nursing, anesthesia, pain management, nutrition, psychology, physiotherapy, and other multidisciplinary treatments. It can significantly alleviate the patient's pain, reduce his or her postoperative stress response, accelerate the recovery speed, shorten the length of hospitalization, reduce medical costs, and expedite psychological recovery.[4]

In recent years, with the change of medical model and the development of psychosomatic medicine, people gradually realize that physical health and mental health are equally important. The

Editor: Leonardo Roever.

The authors have no funding and conflicts of interest to disclose.

All data generated or analyzed during this study are included in this published article [and its supplementary information files].

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How to cite this article: Zhong M, Liu D, Tang H, Zheng Y, Bai Y, Liang Q, Yang X. Impacts of the perioperative fast track surgery concept on the physical and psychological rehabilitation of total hip arthroplasty: a prospective cohort study of 348 patients. Medicine 2021;100:32(e26869).

Received: 27 March 2020 / Received in final form: 12 July 2021 / Accepted: 13 July 2021

http://dx.doi.org/10.1097/MD.0000000000026869

elderly are more vulnerable. When told to have a THA operation, they will be extremely anxious or depressed. If the medical staff do not pay attention to the mental health of patients, it may lead to the failure of surgery. However, very few studies have been conducted on the effect of FTS on patients' psychological rehabilitation. This large-scale prospective cohort study was conducted to explore the value of FTS during the perioperative period for patients undergoing THA.

2. Patients and methods

2.1. Clinical baseline data

For this prospective cohort study, we selected 348 patients who underwent THA at our hospital from January 2015 to December 2018. A total of 348 patients were included in the study; of these, 180 were in the rapid rehabilitation surgery group and 168 were in the conventional rehabilitation group. There were no statistically significant differences in sex, age, etiology, body mass index, preoperative hemoglobin, and preoperative albumin between the 2 groups (Table 1). Based on their preferences, the patients were assigned to either the FTS group or the regular surgery group.

2.2. Ethics review

The study was approved by the Ethics Committee of Minzu Affiliated Hospital of Guangxi Medical University (Nanning, China). The patients and their family members were fully informed and signed a consent form.

2.3. Inclusion and exclusion criteria

Inclusion criteria: patients with a first-listed diagnosis with femoral neck fractures or osteonecrosis of the femoral head; 58 < patients < 90 years of age; patients who received regular postoperative follow-up; patients who were willing to cooperate with the survey; primary THA; complete visit and follow-up data.

Exclusion criteria: patients with severe hypertension, diabetes, coronary heart disease and other primary diseases that precluded surgery; patient with low compliance that prevented completion of the study; patients with hip revision surgery; patients with incomplete information in our database.

Table 1

Baseline data analysis of patients.

	FTS group (n = 180)	RS group (n = 168)	*P* value
Sex			.889
Male	78	73	
Female	102	95	
Age (years)	65 ± 11.2	64 ± 12.1	.878
Pathogeny			.501
FNF	124	117	
ONFH	56	51	
BMI (kg/m^2)	23.8 ± 3.5	24.1 ± 3.6	.787
Preoperative Hb (g/L)	125.8 ± 15.6	120 ± 19.9	.128
Preoperative Alb (g/L)	42.4 ± 9.5	41.8 ± 8.9	.245
Platelet (*10^9/L)	232 ± 76.7	253 ± 87.3	.289

Alb = albumin, BMI = body mass index, FNF = femoral neck fractures, FTS = fast track surgery, Hb = hemoglobin, ONFH = osteonecrosis of the femoral head, RS = regular surgery.

2.4. Rapid recovery surgery implementation methods

2.4.1. Hospitalization education and psychological counselling. We established an FTS treatment team that consisted of the attending doctor, subordinate doctor, head nurse, responsible nurse, and assistant nurse. Once admitted, the patient received hospitalization education and psychological counselling from the team members in the ward. Before the operation, efforts were made to ensure that the patient would be in the best possible psychological state during the operation. In addition, we described the precautions that must be taken after hip replacement and presented successful cases at home and abroad. This education was provided in person to reduce the patient's stress. We played videos of patients who have successfully undergone THA and instructed the patients to perform moderate preoperative exercises to reduce their psychological burden.

2.5. Intestinal preparation management

To prevent the risk of reflux and aspiration during surgery, the principles of fasting for 12 hours and no drinking for 6 hours before surgery have been used for many years. The rapid recovery approach breaks the rules regarding fasting from food and water before surgery. Instead, it prohibits solid foods for 6 hours before surgery and liquid foods for 2 hours. Drinking carbonated beverages 2 to 3 hours before surgery can increase the body's tolerance during surgery, reduce the feeling of gastric emptying after surgery, and provide necessary strength for early functional training after surgery.

2.5.1. Nutrition assessment. Preoperative malnutrition directly affects the speed of postoperative recovery. Thus, preoperative nutrition assessment is particularly important. In general, nutrition monitoring indicators are used to determine the effectiveness of nutritional support before surgery. Albumin, pre-albumin, and transferrin are the main nutritional indicators examined. We monitored the patients' albumin on the day of admission, the day before and after the operation, and the third and the fifth days after the operation. We obtained the time curves of patients' nutritional deficiencies and supplementation to help patients recover their functional nutrition status as soon as possible.

2.5.2. Intraoperative measures. Maintaining body temperature and limiting intravenous fluid replacement during surgery are critical in rapid recovery. Hypothermia during the operation can induce a series of accidents, such as cardiovascular dysfunction, and increase the possibility of postoperative infection. Effective warming during surgery by adding blankets, increasing the room temperature, and heating the input liquid, can avoid hypothermia. Excessive infusion during surgery, especially of sodium-containing fluids, will lead to postoperative intestinal palsy. Therefore, shortening the operation time and effectively stopping bleeding during the operation can reduce the amount of fluid replacement required and promote patients' postoperative activity.

2.5.3. Pain care. We adopted pre-emptive and multimodal analgesia management methods. If the patient indicates visual analog scale pain level higher than 4 before surgery, opioids can be used, such as tramadol. If there is no history of sulfa allergy and cardiovascular disease, drugs such as celecoxib capsules can be added. From the day of the operation to 3 days postoperation, 2 doses of parecoxib sodium 40 mg can be added to the drugs

described above, and 1 dose should be taken before sleep. Opioid analgesics are often avoided because they can cause complications such as urinary retention, hypotension, lethargy, nausea, and vomiting.

2.5.4. Early postoperative exercises. The patients started simple exercises such as quadriceps static contraction and ankle dorsiflexion 6 hours after the operation. We removed the patients' urinary tubes and incision drainage tubes within 2 days after the operation. They could stretch the operated leg and do lifting exercises. Within 1 week after surgery, patients need to transit from lying to standing gradually and to walk without crutches. The rehabilitation training required a rehabilitation doctor's professional guidance to help patients stop using crutches and walk on their own as soon as possible.

2.6. Conventional rehabilitation methods

Before surgery, the patients received only education regularly provided on admission. They were required to fast from food for 12 hours before surgery and from water for 6 hours before surgery. No pre-emptive analgesics were provided before surgery. Postoperative opioid analgesics such as dezocine were given by intravenous drip. When necessary, oral painkillers such as tramadol capsules and celecoxib capsules were added. We removed the drainage tube and urinary tube at an average of 4 days after surgery. The patients gradually began rehabilitation exercises and walked without weight-bearing at approximately 14 days after surgery.

2.7. Main observation indicators

2.7.1. Length of hospitalization. This indicator is calculated based on the duration between admission and discharge. We generally perform total knee replacement after completing the necessary admission examinations.

2.7.2. Off-bed time. Drainage tubes were placed in the incisions of both groups. We encouraged the patients to perform off-bed activities as soon as possible. Then, we calculated the time between the patient's awakening from anesthesia on the ward to their first off-bed stand-up.

2.7.3. Postoperative complications (within 1 year). Such complications include deep vein thrombosis of the lower extremities, urinary tract infections, periprosthetic infections, and death.

2.7.4. Satisfaction during hospitalization. The satisfaction during hospitalization scale was divided into 5 categories: very dissatisfied, dissatisfied, neutral, satisfied, and very satisfied. Patient satisfaction was evaluated in relation to their degree of rehabilitation after total knee replacement (very dissatisfied, –2; dissatisfied, –1; neutral, 0; satisfied, 1; very satisfied, 2).

2.7.5. The Self-Rating anxiety scale. This scale was used to evaluate the patient's anxiety level on the day of admission, before surgery, and on the third day after surgery. The scale uses a 4-point rating system and mainly assesses the frequency of symptoms. A final score of 50 to 59 points indicates mild anxiety, 60 to 69 points indicates moderate anxiety, and 70 points or more indicates severe anxiety.[5]

2.7.6. The Self-Rating depression scale. This scale was used to evaluate the patients' depression level. This scale contains 20 items that reflect subjective feelings of depression. Each item is scored according to the frequency of symptoms. The items are answered on a 4-point rating response system. Ten items are scored positively, and 10 are scored negatively. Scores of 53 to 62 indicate mild depression, 63 to 72 indicate moderate depression, and 73 or higher indicates severe depression.[5]

2.7.7. Pain evaluation. We used the visual analog scale scores to evaluate the patient's pain. We drew a 10-cm horizontal line on a piece of paper. One end of the horizontal line is 0, indicating no pain. The other end is 10, indicating severe pain. The line between these points indicates different degrees of pain. Patients provided self-ratings based on their pain levels.

2.8. Statistical methods

SPSS 22.0 (IBM Corporation, Chicago, IL, USA) software was used for statistical analysis. Measurement data are expressed as x ±s. The chi-square test was used to compare count data. Independent-sample t test was used for comparisons between groups. If $P < .05$, the difference is significant.

3. Results

3.1. Comparison of hospitalization time and off-bed time between the 2 groups

The hospitalization time of the patients in the rapid rehabilitation group was 11.5 ± 1.2 days; this was shorter than that of the conventional rehabilitation group, which was 15.5 ± 2.3 days. The difference between the 2 groups was statistically significant ($P = .021$). In terms of recovery time, the rapid rehabilitation group required 20.5 ± 3.4 hours after surgery before performing off-bed activities, which was significantly less than the conventional group (61.8 ± 4.7 hours, $P = .001$). (Table 2).

3.2. Complications within 1 year after surgery in the 2 groups of patients

As we can see in Table 3, the incidences of deep vein thrombosis in the lower limbs, urinary tract infection, and pulmonary infection in the rapid rehabilitation group were 1.1%, 2.8%, and 3.8%, respectively. The results were significantly lower than those for the conventional group, which were 16.1%, 17.3%, and 19.0% respectively (P values were all less than .001, chi-square test). There was no significant difference in the incidence of prosthesis dislocations between the 2 groups (1.7% vs 2.4%, $P = .716$, chi-square test).

3.3. Comparison of patient satisfaction between the 2 groups

Table 4 showed that the hospitalization satisfaction rate of the rapid recovery group was significantly higher than that of the conventional group (94.4% vs 56.0%, $P < .001$, chi-square test).

3.4. Comparison of pain, anxiety, and depression scores between the 2 groups

There were no significant differences in the anxiety and depression scores between the 2 groups on admission. On 1 day before operation and 3 days after operation, the anxiety scores for the rapid recovery group were 34.4 ± 1.7 and 28.9 ±

Table 2

Comparison of hospitalization time and off-bed time between the 2 groups.

	FTS group (n = 180)	RS group (n = 168)	*P* value
LHS (days)	11.5 ± 1.2	15.5 ± 2.3	.021
OBT (h)	20.5 ± 3.4	61.8 ± 4.7	.001

FTS = fast track surgery, OBT = off-bed time, LHS = length of hospital stay, RS = regular surgery.

Table 3

Complications within 1 year after surgery in the 2 groups.

	FTS group (n = 180)	RS group (n = 168)	*P* value
DVT	2 (1.1%)	27 (16.1%)	<.001
UTI	5 (2.8%)	29 (17.3%)	<.001
PI	7 (3.8%)	32 (19.0%)	<.001
PD	3 (1.7%)	4 (2.4%)	.716

DVT = deep vein thrombosis, FTS = fast track surgery, PD = prosthesis dislocations, PI = pulmonary infection, RS = regular surgery, UTI = urinary tract infection.

1.4, respectively. These results were lower than those for the conventional rehabilitation group, which were 45.5 ± 2.3 and 51.8 ± 3.3, respectively. The difference was statistically significant ($P < .001$, *t* test). Similarly, the depression scores of the rapid recovery group on the day before operation and 3 days after operation were significantly lower than those for the conventional rehabilitation group (24.4 ± 2.1 vs 47.9 ± 2.9, 25.8 ± 1.8 vs 43.7 ± 1.7, $P < .001$, *t* test). The pain scores on admission and before surgery did not differ significantly between the 2 groups. However, the pain score of the rapid recovery group was significantly lower than that of the conventional recovery group (4.0 ± 1.2 vs 6.5 ± 1.1, $P < .001$, *t* test) at 3 days after surgery (Table 5).

4. Discussion

FTS was first proposed by KehletKehlet and has been widely used in the surgical area. In recent years, FTS has been also widely used in orthopedics. In this prospective cohort study, we grouped and compared 348 patients. For the first time, we proved that rapid rehabilitation surgery could reduce depression and anxiety in patients with THA. We also verified that rapid recovery surgery could accelerate the postoperative recovery in patients with a THA and reduce their complications.

With the transformation of the modern medical model, more attention has been paid to patients' psychological status.[6] Surgery is a dreaded experience that can produce negative emotional responses in patients, which will affect postoperative recovery.[7] If a patient reacts very strongly to the surgery and is unprepared, significant adverse effects on postoperative rehabilitation and surgical outcomes can result. Although an increasing number of articles have examined the use of a rapid rehabilitation model in THA,[8–10] few have focused on the impact of this model on patients' psychophysiology. In this study, there were 180 patients in the rapid recovery group and 168 patients in the conventional recovery group. There were no significant differences in anxiety and depression scores between the 2 groups on admission. However, on 1 day before and 3 days after surgery, the depression and anxiety scores of the patients in the rapid recovery group were significantly lower than those of the patients in the conventional group. That indicated the FTS can alleviate the anxiety, depression, and pain symptoms of patients with THA, improve their psychological anti-strike capability, and ensure the patients get through the difficulties smoothly.

After the operation, the medical staff should take the initiative to care for the patients, inform the patients of the general process of the operation, and explain to the patients various factors affecting rehabilitation and relative preventive measures. We conclude that rapid rehabilitation surgery could promote patients' psychological adjustment for the following reasons. First, rapid rehabilitation surgery provides psychological guidance before surgery for patients undergoing THA. This guidance alleviates patients' psychological stress and significantly reduces their anxiety, depression, and pain symptoms, allowing them to cope better with the negative impacts of surgery.[11,12] Second, rapid rehabilitation surgery provides long-term follow-up to address patients' psychological problems, which promotes psychological rehabilitation. Third, rapid rehabilitation surgery actively motivates patients to exercise correctly and reminds them to seek appropriate psychological rehabilitation treatment, thus helping them with their treatment.

This study also found the following measures might be associated with rapid rehabilitation surgery's ability to accelerate postoperative recovery from THA. First, the preoperation fasting and drinking requirements are changed. Studies have shown that foreign scholars allow patients to drink 800 to 1000 mL of 12.5% carbohydrates on the eve of surgery and give patients 400 to 500 mL to drink 2 to 3 hours before surgery. These measures can reduce patients' thirst and anxiety, significantly reduce the incidence of postoperative insulin resistance, and prevent immunosuppression and unrestricted gastrointestinal function or activity caused by surgery.[13,14] In this study, the patients in the rapid recovery group were prohibited from consuming solid food for 6 hours before surgery and from drinking liquids 2 hours before surgery. They drank carbonated beverages 2 to 3 hours before the operation, which we believed would increase the body's tolerance during surgery and reduce the feeling of gastric emptying after surgery. The preoperative consumption of

Table 4

Comparison of patient satisfaction between the 2 groups.

	Very dissatisfied	Dissatisfied	Neutral	Satisfied	Very satisfied	Satisfaction rate
FTS group (n = 180)	2	2	6	101	69	94.4%
RS group (n = 168)	4	28	42	82	12	56.0%
Z-value				20.8		
P value				<.001		

FTS = fast track surgery, RS = regular surgery.

Table 5

Comparison of pain, anxiety and depression scores between the 2 groups.

		FTS group (n=180)	RS group (n=168)	*P* value
SAS scores	FDA	45.5±2.3	46.5±2.8	.687
	ODBS	34.4±1.7	45.5±2.3	<.001
	TDAO	28.9±1.4	51.8±3.3	<.001
SDS scores	FDA	26.4±3.2	21.3±2.6	.476
	ODBS	24.4±2.1	47.9±2.9	<.001
	TDAO	25.8±1.8	43.7±1.7	<.001
VAS scores	FDA	3.8±0.7	3.5±0.8	.714
	ODBS	3.7±0.2	4.3±0.6	.067
	TDAO	4.0±1.2	6.5±1.1	<.001

FDA = first day of admission, FTS = fast track surgery, ODBS = one day before surgery, RS = regular surgery, SAS = Self-Rating Anxiety Scale, SDS = Self-Rating Depression Scale, TDAO = three days after operation, VAS = visual analog scale.

carbonated beverages also provides necessary strength for early body function training after surgery. Second, postoperative analgesia is crucial. Adequate pain management is critical because our goal is to encourage patients to leave their beds as soon as possible after surgery. Patients with severe pain may not be able to perform physical activities, which will introduce a series of complications, such as joint stiffness. It will also prolong the postsurgical duration of hospitalization and increase medical costs. In this study, the rapid rehabilitation group received pre-emptive analgesia and multimodal analgesia management. These strategies are beneficial to patients' postoperative recovery and the results are consistent with those reported in a previous study.[15] Finally, we encouraged patients to get out of bed and exercise early after surgery, which can promote rapid recovery and prevent complications such as infection. In a prospective study, Nasser et al[16] included 220 patients with knee replacement and 165 patients with hip replacement. He found that patients who were treated with the rapid rehabilitation approach had less pain after surgery, shorter hospital stays, and lower hospital costs. Our results are consistent with those findings. What's more, most postoperative rehabilitation training needs to be carried out after discharge, which requires the medical staff to formulate regular follow-up visits and dynamic guidance of rehabilitation plan to help patients get the most satisfactory and fastest functional recovery.

5. Conclusion

Rapid rehabilitation surgery can reduce depression and anxiety in patients with THA. We proved that rapid rehabilitation surgery could accelerate the postoperative recovery of patients with THA and reduce their complications.

6. Limitations

First, this article does not consider comorbidities, such as hypertension and diabetes. Such comorbidities will affect postoperative rehabilitation. This study only investigated the psychological effects of rapid rehabilitation among patients undergoing THA. As we have not studied other orthopedic diseases, the results cannot be generalized to all orthopedic diseases. Therefore, more rigorous and in-depth research is necessary.

7. Future directions

More prospective studies should be carried out and the steps and details of rapid rehabilitation should be further improved and optimized.

Author contributions

MYZ and XNY conceived and designed the study and edited the final manuscript. DHL and HJT collected the data, performed a literature review, and produced the draft manuscript. YDZ, QHL and YB contributed to the pathological part of the review and helped with the writing of the manuscript. All authors read and approved the final manuscript.

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