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Analysis on Characteristics and Nursing Points of Surgical and Interventional Treatment for Elderly Cerebral Aneurysm

Haiying You[1], Jing Li[2], Xiaojie Wang[3], Guodong Zhang[4] and Juan Yang[5,*]

[1]Department of Intervention Nursing, Liaocheng Second People's Hospital, Liaocheng, China
[2]Department of Nephrology Nursing, The Eighth People's Hospital of Qingdao, Qingdao, China
[3]Department of Respiratory Medicine Nursing, The Eighth People's Hospital of Qingdao, Qingdao, China
[4]School of Computer Science and Engineering, Nanyang Technological University of Singapore, Singapore
[5]Department of Cardiothoracic Surgery, Qingdao Hospital of Traditional Chinese Medicine (Qingdao Hiser Hospital), Qingdao, China
[*]Corresponding Author: Juan Yang. Email: yjyl0881667@163.com

Abstract: Objective. The purpose was to explore the characteristics and nursing points of surgical and interventional treatment for elderly cerebral aneurysm. Methods. 100 elderly patients with cerebral aneurysm treated in our hospital from January 2017 to December 2019 were selected, and divided into craniotomy group (40 patients with neurosurgical clipping) and interventional surgery group (60 patients with endovascular interventional embolization) according to the treatment method to compare the operation time, hospitalization time, hospitalization expenses, degree of brain injury, complications and prognostic scores of the patients in two groups. Meanwhile, the relationship between the factors (age, aneurysm size, location) and prognosis of patients was analyzed, and the nursing points were summarized. Results. (1) The operation time and hospitalization time of the interventional surgery group were lower than those of the craniotomy group, but the hospitalization expenses were higher than those of the craniotomy group ($P = 0.000$). (2) The brain injury indexes of the two groups at 6h and 24h after operation were higher than those before operation, and the indexes of the craniotomy group were higher than those of the interventional surgery group ($P = 0.00$). (3) The overall complication rate was 16.67% in the interventional surgery group, which was lower than 37.50% in the craniotomy group ($P = 0.005$). (4) The good recovery rate of GCS score in interventional surgery group was 63.33%, which was higher than 42.50% in craniotomy group ($P = 0.040$). (5) Univariate analysis. The aneurysm location, preoperative Hunt-Hess grade and combined hyperlipidemia were related to the prognosis of patients ($P < 0.05$). (6) Multivariate analysis. The aneurysm location and preoperative Hunt-Hess grade were independent factors affecting the prognosis of patients ($P < 0.05$). Conclusion. Interventional surgery for elderly cerebral aneurysm is superior to craniotomy in reducing surgical trauma and accelerating postoperative recovery, but the hospitalization expenses are higher than those of craniotomy. Aneurysm location and preoperative Hunt-Hess grade were independent factors influencing the prognosis of patients. Postoperative nursing for elderly cerebral aneurysm should start from basic nursing, psychological nursing and symptomatic nursing.

Keywords: Elderly; cerebral aneurysm; surgery; interventional therapy; treatment characteristics; nursing points

1 Introduction

Cerebral aneurysm (CA) refers to aneurysmal protrusions caused by abnormal enlargement of the lumen of cerebral arteries, which are often found in the elderly population [1]. CA is mainly caused by

increased wall pressure and congenital defects of cerebral arteries [2]. CA has a high rate of disability and mortality, and poor prognostic effect [3]. Clinical studies have shown that the incidence of CA in the elderly population is significantly higher than that in the young and middle-aged population due to the decline of physical function and the prevalence of cerebrovascular diseases, with a more serious condition [4]. Statistics show that the incidence of CA in the elderly is up to 15% with the long-term survival rate within 5 years as less than 7.5% [5]. Early diagnosis and early treatment are the key to reducing the disability and mortality rate of CA in the elderly [6]. At present, there are two main clinical treatments for CA, one is neurosurgical clipping, the other is endovascular interventional embolization [7]. In order to explore the characteristics and nursing points of surgical and interventional treatment for elderly CA, 100 elderly CA patients treated in our hospital from January 2017 to December 2019 were divided into groups for study, summarized and reported as follows.

2 Materials and Methods

2.1 General Information

In this study, 100 elderly CA patients treated in our hospital from January 2017 to December 2019 were selected, and divided into craniotomy group (40 patients with neurosurgical clipping) and interventional surgery group (60 patients with endovascular interventional embolization) according to the treatment method. There were 22 males and 18 females in the craniotomy group, aged 63–82 years, with an average age of (67.83 ± 5.75) years. There were 32 males and 28 females in the interventional surgery group, aged 62–83 years, with an average age of (68.04 ± 5.83) years. There was no significant difference in gender, age and other clinical data between the two groups of patients ($P > 0.05$), which was of research significance.

2.2 Inclusion/Exclusion Criteria

2.2.1 Inclusion Criteria

(1) It met the diagnostic criteria of cerebral aneurysm and the patients were confirmed by Digital Subtraction Angiography (DSA) and Computed Tomography Angiography (CTA) examination;

(2) The patients had no other serious organic diseases or malignant tumors;

(3) All indexes of the patients met the surgical indications;

(4) The study was approved by the hospital ethics committee, and the patients voluntarily participated in the study and signed the informed consent.

2.2.2 Exclusion Criteria

(1) The patients supported conservative treatment without cooperation with researchers

(2) The patients had cognitive dysfunction or severe psychiatric diseases

(3) The patients had other cardiovascular diseases or a history of cerebrovascular accidents

(4) The patients had Hunt-Hess grade V

2.3 Methods

2.3.1 Early Rescue

The patients should be given early rescue immediately after admission, including intracranial decompression, drainage of cerebrospinal fluid and prevention of cerebral vasospasm and shock, etc. [8]. On this basis, CTA, DSA and other cranial vascular examinations were carried out, and surgical methods were determined according to the examination results and the wishes of the patients and their families.

2.3.2 Neurosurgical Clipping

The patients underwent general anesthesia, routine endotracheal intubation, and intravenous drip of nimodipine injection (Baoding Sanjiushi Biopharmaceutical Co., Ltd.). The location of aneurysm was determined according to the results of CTA, DSA and other examinations. Lateral fissure approach was used for middle cerebral aneurysms and Willis ring aneurysms, Yasargil pterional approach was used for anterior and posterior communicating aneurysms, and longitudinal fissure approach was used for pericallosal aneurysms through a coronal incision [9]. After sterilizing the drape, an arc incision with a length of 7–8 cm was made on the scalp, then the scalp, subcutaneous tissue and periosteum were cut in turn, and a skull drill was performed after the flap was turned over [10]. Then the dura mater was cut to find the location of the aneurysm. After blocking the blood supply of the aneurysm, the aneurysm and its adhesion were separated in turn, and the appropriate aneurysm clip was selected to clip the aneurysm. After no vasospasm or hemorrhage was found in the clip of the tumor neck, a drainage tube was placed under the dura mater (removed 2–4 h after operation), and the wound was sutured layer by layer. After surgery, the patients received continuous intravenous infusion of nimodipine injection, 1 mg/h, for 1–2 weeks [11].

2.3.3 Endovascular Interventional Embolization

Preoperative preparation was the same as above. The patients underwent general anesthesia and endotracheal intubation. Nimodipine injection was injected intravenously before and during the operation. The patient was first treated with systemic heparinization, with the systolic blood pressure controlled within 100 mmHg. Puncture angiography was performed through the femoral artery to clarify the basic information of the aneurysm, including size, location, diameter, and direction, etc. [12]. The Seldinger technique was used for puncture, and the 6F artery sheath was inserted into the vertebral artery or internal carotid artery. A microcatheter was inserted under the guidance of the microguide wire and moved to the middle of the aneurysm lumen. According to DSA examination results, spring coils of appropriate type and length were selected for arterial embolization to ensure that all coils were located within the aneurysm [13]. The operation was completed when the aneurysm was not developed. The arterial sheath was removed 3 h later and the puncture point was pressed. After pressing for 30 min, the puncture point was pressurized and bandaged [14]. After surgery, the patients received continuous intravenous infusion of nimodipine injection with the same dose and treatment time as above.

2.4 Evaluation Indexes

(1) The operation time, hospitalization expenses and hospitalization time of the patients in two groups were counted.

(2) Indexes of brain injury. Peripheral venous blood (3–5 ml) was taken from two groups of patients before, 6 h and 24 h after operation. ELISA was used to determine serum S100B protein and neuron specific enolase (NSE) content after centrifugation.

(3) Complications. The perioperative complications were counted in the two groups of patients, including rebleeding, cerebral vasospasm, transient cerebral ischemia and hydrocephalus, etc.

(4) Prognostic scores. Two groups of patients were followed up 6 months after surgery, and their prognostic status was scored with Glasgow Coma Scale (GCS). The total score was 15 points, including 1–2 points for death, 3–6 points for vegetative state, 7–10 points for severe disability, 11–13 points for mild disability, and 14–15 points for good recovery.

(5) Prognostic factors. Univariate and multivariate logistic regression analysis was used to explore the relationship among age, aneurysm location, aneurysm size, aneurysm number, Hunt-Hess grade, combined basic disease and prognosis of elderly CA patients.

2.5 Statistical Processing

Relevant materials and data in this study were processed and analyzed by statistical software SPSS21.0.

The count data were tested by $X^{2,}$ expressed by [n(%)], and the measurement data were measured by *t* test, expressed by ($\bar{x} \pm s$). F test was used for comparison of different periods within the group, and Logistic regression analysis was used to analyze the relationship between influencing factors and prognosis. The difference was statistically significant when $p < 0.05$.

3 Results

3.1 Comparison of Operation Time, Hospitalization Time and Hospitalization Expenses between the Two Groups

The operation time and hospitalization time of the interventional surgery group were lower than those of the craniotomy group, but the hospitalization expenses were higher than those of the craniotomy group, with statistically significant differences (P = 0.000), as shown in Fig. 1.

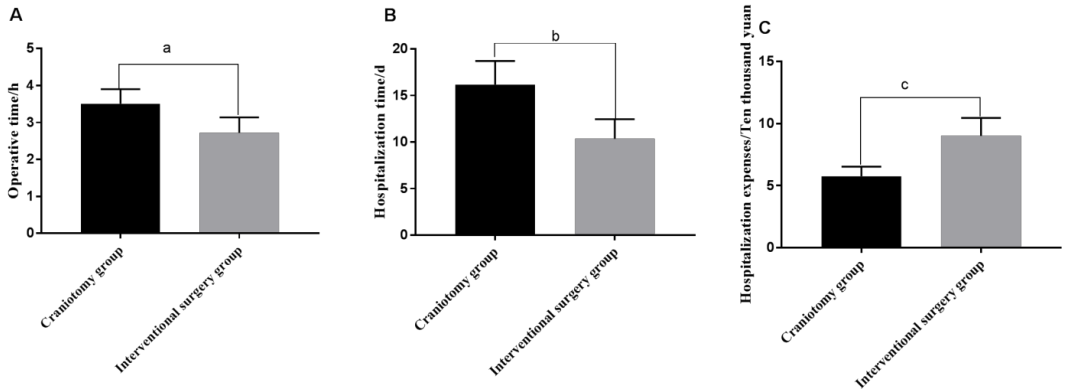

Figure 1: Comparison of operation time, hospitalization time and hospitalization expenses between two groups. Note: A) Comparison of operation time between two groups, aP = 0.000. B) Comparison of hospitalization time between two groups, bP = 0.000. C) Comparison of hospitalization expenses between two groups, cP = 0.000

3.2 Comparison of Brain Injury Indexes between Two Groups of Patients

Before operation, there was no significant difference in the brain injury indexes (S100B, NSE) between two groups of patients (P > 0.05). The brain injury indexes of the two groups at 6 h and 24 h after operation were higher than those before operation, and the indexes of the craniotomy group were higher than those of the interventional surgery group, with statistically significant differences (P = 0.00), as shown in Tab. 1.

Table 1: Comparison table of brain injury indexes between two groups（$\bar{x} \pm s$）

Group	Case	S100B			NSE		
		Before operation	6 h after operation	24 h after operation	Before operation	6 h after operation	24 h after operation
Craniotomy group	40	3.30 ± 0.44	5.90 ± 0.76	6.01 ± 0.75	11.56 ± 2.14	20.28 ± 3.13	21.66 ± 3.04
Interventional surgery group	60	3.27 ± 0.42	4.87 ± 0.60	4.35 ± 0.55	11.35 ± 2.06	14.76 ± 2.06	15.02 ± 1.69
t		0.343	7.551	12.763	0.492	10.645	14.002
P		0.732	0.000	0.000	0.624	0.000	0.000

Note: In craniotomy group, S100B difference: F = 250.713, P = 0.000; NSE difference: F = 175.574, P = 0.000; In interventional surgery group, S100B difference: F = 79.165, P = 0.000; NSE difference: F = 35.863, P = 0.000.

3.3 Comparisons of Complications between Two Groups of Patients

There was no significant difference in the incidence of individual complications between the two groups of patients (P > 0.05), but the overall complication rate was 16.67% in the interventional surgery group, which was lower than 37.50% in the craniotomy group, with statistically significant difference (P = 0.005), as shown in Fig. 2.

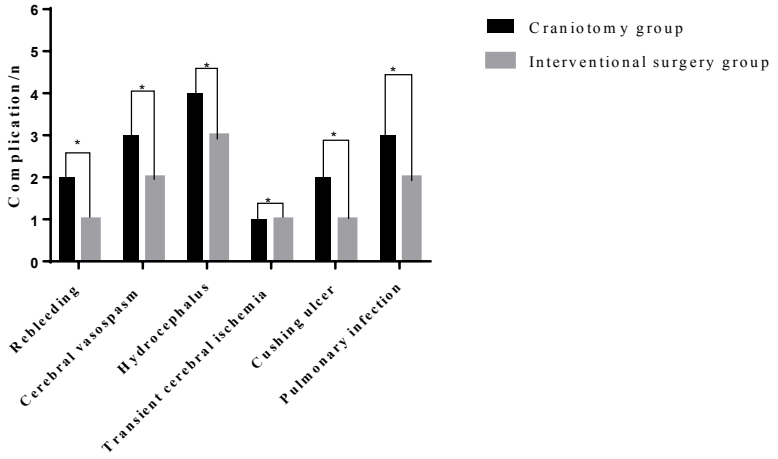

Figure 2: Comparisons of complications between two groups of patients. Note: *P = 0.338, 0.349, 0.337, 0.771, 0.338, 0.349

3.4 Comparison of GCS Scores between Two Groups of Patients

The good recovery rate of GCS score in interventional surgery group was 63.33% (38/60), which was higher than 42.50% (17/40) in craniotomy group, with statistically significant difference (P = 0.040). However, there was no significant difference in other items of GCS pre-scores between the two groups (P > 0.05), as shown in Fig. 3.

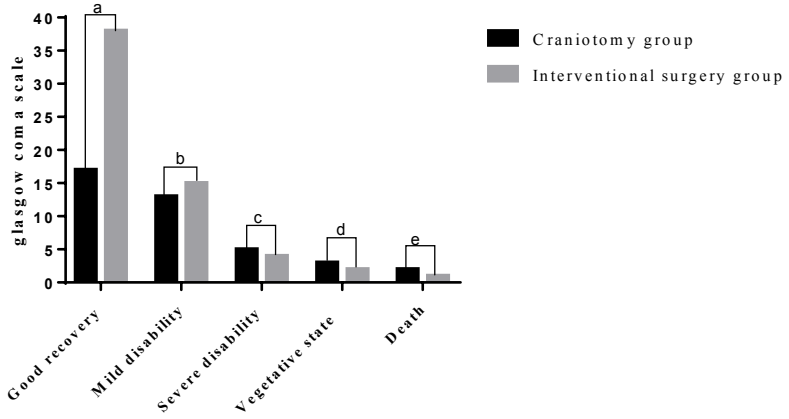

Figure 3: Comparison of GCS scores between two groups of patients. Note: aP = 0.040, bP = 0.413, cP = 0.318, dP = 0.349, eP = 0.338

3.5 Univariate Analysis of Prognosis in Elderly CA Patients

Univariate analysis showed that aneurysm location, preoperative Hunt-Hess grade and combined hyperlipidemia were related to the prognosis of elderly CA patients (P < 0.05), as shown in Tab. 2.

Table 2: Univariate analysis of prognostic effects in elderly CA patients [n (%)]

Item	Case	Craniotomy group (n = 40)	Interventional surgery Group (n = 60)	χ^2	P
Age	–	–	–	–	–
60–69 years old	46 (46)	20 (50.00)	26 (43.33)		
70–79 years old	42 (42)	18 (45.00)	24 (40.00)	0.097	0.213
≥80 years old	12 (12)	2 (5.00)	10 (16.67)		
Aneurysm location	–			–	–
Arteria carotis	46 (46)	25 (62.50)	21 (35.00)		
Anterior cerebral artery and anterior communicating artery	22 (22)	8 (20.00)	14 (23.33)	8.488	0.037
Middle cerebral artery	17 (17)	4 (10.00)	13 (21.67)		
Vertebrobasilar artery	15 (15)	3 (7.50)	12 (20.00)		
Aneurysm size	–	–	–	–	–
≤1 cm	55 (55)	24 (60.00)	31 (51.67)		
1.1–2.4 cm	26 (26)	9 (22.50)	17 (28.33)	0.696	0.706
≥2.5 cm	19 (19)	7 (17.50)	12 (20.00)		
Aneurysm number	–	–	–	–	–
Single aneurysm	67 (67)	30 (75.00)	37 (61.67)	1.930	0.165
Multiple aneurysm	33 (33)	10 (25.00)	23 (38.33)		
Hunt-Hess grade	–	–	–	–	–
Level 0	32 (32)	15 (37.50)	17 (28.33)		
Level 1–2	45 (45)	21 (52.50)	24 (40.00)	6.362	0.042
Level 3–4	23 (23)	4 (10.00)	19 (31.67)		
Hyperlipidemia	–	–	–	–	–
Yes	55 (55)	17 (42.50)	39 (65.00)	4.931	0.026
No	45 (45)	23 (57.50)	21 (35.00)		

Coronary disease	–	–	–	–	–
Yes	34 (34)	15 (37.50)	19 (31.67)	0.364	0.546
No	66 (66)	25 (62.50)	41 (68.33)		

3.6 Multivariate Analysis of Prognosis in Elderly CA Patients

Multivariate analysis showed that aneurysm location and preoperative Hunt-Hess grade were independent factors affecting the prognosis of elderly CA patients ($P < 0.05$), as shown in Tab. 3.

Table 3: Multivariate logistic analysis table of the factors affecting prognostic effect of elderly CA patients

Variable	Index	Quantification	U	P	RR (95%CI)
χ_1	Age	Years old	1.848	0.0645	0.94 (0.864~1.003)
χ_2	Aneurysm location	Arteria carotis: 1; Anterior cerebral artery and anterior communicating artery: 2; Middle cerebral artery: 3; Vertebrobasilar artery: 4	2.012	0.0443	2.21 (1.020~4.688)
χ_3	Aneurysm size	≤1 cm: 1; 1.1-2.4 cm: 2; ≥2.4 cm: 3	0.775	0.4377	1.68 (0.456~6.124)
χ_4	Aneurysm number	Single aneurysm: 0; Multiple aneurysm: 1.	0.621	0.5341	1.70 (0.315~9.252)
χ_5	Hunt-Hess grade	Level 0: 1; Level 1-2: 2; Level 3-4: 3	3.195	0.0015	9.72 (2.408~39.153)
χ_6	Hyperlipidemia	No: 0; Yes: 1	1.202	0.2292	2.44 (0.573~10.344)
χ_7	Coronary disease	No: 0; Yes: 1	0.397	0.6910	1.41 (0.266~7.347)

4. Discussion

4.1 Characteristics of Surgical and Interventional Treatment for Elderly CA

CA is a common cerebrovascular disease in the elderly and the primary cause of subarachnoid hemorrhage (SAH) in the aged [15]. Clinical studies have shown that early diagnosis and standardized treatment within 72 h before the onset of CA can effectively reduce its disability and mortality, and improve its prognosis. Neurosurgical clipping is a common CA treatment method. Although it is easy to operate, quick to stop bleeding and has good short-term effect, it also has disadvantages such as large trauma, many complications and poor long-term effect [16]. With the development of intervention technique, endovascular interventional embolization has become an emerging way to treat CA in recent years. Although its operation is complex, it has the advantages of small trauma, high accuracy and rapid recovery after surgery [17].

In this study, comparison of the various indexes between craniotomy group and interventional surgery group showed that the operation time, hospitalization time, degree of brain injury, overall complication rate and good recovery rate of GCS scores in the interventional surgery group were better than those in the craniotomy group, but the hospitalization expenses were higher than those of the craniotomy group, with statistically significant differences ($P < 0.05$). This was similar to the results of Wu et al. [18], who divided 60 patients with micro-CA into control group (craniotomy) and test group (endovascular embolization), 30 patients in each group. After 6 months of follow-up of the two groups, it was found that the GCS prognostic score of the test group was significantly better than that of the control group, with statistically significant difference ($P = 0.031$), indicating that interventional surgery is superior to craniotomy in reducing surgical

trauma and improving rehabilitation effect, but with higher expenses.

4.2 Factors Influencing the Prognosis of Elderly CA Patients

Compared with young and middle-aged patients, elderly CA patients have poor prognosis due to the decline of body function and other diseases. In this study, in order to explore the factors influencing the prognosis of elderly CA patients, analysis was conducted on the factors such as age, aneurysm size, location, number, Hunt-Hess grade and whether combined with basic diseases. It was found that aneurysm location, preoperative Hunt-Hess grade and combined hyperlipidemia were related to the prognosis of elderly CA patients, in which aneurysm location and preoperative Hunt-Hess grade were the independent factors influencing the prognosis of elderly CA patients ($P < 0.05$). This was similar to the results of Ma et al. [19], who analyzed the medical records of 53 elderly CA patients and found that high Hunt-Hess grade at admission is a risk factor affecting the prognosis of patients ($P = 0.008$).

4.3 Postoperative Nursing Points for Elderly CA Patients

Based on the experience of this study and related literature, the author believes that the postoperative nursing points of elderly CA patients mainly include the following three aspects.

(1) Basic nursing

① Bed and body position. Patients must rest in bed after aneurysm rupture or bleeding and keep the height of the bed head between 15 and 30 degrees to avoid head movement and other unnecessary operations, turning over once every 2 to 3 h to prevent pressure ulcers [20]. ② Nutrition and diet. Critically ill patients are fasted within 48 h, and can be fed by nasal feeding after 48 h. Conscious patients who swallow without difficulty adopt a liquid and semi-liquid diet. Patients with basic diseases such as hypertension adopt a low-fat and low-salt diet. Feeding should be done slowly with small amounts from the healthy side of the mouth to avoid aspiration and cough. ③ Excretion. The patients should defecate smoothly, and if necessary, drugs such as glycerine enema can be used. Massage is used to promote urination of patients with dysuria, and perineum is maintained regularly.

(2) Psychological nursing

① Stable mood. The reasons why they cannot move and speak after operation were explained patiently to the patients to avoid words and actions that stimulate their emotions. ② Communication with patience. When communicating with patients, the nursing staff should speak slowly with short sentences, and repeat important questions to ensure that patients can understand clearly. ③ Communication and guidance. Family members were guided to communicate with patients with posture and eyes. ④ Encouraging patients. Successful cases are introduced to the patients, which encourage them to enhance confidence and actively get involved in the treatment.

(3) Symptomatic nursing

① Vital signs monitoring. Nursing staff should be arranged to take care of the patients after operation and monitor their vital signs at any time. Pupils and vital signs of patients with intensive care are observed once every 30 min, and doctors are notified in time of abnormalities for rescue. ② Epilepsy monitoring. After surgery, patients are given Depakine intravenously for epilepsy prevention. Low flow of oxygen is maintained, and intracranial pressure detection is used when needed. ③ Control of blood pressure. Postoperative stimulation to the patients is minimized, the ward is kept quietly, and the blood pressure is kept at 110-130/60-85 mmHg. ④ Prevention of pneumonia. The ward should be ventilated, and suctioning is performed timely. The patients turn over to perform the percussion on back every 2 h to avoid sputum dropping, which will cause pneumonia. ⑤ Control of body temperature. Body temperature is measured

every 4 h after operation. Physical cooling can be used if the body temperature is higher than 38.5°C, but antipyretics should not be used as far as possible to prevent patients from prostration.

5 Conclusion

In conclusion, interventional surgery for elderly CA is superior to craniotomy in reducing surgical trauma and accelerating postoperative recovery, but the hospitalization expenses are higher than those of craniotomy. Aneurysm location and preoperative Hunt-Hess grade were independent factors influencing the prognosis of patients. Postoperative nursing for elderly CA should start from basic nursing, psychological nursing and symptomatic nursing [21]. In postoperative nursing, it is necessary to strengthen communication with the patients, and the psychological guidance should also be carried out to improve the prognosis of the patients. Besides, the daily activities of patients such as sleeping, diet and excretion should be strictly controlled, and blood pressure and body temperature of patients should also be monitored in real time to ensure stable vital signs of patients.

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