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Effect of Nursing Intervention Based on Caprini Risk Assessment Scale for Venous Thromboembolism in Perioperative Patients with Liver Cancer

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Abstract: *Objective:* To explore the effect of nursing intervention based on Caprini risk assessment scale for venous thromboembolism (VTE) in perioperative patients with liver cancer. *Methods:* A total of 128 hepatocellular cancer (HCC) patients who were hospitalized in our department from January 2021 to March 2022 and met the research criteria were selected. According to odd and even numbers in the order of inclusion, 64 cases were divided into two groups: a control group and an observation group. The control group received routine nursing intervention during perioperative period, while the observation group received nursing intervention based on Caprini risk assessment scale for VTE. The incidence of VTE and complications were compared between the two groups. *Results:* The incidence of VTE and postoperative complications in the observation group were lower than those in the control group ($P < 0.05$). *Conclusion:* Nursing intervention based on Caprini risk assessment scale for VTE can reduce the incidence of perioperative deep vein thrombosis and complications in patients with liver cancer; thus, it is worthy of clinical application.

Keywords: Thrombotic risk assessment scale based on Caprini model; Deep vein thrombosis; Liver cancer; Nursing intervention

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1. Introduction

Venous thromboembolism (VTE) is a common clinical disorder caused by abnormal aggregation of blood in veins. It includes deep vein thrombosis (DVT) and pulmonary embolism (PE). DVT is more common in the lower extremities, and the detachment of thrombus may cause pulmonary embolism, which endangers the life of patients. The incidence of VTE in patients with malignant tumors is about 5%–60%, which is about 4 times that of healthy people [1]. Liver malignancy ranks fourth in the incidence of malignant tumors in China. At present, surgical resection is an effective treatment. It is of great clinical significance to conduct perioperative VTE screening and intervention in patients with liver cancer, so as to achieve early detection and prevention. The Caprini risk assessment scale is an individualized VTE risk assessment model developed by American surgeons based on the clinical characteristic assessment of surgical patients by Caprini [2]. Relevant research results have shown that Caprini risk assessment scale can effectively screen high-risk, medium-risk, and low-risk patients with VTE, so as to facilitate the adoption of targeted, graded prevention measures and thus effectively reduce the incidence of VTE in patients [3]. In this study, we explored the effect of nursing intervention based on Caprini risk assessment scale for VTE in perioperative

patients with liver cancer.

2. Data and methods

2.1. General information

A total of 128 patients who received surgical treatment for liver cancer in our department from January 2021 to March 2022 were selected as the research subjects. Inclusion criteria: (1) surgical treatment for liver cancer; (2) no venous thrombosis on admission; (3) no sensory, language, motor, cognitive, intellectual, or other dysfunction before surgery; and (4) informed consent given. Exclusion criteria: (1) patients with confirmed venous thrombosis at admission; (2) patients with contraindications at admission and no intervention measures can be taken; (3) patients using anticoagulants, such as low molecular weight heparin and warfarin; and (4) patients with communication disorders and poor compliance. Patients who met the criteria were divided into two groups (a control group and an observation group) according to odd and even numbers of inclusion order, with 64 cases in each group. The control group consisted of 38 male and 26 female patients with an average age of 59.3 ± 3.65 years, while the observation group consisted of 34 male and 30 female patients with an average age of 62.1 ± 2.11 years. There were no deaths in the two groups during hospitalization, and no statistically significant differences were observed between the two groups in terms of age, gender, surgical method, operation time, Autar [4] score, and other data ($P > 0.05$), as shown in **Table 1**.

Table 1. Comparison of general data between the two groups

Factors	Control group	Observation group	*P*-value
Gender			
Male	38	34	
Female	26	30	
Age (mean ± SD, years)	59.3 ± 3.65	62.1 ± 2.11	> 0.05
Operation time (mean ± SD, h)	3.56 ± 1.23	3.72 ± 1.06	> 0.05
Autar score on postoperative day			
Medium-risk group (11–14 points)	23	21	
High-risk group (≥ 15 points)	41	43	

2.2. Methods

2.2.1. Control group

Routine nursing was adopted in the perioperative period, *i.e.*, the nurses explained to the patients and their families the purpose and method of preventing venous thrombosis, ensured that the patients maintained proper lower limb position, turned over the patients and patted their backs regularly, avoided the lower limb intravenous line, ensured moderate fluid replacement to avoid blood from being too concentrated, taught the patients ankle pump exercises in bed, encouraged them to drink more water, *etc*.

2.2.2. Observation group

On the basis of routine nursing, the Caprini risk assessment scale for VTE was used for scoring and intervention. The specific measures were as follows: a VTE intervention core group consisting of 2 chief physicians, 4 attending physicians, 1 head nurse, and 5 nurses was established in the department of which the 2 chief physicians in the team were responsible for training the team members on VTE-related knowledge and the application of the risk assessment scale. Each team member mastered the evaluation methods and preventive measures of the risk assessment scale. The first assessment of each patient was

done by the doctor and nurse in charge within 24 hours of admission using the Caprini risk assessment scale. The patient/family member was required to provide informed consent, and the results were recorded in the course of disease and nursing record sheet. High-risk and extremely high-risk patients were assessed every 8 hours, dynamically when their condition changes, and again within 6 hours after surgery. 0–1 was classified as low risk, 2 as medium risk, 3–4 as high risk, and 5–7 as very high risk (**Table 2**). According to the score, corresponding nursing and treatment orders were provided by the doctor in charge (**Table 3**). For high-risk and extremely high-risk patients with a score of 3 or more, the chief physician of the group was invited to participate in the review of the treatment plan. The specific measures are stated below.

(1) Basic measures: Suitable for low-risk patients with a score of 0–1. The doctors and nurses in charge educated and encouraged the patients to quit smoking and drinking, keep their stools soft, drink more water (> 2,500 mL/d), perform deep breathing exercises, blow up balloons, get out of bed more often, perform ankle pump and quadriceps exercises, prevent lower limb infusion, *etc*.

(2) Basic measures + physical measures: Suitable for medium-risk patients with a score of 2. On the basis of basic measures, intermittent pneumatic compression device was used and elastic socks were worn. Pneumatic therapy was performed twice a day for one hour each time. The nurses assisted the patients in selecting medical elastic socks with appropriate specifications and instructed the patients to wear them before getting up or 8 minutes after elevating their lower extremities, with a slight sense of tightness as appropriate, observe the temperature and color of their lower extremities, wear them for no more than 12 hours a day, and relax once every 4 hours.

(3) Basic measures + physical measures + drug: Suitable for high-risk patients with a score of 3–4. On the basis of basic measures + physical measures, oral warfarin and rivaroxaban or injection of low molecular weight heparin were followed by medical advice to ensure timely and accurate anticoagulant therapy. In drug treatment, patients were encouraged to avoid injury or falls and brush their teeth with a soft-bristled toothbrush, observed for bleeding tendency, regularly tested to determine their coagulation function, and given low molecular weight heparin according to the results; their body temperature was closely monitored, and the color and swelling of their limbs were also monitored on a daily basis; a subcutaneous injection of 4000 IU low molecular weight heparin was administered 12 hours before surgery.

(4) Basic measures + physical measures + drugs + others: Suitable for extremely high-risk patients with a score of 5. On the basis of implementing the aforementioned measures, vascular surgeons and other specialists were invited for consultation when necessary to conduct individualized intervention programs and regularly review the patients' coagulation function and other indicators.

Table 2. Caprini risk assessment scale

Score	Description
1 point	Age 41–60; obese (BM1 ≥ 25 kg/m^2); abnormal pregnancy; pregnancy or postpartum (1 month); on birth control pills or hormone replacement therapy; bedbound; history of inflammatory bowel disease; lower limb edema; varicose veins; severe lung disease, including pneumonia (within 1 month); abnormal pulmonary function, chronic obstructive pulmonary disease; acute myocardial infarction; congestive heart failure (within 1 month); sepsis (within 1 month); planning for minor surgery; major surgery (within 1 month); other risk factors
2 points	Age 61–74; plaster fixation (within 1 month); in bed for > 72 hours; malignant tumor (past or present); central vein catheterization; laparoscopic surgery (> 45 minutes); major surgery (> 45 minutes); arthroscopic surgery
3 points	Age ≥ 75; deep vein thrombosis/pulmonary embolism; family history of thrombosis; heparin-induced thrombocytopenia (HIT); congenital or acquired thrombosis; anticardiolipin antibody positive; prothrombin 20210A positive; factor V Leiden positive; Lupus anticoagulant positive; elevated serum homocysteine.

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5 points	Stroke (within 1 month); acute spinal cord injury (paralysis) (within 1 month); selective lower limb joint replacement; multiple trauma to hip, pelvic, or lower limb fractures (within 1 month)

Note: Low risk 0–1 point; medium risk 2 points; high risk 3–4 points; extremely high risk ≥ 5 points

Table 3. Corresponding treatment strategy

Surgical and invasive procedures	Venous thromboembolism risk classification	Prevention strategy
0–1	Low risk	Basic measures
2	Medium risk	Basic + physical measures
3–4	High risk	Basic + physical + drug
≥ 5	Extremely high risk	Basic + physical + drug + other
(1) Basic measures: □ Elevation of affected limb □ Ankle movement □ Quadriceps contraction □ Turn over or actively flex lower limbs every 2hours □ Drink more water □ Quit smoking and drinking □ Keep bowels open □ Deep breathing exercises or blow balloons □ Get out of bed and exercise □ Others: _____		
(2) Physical measures: □ Intermittent inflation pressure device □ Wear elastic socks		
(3) Drug: □ Low molecular weight heparin subcutaneous injection □ Rivaroxaban □ Warfarin □ Other		

2.2.3. Observation indicators

The incidence of VTE and its complications were compared between the two groups. Lower limb vascular ultrasonography was performed 3–5 days after surgery to determine the presence of DVT. Complications included pulmonary infection, gastrointestinal bleeding, pressure sore, *etc*., and gastrointestinal bleeding included blood in gastric fluid from gastric tube drainage, positive stool occult blood, and black stool.

2.2.4. Statistical analysis

SPSS 17.0 was used. Statistical data were compared by chi-square test with two independent samples, and rank data were compared by Wilcoxon rank-sum test with a test level of $\alpha = 0.05$.

3. Results

3.1. Incidence of venous thromboembolism

The occurrence of VTE in the two groups was compared (see **Table 4**). Postoperative VTE occurred in one case (3.12%) in the observation group and five cases (7.81%) in the control group, with four cases of DVT involving the lower extremity and one case of pulmonary embolism. The incidence of thrombus in both the observation group and the control group was consistent with the findings of Jing *et al*. [5].

Table 4. Comparison of venous thromboembolism incidence between the two groups

Group	Number of cases	With VTE	No VTE
Control group	64	5 (7.81)	59 (92.19)
Observation group	64	1 (1.56)	63 (98.43)
χ^2 value			9.714
P-value			0.002

Abbreviation: VTE, venous thromboembolism.

3.2. Complications

The comparison of complications between the two groups is shown in **Table 5**.

Table 5. Comparison of rate of complications between the two groups

Group	Number of cases	Bleeding from gastric tube drainage	Stool occult blood	Tarry stool	Pulmonary infection	Pressure sore
Control group	64	2 (3.92)	4 (7.84)	2 (3.92)	2 (3.92)	3 (5.88)
Observation group	64	0 (0.00)	1 (1.96)	1 (1.96)	1 (1.96)	1 (1.96)
χ^2 value						5.718
P-value						0.017

4. Discussion

VTE is a high-incidence complication after major surgery and also one of the important causes of perioperative deaths and unexpected deaths in hospital. According to Nam *et al*. [6], prevention and control should be carried out according to the level of VTE risk to ensure appropriate prevention and control; both safety and efficacy should be taken into account. Patients with liver cancer after surgery may be at high risk of thrombosis due to prolonged immobilization, as well as surgical and tumor-related factors. A survey of 32 countries around the world has shown that the evaluation process by nurses is time-consuming, patients have poor compliance, and nearly half of the patients at high risk for VTE do not take any preventive measures [7]. The Caprini risk assessment scale requires doctors and nurses to participate in assessment and intervention, so as to ensure that patients receive both clinical and nursing intervention, effective communication between medical care, dynamic observation of the condition, and timely adjustment of intervention measures. Through whole-course and professional health guidance and intervention, patients are more likely to accept it, thus achieving the purpose of preventing VTE. The American College of Chest Physicians (ACCP) clinical practice guidelines recommend risk stratification based on Caprini score [8], followed by standardized care and treatment. The Caprini risk assessment scale accurately reflects the degree and level of risk of patients by assessing the risk of VTE. Targeted nursing interventions based on the level of risk can effectively reduce the possibility of VTE occurrence in patients [9] and improve the quality of life and satisfaction of patients. In the present study, the incidence of VTE and its complications in the observation group were lower than those in the control group, and the satisfaction of patients in the observation group was higher than that of patients the control group.

In conclusion, the overall diagnostic accuracy of VTE risk assessment for patients with liver cancer surgery based on Caprini risk assessment scale is high. Caprini risk assessment scale can be used to effectively screen out patients with risk of venous thrombosis and ensue targeted intervention measures, which can effectively reduce the incidence of VTE and its complications, improve patients' quality of life, and increase patient satisfaction. Therefore, it is worth promoting and using in clinical settings.

Disclosure statement

The authors declare no conflict of interest.

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