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An Analysis of Risk Factors for Deep Vein Thrombosis in the Lower Limbs and Nursing Strategies

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Abstract: This study aimed to analyze risk factors for deep vein thrombosis (DVT) in the lower limbs among inpatients and to discuss appropriate nursing measures. Clinical data from 32 DVT patients were analyzed retrospectively to identify the potential risk factors. Except for one case who was transferred to another hospital for surgical treatment, all 31 cases received conservative therapy via medication. With the Autar DVT scale applied, 10 cases scored below 10; 11 cases 11-14, and 11 cases 15 or above 15. The preliminary risk factors for DVT included advanced age, concurrent high-risk illnesses, lying in bed, obesity, trauma and surgical intervention. Among these 32 cases, the commonly noted concurrent illnesses were hypertension, coronary heart disease, diabetes, atrial fibrillation, infection and cerebral infarction. Twenty-five cases were combined with three or more concurrent illnesses (78.1%). Considering the risk factor scores for DVT and increasing the level of knowledge about DVT among nursing staff are crucial points in improving the quality of nursing practices. Extended nursing is a significant factor in reducing the risk of DVT among those lying in bed for long periods.

Keywords: Deep Vein Thrombosis, Risk Factors, Nursing Intervention

1. Introduction

Venous thromboembolism (VTE) consists of deep vein thrombosis (DVT) and pulmonary thromboembolism (FTE), with DVT accounting for about two thirds of all VTE cases [1]. DVT refers to the condition where in the blood coagulates abnormally in deep veins, thereby blocking the vascular lumen and leading to venous return flow disorder. If not properly treated, DVT may finally result in chronic deep venous insufficiency (CVI), which hinders patients' daily functioning and may even cause disability or death [2]. This study retrospectively analyzes clinical data from 32 patients with DVT in their lower limbs, confirmed by vascular color Doppler ultrasound at the 7th People's Hospital in Changzhou City from August 2013 to July 2016. By reviewing their medical histories, the risk factors for DVT and the appropriate preventive treatment and nursing measures are analyzed. A solid basis is then laid for comprehensive intervention against DVT in the lower limbs.

2. Data and Methodology

2.1. Baseline Information

From the databases of the functionary department, the clinical data of patients with DVT (confirmed by vascular color Doppler ultrasound) from August 2013 to July 2016 were retrieved. Their medical histories were reviewed from medical records based on the inpatient number. According to the inclusion and exclusion criteria, 32 DVT cases were included, with 17 males and 15 females. They were aged 44-97 years old with an average of 71.4 ± 14.7 years. There was one patient aged 91-97 years old, with 11 patients aged 81-90, 6 aged 71-80, 7 aged 61-70, 3 aged 51-60, and 4 aged 41-50. As to their distributions across the departments, 7 patients were from the department of cardiovascular medicine, 4 from the department of traumatic surgery, 5 from the

department of urology, 3 from the department of hematology and oncology, 3 from the department of general surgery, 3 from the department of neurology, 2 from the ICU, 2 from the department of endocrinology, 1 from the department of orthopedics, 1 from the department of urinary surgery and 1 from the department of respiratory medicine. There were three cases who visited the outpatient clinic and were admitted into the department of nephrology, the department of general surgery and the department of neurology, respectively.

2.2. Method

The Autar DVT scale was applied to all 32 cases. Low-risk patients were those scoring ≤ 10 points; moderate-risk patients scored 11-14 points, and high-risk patients scored ≥ 15 points. The difference in the scores for each factor on the Autar DVT scale was analyzed retrospectively for patients of different levels of risk.

3. Results

3.1. Analysis of Baseline Data Among DVT Patients

The initial symptoms included swelling, pain, increased skin temperature, decreased muscle strength, purplish skin and lack of pulse in the lower limbs. Ten cases (31.3%) had edema or convulsion bilaterally in the lower limbs, and three cases (9.4%) were asymptomatic. DVT affected the proximal end of the lower limbs (the popliteal vein or its adjacent sites, and the femoral vein) in 30 cases and in the distal end (calf muscle veins) in 2 cases. DVT affected the left lower limb in 15 cases, the right lower limb in 16 cases and the myenteric veins bilaterally in the lower limbs in 1 case. DVT was confirmed on the day of admission in 5 cases, at 2-3 days post-admission in 14 cases, at 4-7 days post-admission in 3 cases, at 8-14 days post-admission in 5 cases, at 15-30 days post-admission in 1 case and at over 30 days post-admission in 4 cases. DVT occurred within one week post-admission in 22 cases (68.8%) and within two weeks post-admission in 27 cases (84.4%).

3.2. Treatment and Outcomes

Except for one case who was transferred to another hospital

for surgical treatment, all of the remaining 31 cases received conservative therapy via medication. The therapy consisted of urokinase thrombolysis, low-molecular-weight heparin calcium, anticoagulation with bayaspirin or warfarin, as well as blood-activating therapy such as Xuesaitong Injection, Shuxuetong Injection, Shenmai Injection and Xuebijing Injection. As to nursing procedures, before the confirmation of DVT, the patients were instructed to perform lower limb functional exercises and ankle pump exercises, to receive an injection of low-molecular-weight heparin calcium and to monitor any adverse events. After confirmation of the diagnosis, the patients were told to elevate the affected limb, while avoiding hot compress, collision or venous puncture of the lower limbs, while recording any drug-related adverse events. After active treatment, the clinical signs and symptoms were either relieved or disappeared in all DVT patients.

3.3. Analysis of Risk Factors

Ten cases were scored ≤ 10 on the Autar DVT scale, 11 cases 11-14, and 11 cases ≥ 15. The overall mean score was 11.9 ± 4.9. The average score was 11.4 ± 3.2 in the patients of moderate-to-high risk. The scores on the Autar DVT scale for patients of different risk levels are shown in Table 1. All 32 cases were combined with one or several concurrent illnesses. Eighteen cases were combined with hypertension, 12 with coronary heart disease, 10 with diabetes, 8 with atrial fibrillation, 8 with infection, 7 with cerebral infarction, 6 with bone fracture, 6 with trauma, 3 with cancer, 1 with varices and 1 with pulmonary embolism. Twenty-five cases were combined with three or more illnesses (78.1%); 23 with 4 or more illnesses (71.9%), 16 with 5 or more illnesses (50.0%), and 14 with 6 or more illnesses (43.8%). Furthermore, 12 cases had already lain in bed for 7-60 days or had decreased muscle tone before admission (37.5%). Nine cases were given diuretics, 3 cases received surgical intervention for bone fracture in the lower limbs, and 1 case received transcatheter arterial chemoembolization. Four cases had a history of falls before admission, and 1 case fell after admission. Two cases had a prior history of DVT. All 32 cases received peripheral venous infusion in the lower limbs, and five of them had indwelling needles.

Table 1. Scores on the Autar DVT scale upon admission (x ± s).

Item	n	Age	Combined with high-risk illnesses	Motor ability	BMI	Risk of trauma	Surgical intervention	Autar scores
High-risk patients	11	4.6 ± 0.7	5.1 ± 2.7	3.5 ± 1.2	0.6 ± 1.4	1.8 ± 2.0	1.3 ± 1.8	17.0 ± 2.5
Moderate-risk patients	22	4.5 ± 0.8	4.8 ± 2.4	2.1 ± 2.0	1.0 ± 1.3	1.1 ± 1.8	0.8 ± 1.6	14.4 ± 3.2
Total	32	4.3 ± 1.1	3.8 ± 2.7	1.5 ± 1.9	1.3 ± 1.3	0.8 ± 1.6	0.6 ± 1.3	11.9 ± 4.9

4. Discussion

VTE has already become a major health concern worldwide [3]. It is the third leading cause of death associated with cardiovascular diseases after ischemic heart disease and stroke [4]. Hospitalization is among the major risk factors of VTE [5]. This study was concerned with the

risk factors and integrated intervention measures for DVT among the inpatients.

4.1. Raising Levels of Awareness about DVT

In the present study, 10 cases were confirmed based on edema and convulsion in bilateral lower limbs. Three cases were completely free of any discomfort and clinical signs

before the confirmed diagnosis. According to the previous literature, DVT is usually asymptomatic [6] and therefore neglected. That is why nursing staff should be fully aware of the risk of DVT. In our group, the diagnosis of DVT was confirmed at 1-2 weeks post-admission. The peak period of onset was 2-3 days post-admission, which is probably attributable to the fact that 12 cases had lain in bed for 7-60 days at home before admission. Moreover, the long-term stay in bed, reduced mobility and insufficient preventive measures after admission also contributed to DVT. According to Huang et al. [7], the incidence of DVT was 3.33% in patients lying in bed for less than 7 days, but as high as 8.22% in those lying in bed for 7 days or longer. Therefore, DVT screening is necessary after admission. In another study [8], endothelin-1 (ET-1) plus serotonin (5-HT) was proposed as a biomarker of early diagnosis and detection of DVT, though the specificity was not satisfactory. Venous DSA is considered as the gold standard for diagnosis of DVT in the lower limbs, but the preparation and examination procedures are time-consuming in addition to the invasiveness of this technique. In contrast, color Doppler ultrasonography of the veins in the lower limbs has high diagnostic sensitivity and specificity, and is also non-invasive. Therefore, this method is mainly used for screening and dynamic monitoring of DVT [9]. It is important for the inpatients to receive the first color Doppler ultrasonography of the veins after admission. On this basis, the necessity and feasibility of functional exercises will be assessed in comparison with the patients' condition so as to prevent thrombus shedding. Early mobility, dietary guidance and drug intervention are of high value for reducing the incidence of DVT [10-12]. In a meta-analysis, a lower extremity venous pump can significantly reduce the incidence of DVT [13]. Moreover, the combined use of mechanical therapy and drug intervention outperforms either one alone [14].

4.2. Valuing the Importance of Risk Factor Scores for DVT

Zhang et al. [15], in a multivariate non-conditional logistic regression analysis, showed that advanced age was an independent risk factor for DVT in the lower limbs. Bi et al. [16] conducted nursing risk prewarning monitoring, which proved capable of increasing the accuracy of risk factor analysis implemented by the nurses and decreasing the incidence of DVT. In the current study, most DVT patients were affected by one or several other high-risk illnesses [16]. The common concurrent conditions included hypertension, coronary heart disease, diabetes, atrial fibrillation, infection, cerebral infarction and bone fracture. Twenty-five cases were combined with three or more illnesses (78.1%), 18 with hypertension (56.3%), 12 with coronary heart disease (37.5%), 10 with diabetes (31.3%) and 8 with infection (25%). According to the literature, patients with several illnesses admitted to the department of internal medicine were more likely to have DVT than those with trauma or bone fracture, or those receiving surgery or invasive procedures [17]. Cardiovascular diseases, atherosclerosis and hypertension are risk factors of VTE, which can be prevented

by a lifestyle conducive to heart health [18]. Close attention and early DVT screening are required for inpatients with these three risk factors to formulate the most appropriate preventive and nursing measures. In addition, attention should also be paid to the use of diuretics and decreased muscle tone as high risk factors of DVT, which may be associated with dehydration-induced blood concentration and decline in muscle pump function, consistent with the high incidence of thrombosis in restrictive fluid therapy, as reported by Xi et al. [19]. These patients should drink more water or increase fluid infusion if permitted, in order to reduce perioperative dehydration [20].

4.3. Improving the Quality of Specialist Nursing

Nurses from different departments tend to attach importance to different aspects of nursing for DVT [21]. Nurses from the department of surgery and the ICU are more concerned with active and passive functional exercises and diet, and keep a thorough record of the nursing measures used after the onset of DVT, such as elevating the affected limb, forbidding hot compress and massage, and close observation of swelling and pain in the body. In contrast, nurses from the department of internal medicine care more about body position, diet and drug-related adverse events, but pay less attention to a detailed record of nursing procedures following DVT. This may be related to the standardized prevention measures for DVT and the relevant training in the department of surgery and the ICU. In other words, nurses specially trained at these two departments have higher awareness of the prevention of DVT. Consistent with relevant studies [22], nurses who have received systematic training tend to develop a higher awareness of the prevention of DVT in the lower limbs. These nurses will remind the doctors to perform examinations to detect potential DVT in high-risk patients. Among relevant foreign studies [23-24], nurses play an important role in active observation, risk prevention and management of complications. Li et al. [25] implemented health education for patients with DVT in the lower limbs using a standardized pathway of health education and informing the nurses at different levels about uniform health education protocols for DVT management. Xu et al. [26] effectively reduced the risk factors of DVT by establishing a DVT management group, in an attempt to improve specialist nursing skills and quality. Zhan et al. [27] carried out monitoring of five specialist nursing quality indicators, including the implementation rate of prevention measures for DVT, which was successful in reducing the incidence of DVT in the lower limbs, promoting the improvement of specialist nursing levels, and developing a system for sustained quality improvement.

4.4. Implementation of Extended Nursing

Among the 32 DVT patients in our study, 12 patients had already lain in bed for a long time or had decreased muscle tone before admission. Four patients had history of falls, and 2 patients had a prior history of DVT. For these patients,

health education after discharge is highly important. Firstly, discharge instructions and extended nursing should be emphasized by medical and nursing staff, which should focus on teaching elderly patients who lie in bed for a long time about breathing, turning onto their sides, elevating the limbs, lifting the buttocks and other stress-relief activities in bed. Secondly [28], training on nursing knowledge and skills for chronic diseases should be carried out among community-based medical staff, a health management system for patients should be established, and the hospital-community-family connection should be enhanced.

To conclude, considering the risk factor scoring system for DVT and raising the awareness of nursing staff about DVT are crucial to improve the quality of nursing for DVT management. Moreover, extended nursing post-discharge is significant in controlling the risk of DVT among patients who lie in bed for extended periods.

5. Conclusion

In this study, a retrospective analysis of risk factors in 32 cases of deep vein thrombosis of the lower extremities found that a patient's score for DVT risk factors played a very important role in early identification of individuals at high risk of DVT. Improving the awareness levels of DVT among nursing staff, and identifying and taking corresponding preventive measures in time can reduce the risk of DVT, and is also the key to improving the quality of relevant nursing practices. At the same time, improving the guidance given at patient discharge and carrying out continuous nursing are of positive significance in reducing the risk of DVT in patients who are bedridden for long periods of time.

Acknowledgements

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Biography

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