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ARTICLE

# Clinical Application of Percutaneous Transluminal Angioplasty and Stent Implantation in Acute Lower Extremity Deep Venous Thrombosis

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ABSTRACT

Purpose: To analyze the application of percutaneous transluminal angioplasty and stenting in acute deep venous thrombosis of lower extremities. Methods: 70 patients were divided into two groups according to the presence or absence of percutaneous transluminal angioplasty and stenting. Results: The mean circumferential diameter difference between the affected limbs and the healthy limbs and the knees at 15 cm was statistically significant. The cure rate and effective rate of the research group were higher than those of the control group ($P<0.05$). Conclusion: Percutaneous transluminal angioplasty and stenting are of high value in acute lower extremity deep venous thrombosis.

## 1. Introduction

Deep vein thrombosis of the lower extremity, also known as deep vein thrombosis of the lower extremity, is a common disease, which refers to the clotting of venous blood in the deep veins of the lower extremities. This disease is prone to residual varicose veins, lower extremity edema, hyperpigmentation, stasis, ulcers, dermatitis and other diseases.[1] A large number of literature reports that anticoagulation and transcatheter endovascular thrombolysis are effective methods for the treatment of deep vein thrombosis, but not all patients can achieve therapeutic goals. In recent years, academic research on the deep venous thrombosis of the lower extremities has continued to deepen, and with the rapid development of interventional therapy, some scholars have begun to propose a comprehensive intervention program for the treatment of deep venous thrombosis of lower extremities, and put it into practice. In this paper, the authors conducted a group research of 70 patients to explore the clinical application of percutaneous transluminal angioplasty and stenting in acute lower extremity deep venous thrombosis. The research is summarized as follows.

## 2. Data and Methods

### 2.1 Basic Data

From March 2015 to November 2017, 70 patients with acute deep venous thrombosis of the lower extremity admitted to our hospital were selected as subjects of this research. All subjects had complete clinical data. The affected limb was diagnosed by color Doppler or deep

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venous angiography of the lower extremity, and the first onset was clinically manifested as lower extremity swelling, pain, bruising, etc. The patients are informed of the research, willing to participate in the research, and signed the informed consent forms. The research was approved by the Medical Ethics Committee. Among them, patients who did not want to participate in the research were excluded, and patients with severe heart, liver and kidney dysfunction, mental disorders, severe disability and inability to communicate properly were excluded. Females during pregnancy or lactation were also excluded. According to the presence or absence of percutaneous transluminal angioplasty and stenting, the 70 patients were divided into two groups: control group (n=32) and research group (n=38). Control group: 19 males and 13 females, the youngest age was 18 years old, the maximum age was 74 years, the average age was (51.4±5.98) years old, the course of disease was 1-7 days, and the average disease duration was (4.5±0.86) days. Research group: 22 males and 16 females, the youngest age was 19 years old, the maximum age was 71 years old, the average age was (50.9±5.14) years old, the course of disease was 1-9 days, and the average disease duration was (4.7±1.35) days. Objective comparison of the basic data of the above two groups of patients, the difference is not large, no statistical significance, P> 0.05, but comparable, can be grouped.

## 2.2 Methods

In the control group, percutaneous transluminal angioplasty and stenting were not performed. The research group underwent percutaneous transluminal angioplasty and stenting. The specific treatment plan is as follows: (1) the inferior vena cava filter was placed through the contralateral femoral vein. According to the actual situation of the patient, 57 cases were selected Braun filter, and 13 cases were selected with Cordis filter. Take the prone position, after successful puncture of the iliac vein, the conventional indwelling sheath, using catheter pulse technology, give 3000 U heparin, and inject 50-100 million U urokinase. Thrombus was still seen in 41 patients after thrombolysis and was treated with thromboablation. Based on the fluoroscopy, a 7F thrombus ablation (ATD) catheter was selected, and the head end was placed in close contact with the thrombus to perform ablation. At the time of ablation, an appropriate amount of contrast agent was injected through the catheter sheath bypass to evaluate the thrombus ablation effect. After the above treatment, 38 patients with residual stenosis >30%, residual segmental irregular stenosis or occlusion of the vessel segment were performed by angiography, and percutaneous transluminal angioplasty and stenting were performed. During operation, the guide wire is exchanged and delivered to the inferior vena cava, through the filter, to the proximal end; a 6-10mm Nylon balloon produced by American Bard International Co., Ltd. was used for preoperative percutaneous transluminal angioplasty with a lesion of 4-8 atm. Before placing the stent, give 3000 U heparin. According to the specific condition of the diseased blood vessel, choose a suitable self-expanding stent (8-12 mm in diameter and 6-10 cm in length). Lum inexx W allstent stents are generally used, which are implanted in the order of the proximal end - the distal end. In patients with stenosis of the common iliac vein, the head end of the stent enters the inferior vena cava, about 0.5-1.0 cm. During the release of the stent, the position is slightly adjusted to ensure good adherence and smoothness. After the sheath is retracted to the end mark, the stent is completely released. The same method is used to perform the next stent implantation operation. Under normal circumstances, the distal end of the distal end stent should not exceed the proximal segment of the femoral vein. (2) 500,000 urokinase was pumped daily through the indwelling sheath for 3-5 days; subcutaneous injection of low molecular weight heparin, i.e. speed Bilin, 0.4ml/time, once a day; oral aspirin, 100mg/time, 1 Times / d; from the 5th day, add warfarin, starting from 8d, use warfarin alone. Among them, warfarin anticoagulant therapy lasts for 6-9 months. According to the patient's condition, the dosage of warfarin is adjusted appropriately to ensure that the international normalized ratio (NR) is within the controllable range.

## 2.3 Observation Indicators and Efficacy Evaluation

### 2.3.1 Observation Indicators

The average circumferential diameter difference between the affected limbs and the healthy limbs and the knees at 15 cm was observed and compared.

### 2.3.2 Evaluation Criteria for Efficacy

The efficacy evaluation criteria of this research included four indicators: cure, markedly effective, effective and ineffective: (1) cure. After treatment, the blood flow recovered completely, or basically recovered, no contrast agent retention, the residual stenosis of the lumen was less than 30%, the residual stenosis of the stent implantation was less than 20%, and the clinical symptoms and signs basically disappeared. (2) Markedly effective. After treatment, the patient's blood flow recovered most, no contrast agent retention, lumen residual stenosis 30%-70%, clinical symptoms and signs basically disappeared. (3) Effective. After treatment, the patient's blood flow recovery part, accompanied by mild contrast agent retention, occlusion of the lumen has been opened, but the residual stenosis is greater than 70%, or the vascular part of the obstruction section is opened, the collateral circulation is significantly increased compared with before treatment, clinical symptoms And the signs have improved. (4) Invalid. After



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treatment, the above criteria were not met, and there was obvious contrast agent retention.[2] Total effective rate of treatment = (number of cures + number of effective cases + number of effective cases) / total number of cases 100%.

### 2.4 Statistical Methods

The data of this research were processed by SPSS20.00 software. The mean plus or minus standard deviation ($\bar{x} \pm s$) and the case (n) and percentage (%) indicate the measurement data and the count data. The T value and the X2 test were performed. The test value P was less than 0.05. The difference was statistically significant.

## 3. Results

### 3.1 The Average Circumferential Diameter Difference between the Affected Limb and the Healthy Limb on the Knee and 15cm below the Knee

The average circumferential diameter difference between the affected limbs and the healthy limbs and the knees at 15 cm was compared between the two groups. There was no significant difference before surgery. However, the difference was significant after the next day and the 5th day after surgery, which was statistically significant (P <0.05). See Table 1 for details.

### 3.2 Comparison of Clinical Efficacy Analysis

The clinical treatment effect of the two groups of patients was evaluated and compared. The total effective rate of the research group was 96.9%, and the total effective rate of the control group was 100%. There was no significant difference between the groups (P>0.05), but the cure rate and marked efficiency of the research group were significantly higher than the control group (P<0.05). See Table 2 for details.

## 4. Discussion

Deep venous thrombosis (DVT) is a disease of limb venous reflux. It refers to abnormal blood clotting in deep veins. Slow blood flow, damage to the vein wall and hypercoagulability are the key causes of the disease. Once a thrombus is formed, a small number of cases can be ablated or confined to the site of occurrence. Most patients will slowly spread to the deep vein trunk of the entire limb. If not diagnosed and treated in time, it may cause thrombosis and form sequelae, which have different effects on patients' daily life and work and research, greatly reducing the quality of life of patients, and even inducing pulmonary embolism and other diseases, causing serious consequences.[3-4] In recent years, a large amount of data indicates that the incidence of acute deep venous thrombosis of the lower extremities is increasing year by year. The clinical diagnosis and treatment has attracted the attention and attention of the public and clinicians, experts and scholars, and has become one of the important topics for academic research.

It has been reported that the anatomical features of the left iliac vein make it easier for the iliac vein system to form a thrombus. For most patients, the single treatment of blood flow is not effective, which easily leads to incomplete lumen recanalization or thrombus re-formation.[5] At the same time, deep venous blood flow cannot be recovered for a long time, may affect the function of venous valve, induce post-thrombotic embolism syndrome.[6] A total of 70 patients in this research were unilateral deep vein thrombosis. After anticoagulant thrombolysis and thromboablation, the patient's affordability was considered. 38 patients underwent percutaneous transluminal angioplasty and stenting. Table 1 shows that there was no significant difference in the mean circumferential diameter difference

**Table 1.** Analysis and Comparison of the Average Circumferential Diameter Difference between the Affected Limbs and the Healthy Limbs at 15 cm at Different Time Points in the Two Groups of Patients [$\bar{x} \pm s$, cm]

| Time | Position | Research Group (n=38) | Control Group (n=38) | T-value | P-value |
|---|---|---|---|---|---|
| Before operation | Above knee | 7.5±2.94 | 7.3±2.35 | 0.310 | 0.757 |
| | Below knee | 5.9±1.89 | 5.8±1.97 | 0.216 | 0.829 |
| Next day after operation | Above knee | 4.7±1.72 | 5.6±1.82 | 2.123 | 0.037 |
| | Below knee | 3.5±1.17 | 4.1±1.25 | 2.154 | 0.034 |
| 5th day after operation | Above knee | 0.9±0.31 | 1.8±0.69 | 7.227 | 0.000 |
| | Below knee | 0.7±0.25 | 1.5±0.51 | 8.536 | 0.000 |

**Table 2.** Evaluation and Comparison of Clinical Efficacy of Two Groups of Patients [n, %]

| Group | Number of cases | Cure | Markedly effective | Effective | Invalid | Total effective rate |
|---|---|---|---|---|---|---|
| Control Group | 32 | 9（28.1%） | 8（25%） | 14（43.8%） | 1（3.1%） | 31（96.9%） |
| Research Group | 38 | 20（52.7%） | 15（39.4%） | 3（7.9%） | 0（0） | 38（100%） |
| $X^2$- value | / | 12.566 | 4.749 | 33.619 | 3.148 | 3.148 |
| P-value | / | 0.000 | 0.029 | 0.000 | 0.075 | 0.075 |

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between the research group and the control group before the operation of the affected limb and the limbs and the knees at 15 cm (P>0.05). However, on the second day after surgery and on the fifth day after surgery, the mean circumferential diameter difference between the affected limbs and the healthy limbs and the knees at 15 cm was lower than that of the control group (P<0.05). Table 2 shows that there was no significant difference in the total effective rate between the research group and the control group (100% vs 96.9%, P=0.075). However, the cure rate and effective rate of the research group were significantly higher than those of the control group (52.7% vs 28.1%; 39.4% vs 25%, P < 0.05). According to the data in Table 1 and 2, percutaneous transluminal angioplasty and stenting are effective in improving clinical symptoms of patients.

Regarding the implantation of intravascular stents, the key is to determine that blood flow obstruction is caused by localized stenosis before surgery.[7] For percutaneous transluminal angioplasty and stent implantation, the following points should be noted during the operation: (1) Fully expand the stenotic vessels of the stent, and minimize residual stenosis. (2) There are many venous valves in the middle and distal femoral veins. When the stent is placed, it is easy to cause venous valve injury and cause sequelae of deep vein thrombosis. It is necessary to pay attention to it. Under normal circumstances, the end of the stent should not exceed the proximal end of the femoral vein. (3) The stent should not be connected to the joint as much as possible to prevent the joint from shifting. (4) The wall of the venous blood vessel is thin and the elasticity is poor. Once the pressure is applied, the collapse phenomenon is easy. For this, when the stent is selected, the diameter should be slightly larger than the diameter of the adjacent normal blood vessel, generally 2-3 mm. Ensure that the tension is appropriate and ensure that the blood vessels are unobstructed. (5) After placing the stent, slowly retract the catheter based on the perspective condition to prevent the position of the stent from changing.[8]

## 5. Conclusion

Through this research, the authors found that percutaneous transluminal angioplasty and stenting have a high application value in acute lower extremity deep venous thrombosis. For the acute phase of iliofemoral venous thrombosis, combined with percutaneous transluminal angioplasty and stenting, on the one hand, the meridian blood flow can be cleared as soon as possible, and the blood supply can be completely reconstructed. On the other hand, to eliminate the remaining problems of venous wall stenosis, to prevent increased pressure on the distal end of the stenotic blood vessels, slow blood flow to form new venous thrombosis, to prevent the formation of venous thrombosis. For high risk factors, certain measures can be taken to prevent deep vein thrombosis of the lower extremities. For example, preoperative and postoperative drug prevention, intraoperative operation, gentle movements, so as not to damage the intima, to avoid postoperative lower leg occipital to affect the deep venous return of the calf, encourage patients to carry out simple foot and toe active activities. Do more deep breathing, coughing movements, conditions to allow, early out of bed activities, if necessary, wear medical elastic stockings under the lower limbs, especially elderly patients, cancer, femur fractures, and postpartum women should pay attention.

In summary, percutaneous transluminal angioplasty and stenting for the treatment of acute deep venous thrombosis of the lower extremity, the effect is significant, it is recommended to promote the use.

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