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Original Article

Endovascular therapy for iliac vein compression syndrome: superior outcomes in non-thrombotic patients and risk factors for stent restenosis

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Abstract: Objective: To evaluate the long-term efficacy and thrombotic outcomes of endovascular therapy for iliac vein compression syndrome (IVCS), with a focus on identifying risk factors for postoperative stent restenosis. Methods: This retrospective cohort study analyzed 98 IVCS patients treated with endovascular therapy at Hefei First People's Hospital between January 2020 and December 2022. Patients were divided into non-thrombotic (NIVCS, n=48) and acute thrombotic (TIVCS, n=50) groups. Outcomes included 1-year stent patency, complications, and quality-of-life metrics (CIVIQ-20 and VCSS scores). Logistic regression was used to identify risk factors for restenosis, with diagnostic performance accessed via ROC analysis. Results: The NIVCS group demonstrated significantly better 1-year stent patency (91.67% vs. 74%, P=0.018) but higher complication rates (20% vs. 8.33%, P=0.025) compared to the TIVCS group. Both groups showed significant improvements in CIVIQ-20 and VCSS scores (P<0.05), with NIVCS patients achieving better final outcomes. Multivariate analysis identified thrombotic IVCS (OR=3.41, 95% CI: 1.28-9.07), body mass index ≥28 kg/m^2 (OR=2.89, 95% CI: 1.15-7.26), and hypertension (OR=2.54, 95% CI: 1.03-6.25) as independent predictors of restenosis. The predictive model demonstrated strong discriminative capacity (AUC=0.82, 95% CI: 0.74-0.90). Conclusion: Endovascular therapy effectively improves symptoms and quality of life in IVCS, particularly in non-thrombotic cases. The thrombotic subtype, obesity, and hypertension significantly influence long-term stent patency, highlighting the need for personalized postoperative management. These findings underscore the potential of risk-stratified therapeutic strategies in vascular interventions.

Keywords: Iliac vein compression syndrome, endovascular therapy, deep vein thrombosis, stent restenosis, risk stratification

Introduction

Iliac vein compression syndrome (IVCS) is a condition characterized by lower extremity and pelvic vein reflux due to compression of the iliac vein and abnormal adhesion structure in the cavity, caused by various factors [1, 2]. According to Virchow's triad of thrombosis: Bradyhemorheology, hypercoagulability, and vascular injury, IVCS is considered a significant risk factor for deep venous thrombosis (DVT). Once thrombosis forms, it is often difficult to recanalize spontaneously. If untreated, it may lead to post-thrombotic syndrome (PTS) and, in severe cases, pulmonary embolism (PE) due to thrombus migration in the acute stage [3]. Therefore, in patients with IVCS complicated by acute DVT, it is essential not only to address the DVT promptly but also to treat the underlying iliac vein stenosis or occlusion to improve DVT outcomes and maintain vessel patency [4, 5].

The treatment of IVCS mainly includes conservative or invasive approaches. Conservative treatment typically involves medication and the use of compression stockings. However, in patients with DVT or severe symptoms, conservative treatment often fails to fully alleviate symptoms. Multiple studies have shown that endovascular therapy can markedly improve symptoms, prognosis, treatment outcomes, and quality of life. Moreover, interventional treatments can help reduce the recurrence rate of DVT in these patients [6, 7]. Despite these benefits, the long-term efficacy of endovascular therapy in IVCS treatment, particularly its

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specific impact on DVT, remains controversial [8]. While some studies have indicated short-term efficacy, there is a lack of extensive research on long-term effects. In addition, the recurrence rate, chronic venous insufficiency, and potential complications after treatment warrant further investigation [9]. When treating IVCS, it is essential to consider the individual characteristics of each patient, particularly if DVT has already developed. Timely diagnosis and appropriate treatment are crucial for improving patient prognosis [10]. Therefore, to achieve optimal treatment outcomes, doctors should comprehensively assess patient characteristics, the risk of complications, and treatment options.

Traditional surgery for IVCS is associated with significant disadvantages, including major trauma, slow recovery, and a high incidence of postoperative complications. In contrast, percutaneous mechanical thrombectomy (PMT) has gained widespread use in the treatment of DVT in recent years. PMT incorporates catheter-based technique with the injection and inhalation of thrombolytic drugs to reduce or eliminate the effects of DVT [11]. This method can rapidly restore venous patency, lower blood pressure, and prevent the occurrence of post-thrombotic syndrome. Generally, patients with thrombotic IVCS are divided into stable chronic IVCS patients and acute IVCS patients. Stable chronic thrombotic IVCS patients tend to progress slowly with milder symptoms, whereas patients with acute TIVCS experience rapid progression and more severe symptoms, often requiring urgent intervention. In contrast, patients with non-thrombotic IVCS generally present with venous compression due to factors other than thrombosis, resulting in less severe symptoms compared to TIVCS patients, who often exhibit significant thrombosis or embolic lesions.

This study reviews the role of intravascular treatment for IVCS, with particular focus on DVT. The goal is to provide clinicians with effective treatment options based on long-term follow-up data and analysis of relevant patient outcomes. Such insights can inform effective treatment plans and reduce possible complications during the treatment process.

Methods

Case selection

This retrospective study included 98 patients diagnosed with IVCS at Hefei First People's Hospital from January 2020 to December 2022. Patients were divided into two groups: the non-thrombotic IVCS group (NIVCS) and the thrombotic IVCS group (TIVCS). General and clinical data from both groups were analyzed. This study was approved by the Ethics Committee of Hefei First People's Hospital. All patients met the diagnostic criteria detailed in the "Diagnosis and Treatment Standards for Common Venous Diseases" published by the Venology Group of the Vascular Surgery Branch of the Chinese Medical Association [12].

Inclusion criteria: (1) Diagnosis of IVCS and indications for endovascular treatment; (2) Presence of typical IVCS symptoms, such as unilateral lower limb swelling, pain, or varicose veins; (3) Preoperative lower limb venous Doppler ultrasound or computed tomography venography (CTV) indicating no absolute surgical contraindications; (4) Age between 20 and 90 years; (5) Complete medical records and one-year follow-up data after surgery.

Exclusion criteria: (1) Presence of other diseases affecting the lower limb venous system, such as DVT or venous malformations; (2) Severe cardiovascular, liver, or kidney dysfunction, or other major complications; (3) Pregnant or lactating women; (4) History of allergies to the drugs or contrast agents used in the study; (5) Serious mental illness or cognitive impairment; (6) Participation in other clinical trials that may affect the results of this study [13, 14].

Intervening method

Based on case review, patients were divided into two groups: the NIVCS group and the TIVCS group. Patients in the NIVCS group underwent percutaneous transluminal angioplasty (PTA) and stent implantation in the supine position. After local anesthesia, the femoral vein was punctured using Seldinger technique, and a 5F vascular sheath was inserted [15, 16]. Following systemic heparinization, angiography was performed to assess vascular status and le-

sion characteristics, and a roadmap was created. A guidewire with catheter support was advanced through the lesion to confirm the position of the catheter tip. According to the pathological conditions and the evaluated diameter of the original lumen, a balloon catheter of appropriate size and length was selected. The pathological segment was then dilated step-by-step, with each dilation conducted at the standard working pressure of the balloon and maintained for 2 to 3 min. If the lesion segment showed no significant improvement upon angiographic evaluation, or if elastic retraction exceeded 1/3 or stenosis was >50%, stent implantation was performed. The proximal end of the bare stent was positioned approximately 5-10 mm into the inferior vena cava, while the distal end was placed just before the common femoral vein (in cases with longer lesions require multiple stents, the overlap between stents should exceed 20 mm). The stent diameter was selected to be 10-15% larger than the normal vessel diameter to prevent stent displacement. After implantation, the affected iliac vein was developed, ensuring that the stent was well-positioned, the lumen was unobstructed, and collateral circulation was occluded. If necessary, balloon dilatation was performed, the vessel sheath was withdrawn, and pressure was applied at the puncture site to stop bleeding. For patients with severe varicose veins, simultaneous or staged superficial vein laser cauterization treatment was considered.

Patients in the TIVCS group underwent PMT combined with PTA and stent implantation. A temporary inferior vena cava (IVC) filter was inserted through the healthy femoral vein to prevent thrombus detachment. The vascular sheath was inserted through a puncture in the popliteal vein on the affected side, and venography was performed to determine iliofemoral vein blood flow velocity, thrombus occlusion, the position of iliac vein compression, lesion length and diameter, and IVC patency. The catheter, along with a guide wire, was introduced into the thrombus aspiration system through the common iliac vein on the affected side. Initially, 200,000 units of urokinase were sprayed into the thrombus for thrombolysis. After 15 minutes, the thrombus aspiration mode was activated to aspirate fresh thrombus from the iliofemoral vein. For patients requiring balloon dilation and stent implantation, corresponding PTA and stent implantation were performed in the first phase. Finally, IVC filter was retrieved after confirming that no new blood clots had been captured.

All patients began anticoagulant therapy with low molecular weight heparin (100 U/kg subcutaneously every 12 h) immediately after surgery, in addition to taking enteric-coated aspirin and wearing elastic compression stockings. Following discharge, patients in the NIVCS group continued anticoagulant treatment for at least 3 months, while those in the TIVCS group received at least 6 months of treatment. In addition, all patients were instructed to wear elastic stockings for at least 6 months and attend follow-up examinations at 1, 3, 6, and 12 months post-surgery.

Data collection and outcome measurement

The research team collected basic demographic and clinical information from participants. Additionally, detailed information about the stent such as quantity, type, diameter, total length, and position, was recorded. Moreover, a comprehensive evaluation of patients' preoperative and postoperative conditions was conducted. The degree of stenosis was evaluated through lower limb venous Doppler ultrasound and CTV. Follow-ups were conducted 12 months after surgery to monitor stent patency and the occurrence of complications.

The study used the Chronic Venous Insufficiency Quality of Life Questionnaire (CIVIQ-20) and Venous Clinical Severity Scale (VCSS) to gather data on the patients' quality of life and clinical symptom improvement. Changes in the patients' condition before and after surgery were monitored through regular outpatient visits and remote communication methods, such as phone calls or WeChat. The CIVIQ-20 served as the primary tool to measure differences in patient quality of life (QL), while the VCSS was used to quantify surgical outcomes, providing direct evidence of the effectiveness of surgical interventions. This method ensured comprehensive evaluation and helped optimize treatment plans in clinical work.

Statistical analysis

Data were analyzed using SPSS 23.0. Continuous variables with a normal distribution

Table 1. Comparison of general information between patients in the NIVCS and TIVCS groups

Group	NIVCS	TIVCS	t or χ^2	P
Number of cases (n)	48	50	-	-
Sex			0.151	0.697
Male (Case, %)	23 (47.92)	22 (44)		
Female (Case, %)	25 (52.08)	28 (56)		
Average age ($\bar{x}$±sd, age)	68.29±10.17	68.36±11.09	0.032	0.974
Weight ($\bar{x}$±sd, kg)	52.67±12.37	54.36±8.25	0.799	0.427
BMI ($\bar{x}$±sd, kg/m^2)	26.37±5.22	27.15±2.78	0.928	0.356
Smoking situation ($\bar{x}$±sd, year)	15.37±4.15	17.33±3.64	2.488	0.015
Alcohol consumption situation ($\bar{x}$±sd, year)	26.31±8.37	32.67±8.18	3.804	<0.001

NIVCS, non-thrombotic iliac vein compression syndrome; TIVCS, acute thrombotic iliac vein compression syndrome.

(assessed using the Shapiro-Wilk test) were expressed as mean ± standard deviation. Comparisons between two groups were made using independent t-tests, while one-way ANOVA with LSD post hoc tests (multiple groups) was used for comparisons among multiple groups. Categorical variables were reported as frequencies (%) and analyzed using χ^2 or Fisher's exact tests (for expected frequencies <5). Binary logistic regression was employed to identify independent risk factors for stent restenosis, and receiver operating characteristic (ROC) curve analysis was used to calculate the area under the curve (AUC) and 95% confidence interval (95% CI) to evaluate the discrimination power of the model. A significance level of α=0.05 was used for all tests.

Results

Comparison of general information between NIVCS group and acute TIVCS group

This study included 98 IVCS patients, including 45 males and 53 females, aged 52 to 81 years. Among the participants, 29 were smokers, 25 were drinkers, and 22 had hypertensive patients. Lesions were found in the left lower extremity in 72 patients, the right lower extremity in 15, and both lower extremities in 11. A total of 115 stents were implanted, including 44 braided Wallstent stents and 71 self-expanding Luminexx stents. When comparing the NIVCS and TIVCS groups, no statistically significant differences were observed in age, sex distribution, body mass index, smoking, or alcohol consumption (P>0.05). These factors were therefore unlikely to influence the subsequent comparison of the efficacy of NIVCS and TIVCS. The general comparison of data is shown in **Table 1**.

Comparison of CIVIQ-20 scores between NIVCS group and TIVCS group of patients

CIVIQ-20 scores continued to decline in the 12 months after surgery. Although the score of the NIVCS group was lower than that of the TIVCS group in the first month, the difference was not statistically significant. It is worth noting that there were significant differences among the groups at 2, 3, 4, 6 and 7 months, especially at 4 and 7 months. By 12 months, there was no statistically significant difference in scores between the two groups, indicating that the long-term results of the two surgical methods were consistent. Overall, both surgical methods effectively improved patients' long-term quality of life (QoL), as shown in **Table 2**.

Comparison of VCSS scores between NIVCS group and TIVCS group of participants

The results showed a significant decrease in VCSS scores for both groups after surgery, indicating substantial improvement in clinical symptoms. The score of the NIVCS group was slightly higher in the first month after surgery, but the difference was not statistically significant. However, during the 12-month follow-up, the improvement in symptoms was similar between the two groups, demonstrating that both NIVCS and TIVCS treatment methods effectively improved the clinical symptoms of patients, as shown in **Table 3**.

Comparison of general information between the stent restenosis (SR) group and the stent patency (SP) group

Based on the stent patency during the follow-up period, the 98 IVCS participants were separated into a SR group (n=20) and a SP (n=78)

Table 2. Comparison of CIVIQ-20 scores between NIVCS group and TIVCS group

Group	NIVCS group	TIVCS group	*t*	*P*
The 1th month	54.21±4.36	56.08±5.27	1.909	0.059
The 2nd month	51.06±1.68[a]	53.21±4.68[a]	3.002	0.003
The 3rd month	48.28±5.01[a,b]	50.63±2.72[a,b]	2.901	0.004
The 4th month	45.08±3.87[a,b,c]	47.86±0.75[a,b,c]	4.983	<0.001
The 5th month	42.72±2.86[a,b,c,d]	44.06±4.38[a,b,c,d]	1.785	0.077
The 6th month	39.06±3.75[a,b,c,d,e]	41.38±4.21[a,b,c,d,e]	2.876	0.005
The 7th month	36.76±2.38[a,b,c,d,e,f]	38.38±1.38[a,b,c,d,e,f]	4.142	<0.001
The 8th month	35.29±3.78[a,b,c,d,e,f,g]	36.63±4.35[a,b,c,d,e,f,g]	1.624	0.107
The 9th month	33.53±6.74[a,b,c,d,e,f,g,h]	35.21±2.35[a,b,c,d,e,f,g,h]	1.660	0.100
The 10th month	30.75±4.06[a,b,c,d,e,f,g,h,i]	32.08±3.78[a,b,c,d,e,f,g,h,i]	1.679	0.096
The 11th month	28.25±2.76[a,b,c,d,e,f,g,h,i,j]	29.17±2.67[a,b,c,d,e,f,g,h,i,j]	1.677	0.096
The 12th month	27.62±5.73[a,b,c,d,e,f,g,h,i,j]	28.36±3.84[a,b,c,d,e,f,g,h,i,j]	1.112	0.270
F	229.277	335.172	-	-
P	<0.001	<0.001	-	-

CIVIQ-20, chronic venous insufficiency quality of life questionnaire; NIVCS, non-thrombotic iliac vein compression syndrome; TIVCS, acute thrombotic iliac vein compression syndrome. a, compared with the 1st month; b, compared with the 2nd month; c, compared with the 3rd month; d, compared with the 4th month; e, compared with the 5th month; f, compared with the 6th month; g, compared with the 7th month; h, compared with the 8th month; I, compared with the 9th month; j, compared with the 10th month.

Table 3. Comparison of VCSS scores between NIVCS group and TIVCS group

Group	NIVCS group	TIVCS group	*t*	*P*
The 1st month	11.57±3.28	10.38±4.35	1.524	0.130
The 2nd month	10.46±2.74	10.05±2.43	0.784	0.434
The 3rd month	9.87±0.76[a]	9.65±1.28	1.029	0.306
The 4th month	9.24±4.37[a]	9.01±2.86[a]	0.309	0.757
The 5th month	8.37±3.75[a,b,c]	8.46±3.74[a,b]	0.118	0.905
The 6th month	7.54±2.64[a,b,c,d]	8.05±2.18[a,b,c]	1.044	0.298
The 7th month	6.76±6.72[a,b,c,d,e]	7.68±4.19[a,b,c,d]	0.816	0.416
The 8th month	6.12±5.34[a,b,c,d,e,f]	6.63±0.58[a,b,c,d,e,f]	0.671	0.503
The 9th month	5.48±3.74[a,b,c,d,e,f,g]	6.11±5.75[a,b,c,d,e,f,g]	0.640	0.523
The10th month	4.95±6.18[a,b,c,d,e,f,g]	5.76±2.16[a,b,c,d,e,f,g]	0.873	0.384
The 11th month	4.23±5.35[a,b,c,d,e,f,g]	5.28±3.67[a,b,c,d,e,f,g,h]	1.136	0.254
The 12th month	3.47±2.14[a,b,c,d,e,f,g,h,i]	4.23±5.12[a,b,c,d,e,f,g,h,i,j]	0.951	0.343
F	22.552	19.015	-	-
P	<0.001	<0.001	-	-

NIVCS, non-thrombotic iliac vein compression syndrome; TIVCS, acute thrombotic iliac vein compression syndrome. a, compared with the 1st month; b, compared with the 2th month; c, compared with the 3th month, d, compared with the 4th month; e, compared with the 5th month; f, compared with the 6th month; g, compared with the 7th month; h, compared with the 8th month; I, compared with the 9th month; j, compared with the 10th month.

group, to analyze factors affecting stent efficacy. There were no statistically significant differences in most outcomes between the two groups ($P>0.05$). Nevertheless, the average BMI of the SR group was significantly higher than that in the SP group, so was the proportion of patients with TIVCS type in the SR group. These findings suggest an association between these factors and the risk of restenosis. Moreover, the duration of the disease varied between the two groups, highlighting the potential impact of disease progression on stent efficacy. The comparison of general information is shown in **Table 4**.

Table 4. Comparison of general information between the SR group and the SP group

Items	Stent restenosis group	Support unobstructed group	t or χ^2	P
Number of cases	20	78	-	-
Sex			1.547	0.213
Male (Case, %)	12 (60)	37 (47.44)		
Female (Case, %)	8 (40)	41 (52.56)		
Average age ($\bar{x}$±sd, age)	63.18±7.64	60.32±7.98	1.442	0.153
BMI ($\bar{x}$±sd, kg/m^2)	29.76±4.15	26.41±3.22	3.903	0.002
Smoking situation ($\bar{x}$±sd, year)	13.78±2.14	16.75±2.53	4.821	<0.001
Alcohol consumption situation ($\bar{x}$±sd, year)	32.64±5.27	28.17±6.28	2.927	0.004
Duration of illness (n, %)			98.000	5.242
<2 weeks	2 (10)	9 (11.54)		
2 weeks to 10 years	11 (55)	32 (41.02)		
>10 years	7 (35)	37 (47.44)		
IVCS type (n, %)			0.035	0.063
NIVCS	6 (30)	44 (56.41)		
TIVCS	14 (70)	34 (43.59)		

BMI, body mass index; SR, stent restenosis; SP, stent patency; NIVCS, non-thrombotic iliac vein compression syndrome; TIVCS, acute thrombotic iliac vein compression syndrome.

Table 5. Univariate analysis of factors affecting IV patency

Items		Stent restenosis group	Support unobstructed group	t or χ^2	P
Multiple stent placement situation	Yes	13 (65)	30 (38.46)	6.902	0.008
	No	7 (35)	48 (61.54)		
Support diameter ($\bar{x}$±sd, mm)		13.37±0.28	14.62±0.84	6.540	<0.001
Support length ($\bar{x}$±sd, cm)		8.99±2.01	8.84±2.15	0.282	0.779
Anticoagulant regimen (n, %)	Warfarin	4 (20)	33 (42.31)	4.876	0.027
	Rivaroxaban	16 (80)	45 (57.69)		
Postoperative lower limb fracture (n, %)		8 (40)	14 (17.95)	4.446	0.035
Hypertension (n, %)		11 (55)	16 (20.51)	9.485	0.002
Diabetes (n, %)		6 (30)	7 (8.97)	6.116	0.013
Cerebral infarction (n, %)		6 (30)	7 (8.97)	6.116	0.013

SR, stent restenosis; SP, stent patency; IV, iliac vein.

Univariate analysis of factors affecting IV patency

A univariate analysis was conducted to compare factors such as number of stents placed, postoperative anticoagulant treatment plans, and history of hypertension between the SR and SP groups. In the SR group, there were 8 cases of lower limb fracture, 11 cases of hypertension, and 6 cases each of diabetes and cerebral infraction, respectively; while in the SP group, there were 14 cases of lower limb fracture, 16 cases of hypertension, 7 cases each of diabetes and cerebral infarction, respectively. The results of the single factor analysis are shown in **Table 5**.

Multivariate analysis of factors affecting IV patency

Logistic regression analysis was performed on five indicators: BMI, history of hypertension, multiple stent placement, IVCS type, and postoperative anticoagulation regimen. The analysis revealed that BMI, history of hypertension, and thrombotic IVCS were independent risk factors for restenosis (P<0.05), as shown in **Table 6**.

Table 6. Multivariate logistic regression analysis of factors affecting IV patency

Project	β	S.E.	Wald χ^2	P	OR	95% confidence interval
BMI	0.292	0.110	7.045	0.008	1.341	[1.076, 1.665]
IVCS						
No	Reference					
Yes	1.959	0.853	5.273	0.021	7.010	[1.333, 37.840]
Hypertension						
No	Reference					
Yes	1.792	0.779	5.359	0.020	5.995	[1.305, 27.549]
Brackets						
No	Reference					
Yes	0.816	0.834	0.956	0.329	2.266	[1.305, 27.549]
Anticoagulant drugs						
No	Reference					
Yes	1.735	1.007	2.966	0.086	5.664	[0.789, 40.686]
Constant	-12.896	3.535	13.308	<0.001	<0.001	-

LRA, Logistic regression analysis; BMI, body mass index; SR, stent restenosis; IVCS, iliac vein compression syndrome.

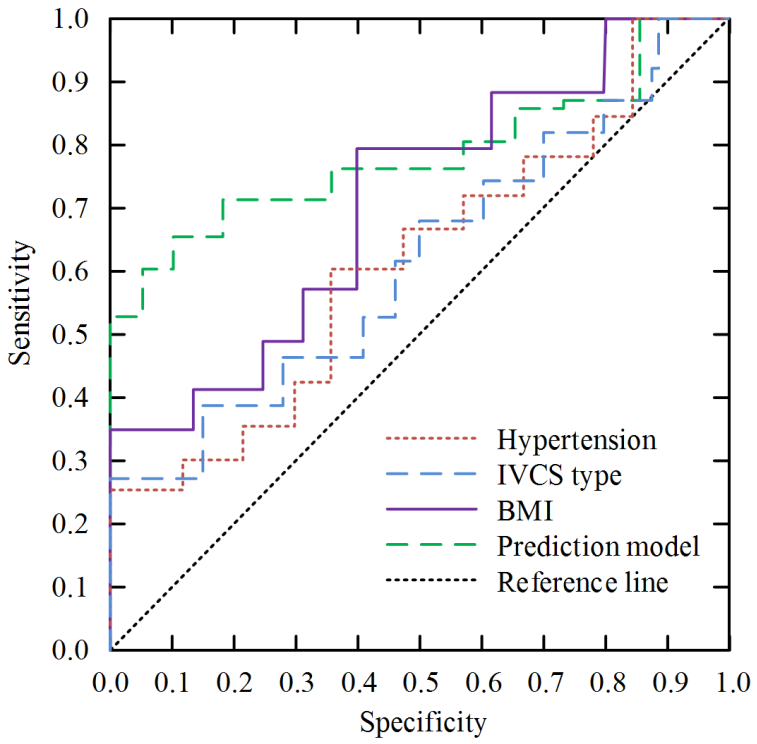

Figure 1. ROC curve analysis of factors for predicting SR. ROC, receiver operating characteristic; BMI, body mass index; SR, stent restenosis; IVCS, iliac vein compression syndrome.

Prediction effect analysis

Binary logistic regression analysis was conducted on multiple risk factors, and receiver operating characteristic (ROC) curves were generated to evaluate the predictive ability of the model for the risk of stent restenosis. The overall prediction model showed good diagnostic performance, with an area under the ROC curve (AUC) of 0.875. BMI had an AUC of 0.759, while the AUC for IVCS type was 0.677, and for a history of hypertension, it was 0.652 (**Figure 1**).

Discussion

The results of this study showed a significant decrease in both the CIVIQ-20 and VCSS scores during the 12-month follow-up period after surgery. These improvements in quality of life (QoL) and clinical symptoms were consistent with findings from previous studies, demonstrating that endovascular treatment significantly enhanced QoL and alleviated clinical symptoms of IVCS patients 12 months after surgery [17, 18].

Stent restenosis or occlusion after IV stent implantation is mainly caused by thrombosis within the stent, a critical concern in the treatment of IVCS [19]. Bondarev et al. found a significant independent relationship between poor venous inflow or outflow and symptom recur-

rence after IV stent implantation [20]. This is consistent with the findings of the current study, where BMI, a history of hypertension, and thrombotic IVCS were identified as independent risk factors for SR after IV surgery.

Multivariate analysis is crucial for studying the impact of endovascular therapy on IVCS and associated DVT. Medical research often involves multiple factors that can simultaneously affect treatment outcomes. Multivariate analysis is a powerful tool to control for potential confounding factors such as age, gender, and medical history, allowing for a more accurate evaluation of the impact of specific treatments, such as endovascular therapy, on IVCS and DVT. Aurshina et al. also identified DVT as a main complication of IVCS. A retrospective analysis of potential lesion locations after iliac vein stent thrombectomy or thrombolysis found that the causes of iliac vein stent thrombosis aligned with the results of this study [21].

For patients with acute DVT complicated with IVCS, rapid catheter thrombolysis, mechanical thrombus removal, and stent placement to relieve pressure have proven to be effective treatments [22]. If thrombus removal is delayed and the compression of the IV is not addressed, the patient may develop severe chronic venous insufficiency (CVI), negatively affecting their QoL. When thrombus removal is not performed promptly and IVCS remains unresolved, patients are at a higher risk of developing irreversible venous problems, such as CVI. This can lead to persistent symptoms like pain, edema, and skin changes, increasing the need for long-term medical intervention and significantly raising medical expenses. Therefore, early intervention is essential in preventing these complications and maintaining or improving the patient QoL. In this study, two patients in the NIVCS group developed superficial vein thrombosis, and two patients developed DVT. In the acute TIVCS group, there were two patients with mild pulmonary embolism, two with pseudoaneurysm, one with repeated skin infection, two with nosebleeds, and three with stent thrombosis. Symptoms were relieved after appropriate treatment. Notably, there were no serious complications such as venous rupture, stent rupture, displacement, or death in either group [23]. These findings underscore the importance of regular follow-ups and monitoring to promptly address any existing or newly developed vascular problems. After treatment, patients typically require anticoagulant therapy and compression stockings to prevent thrombosis recurrence and need ongoing assessments of their vascular status. In addition, patient education plays a crucial role in improving outcomes, as it equips patients with knowledge about their disease, treatment options, and preventive measures for complications, enhancing their self-management abilities.

The present research demonstrates that endovascular therapy is both effective and safe for treating IVCS patients. Hypertension and thrombosis within IVCS are significant risk factors for stent restenosis. Therefore, for NIVCS patients, it is crucial to implement early intervention measures. For TIVCS patients, continuous monitoring and prompt management of thrombosis within the stent are essential. Additionally, it is recommended that patients adopt a healthier lifestyle which includes weight loss, blood pressure control, a low-salt and low-fat diet, and engaging in appropriate lower limb exercises. Wearing compression stockings is also advised to further support venous health.

However, due to the small sample size and relatively short follow-up time, the study is subject to potential selection bias. The treatment plans of different physicians and variations in patient compliance may also introduce variability in the results. To overcome these limitations, future studies should focus on larger, multicenter trials with longer follow-up periods to confirm and expand upon these findings.

Disclosure of conflict of interest

None.

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