# Principles of Optimal Antithrombotic Therapy for Iliac VEnous Stenting (POATIVES): A national expert-based Delphi consensus study

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## ABSTRACT

**Objective:** Management of antithrombotic therapy in patients undergoing venous stents has not yet reached consensus, and there are not any recommendations from published guidelines. We undertook a Delphi consensus from Chinese experts to develop recommendations regarding the preferred antithrombotic therapy in patients following venous stenting.

**Methods:** The phase 1 questionnaire was comprised of three clinical scenarios of venous stenting for non-thrombotic iliac vein lesions (NIVL), acute deep vein thrombosis (DVT), and post-thrombotic syndrome (PTS) and was sent to venous practitioners across China. In phase 2, the results of phase 1 were distributed to a panel of experts for evaluation along with a questionnaire encompassing a series of statements produced during phase 1. A modified Delphi method was used to reach consensus on recommendations through two rounds of surveys.

**Results:** The phase 1 questionnaire was completed by 283 respondents. In phase 2, an expert panel consisting of 28 vascular surgeons and interventional radiologists was assembled and voted 17 statements relating to antithrombotic management after venous stenting for NIVL (4 statements), DVT (6 statements), and PTS (7 statements). The majority of the statements about the antithrombotic agent selection received a high consensus strength.

**Conclusions:** Based on the national Delphi consensus of Chinese experts regarding antithrombotic therapy following iliac venous stenting in three common scenarios, most of the statements could be used to guide antithrombotic management following venous stenting. Further studies are required to clarify controversial issues including the dose and duration of anticoagulants, the role of antiplatelet agents, especially in patients with NIVL. (J Vasc Surg Venous Lymphat Disord 2024;12:101739.)

**Keywords:** Antithrombotic management; China; Consensus; Delphi Technique; Venous stent

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Currently, estimates of the global burden of chronic venous disease (CVD) range from 45.6% to 83.6%,[1] and epidemiological data on CVD in China are scarce.[2] Chronic venous insufficiency (CVI) as an advanced stage of CVD occurs in approximately 1% to 5% of the adult population,[3] with the cost of CVI equaling over 2% of the annual health care budget in Western societies.[4]

Iliac vein obstruction is a major cause of CVI,[5] which mainly results from non-thrombotic iliac vein compression lesions (NIVL), acute deep venous thrombosis (DVT) with a residual obstruction, and post-thrombotic syndrome (PTS). Due to the establishment of safety and efficacy profiles, endovascular stenting has been widely implemented to relieve the symptoms of venous hypertension and improve the quality of life of patients with iliac vein obstruction.[6-10] To maintain the long-term patency of revascularization and mitigate adverse systematic outcomes, it is reasonable to receive antithrombotic therapy for patients after venous stenting. Nevertheless, substantial evidence regarding its impact on outcomes of these patients is limited.[11,12] Moreover,

there are currently no clinical practice guidelines and a scarcity of studies in which the antithrombotic regimens following venous stent are addressed.[13,14] The current antithrombotic management following venous stents was extrapolated from randomized controlled studies of patients who did not undergo endovascular interventions and retrospective data that lack direct comparisons between different strategies.[13,15,16] Due to the dearth of compelling evidence, there exists significant heterogeneity in postprocedural therapeutic regimens.[17-19] There is a significant prevalence and socioeconomic burden of CVI, increasing the administration of venous stents but a paucity of research regarding antithrombotic therapy following venous stenting. As a result, in the present study, the practices endorsed at many venous institutes across the country were investigated, and a Chinese expert-based Delphi consensus was achieved to provide recommendations on antithrombotic protocols following venous stenting.

## ARTICLE HIGHLIGHTS

- **Type of Research:** A national expert-based Delphi consensus study
- **Key Findings:** We developed 17 statements relating to antithrombotic management after venous stenting for non-thrombotic iliac vein lesions (4 statements), acute deep vein thrombosis (6 statements), and post-thrombotic syndrome (7 statements). The majority of the statements about the antithrombotic agent selection received a high consensus strength.
- **Take Home Message:** The expert panel agrees that anticoagulation should be the primary treatment for patients undergoing venous stenting. Further studies are required to clarify controversial issues including the dose and duration of anticoagulants and the role of antiplatelet agents.

## METHODS

**Study design.** The present study was conducted in two phases: a questionnaire and the formation of a Delphi expert consensus. A working group was established to design, issue, and recover the questionnaires, collect and analyze the feedback, and to select and contact the experts who would participate in developing the consensus. The members of the working group were identified among the study principal investigators. Because the study involved no contact with patients, ethical committee approval was not required.

**Phase 1 questionnaire survey.** Preliminary exploratory questionnaires (with single-choice questions and options for open-ended suggestions) were issued to each center to investigate the daily practice of antithrombotic management following venous stenting and to develop the initial lists of statements that were to be evaluated during the Delphi process. In the questionnaire (Supplementary Appendix, online only), three cases representing three clinical scenarios that were presented in the study conducted by Milinis et al were utilized.[19] The three clinical scenarios included stent placement for NIVL (case 1), acute iliofemoral DVT with a residual obstruction after thrombolysis (case 2), and PTS (case 3). Based on a literature review of the indications for venous stenting and the authors' clinical experience, the working group designed questions and answers that related to antithrombotic treatment after venous stenting for each scenario. All questionnaires were submitted online and recorded via Questionnaire Star (https://www.wjx.cn/). Questionnaire Star is an online survey tool that has a skip pattern. In this questionnaire, if the respondents choose A, they are then presented with only questions like A1, A2, A3 in the online survey tool, and other questions (B1, B2, B3, C1, C2, C3, …, F1, F2, F3) will be hidden. Demographic details including the location of practice sites, years of experience concerning venous stenting, and the caseloads of the respondents were also recorded. We included an open-ended suggestion option for all questions about antithrombotic strategies, and if the respondents had answers other than the given options, they could provide them by filling in the blanks. An invitation was sent to venous practitioners, including vascular surgeons, interventional radiologists, and general surgeons (specializing in vascular diseases) based in the 32 provinces, autonomous regions, and municipalities throughout mainland China and Taiwan via email or WeChat (a universal Chinese instant messaging app).

**Phase 2 Delphi process.** A modified Delphi process was employed to gather an expert consensus on antithrombotic therapy following venous stenting. The answers produced in phase 1 were used by the working group to design statements relating to the postoperative management of antithrombotic drugs. The antithrombotic strategy following venous stenting was divided into the initial and maintenance treatment phases, which were defined as the period within and beyond 30 days following the operation, respectively. A three-point Likert type scale was used to grade statements based on the level of agreement: full agreement (score 3), agreement (score 2), disagreement (score 1). Full agreement indicated that they always agreed with the statement; agreement indicated that they agreed but they were not confident in the data supporting the statement; and disagreement indicated that they never agreed with the statement. The definition of these three options was placed in the questionnaire to allow respondents to make better choices. The panel members were selected among active physicians who specialized in vascular surgery or interventional radiology in China. The members were physicians that were identified based on their

**Table I.** Strength and consistency grading definitions used in the development of the Delphi consensus for the recommendation of antithrombotic therapy following venous stent procedures

| Grade | Description | Definition |
|---|---|---|
| Strength grading | | |
| A | Very strong | Full agreement ≥75% |
| B | Strong | Full agreement <75%, Full disagreement <5% |
| C | Fair | Full agreement <75%, Full disagreement <10%, |
| D | Poor | Full disagreement ≥10% |
| Consistency grading | | |
| I | Very high | Bland-Altman analysis, *P* value > .05 and ICC, *P* value < .01 |
| II | High | Bland-Altman analysis, *P* value > .05 and ICC, *P* value < .05 |
| III | Fair | Bland-Altman analysis, *P* value > .05 and ICC, *P* value > .05; or Bland-Altman analysis, *P* value < .05 and ICC, *P* value < .05 |
| IV | Poor | Bland-Altman analysis, *P* value < .05 and ICC, *P* value > .05 |

*ICC*, Intraclass correlation coefficient.

prior publications in high-ranking vascular scientific journals on venous stenting procedures or researchers serving on editorial boards for peer-reviewed journals relevant to the study practice. The requirements of the panel members included: (1) from an institute with average annual volume of venous stenting of more than 50 in the past 3 years; and (2) demonstrating as first operator during their career. This study was done anonymously, and the panel members were unaware of each others' identities. The statements were submitted to two rounds for evaluation, and those with a proportion of disagreement ≥10% and or a mean score <2.5 were not resubmitted after the first round.

**Statistical analysis, evaluation of consensus strength, and consistency of scoring.** The strength of consensus was classified into four categories based on the experts' responses (Table I). The consistency of scoring between rounds with the proportion of agreement was estimated using the *P* values from Bland-Altman plot and from the intraclass correlation coefficient that was set for consistency, separately between the first and second round. Consistency was graded into four levels (for grading criteria, please see Table I). The summary of the results for categorical variables were presented as frequency and percentage, whereas for continuous variables, we used the standardized mean difference and 95% confidence interval for analysis. Data analysis was performed using SPSS 26.0 (IBM SPSS) software, and graphs were made using Microsoft Visio.

## RESULTS

**Summary of phase 1 questionnaire results.** The response rate for the phase 1 questionnaire was 100%, and it was completed by 283 respondents who were practicing in all 32 provinces, autonomous regions, and municipalities of mainland China and Taiwan (Table II, Fig 1). The majority of participants work in tertiary hospitals (96.1%; 272/283). The respondents performed more than 10 venous stenting procedures per month in 21.2% of the institutions, five to 10 procedures in 37.8%, and less than five procedures in 41.0%. Chief physicians made up 36.0% of the respondents, 36.4% were associate chief physicians, and 27.6% were attending physicians. Eighty-three percent of participants had been performing venous stenting for over 5 years, and 62.9% had practiced for more than 10 years. The demographic characteristics of the phase 1 respondents are detailed in Table II. The choice of postoperative antithrombotic therapy for deep venous stenting of NIVL, acute iliofemoral DVT, and PTS can be seen in Figs 2 and 3.

**Deep venous stenting of non-thrombotic iliac vein lesions.** For deep venous stenting of NIVL, the majority of the responders recommended that initial therapy should include anticoagulants (Fig 2, *A*). Of those, 89.4% preferred a direct oral anticoagulant (DOAC) or low-molecular-weight heparin (LMWH), whereas 24.7% (70/283) chose to use an antiplatelet agent additionally during the initial stage and 65.0% (184/283) chose not to. A total of 268 of the 283 respondents utilized anticoagulant therapy, and most of them (64.9%; 174/268) preferred therapeutic doses during anticoagulant treatment. In the maintenance treatment phase, 55.8% (171/283) of the respondents selected DOACs and 33.2% (94/283) chose single antiplatelet therapy. Of the 171 respondents who preferred anticoagulant therapy alone, 60.2% (103/171) opted to use anticoagulants at a prophylactic dose during anticoagulant treatment. The percentage of responders that believed the course of antithrombotic therapy following venous stenting should be greater than 6 months was 66.1% (187/283), with 41% giving treatment over 12 months. Among the 82 respondents that favored dual-pathway inhibitors (DPIs) by combining anticoagulation with antiplatelets in the initial stage, 72.0% and 35.4% believed that the course of DPIs should be more than or equal to 3 months and 6 months, respectively.

**Deep venous stenting following acute iliofemoral deep venous thrombosis.** All the responders agreed that initial therapy should include anticoagulants (Fig 2, *B*). Precisely 87.3% of the respondents chose LMWH or DOACs with (29.0%; 82/283) or without (64.7%; 183/283) an antiplatelet agent during the initial stage. The number of respondents that considered anticoagulants at therapeutic doses as an anticoagulant strategy was

**Table II.** Demographic characteristics of phase 1 respondents

| Characteristics | No. respondents | % respondents |
|---|---|---|
| Hospital rank | | |
| Tertiary hospital | 272 | 96 |
| Secondary hospital | 11 | 4 |
| Department | | |
| Vascular surgery | 253 | 89 |
| Interventional radiology | 13 | 5 |
| General surgery | 17 | 6 |
| Professional title | | |
| Chief physician | 102 | 36 |
| Associate chief physician | 103 | 36 |
| Attending physician | 78 | 28 |
| Experience on venous disease | | |
| >10 years | 178 | 63 |
| 5~10 years | 57 | 20 |
| 3~5 years | 30 | 11 |
| ≤3 years | 18 | 6 |
| Caseloads per month | | |
| >10 procedures | 60 | 21 |
| 5~10 procedures | 107 | 38 |
| <5 procedures | 116 | 41 |

92.6% (261/283). During the later maintenance phase, 65.0% (184/283) of respondents chose DOAC, and 23.3% (66/283) chose single antiplatelet therapy. Anticoagulants at a therapeutic dose and a prophylactic dose were perceived as an anticoagulation strategy by 58.8% (114/194) and 39.2% (76/194) of the participants, respectively. Most responders (78.4%; 222/283) considered that the course of antithrombotic therapy following venous stenting should be greater than 6 months, whereas 52.7% argued it should be greater than 12 months. Among the 99 respondents who favored DPIs in the initial stage, 84.9% and 52.5% thought that the course of DPIs should be more than or equal to 3 months and 6 months, respectively.

**Deep venous stenting in the context of post-thrombotic syndrome.** All responders agreed that use of anticoagulants for patients with PTS following stents is necessary during the initial stage treatment (Fig 2, *C*). It was found that 92.6% of the respondents chose LMWH or DOACs with (30.0%; 82/283) or without (61.5%; 174/283) an antiplatelet agent during the initial stage. Therapeutic doses were considered as anticoagulant treatment by 86.6% (245/283) of participants. DOACs were chosen by 73.1% (207/283) of the respondents during the later maintenance phase. Further, 58.5% (131/224) and 37.9% (85/224) of the participants considered therapeutic doses and prophylactic doses as an anticoagulation strategy, respectively. Most responders (86.2%; 244/283) recommended that the course of antithrombotic therapy following venous stenting should be greater than 6 months, and 72.8% (222/283) believed it should be greater than 12 months. Among the 108 respondents that favored DPIs in the initial stage, 89.8% and 71.3% thought that the course of DPI therapy should be more than or equal to 3 months and 6 months, respectively.

**Phase 2 survey summary of results: consensus statements.** Twenty-eight experts (Supplementary Table, online only) participated the Delphi rounds. For the first round, the working group designed 31 statements related to antithrombotic therapy following venous stenting of NIVL (n = 10), acute iliofemoral DVT (n = 11), and PTS (n = 10). The strength of consensus obtained during first round can be observed in Table III. After round 1, 14 statements were rejected, and 17 statements were resubmitted to experts panel for evaluation in round 2. The strength and consistency classification of statements in the second round are summarized in Table IV.

**Deep venous stenting of a non-thrombotic iliac vein lesion.** For patients with deep venous stenting of NIVL, anticoagulation with or without antiplatelet agents was recommended to improve outcomes in initial phase therapy (first 1 months) (Grade A, consistency Grade I), and LMWH or DOACs were recommended as the initial treatment agents (Grade A, consistency Grade III). Anticoagulation alone or antiplatelet therapy alone was recommended in maintenance-phase management (Grade C, consistency Grade III), and DOACs were the preferred anticoagulants (Grade A, consistency Grade III).

**Deep venous stenting following acute iliofemoral deep venous thrombosis.** For patients with deep venous stenting following acute iliofemoral DVT, therapeutic-dose anticoagulation with or without antiplatelet agents was recommended to improve outcomes in initial phase therapy (first 1 months) (Grade A, consistency Grade III). In the maintenance-phase therapy, therapeutic-dose (Grade A, consistency Grade IV) DOACs (Grade A, consistency Grade III) with a treatment course of at least 6 months (Grade A, consistency Grade II) were appropriate. In addition, if anticoagulation with antiplatelet agents were chosen for initial treatment, we recommended at least a 6-month treatment phase of dual pathway antithrombotic therapy (Grade A, consistency Grade III).

**Deep venous stenting of post-thrombotic syndrome.** For patients with deep venous stenting of PTS, therapeutic-dose DOACs with or without antiplatelet agents were recommended to improve outcomes in initial phase therapy (first 1 months) (Grade A, consistency Grade III). In the maintenance-phase therapy,

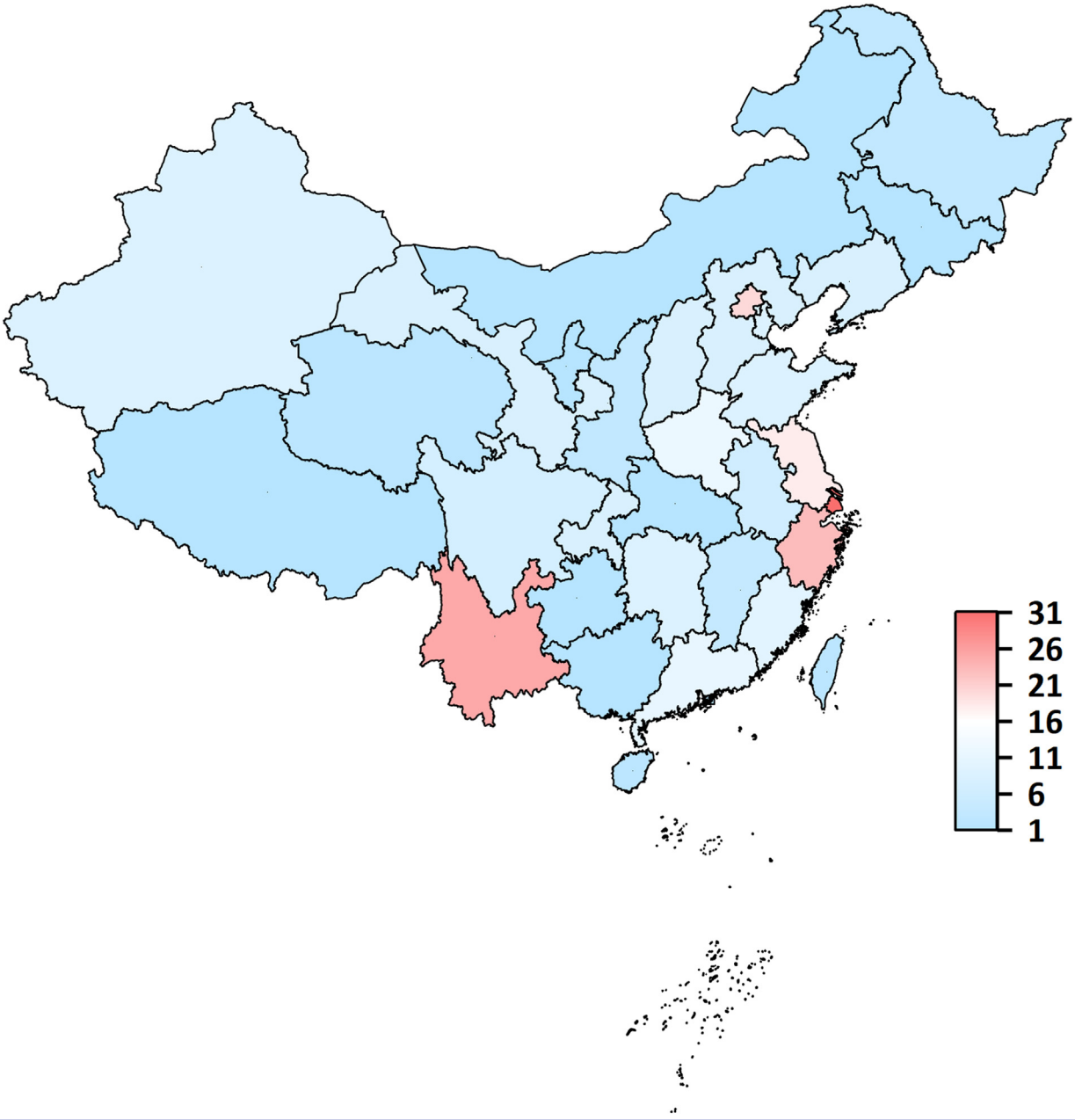


**Fig 1.** Geographic location of respondents in the phase 1 survey.

therapeutic-dose (Grade A, consistency Grade III) DOACs (Grade A, consistency Grade IV) with a treatment course at least 12 months (Grade A, consistency Grade IV) were recommended.

## DISCUSSION

In the present study, a 2-round modified Delphi survey was conducted with Chinese experts that specialized in venous disease and statements related to antithrombotic therapy following venous stenting of NIVL, acute iliofemoral DVT, and PTS were gathered. Consequently, a consensus was reached on all 17 statements regarding antithrombotic drug selection, dosage, and course. The majority of the statements about the antithrombotic agent selection received a high consensus strength.

The majority of the experts on the panel agreed that anticoagulation should be the primary treatment for patients undergoing venous stenting, which was consistent with the previous international consensus[19] that anticoagulation was preferable to antiplatelets for the first 6 to 12 months following stenting for NIVL. The current practices for the management following venous stenting are mainly drawn lessons from experience in treatment of venous thromboembolism (VTE) without endovascular interventional therapy. Venous thrombosis occurs during low shear flow and predominantly around intact

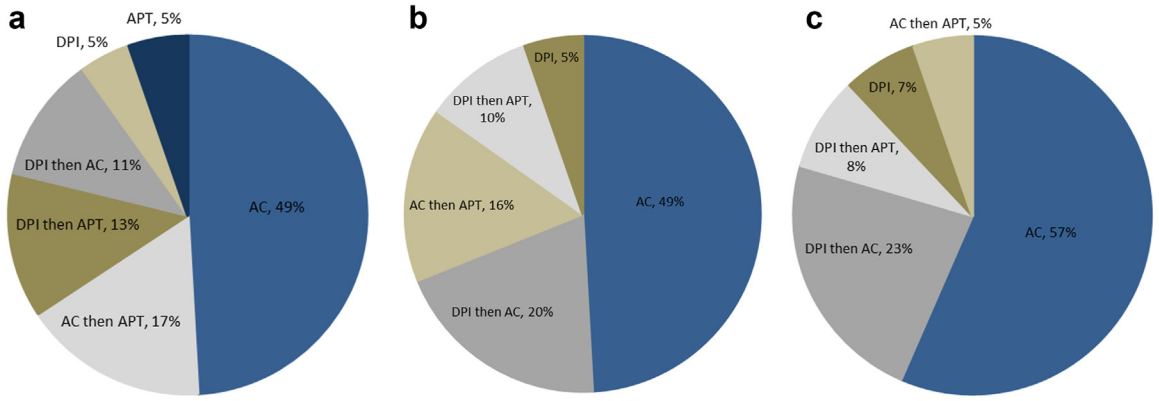


**Fig 2.** Percentage of respondents with various postoperative antithrombotic therapy strategies for deep venous stenting of non-thrombotic iliac vein lesions (NIVLs) **(A)**; acute iliofemoral deep vein thrombosis (DVT) **(B)**; and post-thrombotic syndrome (PTS) **(C)**. *AC*, Anticoagulant therapy; *APT*, antiplatelet therapy; *DPI*, dual-pathway inhibitors therapy.

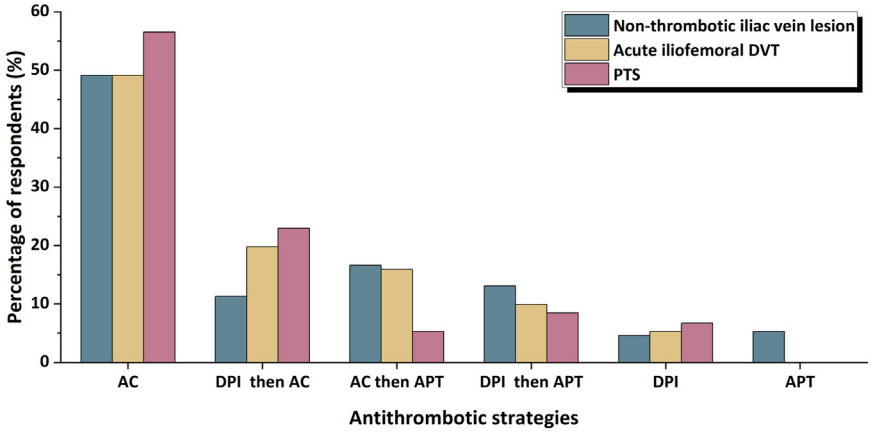


**Fig 3.** Percentage of respondents with various postoperative antithrombotic therapy strategies for deep venous stenting of non-thrombotic iliac vein lesions (NIVLs), acute iliofemoral deep vein thrombosis (*DVT*), and post-thrombotic syndrome (*PTS*). *AC*, Anticoagulant therapy; *APT*, antiplatelet therapy; *DPI*, dual-pathway inhibitors therapy.

endothelial walls, leading to the belief that anticoagulants should be used to treat venous disease.[20,21] Based on the experience of antithrombotic therapy after arterial stenting, some of the experts believed that concomitant anticoagulation or subsequent use of antiplatelet agents were reasonable regimens. Following a systematic review of 56 studies,[15] it was observed that treatment in 77% of the studies involved warfarin as a base anticoagulant with or without antiplatelet agents. Meissner et al argued that antiplatelet agents may be more appropriate for patients with primary non-occlusive iliac vein lesions, whereas anticoagulants may serve a more significant role in post-thrombotic disease. It was observed that anticoagulants prevented the recurrence of VTE, and antiplatelet agents maintained the stent patency. Lin et al[18] evaluated the clinical outcomes of different antithrombotic regimens following venous stenting at a large medical center, and found that various antithrombotic regimens were used to prevent thrombosis and restenosis after stenting, and 91% of patients (79/87) received anticoagulation with or without antiplatelet therapy. Additionally, compared with antithrombotic regimens based on antiplatelet agents, triple regimens may be beneficial in reducing restenosis rates, but it is unclear whether the risk of bleeding is increased. In a previous study,[15] the average primary stent patency rate was 82% over 1 year following venous stenting of the iliofemoral tract in acute and chronic thrombosis, which decreased to 73% after 2 years. The average primary stent patency rate for patients suffering NIVL administrated with clopidogrel was observed as 99%, 98%, and 98% at 6 months, 1 year, and 2 years of follow-up, respectively.[22]

Currently, there is a scarcity of studies in which the effectiveness/efficacy of poststent anticoagulation and antiplatelet therapy on the patency of venous stent is

**Table III.** The strength classification of statements on antithrombotic strategy following venous stenting in the first round of the Delphi process[a]

| Recommendations | | | Full agreement, % | Agreement, % | Disagreement, % | Mean score (95% CI) | Strength | After round 1 |
|---|---|---|---|---|---|---|---|---|
| Deep venous stenting of an NIVL[b] | | | | | | | | |
| Initial phase therapy | Statement 1 | For patients with deep venous stenting of an NIVL, anticoagulation with or without antiplatelet agents are recommended to improve outcomes in initial phase therapy. | 76 | 17 | 7 | 2.71 (2.48-2.95) | Grade A | Resubmitted to round 2 |
| | Statement 2 | For patients with deep venous stenting of an NIVL, we recommend initial treatment with LMWH or DOAC. | 86 | 14 | 0 | 2.86 (2.73-3.00) | Grade A | Resubmitted to round 2 |
| | Statement 3 | For patients with deep venous stenting of an NIVL, if anticoagulation with antiplatelet agents were chosen for treatment, single antiplatelet therapy may be a suitable therapeutic option. | 48 | 49 | 3 | 2.48 (2.26-2.70) | Grade B | Rejected |
| | Statement 4 | For patients with deep venous stenting of an NIVL, therapeutic-dose anticoagulation was recommended. | 48 | 42 | 10 | 2.41 (2.15-2.67) | Grade D | Rejected |
| Maintenance-phase therapy | Statement 5 | For patients with deep venous stenting of an NIVL, we recommend anticoagulation alone or antiplatelet therapy alone in maintenance-phase management. | 66 | 27 | 7 | 2.62 (2.38-2.86) | Grade C | Resubmitted to round 2 |
| | Statement 6 | For patients with deep venous stenting of an NIVL, we recommend DOACs in maintenance-phase therapy. | 69 | 31 | 0 | 2.71 (2.54-2.89) | Grade B | Resubmitted to round 2 |
| | Statement 7 | For patients with deep venous stenting of an NIVL, we recommend single antiplatelet therapy in maintenance-phase management. | 48 | 38 | 14 | 2.39 (2.13-2.66) | Grade D | Rejected |
| | Statement 8 | For patients with deep venous stenting of an NIVL, prophylactic-dose anticoagulation was recommended in maintenance-phase therapy. | 34 | 63 | 3 | 2.32 (2.11-2.53) | Grade B | Rejected |
| Duration of antithrombotic therapy | Statement 9 | For patients with deep venous stenting of an NIVL, we recommend for at least 6-month treatment phase of antithrombotic therapy. | 52 | 41 | 7 | 2.46 (2.22-2.71) | Grade C | Rejected |

*(Continued on next page)*

**Table III.** Continued.

| Recommendations | | | Full agreement, % | Agreement, % | Disagreement, % | Mean score (95% CI) | Strength | After round 1 |
|---|---|---|---|---|---|---|---|---|
| | Statement 10 | For patients with deep venous stenting of an NIVL, if anticoagulation with antiplatelet agents were chosen for initial treatment, we recommend for at least 3-month treatment phase of dual pathway antithrombotic therapy. | 38 | 48 | 14 | 2.29 (2.03-2.54) | Grade D | Rejected |
| Deep venous stenting following acute iliofemoral DVT[c] | | | | | | | | |
| Initial phase therapy | Statement 11 | For patients with deep venous stenting following acute iliofemoral DVT, anticoagulation with or without antiplatelet agents are recommended to improve outcomes in initial phase therapy. | 69 | 31 | 0 | 2.68 (2.49-2.86) | Grade B | Resubmitted to round 2 |
| | Statement 12 | For patients with deep venous stenting following acute iliofemoral DVT, we recommend initial treatment with LMWH. | 28 | 58 | 14 | 2.14 (1.89-2.40) | Grade D | Rejected |
| | Statement 13 | For patients with deep venous stenting following acute iliofemoral DVT, we recommend initial treatment with DOAC. | 41 | 56 | 3 | 2.39 (2.17-2.61) | Grade B | Rejected |
| | Statement 14 | For patients with deep venous stenting following acute iliofemoral DVT, if anticoagulation with antiplatelet agents were chosen for treatment, single antiplatelet therapy may be a suitable therapeutic option. | 52 | 31 | 17 | 2.39 (2.11-2.68) | Grade D | Rejected |
| | Statement 15 | For patients with deep venous stenting following acute iliofemoral DVT, therapeutic-dose anticoagulation was recommended. | 86 | 14 | 0 | 2.89 (2.77-3.01) | Grade A | Resubmitted to round 2 |
| Maintenance-phase therapy | Statement 16 | For patients with deep venous stenting following acute iliofemoral DVT, we recommend anticoagulation alone or antiplatelet therapy alone in maintenance-phase management. | 48 | 49 | 3 | 2.46 (2.24-2.69) | Grade B | Rejected |

**Table III.** Continued.

| | Recommendations | | Full agreement, % | Agreement, % | Disagreement, % | Mean score (95% CI) | Strength | After round 1 |
|---|---|---|---|---|---|---|---|---|
| | Statement 17 | For patients with deep venous stenting following acute iliofemoral DVT, we recommend DOACs in maintenance-phase therapy. | 72 | 28 | 0 | 2.75 (2.58-2.92) | Grade B | Resubmitted to round 2 |
| | Statement 18 | For patients with deep venous stenting following acute iliofemoral DVT, we recommend single antiplatelet therapy in maintenance-phase management. | 34 | 56 | 10 | 2.25 (2.00-2.50) | Grade D | Rejected |
| | Statement 19 | For patients with deep venous stenting following acute iliofemoral DVT, therapeutic-dose anticoagulation was recommended in maintenance-phase therapy. | 66 | 34 | 0 | 2.68 (2.49-2.86) | Grade B | Resubmitted to round 2 |
| Duration of antithrombotic therapy | Statement 20 | For patients with deep venous stenting following acute iliofemoral DVT, we recommend for at least 6-month treatment phase of antithrombotic therapy. | 72 | 28 | 0 | 2.75 (2.58-2.92) | Grade B | Resubmitted to round 2 |
| | Statement 21 | For patients with deep venous stenting following acute iliofemoral DVT, if anticoagulation with antiplatelet agents were chosen for initial treatment, we recommend for at least 6-month treatment phase of dual pathway antithrombotic therapy. | 59 | 41 | 0 | 2.61 (2.41-2.80) | Grade B | Resubmitted to round 2 |
| Deep venous stenting of PTS[d] | | | | | | | | |
| Initial phase therapy | Statement 22 | For patients with deep venous stenting of PTS, anticoagulation with or without antiplatelet agents are recommended to improve outcomes in initial phase therapy. | 76 | 21 | 3 | 2.75 (2.55-2.95) | Grade A | Resubmitted to round 2 |
| | Statement 23 | For patients with deep venous stenting of PTS, we recommend initial treatment with LMWH. | 24 | 73 | 3 | 2.21 (2.02-2.41) | Grade B | Rejected |
| | Statement 24 | For patients with deep venous stenting of PTS, we recommend initial treatment with DOAC. | 52 | 48 | 0 | 2.54 (2.34-2.73) | Grade B | Resubmitted to round 2 |

*(Continued on next page)*

**Table III.** Continued.

| | Recommendations | | Full agreement, % | Agreement, % | Disagreement, % | Mean score (95% CI) | Strength | After round 1 |
|---|---|---|---|---|---|---|---|---|
| | Statement 25 | For patients with deep venous stenting of PTS, if anticoagulation with antiplatelet agents were chosen for treatment, single antiplatelet therapy may be a suitable therapeutic option. | 34 | 56 | 10 | 2.25 (2.00-2.50) | Grade D | Rejected |
| | Statement 26 | For patients with deep venous stenting of PTS, therapeutic-dose anticoagulation was recommended. | 72 | 28 | 0 | 2.75 (2.58-2.92) | Grade B | Resubmitted to round 2 |
| Maintenance-phase therapy | Statement 27 | For patients with deep venous stenting of PTS, we recommend anticoagulation alone in maintenance-phase management. | 62 | 35 | 3 | 2.61 (2.39-2.83) | Grade B | Resubmitted to round 2 |
| | Statement 28 | For patients with deep venous stenting of PTS, we recommend DOACs in maintenance-phase therapy. | 72 | 28 | 0 | 2.75 (2.58-2.92) | Grade B | Resubmitted to round 2 |
| | Statement 29 | For patients with deep venous stenting of PTS, therapeutic-dose anticoagulation was recommended in maintenance-phase therapy. | 62 | 35 | 3 | 2.61 (2.39-2.83) | Grade B | Resubmitted to round 2 |
| Duration of antithrombotic therapy | Statement 30 | For patients with deep venous stenting of PTS, we recommend for at least 12-month treatment phase of antithrombotic therapy. | 52 | 45 | 3 | 2.50 (2.28-2.72) | Grade B | Resubmitted to round 2 |
| | Statement 31 | For patients with deep venous stenting of PTS, if anticoagulation with antiplatelet agents were chosen for initial treatment, we recommend for at least 6-month treatment phase of dual pathway antithrombotic therapy. | 45 | 55 | 0 | 2.46 (2.27-2.66) | Grade B | Rejected |

*CI*, Confidence interval; *DOAC*, direct oral anticoagulant; *DVT*, deep vein thrombosis; *LMWH*, low-molecular-weight heparin; *NIVL*, non-thrombotic iliac vein lesion; *PTS*, post-thrombotic syndrome.

[a]The antithrombotic strategy following venous stenting was divided into the initial and maintenance treatment phases, which were defined as the period within and beyond 30 days following the operation, respectively.

[b]Statements 1-10 were based on a clinical scenario (case 1)[19]: A 25-year-old man presents with painful left leg oedema and varicose veins. He has no personal or family history of venous thromboembolism. His venous duplex, venogram, and intravascular ultrasound suggest May-Thurner syndrome. He undergoes left iliofemoral deep venous stenting with a good technical result and there is good inflow and outflow from the stent. Pre-discharge duplex shows a patent, well-aligned stent.

[c]Statements 11-20 were based on a clinical scenario (case 2)[19]: A 30-year-old man presents with an acute ilio-femoral DVT and undergoes catheter directed thrombolysis. On venography and intravascular ultrasound at completion of thrombolysis, a May-Thurner lesion is seen. A decision is made to stent this lesion, and there appears to be a good technical result with good inflow and outflow. Pre-discharge duplex shows a patent, well-aligned stent.

[d]Statements 21-31 were based on a clinical scenario (case 3)[19]: A 40-year-old man presents with a left leg venous ulcer following 2 DVTs in the last 10 years. His venous duplex, venogram, and intravascular ultrasound demonstrate a long segment left iliac vein occlusion. He undergoes venoplasty and iliofemoral deep venous stenting with a good technical result. There appears to be good inflow and outflow. Pre-discharge duplex shows a patent, well-aligned stent.

**Table IV.** The strength and consistency classification of statements on antithrombotic strategy following venous stenting in the second round of the Delphi process[a]

| | | Recommendations | Full agreement, % | Agreement, % | Disagreement, % | Mean score (95% CI) | Strength | Consistency |
|---|---|---|---|---|---|---|---|---|
| Deep venous stenting of an NIVL[b] | | | | | | | | |
| Initial phase therapy | Statement 1 | For patients with deep venous stenting of an NIVL, anticoagulation with or without antiplatelet agents are recommended to improve outcomes in initial phase therapy. | 82 | 11 | 7 | 2.79 (2.57-3.01) | Grade A | Grade I |
| | Statement 2 | For patients with deep venous stenting of an NIVL, we recommend initial treatment with LMWH or DOAC. | 96 | 0 | 4 | 2.97 (2.89-3.04) | Grade A | Grade III |
| Maintenance-phase therapy | Statement 5 | For patients with deep venous stenting of an NIVL, we recommend anticoagulation alone or antiplatelet therapy alone in maintenance-phase management. | 68 | 25 | 7 | 2.55 (2.31-2.79) | Grade C | Grade III |
| | Statement 6 | For patients with deep venous stenting of an NIVL, we recommend DOACs in maintenance-phase therapy. | 86 | 14 | 0 | 2.86 (2.72-3.00) | Grade A | Grade III |
| Deep venous stenting following acute iliofemoral DVT[c] | | | | | | | | |
| Initial phase therapy | Statement 11 | For patients with deep venous stenting following acute iliofemoral DVT, anticoagulation with or without antiplatelet agents are recommended to improve outcomes in initial phase therapy. | 86 | 14 | 0 | 2.86 (2.72-3.00) | Grade A | Grade III |
| | Statement 15 | For patients with deep venous stenting following acute iliofemoral DVT, therapeutic-dose anticoagulation was recommended. | 89 | 11 | 0 | 2.89 (2.94-3.00) | Grade A | Grade III |
| Maintenance-phase therapy | Statement 17 | For patients with deep venous stenting following acute iliofemoral DVT, we recommend DOACs in maintenance- -phase therapy. | 93 | 7 | 0 | 2.93 (2.83-3.03) | Grade A | Grade III |
| | Statement 19 | For patients with deep venous stenting following acute iliofemoral DVT, therapeutic-dose anticoagulation was recommended in maintenance-phase therapy. | 93 | 7 | 0 | 2.93 (2.83-3.03) | Grade A | Grade IV |
| Duration of antithrombotic therapy | Statement 20 | For patients with deep venous stenting following acute iliofemoral DVT, we recommend for at least 6-month treatment phase of antithrombotic therapy. | 89 | 11 | 0 | 2.89 (2.77-3.01) | Grade A | Grade II |

*(Continued on next page)*

**Table IV.** Continued.

| | Recommendations | | Full agreement, % | Agreement, % | Disagreement, % | Mean score (95% CI) | Strength | Consistency |
|---|---|---|---|---|---|---|---|---|
| | Statement 21 | For patients with deep venous stenting following acute iliofemoral DVT, if anticoagulation with antiplatelet agents were chosen for initial treatment, we recommend for at least 6-month treatment phase of dual pathway antithrombotic therapy. | 75 | 25 | 0 | 2.75 (2.58-2.92) | Grade A | Grade III |
| Deep venous stenting of PTS[d] | | | | | | | | |
| Initial phase therapy | Statement 22 | For patients with deep venous stenting of PTS, anticoagulation with or without antiplatelet agents are recommended to improve outcomes in initial phase therapy. | 86 | 14 | 0 | 2.86 (2.72-3.00) | Grade A | Grade III |
| | Statement 24 | For patients with deep venous stenting of PTS, we recommend initial treatment with DOAC. | 75 | 25 | 0 | 2.75 (2.58-2.92) | Grade A | Grade III |
| | Statement 26 | For patients with deep venous stenting of PTS, therapeutic-dose anticoagulation was recommended. | 86 | 14 | 0 | 2.86 (2.72-3.00) | Grade A | Grade III |
| Maintenance-phase therapy | Statement 27 | For patients with deep venous stenting of PTS, we recommend anticoagulation alone in maintenance-phase management. | 79 | 21 | 0 | 2.79 (2.62-2.95) | Grade A | Grade III |
| | Statement 28 | For patients with deep venous stenting of PTS, we recommend DOACs in maintenance-phase therapy. | 96 | 4 | 0 | 2.96 (2.89-3.04) | Grade A | Grade IV |
| | Statement 29 | For patients with deep venous stenting of PTS, therapeutic-dose anticoagulation was recommended in maintenance-phase therapy. | 86 | 14 | 0 | 2.86 (2.72-3.00) | Grade A | Grade III |
| Duration of antithrombotic therapy | Statement 30 | For patients with deep venous stenting of PTS, we recommend for at least 12-month treatment phase of antithrombotic therapy. | 79 | 21 | 0 | 2.79 (2.62-2.95) | Grade A | Grade IV |

*CI*, Confidence interval; *DOAC*, direct oral anticoagulant; *DVT*, deep vein thrombosis; *LMWH*, low-molecular-weight heparin; *NIVL*, non-thrombotic iliac vein lesion; *PTS*, post-thrombotic syndrome.

[a]The antithrombotic strategy following venous stenting was divided into the initial and maintenance treatment phases, which were defined as the period within and beyond 30 days following the operation, respectively.

[b]Statements 1-10 were based on a clinical scenario (case 1)[19]: A 25-year-old man presents with painful left leg edema and varicose veins. He has no personal or family history of venous thromboembolism. His venous duplex, venogram, and intravascular ultrasound suggest May-Thurner syndrome. He undergoes left iliofemoral deep venous stenting with a good technical result, and there is good inflow and outflow from the stent. Pre-discharge duplex shows a patent, well-aligned stent.

[c]Statements 11-20 were based on a clinical scenario (case 2)[19]: A 30-year-old man presents with an acute ilio-femoral DVT and undergoes catheter directed thrombolysis. On venography and intravascular ultrasound at completion of thrombolysis, a May-Thurner lesion is seen. A decision is made to stent this lesion, and there appears to be a good technical result with good inflow and outflow. Pre-discharge duplex shows a patent, well-aligned stent.

[d]Statements 21-31 were based on a clinical scenario (case 3)[19]: A 40-year-old man presents with a left leg venous ulcer following two DVTs in the last 10 years. His venous duplex, venogram, and intravascular ultrasound demonstrate a long segment left iliac vein occlusion. He undergoes venoplasty and iliofemoral deep venous stenting with a good technical result. There appears to be good inflow and outflow. Pre-discharge duplex shows a patent, well-aligned stent.

compared, and even less literature involving long-term follow-up on patency rates and clinical events. In a study conducted on animals,[23] it was found that antiplatelet agents did not prevent venous stent thrombosis, whereas Factor Xa inhibitors completely suppressed venous stent thrombosis. It was also observed that stent patency was best predicted by DPIs rather than anticoagulation alone after iliocaval venous stenting in a study[24] conducted on 62 patients. Langwieser et al[25] also articulated that DPIs resulted in an improved stent patency. However, Tran et al[26] found that the type of antithrombotic regimens for NIVL failed to improve stent patency or prevent the development of restenosis. The role of antiplatelet agents after venous stenting is debatable. In summary, there is no strong consensus on whether there are additional benefits of using DPIs following venous stenting.[19]

The consensus[19] reached in 2018 was that various antithrombotic agents, including LMWH, warfarin, and DOACs, should be employed, with most experts preferring traditional anticoagulants. Previous studies[27,28] had proved that the effectiveness and safety of DOACs were comparable with conventional anticoagulant therapy when preserving stent patency without an increased risk for bleeding complications or VTE recurrence in patients with venous stents. In the present survey, it was reported that warfarin was slowly being replaced by DOACs as the mainstream in clinical practices, even with DOACs not being officially licensed for use in venous stenting. DOACs being the new primary choice may be due to the decrease in prices of DOACs and the accumulation of clinical experience in China. Generally, patients following venous stenting were treated with LMWH during hospitalization and discharged on DOACs. Results from a retrospective study[29] conducted in China highlighted that, compared with warfarin, rivaroxaban exhibited a similar safety but superior efficacy to warfarin for patients with PTS with chronic iliofemoral venous occlusion undergoing iliofemoral venous stenting.

The appropriate dosage of anticoagulants yields significant clinical implications to balancing thromboembolic events and bleedings. However, it has not been clarified whether full doses of anticoagulation are necessary for patients following venous stents. Drabkin et al[30] suggested that, compared with no anticoagulation or antiplatelet therapy, therapeutic anticoagulation was associated with less stent thrombosis in patients with cancer that were stented for non-thrombotic iliocaval and iliofemoral venous obstruction. Despite said suggestion, a retrospective cohort[31] indicated that therapeutic doses of anticoagulation do not improve outcomes compared with subtherapeutic anticoagulation regimens following non-thrombotic venous stent placement. The definition of subtherapeutic anticoagulation regimens included no anticoagulation therapy, subtherapeutic dose, or short treatment course. In the present Delphi survey, there was a strong consensus on the benefits of full-dose anticoagulation for patients stented for acute iliofemoral DVT, PTS, and NIVL (initial treatment stage). For patients with NIVL, intermediate-dose prophylactic anticoagulation may be appropriate beyond the initial treatment stage.

Although the duration of treatment for anticoagulants was more varied, it has been suggested in most literature[26,27] that the duration of anticoagulant therapy should be 3 months or more, depending on the type of venous lesions, length of the implanted stent, prior thromboembolic history, and known hypercoagulable states. Other evidence[18,28] indicates that anticoagulant or antiplatelet therapy should be lifelong. Despite such evidence, Pappas et al[32] indicated that perioperative stent thrombosis in patients with NIVL is uncommon, thus, anticoagulation for perioperative (≥3 months) stent thrombosis prophylaxis is unnecessary. Ryan Abdul-Haqq et al[33] found that iliac vein stents administered for NIVL yielded statistically higher patency rates and few stent failures than those placed for venous thrombosis, with the stent failures all occurring within 6 months. Stent failures when iliac vein stents were placed for venous thrombosis persisted after 6 months, indicating that extended observation may be beneficial. The group of experts in the present study recommended that the courses should continue for at least 6 months after venous stents, and no consensus was reached regarding lifelong antithrombotic therapy. The earlier international Delphi consensus was that patients with a single acute DVT and iliac vein stent could stop anticoagulation after 6 to 12 months, given a satisfactory stent appearance on an ultrasound and a negative thrombophilia screen.[19] On the other hand, there is currently no consensus on whether lifelong antiplatelet therapy is needed for patients with compressive iliac vein lesions. Moreover, experts believe that patients with PTS require a longer course of anticoagulation than patients with acute DVT because patients with PTS tend to implant longer stents and have a more complex condition, which may lead to a higher rate of stent re-occlusion.

A strength of the present study was the use of the Delphi technique, as it is a scientifically justified formal consensus procedure. The Delphi technique involved the collective knowledge of a group of experts, which was more significant than that of each individual.[34] Further, the response rate among the present experts was higher compared with other surveys. Compared with previous similar studies, we formulated a series of more specific statements on drug selection, dosage, and course of antithrombotic regimens after venous stenting under three common different clinical scenarios based on panel of experts with different backgrounds, geographic locations, and practice settings.

There are several limitations to this study alongside notable strengths. First, the Delphi methodology may

be subject to intrinsic shortcomings. Delphi studies have been criticized due to the included items being chosen by the researcher(s), thereby potentially introducing bias. Furthermore, there is no gold standard threshold for the definition of the consensus. Consequently, the choice of cutoff value was mostly based on previous literature. It is possible to read the present paper without setting a threshold for consensus at all and simply using the voting as an expression of strength of feeling in the venous stenting community. Additionally, in this study, the formation of statements was based on three clinical scenarios representing general clinical conditions; however, recommendations for an individual patient depend on multiple specific factors, such as hyper-coagulable states, which are difficult to capture during the Delphi process. Therefore, the recommendations formed in the presented study may not apply to all patients undergoing venous stenting due to their specific situation and risk factors for recurrent thrombosis.

## CONCLUSIONS

The statements designed when formulating the national Delphi consensus of Chinese experts following iliac venous stenting for NIVL, acute DVT or PTS may help guide current antithrombotic management practice. Further studies are required to clarify controversial issues, including the dose and duration of anticoagulants and the role of antiplatelet agents, especially in patients with NIVL.

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## AUTHOR CONTRIBUTIONS

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## DISCLOSURES

None.

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*Additional material for this article may be found online at www.jvsvenous.org.*

## SUPPLEMENTARY Appendix (online only).

### Questionnaire on antithrombotic strategies after venous stenting

Dear experts:

Thank you for taking time out of your busy schedule to fill in this questionnaire. This questionnaire adopts an anonymous form, mainly to investigate the selection of antithrombotic strategies after venous stenting. After the survey, our research group will feed back the analysis results to the experts. Thank you for your cooperation.

1. Basic information of the interviewed experts
   1. The level of your hospital ()
      A. Tertiary hospitals.
      B. Secondary hospital.
   2. Your department ()
      A. Vascular surgery.
      B. Interventional radiology.
      C. General surgery.
      D. Other.
   3. Your title ()
      A. Chief physician.
      B. Associate chief physician.
      C. Attending physician.
   4. The number of years you have worked in the vein field ()
      A. 1 to 3 years.
      B. 3 to 5 years.
      C. 5 to 10 years.
      D. More than 10 years.
   5. The number of patients treated with venous stents in your department each year ()
      A. <5 cases/month.
      B. 5~10 cases/month.
      C. >10 cases/month.
2. Selection of antithrombotic strategies after venous stenting

Below, we have simulated three clinical scenarios based on literature and clinical experience, and hope that you can give the corresponding antithrombotic treatment strategy.

**Case 1.** A male patient, 25 years old, presents with pain in the left lower limb with edema and varicose veins. He had no previous or family history of venous thromboembolism. Venous bifunctional ultrasound, venography, and intravascular ultrasound suggest May-Thurner syndrome (iliac vein compression syndrome or Cockett syndrome). After admission, the left iliofemoral deep vein stent was implanted. The operation was successful, the stent was in good position, and the blood flow in the inflow and outflow channels of the stent was unobstructed. Before discharge, bifunctional ultrasound showed that the stent was unobstructed and in good position.

5. Which antithrombotic strategy do you think should be chosen for this patient? ()
   A. Anticoagulants.
   B. Anticoagulants → Antiplatelet agents.
   C. Anticoagulants + antiplatelet agents.
   D. (Anticoagulants + antiplatelet agents) → Anticoagulants.
   E. (Anticoagulants + antiplatelet agents) → antiplatelet agents.
   F. Antiplatelet agents.
   G. Others.

A1. What is your choice of medication for this patient? ()
   A. Low molecular weight heparin.
   B. Warfarin.
   C. Direct oral anticoagulants.
   D. Low molecular weight heparin → Warfarin.
   E. Low molecular weight heparin → Direct oral anticoagulant.
   F. Others (Please specify dosage and course of treatment)

A2. What is your choice of anticoagulant dosage for this patient? ()
   A. Therapeutic dose.
   B. Prophylactic dose.
   C. Therapeutic dose → Prophylactic dose.
   D. Others.

A3. Total anticoagulation treatment course for this patient ()?
   A. <3 months.
   B. 3 to 6 months.
   C. 6 to 12 months.
   D. 12 months to life.
   E. Others.

B1. What is your choice of medication for this patient? ()
   A. Low molecular weight heparin → Antiplatelet agents.
   B. Warfarin → Antiplatelet agents.
   C. Direct oral anticoagulants → Antiplatelet agents.
   D. Low molecular weight heparin → Warfarin → Antiplatelet agents.
   E. Low molecular weight heparin → Direct oral anticoagulants → Antiplatelet agents.
   F. Others (Please specify dosage and course of treatment)

B2. What is your choice of anticoagulant dosage for this patient? ()
   A. Therapeutic dose.
   B. Prophylactic dose.
   C. Therapeutic dose → Prophylactic dose.
   D. Others.

B3. Total antithrombotic course for this patient is (), the anticoagulation treatment course is (), and the antiplatelet treatment course is ().
   A. <3 months.
   B. 3 to 6 months.
   C. 6 to 12 months.
   D. 12 months to life.
   E. Others.

C1. What is your choice of medication for this patient? ()
   A. Low molecular weight heparin + antiplatelet agents.
   B. Warfarin + antiplatelet agents.
   C. Direct oral anticoagulants + antiplatelet agents.
   D. (Low molecular weight heparin → Warfarin) + antiplatelet agents.
   E. (Low molecular weight heparin → Direct oral anticoagulants) + antiplatelet agents.

F. Others (please specify dosage and course of treatment)

C2. What is your choice of anticoagulant dosage for this patient? ()
- A. Therapeutic dose.
- B. Prophylactic dose.
- C. Therapeutic dose → Prophylactic dose.
- D. Others.

C3. Total antithrombotic course for this patient is ()?
- A. <3 months.
- B. 3 to 6 months.
- C. 6 to 12 months.
- D. 12 months to life.
- E. Others.

D1. What is your choice of medication for this patient? ()
- A. (Low molecular weight heparin + antiplatelet agents) → Direct oral anticoagulants.
- B. (Low molecular weight heparin + antiplatelet agents) → Warfarin.
- C. (Direct oral anticoagulant + antiplatelet agents) → Direct oral anticoagulants.
- D. (Warfarin + antiplatelet agents) → Direct oral anticoagulants.
- E. (Warfarin + antiplatelet agents) → Warfarin.
- F. ((Low molecular weight heparin → Warfarin) + antiplatelet agents) → Direct oral anticoagulants.
- G. ((Low molecular weight heparin → Warfarin) + antiplatelet agents) → Warfarin.
- H. ((Low molecular weight heparin → Direct oral anticoagulants) + antiplatelet agents) → Direct oral anticoagulants.
- I. Others (Please specify dosage and course of treatment)

D2. What is your choice of anticoagulant dosage for this patient? ()
- A. Therapeutic dose.
- B. Prophylactic dose.
- C. Therapeutic dose → Prophylactic dose.
- D. Others.

D3. Total antithrombotic course for this patient is (), the course of combined anticoagulation and antiplatelet treatment is (), and the course of anticoagulation treatment alone is ()?
- A. <3 months.
- B. 3 to 6 months.
- C. 6 to 12 months.
- D. 12 months to life.
- E. Others.

E1. What is your choice of medication for this patient? ()
- A. (Low molecular weight heparin + antiplatelet agents) → Antiplatelet agents.
- B. (Direct oral anticoagulant + antiplatelet agents) → Antiplatelet agents.
- C. (Warfarin + antiplatelet agents) → Antiplatelet agents.
- D. ((Low molecular weight heparin → Warfarin) + antiplatelet agents) → Antiplatelet agents.
- E. ((Low molecular weight heparin → direct oral anticoagulants) + antiplatelet agents)→ Antiplatelet agents.
- F. Others (Please specify dosage and course of treatment)

E2. What is your choice of anticoagulant dosage for this patient? ()
- A. Therapeutic dose.
- B. Prophylactic dose.
- C. Therapeutic dose → Prophylactic dose.
- D. Others.

E3. Total antithrombotic course for this patient is (), the course of combined anticoagulation and antiplatelet treatment agent is (), the antiplatelet treatment course is ().
- A. <3 months.
- B. 3 to 6 months.
- C. 6 to 12 months.
- D. 12 months to life.
- E. Others.

F1. What is your choice of medication for this patient? ()?
- A. Single antiplatelet agents.
- B. Dual antiplatelet agents.
- C. Dual antiplatelet agents → Single antiplatelet agents.
- D. Others (Please specify dosage and course of treatment)

F2. Total antiplatelet treatment course for this patient is ()?
- A. <3 months.
- B. 3 to 6 months.
- C. 6 to 12 months.
- D. 12 months to life.
- E. Others.

6. Selection of the antithrombotic strategies is based on () (multiple choices)
- A. Clinical experience.
- B. Literature research.
- C. Prescribing habits.
- D. Others.

**Case 2.** A male patient aged 30 years old who had undergone post catheterization of acute iliofemoral deep vein thrombosis. Post-catheterization venography and intravascular ultrasound indicated a May-Thurner lesion (residual obstruction after catheterization). The left iliofemoral deep vein stenting was performed. The operation was successful, and the blood flow in the stent outflow and inflow channels was unobstructed.

Before discharge, bifunctional ultrasound showed that the stent was unobstructed and in good position.

7. Which antithrombotic strategy do you think should be chosen for this patient? ()
- A. Anticoagulants.
- B. Anticoagulants → Antiplatelet agents.
- C. Anticoagulants + antiplatelet agents.
- D. (Anticoagulants + antiplatelet agents) → Anticoagulants.
- E. (Anticoagulant + antiplatelet) → Antiplatelet agents.
- F. Antiplatelet agents.
- G. Others.

A1. What is your choice of medication for this patient? ()
- A. Low molecular weight heparin.
- B. Warfarin.

C. Direct oral anticoagulants.
D. Low molecular weight heparin → Warfarin.
E. Low molecular weight heparin → Direct oral anticoagulants.
F. Others (Please specify dosage and course of treatment)

A2. What is your choice of anticoagulant dosage for this patient? ()
A. Therapeutic dose.
B. Prophylactic dose.
C. Therapeutic dose → Prophylactic dose.
D. Others.

A3. Total anticoagulation treatment course for this patient is ()?
A. < 3 months.
B. 3 to 6 months.
C. 6 to 12 months.
D. 12 months to life.
E. Others.

B1. What is your choice of medication for this patient? ()
A. Low molecular weight heparin → Antiplatelet agents.
B. Warfarin → Antiplatelet agents.
C. Direct oral anticoagulants → Antiplatelet agents.
D. Low molecular weight heparin → Warfarin → Antiplatelet agents.
E. Low molecular weight heparin → Direct oral anticoagulant → Antiplatelet agents.
F. Others (Please specify dosage and course of treatment)

B2. What is your choice of anticoagulant dosage for this patient? ()
A. Therapeutic dose.
B. Prophylactic dose.
C. Therapeutic dose → Prophylactic dose.
D. Others.

B3. Total antithrombotic course for this patient is (), The anticoagulation treatment course is (), and the antiplatelet treatment course is ().
A. <3 months.
B. 3 to 6 months.
C. 6 to 12 months.
D. 12 months to life.
E. Others.

C1. What is your choice of medication for this patient? ()
A. Low molecular weight heparin + antiplatelet agents.
B. Warfarin + antiplatelet agents.
C. Direct oral anticoagulants + antiplatelet agents.
D. (Low molecular weight heparin → Warfarin) + antiplatelet agents.
E. (Low molecular weight heparin → direct oral anticoagulants) + antiplatelet agents.
F. Others (please specify dosage and course of treatment)

C2. What is your choice of anticoagulant dosage for this patient? ()
A. Therapeutic dose.
B. Prophylactic dose.
C. Therapeutic dose → Prophylactic dose.
D. Others.

C3. Total antithrombotic course for this patient is () ?
A. <3 months.
B. 3 to 6 months.
C. 6 to 12 months.
D. 12 months to life.
E. Others.

D1. What is your choice of medication for this patient? ()
A. (Low molecular weight heparin + antiplatelet agents) → Direct oral anticoagulants.
B. (Low molecular weight heparin + antiplatelet agents) → Warfarin.
C. (Direct oral anticoagulants + antiplatelet agents) → Direct oral anticoagulants.
D. (Warfarin + antiplatelet agents) → Direct oral anticoagulants.
E. (Warfarin + antiplatelet agents) → Warfarin.
F. ((Low molecular weight heparin → Warfarin) + antiplatelet agents) → Direct oral anticoagulants.
G. ((Low molecular weight heparin → Warfarin) + antiplatelet agents) → Warfarin.
H. ((Low molecular weight heparin → Direct oral anticoagulants) + antiplatelet agents) → Direct oral anticoagulants.
I. Others (Please specify dosage and course of treatment)

D2. What is your choice of anticoagulant dosage for this patient? ()
A. Therapeutic dose.
B. Prophylactic dose
C. Therapeutic dose → Prophylactic dose.
D. Others.

D3. Total antithrombotic course for this patient is (), the course of combined anticoagulant and antiplatelet treatment is (), and the course of anticoagulation treatment alone is ()?
A. <3 months.
B. 3 to 6 months.
C. 6 to 12 months.
D. 12 months to life.
E. Others.

E1. What is your choice of medication for this patient? ()
A. (Low molecular weight heparin + antiplatelet agents) → Antiplatelet agents.
B. (Direct oral anticoagulants + antiplatelet agents) → Antiplatelet agents.
C. (Warfarin + antiplatelet agents) → Antiplatelet agents.
D. ((Low molecular weight heparin → Warfarin) + antiplatelet agents) → antiplatelet agents.
E. ((Low molecular weight heparin → Direct oral anticoagulants) + antiplatelet agents) → Antiplatelet agents.
F. Other (Please specify dosage and course of treatment)

E2. What is your choice of anticoagulant dosage for this patient? ()
A. Therapeutic dose.
B. Prophylactic dose.
C. Therapeutic dose → Prophylactic dose.
D. Others.

E3. Total antithrombotic course for this patient is (), the course of combined anticoagulation and antiplatelet treatment is (), the course of antiplatelet treatment alone is ().
A. <3 months.

B. 3 to 6 months.
C. 6 to 12 months.
D. 12 months to life.
E. Others.

F1. What is your choice of medication for this patient ()?
A. Single antiplatelet agents.
B. Dual antiplatelet agents.
C. Dual antiplatelet agents→ Single antiplatelet agents.
D. Others (Please specify dosage and course of treatment)

F2. Total antiplatelet treatment course for this patient? ()
A. <3 months.
B. 3 to 6 months.
C. 6 to 12 months.
D. 12 months to life.
E. Others.

8. Selection of the antithrombotic strategies is based on () (multiple choices)
A. Clinical experience.
B. Literature research.
C. Prescribing habits.
D. Others.

**Case 3.** The 40-year-old male patient had a history of DVT twice in the past 10 years and had a left lower extremity venous ulcer. Venous bifunctional ultrasound, venography, and intravascular ultrasound indicated occlusion of the long segment of the left iliac vein. Angioplasty plus iliofemoral deep vein stent was performed. The operation was successful, and the blood flow in the outflow and inflow channels of the stent was unobstructed. Before discharge, bifunctional ultrasound showed that the stent was unobstructed and in good position.

9. Which antithrombotic strategy do you think should be chosen for this patient? ()
A. Anticoagulants.
B. Anticoagulants → antiplatelet agents.
C. Anticoagulants + antiplatelet agents.
D. (Anticoagulants + antiplatelet agents) → anticoagulants.
E. (Anticoagulants + antiplatelet agents) → antiplatelet agents.
F. Antiplatelet agents.
G. Others.

A1. What is your choice of medication for this patient? ()
A. Low molecular weight heparin.
B. Warfarin.
C. Direct oral anticoagulants.
D. Low molecular weight heparin → Warfarin.
E. Low molecular weight heparin → Direct oral anticoagulants.
F. Other (Please specify dosage and course of treatment)

A2. What is your choice of anticoagulant dosage for this patient? ()
A. Therapeutic dose.
B. Prophylactic dose.
C. Therapeutic dose → Prophylactic dose.
D. Others.

A3. Total anticoagulation treatment course for this patient is ()?
A. <3 months.
B. 3 to 6 months.
C. 6 to 12 months.
D. 12 months to life.
E. Others.

B1. What is your choice of medication for this patient? ()
A. Low molecular weight heparin → Antiplatelet agents.
B. Warfarin → Antiplatelet agents.
C. Direct oral anticoagulants → Antiplatelet agents.
D. Low molecular weight heparin → Warfarin → Antiplatelet agents.
E. Low molecular weight heparin → Direct oral anticoagulant → Antiplatelet agents.
F. Others (Please specify dosage and course of treatment)

B2. What is your choice of anticoagulant dosage for this patient? ()
A. Therapeutic dose.
B. Prophylactic dose.
C. Therapeutic dose → Prophylactic dose.
D. Others.

B3. Total antithrombotic course for this patient is (), the anticoagulation treatment course is (), and the antiplatelet treatment course is ().
A. <3 months.
B. 3 to 6 months.
C. 6 to 12 months.
D. 12 months to life.
E. Others.

C1. What is your choice of medication for this patient? ()
A. Low molecular weight heparin + antiplatelet agents.
B. Warfarin + antiplatelet agents.
C. Direct oral anticoagulants + antiplatelet agents.
D. (Low molecular weight heparin → Warfarin) + antiplatelet agents.
E. (Low molecular weight heparin → direct oral anticoagulant) + antiplatelet agents.
F. Other (Please specify dosage and course of treatment)

C2. What is your choice of anticoagulant dosage for this patient? ()
A. Therapeutic dose.
B. Prophylactic dose.
C. Therapeutic dose → Prophylactic dose.
D. Others.

C3. Total antithrombotic course for this patient is ()?
A. <3 months.
B. 3 to 6 months.
C. 6 to 12 months.
D. 12 months to life.
E. Others.

D1. What is your choice of medication for this patient? ()
A. (Low molecular weight heparin + antiplatelet agents) → Direct oral anticoagulants.
B. (Low molecular weight heparin + antiplatelet agents) → Warfarin.

C. (Direct oral anticoagulants + antiplatelet agents) → Direct oral anticoagulants.
D. (Warfarin + antiplatelet agents) → Direct oral anticoagulant.
E. (Warfarin + antiplatelet agents) → Warfarin.
F. ((Low molecular weight heparin → Warfarin) + antiplatelet agents) → Direct oral anticoagulants.
G. ((Low molecular weight heparin → Warfarin) + antiplatelet agents) → Warfarin.
H. ((Low molecular weight heparin → Direct oral anticoagulants) + antiplatelet agents)→ Direct oral anticoagulants.
I. Other (Please specify dosage and course of treatment)

D2. What is your choice of anticoagulant dosage for this patient? ()
A. Therapeutic dose.
B. Prophylactic dose.
C. Therapeutic dose → Prophylactic dose.
D. Others.

D3. Total antithrombotic course for this patient is (), the course of combined anticoagulation and antiplatelet treatment is (), the course of anticoagulation treatment alone is ().
A. <3 months.
B. 3 to 6 months.
C. 6 to 12 months.
D. 12 months to life.
E. Others.

E1. What is your choice of medication for this patient? ()
A. (Low molecular weight heparin + antiplatelet agents) → Antiplatelet agents.
B. (Direct oral anticoagulant + antiplatelet agents) → Antiplatelet agents.
C. (Warfarin + antiplatelet agents) → Antiplatelet agents.
D. ((Low molecular weight heparin → Warfarin) + antiplatelet agents) → Antiplatelet agents.
E. ((Low molecular weight heparin → Direct oral anticoagulants) + antiplatelet agents) → Antiplatelet agents.
F. Others (Please specify dosage and course of treatment)

E2. What is your choice of anticoagulant dosage for this patient? ()
A. Therapeutic dose
B. dose.
C. Therapeutic dose → dose.
D. Others.

E3. Total antithrombotic course for this patient is (), the course of combined anticoagulation and antiplatelet treatment is (), the course of antiplatelet treatment alone is ().
A. <3 months.
B. 3 to 6 months.
C. 6 to 12 months.
D. 12 months to life.
E. Others.

F1. What is your choice of medication for this patient ()?
A. Single antiplatelet agents.
B. Dual antiplatelet agents.
C. Dual antiplatelet agents→ single antiplatelet agents.
D. Others (Please specify dosage and course of treatment)

F2. Total antiplatelet treatment course for this patient is ()?
A. <3 months.
B. 3 to 6 months.
C. 6 to 12 months.
D. 12 months to life.
E. Others.

10. Selection of the antithrombotic strategies is based on () (multiple choices)
A. Clinical experience.
B. Literature research.
C. Prescribing habits.
D. Others.

**Supplementary Table (online only).** The experts panel in phase 2

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