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Venous stenting: Long-Term Patency, Outcome Predictors, and Evolving Practice in Post-Thrombotic Syndrome

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Abstract

Background: Iliofemoral venous stenting has become an essential treatment for chronic post-thrombotic syndrome (PTS) and iliofemoral venous obstruction. It can provide permanent relief of symptoms that cannot be corrected by other means through the outflow blockage. *Objectives:* The aim is to summarise the current primary clinical data on venous stenting for PTS, critically analyse trends in long-term patency, identify predictors of outcomes that are consistently observed, and identify new therapeutic approaches that would allow fine-tuning patient selection and maximising stent performance. *Methods:* Ten primary studies have been summarised in this review. The studies consider long-term patency, the features of anatomy and clinical appearance predictive of success, the patient-reported outcomes, and the performance of dedicated venous stents. *Results:* The findings indicate high technical success and significant improvements in pain, swelling, function, and quality of life in both acute and chronic patients. The rates of patency vary, though: lesions in non-thrombotic iliac veins are more likely to support patency, whereas PTS is associated with lower patency due to issues with inflows, scar tissue formation, and increased stent sets. In the literature, total elimination of clots, good inflow quality, and accurate stent placement were the strongest predictors of good results. *Conclusions:* The new-generation stents, such as Venovo and V-Mixtent, are performing well in terms of safety and efficacy, but results remain sparse in patients with severe fibrosis. Although studies vary in design and follow-up criteria, the overall evidence supports venous stenting as an effective and evolving treatment. Stricter comparative trials are needed to improve device selection, establish standard imaging criteria, and improve long-term outcomes.

Keywords: Post-thrombotic syndrome, Iliac vein stenting, Venous obstruction, Patency predictors, Dedicated venous stents.

Introduction

One of the most crippling chronic problems of deep vein thrombosis (DVT) is post-thrombotic syndrome (PTS). PTS is characterised by obstruction of the venous circulation, pain, edema, and soreness, which significantly deteriorate the quality of life [1]. Conventional therapy is based on compression treatment and anticoagulation. Nevertheless, Esposito et al. [2] mention that these techniques do not often correct the underlying ilio caval outflow impediment, particularly in patients having recanalised yet fibrotic venous segments. As Barbati et al. [3] explain, endovascular venous stenting has, over the last decade, evolved into a game changer as a form of therapy aimed at restoring a clear venous circulation and reducing the burden of symptoms. According to Qiu et al. [4], technical success and symptomatic improvement are achieved with iliac or iliofemoral venous stenting in patients with PTS. More recent prospective evidence has been reported by Majeed et al. [5], which further indicates the clinical advantages of dedicated technologies in venous stents. Although these improvements have been made, there are still considerable uncertainties. The long-term patency rates differ widely in the literature, particularly for post-thrombotic lesions that are more complex in morphology and unfavourable to inflow

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than for non-thrombotic iliac vein lesions [6]. There is inconsistency in the predictors of restenosis and stent dysfunction, including the inflow quality, lesion chronicity, stent extension, and hemodynamic parameters, with limited agreement among studies [7]. In addition, although Lee et al. [8] assessed symptom scores and patient-reported outcomes, there remain gaps regarding the sustainability of these improvements in long-term follow-up. Literature nowadays either focuses on technical success or on short-term results, and there is a gap in synthesising long-term patency and its determinants with changing trends in clinical practice. Hence, the purpose of the review is to summarise the current primary clinical data on venous stenting for PTS, critically analyse trends in long-term patency, identify predictors of outcomes that are consistently observed, and identify new therapeutic approaches that would allow fine-tuning patient selection and maximising stent performance.

METHODS

Search Strategy

The researchers conducted a systematic literature review to identify the primary empirical research on venous stenting in post-thrombotic syndrome (PTS). The search criteria included long-term patency, prognostic factors for clinical or anatomical outcomes, and the modifying practice of endovascular. Despite using a narrative review, we adhered to PRISMA 2020 search and screening rules. Such a methodology encourages transparency and reproducibility and minimises selection bias, which are required in vascular and endovascular studies where results vary across diverse patient groups and devices. The systematic approach enhances the strength of evidence synthesis in interventional vascular medicine by systematically extracting clinical trials, prospective registries, and observational cohorts. An extensive search was conducted across PubMed, Scopus, Web of Science, and Google Scholar, including publications through January 2025. There was no date restriction on publication, allowing both early and modern research on venous stents. Each database had its own Boolean operators and key terms. PubMed search query included “(iliac vein stenting) or (iliofemoral venous stent) and (post-thrombotic syndrome) or (PTS) and (patency) or (restenosis) or (outcomes)”. Web of Science search included “(venous stent* AND post-thrombotic AND long-term outcome* OR predictor*)”. Google Scholar query included “(PTS treatment) AND (venous stenting) AND (iliac obstruction) OR (iliofemoral obstruction)” (See Appendix B). Further, the research restricted the search to English-language, peer-reviewed, original research articles. The research omitted conference abstracts, editorials, case reports of single patients, guidelines, and all systematic reviews. All records were manually filtered for relevance, and duplicates were eliminated. Section 3 presents a PRISMA flow diagram (Fig. 1) which summarises the process.

Selection Criteria

Inclusion Criteria

The inclusion criteria were designed to include strong, clinically significant evidence relevant to venous stenting regarding post-thrombotic syndrome (PTS). The eligible investigations included both primary empirical studies, both quantitative and qualitative, published between 2000 and 2025. They included only studies that measured the efficacy of endovascular stenting in iliac, iliofemoral, or ilio caval barriers that were directly related to PTS or chronic deep venous thrombosis sequelae. To enable comparability, studies had to report measurable clinical or imaging outcomes, including patency, restenosis, Villalta score, or Venous Clinical Severity Score (VCSS) index, hemodynamic changes, complications, reinterventions, or quality-of-life index. The acceptable study designs were prospective or retrospective cohort studies, randomised

or non-randomised clinical trials, multicentre registries, and extensive case series with a minimum of 10 participants, especially studies examining predictors such as quality of inflow, lesion chronicity, stent choice, or procedural variables.

Exclusion Criteria

The studies were excluded if they were not relevant to PTS-related venous stenting or did not present empirical outcome data. Namely, systematic reviews, meta-analyses, editorials, commentaries, conference abstracts, and publications in non-English were excluded. Studies that focused solely on non-thrombotic iliac vein lesions (NIVL) and did not distinguish a specific PTS subgroup were also excluded to maintain the coherence of the population. Also, case reports with fewer than 10 patients, descriptions that were purely technical without follow-up outcomes, and studies that did not quantify clinical, imaging, or patency outcomes were excluded.

Data Extraction

A structured matrix, based on the JBI evidence charting guidelines, was used to extract data. The variables extracted were: author, year, country, sample size, patient characteristics, venous segment treated, type/design of stent, imaging modality, duration of follow-up, patency definitions, outcome measures (Villalta score, VCSS, QoL, reintervention), and predictors of success or restenosis. To enhance accuracy, the extraction was performed independently by two reviewers, and any differences were resolved through discussion.

Data Analysis

The research papers were arranged in a narrative synthesis. They divided them into five general themes: long-term patency results; anatomical and clinical predictors of success; patient-reported outcomes; performance features of dedicated venous stents; and complications or patterns of reintervention. This framework enabled comparative systematisation of various study designs and patient groups. It helped determine stable determinants of stent durability, including inflow quality, lesion chronicity, and stent length or extension. It also reported new practice trends, such as the development of stent technology and antithrombotic strategies.

Ethical Considerations

Data in published studies that were easily accessible were used in this review, and there were no human or animal subjects. Thus, the formal ethical approval was not demanded. There is a proper citation of all sources as a means of preserving academic integrity.

RESULTS

Data Screening

In all, 244 records were found in PubMed (n=34), Google Scholar (n=29), and Web of Science (n=181). The result was 146 records passed to title and abstract screening after removal of 98 duplicates and the use of a temporal filter. Of those, 54 were eliminated due to irrelevance or lack of peer-reviewed status. The remaining 92 reports were retrieved with full text, but 35 were unavailable due to a lack of full text or were restricted to conference proceedings. After a thorough evaluation of 28 reports based on eligibility, 18 studies were excluded for failing to meet the inclusion criteria. In the end, 10 major cohort studies were incorporated into this review (Figure 1).

Identification of studies via databases and registers

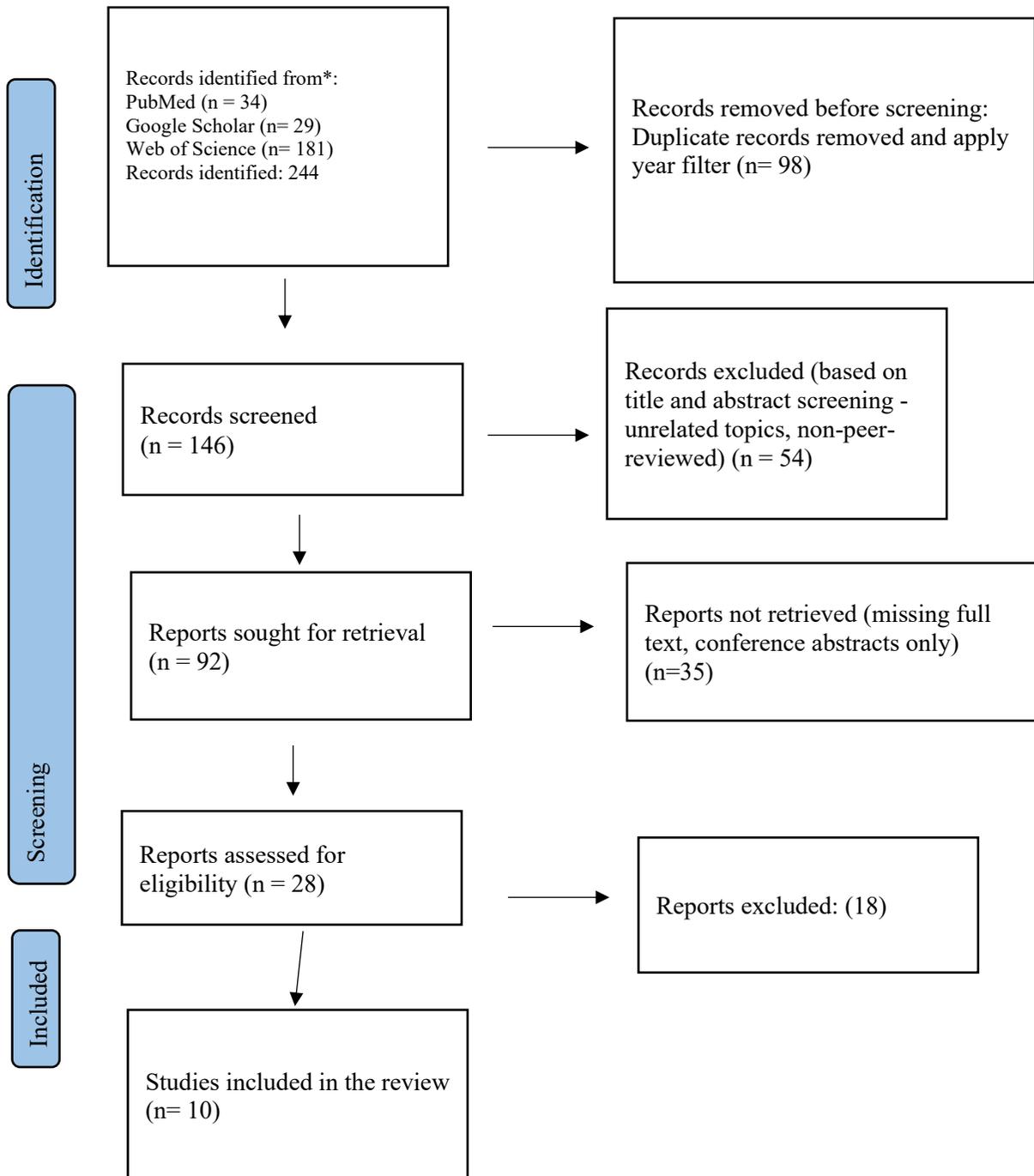


Figure 1 Prisma Flow Diagram

Quality Assessment

The quality assessment of the 10 studies included in the cohort study sample met high methodological standards. All studies presented a concise, clinically significant research question focused on the outcomes of venous stenting in patients with post-thrombotic or obstructive iliofemoral disease (e.g., Avgerinos et al. [9]; Falcoz et al. [10]; Guillen et al. [11]). The subjects were recruited through appropriate vascular referral pathways, ensuring the sample was representative of the population with respect to acute DVT, chronic PTS, and NIVL (Espitia et al. [12]; Moini et al. [13]). The measurements of exposure and outcome (duplex-confirmed patency, Villalta and VCSS scoring, and validated quality-of-life indices) were obtained with accuracy and reliability, thus minimising measurement bias (Klitfod et al. [14]; Bakas et al. [15]). Key confounders, such as inflow quality, lesion chronicity, thrombus clearance, and anticoagulation history, were identified and, in several studies, corrected using multivariate analysis (Avgerinos et al.[9]; Espitia et al. [12]). The follow-up periods were quite sufficient, ranging from months to several years, allowing assessment of durability (Dake et al. [16]; Sheng et al. [17]; Sun et al. [18]). On the whole, the studies' results were feasible, internally consistent, and consistent with existing evidence on venous reconstruction, making them applicable to similar patient groups. Table 2 in Appendix B gives the detailed scoring in CASP.

Study Characteristics

Throughout the ten primary studies that are represented, there is a trend on the efficacy and restriction of venous stenting in relation to post-thrombotic and iliofemoral venous blockage [9] [10] [11] [12] [13] [14] [15] [16] [17] [18]. Both acute and chronic cohorts have high rates of technical success and significant relief of meaningful symptoms, with improvements in Villalta scores, Venous Clinical Severity Scores (VCSS), pain, and quality-of-life (QoL) scores reported across studies. Long-term patency, however, varies depending on the underlying pathology: non-invasive venous laser (NIVL) is very durable, whereas post-thrombotic syndrome (PTS) has lower patency rates due to complex lesions, inflow impairment, and longer stent constructs. Some studies identify predictors with a potent effect on outcomes, such as complete thrombus elimination, stent extension, anticoagulation history, and bilateral disease. Specific venous stents, including Venovo and V-Mixtent, have good safety profiles, durability, and clinical outcomes. In general, stenting is effective, and outcomes depend on anatomical factors, inflow features, and device choice (see Table 1).

Table 1: Study Characteristics

Authors	Year	Aim of the Study	Methodology	Solution / Intervention	Findings of the Study	Outcome
Avgerinos et al.	2019	To evaluate outcome factors and predictors of iliac vein stent failure and contralateral thrombosis following catheter-directed thrombolysis for acute iliofemoral DVT.	Retrospective cohort study of 73 patients (77 limbs) treated between 2007 and 2017; clinical, imaging, and procedural data analysed; multivariate Cox regression used.	Catheter-directed thrombolysis followed by self-expanding iliac vein stenting (Wallstent/Protégé), with assessment of stent extension proximally and distally.	3-year primary and secondary patency were 75.2% and 82.2%; incomplete thrombolysis was the strongest predictor of failure (HR 7.41). Stent extension below the inguinal ligament increased PTS risk; contralateral DVT risk was low and not significantly higher with proximal extension.	Iliac stenting after thrombolysis provides good long-term patency when thrombus clearance is adequate; inflow quality and stent positioning significantly affect PTS and patency.

<p>Bakas et al.</p>	<p>2024</p>	<p>To evaluate the long-term quality of life after venous stenting for PTS and assess whether inflow disease impacts patient-reported outcomes.</p>	<p>Cross-sectional QoL survey with retrospective chart review in patients stented between 2006 and 2021; CIVIQ-20 and SF-36 questionnaires collected (response rate 70%).</p>	<p>Iliac/iliofemoral/caval venous stenting for PTS; assessment of inflow from deep femoral and femoral veins.</p>	<p>Median CIVIQ-20 was 35.5, indicating impaired QoL; PCS was significantly below population norms, while MCS exceeded norms. Age was a significant predictor of poorer CIVIQ-20 scores. Inflow disease did not influence QoL in patients with patent stents; patients with permanent occlusions had the worst QoL.</p>	<p>Venous stenting improves overall QoL, but physical limitations persist; inflow disease does not worsen QoL if stents remain patent; stent occlusion strongly correlates with poor functional status.</p>
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<p>Dake et al. (VERNACULAR Trial)</p>	<p>2021</p>	<p>To assess the safety, patency, and clinical performance of the Venovo dedicated venous stent in iliofemoral obstruction over 3 years.</p>	<p>Prospective, multicenter clinical trial (170 patients; 22 centres). Core-lab adjudicated venography and duplex imaging; hypothesis-driven evaluation of primary endpoints.</p>	<p>Implantation of the Venovo self-expanding nitinol venous stent in obstructive iliofemoral lesions (PTS or NIVL).</p>	<p>12-month primary patency was 88.6% and freedom from major adverse events was 93.5%; there was a significant improvement in CIVIQ-20 and VCSS pain scores. At 36 months, primary patency was 79.5% with no migration or fractures.</p>	<p>The Venovo stent demonstrated high patency, durable symptom improvement, and a strong safety profile over 3 years, supporting its use for iliofemoral venous obstruction.</p>
<p>Espitia et al.</p>	<p>2023</p>	<p>To determine predictors of primary patency after iliofemoral venous stenting across NIVL, aDVT, and PTS groups.</p>	<p>Retrospective multicentre cohort (n=377); minimum 6-month imaging; Kaplan–Meier + Cox regression.</p>	<p>Iliac/iliofemoral/IVC venous stenting after thrombolysis/recanalisation.</p>	<p>NIVL had the highest patency (99.3%); PTS had the lowest (68.6%). Long-term anticoagulation was associated with patency loss in aDVT. PTS had more complex, longer stent constructs.</p>	<p>PTS anatomy results in poorer durability; patency is influenced by inflow quality, lesion type, and anticoagulation history.</p>

<p>Falcoz et al.</p>	<p>2016</p>	<p>To evaluate safety, patency, symptom response, and QoL improvement after stenting for chronic post-thrombotic iliofemoral obstruction.</p>	<p>Prospective single-centre cohort (21 pts; 25 procedures); Villalta + CIVIQ-20 at baseline and 3 months; duplex/CT follow-up.</p>	<p>Recanalisation + balloon angioplasty + nitinol stent placement (2–7 stents/limb).</p>	<p>Technical success 96%; patency 90.5%; Villalta improved 14→5; CIVIQ-20 improved 48.5→26.5 (p<0.0001).</p>	<p>Stenting is safe, restores venous patency, and significantly improves symptoms and QoL in chronic PTS.</p>
<p>Guillén et al.</p>	<p>2023</p>	<p>To assess patient-reported outcomes after iliofemoral stenting for PTS and identify predictors of symptomatic improvement.</p>	<p>Ancillary analysis of national SFICV cohort; 539 patients (Villalta), 298 (CIVIQ-20); multivariate regression.</p>	<p>Endovascular angioplasty + stenting for chronic post-thrombotic obstruction.</p>	<p>Villalta improved by a mean of 7 points; CIVIQ-20 improved by 19.2 points (p<0.0001)—improvement is linked to lesion severity, time since DVT, bilateral stenting, and single stented segment.</p>	<p>Significant patient-reported improvement; symptom relief does not always mirror imaging patency, supporting PROM-based follow-up.</p>
<p>Klitfod et al.</p>	<p>2015</p>	<p>To evaluate long-term patency and clinical outcomes after stenting for chronic iliofemoral venous obstruction.</p>	<p>Retrospective cohort; 55 patients; median follow-up 44 months; duplex + symptom scoring.</p>	<p>Iliac/iliofemoral venous recanalisation + stenting.</p>	<p>Primary patency 82%; assisted primary 90%; significant symptom and ulcer improvement.</p>	<p>Stenting provides durable patency with sustained symptom relief in chronic obstruction.</p>

<p>Moini et al.</p>	<p>2019</p>	<p>To compare patency and symptom improvement between NTIVL vs PTS individuals undergoing venoplasty + stenting.</p>	<p>Historical cohort; 164 patients (88 NTIVL, 76 PTS); 6-month follow-up; serial duplex + VDS/VCSS.</p>	<p>Venoplasty + stenting under local anaesthesia using multiple stent platforms; warfarin anticoagulation.</p>	<p>NTIVL had higher primary patency (98.8% vs 88%); PTS had more thrombosis; symptoms significantly improved in both groups.</p>	<p>Stenting is effective for both etiologies; the PTS anatomy associated with early thrombosis is also associated with lower primary patency.</p>
<p>Sheng et al.</p>	<p>2024</p>	<p>To assess the safety and 12-month effectiveness of the new V-Mixtent hybrid venous stent in iliofemoral obstruction.</p>	<p>Prospective multicentre cohort; 171 patients; core-lab imaging; CEAP/VCSS/ CIVIQ-14 at 6 and 12 months.</p>	<p>V-Mixtent stent implantation with standardised anticoagulation; venography-guided deployment.</p>	<p>12-month primary patency 91.36%; MAE rate 1.17%; significant VCSS and QoL improvement.</p>	<p>The novel stent demonstrated high safety, strong patency, and marked symptom/QoL improvement.</p>
<p>Sun et al.</p>	<p>2025</p>	<p>To evaluate outcomes of stenting for IVCS with acute DVT after thrombectomy or thrombolysis.</p>	<p>Retrospective cohort; 31 patients; 3-, 6-, 12-month follow-up using DUS/CTV + VAS, VCSS, EQ-5D-5L.</p>	<p>Iliac vein stenting plus thrombectomy/t hrombolysis for decompression</p>	<p>High technical success, excellent patency, symptoms markedly improved</p>	<p>Safe, effective early treatment with sustained clinical benefit</p>

Findings

In the 10 primary studies included in this review, there is a consistent trend in the performance, durability, and clinical effects of iliofemoral and iliocaval venous stenting in both post-thrombotic and non-thrombotic conditions. Though the studies reviewed differ in terms of patient population, device platforms, and time of follow-up, there are overlapping themes that identify the factors that determine long-term patency and symptomatic improvement. The best patency results were consistently observed in non-thrombotic iliac vein lesions (NIVL). After 99.3% was reported by Espitia et al. [12] as the primary patency of the NIVL versus 68.6% as the primary patency of the post-thrombotic syndrome (PTS), the impact of the chronicity of the lesion and venous scarring on stent longevity is evident (See Fig. 2). This comparison is consistent with the results of Moini et al. [13], where 98.8% of the patency of NIVL patients was compared to 88%

of PTS with the same technical interventions, and it is clear that obstruction aetiology, but not stent technology, is the main distinguishing factor of success. The theme of the two studies is the same: post-thrombotic lesions that require longer stent constructs, which may extend below the inguinal region and further increase the risk of inflow compromise.

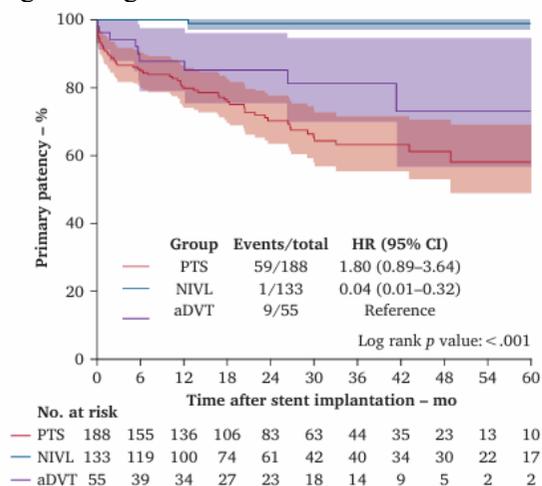


Figure 1: Cumulative KaplanMeier estimate of primary patency; Source: Espitia et al. [12]

Conversely, research involving PTS populations alone, such as Falcoz et al. [10] and Klitfod et al. [14], has shown that although patency is lower than in NIVL groups, the clinical outcome remains significant. Falcoz et al. [10] reported a large decrease in Villalta scores (14.5) and CIVIQ-20 (48.5, 26.5), but Klitfod et al. [14] reported 84% symptomatic relief at long-term PTS, with a median follow-up of 81 months. These results support the notion that PTS patients can gain a more relative benefit, despite imperfect patency, in that their symptom burden is greater at baseline. Nevertheless, the PTS-exclusive cohorts did not use multivariate models to control for predictors of restenosis, which limits interpretability. Various studies have identified predictors widely utilised to determine stent longevity. The survey conducted by Avgerinos et al. [9] showed that the residual thrombus after catheter-directed thrombolysis was the most significant predictor of stent failure (HR 7.41), underscoring the potential significance of high-quality inflow. Their finding that stent extension below the inguinal ligament predisposed patients to PTS is consistent with Espitia et al. [12], who reported that PTS patients who required a larger stent had lower patency. The overlap of these findings indicates a dose-response relationship between the degree of stenting and inflow vulnerability, which repeats in datasets. However, these studies use a retrospective design and different imaging protocols, which should be considered when making these predictions.

Specific results were obtained with trials assessing dedicated venous stents. Dake et al. [16] showed that the Venovo stent had a 79.5% primary patency at 3 years without device-related migration or fracture, providing strong evidence of long-term mechanical durability. Sheng et al. [17] also found high patency of 12 months (91.36%) with the V-Mixtent hybrid stent, with significant VCSS and quality of life changes (See Fig 3). Collectively, these device trials indicate that dedicated venous stents are more promising than older platforms for long-term luminal integrity. Nevertheless, the two trials had limited PTS subgroup analyses, and there was also a

question about whether stents performed well in highly scarred venous segments, the areas where stents are most exposed to mechanical stress. Articles that specifically studied patient-reported outcomes (PROs) added more knowledge to the clinical benefit. Bakas et al. [15] reported that, despite the presence of patent stents, QoL remains below population levels, with residual physical limitations a major contributor to this problem. Surprisingly, the inflow disease did not reduce QoL unless the stents were blocked, suggesting that patency, not the complexity of the anatomy, is the key factor in symptom reduction. Guillen et al. [11] provided a more granular perspective, showing that the relationship between symptomatic improvement and lesion severity, bilateral stenting, and duration since thrombosis remains unexplored in previous studies. The fact that they discovered that PROMs do not necessarily correlate with imaging patency also leads them to think that patient-centred measures can offer a more holistic image of treatment effectiveness, especially in chronic PTS.

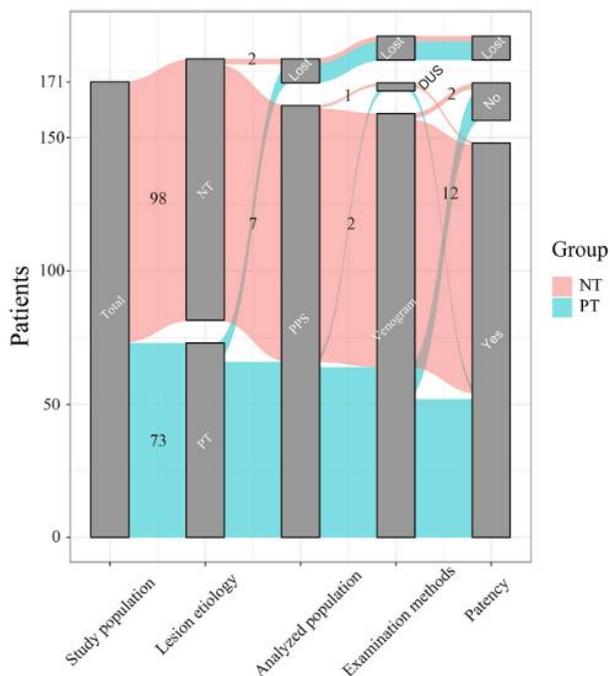


Figure 2: Sankey diagram displayed the population flow; Source: Sheng et al. [17]

There were varying patterns in cases of acute deep venous thrombosis (DVT) with obstruction. Sun et al. [18] claimed very high patency (96.8% at all follow-ups) after either percutaneous mechanical thrombectomy (PMT) or catheter-directed thrombolysis (CDT) with stenting of the inferior vena cava syndrome-related acute DVT See Fig 4). Their cohort is not comparable to chronic PTS populations; new thrombus, reduced obstruction, and less remodelling have probable explanations for their better outcomes. These results resonate with those of Avgerinos et al. [9], who found that optimal patency is achieved by prompt and efficient thrombus clearance. However, Sun et al. did not stratify outcomes by thrombus chronicity or stent type, which limits cross-study comparison. All in all, the general evidence suggests that the usefulness of venous stenting depends on the success of restoring circulation and alleviating symptoms. Still, the results largely depend on underlying pathology, inflow quality, and technical performance. PTS is the most difficult subset, which shows reduced patency with a significant symptomatic

220 Venous stenting: long-term patency, outcome predictors, and evolving improvement. Devoted venous stents prove to be more durable, yet long-term evidence in PTS-afflicted cohorts is yet to be published.

Five-level EuroQol-five Dimensions

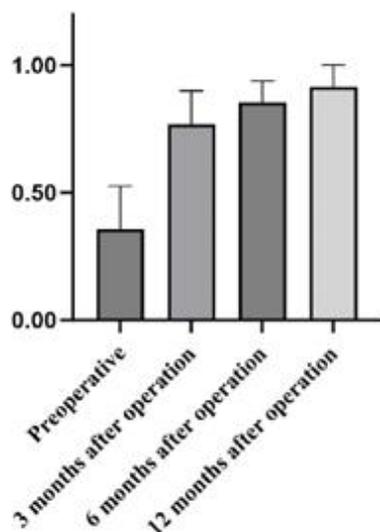


Figure 3: Five-level EuroQol-five dimensions to assess the quality; Source: Sun et al. [18].

DISCUSSION

The results of the ten primary studies selected provide strong evidence that venous stenting is an effective intervention for improving symptoms and iliofemoral venous outflow in both thrombotic and non-thrombotic iliac vein lesions (NIVL). The magnitude of advantage, the patency of effect, and the clinical prognosticators of success, however, differ significantly across patients, lesion features, and stent platforms. One significant theme reflected in the studies is the consistent difference in patency outcomes between the NIVL and PTS cohorts. Espitia et al. [2] showed that NIVL had almost flawless patency and PTS, with only a moderate rate, a pattern also observed in Moini et al. [13], where NIVL had higher patency than lower PTS. These findings are also consistent with Prionidis [19], which states that chronic venous scarring, inflow disruptions, and long-term post-thrombotic obstruction are more challenging to treat endovascularly than compressive lesions. Equally, Ullrich [7] posits that PTS is a subgroup with the most significant risk of restenosis, with certain long-term registries reporting rates of 25 to 40 percent.

PTS patients show significant symptomatic improvement despite reduced patency. Both Falcoz et al. [10] and Klitfod et al. [14] reported clinically essential improvements in Villalta scores and pain, in addition to ulcer healing. The findings can be compared with those of Mustapha et al. [20], who note that even partial venous outflow restoration is a significant means of reducing ambulatory venous hypertension. It implies that the extent of symptomatic benefit is not necessarily related to ideal stent patency; instead, better hemodynamics can provide PTS patients with meaningful functional relief.

Another vital intersection point was on predictors of stent failure. The study by Avgerinos et al. [9] found that the strongest predictor of failure was incomplete thrombus removal (HR 7.41), a finding supported by Sun et al. [18], who reported good patency following PMT/CDT use in

acute DVT episodes. These works emphasise that the quality of inflow, in particular, patency of the femoral vein, is the key to the sustained performance of stents. This is supported by Mahadevan et al. [21], who explain that the odds ratios for stent failure are mainly due to inflow disease and are similar to those reported by Avgerinos et al. [9]. The similarity in relationships across datasets underscores the importance of inflow assessment during pre-interventional planning. Some other nuances came in with device-specific performance results. Dake et al. [16] reported a 36-month high patency rate and no fractures or migration in the Vernacular trial, which is significantly better than other older platforms that have been repeatedly criticised for foreshortening and radial force. Likewise, Sheng et al. [17] reported that the V-Mixtent hybrid stent had a high 12-month patency rate. The positive device results are supported by Brodie [22], who demonstrates that later nitinol-based specialised venous stents are more resistant to compression, radial recoil, and fatigue. Nonetheless, the two trials of the devices involved mixed populations, and there was a relatively small number of PTS patients; hence, generalisation to highly scarred PTS lesions would remain somewhat limited.

The added value to the clinical understanding of stenting's impact was patient-reported outcomes (PROs). Guillen et al. [11] reported a substantial increase in Villalta and CIVIQ scores, and Bakas et al. [15] reported a significant rise in quality of life despite having patent stents and physical restrictions. Nicklas et al. [23] contribute to this inconsistency and point out that permanent venous injury due to past DVT can institute permanent microvascular and lymphatic remodelling, making full functional recovery after successful recanalisation impossible. The discrepancy between imaging patency and PROs underscores the need to integrate PROMs into routine post-stent assessments rather than relying solely on duplex measures. Moreover, Comerota et al. [24] also found that PTS in general did not benefit significantly from long-term reduction in CDT. Yet, subgroup analysis demonstrated that iliofemoral DVT, which is the targeted population in the stent studies included, was beneficial. The chosen articles add to this background and show that, when combining thrombus clearance with definitive venous stenting (rather than CDT alone), symptomatic outcomes are more promising. Nonetheless, the heterogeneity of the studies prevents a direct comparison: the selected articles differ in follow-up duration, patency definition, imaging type, and selection criteria.

Strengths and Limitations.

The studies have some strengths. To start with, trials with long-term follow-up were numerous, such as Klitfod et al. [14] (44 months) and Dake et al. [16] (36 months), which enabled a robust evaluation of stent durability. Second, various cohorts used objective scoring systems such as Villalta, VCSS, and CIVIQ, which provided consistency in outcome assessment. Third, multicentre designs, such as those by Espitia et al. [12], Guillen et al. [11], and Sheng et al. [17], demonstrate greater generalisability. Several limitations do appear, however, on occasion. Most of the research was retrospective, introducing selection bias and limiting the ability to control for confounders. A wide variety of imaging modalities were used, including duplex, CT, and venography, resulting in patency being defined at the discretion of the operator. Some PTS cohorts, such as the 21 patients in Falcoz et al. [10], were small, limiting statistical power. Few studies are stratified by stent type, limiting our ability to compare stent platforms directly. Also, the methods for assessing inflow were not standardised across studies, although inflow quality is the most important predictor of outcomes. Lastly, the absence of randomised controlled trials in this area is a significant gap in evidence. Altogether, the results indicate that venous stenting is advantageous, but they depend on several factors. NIVL is the best sign; PTS shows positive results with less patency. The evolution of the device makes it better, and the quality of inflow is

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Conclusion

This review demonstrates that venous stenting is a highly effective intervention for iliofemoral venous outflow and symptom reduction in both acute and chronic venous obstruction. In all studies, stenting had a consistent positive effect on pain, oedema, functional scores, and quality of life - even in patients with widespread post-thrombotic changes. Although long-term patency was best in the NIVL, PTS patients, despite lower durability rates, also gained a considerable clinical benefit, demonstrating the hemodynamic and symptomatic advantages of restoring venous patency. The correlates of success were also comparable across all studies: quality of inflow, total thrombus clearance, and correct stent position were necessary for long-term success. Specific venous stents, such as Venovo and V-Mixtent, demonstrated better structural performance, but further research is required to confirm this in PTS-dominant populations. The heterogeneity in study design, imaging follow-up, and patency definition was also a consistent limitation to comparison. The dominance of the retrospective approach necessitates prospective, standardised trials.

Future efforts ought to concentrate on randomised comparative studies of stent types, long-term patient follow-up based on patient reports, standardised criteria for inflow evaluation, and AI-aided imaging to predict restenosis. Further studies are required to discuss a customised antithrombotic approach, biomechanical interactions between stents and veins in PTS, and how to enhance inflow rehabilitation. Development of evidence in these fields will assist in accurate patient selection, improve stent efficacy, and optimise long-term outcomes in venous reconstruction.

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