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Superficial Vein Thrombosis
A Review

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IMPORTANCE Superficial vein thrombosis (SuVT) is characterized by thrombus in the superficial veins, typically in the lower or upper extremities, and has an estimated annual incidence of 64 to 131 per 100 000 person-years. Approximately 10% of patients with SuVT progress to deep vein thrombosis (DVT) or pulmonary embolism (PE).

OBSERVATIONS Endothelial injury (caused by infection or intravenous devices), venous stasis (such as from chronic venous insufficiency or prolonged immobility), and hypercoagulability (due to cancer or pregnancy) are pathophysiologic factors associated with SuVT. Clinical risk factors for lower extremity SuVT are similar to those of DVT and PE and include pregnancy, varicose veins, and active cancer. The incidence of SuVT is greater in females than males (78-167 compared with 49-116 per 100 000 person-years). In contrast with lower extremity SuVT, upper extremity SuVT is primarily caused by indwelling intravenous catheters. Patients typically present with a tender, red, palpable cord under the skin in the upper or lower extremity. D-dimer testing has a sensitivity of approximately 48% to 74.3% and, therefore, is not reliable for excluding SuVT. Approximately 25% of patients with lower extremity SuVT present with concomitant DVT, likely because risk factors for SuVT and DVT are similar and because SuVT can extend into deep veins. In people without classic symptoms and signs of SuVT, ultrasonography can establish the presence and extent of the thrombus. Management may include elastic compression stockings and nonsteroidal anti-inflammatory drugs. For patients with SuVTs that are at least 5 cm long or those with persistent or worsening symptoms despite several days of conservative therapy, treatment includes anticoagulation with fondaparinux 2.5 mg. Alternative anticoagulation treatment includes rivaroxaban 10 mg once daily and low-molecular-weight heparins (eg, enoxaparin 40 mg once daily), which may reduce subsequent venous thromboembolic events. SuVT located within 3 cm of a deep vein should be treated with therapeutic doses of anticoagulation such as direct oral anticoagulants.

CONCLUSIONS AND RELEVANCE SuVT typically presents as a tender, painful, palpable cord under the skin. Management may include elastic compression stockings, nonsteroidal anti-inflammatory drugs, and systemic anticoagulation with fondaparinux 2.5 mg or rivaroxaban 10 mg. SuVTs within 3 cm of a deep vein should be treated with therapeutic dose anticoagulation.

Multimedia

Supplemental content

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Superficial vein thrombosis (SuVT), defined as a thrombus within the superficial veins of the lower or upper extremities, has an estimated annual incidence of 64 to 131 per 100 000 person-years.[1,2] In comparison, the incidence of deep vein thrombosis (DVT) is 147 to 179 cases per 100 000 person-years.[3,4] SuVT is most common in the great saphenous and small saphenous veins of the lower extremities and the basilic and cephalic veins of the upper extremities (**Figure 1**).[5] SuVT can also manifest in the chest wall, breasts, or penis (Mondor disease).[6] If untreated, the 45-day incidence of DVT or pulmonary embolism (PE) and extension of SuVT in patients with lower extremity SuVT can be as high as 1.3% and 3.4%, respectively.[7] This review summarizes current evidence regarding the diagnosis and treatment of SuVT.

Methods

A literature search of PubMed was conducted for English-language articles using the search terms *superficial vein thrombosis* and *superficial thrombophlebitis*. A search was conducted on September 1, 2023, for articles published between 1950 and 2023. A second search was conducted on June 9, 2025, for articles published between 2023 and 2025 (eTable 1 and eFigures 1-3 in the Supplement). For data regarding epidemiology and risk factors, larger prospective studies were prioritized. For evidence regarding treatment, randomized clinical trials (RCTs) and meta-analyses based on well-designed RCTs were prioritized. Additional articles were identified from the reference lists of articles identified during the search. Of 200 articles identified, 83 were included, consisting of 14 RCTs, 7 meta-analyses, 32 longitudinal observational studies, 29 review articles, and 1 cross-sectional study.

Discussion

Pathophysiology

SuVT, which may occur due to venous stasis, endothelial injury, and/or hypercoagulability, begins when a thrombus forms in a superficial vein near the skin surface and partially or fully obstructs blood flow (Figure 1 and **Figure 2**; eFigure 4 in the Supplement).[8-10] Nearly 45% of lower extremity SuVTs occur in patients with varicose veins.[11,12] Chronic venous insufficiency is observed in up to half of patients with lower extremity SuVT and may result from venous obstruction and/or venous valvular incompetence.[13,14] Chronic venous thrombosis may obstruct venous return through superficial veins. Venous valvular incompetence, failure of venous valves to function due to damaged venous valves or dilated veins,

Figure 1. Common Sites of Superficial Vein Thrombosis With a Brief Summary of the Pathophysiology

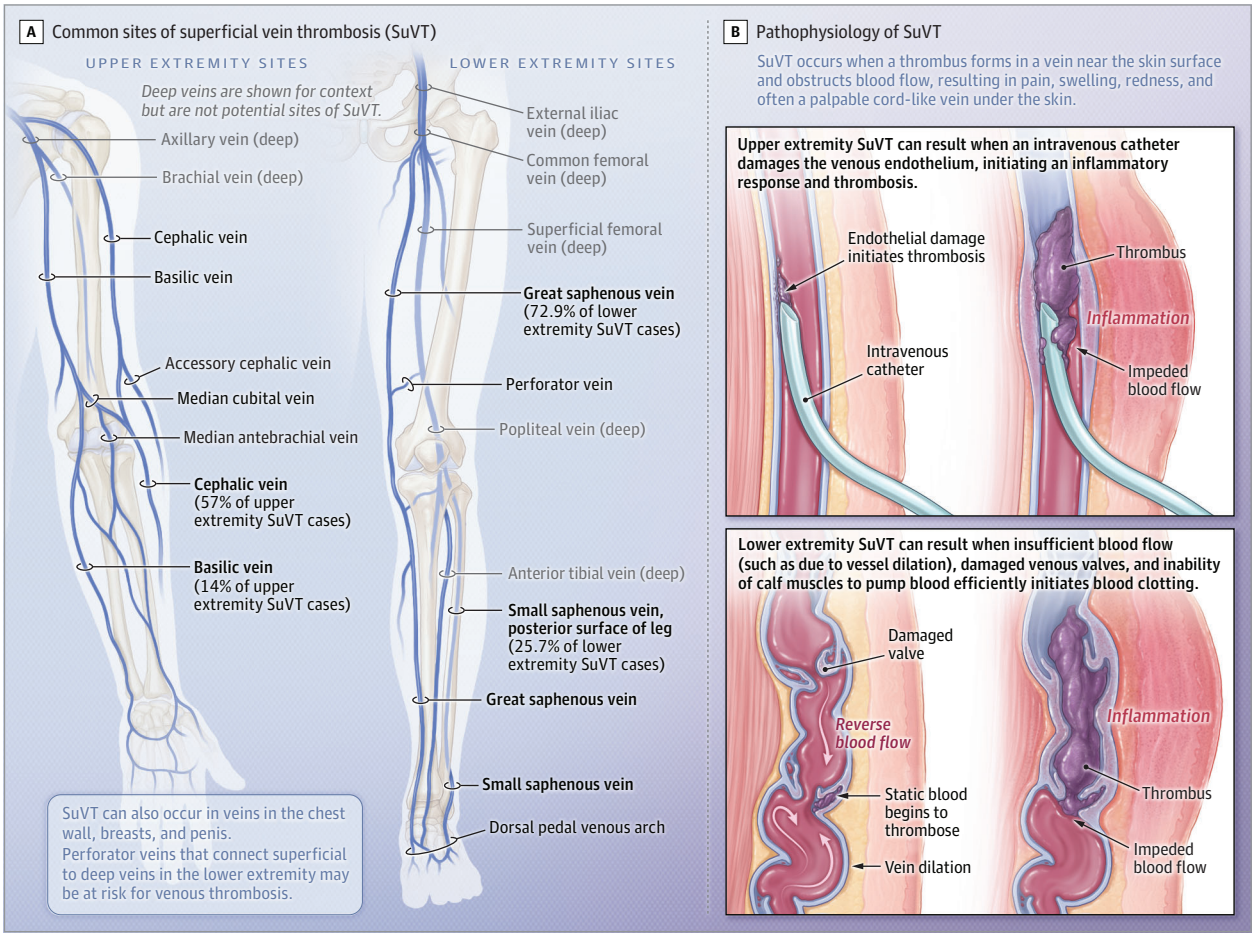
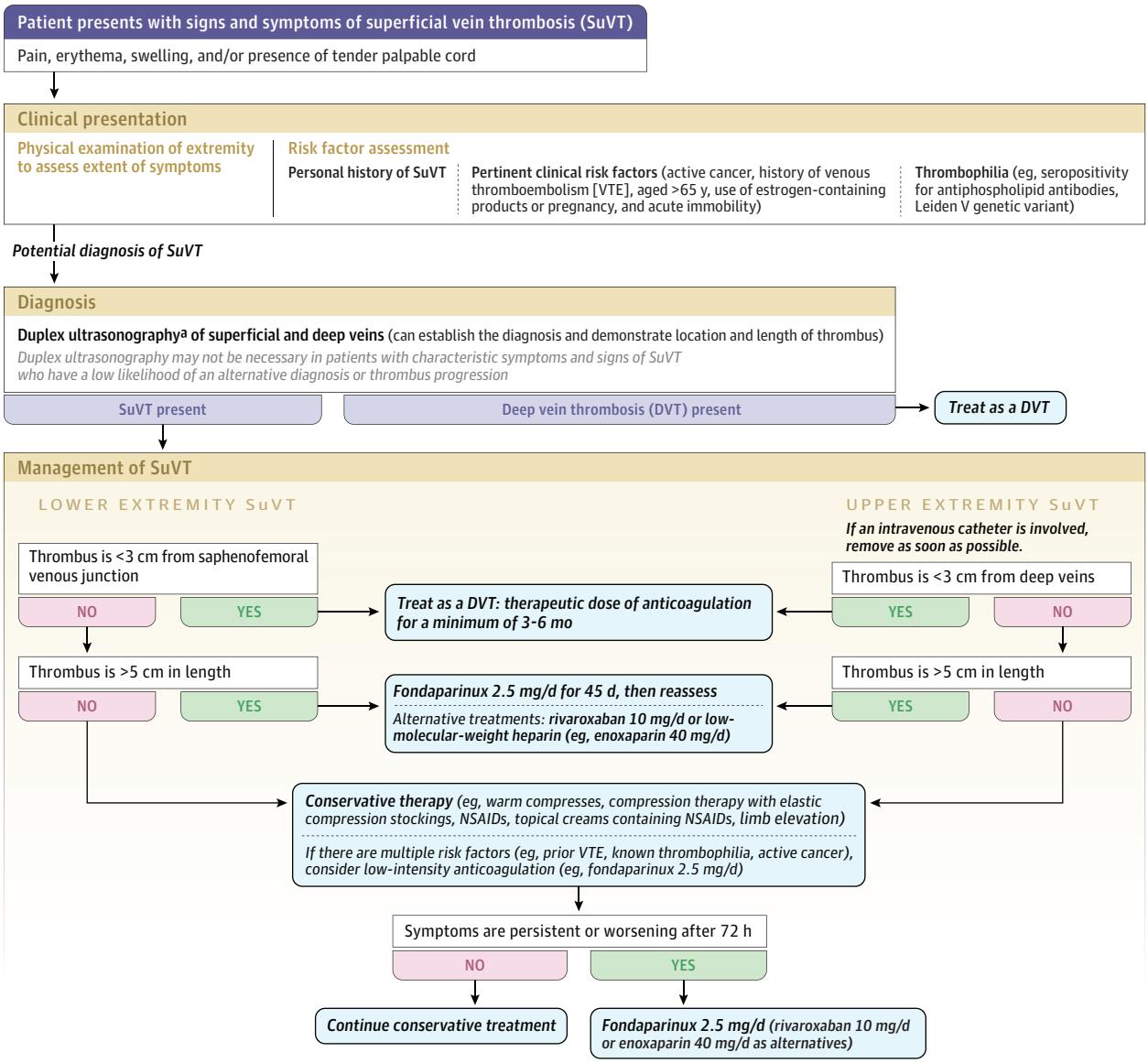


Figure 2. Flow Diagram Summarizing Approach to Diagnosis and Management of Superficial Vein Thrombosis



NSAID indicates nonsteroidal anti-inflammatory drug.

[a]Ultrasonography is considered the reference standard for evaluating and determining thrombus extension due to its accessibility, high resolution, and presumed sensitivity and specificity. However, in cases with typical symptoms and a low likelihood of alternative diagnoses, thrombus progression, or deep venous involvement, confirmatory imaging might not be required.

and the inability of calf muscles to pump blood effectively may also contribute to venous hypertension.[14,15]

Risk Factors for SuVT

Risk factors associated with SuVT include varicose veins, pregnancy, cancer, and the presence of an upper extremity catheter.[16] Other risk factors and comorbidities associated with SuVT include trauma, recent surgery, acute infection or active inflammation, history of venous thromboembolism (VTE), and age 60 years or older (**Table 1**; eTable 2 in the Supplement).[1,7,16,18-23] Approximately 6.1% to 16.6% of people diagnosed with SuVT have active cancer. Colorectal, breast, and urinary cancers are the most common cancer types associated with SuVT.[17,24,25] Inherited or acquired thrombophilia (eg, seropositivity for antiphospholipid antibodies) may also be associated with increased risk of SuVT.[26,27]

The presence of impaired venous blood return, use of oral contraceptives or hormone replacement therapy with estrogen or progesterone, immobility, and venous varicosities can contribute to the pathogenesis of SuVT.[1,7] Pregnancy is associated with increased rates of SuVT, likely related to compression of pelvic veins by the uterus, decreased mobility, increased estrogen and coagulation factors (eg, factors II, VII, VIII, IX, and XII), decreased protein S levels, and inhibition of fibrinolysis.[28-31] Risk of SuVT is highest during the postpartum period (12 weeks postpartum) compared with

Table 1. Summary of Common Risk Factors Associated With SuVT

Risk factor	Relationship to superficial venous thrombosis	Comments
Varicose veins	In a case-control study, patients with SuVT were more likely to have varicose veins than patients without (43.7% vs 5.3%; aOR, 12.1 [95% CI, 5.2-28.2]).[16]	Varicose veins are a common risk factor for lower extremity SuVT. Their association with upper extremity SuVT has not been investigated.
Malignancy	Cancer is a common comorbidity in patients with SuVT. Some,[17] but not all,[18] studies suggest a higher risk of future cancer diagnosis in those with SuVT.	While the thrombogenicity of cancer is well-known for deep vein thrombosis and pulmonary embolism, there are currently no matched cohort or case-control studies investigating malignancy as a risk factor for lower or upper extremity SuVT.
Obesity	In a case-control study, patients with SuVT were more likely to have obesity (BMI >30)[2] than patients without (36.4% vs 18.5%; aOR, 2.7 [95% CI, 1.4-5.1]).[16]	Although known as a risk factor for lower extremity SuVT, its association with upper extremity SuVT is not known.
Recent immobilization	In a case-control study, patients with SuVT were more likely to have recent immobilization due to major surgery or disease within 30 d than patients without SuVT (14.6% vs 1.3%; aOR, 22.3 [95% CI, 4.8-103.9]).[16]	Prospective data on past surgery/recent immobilization are limited for patients with upper extremity SuVT.
Pregnancy	In a retrospective cohort study, the incidence of SuVT during the antepartum and postpartum period was 0.6 (95% CI, 0.5-0.6) per 1000 person-years.[19]	Risk of SuVT is higher during the 12-week postpartum period compared with the antepartum period. Although the risk of VTE during pregnancy is well established, no matched cohort or case-control studies have evaluated pregnancy as a risk factor for SuVT of the lower or upper extremities.
Indwelling catheters	In a prospective study of 645 patients receiving indwelling catheters, SuVT was seen in 51.9% of patients, with a mean placement time of 40.7 h.[20]	Indwelling catheters are the most common risk factors for upper extremity SuVT; however, more recent prospective studies are needed to determine the quantified magnitude of risk, stratified by catheter diameter.

Abbreviations: aOR, adjusted odds ratio; BMI, body mass index (calculated as weight in kilograms divided by height in meters squared); SuVT, superficial vein thrombosis.

the antepartum period, with an incidence of 1.6 vs 0.3 per 1000 person-years, respectively.[19]

Approximately 16% to 36% of people with SuVT have obesity (body mass index >30). Approximately 40% of individuals with thromboangiitis obliterans, a small- and medium-sized vessel vasculitis associated with smoking, develop SuVT in their lifetime.[32,33]

Indwelling catheters are the primary cause of upper extremity SuVT. Large-bore catheters, specifically 14-gauge catheters that have not been changed from one site to another for more than 72 hours, are associated with a particularly high risk of SuVT.[34,35] In a prospective study of 645 patients conducted over 4 months, thrombophlebitis occurred in 40.9% of 330 patients receiving polyurethane-based cannulas and 63.5% of 315 patients receiving Teflon-based cannulas.[20] Although intravenous catheter dwell time in each group was not available, the overall mean intravenous catheter time was 40.7 hours.[20] The risk of SuVT does not significantly differ with the use of more malleable silicone-based catheters compared with polyurethane-based catheters.[36,37] In a retrospective study of 328 patients with upper extremity SuVT provoked by intravenous catheters, the most common underlying predisposing conditions were hematologic malignancies (29.6%), solid cancers (11.3%), infections or inflammatory conditions (35.1%), and hepatogastrointestinal disorders (25.3%).[38]

Epidemiology

The incidence of SuVT ranges from 64 to 131 per 100 000 person-years (eTable 3 in the Supplement). A primary care–based prospective study from France conducted between 2011 and 2012 by the Superficial Thromboembolism Prevalence High-risk (STEPH) group (n = 265 687) reported an incidence of 64 cases of lower extremity ultrasonography-confirmed SuVT per 100 000 person-years (95% CI, 55-74).[1] A retrospective cohort study that included all patients in the Utrecht General Practitioner Network in the Netherlands (n = 1 534 845) conducted from 2010-2016 reported an incidence of 131 cases of lower extremity SuVT per 100 000 person-years (95% CI, 125-137).[2]

SuVT is more common in females (incidence of 78 to 167 per 100 000 person-years) than males (incidence of 49 to 116 per 100 000 person-years),[1,2] which may be due to a higher prevalence of varicose veins in females. Approximately 50.5% of females older than 18 years have varicose veins, compared with 30.1% in males older than 18 years.[39] Pregnancy and the use of estrogen-containing hormonal contraceptives may also be associated with an increased incidence of SuVT among females.[40]

The most common sites of lower extremity SuVT are the great saphenous vein (72.9%) and small saphenous vein (25.7%) (Figure 1). SuVT located in the great saphenous vein can be identified along the entire length of the vein, which runs from the medial side of the foot up along the medial aspect of the lower leg and extends through the medial thigh, continuing to the inguinal region (where the vein drains into the deep venous system near the groin). However, SuVT originating from tributaries, which are veins that drain into the saphenous veins, especially those that connect the superficial and deep vein systems (perforator veins), may be at an increased risk of DVT (Figure 1).[41-43] Bilateral SuVT is present in 5% to 10% of patients with SuVT and is associated with prothrombotic states such as cancer or autoimmune diseases.[43,44] There is a paucity of data on the prevalence of SuVT across different racial and ethnic groups.

Clinical Presentation

Typical presenting symptoms of SuVT may include erythema, localized pain, swelling, pruritus, hyperpigmentation, and a tender palpable cord. Physical findings may show induration of the surrounding tissue.[38,45] In a retrospective study of 316 patients with lower extremity SuVT, 76.9% had localized pain in a superficial vein, 60.1% had a palpable cord, and 58.2% had erythema.[46] Patients with upper extremity SuVT may develop these symptoms along a cannulated vein.[47] However, in a study of 120 patients with cancer receiving chemotherapy who had ultrasonography performed after peripheral catheter insertion at 1 and 3 months or if symptomatic, 31 (26%) developed an upper extremity SuVT over 3 months, but only 7 were symptomatic.[48]

Table 2. Summary of Findings for Treatment of Superficial Vein Thrombosis

Intervention	Summary of findings in clinical trials	Adverse events associated with the therapy	Comments
Fondaparinux 2.5 mg for 45 d	Significantly reduced SuVT progression, PE, DVT, and recurrence. In a large RCT, with 3002 patients with lower extremity SuVT, treatment with fondaparinux 2.5 mg vs placebo for 45 d demonstrated efficacy over placebo with an absolute risk reduction of 5% (RR, 0.15 [95% CI, 0.08-0.26]).[7]	Major bleeding occurred in 1 patient (0.1%) in each group ($P > .99$).	Evidence is based on 1 large clinical trial.
Rivaroxaban 10 mg	Noninferior to fondaparinux for prevention of symptomatic events. In an RCT of 472 patients with isolated lower extremity SuVT, the primary outcomes occurred in 3.3% (7/211) of patients receiving rivaroxaban and 1.8% (4/224) of patients receiving fondaparinux (absolute difference, 1.53%; upper bound CI, 4.03%; $P = .0025$ for noninferiority).[55]	No major bleeding events were reported in either group. Clinically relevant nonmajor bleeding was reported in 6 of 236 patients (3%) in the rivaroxaban group and in 1 of 235 patients (<1%) in fondaparinux group.	Oral agent offers convenience advantage. The noninferiority margin was relatively wide (4.5% absolute/relative difference) and does not exclude a smaller significant difference between fondaparinux and rivaroxaban.
Low-molecular-weight heparin (varied doses)[a]	In an RCT, patients with lower extremity SuVT were randomized to receive 2 different doses of enoxaparin, tenoxicam, or placebo. Treatment with enoxaparin 40 mg (−2.69 [98.5% CI, −7.52 to 2.15]), enoxaparin 1.5 mg/kg (−2.62 [98.5% CI, −7.53 to 2.28]), and oral tenoxicam (not available in the US) 20 mg (−1.47 [98.5% CI, −7.09 to 4.14]) did not significantly reduce incidence of VTE/SuVT compared with placebo.[56]	One patient (0.9%) in the placebo group and 1 patient (0.9%) in the 1.5-mg/kg enoxaparin group had minor hemorrhage several weeks after discontinuation of study medication.	The trial was stopped prematurely due to slow recruitment. Several small clinical trials assessed other LMWHs not available in the US.
NSAIDs	May be effective in reducing symptoms such as pain and inflammation. Randomized trial data are limited to the tenoxicam group of the clinical trial discussed above. [56]	Limited evidence of adverse events of NSAIDs from clinical trials.	Limited clinical trial evidence.
Compression stockings	A single-center RCT involving 88 participants evaluated the effect of daily subcutaneous 40-mg enoxaparin and found that wearing thigh-length compression stockings (23-32 mm Hg) for 3 weeks, compared with no compression stockings, did not significantly reduce thrombus length (mean decrease of 12.8 cm vs 6 cm; $P = .07$) or SuVT-related pain, as measured by the Lowenberg test (mean reduction of 42.6 mm Hg vs 43 mm Hg; $P = .81$).[57]	None reported	There is currently only 1 RCT investigating compression stocking for treatment of SuVT compared with no compression stockings.
Surgical intervention	There were 2 clinical trials investigating saphenofemoral disconnection and superficial thrombectomy. The most recent study included 60 patients evaluated the effect of saphenofemoral disconnection vs LMWH. Findings showed that there was no significant difference between the groups for recurrent SuVT/VTE (10% in both groups). [58]	Ecchymosis and infection occurred in 2 patients in the disconnection group (6.7%) and none in the enoxaparin group. Minor bleeding (epistaxis and rectal bleeding) occurred in 2 patients of the enoxaparin group (6.7%), and no bleeding events occurred in the disconnection group.	Available data on surgical therapy are limited. Therefore, surgical intervention is note routinely recommended in the management of SuVT.

Abbreviations: DVT, deep vein thrombosis; NSAID, nonsteroidal anti-inflammatory drugs; PE, pulmonary embolism; RCT, randomized clinical trial; RR, relative risk; VTE, venous thromboembolism.

[a] Enoxaparin is the widely investigated low-molecular-weight heparin (LMWH).

Diagnostic Testing

Physical examination findings such as tender palpable cords associated with erythema and pain are characteristic findings for SuVT.[49] However, confirmation of suspected SuVT with duplex ultrasonography is often useful because other conditions, such as cellulitis, erythema nodosum, phlebitis without thrombosis, DVT, lymphangitis, insect bites, localized soft tissue infections, and hematomas, can present with similar signs and symptoms to SuVT.[50]

Although a D-dimer value greater than 500 ng/mL has 95% to 96% sensitivity for DVT and PE,[51] its sensitivity is lower for SuVT, ranging from 48.0% to 74.3%.[52,53] Therefore, D-dimer measurement is not widely used for screening for or excluding SuVT.[52,54]

No large diagnostic accuracy studies for consecutive and representative patients with signs or symptoms of SuVT exist. Duplex ultrasonography is considered a reference-standard test for diagnosis and assessment of the extent of thrombus extension, because it is accurate for evaluating superficial veins. However, Duplex ultrasonography may not be necessary in patients with characteristic symptoms and signs of SuVT who have a low likelihood of an alternative diagnosis or thrombus progression, such as those presenting with a small area of induration, and without cancer or other major risk factors.

Treatment

SuVT treatment may include topical treatments for symptom relief, including heparin ointment or heparin spray gel, nonsteroidal anti-inflammatory drugs (NSAIDs), and surgical procedures consisting of venous ablation or ligation. Systemic anticoagulation with fondaparinux 2.5 mg daily or rivaroxaban 10 mg daily can reduce thrombus progression and prevent future thrombotic events.[7]

Conservative Treatment

Conservative therapy includes warm compresses, compression therapy with elastic compression stockings, NSAIDs, topical creams

containing NSAIDs, and limb elevation (**Table 2**). Limb elevation and warm compresses have not been tested in high-quality RCTs.[59] Compression therapy, including elastic compression stockings, applies graduated pressure to the lower extremities with compression strength highest at the ankles and decreasing proximally. This graduated compression promotes the return of venous blood flow, reduces venous stasis and venous hypertension, and may reduce thrombus propagation.[60] A single-center RCT of 88 participants with SuVT who were treated with 40 mg of enoxaparin subcutaneously daily reported that, compared with a control group that did not receive compression stockings, thigh-length compression stockings (23-32 mm Hg) for 3 weeks did not significantly reduce thrombus length (decrease of 12.8 cm vs 6 cm; $P = .07$). Pain related to the SuVT was not significantly reduced (decrease of 42.6 mm Hg vs 43 mm Hg via the Lowenberg test by inflating a blood pressure cuff until pain is felt; $P = .81$; 4.3 cm vs 3.5 cm via the visual analog scale; $P = .33$). However, this clinical trial may have lacked adequate statistical power to detect a smaller but meaningful treatment effect on thrombus length.[57]

Topical over-the-counter treatments such as heparin ointment or spray gel may relieve symptoms. Although heparin has anticoagulant properties, when applied topically, it may reduce symptoms of inflammation such as pain, redness, or tenderness.[61,62] RCTs evaluating topical treatments have been limited by small sample size, early termination of the clinical trial, or absence of a placebo group.[63] (eTable 4 in the Supplement). Although topical medications are the most common type of treatment evaluated in RCTs for upper extremity SuVT, the studies are typically low quality and limited by a small sample size.[47,63] Topical heparin requires a prescription and is available only at specialty compounding pharmacies in the US. Therefore, NSAIDs such as naproxen or ibuprofen are typically used because they are readily available over the counter and inexpensive.

Anticoagulation

Although multiple RCTs have evaluated the effects of anticoagulation for patients with SuVT, most had small sample sizes (Table 2). The most widely studied intervention for lower extremity SuVT is systemic anticoagulation,[63] although no high-quality RCTs have evaluated anticoagulation for treating upper extremity SuVT. The Comparison of Arixtra in Lower Limb Superficial Thrombophlebitis With Placebo (CALISTO) RCT assessed the efficacy of a 45-day course of fondaparinux (2.5 mg subcutaneously once daily) vs placebo in 3002 patients with lower extremity SuVT at least 5 cm in length located more than 3 cm from the saphenofemoral junction.[7] The primary efficacy outcome was a composite of all-cause mortality, symptomatic VTE, symptomatic SuVT extension (toward the saphenofemoral junction), or SuVT recurrence by day 47. The composite outcome occurred in 0.9% of participants in the fondaparinux group vs 5.9% of those in the placebo group (relative risk, 0.15 [95% CI, 0.08-0.26]; $P < .001$). The benefit of fondaparinux was primarily due to decreased SuVT recurrence and extension.[7] Deaths occurred in 0.1% of participants in each group.[7] DVT or PE occurred in 3 patients (0.2%) treated with fondaparinux and 20 patients (1.3%) in the placebo group (absolute risk difference, −1.1% [95% CI, −1.8% to −0.5%]). Rates of bleeding were 1.0% in the fondaparinux group vs 0.9% in the placebo group.[7]

Low-molecular-weight heparin (LMWH) has been evaluated to treat SuVT. A double-blind, double-dummy RCT conducted by the Superficial Thrombophlebitis Treated by Enoxaparin (STENOX) study group compared 4 treatments: enoxaparin 40 mg subcutaneously, enoxaparin 1.5 mg/kg subcutaneously, oral tenoxicam 20 mg (a type of NSAID), and placebo. All medications were administered once daily for 8 to 12 days in patients with isolated lower extremity SuVT measuring at least 5 cm.[56] The primary outcome was incident DVT diagnosed by ultrasonography or symptomatic PE at 12-day follow-up. The trial was stopped early due to slow recruitment after 427 of the planned 1260 individuals were randomized. The incidence of DVT was 0.9% in the 40-mg enoxaparin group, 1.0% in the 1.5-mg/kg enoxaparin group, 2.1% in the tenoxicam (not available in the US) group, and 3.6% in the placebo group.[56,63] There were no statistically significant differences in rates of DVT between therapy and placebo (enoxaparin 40 mg once daily: −2.69 [98.5% CI, −7.52 to 2.15]; enoxaparin 1.5 mg/kg once daily: −2.62 [98.5% CI, −7.53 to 2.28]; and oral tenoxicam 20 mg once daily: −1.47 [98.5% CI, −7.09 to 4.14]).[56] No major bleeding events occurred.

In an RCT of 164 participants with SuVT of the greater saphenous vein randomized to receive low-dose nadroparin (0.3 mL) for 30 days or high-dose nadroparin (0.4 mL) for patients less than 50 kg and +0.1 mL per additional 10 kg for patients above 50 kg for 10 days followed by half dose for 20 days, there was no significant difference in the primary outcome of SuVT progression or VTE at 3-month follow-up (8.6% vs 7.2%; absolute risk difference, 1.4 [95% CI, −6.9 to 9.7]).[64]

A noninferiority clinical trial randomized 472 patients with symptomatic SuVT greater than or equal to 5 cm above the knee and at least 1 risk factor (eg, age >65 years, male sex, prior VTE, cancer, autoimmune disease, non–varicose vein involvement) to receive rivaroxaban 10 mg once daily or fondaparinux 2.5 mg once daily for 45 days. The primary efficacy outcome was a composite of symptomatic DVT or PE, progression or recurrence of SuVT, or all-cause mortality. The noninferiority margin was defined as an absolute difference in the primary outcome of 4.5%. At 45-day follow-up, the primary outcome occurred in 3.3% (95% CI, 1.6%-6.7%) of patients in the rivaroxaban group (7 of 211) and 1.8% (95% CI, 0.7%-4.5%) of patients in the fondaparinux group (4 of 244), indicating noninferiority of rivaroxaban compared with fondaparinux (absolute difference, 1.53%; 1-sided upper bound CI limit, 4.03%; P value for noninferiority = .003) at day 45.[55] However, the chosen noninferiority margin of 4.5% in this trial was a large absolute difference, and a smaller clinically meaningful difference in clinical outcomes was not excluded.[65] Tenoxicam and nadroparin (LMWH) are not available in the US.[8,56,64,66]

NSAIDs may reduce discomfort in patients with SuVT, although high-quality RCTs are necessary.[56] NSAIDs should be used with caution in patients taking anticoagulants to decrease the risk of gastrointestinal bleeding and other forms of bleeding.[67]

Surgical Intervention

After initiation of medical treatment, endovenous procedures, which close off or remove the lower extremity vein, may be considered to prevent SuVT recurrence, especially if venous reflux is identified on ultrasonography. Minimally invasive office-based treatments include thermal ablation (radiofrequency or laser), in which an ultrasonography-guided catheter is used to heat and close the vein, or sclerotherapy, in which liquid or foam is injected to collapse the affected superficial vein. These procedures are typically performed by

endovenous experts such as vascular surgeons, interventional radiologists, and interventional cardiologists.[68] More invasive procedures may be considered, such as surgical ligation of the great saphenous vein at the saphenofemoral junction or removal of the affected veins. An RCT of 60 patients with SuVT in veins proximal to the knee compared saphenofemoral disconnection (ligating the great saphenous vein and femoral vein) with enoxaparin (1 mg/kg twice daily for 1 day, then once daily for 21 days). Although the study did not report a prespecified and a priori powered primary outcome, clinical outcomes, including SuVT recurrence, subsequent VTE, and treatment-related complications, were assessed. There were 3 thrombotic events in both the disconnection group (1 SuVT recurrence and 2 nonfatal PE; 10%) and the enoxaparin group (3 SuVT recurrences; 10%).[58] Complications of the surgical wound, more specifically ecchymosis and infection, occurred in 2 patients in the disconnection group (6.7%) and none in the enoxaparin group. Minor bleeding (epistaxis and rectal bleeding) occurred in 2 patients (6.7%) in the enoxaparin group, and no bleeding events occurred in the disconnection group.[58]

The risk of DVT for patients with SuVT after endovenous procedures such as ablation, sclerotherapy, or ligation/stripping is unclear. A prospective, observational study of 872 patients with SuVT and no concomitant VTE found that those receiving invasive treatment within 12 months of the index event did not have a significantly higher risk of VTE at 3-month follow-up than those not undergoing invasive treatment (7.6% vs 8.1%).[69] Despite these findings, many studies lacked a comparator group, included only patients with varicose veins, and had small sample sizes, making it difficult to assess the risk of DVT.[63,70] After an endovenous procedure, enoxaparin 40 mg once daily or low-intensity direct oral anticoagulants for up to a week may be appropriate for patients at risk for VTE to prevent postsurgery DVT.[70]

Recommendations by Professional Societies

As a result of limitations of existing evidence, recommendations from professional societies about the management of SuVT are largely based on expert opinion rather than high-quality RCTs (eFigure 5 in the Supplement). Professional societies advise treatment with fondaparinux subcutaneously 2.5 mg once daily for 45 days in patients with a lower extremity SuVT that meets the following criteria: thrombus greater than or equal to 5 cm in length and greater than 3 cm away from the deep vein junction (eg, saphenofemoral junction) based on findings from the CALISTO trial.[70-73] Rivaroxaban 10 mg once daily and low-dose LMWH (no specified type) have been recommended as alternatives to fondaparinux, but high-quality evidence regarding these therapies is lacking, particularly for LMWHs.[70-73]

Prognosis

Thrombotic complications from SuVT, such as the extension of SuVT or progression to DVT, are higher in people who do not receive anticoagulation compared with those who receive anticoagulation.[74] Thromboembolic events such as DVT and PE can occur in up to 7% of patients with SuVT within 90 days after diagnosis, but whether anticoagulation therapy prevents these thrombotic events for durations longer than 45 days has not been studied in high-quality RCTs.[7,55] A prospective observational study compared rates of VTE and SuVT recurrence at 120 days in 98 patients who received variable-dose tinzaparin (175 IU/kg for extensive SuVT; 131 IU/kg otherwise) for 30 days with 49 patients who received standard-dose tinzaparin of 131 IU/kg for 90 days. Ninety days of tinzaparin was associated with fewer recurrent VTE and SuVT events (0/147 vs 15/147) (P = .004).[75] However, the study was limited by its observational design and by the lack of uniform-dose standardization in the 30-day treatment group, where some patients received only 75% of the full therapeutic dose.

People with SuVT are at increased risk of recurrent SuVT, thrombus extension, and subsequent DVT and PE. The POST study evaluated thromboembolic complications in 844 patients with symptomatic lower extremity SuVT of at least 5-cm length measured by compression ultrasonography.[43] Among 586 patients (60% of whom received anticoagulation) presenting with isolated lower extremity SuVT, at 3-month follow-up, 10.2% (95% CI, 7.7%-12.7%) developed VTE (2.1% were asymptomatic and 8.3% were symptomatic).[43] In patients with SuVT, residual reflux, consisting of retrograde blood flow in the superficial vein, may exacerbate venous insufficiency, which may lead to venous ulcers; however, to our knowledge, rates of venous ulcers in patients with SuVT have not been reported.[76]

Characteristics associated with a worse prognosis in people with SuVT include a history of cancer, history of VTE, absence of varicose veins, male sex, and SuVT involving the saphenofemoral popliteal junction. In an analysis of the multinational Registro Informatizado Enfermedad Tromboembolica (RIETE) registry, among 1140 patients with SuVT, those with cancer (n = 110) had higher 3-month odds of VTE (4.5% vs 1.9%; odds ratio [OR], 4.92 [95% CI, 1.82-12.4]), major bleeding (2.7% vs 0.3%; OR, 9.56 [95% CI, 1.63-56.2]), and death (8.2% vs 0.3%; OR, 30.3 [95% CI, 8.41-141]) compared with those without cancer (n = 1030).[77] In the POST study, among the 586 patients presenting with isolated SuVT, male sex (35.5%; hazard ratio [HR], 2.63 [95% CI, 1.42-4.86]), history of VTE (19.1%; HR, 2.18 [95% CI, 1.15-4.12]), and absence of varicose veins (13.7%; HR, 2.06 [95% CI, 1.01-4.25]) were associated with an increased risk of thrombotic events at the 3-month follow-up.[43] A pooled analysis of 2 registry studies that included 1178 patients reported that SuVT involving the saphenofemoral/popliteal junction (11%) was associated with an increased risk of VTE occurrence at 3 months compared with patients without involvement of the junction (HR, 3.23 [95% CI, 1.25-8.33]).[78] In a meta-analysis of 8 studies that included 5998 patients, 448 with malignancy and SuVT, those with cancer-associated isolated SuVT had an increased rate of VTE compared with patients without active malignancy (risk ratio, 2.57 [95% CI, 1.78-3.71]; P < .001).[79]

Patients with SuVT may present with concomitant DVT or PE. The Optimisation de l'Interrogatoire dans l'Évaluation du Risque Thrombo-Embolique Veineux (OPTIMEV) study, a prospective registry that included both inpatients and outpatients with ultrasonography confirmed SuVT, reported that 22.3% of patients with SuVT had concomitant DVT alone, 6.3% had both DVT and PE, and 0.6% presented with PE only. Three-month mortality was significantly higher in patients presenting with concomitant DVT vs those without DVT (9.3% vs 1.2%; P < .001).[24] A study from RIETE reported an increased risk of subsequent PE in patients presenting with concomitant lower limb SuVT and DVT (1.7%) compared with isolated DVT (0.9%) at a median follow-up of approximately 6 months (rate ratio, 2.12 [95% CI, 1.13-3.75]).[80] There are no high-quality data on the subsequent risk of PE in patients with upper extremity SuVT.

Box. Commonly Asked Questions About Superficial Vein Thrombosis (SuVT)

What is the typical clinical presentation of SuVT?
SuVT typically presents as a palpable, tender cord along the superficial veins. In the lower extremities, it is frequently associated with varicose veins, while in the upper extremities, it most often occurs in patients with intravascular devices such as intravenous catheters.

How is SuVT typically diagnosed?
A suggestive history (such as known varicose veins or recent placement of intravenous catheters and presence of risk factors such as prior venous thrombosis or pregnancy), physical examination findings of tender palpable cords associated with erythema and pain are often sufficient to diagnose SuVT. In patients with suspected SuVT or those with concern for proximal extension of the thrombus, ultrasonography can establish the diagnosis and assess the extent of thrombus propagation.

Does treatment of SuVT require anticoagulation?
Anticoagulation is recommended for thrombus >5 cm in length, thrombi that do not improve with conservative measures. First-line anticoagulation therapy for SuVT is fondaparinux 2.5 mg daily or rivaroxaban 10 mg daily for 45 d. Anticoagulation is also recommended for SuVT within 3 cm of a deep vein junction and should be treated similarly to deep vein thrombosis with full-intensity anticoagulation.

Practical Considerations

The diagnosis of SuVT can often be made clinically in the context of a suggestive history and physical examination. For patients in whom there is uncertainty about the diagnosis or extent of thrombi, ultrasonography should be considered (Figure 2).[12,43,80] Treatment with NSAIDs for acute SuVT is appropriate for treating pain. Patients may be treated with anticoagulation if they have greater symptom severity, thrombus size greater than 5 cm, proximity to the deep veins (ie, within 3 cm of the deep vein), and presence of underlying risk factors for propagation to the deep veins, such as male sex, cancer, and history of VTE.[12,43,80] Patients treated with topical agents for SuVT should be advised to seek medical care if symptoms do not improve within 7 days or in the case of worsening, including swelling or redness, which could indicate thrombus progression to DVT. Systemic anticoagulation for 45 days is typically considered for patients with SuVT greater than 5 cm in length or those with worsening or persistent symptoms despite conservative therapy. As detailed above, fondaparinux 2.5 mg once daily is the best studied and first-line treatment, with rivaroxaban 10 mg once daily and enoxaparin 40 mg once daily being treatment alternatives. If the SuVT is closer than 3 cm to the deep vein junctions, therapeutic anticoagulation with regimens similar to those used for management of DVT should be considered, such as therapeutic doses of direct oral anticoagulants[81] (**Box**). Follow-up ultrasonography should be performed within 1 week for patients with worsening symptoms, such as visible extension of the SuVT proximally or more diffuse extremity edema. New-onset dyspnea or chest pain in patients with SuVT should prompt evaluation for PE, typically with computed tomographic pulmonary angiography.

Limitations

This review has several limitations. First, the quality of included studies was not formally assessed. Second, relevant studies may have been missed. Third, only SuVT in the upper and lower extremities was reviewed. Fourth, few clinical trials have been performed to inform the treatment of SuVT. Fifth, some studies were not specific in distinguishing between isolated phlebitis (inflammation of the vessel wall) vs thrombophlebitis or SuVT.

Conclusions

SuVT typically presents as a tender, painful, palpable cord under the skin. Management may include elastic compression stockings, NSAIDs, and systemic anticoagulation with fondaparinux 2.5 mg or rivaroxaban 10 mg. SuVTs within 3 cm of a deep vein should be treated with therapeutic doses of anticoagulation such as direct oral anticoagulants.

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Submissions: We encourage authors to submit papers for consideration as a Review. Please contact Kristin Walter, MD, at kristin.walter@jamanetwork.org.

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